# A DIATOM CALIBRATION SET FOR THE CASCADE MOUNTAIN ECOREGION

**Prepared for**

**PACIFICORP**
**Centralia, WA**

**by**


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# TABLE OF CONTENTS

## EXECUTIVE SUMMARY

A diatom calibration set was constructed for the Washington and Oregon Cascade Range for the purpose of assessing water quality changes in Cascade lakes. The 48 lakes used for the analysis were based on 27 lakes sampled in 1996 and 21 lakes sampled previously. Among the 21 previously sampled lakes 19 were in Mount Rainier National Park. The relationship between diatom assemblages and water chemistry and other lake attributes was determined using correspondence analysis (CA) and canonical correspondence analysis (CCA). The measured environmental variables captured 90% of the variance along the first ordination axis. The amount of variance explained by subsequent axes was comparatively minor. The variables that best explained the diatom assemblages were pH, conductivity, acid neutralizing capacity, magnesium, lake depth, and total phosphorus. Among these variables, pH ($s$=0.31, $r^2$=0.89) provided the strongest predictive power for diatom-inferred (DI) reconstructions in the Cascades. Several subsets of lakes were explored to improve the pH calibration including a subset of lower pH (pH $<$ 7.5) lakes (n=38, $s$=0.27, $r^2$=0.76) and a subset excluding the lakes from Mt. Rainier (n=29, $s$=0.25, $r^2$=0.94). However, other variables such as conductivity ($s$=24.8 µS, $r^2$=0.93) and total phosphorus ($s$=5.1 µg/L, $r^2$=0.62) also show potential for future applications in the Cascades. The calibration equations were used to reconstruct water quality changes in Summit Lake, WA, a low pH (5.3-5.9), low conductivity (3-5 µS) lake northwest of Mount Rainier. The diatom-inferred pH and conductivity values showed no significant changes over the previous 3150 years within the standard errors of the predictions (0.31 for pH and 4.9 µS for conductivity). The Cascade diatom calibration set is a valuable tool for reconstructing water quality changes for a variety of purposes including changes associated with atmospheric deposition, timber harvest, fisheries management, and recreational activities. The value of the calibration set can be enhanced by collecting additional water chemistry data for lakes presently in the data base, standardizing the diatom taxonomy from samples collected prior to 1996, resolving the taxonomic ambiguities associated with taxa such as *Aulacoseira distans*, and continuing to add additional lakes to the data base.

## ACKNOWLEDGMENTS

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Assistance in collection of field samples was provided by Michael Wing and Joseph Bernert of E&S. Sediment samples from Mt. Rainier National Park were collected by Barbara Samora. Analysis of major ion chemistry was provided by the USDA Forest and Range Experiment Station in Fort Collins, CO under the direction of Louise O'Deen. Analysis of phosphorus and chlorophyll was conducted by Jim Sweet, Aquatic Analysts, Portland, OR. Kalina Manoylova, University of Louisville, assisted with the diatom counting and taxonomy. Dr. Mark Whiting performed the diatom taxonomy on slides from Mount Rainier National Park collected in 1990.

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## LIST OF TABLES

## LIST OF FIGURES

# TERMS, ABBREVIATIONS, AND UNITS

## Terms

| | |
|---|---|
| Base cations ($C_B$) | the sum of calcium, magnesium, sodium, and potassium |
| Benthic | an organism that is attached to the substrate |
| $^{14}C$ | carbon-14, a naturally-occurring isotope with a half-life of 5730 years |
| Canonical Correspondence Analysis (CCA) | a method to find linear combinations of variables such that linear combinations have maximal correlations |
| Chrysophytes | a group of algae with siliceous shells, but with different anatomical and ecological properties than diatoms |
| Correspondence Analysis (CA) | a statistical ordination procedure used to generate hypotheses about the relationship between species composition and underlying environmental factors |
| Diatom | a class of algae characterized by silicon shells that remain preserved after the death of the cell |
| Epiphyte | a plant that grows on the surface of another plant |
| Euplankton | organisms that are truly planktonic, i.e. live in the water column of a lake |
| $^{210}Pb$ | lead-210, a naturally-occurring isotope with a half-life of 20.4 years; used for determining the age of lake sediments |
| Plankton | an organism that lives in the water column |
| Root Mean Square Error (RMSE) | a statistical measure of dispersion (standard deviation) |
| $^{34}S$ | sulfur-34, a naturally-occurring isotope with a natural abundance of 4.2% |
| Trophic state | a classification of lake productivity ranging from oligotrophic (unproductive) to eutrophic (highly productive) |
| Tycoplanktonic | organisms that can live in the water column when currents move them from the substrate |
| Weighted-Averaging (WA) | a regression approach in which values with more information are weighted more heavily in computing the regression statistics |

## Abbreviations

| | |
|---|---|
| Al | aluminum |
| ANC | acid neutralizing capacity (alkalinity) |
| C | carbon |

| | |
|---|---|
| Ca | calcium |
| CA | correspondence analysis |
| $C_B$ | sum of base cations |
| CCA | canonical correspondence analysis |
| Cl | chloride |
| Cu | copper |
| DOC | dissolved organic carbon |
| Mg | magnesium |
| $NH_4$ | ammonium |
| $NO_3$ | nitrate |
| Pb | lead |
| pH | a measure of acidity; negative log of $[H^+]$ |
| S | sulfur |
| Si | silicon |
| $SO_4$ | sulfate |
| Ti | titanium |
| TP | total phosphorus |
| V | vanadium |
| WA | weighted averaging |
| Zn | zinc |

<u>Units</u>

| | |
|---|---|
| ha | hectares (0.4047 acres) |
| L | liter (0.264 gallons) |
| m | meter (0.3048 ft.) |
| $m^3$ | cubic meter ($8.14 \times 10^{-4}$ acre-ft) |
| µg/L | microgram ($10^{-6}$ g) per liter |
| µS | microSiemen ($10^{-6}$), a unit of conductance |
| µeq/L | microequivalent per liter |

## A. INTRODUCTION

Paleolimnology, the study of lake history through analysis of lake sediments, includes a variety of techniques for assessing change. In some cases, changes are inferred on the basis of chemical composition of the sediment. In other approaches, watershed changes may be inferred on the basis of changes in vegetation as determined by pollen or from changes in rates of sediment accumulation. To determine changes in lake water quality, one of the most successful approaches has involved the use of specific algal remains preserved in the sediments. These applications were first developed to assess changes in lake acidification. Atmospheric deposition of sulfur and nitrogen compounds has caused acidification of lakes and streams in the eastern United States, Canada, and northern Europe. Attempts to characterize the status of aquatic ecosystems has been hampered by a paucity of high quality, long-term, water chemistry data. In an attempt to better determine the degree of lake acidification, researchers have noted that the changes in lake chemistry can be inferred from changes in species composition of a class of algae called diatoms.

Diatoms, an important algal group in lakewaters, have cell walls composed of silica. When the cells die, their exteriors (frustules) are often well preserved and incorporated into lake sediments. By sampling the sediments, it is possible to reconstruct changes in lake chemistry based on changes in the relative abundance of the diatoms and known preferences of specific taxa for various ranges of water quality. Early use of diatoms to assess historical changes in acidification employed qualitative approaches that allowed investigators to infer the direction of the pH changes in lakes, but provided little information on the magnitude of the change. More recent advances in the field have made it possible to reconstruct quantitative changes in lake chemistry using a technique in which the downcore changes in diatom taxa are assessed using diatom information collected from the surface sediments of a number of lakes. The lakes from which the surface sediments are collected is referred to as the calibration set. The calibration set makes it possible to develop quantitative estimates of historical water quality changes through the use of multivariate statistical techniques in which a species preference for given water quality conditions is mathematically related to the water quality in the lake and the diatom taxa present in the surface sediments. However, because taxonomic preferences for specific water quality conditions vary among regions, it is necessary to develop calibration sets that are tailored for a specific region.

Diatom calibration sets have been developed for the Adirondack Mountains in New York (Charles et al. 1987, 1990), Florida (Charles et al. 1986), the Upper Midwest (Kingston et al. 1990), and the Sierra Nevada (Whiting et al. 1989). However, no calibration set was previously available for the Cascade Mountains.

## B. BACKGROUND ON DIATOM INFERENCE TECHNIQUES

In the absence of long-term chemical monitoring data, generation of statistical inferences based upon diatom, and in some cases chrysophyte, fossil assemblages preserved in lake sediments is the best technique available to evaluate historical chemical changes (Charles and Norton 1986, Smol 1992). Diatoms (Bacillariophyta) and scaled chrysophytes (Chrysophyceae, Synurophyceae) are single-cell algae composed of siliceous valves and overlapping siliceous scales, respectively. The fossil remains of these organisms are excellent indicators of past lakewater chemistry because: (1) they are common in most lakes, (2) many taxa have rather narrow ecological (water chemistry) tolerances, (3) remains are generally well preserved in sediment, usually in very large numbers, and (4) they can be identified to the species level or below (Smol et al. 1984,1986; Charles 1985; Charles and Norton 1986; Husar et al. 1991).

Paleolimnological reconstructions of past lakewater chemistry are based on transfer functions derived from relationships between current chemistry and diatom/chrysophyte remains in surface sediments. Predictive equations are developed from these relationships using regional lake data sets to infer past water chemistry. Several techniques have been developed and applied to infer lakewater pH. Calibration equations have also been developed for inferring the concentration of other constituents, including dissolved organic carbon, acid neutralizing capacity, salinity, trophic state, total aluminum, and monomeric aluminum.

Once developed, predictive equations can be applied to diatom assemblage data from lake sediment cores to infer past conditions. Trends within cores can be analyzed statistically to determine if they are significant (Birks et al. 1990). Inferred chemical data can be dated using $^{\text{lead-210}}$ ($^{210}$Pb) activity and compared with stratigraphies of other lake sediment characteristics such as pollen, charcoal, coal and oil carbonaceous particles, polycyclic aromatic hydrocarbons, lead, zinc, copper, vanatium, calcium, magnesium, titanium, sulfur, and others that provide a record of atmospheric inputs of materials associated with the combustion of fossil fuels and of watershed disturbance (Heit et al. 1981, Tan and Heit 1981, Charles and Norton 1986). With these data, in addition to knowledge of watershed events and some historical information on regional atmospheric emissions of sulfur and nitrogen, it is often possible to assess with reasonable certainty whether lakes have been affected by acidic deposition, and to what extent (Husar et al. 1991, Charles et al. 1989).

Diatom studies have documented the rates and magnitude of acidification of selected lakes in the Adirondack Mountains (Del Prete and Schofield 1981; Charles 1984, 1987; Charles et al. 1986, 1987,1990; Sullivan et al. 1990; Cumming et al. 1992), New England (Davis et al. 1983), the Upper Midwest (Kingston et al. 1990), Florida (Charles et al. 1986), the Sierra Nevada (Whiting et al. 1989), Ontario (Dixit 1983; Dixit et al. 1987,1989a,b), Sweden (Renberg and Hellberg 1982, Renberg and Wallin 1985, Renberg et al. 1993), Finland (Tolonen and Jaakkola 1983), Norway (Davis and Anderson 1985, Davis and Berge 1980), Scotland (Flower and Battarbee 1983, Flower et al. 1987), West Germany (Arzet et al. 1986), and the Netherlands (van Dam et al. 1988).

In order to interpret information contained in the sedimentary profile, it is necessary for the signal associated with the sedimentary algal microfossils not to have been modified subsequent to deposition. Approximate timing of sediment interval deposition must also be determined using radioisotope dating techniques (e.g., $^{210}Pb$) or by examining changes in other sedimentary constituents, such as pollen or charcoal, that can be correlated with documented major fires, land-clearing activities, etc.

A paleolimnological study by Davidson (1984) at experimentally acidified Lake 223 in the Experimental Lakes Area in Ontario illustrated the rapid response of diatoms to changes in water chemistry. Results from the sediment core showed close agreement with the plankton history measured in the water column. Similarly, paleolimnological inferences of recent changes in lakewater chemistry have been shown to correspond closely with measured values at three lakes near Sudbury, Ontario (Dixit et al. 1987, 1989b). Dixit et al. (1987) reconstructed the pH of Hannah, Lake, near Sudbury, using diatom remains. Between about 1880 and 1975, the inferred lakewater pH declined from about 6.0 to 4.6. After the lake was limed in 1975, its measured pH increased from 4.3 to 7.0. This increase was also reflected in the diatom-inferred values (Dixit et al. 1987). A paleolimnological investigation (Dixit et al. 1989a) of acidification and subsequent recovery of Swan Lake, near Sudbury, indicated that paleolimnological reconstructions of recent chemical change corresponded well with measured values. Also of significance were the large observed declines in trace metal concentrations coincident with pH recovery. The changes in metal concentrations did not inhibit accurate pH reconstruction. Dixit et al. (1989b) also used diatoms and chrysophytes to reconstruct the recovery of Baby Lake subsequent to the closure of the nearby (1 km distance) Conistan Smelter in 1972. Measured lakewater pH increased from 4.2 in 1972 to 6.5 in 1987. This recovery was closely mirrored by shifts in the diatom and chrysophyte species composition and inferred pH.

A number of techniques have been used to reconstruct lakewater chemistry, particularly pH, from sedimentary diatom remains. Paleolimnology as a quantitative science has evolved extremely rapidly over the past decade. Hustedt (1939) was the first to quantify diatom-pH relationships. Recognizing the strong empirical relationship between diatom distributions and lakewater pH, Hustedt defined the following pH occurrence categories:

alkalibiontic - occurring at pH values > 7
alkaliphilous - occurring at pH about 7, with widest distribution at pH > 7
indifferent - equal occurrences on both sides of pH 7
acidophilous - occurring at about pH 7, with widest distribution at pH < 7
acidobiontic - occurring at pH values below 7, with optimum distribution at pH 5.5 and below

Diatom taxa can be assigned to these various categories based on published ecological information or regional patterns of distribution. Changes in the percentages of diatom valves in each pH category within a sediment core can be used to evaluate trends in lakewater pH.

Multiple linear regression analysis of measured lakewater pH with the percentage of diatoms in each pH category has been used to develop predictive equations that typically have smaller standard errors and confidence intervals for prediction of new points than the earlier indices (Charles 1985, Huttenen and Meriläinen 1986). Other multiple regression approaches involve the use of selected taxa, or principal components of taxa (Davis and Anderson 1985, Gasse and Tekaia 1983). The standard error for inferred pH for these techniques ranges between 0.25 and 0.40 pH units (Battarbee 1984, Charles and Norton 1986). Other techniques include detrended correspondence analysis (Huttenen and Meriläinen 1986), canonical correspondence analysis (ter Braak 1986, Stevenson et al. 1989), and a multiple regression technique using both diatoms and chrysophytes (Charles and Smol 1988). ter Braak and Van Dam (1989) developed new methods using maximum-likelihood calibration based on Gaussian logit response curves of taxa against pH and on weighted averaging (WA). Oksanen et al. (1988) used weighted averaging, least squares, and maximum likelihood to calculate pH optima and tolerance of diatom taxa, and then used these estimates to predict pH of other lakes, using weighted averaging. Birks et al. (1990) suggested using the straightforward but heuristic approach of weighted averaging regression and calibration as a compromise between ecological realism and computational feasibility.

Diatoms and chrysophytes differ somewhat in their ecological characteristics and both can provide useful qualitative and quantitative information regarding temporal trends in the acid-base status of lake water. Chrysophytes are euplanktonic; diatoms are both planktonic and benthic, but the diatom flora of low pH (< 5.5) lakes are dominated by benthic forms (Battarbee 1984, Charles 1985, Charles and Smol 1988). Chrysophytes usually bloom in spring. Although planktonic diatoms are also most abundant in spring, most littoral species are common throughout spring and summer (DeNicola 1986, Jones and Flower 1986, Charles and Smol 1988). Thus, chrysophyte assemblages may provide a better reflection of spring snowmelt pH depressions. Chrysophyte assemblage composition seems to change more rapidly than diatom assemblages along the pH gradient for pH values ≤ 5.5, and are, therefore, particularly useful indicators in this range. Chrysophyte scales are not always present in sufficient quantity and variety to be useful, however. We have found chrysophytes to be scarce in several Pacific Northwest lakes. For this reason and also because diatom inference equations have lower root mean square error (Sullivan 1990), we used diatoms for pH reconstructions in Cascade Mountain lakes.

By late 1986 (as the Paleoecological Investigation of Recent Lake Acidification [PIRLA-I] project was ending), category-based, multiple regression techniques were being replaced by theoretically superior gradient analysis techniques. The theory involved has been summarized, elaborated, and implemented primarily by ter Braak (ter Braak 1985,1986,1987a,1988; ter Braak and Barendregt 1986; ter Braak and Looman 1986; ter Braak and Gremmen 1987; ter Braak and Prentice 1988). Gradient analysis theory is based on a species-packing model along environmental gradients, assuming a simple normal distribution of each species' abundance in samples along the gradient. Although much of ter Braak's research concerns multivariate analysis of several environmental gradients simultaneously (primarily by ordination techniques), the potential for application of these methods to the reconstruction of single environmental variables was recognized as a desirable goal in acidification paleolimnology (Stevenson et al. 1989, ter Braak and van Dam 1989, Birks et al. 1990, Kingston and Birks 1990, Dixit et al., l989a). With the availability of the computer programs CANOCO (ter Braak 1987b) and WACALIB (Line and Birks 1990) to implement gradient analysis theory, there is now little justification for using the previous category techniques.

Given the unimodal response model, several comparisons have been made between different implementations, primarily comparing maximum likelihood and weighted averaging methods. Although it was expected that maximum likelihood, implemented by Gaussian regression, would be superior to the computationally simpler weighted averaging method, this has not proven to be true (Oksanen et al. 1988, ter Braak and van Dam 1989, Birks et al. 1990, Kingston and Birks 1990). Problems with maximum likelihood implementation include the tendency to find local maxima rather than overall maxima in the data and a significant number of samples failing to converge (the numerical procedure is unable to pick a single most likely value). There was also no indication that there are fewer errors than associated with weighted averaging.

Paleolimnological inferences are performed in two steps, regression and calibration. In the regression step, curves are fitted to each taxon's distribution, and the properties of the estimated optimum ($\hat{u}_k$) and estimated tolerance ($\hat{t}_k$) can be determined. The calibration step may be subdivided further between active samples (with associated environmental data) and passive samples (without associated environmental data). The algal assemblage in each active surface-sediment sample is used to obtain a single estimated value based on the optima, with or without tolerance down-weighting, and the relationship between predicted and observed environmental values emerges for the entire set of active samples. In the next calibration step, that of paleolimnological reconstruction, passive samples (sediment core samples) are used to obtain predicted environmental variable values, based on their taxa having the same characteristics as obtained for the active taxa in the regression step.

## C. METHODS

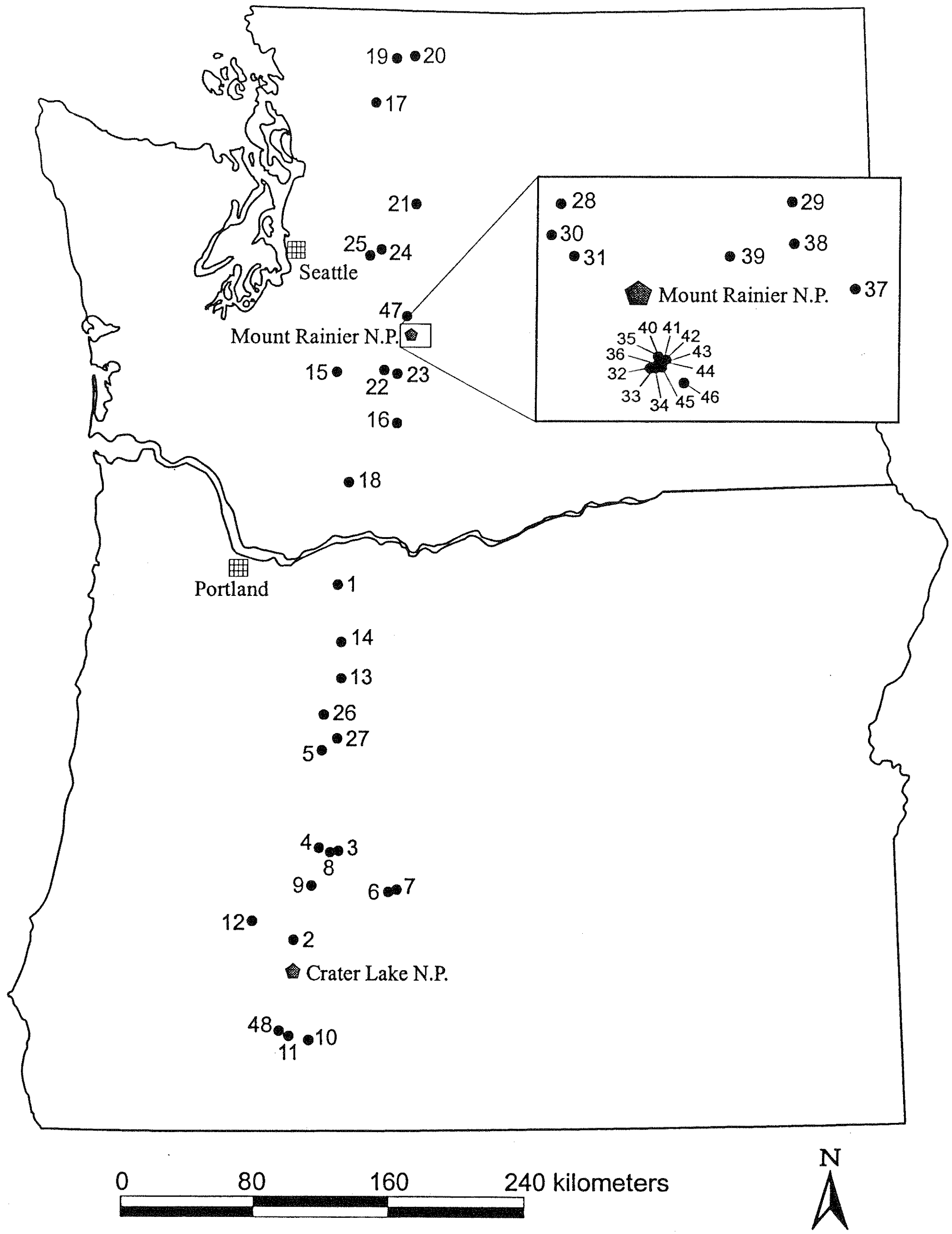
### 1. Lake Selection

Twenty-five lakes were initially selected in the Oregon and Washington Cascades for sampling. This initial list was modified slightly to accommodate access problems. In addition, several changes in the list were made to provide for better geographical distribution and better representation along chemical gradients. The results from these lakes were combined with previously collected diatom and water chemistry data from other selected lakes in the region including data on 19 lakes and ponds in Mount Rainier National Park and two lakes previously reported for the Oregon Cascades (Eilers et al. 1996a,b), bringing the total number of lakes in the calibration set to 48. The 27 lakes sampled in 1996 were selected to provide adequate spatial distribution along the length of the Cascade Range. Particular emphasis was placed on selecting lakes that represented a broad range in pH (4.95-8.44), base cations (13-8246 µeq/L), and nutrients. The final list of study lakes is presented in Table 1 and their locations are shown in Figure 1. The study lakes provide a suitable representation of lakes in the Cascade Range based on cumulative frequency distributions of lakes in the study area (Figures 2-8).

**Table 1.** Study lakes for the diatom calibration set.

| Lake | Core Date | Taxonomy | Reference |
|---|---|---|---|
| A. Newly Sampled Lakes | | | |
| Suttle Lake | 11/9/96 | R. Sweets | This Study |
| Marion Lake | 10/7/96 | R. Sweets | This Study |
| Sphagnum | 9/8/96 | R. Sweets | This Study |
| Nordrum | 9/8/96 | R. Sweets | This Study |
| Caskey Lake | 9/6/96 | R. Sweets | This Study |
| Dumbbell Lake | 8/23/96 | R. Sweets | This Study |
| Shellrock Lake | 8/23/96 | R. Sweets | This Study |
| Heather Lake | 8/22/96 | R. Sweets | This Study |
| Pyramid Lake | 8/21/96 | R. Sweets | This Study |
| Middle Thornton | 8/20/96 | R. Sweets | This Study |
| Unnamed | 8/14/96 | R. Sweets | This Study |
| Gertrude Lake | 8/13/96 | R. Sweets | This Study |
| Cora Lake | 8/12/96 | R. Sweets | This Study |
| Head Lake | 7/30/96 | R. Sweets | This Study |

| Table 1. Continued. | | | |
|---|---|---|---|
| Lake | Core Date | Taxonomy | Reference |
| Summit Lake, OR | 7/30/96 | R. Sweets | This Study |
| Little Twin Lake | 7/26/96 | R. Sweets | This Study |
| Agency Lake | 7/25/96 | R. Sweets | This Study |
| South Heavenly Twin | 7/25/96 | R. Sweets | This Study |
| Lucky Lake | 7/24/96 | R. Sweets | This Study |
| Charlton | 7/24/96 | R. Sweets | This Study |
| Paulina | 7/23/96 | R. Sweets | This Study |
| East Lake | 7/23/96 | R. Sweets | This Study |
| Big Lake | 7/9/96 | R. Sweets | This Study |
| Lava Lake | 6/20/96 | R. Sweets | This Study |
| Mink Lake | 6/20/96 | R. Sweets | This Study |
| Diamond Lake | 6/14/96 | R. Sweets | This Study |
| Burnt Lake | 6/8/96 | R. Sweets | This Study |
| B. Previously Sampled Lakes | | | |
| Summit Lake, WA | 8/24/95 | R. Sweets | Eilers et al. 1996a |
| Unnamed Lake3 | 9/3/91 | R. Sweets | This Study |
| Unnamed Lake4 | 9/3/91 | R. Sweets | This Study |
| Unnamed Lake1 | 8/20/91 | R. Sweets | This Study |
| Unnamed Lake2 | 8/16/91 | R. Sweets | This Study |
| Unnamed Lake5 | 8/14/91 | R. Sweets | This Study |
| Unnamed Lake6 | 8/14/91 | R. Sweets | This Study |
| Unnamed Lake7 | 8/14/91 | R. Sweets | This Study |
| Unnamed Lake8 | 8/13/91 | R. Sweets | This Study |
| Unnamed Lake9 | 8/13/91 | R. Sweets | This Study |
| Unnamed Lake10 | 8/12/91 | R. Sweets | This Study |
| Lake Notasha | 8/3/91 | S. Dixit | Eilers et al. 1996b |
| Snow Lake | 9/27/90 | M. Whiting | National Park Service (unpubl. data) |
| Tipsoo Lake | 9/25/90 | M. Whiting | National Park Service (unpubl. data) |
| Shadow Lake | 9/25/90 | M. Whiting | National Park Service (unpubl. data) |
| Reflection Lake B | 9/12/90 | M. Whiting | National Park Service (unpubl. data) |
| Upper Palisades L | 9/5/90 | M. Whiting | National Park Service (unpubl. data) |
| Sunrise Lake | 9/4/90 | M. Whiting | National Park Service (unpubl. data) |
| Mowich Lake | 8/27/90 | M. Whiting | National Park Service (unpubl. data) |
| Green Lake | 8/26/90 | M. Whiting | National Park Service (unpubl. data) |
| Reflection Lake A | 8/13/90 | M. Whiting | National Park Service (unpubl. data) |




| | | | | |
|---|---|---|---|---|
| 1 Burnt | 11 South Heavenly Twin | 21 Heather | 31 Unnamed | 41 Unnamed |
| 2 Diamond | 12 Little Twin | 22 Dumbbell | 32 Reflection | 42 Unnamed |
| 3 Lava | 13 Head | 23 Shellrock | 33 Unnamed | 43 Unnamed |
| 4 Mink | 14 Summit, OR | 24 Spagnum | 34 Reflection | 44 Unnamed |
| 5 Big | 15 Cora | 25 Nordrum | 35 Unnamed | 45 Unnamed |
| 6 Paulina | 16 Gertrude | 26 Marion | 36 Unnamed | 46 Snow |
| 7 East | 17 Caskey | 27 Suttle | 37 Tipsoo | 47 Summit |
| 8 Lucky | 18 Unnamed | 28 Green | 38 Sunrise | 48 Notasha |
| 9 Charleton | 19 Middle Thornton | 29 Upper Palisades | 39 Shadow | |
| 10 Agency | 20 Pyramid | 30 Mowich | 40 Unnamed | |

Figure 1. Location of lakes in the Cascade Diatom Calibration Set. The inset for Mt. Rainier National Park reveals details of lake locations within the park.

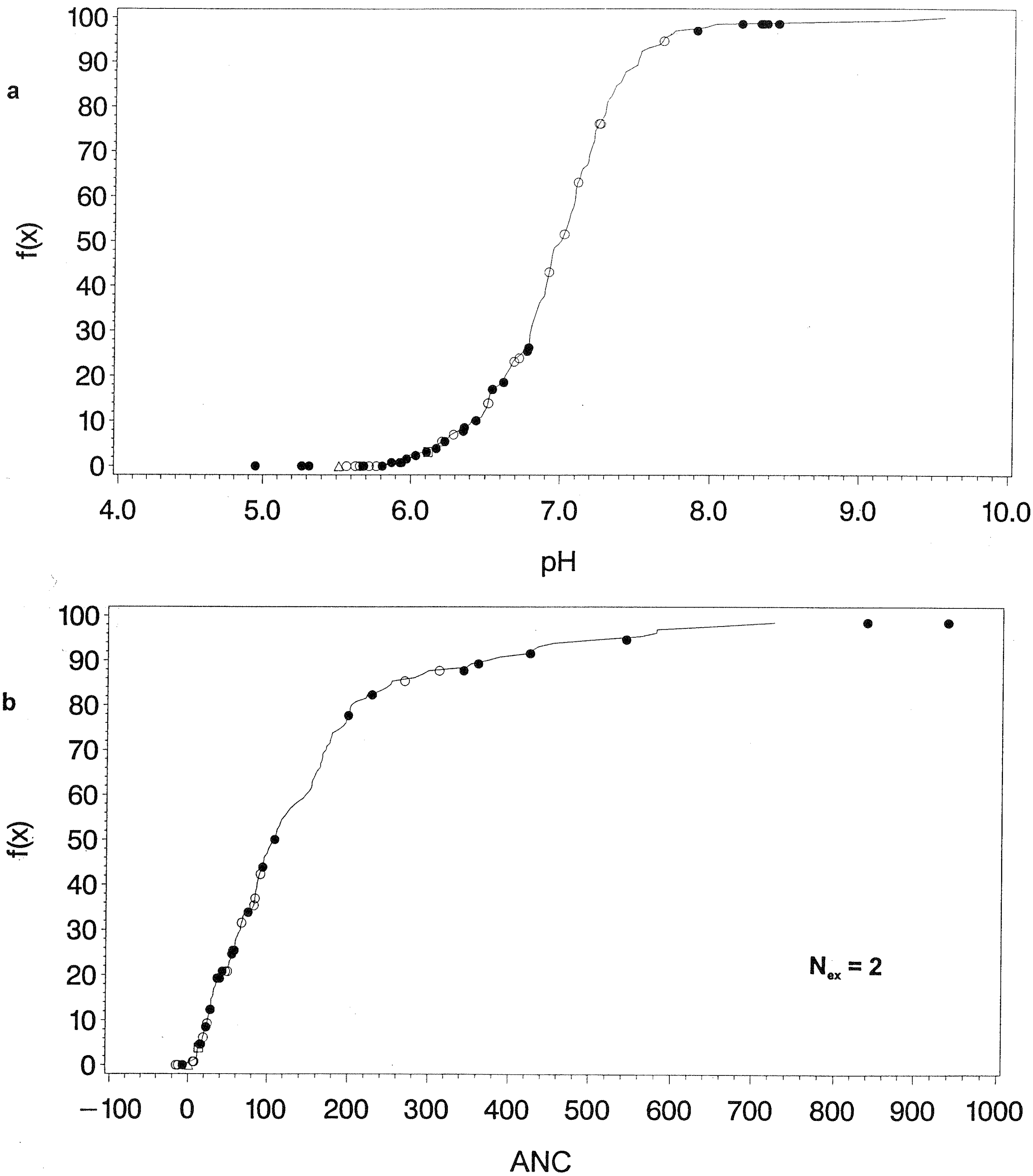



Figure 2. The distribution of Cascade diatom calibration set lakes superimposed over the cumulative frequency distribution of pH (a) and acid neutralizing capacity (ANC; µeq/L) (b) for the lake population in the Oregon and Washington Cascades as defined in the Western Lake Survey (Eilers et al. 1987). The solid circles (●) represent lakes sampled in 1996. Lakes sampled prior to 1996 include those in Mount Rainier National Park (○) and two lakes sampled by Eilers et al. (1996a [△], b[□]). The distribution for some variables has been truncated. The number of lakes extending beyond the displayed population distributions is indicated as $N_{ex}$.

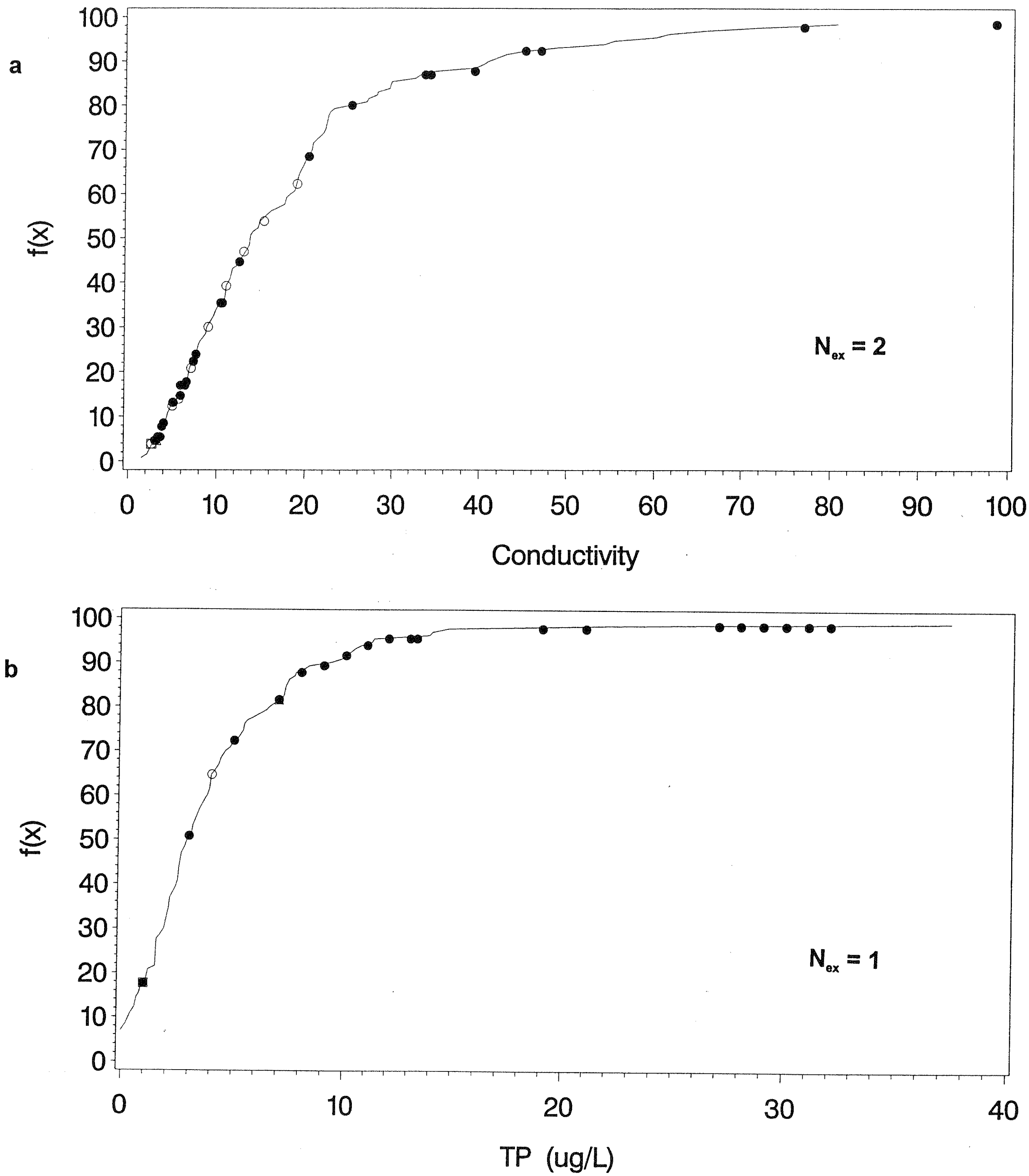



Figure 3. The distribution of Cascade diatom calibration set lakes for a) conductivity (µS); b) total phosphorus (TP; µg/L).

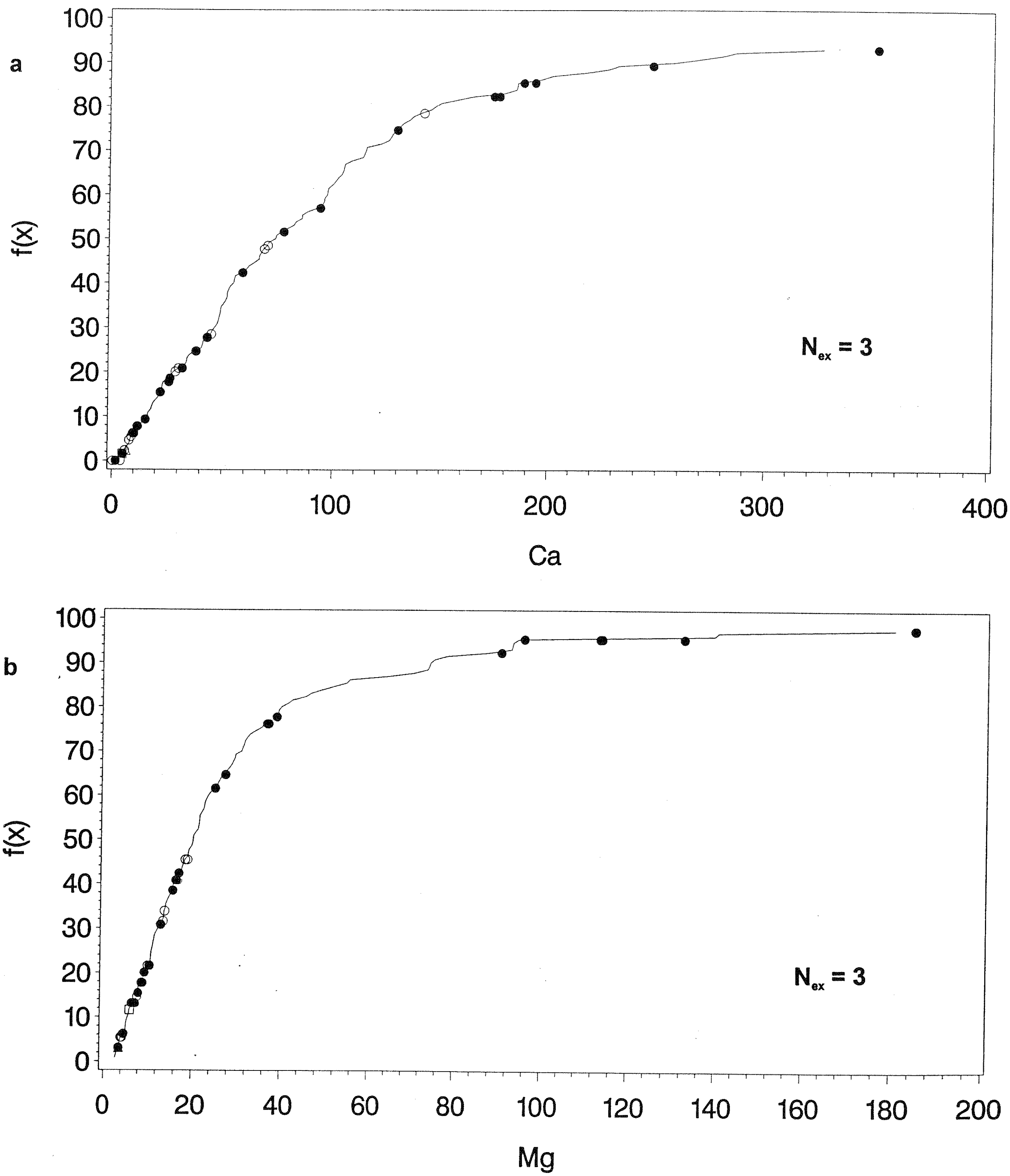



Figure 4. The distribution of Cascade diatom calibration set lakes for a) calcium (μeq/L); b) magnesium (μeq/L).

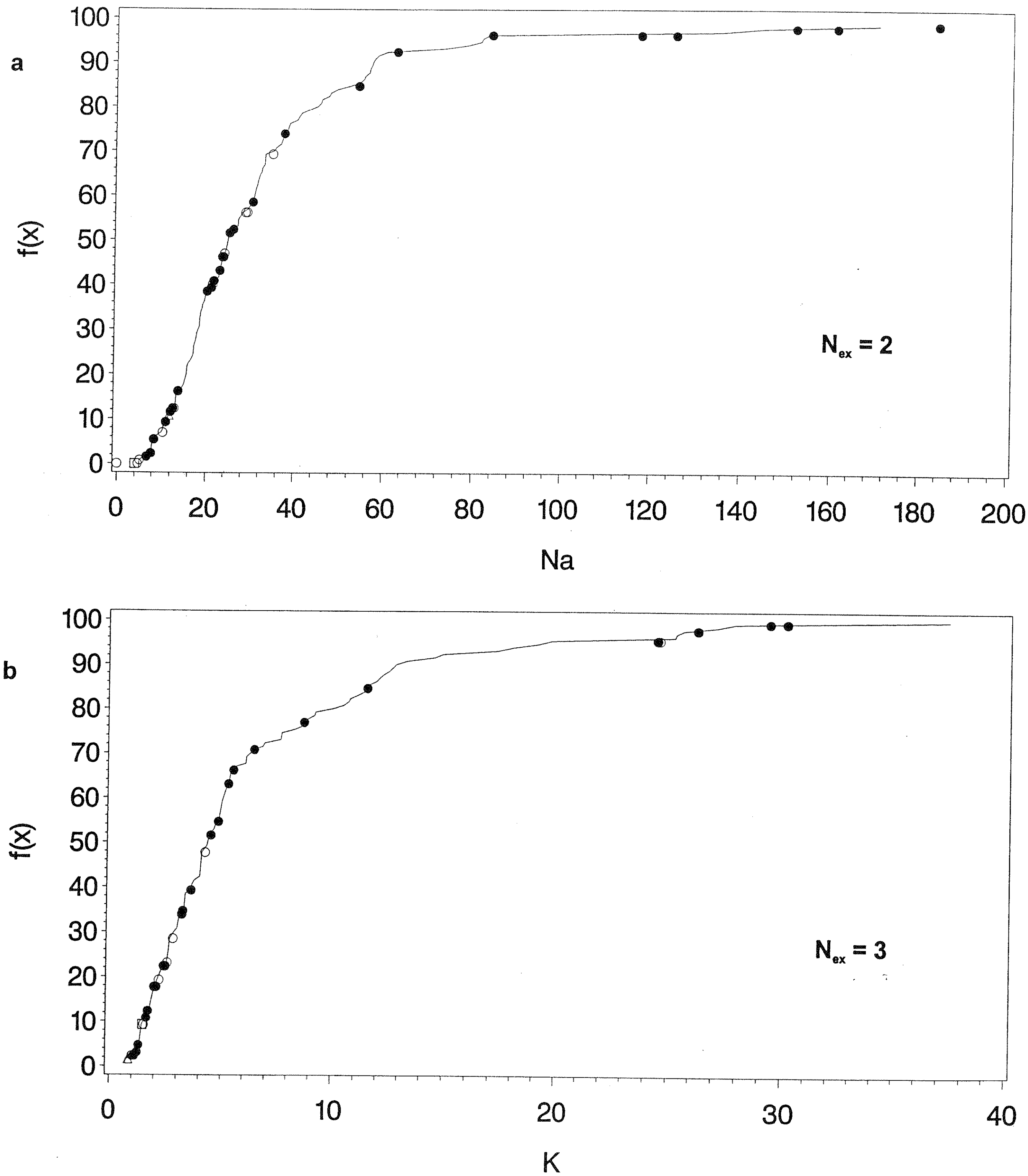



Figure 5. The distribution of Cascade diatom calibration set lakes for a) sodium (µeq/L) ; b) potassium (µeq/L).

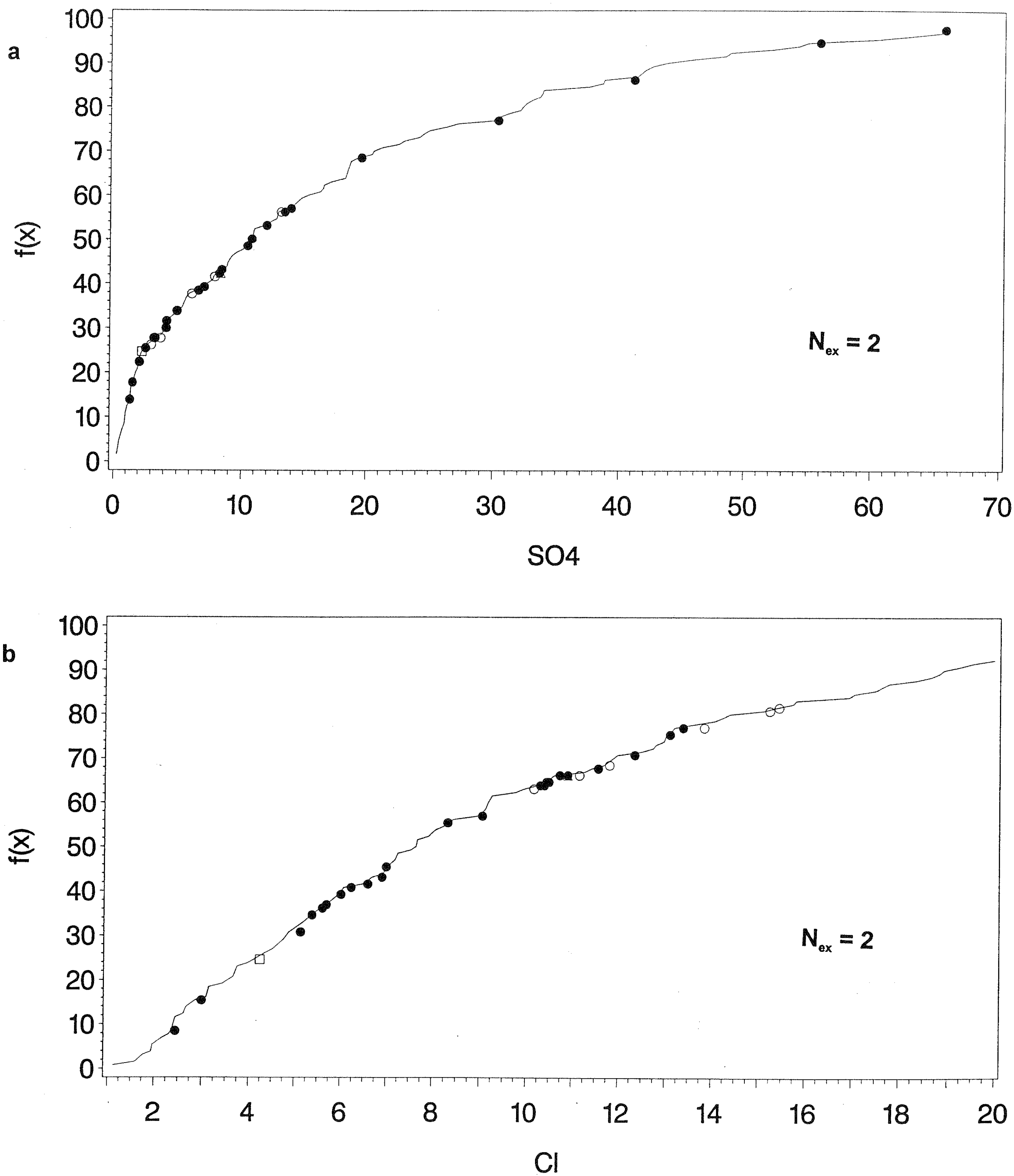
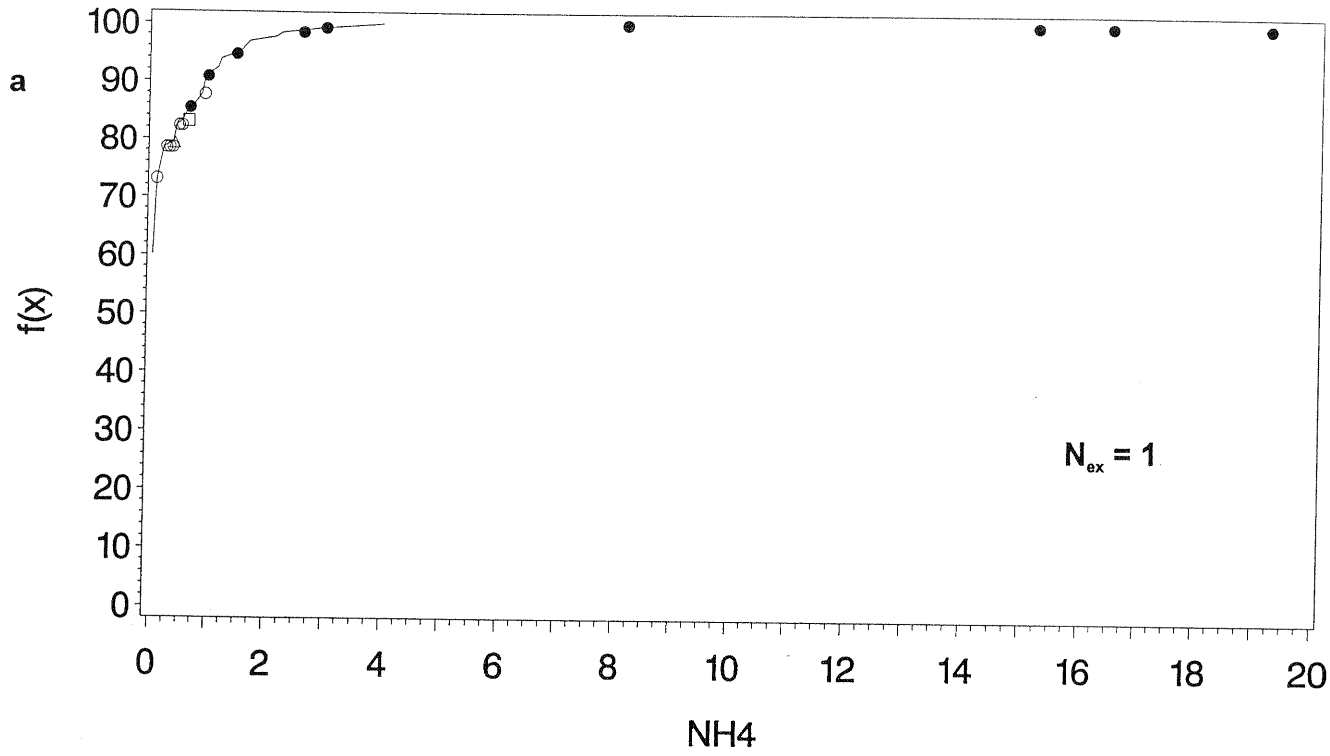



Figure 6. The distribution of Cascade diatom calibration set lakes for a) sulfate (µeq/L); b) chloride (µeq/L).



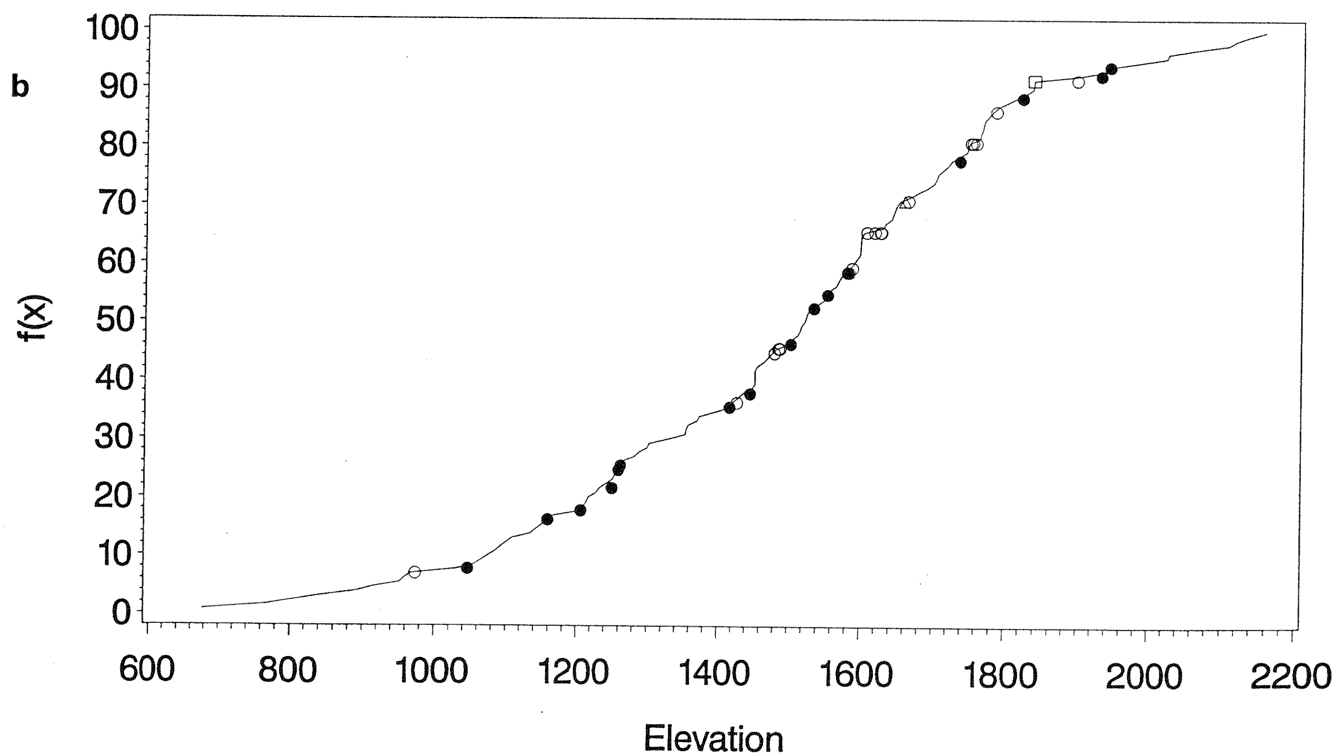
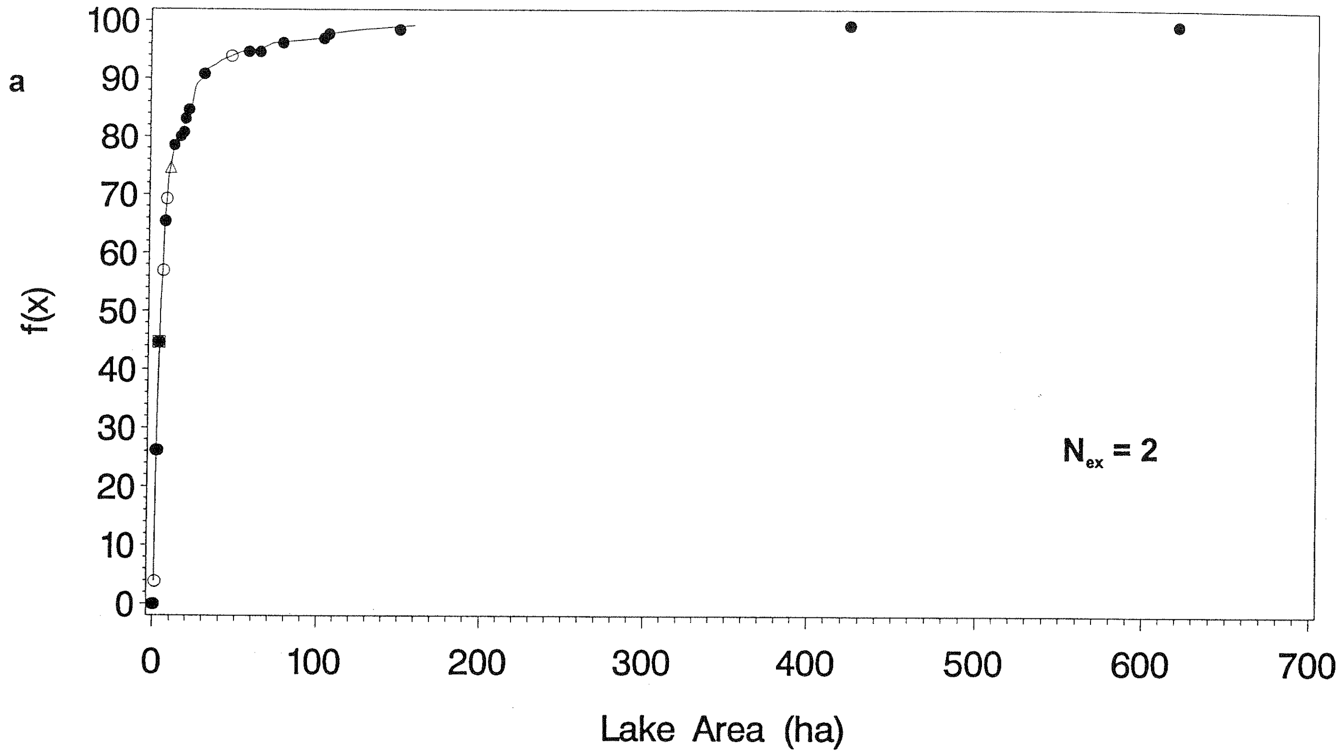




Figure 7. The distribution of Cascade diatom calibration set lakes for a) ammonium (μeq/L); b) elevation (m).



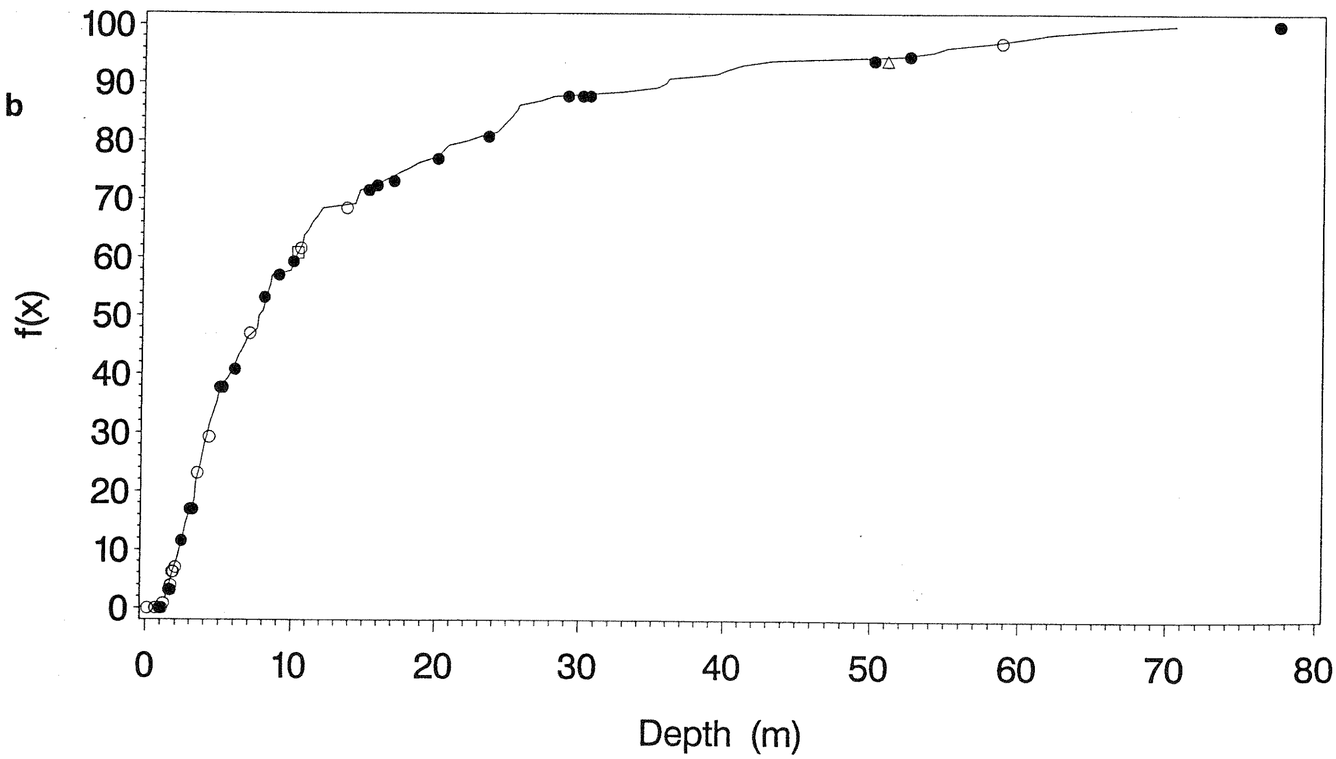




Figure 8. The distribution of Cascade diatom calibration set lakes for a) lake area (ha); b) depth (m).

## 2. Field and Analytical Methods (1996)

Twenty seven lakes were sampled during the summer and fall of 1996 (Table 1). From each lake, a short sediment core (< 20 cm) was collected from the deeper areas in the lakes using a mini-Glew corer. The cores were extruded on site and a section of sediment was removed from the top 0.5 cm of the core for analysis of diatoms. A 1-L water sample was collected from 0.5 m below the surface and placed in a Nalgene bottle and stored on ice. Four aliquots were collected from each lake for analysis of major ions, phosphorus, chlorophyll *a*, and phytoplankton. The phosphorus aliquot was preserved with sulfuric acid, the chlorophyll was preserved with magnesium bicarbonate, and the phytoplankton was preserved with Lugol's solution. Phytoplankton samples were archived for possible future analysis. Water samples were shipped via overnight courier to the Rocky Mountain Forest and Range Experiment Station laboratory in Fort Collins, CO for analysis of acid-base chemistry. Water samples were analyzed for pH, ANC, conductivity, calcium, magnesium, sodium, potassium, ammonium, sulfate, nitrate, chloride, total phosphorus, and chlorophyll *a*. Analytical methods are summarized in Table 2. Separate aliquots were sent to Aquatic Analysts in Portland, OR for analyses of chlorophyll *a* and phosphorus. The sediment samples were sent to the University of Louisville for analysis of diatom taxonomy. The sediment samples were placed on slides and digested to facilitate counting and identification of diatoms. The

**Table 2.** Analytical methods for analysis of lake samples collected in 1996 for the diatom calibration set.

| Analyte | Method Description | Laboratory |
|---|---|---|
| pH | ARAS | USDA - Fort Collins |
| ANC | ARAS, Gran titration | USDA - Fort Collins |
| Ca, Mg, Na, K | Atomic absorption | USDA - Fort Collins |
| $SO_4$, Cl, $NO_3$ | Ion chromatography (Dionex) | USDA - Fort Collins |
| Conductivity | Specific conductance meter | USDA - Fort Collins |
| Total Phosphorus | Ascorbic Acid | Aquatic Analysts |
| Chlorophyll *a* | Trichromatic | Aquatic Analysts |

The treatment of the diatom data followed the protocols established in the PIRLA program (Charles and Whitehead 1988, Charles and Smol 1990), in which 500 individuals were counted per slide. The data were entered into a data base and calibration equations were developed for pH and other related variables using weighted averaging calibration techniques as described below.

### 3. Diatom Taxonomic Identification

Laboratory procedures for diatoms generally followed those used in the PIRLA project (Whitehead et al. 1990). Surface sediment material (typically the top 0.5 cm) was homogenized by gentle working and at least a 1 cc sample extracted for analysis. The organic material was removed by digestion in a strong acid with a catalyst, such as nitric acid and potassium dichromate. The remaining material was almost completely made up of the diatoms' siliceous cell walls. The resulting solution was quantitatively, randomly settled on cover slips using Battarbee trays (Battarbee 1973), and subsequently mounted in Hyrax. Five hundred diatom valves were identified to the lowest possible taxonomic level at 1000X.

For this project, surface sediments from 27 Cascade lakes were collected and the diatoms enumerated by P.R. Sweets. In addition, slides and counts were obtained from an earlier project on lakes from Mt. Rainier conducted by M.C. Whiting as described above. The diatoms from 10 of these lakes were also counted by P.R. Sweets with assistance from K. Manoylova. Nine counts were imported directly from Whiting's data. Two more Northwest lakes (Summit [Eilers et al. 1996a] and Notasha [Eilers et al. 1996b]) were added from previous projects performed by Sweets and Eilers. The melding of these two data sets was performed to enlarge the available calibration data set and to increase the ranges of important environmental parameters.

More than 450 diatom taxa (Appendix 1) were identified from the total calibration set. This large data set was reduced for ordination and modeling. Typically rare taxa are removed, or taxonomic uncertainties are eliminated by 'lumping' some groups of taxa. This latter procedure was done in some cases due to the combining of the Sweets and Whiting datasets. For the Cascades, a minor compression of the data set was performed by choosing important taxa using several criteria:

if the taxon occurred in at least 10% of the sample lakes (5-6) at a frequency of 1% or higher; if the taxon had a maximum percentage in any lake of 10% or greater; and if the taxon occurred in any percentage in 15% of the sampled lakes (10). Taxa fitting any of these three criteria were always admitted to the analytical taxon list (Appendix 2). Each taxon was then examined individually for its occurrence to ensure important taxa were included in the analytical dataset. An example of how a taxon might be introduced into the analytical dataset after the initial screening might be: small taxonomic splits (varieties of species) may result in a low individual frequency in any one lake. However, these species nearly always occur together. In this case, the varieties may be combined to make up a 'lumped' taxon and admitted to the dataset. Or, a lumping procedure may be done purely on the basis of taxonomy or uncertainty, perhaps due to the combination of counts from two individuals.

Many taxonomic references are used, but among the most important are Patrick and Reimer (1966, 1975), Camburn et al. (1986), the series of Krammer and Lange-Bertalot (e.g. 1986), and the many works of F. Hustedt (e.g., 1939). A photographic record is collected of the known and unknown diatom species, digitized, and used for subsequent identifications.

For the Cascade diatom calibration set, taxonomic issues are particularly important, as previous work on these lakes is not described in the literature. A large number of unknown species were identified from the 48 lakes, and taxonomic work is still required to resolve several taxonomic issues. Indeed, more than 60 of the 450 taxa (13.3%) are listed as `unknown' species. However, in the context of an ordination and modeling project, the crucial taxonomic criterion is that taxa are consistently identified. In most cases, therefore, the fact that taxa are previously undescribed does not affect the resulting statistical tests and models, so long as the taxonomic naming convention is internally consistent. In Appendices 1 and 2, the unknowns are identified by the project in which they were first observed. The many taxa identified as, e.g., '*Cymbella* sp. 6', were first delineated during the PIRLA project (Charles et al. 1986). Another common form is `*Achnanthes* sp. PRS 0A project: Cascades', a form identified by P.R. Sweets during the Cascades project.

When identifications from two different taxonomists at different times are mixed, unknown taxa may become more of a problem. Whiting and Sweets have worked together in the past, however, and in general, these problems are minimized in this project. For example, many of the unknown taxa were described during the PIRLA project and pictures of the taxa in question were reproduced in Camburn et al. (1986). Both Whiting and Sweets were active in this project, so most of these taxa are uniformly identified.

However, there are a subset of unknown taxa seen by Whiting that exist in the lakes from which his counts were directly imported into the dataset (these are typically identified as the highest PIRLA numbered unknowns). For these, the original descriptions were not available, and the slides themselves were only located recently. Further work on harmonizing these unknown taxa or replacement of the Whiting counts with Sweets counts may improve the dataset. The individual cases are discussed in the next section.

## 4. Inference of Water Quality Characteristics Using Weighted Averaging (WA)

Weighted averaging regression and calibration, robust, computationally-simple, and straightforward methods for reconstructing environmental variables were used to develop calibration equations. They provide more accurate and precise inference than methods based on ecological categories (Birks et al. 1990). This approach is effective primarily because it uses information provided by each individual taxon, and not just abundance-weighted mean, $\hat{u}_k$, estimated as:

$$\hat{u}_k = \sum_{i=1}^{n} y_{ik} x_i / \sum_{i=1}^{n} y_{ik} \qquad (1)$$

The fundamental assumption of the WA technique is that the weighted average of a taxon represents the conditions for which this taxon is most abundant. This `optimum' condition for each taxon can be calculated as the average of mean values for the environmental characteristics (e.g., water chemistry) at the sites in which it is found, weighted by the abundance of the taxon at the sites, namely:

$$\hat{t} = \sqrt{\sum_{j=1}^{n} y_{ik}(x_j - \hat{u}_k)_2 / \sum_{j=1}^{n} y_{ik}} \qquad (2)$$

Once WA values for an environmental characteristic (e.g., water pH) were calculated for taxa in a calibration data set, the information was used to infer that characteristic from lake samples and consequently to reconstruct past conditions. The first step was to determine the percent abundance of each taxon in the sample assemblages. The taxon abundance was then multiplied by the WA value for that taxon (determined from the calibration data set). These products are summed for all taxa and are standardized by the sum of the relative abundances of the taxa in that sample to obtain an inferred value, namely:

$$\hat{x}_i = \sum_{k=1}^{m} y_{ik}\, \hat{u}_k / \sum_{k=1}^{m} y_{ik} \qquad (3)$$

where $\hat{x}_i$ is the water chemistry characteristic being inferred, and m is the number of taxa in the sample assemblage.

An option we also employed in using the WA technique is `tolerance weighting.' The rationale for this approach is that taxa occurring over a narrow range of an environmental gradient should be better indicators than taxa with broader tolerances. Consequently, taxa with narrower tolerances should be weighted more heavily in the WA calculations. A tolerance-weighted estimate was calculated as:

$$\hat{x}_i = \left( \sum_{k=1}^{m} y_{ik}\, \hat{u}_k / \hat{t}_k^{\,2} \right) / \left( \sum_{k=1}^{m} y_{ik} / \hat{t}_k^{\,2} \right) \qquad (4)$$

Tolerance weighting has not always worked as well as expected in diatom reconstructions for lakes (Birks et al. 1990), perhaps because calibration data sets have not been large enough to provide sufficiently accurate estimates of tolerance values.

Weighted averaging without tolerance correction has generally proven superior for diatom reconstructions of several environmental variables (Birks et al. 1990, Kingston and Birks 1990), whereas tolerance correction may be superior for chrysophyte data (B.F. Cumming and H.J.B. Birks, personal communication); this may be explained by the higher diversity and greater number of `zero occurrences' in the diatom data.

Averages are taken twice, once in the regression step and once in the calibration steps. This results in shrinkage of the environmental gradient, which is corrected by a linear deshrinking regression. To minimize this effect, a simple `classical' or an `inverse' regression (sometimes called a `deshrinking' step) can be used (see ter Braak and van Dam 1989 and Birks et al. 1990 for more detailed discussion). For example, the classical deshrinking process performs a simple linear regression to determine the relationship between inferred values ($x_{inf}$) and actual measured values ($x_{meas}$):

$$\text{initial } x_{inf} = a + bx_{meas} + \epsilon \qquad \textbf{(5)}$$

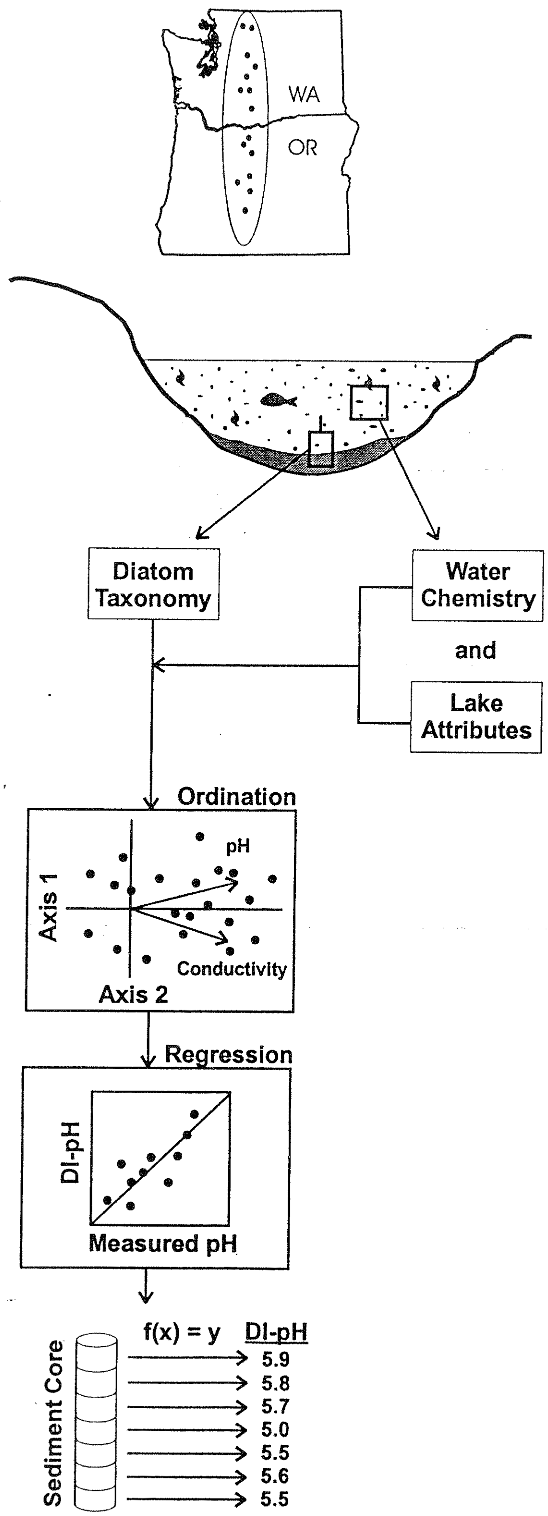
where a is the intercept, b is the slope and $\epsilon$ is an error term. The terms from this regression equation are then used to calculate a final `corrected' or `deshrunk' value:

$$\text{final } x_{inf} = (\text{initial } x_{inf} - a)/b. \qquad \textbf{(6)}$$

Inverse deshrinking involves the same process, except that the measured values are regressed on the initial inferred values instead of vice versa. Classical deshrinking moves inferred values farther from the mean than inverse deshrinking, and the former is best if values to be inferred lie near the ends of the environmental gradient. Inverse deshrinking minimizes the root mean square error of the predicted versus measured regression relationships, and therefore may lead to more accurate inferred values over the entire range of the environmental gradient.

In summary, the process of developing and applying a diatom calibration set for the Cascades involved six distinct steps as illustrated schematically in Figure 9.

# Process of Developing and Applying a Diatom Calibration Set




1. Select lakes - optimize for geographic distribution and wide distributions

2. Sample lakes and sediment

3. Analyze samples - construct calibration data base

4. Relate diatom preferences to water chemistry and lake attributes by ordination of variables using CANOCO. This produces a list of variables explaining diatom assemblages

5. Develop transfer functions using weighted-averaging regression (WACALIB) for specific variables

6. Reconstruct historical water chemistry in lakes with sediment cores which have been sectioned and analyzed for diatoms

Figure 9. Schematic representation of the process of developing and applying the diatom calibration set for the Cascade Mountain Ecoregion.

## 5. Diatom Inferences

A standardized technique for quantitative diatom paleolimnological inferences has been established, based largely on research by C.J.F. ter Braak & H.J.B. Birks (e.g., ter Braak & Prentice 1988, ter Braak & van Dam 1989, Birks et al. 1990), and the availability of the computer programs CANOCO (ter Braak 1987b), CALIBRATE (Juggins & ter Braak 1992), and WACALIB 3.1 (Line et al. 1994). Weighted averaging regression and calibration has proven to be an effective technique for explaining the variance in complex taxonomically-rich data sets.

A series of exploratory ordinations of the Cascade calibration lake data was performed using correspondence analysis and canonical correspondence analysis. These analyses use eigenvector techniques to determine which environmental variables explain the greatest amounts of variance within the species assemblages (ter Braak 1987b). Variables that are significantly related to diatom species variance are considered to be good candidates for inferences studies. All variables except pH were $\log_{10}$ transformed for the correspondence analyses.

The entire Cascade calibration set presented challenges in conducting this analysis because of an incomplete data matrix and slight differences in taxonomy for the Mount Rainier lakes. Some of these challenges were presented by melding the 27 Cascade lakes sampled in 1996 with the previously sampled lakes from Mount Rainier National Park (referred to here as the `Rainier' subset). For instance, taxonomy on the Rainier lakes by Dr. Mark Whiting had to be reconciled with taxonomy on the lakes sampled in 1996 (see Table 1). Of particular importance in conducting the correspondence analyses, however, was the incomplete nature of the environmental data available (particularly with the Rainier lakes). Accurate CA analyses require a full data set without missing values. Therefore, different combinations of lakes were used in the numerous types of analyses performed, depending on the data available. In particular, two main subgroups were used:

Calset A:
34 lakes: eliminates lakes 29-40, 45-47
most environmental variables available: area, depth, conductivity, pH, sulfate, chloride, ANC, total phosphorus, magnesium, calcium, potassium

Calset B:
- 42 lakes: eliminates lakes 29, 30, 33, 40, 45, 46, 47
- sulfate and chloride values unavailable
- synthetic conductivity values added for three lakes: 32, 34, 39 (based on pH:conductivity in similar lakes)

Other changes in lake subgroupings are noted individually.

CA maximizes the dispersion or variance obtainable in the diatom data among the sites along a theoretical ('latent') environmental variable. The resulting eigenvalues for axis 1 ($\lambda_1$), axis 2 ($\lambda_2$), etc., and the total of all 'unconstrained' eigenvalues ($\lambda_{unc}$) are measures of the 'explainable' variance in the diatom calibration set. CCA is essentially a restricted correspondence analysis, selecting the linear combination of environmental variables that maximizes the dispersion of the species scores for the first CCA axis. Successive axes are created under the same restraint, but these additional axes also must be uncorrelated to the previous axes. The number of axes is restricted only by the number of available environmental variables, but typically only the first two axes describe meaningful trends in the species assemblages. The eigenvalues calculated for each CCA axis will generally be smaller than that of CA, as the dispersion of diatom taxa is restricted by the variables. A total of all canonical eigenvalues is then calculated ($\lambda_{can}$ ).

Therefore, a comparison of total and axis eigenvalues obtained by CCA with CA (e.g., CCA $\lambda_1$/ CA $\lambda_1$) is a measure of how well the environmental variables explained the variance in the taxonomic data. A further test of the statistical model is to run a 'constrained' CCA where only one variable is fitted to the first axis. Comparisons of $\lambda_1$ can then indicate the amount of variance explained by that individual variable.

## D. RESULTS

### 1. Chemistry and Morphometry of Study Lakes

The chemistry of the individual study lakes (Table 3) span considerable ranges in pH (4.95 to 8.44), ANC (-15 to 7226 µeq/L), conductivity (2.7 to 554 µS), and total phosphorus (1 to 170 µg/L). Two lakes (East and Paulina Lakes) are particularly alkaline and removal of these outliers reduces the ranges of ANC and conductivity considerably, although the ranges in pH and total phosphorus are unaffected by their removal. The upper distribution in total phosphorus is represented by Agency Lake; the next highest total phosphorus value is only 32 µg/L. The chemistry of these systems ranges from precipitation-dominated lakes such as Notasha and Summit (WA) to lakes such as Paulina and East which receive major geothermal inputs.

The distribution for pH is nearly normal with a skewness of only 0.66 (Table 4). Most other distributions are highly skewed. The Rainier subset of lakes exhibits a much more restricted range of chemistry compared to non-Rainier lakes. Consequently, the distributions for the lake chemistry among the Rainier lakes exhibit a lower degree of skewness.

The physical properties of the study lakes also exhibit a wide range (Tables 5 and 6). The study sites range from small, shallow ponds that refill with every storm event to moderately large, deep lakes that have hydraulic residence times of multiple decades. Most of the study lakes occurred at elevations of about 1400 to 1700 m (~ 4600 to 5600 ft). The depths of the lakes varies considerably (0.1 to 77 m) with a central tendency of 8 to 14 m.

**Table 3**. Water chemistry for calibration lakes.

| Lake | pH | ANC[a] | Cond[b] | TP[c] | Chloro[d] | Ca[e] | Mg[f] | Na[g] | K[h] | $SO_4$[i] | $NO_3$[j] | $NH_4$[k] | Cl[l] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | μeq/L | μS | μg/L | μg/L | μeq/L | | | | | | | |
| A. Newly Sampled Lakes | | | | | | | | | | | | | |
| Marion Lake | 8.35 | 425 | 39.3 | 32 | 11.2 | 187.9 | 113.3 | 125.4 | 30.2 | 3.2 | < dl | 15.24 | 10.89 |
| Sphagnum | 5.81 | 37 | 7.3 | 13 | 0.5 | 43.2 | 9.0 | 22.9 | 1.7 | 10.5 | < dl | < dl | 10.72 |
| Nordrum | 6.44 | 40 | 6.4 | 5 | 0.4 | 32.1 | 9.5 | 20.1 | 2.0 | 10.8 | < dl | < dl | 10.29 |
| Caskey Lake | 6.17 | 109 | 12.5 | 19 | 0.2 | 77.5 | 36.6 | 37.5 | 3.2 | 13.9 | < dl | < dl | 11.55 |
| Dumbbell Lake | 6.55 | 55 | 7.6 | 12 | 0.3 | 22.3 | 16.4 | 25.1 | 4.5 | 6.7 | < dl | 0.94 | 5.70 |
| Shellrock Lake | 5.69 | 39 | 5.9 | 13 | 0.2 | 15.6 | 15.6 | 21.6 | 3.3 | 7.1 | < dl | < dl | 6.23 |
| Heather Lake | 6.23 | 94 | 10.6 | 10 | 0.2 | 59.0 | 27.2 | 23.8 | 8.7 | 13.9 | < dl | < dl | 5.13 |
| Pyramid Lake | 6.78 | 839 | 76.8 | 5 | 1.3 | 753.9 | 132.4 | 54.2 | 11.5 | 41.1 | < dl | < dl | 5.39 |
| Middle Thornton | 6.36 | 40 | 5.1 | 3 | 0.3 | 26.1 | 4.7 | 7.8 | 3.6 | 8.4 | < dl | < dl | 2.45 |
| No Name | 6.03 | 43 | 6.6 | 12 | 1.7 | 12.2 | 10.6 | 30.4 | 6.4 | 8.3 | < dl | < dl | 13.08 |
| Gertrude Lake | 6.62 | 75 | 10.4 | 13.3 | 2.2 | 38.2 | 24.9 | 26.0 | 5.3 | 12.0 | 0.06 | 0.64 | 6.60 |
| Cora Lake | 6.36 | 228 | 20.3 | 1 | 6.5 | 176.6 | 38.7 | 62.8 | 2.4 | 19.6 | < dl | 1.44 | 8.32 |
| Head Lake | 5.93 | 17 | 3.4 | 21 | 2.1 | 4.9 | 6.5 | 11.1 | 1.1 | 2.1 | < dl | < dl | 6.02 |
| Summit Lake, OR | 5.94 | 15 | 4.0 | 27 | 1.8 | 1.8 | 3.6 | 12.7 | 4.8 | 1.3 | < dl | < dl | 9.05 |
| Little Twin Lake | 4.95 | -7 | 45.0 | 11 | 0.1 | 193.3 | 90.3 | 117.6 | 5.5 | 319.6 | < dl | 2.96 | 10.48 |
| Agency Lake | 8.37 | 939 | 98.5 | 170 | 23.4 | 351.1 | 300.7 | 520.6 | 47.3 | 55.9 | 7.56 | 16.53 | 115.99 |
| South Heavenly Twin | 5.32 | 17 | 3.2 | 9 | 0.9 | 11.7 | 8.7 | 6.8 | 1.3 | 2.1 | < dl | < dl | 3.01 |
| Lucky Lake | 5.27 | 16 | 3.1 | 11 | 0.3 | 9.6 | 8.0 | 8.5 | 2.1 | 5.0 | < dl | < dl | 5.61 |
| Charlton | 5.87 | 58 | 5.9 | 8 | 0.3 | 26.6 | 16.9 | 21.0 | 3.2 | 1.5 | < dl | < dl | 5.14 |
| Paulina | 8.44 | 7226 | 553.8 | 30 | 0.3 | 1567.1 | 4107.7 | 2438.5 | 132.4 | 65.7 | < dl | < dl | 30.72 |
| East Lake | 7.90 | 2161 | 342.0 | 19 | 0.9 | 1398.4 | 1199.9 | 83.8 | 91.5 | 1367.6 | < dl | < dl | 10.89 |
| Big Lake | 5.97 | 28 | 3.7 | 7 | 0.2 | 10.3 | 13.0 | 12.2 | 2.5 | 4.2 | < dl | < dl | 6.91 |
| Lava Lake | 7.90 | 342 | 34.3 | 29 | 2 | 94.1 | 113.8 | 184.3 | 24.5 | 13.4 | < dl | 8.17 | 12.33 |
| Mink Lake | 6.11 | 23 | 3.8 | 5 | 0.3 | 10.3 | 7.2 | 13.9 | 1.2 | 2.6 | < dl | < dl | 7.00 |
| Diamond Lake | 8.20 | 361 | 33.7 | 28 | 5.6 | 129.5 | 95.6 | 161.2 | 26.3 | 3.3 | < dl | 19.24 | 10.42 |
| Burnt Lake | 6.79 | 199 | 25.1 | 3 | 0.8 | 174.2 | 36.9 | 54.1 | 1.7 | 30.3 | < dl | 2.58 | 10.38 |
| Suttle Lake | 8.33 | 543 | 46.8 | 31 | 15.7 | 247.5 | 185.0 | 151.9 | 29.4 | 4.2 | < dl | 30.94 | 13.37 |

**Table 3.** Continued

| Lake | pH | ANC[a] | Cond[b] | TP[c] | Chloro[d] | $Ca^e$ | $Mg^f$ | $Na^g$ | $K^h$ | $SO_4^i$ | $NO_3^j$ | $NH_4^k$ | $Cl^l$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µeq/L | µS | µg/L | µg/L | µeq/L | | | | | | | |
| B. Previously Sampled Lakes | | | | | | | | | | | | | |
| Unnamed Lake3 | 6.21 | -12 | 2.7 | | | | | | | | | | |
| Unnamed Lake4 | 5.72 | 8 | | 27 | | 10.5 | 18.9 | 0.0 | 2.6 | | 0.02 | 0.50 | |
| Unnamed Lake | 5.66 | 8 | 7.1 | | | | | | | | | | |
| Unnamed Lake | 5.68 | -15 | 5.1 | 8 | | 0.5 | 4.4 | 5.2 | 2.6 | | 0.03 | 0.89 | |
| Unnamed Lake5 | 5.57 | 24 | | | | | | | | | | | |
| Unnamed Lake6 | 5.63 | 6 | | 10 | | 4.0 | 4.6 | 5.2 | 2.2 | | 0.02 | 0.06 | |
| Unnamed Lake7 | 6.52 | 7 | | 10 | | 6.0 | 4.1 | 4.8 | 1.5 | | | 0.06 | |
| Unnamed Lake8 | 5.77 | 28 | 5.7 | 9 | | 8.0 | 7.8 | 10.4 | 1.0 | | 0.02 | 0.06 | |
| Unnamed Lake9 | 6.62 | 56 | 10.4 | 7 | | 30.4 | 13.5 | 28.7 | 2.0 | | 0.00 | 0.22 | |
| Unnamed Lake10 | 7.11 | 47 | 5.0 | 13 | | 44.9 | 18.3 | 29.1 | 24.6 | | 0.02 | 0.44 | |
| Snow Lake | 7.26 | 67 | 9.0 | 9 | | 44.9 | 7.3 | 21.3 | 2.0 | 3.7 | 0.13 | 0.28 | 10.15 |
| Tipsoo Lake | 7.68 | 312 | 15.3 | | | | | | | | | | |
| Shadow Lake | 6.72 | 49 | 5.1 | | | | | | | | | | |
| Reflection Lake B | 6.69 | 82 | 11.0 | 9 | | 28.9 | 10.2 | 23.9 | 2.6 | 3.0 | 0.02 | 0.28 | 11.14 |
| Upper Palisades L | 7.25 | 84 | 13.0 | 11 | | 68.9 | 16.6 | 34.8 | 4.2 | 13.1 | 0.02 | 0.06 | 15.43 |
| Sunrise Lake | 6.92 | | 6.0 | | | | | | | 6.2 | | | 11.79 |
| Mowich Lake | 7.11 | 91 | 11.0 | 4 | | 70.4 | 13.8 | 23.5 | 1.5 | 3.7 | 0.00 | 0.28 | 13.82 |
| Green Lake | 7.02 | 268 | 19.0 | 7 | | 141.7 | 16.3 | 34.8 | 2.8 | 7.9 | 0.13 | 0.33 | 15.23 |
| Reflection Lake A | 6.29 | 19 | 5.9 | 3 | | 9.0 | 4.0 | 13.0 | 1.5 | | 0.02 | | |
| Summit Lake | 5.52 | 1 | 3.3 | 7 | 1.8 | 6.6 | 3.6 | 11.8 | 0.8 | 8.3 | 0.01 | 0.37 | 10.89 |
| Lake Notasha | 6.12 | 14 | 2.7 | 1 | 1.2 | 4.9 | 6.0 | 4.1 | 1.5 | 2.3 | < dl | 0.61 | 4.25 |

[a] acid neutralizing capacity
[b] conductivity
[c] total phosphorus
[d] chlorophyll *a*
[e] calcium
[f] magnesium
[g] sodium
[h] potassium
[i] sulfate
[j] nitrate
[k] ammonium
[l] chloride

**Table 4.** Summary statistics for calibration lakes and major subsets of study lakes.

| | pH[a] | Cond[b] | ANC[c] | $C_b$[d] | $C_a$[e] | Mg[f] | Na[g] | K[h] | $NH_4$[i] | $SO_4$[j] | Cl[k] | $NO_3$[l] | TP[m] | Chloro[n] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | μS | μeq/L | | | | | | | | | | μg/L | μg/L |
| All N=48 | 48 | 44 | 47 | 42 | 42 | 42 | 42 | 42 | 41 | 35 | 35 | 41 | 42 | 29 |
| Min | 4.95 | 2.7 | -15 | 13 | 0.5 | 3.6 | 0.04 | 0.9 | 0 | 1.3 | 2.5 | 0 | 1 | 0.1 |
| Max | 8.44 | 554 | 7226 | 8246 | 1567 | 4108 | 2439 | 132 | 31 | 1368 | 116 | 7.6 | 170 | 23.4 |
| Median | 6.36 | 7.5 | 47 | 71 | 31 | 15 | 24 | 2.7 | 0.06 | 7.9 | 10.4 | 0 | 10 | 0.9 |
| Mean | 6.54 | 35.3 | 321 | 427 | 147 | 161 | 107 | 12 | 2.5 | 60 | 12.8 | 0.2 | 16.2 | 2.9 |
| sd | 0.91 | 95.9 | 1090 | 1324 | 330 | 652 | 379 | 25 | 6.4 | 234 | 18.6 | 1.2 | 25.8 | 5.3 |
| Skewness | 0.66 | 4.63 | 5.87 | 5.41 | 3.55 | 5.78 | 6.00 | 3.62 | 3.2 | 5.49 | 5.30 | 1.2 | 5.38 | 2.88 |
| Cascade N=34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 34 | 29 |
| Min | 4.95 | 2.7 | -6.5 | 16.5 | 1.8 | 3.6 | 4.1 | 0.8 | 0 | 1.3 | 2.5 | 0 | 1 | 0.1 |
| Max | 8.44 | 554 | 7226 | 8246 | 1567 | 4108 | 2439 | 132 | 30.9 | 1368 | 116 | 7.6 | 170 | 23.4 |
| Median | 6.40 | 10.5 | 71 | 86 | 44 | 16 | 25 | 3.2 | 0 | 8.1 | 10.3 | 0 | 12 | 0.9 |
| Mean | 6.63 | 43.6 | 428 | 519 | 178 | 197 | 130 | 13.9 | 3.7 | 61 | 12.8 | 0.3 | 20.3 | 2.9 |
| sd | 0.98 | 108.0 | 1269 | 1460 | 361 | 722 | 419 | 27.6 | 7.7 | 237 | 18.9 | 1.5 | 31.4 | 5.3 |
| Skewness | 0.51 | 4.04 | 5.00 | 4.87 | 3.16 | 5.20 | 5.41 | 3.29 | 2.4 | 5.40 | 5.22 | 5.0 | 4.46 | 2.88 |
| Rainier N=19 | 19 | 15 | 18 | 13 | 16 | 16 | 13 | 16 | 12 | 6 | 6 | 12 | 13 | No Data |
| Min | 5.57 | 2.7 | -15 | 13 | 0.5 | 4 | 0.04 | 1.0 | 0.06 | 3.0 | 10.1 | 0 | 3 | |
| Max | 7.68 | 19 | 312 | 196 | 142 | 19 | 35 | 25 | 0.9 | 13.1 | 15.4 | 0.1 | 27 | |
| Median | 6.62 | 7.1 | 37 | 66 | 29 | 10.2 | 21 | 2.2 | 0.3 | 5.0 | 12.8 | 0.02 | 9 | |
| Mean | 6.50 | 8.7 | 63 | 69 | 36 | 10.7 | 18 | 3.9 | 0.3 | 6.3 | 12.9 | 0.04 | 9.8 | |
| sd | 0.67 | 4.5 | 89 | 55 | 40 | 5.7 | 12.2 | 6.3 | 0.2 | 3.8 | 2.2 | 0.05 | 5.8 | |
| Skewness | 0.04 | 0.91 | 2.10 | 1.01 | 1.71 | 0.12 | -0.04 | 3.50 | 1.37 | 1.38 | 0 | 1.9 | 2.82 | |
| Non-Rainier | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| Min | 4.95 | 2.7 | -6.5 | 16.5 | 1.8 | 3.6 | 4.1 | 0.9 | 0 | 1.3 | 2.5 | 0 | 1 | 0.1 |
| Max | 8.44 | 594 | 7226 | 8246 | 1567 | 4108 | 2439 | 132 | 30.9 | 1368 | 116 | 7.6 | 170 | 23.4 |
| Median | 6.23 | 7.6 | 55 | 77 | 38 | 17 | 25 | 3.6 | 0 | 8.3 | 9.1 | 0 | 12 | 0.9 |
| Mean | 6.56 | 49 | 482 | 588 | 196 | 229 | 147 | 15.8 | 3.4 | 71 | 12.7 | 0.3 | 19.1 | 2.9 |
| sd | 1.04 | 116 | 1371 | 1574 | 388 | 779 | 452 | 29 | 7.5 | 256 | 20.5 | 1.4 | 30.5 | 5.3 |
| Skewness | 0.71 | 3.71 | 4.62 | 4.49 | 2.88 | 4.80 | 5.00 | 3.01 | 2.5 | 4.99 | 4.89 | 5.18 | 4.57 | 2.89 |

[a] pH
[b] conductivity
[c] acid neutralizing capacity
[d] sum of base cations
[e] sum of acid anions
[f] magnesium
[g] sodium
[h] potassium
[i] ammonium
[j] sulfate
[k] chloride
[l] nitrate
[m] total phosphorus
[n] chlorophyll *a*

**Table 5.** Location and physical characteristics of study lakes.

| Lake | State | Wilderness | Latitude/ Longitude | Area (ha) | Elevation (m) | Depth (m) |
|---|---|---|---|---|---|---|
| A. Newly Sampled Lakes | | | | | | |
| Agency Lake | OR | | 42 30 00 N<br>122 00 00 W | 3763 | 1262 | 3.0 |
| Big Lake | OR | | 44 22 10 N<br>121 52 10 W | 77 | 1416 | 23.5 |
| Burnt Lake | OR | Mt Hood | 45 21 03 N<br>121 48 05 W | 3 | 1250 | 8.0 |
| Charlton | OR | | 43 44 43 N<br>121 57 51 W | 63 | 1735 | 29.0 |
| Diamond Lake | OR | | 43 11 02 N<br>122 09 57 W | 1301 | 1580 | 15.8 |
| East Lake | OR | | 43 43 04 N<br>121 12 53 W | 423 | 1942 | 52.4 |
| Head Lake | OR | | 44 49 07 N<br>121 47 43 W | 3 | 1525[e] | 2.4 |
| Lava Lake | OR | | 43 54 53 N<br>121 45 52 W | 149 | 1445 | 10.0 |
| Little Twin Lake | OR | | 43 13 41 N<br>122 35 47 W | 3 | 1540 | 9.1 |
| Lucky Lake | OR | | 43 54 26 N<br>121 47 49 W | 20 | 1585[e] | 15.2 |
| Marion Lake | OR | Mt. Jefferson | 44 33 41 N<br>121 52 20 W | 105 | 1259 | 50.0 |
| Mink Lake | OR | Three Sisters | 43 55 29 N<br>121 55 17 W | 56 | 1534 | 17.0 |
| Paulina | OR | | 43 42 47 N<br>121 16 26 W | 620 | 1930 | 77.4 |
| South Heavenly Twin | OR | Sky Lakes | 42 31 01 N<br>122 11 41 W | 2 | 1821 | 5.2 |
| Summit Lake | OR | | 45 01 52 N<br>121 47 20 W | 2.5 | 1280[e] | 1.0 |
| Suttle Lake | OR | | 44 25 33 N<br>121 43 23 W | 102 | 1047 | 20.0 |
| Caskey Lake | WA | | 48 24 07 N<br>121 34 25 W | 15 | 250[e] | 5.0 |
| Cora Lake | WA | | 46 41 20 N<br>121 53 19 W | 11 | 1159 | 15.8 |
| Dumbbell Lake | WA | William O. Douglas | 46 41 30 N<br>121 22 45 W | 18 | 1553 | 3.0 |
| Gertrude Lake | WA | Goat Rocks | 46 23 29 N<br>121 23 57 W | 3.3 | 1748 | 6.0 |
| Heather Lake | WA | Henry Jackson | 47 51 30 N<br>121 07 35 W | 29 | 1206 | 30.0 |
| Middle Thornton | WA | North Cascades | 48 41 18 N<br>121 20 11 W | 3.1 | 1450[e] | 30.5 |

**Table 5.** Continued

| Lake | State | Wilderness | Latitude/ Longitude | Area (ha) | Elevation (m) | Depth (m) |
|---|---|---|---|---|---|---|
| Unnamed | WA | Indian Heaven | 46 01 19 N 121 49 51 W | 1.7 | 1260 | 1.7 |
| Nordrum | WA | Alpine | 47 33 23 N 121 26 14 W | 17 | 1118[e] | 9.0 |
| Pyramid Lake | WA | North Cascades | 48 40 59 N 121 08 38 W | 0.9 | 800[e] | 8.0 |
| Shellrock Lake | WA | William O. Douglas | 46 41 05 N 121 20 40 W | 6 | 1502 | 3.2 |
| Sphagnum | WA | Alpine | 47 33 01 N 121 26 26 W | 0.02 | 1180[e] | 1.0 |
| B. Previously Sampled Lakes | | | | | | |
| Lake Notasha | OR | Sky Lakes | 42 34 05 N 122 12 08 W | 2.70 | 1836 | 10.3 |
| Green Lake | WA | Mt. Rainier NP | 46 58 42 N 121 51 48 W | 4.98 | 974 | 29.0 |
| Mowich Lake | WA | Mt. Rainier NP | 46 56 42 N 121 52 12 W | 45.42 | 1502 | 58.6 |
| Reflection Lake A | WA | Mt. Rainier NP | 46 46 00 N 121 43 24 W | 0.70 | 1487 | 3.5 |
| Reflection Lake B | WA | Mt. Rainier NP | 46 46 00 N 121 43 48 W | 6.74 | 1479 | 10.0 |
| Shadow Lake | WA | Mt. Rainier NP | 46 55 06 N 121 39 36 W | 0.89 | 1896 | 4.3 |
| Snow Lake | WA | Mt. Rainier NP | 46 45 48 N 121 41 36 W | 2.39 | 1426 | 10.5 |
| Summit Lake | WA | Clearwater | 47 02 29 N 121 49 57 W | 8.82 | 1658 | 50.9 |
| Sunrise Lake | WA | Mt. Rainier NP | 46 55 00 N 121 35 48 W | 1.50 | 1750 | 7.0 |
| Tipsoo Lake | WA | Mt. Rainier NP | 46 52 54 N 121 31 36 W | 1.45 | 1617 | 1.7 |
| Unnamed Lake | WA | Mt. Rainier NP | 46 55 06 N 121 50 30 W | 0.11 | 1758 | 1.0 |
| Unnamed Lake | WA | Mt. Rainier NP | 46 46 42 N 121 43 00 W | 0.21 | 1626 | 1.2 |
| Unnamed Lake3 | WA | Mt. Rainier NP | 46 46 54 N 121 43 24 W | 0.17 | 1663 | 1.8 |
| Unnamed Lake4 | WA | Mt. Rainier NP | 46 46 48 N 121 43 00 W | 0.05 | 1625 | 0.7 |
| Unnamed Lake5 | WA | Mt. Rainier NP | 46 46 36 N 121 43 54 W | 0.03 | 1606 | 0.1 |
| Unnamed Lake6 | WA | Mt. Rainier NP | 46 46 36 N 121 43 42 W | 0.19 | 1582 | 2.0 |
| Unnamed Lake7 | WA | Mt. Rainier NP | 46 46 30 N 121 43 42 W | 0.13 | 1586 | 1.9 |

**Table 5.** Continued

| Lake | State | Wilderness | Latitude/ Longitude | Area (ha) | Elevation (m) | Depth (m) |
|---|---|---|---|---|---|---|
| Unnamed Lake8 | WA | Mt. Rainier NP | 46 46 00 N<br>121 43 36 W | 0.12 | 1485 | 1.1 |
| Unnamed Lake9 | WA | Mt. Rainier NP | 46 46 06 N<br>121 43 30 W | 0.21 | 1487 | 1.6 |
| Unnamed Lake10 | WA | Mt. Rainier NP | 46 46 06 N<br>121 44 06 W | 0.04 | 1485 | 1.0 |
| Upper Palisades L | WA | Mt. Rainier NP | 46 57 06 N<br>121 35 12 W | 0.78 | 1785 | 15.3 |

[e] estimated from topographic maps

**Table 6.** Summary statistics for physical attributes of study lakes.

| Data Set | Elevation (m) | Lake Area (ha) | Lake Depth (m) |
|---|---|---|---|
| All N = | 38 | 48 | 48 |
| Min | 250 | 0.02 | 0.14 |
| Max | 1942 | 3763 | 77.4 |
| Median | 1514 | 3.0 | 8.0 |
| Mean | 1473 | 143 | 13.9 |
| sd | 309 | 574 | 17.5 |
| Skewness | -1.50 | 3.75 | 1.95 |
| Cascade N = | 23 | 33 | 34 |
| Min | 250 | 0.02 | -1.0 |
| Max | 1942 | 3763 | 77.4 |
| Median | 1465 | 11 | 10.4 |
| Mean | 1413 | 208 | 18.7 |
| sd | 342 | 686 | 19.0 |
| Skewness | -1.15 | 4.76 | 1.54 |
| Rainier N = | 16 | 19 | 19 |
| Min | 974 | 0.03 | 0.14 |
| Max | 1896 | 45.4 | 58.6 |
| Median | 1586 | 0.46 | 22.2 |
| Mean | 1569 | 3.4 | 8.3 |
| sd | 191 | 10.0 | 13.8 |
| Skewness | -1.42 | 4.25 | 2.94 |
| Non-Rainier N = | 29 | 28 | 29 |
| Min | .250 | 0.02 | 1.0 |
| Max | 1942 | 3763 | 77.4 |
| Median | 1450 | 16 | 10.0 |
| Mean | 1409 | 243 | 17.7 |
| sd | 355 | 741 | 18.9 |
| Skewness | -1.17 | 4.37 | 1.67 |

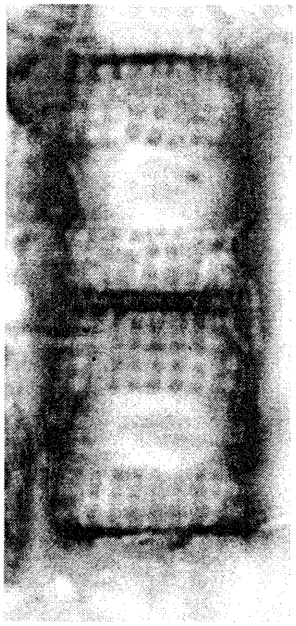


**Figure 10**.
*Aulacoseira distans* from Big Lake, OR.

## 2. Diatom Taxonomy

The most widespread diatom in the data set is the centric *Aulacoseira distans* and its several varieties (Figure 10). It occurred in 40 lakes and was often observed at very high abundances in the sediments. The genus *Aulacoseira* is generally well represented in the Cascade lakes. The species *A. distans* is likely tycoplanktonic, rising into the water column as conditions permit, and resting in the sediments for long periods, often as resting spores. Its weighted average (or optimum) environmental tolerances in the Cascades (Table 7) indicates a species that prefers slightly acidic waters in mildly oligotrophic conditions.

Unfortunately, the *Aulacoseira distans* complex is also the most problematic taxonomic group in the Cascades. Although well known throughout the world, several new forms were seen in the Cascade counts in abundant numbers (*Aulacoseira* sp. 0A, 0B, 0C, 0D; and from the Whiting counts, *Melosira* sp. 4 and 8 PIRLA). This problem was exacerbated by an unclear conception of where the Whiting unknowns may fit in with the Sweets unknowns. Furthermore, *A. distans* itself was most abundant in the Rainier lakes, where it is often the dominant taxon (>30%). Upon examination of the Whiting slides, many of the *A. distans* varieties and the Whiting unknowns were combined in the analysis (*Aulacoseira distans* varieties), but the Sweets unknowns were retained. This group needs additional work, including electron microscopy analysis to fully appreciate the taxonomic differences in the Cascades. It is likely that the analysis might be improved with effort in resolving taxonomic uncertainties.

Another important diatom was *Navicula tenuicephala*. This taxon is one of the best-known strongly acidophilic diatoms in the world and was widely distributed in the Cascade lakes (36). It was present in the most acidic lakes, particularly the small, shallow lakes from Mt. Rainier, and Cascade lakes such as such as Big, Lucky, and Head. For that reason, it had a relatively low pH optimum (5.86).

**Table 7.** Occurrence and optima (abundance weighted mean) for taxa and taxa groups used in ordinations and inference models.

| Genus | Species | Maximum % Abundance | Mean % Abundance | Sites | Optimum pH | Optimum Conductivity (µS/cm) | Optimum ANC (µeq/L) | Optimum Mg (mg/L) | Optimum Depth (m) | Optimum TP (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| Achnanthes | sp. PRS 0A | 16.07 | 5.82 | 3.00 | 6.36 | 5.3 | 41 | 0.06 | 29.3 | 3.3 |
| Achnanthes | sp. 11 PIRLA | 16.93 | 5.59 | 7.00 | 7.15 | 9.8 | 100 | 0.11 | 23.1 | 7.3 |
| Achnanthes | bioreti | 5.36 | 1.20 | 15.00 | 5.99 | 9.8 | 26 | 0.65 | 12.0 | 7.6 |
| Achnanthes | curtissima | 5.00 | 1.95 | 5.00 | 6.53 | 12.4 | 107 | 0.27 | 13.7 | 8.8 |
| Achnanthes | detha | 4.82 | 2.53 | 5.00 | 7.28 | 11.0 | 196 | 0.10 | 15.1 | 8.0 |
| Achnanthes | lanceolata | 4.60 | 0.80 | 9.00 | 6.78 | 63.3 | 624 | 1.46 | 11.1 | 5.8 |
| Achnanthes | linearis | 4.00 | 1.62 | 8.00 | 6.56 | 34.7 | 324 | 0.86 | 16.5 | 11.1 |
| Achnanthes | marginulata | 28.16 | 5.58 | 44.00 | 6.15 | 6.7 | 42 | 0.14 | 13.2 | 13.3 |
| Achnanthes | minutissima | 6.45 | 1.62 | 14.00 | 6.71 | 18.6 | 255 | 0.35 | 21.3 | 8.4 |
| Achnanthes | pusilla | 8.39 | 2.10 | 5.00 | 7.13 | 12.1 | 123 | 0.16 | 50.3 | 4.4 |
| Achnanthes | subatomoides | 6.20 | 2.11 | 6.00 | 6.53 | 11.7 | 105 | 0.29 | 15.9 | 8.6 |
| Achnanthes | suchlandti | 6.21 | 3.25 | 2.00 | 7.09 | 11.0 | 90 | 0.16 | 56.4 | 4.2 |
| Amphora | ovalis | 1.00 | 0.44 | 10.00 | 7.31 | 49.8 | 527 | 1.46 | 13.4 | 11.8 |
| Amphora | perpusilla | 1.67 | 0.59 | 6.00 | 8.21 | 344.9 | 419 | 27.31 | 53.9 | 26.0 |
| Anomoeoneis | brachysira | 4.20 | 1.10 | 27.00 | 6.27 | 8.2 | 62 | 0.18 | 10.3 | 8.4 |
| Anomoeoneis | vitrea | 4.20 | 0.81 | 9.00 | 6.36 | 18.6 | 203 | 0.44 | 24.7 | 9.4 |
| Asterionella | formosa | 35.50 | 10.09 | 7.00 | 8.25 | 142.3 | 441 | 8.08 | 45.7 | 27.5 |
| Aulacoseira | sp. PRS 0A | 6.60 | 3.50 | 2.00 | 6.38 | 20.6 | 226 | 0.45 | 15.4 | 1.1 |
| Aulacoseira | sp. PRS 0B | 37.65 | 5.38 | 20.00 | 6.09 | 7.2 | 49 | 0.18 | 2.9 | 11.4 |
| Aulacoseira | sp. PRS 0C | 6.40 | 1.84 | 8.00 | 6.19 | 7.0 | 49 | 0.16 | 3.6 | 11.8 |
| Aulacoseira | sp. PRS 0D | 7.25 | 2.33 | 10.00 | 6.22 | 6.8 | 36 | 0.14 | 1.8 | 9.0 |
| Aulacoseira | ambigua | 9.00 | 2.94 | 7.00 | 6.66 | 22.3 | 201 | 0.65 | 7.7 | 10.9 |
| Aulacoseira | distans | 57.67 | 17.45 | 42.00 | 6.12 | 7.4 | 34 | 0.12 | 6.8 | 10.9 |

**Table 7.** Continued.

| Genus | Species | Maximum % Abundance | Mean % Abundance | Sites | Optimum pH | Optimum Conductivity (µS/cm) | Optimum ANC (µeq/L) | Optimum Mg (mg/L) | Optimum Depth (m) | Optimum TP (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| Aulacoseira | granulata | 2.80 | 0.97 | 9.00 | 7.11 | 24.4 | 249 | 0.70 | 12.8 | 12.3 |
| Aulacoseira | italica | 5.33 | 1.76 | 11.00 | 7.59 | 43.3 | 353 | 2.04 | 20.5 | 21.8 |
| Aulacoseira | pfaffiana | 65.33 | 9.60 | 16.00 | 5.52 | 22.8 | 17 | 0.53 | 5.3 | 13.0 |
| Cocconeis | placentula | 1.80 | 0.76 | 6.00 | 8.21 | 160.7 | 727 | 7.00 | 24.4 | 21.3 |
| Cymbella | sp. PRS 0A | 28.03 | 4.97 | 22.00 | 5.90 | 4.4 | 18 | 0.09 | 5.7 | 11.8 |
| Cymbella | sp. 18 PIRLA | 3.48 | 1.27 | 5.00 | 6.81 | 5.9 | 48 | 0.09 | 6.7 | 8.6 |
| Cymbella | sp. 6 PIRLA | 16.00 | 5.50 | 10.00 | 5.61 | 4.1 | 22 | 0.09 | 6.6 | 15.3 |
| Cymbella | aequalis | 5.89 | 1.44 | 21.00 | 5.85 | 14.8 | 44 | 0.37 | 8.8 | 10.9 |
| Cymbella | amphicephala | 8.93 | 8.93 | 1.00 | 5.52 | 3.3 | | 0.04 | 50.9 | 27.0 |
| Cymbella | brehmii | 6.60 | 1.15 | 15.00 | 6.06 | 4.8 | 25 | 0.11 | 11.2 | 8.6 |
| Cymbella | falaisensis | 7.66 | 2.77 | 12.00 | 5.82 | 8.2 | 26 | 0.13 | 3.5 | 11.1 |
| Cymbella | gaeumannii | 11.20 | 2.20 | 20.00 | 6.34 | 5.8 | 43 | 0.13 | 10.7 | 8.7 |
| Cymbella | hebridica | 3.20 | 0.98 | 24.00 | 5.87 | 7.2 | 34 | 0.14 | 5.9 | 13.0 |
| Cymbella | lunata | 5.86 | 1.35 | 23.00 | 6.50 | 7.9 | 72 | 0.18 | 9.5 | 11.5 |
| Cymbella | minuta | 13.02 | 1.51 | 18.00 | 7.23 | 12.8 | 217 | 0.25 | 10.5 | 10.1 |
| Cymbella | perpusilla | 2.19 | 1.46 | 3.00 | 6.46 | 8.1 | 39 | 0.11 | 2.4 | 5.5 |
| Cyclotella | ocellata | 6.40 | 3.40 | 2.00 | 6.23 | 11.1 | 101 | 0.32 | 29.2 | 9.5 |
| Cyclotella | pseudostelligera | 40.24 | 25.57 | 2.00 | 7.02 | 19.0 | 268 | 0.19 | 25.7 | 7.0 |
| Cyclotella | stelligera | 80.49 | 16.23 | 14.00 | 6.40 | 16.4 | 179 | 0.33 | 27.0 | 7.3 |
| Eunotia | bilunaris | 3.20 | 0.69 | 10.00 | 6.15 | 10.9 | 51 | 0.20 | 6.5 | 11.9 |
| Eunotia | bilunaris | 1.80 | 0.62 | 19.00 | 6.29 | 8.5 | 58 | 0.19 | 10.8 | 10.3 |
| Eunotia | minor | 4.47 | 1.36 | 8.00 | 5.97 | 6.4 | 50 | 0.10 | 35.1 | 14.6 |
| Eunotia | paludosa | 1.97 | 0.90 | 8.00 | 6.01 | 9.9 | 44 | 0.15 | 5.0 | 10.2 |

**Table 7.** Continued.

| Genus | Species | Maximum % Abundance | Mean % Abundance | Sites | Optimum pH | Optimum Conductivity (µS/cm) | Optimum ANC (µeq/L) | Optimum Mg (mg/L) | Optimum Depth (m) | Optimum TP (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| Eunotia | rhomboidea | 4.27 | 0.65 | 11.00 | 5.75 | 4.6 | 29 | 0.07 | 33.4 | 20.9 |
| Eunotia | subarcuatoides | 3.80 | 1.00 | 9.00 | 6.24 | 6.6 | 39 | 0.12 | 13.9 | 9.0 |
| Eunotia | vanheurckii | 3.37 | 0.93 | 5.00 | 6.31 | 6.2 | 38 | 0.09 | 24.5 | 4.0 |
| Fragilaria | sp. PRS 0A | 4.60 | 1.44 | 5.00 | 6.06 | 6.8 | 42 | 0.12 | 3.8 | 10.6 |
| Fragilaria | sp. 11 PIRLA | 2.17 | 1.38 | 3.00 | 7.23 | 13.2 | 207 | 0.11 | 5.7 | 9.0 |
| Fragilaria | sp. 9 PIRLA | 13.02 | 6.74 | 2.00 | 7.66 | 15.2 | 304 | 0.16 | 3.7 | 4.0 |
| Fragilaria | brevistriata | 33.40 | 9.64 | 19.00 | 7.28 | 105.3 | 339 | 7.02 | 25.2 | 12.4 |
| Fragilaria | capucina | 2.20 | 0.80 | 7.00 | 7.03 | 54.4 | 392 | 1.98 | 15.2 | 9.6 |
| Fragilaria | crotonensis | 34.40 | 10.46 | 7.00 | 8.23 | 104.2 | 480 | 5.07 | 32.1 | 24.3 |
| Fragilaria | construens | 28.60 | 8.84 | 17.00 | 7.32 | 37.2 | 361 | 1.35 | 10.0 | 13.9 |
| Fragilaria | exigua | 3.40 | 0.64 | 9.00 | 7.72 | 61.9 | 634 | 2.24 | 7.4 | 10.4 |
| Fragilaria | pinnata | 43.00 | 8.73 | 9.00 | 7.78 | 67.6 | 334 | 4.04 | 14.8 | 22.4 |
| Fragilaria | pinnata | 32.50 | 9.82 | 17.00 | 7.55 | 52.0 | 463 | 2.01 | 13.3 | 17.7 |
| Fragilaria | pseudoconstruens | 6.80 | 2.86 | 3.00 | 6.86 | 14.7 | 129 | 0.43 | 8.1 | 13.4 |
| Frustulia | rhomboides | 4.96 | 1.23 | 21.00 | 6.26 | 5.8 | 39 | 0.11 | 14.3 | 7.1 |
| Frustulia | rhomboides | 7.80 | 1.49 | 31.00 | 5.98 | 6.0 | 34 | 0.13 | 8.5 | 11.4 |
| Gomphonema | angustatum | 1.45 | 0.66 | 8.00 | 7.06 | 10.4 | 154 | 0.14 | 14.3 | 6.8 |
| Gomphonema | gracile | 1.40 | 0.39 | 14.00 | 6.21 | 18.8 | 149 | 0.51 | 13.5 | 8.9 |
| Melosira | sp. 13 PIRLA | 4.38 | 2.04 | 3.00 | 7.10 | 8.3 | 58 | 0.08 | 9.2 | 9.0 |
| Navicula | sp. 0E | 3.80 | 1.40 | 4.00 | 6.36 | 24.5 | 267 | 0.55 | 14.4 | 4.6 |
| Navicula | sp. 20 PIRLA | 3.53 | 1.41 | 4.00 | 7.16 | 8.6 | 82 | 0.08 | 12.3 | 9.0 |
| Navicula | sp. 24 PIRLA | 11.17 | 1.89 | 16.00 | 6.23 | 7.9 | 26 | 0.10 | 4.3 | 11.9 |
| Navicula | sp. 25 PIRLA | 1.69 | 0.63 | 7.00 | 7.00 | 9.8 | 96 | 0.12 | 18.4 | 7.5 |

**Table 7.** Continued.

| Genus | Species | Maximum % Abundance | Mean % Abundance | Sites | Optimum pH | Optimum Conductivity (µS/cm) | Optimum ANC (µeq/L) | Optimum Mg (mg/L) | Optimum Depth (m) | Optimum TP (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| Navicula | sp. 45 PIRLA | 2.42 | 0.91 | 4.00 | 6.82 | 6.3 | 53 | 0.09 | 6.0 | 9.0 |
| Navicula | cryptocephala | 1.00 | 0.45 | 11.00 | 6.63 | 43.5 | 122 | 2.39 | 10.4 | 9.5 |
| Navicula | cryptotenella | 2.38 | 0.74 | 16.00 | 7.03 | 14.1 | 176 | 0.49 | 15.2 | 11.2 |
| Navicula | laevissima | 2.40 | 0.75 | 10.00 | 6.94 | 35.7 | 414 | 0.98 | 12.5 | 7.6 |
| Navicula | leptostriata | 5.40 | 1.66 | 21.00 | 5.93 | 6.2 | 38 | 0.15 | 6.4 | 13.5 |
| Navicula | mediocris | 10.80 | 1.08 | 27.00 | 6.18 | 7.1 | 51 | 0.16 | 11.1 | 8.3 |
| Navicula | pupula | 6.52 | 1.02 | 13.00 | 6.68 | 24.3 | 210 | 0.57 | 10.8 | 8.8 |
| Navicula | radiosa | 3.10 | 0.82 | 12.00 | 7.15 | 21.3 | 221 | 0.72 | 16.4 | 9.5 |
| Navicula | seminuloides | 5.40 | 1.51 | 7.00 | 6.46 | 16.8 | 168 | 0.58 | 8.5 | 14.7 |
| Navicula | seminulum | 2.60 | 0.78 | 11.00 | 6.67 | 37.6 | 244 | 1.54 | 10.8 | 12.3 |
| Navicula | subatomoides | 2.20 | 0.59 | 9.00 | 6.56 | 28.8 | 165 | 1.45 | 10.9 | 13.1 |
| Navicula | submuralis | 2.40 | 0.85 | 8.00 | 6.62 | 19.9 | 195 | 0.60 | 8.9 | 13.6 |
| Navicula | subtillissima | 16.00 | 1.97 | 27.00 | 5.71 | 5.1 | 19 | 0.11 | 9.4 | 11.5 |
| Navicula | tenuicephala | 49.11 | 15.93 | 36.00 | 5.86 | 5.8 | 25 | 0.12 | 6.5 | 13.0 |
| Neidium | affine | 3.48 | 0.86 | 12.00 | 6.41 | 6.3 | 45 | 0.13 | 9.7 | 12.9 |
| Neidium | alpinum | 1.76 | 0.64 | 18.00 | 6.13 | 6.4 | 35 | 0.11 | 6.5 | 10.9 |
| Neidium | iridis | 2.67 | 0.75 | 27.00 | 5.89 | 11.5 | 27 | 0.24 | 8.5 | 12.5 |
| Nitzschia | fonticola | 14.73 | 1.69 | 14.00 | 7.63 | 32.9 | 319 | 3.26 | 9.4 | 18.7 |
| Nitzschia | frustulum | 10.39 | 3.36 | 5.00 | 7.36 | 12.8 | 259 | 0.11 | 4.4 | 9.0 |
| Nitzschia | gracilis | 6.03 | 1.34 | 17.00 | 6.21 | 27.9 | 121 | 0.62 | 7.0 | 11.1 |
| Nitzschia | perminuta | 5.10 | 1.45 | 6.00 | 6.44 | 8.6 | 78 | 0.25 | 3.8 | 10.8 |
| Nitzschia | tropica | 1.57 | 0.56 | 5.00 | 7.90 | 289.3 | 460 | 15.77 | 43.9 | 21.1 |
| Pinnularia | sp. PRS 0C | 4.20 | 1.52 | 4.00 | 5.79 | 4.5 | 15 | 0.07 | 4.1 | 23.0 |

**Table 7.** Continued.

| Genus | Species | Maximum % Abundance | Mean % Abundance | Sites | Optimum pH | Optimum Conductivity (µS/cm) | Optimum ANC (µeq/L) | Optimum Mg (mg/L) | Optimum Depth (m) | Optimum TP (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| Pinnularia | sp. 28 PIRLA | 14.98 | 4.12 | 7.00 | 6.79 | 5.7 | 47 | 0.08 | 7.0 | 8.5 |
| Pinnularia | biceps | 13.83 | 3.37 | 24.00 | 6.09 | 6.5 | 33 | 0.11 | 7.8 | 12.0 |
| Pinnularia | braunii | 9.20 | 3.43 | 11.00 | 6.14 | 6.1 | 43 | 0.14 | 9.2 | 10.4 |
| Pinnularia | brebissonii | 6.69 | 3.89 | 2.00 | 6.23 | 3.2 | 14 | 0.07 | 9.8 | 8.0 |
| Pinnularia | gibba | 3.33 | 0.68 | 12.00 | 6.62 | 9.7 | 71 | 0.18 | 8.3 | 10.4 |
| Pinnularia | subcapitata | 5.24 | 5.24 | 1.00 | 5.52 | 3.3 | | 0.04 | 50.9 | 27.0 |
| Stenopterobia | intermedia | 0.92 | 0.39 | 14.00 | 6.42 | 7.0 | 64 | 0.17 | 11.2 | 7.9 |
| Stauroneis | anceps | 3.40 | 0.92 | 17.00 | 6.57 | 7.8 | 59 | 0.18 | 7.7 | 11.4 |
| Stephanodiscus | hantzschii | 2.67 | 1.00 | 5.00 | 8.34 | 350.9 | 509 | 27.88 | 60.6 | 28.7 |
| Stephanodiscus | medius | 18.67 | 5.88 | 5.00 | 8.35 | 57.3 | 573 | 2.04 | 34.5 | 30.9 |
| Stephanodiscus | minutus | 56.71 | 15.76 | 8.00 | 8.16 | 387.7 | 516 | 26.30 | 57.7 | 24.2 |
| Stephanodiscus | niagarae | 6.80 | 2.40 | 4.00 | 8.15 | 36.2 | 384 | 1.29 | 14.8 | 21.4 |
| Stephanodiscus | parvus | 3.33 | 1.83 | 7.00 | 8.20 | 215.7 | 536 | 15.31 | 39.6 | 28.2 |
| Surirella | delicatissima | 3.00 | 0.78 | 11.00 | 5.85 | 4.7 | 26 | 0.09 | 7.4 | 16.6 |
| Surirella | delicatissima | 2.98 | 0.92 | 28.00 | 6.03 | 9.5 | 27 | 0.20 | 5.2 | 11.0 |
| Tabellaria | spp. | 0.80 | 0.32 | 11.00 | 6.13 | 9.4 | 82 | 0.23 | 11.5 | 9.1 |

[a] conductivity
[b] acid neutralizing capacity
[c] magnesium
[d] total phosphorus

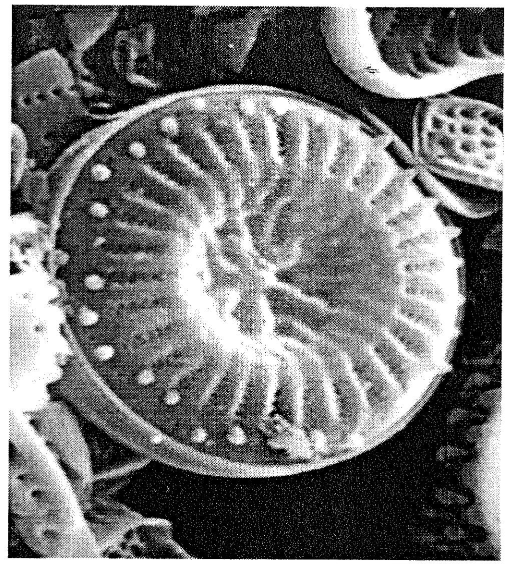


**Figure 11**. Electron micrograph of *Cyclotella stelligera*.

*Achnanthes marginulata* was widespread (37 lakes) and often occurred at very high percentages (e.g., 28% in Summit Lake). It also is most common in the small shallow Rainier lakes, perhaps because it is often found as an epiphyte. Environmental optima are similar to that of *Aulacoseira distans*. Because of some uncertainties in melding the two data sets, the percentages were combined with those of *Achnanthes levanderi*, but this combination, although not taxonomically precise, probably had little effect on the statistical analysis. The common planktonic diatom *Cyclotella stelligera* (Figure 11) occurred in only 14 lakes, but was abundant in these lakes. It appears to prefer relatively unproductive lakes that have sufficient area and depth to support a vigorous planktonic community such as the Cascade lakes Charlton (>80%) and Heather and the small but deep Green Lake from Mt. Rainier. Its pH optima is 6.41. *Stephanodiscus minutulus* is also planktonic, and like *C. stelligera* is found in a few lakes (8), occasionally at high abundances (over 50% in Paulina and East Lake). It is found in larger, deeper lakes of higher productivity, that are typically quite alkaline.

The many small *Fragilaria* taxa that make up the species *F. pinnata, F. construens*, and *F. brevistriata* also are very abundant in the Cascade lakes. Although very similar in appearance under the light microscope, some authorities now separate them into different genera. Nevertheless, they often occur together in differing numbers, and can dominate the surface sediment assemblages of alkaline lakes such as Lava, Caskey and Gertrude. A very different important diatom species is the well known eutrophic plankter *F. crotonensis* which dominated Suttle and Marion lakes. *F. crotonensis*, *Asterionella formosa*, and *S. parvus* were among the species with the highest TP optima.

A number of diatoms probably need further taxonomic effort to resolve their differences in the Cascades. Among these is a very complex group of *Cymbella* (commonly epiphytic) species of which the important and widespread taxa *Cymbella* sp. 6 PIRLA, *Cymbella* sp. 0A CASCADES (Figure 12), and *Cymbella brehmii* may all be closely related. The *Achnanthes* genus is also well represented in the Cascade calibration set and some careful taxonomic work, with electron microscopical analysis, could also benefit this difficult-to-identify group.

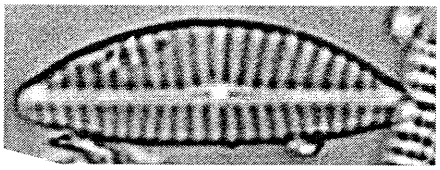


**Figure 12**. *Cymbella* sp. 6 from Lucky Lake, OR

In summary, the Cascade diatom assemblages are typified by larger, more productive lakes being dominated by assorted planktonic species, and smaller, shallower lakes containing a diverse mix of epiphytic and benthic species. The resulting weighted average optima for the many well-known species are consistent with values found in the literature. The most abundant taxon, *Aulacoseira distans* and its varieties, is also the most complex and the most in need of further taxonomic study in the Cascade lakes.

## 3. Statistical Diatom Ordination and Regression

To assess the importance of the fullest possible suite of environmental variables, analyses were first run on the smaller calibration set, Calset A. For both transformed and untransformed data, the first axis was most strongly related to interrelated components of acid-base chemistry such as pH, ANC, conductivity, and the individual base cations. The second axis was most strongly related to lake depth. The first axis was significant as determined by a Monte Carlo permutations test (99 unrestricted permutations, $P \leq 0.05$). The CANOCO program also enables individual variables to undergo forward selection to ascertain their importance to the first axis of ordination. These tests indicated that the variables that best explain the diatom variance were one of the three major metrics of ionic constituency (pH, conductivity, and ANC) with one of the base cations also being important. Sulfate and chloride concentrations (the major variables missing in the Mt. Rainier lakes) were not strongly correlated to diatom assemblages. This was fortunate because it meant that subsequent statistical analysis of the diatoms could be conducted for those lakes in the data set for which sulfate and chloride were not measured. It was decided that the larger calibration set of 42 lakes (Calset B) could be employed for more detailed analyses.

CANOCO also assists in determining correlations between environmental variables (Table 8). It is desirable to eliminate strongly correlated variables. Many variables may be candidates for diatom inferences, but reconstructions of highly correlated variables cannot be considered to be independent. Most of the available variables in the Cascade calibration set are related to major ion chemistry. Lake depth, area, and total phosphorus are not strongly correlated with other variables. It was decided in the second phase of calibration set ordination to eliminate all base cations except Mg (which was the most important in the transformed data), and to explore the three major acid-base variables (pH, ANC, conductivity) in detail. Water depth, area, and total phosphorus would also be retained.

The percent of theoretical variance that may be explained by the diatom assemblages in the 35 lake set by CA approaches 50%, with 12.9% ( $\lambda_1$ = 0.864) ordinating along the first canonical axis (usually the only significant axis) and 23.5% on the first two axes combined (Table 9). This number compares favorably with other diatom calibration set investigations. More importantly, the CCA for the same lake set has a $\lambda_1$ = 0.782. The ratio of the first axis eigenvalues of CA and CCA implies that the measured environmental variables capture 90% of the theoretical variance along the first axis. This demonstrates that we have collected the most important environmental data for representing the diatom communities.

The amount of variance explained by the other axes declines abruptly from CA to CCA and as correlated variables are eliminated. However, it appears that although we captured the most important variables, minor variables that may not be represented could explain some of the variance in the diatom communities. Such variables may include metrics for transparency, morphometry, or other chemical attributes such as silica.

The total unconstrained eigenvalues (or inertia) sum to 6.674; this value is high and reflects the heterogeneity within the diatom data set. A measure of this is found by running CA on just the 27 Cascade lakes sampled for this study. The inertia falls to 5.342 and the variance explained by the

Table 8. Correlation matrix for 12 environmental variables, 35 lakes.

| | Area | Depth | Cond[a] | pH | lg$SO_4$[b] | lgCl[c] | lgANC[d] | lgTP[e] | lgNa[f] | lgK[g] | lgCa[h] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Area | 1.0000 | | | | | | | | | | |
| Depth | .5099 | 1.0000 | | | | | | | | | |
| Cond | .5018 | .3556 | 1.0000 | | | | | | | | |
| pH | .6084 | .3719 | .7368 | 1.0000 | | | | | | | |
| lg$SO_4$ | .1779 | .1900 | .7345 | .2243 | 1.0000 | | | | | | |
| lgCl | .4250 | .0313 | .5943 | .5933 | .3735 | 1.0000 | | | | | |
| lgANC | .5617 | .3830 | .8764 | .8573 | .4536 | .5280 | 1.0000 | | | | |
| lgTP | .3956 | .1659 | .2964 | .3709 | .0843 | .5365 | .2519 | 1.0000 | | | |
| lgNa | .5729 | .2492 | .9044 | .7407 | .5411 | .7311 | .7999 | .4223 | 1.0000 | | |
| lgK | .6424 | .2740 | .8621 | .7721 | .5167 | .5044 | .8224 | .5319 | .8355 | 1.0000 | |
| lgCa | .4002 | .4262 | .9415 | .6841 | .7224 | .5021 | .8387 | .0887 | .8224 | .7271 | 1.0000 |
| lgMg | .6084 | .3701 | .9603 | .7042 | .6804 | .5295 | .8653 | .3621 | .9017 | .8949 | .8881 |
| | Area | Depth | Cond | pH | lg$SO_4$ | lgCL | lgANC | lgTP | lgNa | lgK | lgCa |

[a] Conductivity
[b] log sulfate
[c] log chloride
[d] log acid neutralizing capacity
[e] log total phosphorus
[f] log sodium
[g] log potassium
[h] log calcium

**Table 9.** Eigenvectors calculated in CCA ordination analyses for Cascade Lake subset.

| Subset (variables) | $\lambda_1$ | $\lambda_2$ | $\lambda_{can}$ | $\lambda_{unc}$ |
|---|---|---|---|---|
| 35 lakes, 12 vars. | | | | |
| CA | 0.864 | 0.706 | - | 60.674 |
| CCA | 0.782 | 0.497 | 30.274 | 60.674 |
| 42 lakes, 7 vars. | | | | |
| CCA | 0.775 | 0.308 | 10.981 | 60.803 |
| 42 lakes, 5 vars. | | | | |
| CA | 0.877 | 0.709 | - | 60.762 |
| CCA (5 w/pH) | 0.775 | 0.291 | 10.709 | 60.803 |
| - outliers | 0.764 | 0.305 | 10.739 | 60.803 |
| CCA (5 w/cond) | 0.771 | 0.294 | 10.563 | 60.803 |
| CCA (5 w/ANC) | 0.751 | 0.301 | 10.589 | 60.803 |
| Cascade Lakes (27) | | | | |
| CA | 0.881 | 0.621 | - | 50.342 |
| single vars., 42 lakes | | | | |
| CCA - pH | 0.652 | 0.707 | - | - |
| CCA - conductivity | 0.701 | 0.716 | - | - |
| CCA - ANC | 0.660 | 0.709 | - | - |
| CCA - Mg | 0.713 | 0.721 | - | - |
| CCA - TP | 0.256 | 0.843 | - | - |
| CCA - depth | 0.431 | 0.748 | - | - |

first axis accordingly increases to over 20% with the exclusion of the Rainier lakes. Therefore, the melding of the two data sets (Cascade and Rainier) is a trade-off of greater sample size versus the increased heterogeneity of the merged data. This test merely reflects the differences in diatom assemblages and does not take into account the different physico-chemical status of the two lake sets.

Exploration of important environmental variables

The exploration of the datasets continued by running CA and CCA analyses on different sets of transformed variables using the 42 lake set Calset B described above. First, the eigenvalues and correlations were examined with seven environmental variables (all three major ionic variables) and then substituting just one of either pH, conductivity, or ANC in a run with six environmental variables (pH/ANC/conductivity, total phosphorus, depth, area). The eigenvalues (Table 9) are very similar for the first axis in all the CCA analyses (0.751-0.775) explaining a little more than 11% of the diatom variance, and still capturing a significant amount of the first axis theoretical variance.

In each of these cases, the variables most closely related to the first axis are Mg and one of the three major variables (pH/ANC/conductivity). Depth is most strongly correlated to the second axis. The importance of these five variables can be further tested by constraining the individual variable to the first axis of ordination — in effect, the vector for the variable becomes the first axis and can be tested for its power to explain the variance in the diatom assemblages. In particular, important variables should demonstrate a ratio of close to 1 for $\lambda_1$:$\lambda_2$. Table 9 demonstrates that this criterion is met for all three of the ionic summary variables as well as magnesium, each of these explaining as much as 10% of the variance.

The CANOCO program also identifies those lakes that have an undue influence on the ordination. These lakes are typically identified from a casual review of the environmental variables. For instance, East and Paulina Lakes have extreme values of conductivity and ANC and Agency Lake has a very high total phosphorus value (Table 3). Eliminating these extreme observations does not greatly affect the CCA results (see Table 9), but the outliers can be very important in assessing the standard errors of any lake reconstruction derived from these calibrations. .

A final biplot of both site scores (Figure 13) and sample scores (Figure 14) with the vectors of the retained environmental variables demonstrates the strength of the ionic constituents in describing the first axis of ordination. In particular, the Cascade lakes are well dispersed along the first axis, providing the basic line along which the diatoms differentiate. The Rainier lakes are more concentrated in the low pH (and conductivity and ANC) end of the continuum and are distributed across the poorly defined second axis of ordination. The Rainier lakes also include many of the 40 most important species to a lower abundance weighted mean of the target variables.

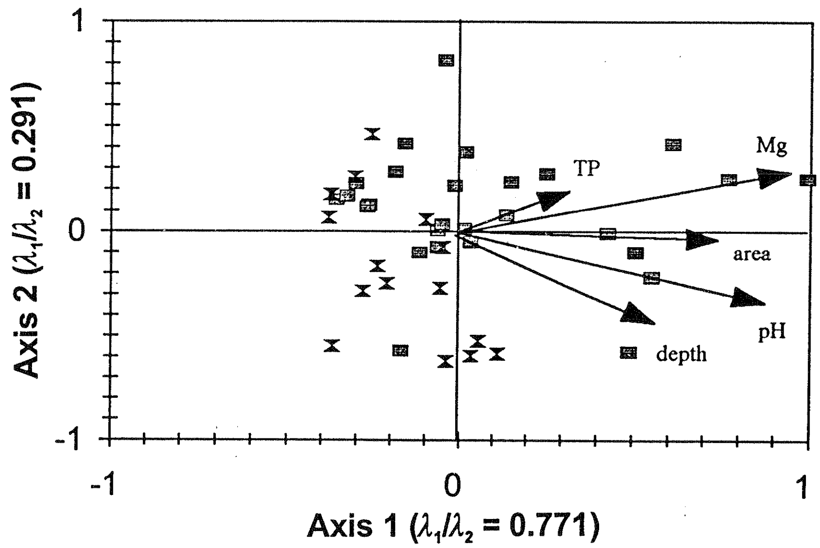



Figure 13. CCA ordination diagrams of sediment diatoms. Biplot of environmental variables with site scores are presented as linear combinations of environmental variables. Cascade lakes are squares and Rainier lakes are double triangles.

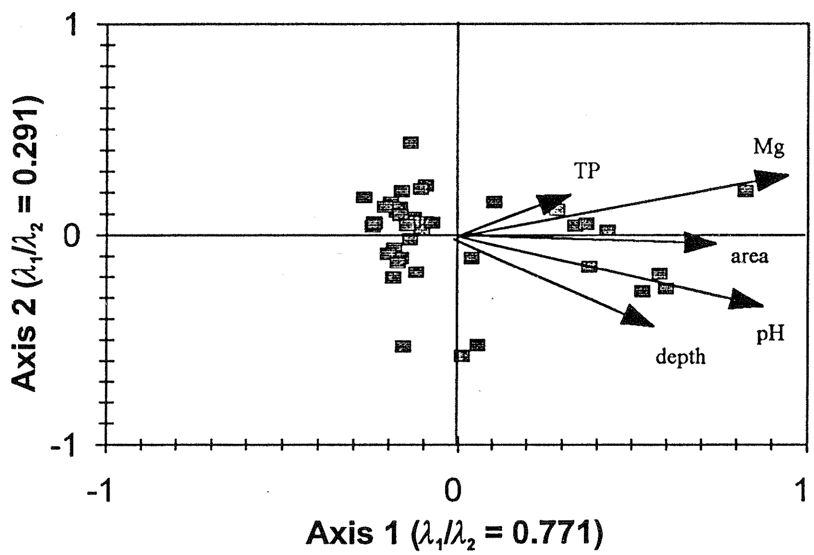



Figure 14. CCA ordination of species scores with environmental variables for Cascade lakes.

<u>Choosing variables as candidates for inference equations</u>

Transfer functions were derived for pH. The computer program WACALIB 3.3 calculates transfer functions using WA regression and calibration. A coefficient is assigned to each diatom based on its optimum (weighted average mean pH, etc.) within the calibration set. The final model may be based on either a simple weighted average (WA) or weighted average with a tolerance or range factor built in (WA-tol). Comparison of the inferred versus observed values will give the absolute residual and what is now referred to as the apparent $r^2$ and apparent standard error (RMSE). Bootstrapping techniques can be used to eliminate the circularity that can affect these statistics. Bootstrapping randomly selects with replacement a subset of lakes to be used as the calibration set and the remainder make up the test set (Birks et al. 1990). By running numerous (e.g., 1000) bootstrap cycles, an error estimation can be determined eliminating the previous circularity. Bootstrapping error is referred to as the $RMSEP_{boot}$ or the standard error of prediction using bootstrapping. In an actual water quality historical reconstruction for a lake, an individual prediction error can be calculated for each modern sample and an estimated prediction error derived for each inferred sample.

Furthermore, outliers can be identified as observations whose absolute residual (observed-inferred) is greater than the standard deviation (Jones & Juggins 1995). The calibration model was run on a series of environmental variables and the resulting inference statistics are summarized in Table 10. Although the table contains statistics from log-transformed reconstructions, in fact such reconstructions can be difficult to use and evaluate. Therefore, we will primarily discuss the statistics based on untransformed values.

*pH*. Inference statistics for pH (based on 48 lakes) indicate a high coefficient of determination ($r^2$ =0.84), with tolerable standard errors (apparent $s$=0.36, $RMSEP_{boot}$ =0.52). Statistics less amenable for use in inference equations often will show a large difference between the two types of standard errors, and the standard errors is well within the range of the metric standard deviation. A graph of the observed versus diatom-inferred pH (Figure 15) shows that most values are closely inferred. Two lakes from the subset of the calibration set had very high absolute residuals

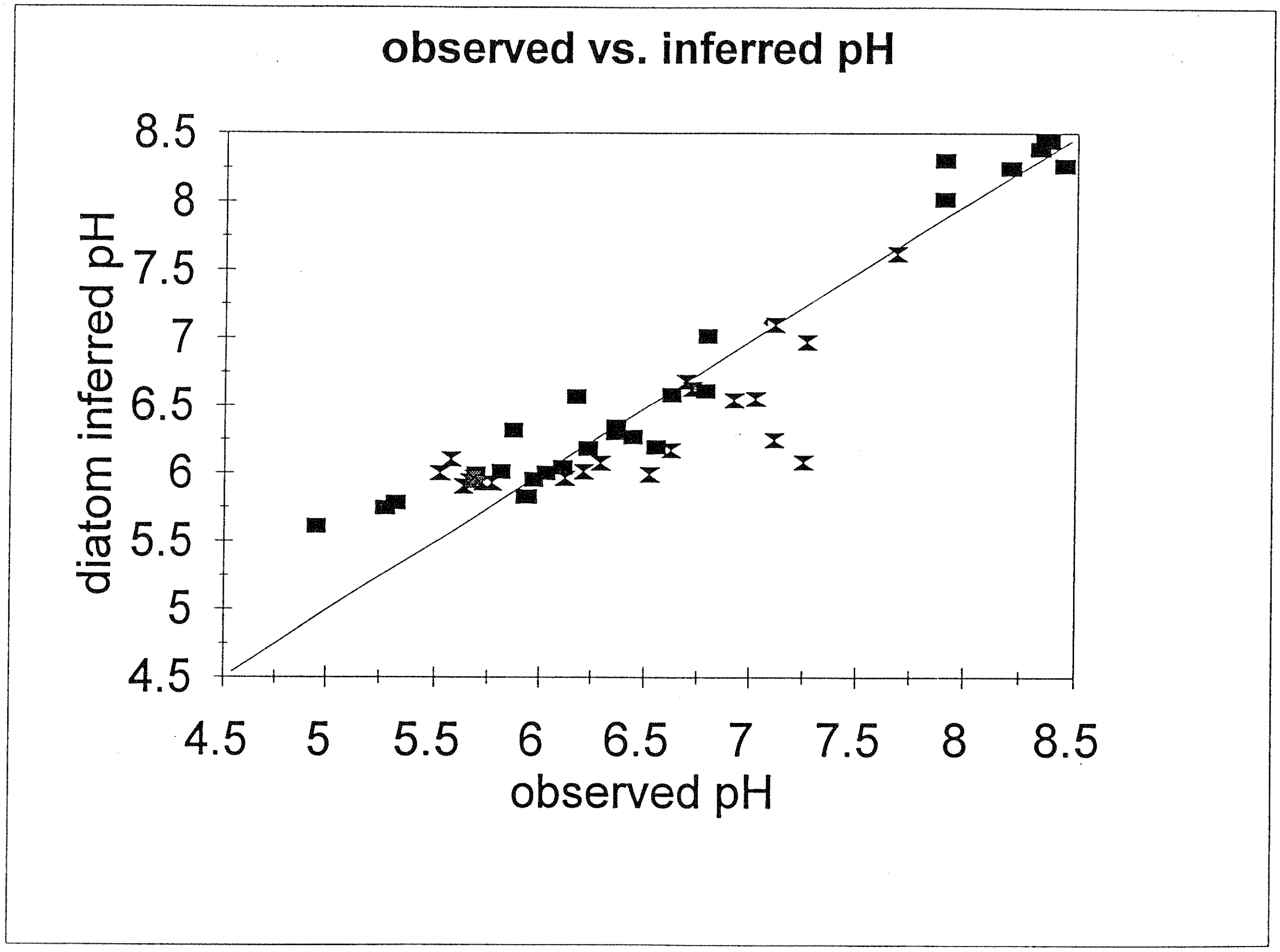



Figure 15. Measured pH versus diatom-inferred pH for all lakes in the Cascade diatom calibration set. Cascade lakes are squares and Rainier lakes are double triangles.

**Table 10**: Summary of inference statistics from weighted averaging regression of selected environmental variables against the diatom assemblages. Calculated using WACALIB and CALIBRATE

| | WA | | WA-tol | | Range of metric | | RMSE bootstrap | |
|---|---|---|---|---|---|---|---|---|
| Environmental Variable | $r^2$ | RMSE | $r^2$ | RMSE | Min /Max | sd | WA | WA-tol |
| ANC | 0.661 | 635 | 0.859 | 409 | -15/7226 | 1079 | 1118 | 992 |
| ANC (-extreme) | 0.668 | 123 | 0.601 | 134 | -15/939 | 207 | 166 | 185 |
| log (ANC +16) | 0.765 | 0.32 | 0.801 | 0.30 | 0/3.86 | 0.66 | 0.39 | 0.41 |
| conductivity | 0.817 | 41.0 | 0.933 | 24.8 | 2.7/553.8 | 94.8 | 80.8 | 84.3 |
| log conductivity | 0.851 | 0.20 | 0.861 | 0.20 | .43/2.74 | 0.52 | 0.30 | 0.33 |
| depth | 0.712 | 9.4 | 0.746 | 8.8 | 0.1/77 | 17.3 | 14.8 | 16.6 |
| log depth | 0.571 | 0.40 | 0.641 | 0.37 | -1/1.9 | 0.61 | .516 | 0.54 |
| magnesium | 0.657 | 4.5 | 0.938 | 1.9 | 0.4/48 | 7.5 | 8.2 | 7.5 |
| log magnesium | 0.861 | 0.25 | 0.877 | 0.24 | -1.4/1.7 | 0.67 | .37 | 0.39 |
| total phosphorus | 0.355 | 20.6 | 0.390 | 20.0 | 1/170 | 25.3 | 31.2 | 26.7 |
| TP (-outliers) | 0.530 | 5.7 | 0.620 | 5.1 | 1/32 | 8.20 | 7.8 | 7.5 |
| log TP | 0.455 | 0.27 | 0.621 | 0.23 | 0/2.23 | 0.37 | .402 | 0.35 |
| pH | 0.786 | 0.42 | 0.845 | 0.36 | 4.9/8.4 | 0.90 | .54 | 0.52 |
| pH (-outliers) | 0.837 | 0.31 | 0.887 | 0.31 | 4.9/8.4 | 0.90 | .48 | 0.46 |

(Figure 16) and were removed from the model for a second run. The removal of these outliers has a moderate effect on the inference statistics ($r^2$ =0.89, *s*=0.31; Table 10) that may not be readily apparent from Figure 17. This demonstrates that the removal of some sites can improve a diatom calibration model if used with caution. Such outliers probably arise most frequently when non-measured environmental variables are controlling diatom populations. In summary, pH is an excellent candidate for inference studies in the Cascades.

The diatom-inferred pH results and plot of residuals, although acceptable on statistical grounds, raise several questions that warrant further examination: (1) What is the effect of the high pH lakes on the predictive capability of the equation? (2) What is the effect of the Rainier lakes? and (3) What is the effect of the lakes for which reconstructions are being prepared? Historically, the primary motivation for creating a diatom-inferred pH calibration has been to assess changes in lake chemistry associated with acidification from atmospheric deposition (e.g., Charles and Smol 1988), although other applications for pH reconstructions are now becoming recognized (Smol 1992).

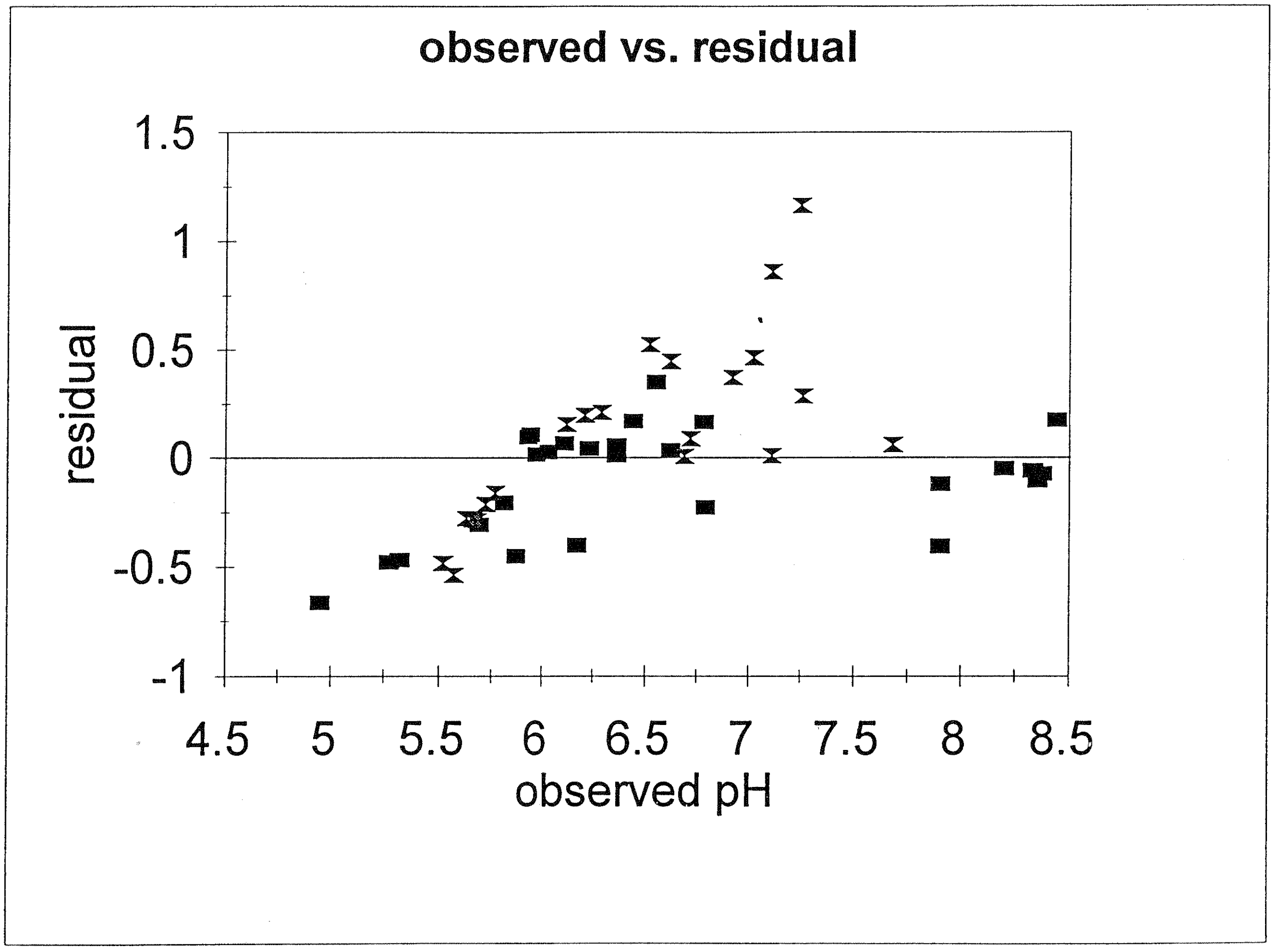



Figure 16. Measured pH versus the residual (from Figure 15) of measured and diatom-inferred pH. Cascade lakes are squares and Rainier lakes are double triangles.

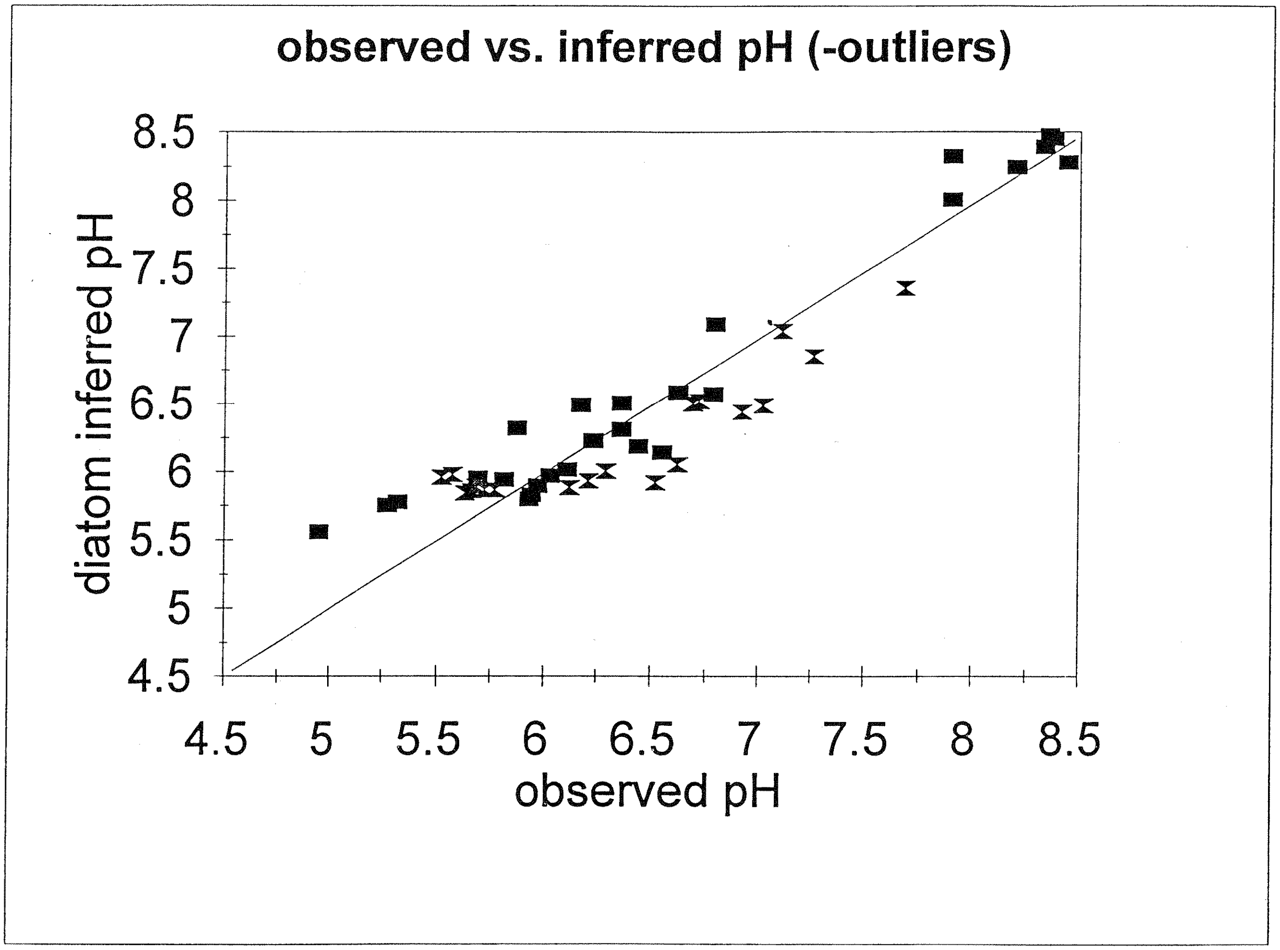



Figure 17. Measured pH versus diatom-inferred pH with two outliers removed. Cascade lakes are squares and Rainier lakes are double triangles.

If the objective of creating a pH reconstruction is to analyze potential acidification issues in low pH lakes, then there is no need or advantage in including high pH lakes in the calibration set because high pH lakes are not susceptible to acidification. To assess the effect of the high pH lakes on the calibration equation, high pH lakes were successively removed from the calibration set starting with lakes with pH greater than 7.5. The resulting calibration set of 38 lakes yields an equation with higher variance ($r^2$=0.76) and lower standard error (*s*=0.27) (Figure 18). The calibration set was further restricted to lakes with pH less than 6.5 (n=26 lakes) to yield an equation with even greater variance ($r^2$=0.58) and lower standard error of prediction (*s*=0.24) (Figure 19).

The plot of pH residuals illustrates that the Rainier subset of lakes predicts somewhat differently than the non-Rainier (i.e. Cascade subset) lakes (Figure 16). The effect of the Rainier lakes was evaluated by removing these lakes from the calibration set and re-running the weighted averaging (with tolerance) equation (Figure 20). The results indicate that removing the Rainier lakes results in reduced unexplained variance ($r^2$=0.94) and a lower standard error of prediction (*s*=0.25). The subset of Cascade lakes (n=29) may yield improved results with the Rainier lakes excluded because of several factors including (1) exclusion of the very shallow Rainier ponds which are dominated by benthic diatom taxa; (2) consistent taxonomy of the Cascade subset, or (3) more consistent water chemistry data in the Cascade subset.

Finally, there was concern that Summit and Notasha Lakes which will utilize the pH calibration results in the pH reconstructions unduly influences the calibration equations. The effect that these two lakes exert on the process was evaluated by re-running the Cascade calibration subset shown above, but this time excluding Summit and Notasha Lakes. The results show a very minimal effect of these two lakes on the calibration equation ($r^2$=0.95, *s*=0.24). Subsequent analyses for other parameters in the remainder of this report report the results with both Summit and Notasha Lakes included in the calibration equations. The effect of the various permutations of lake subsets on the pH calibration statistics are presented in Table 11.

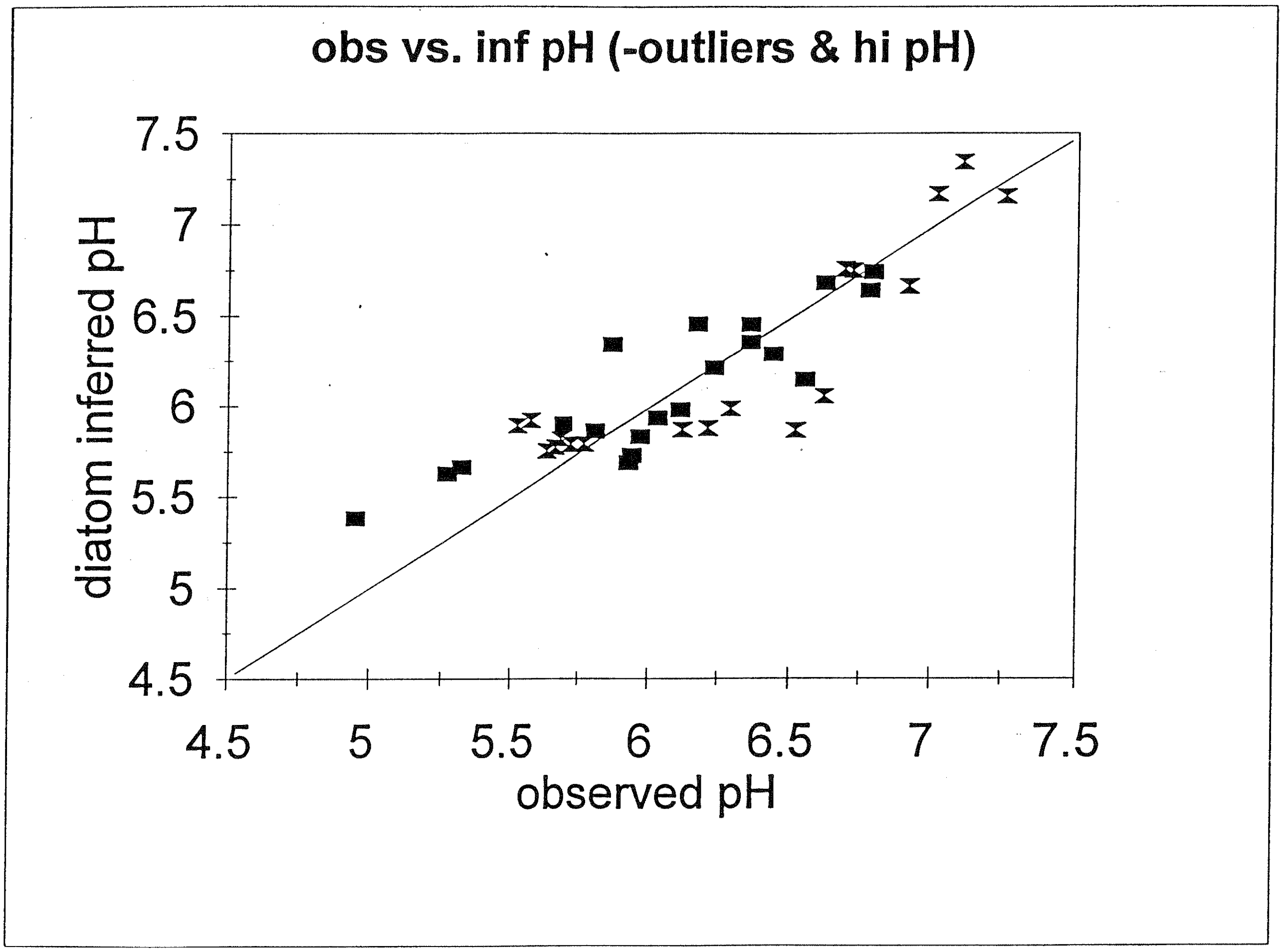



Figure 18. Measured pH versus diatom-inferred pH for lakes with measured pH less than 7.5. Cascade lakes are squares and Rainier lakes are double triangles. Two outliers described in the previous figure are also omitted.

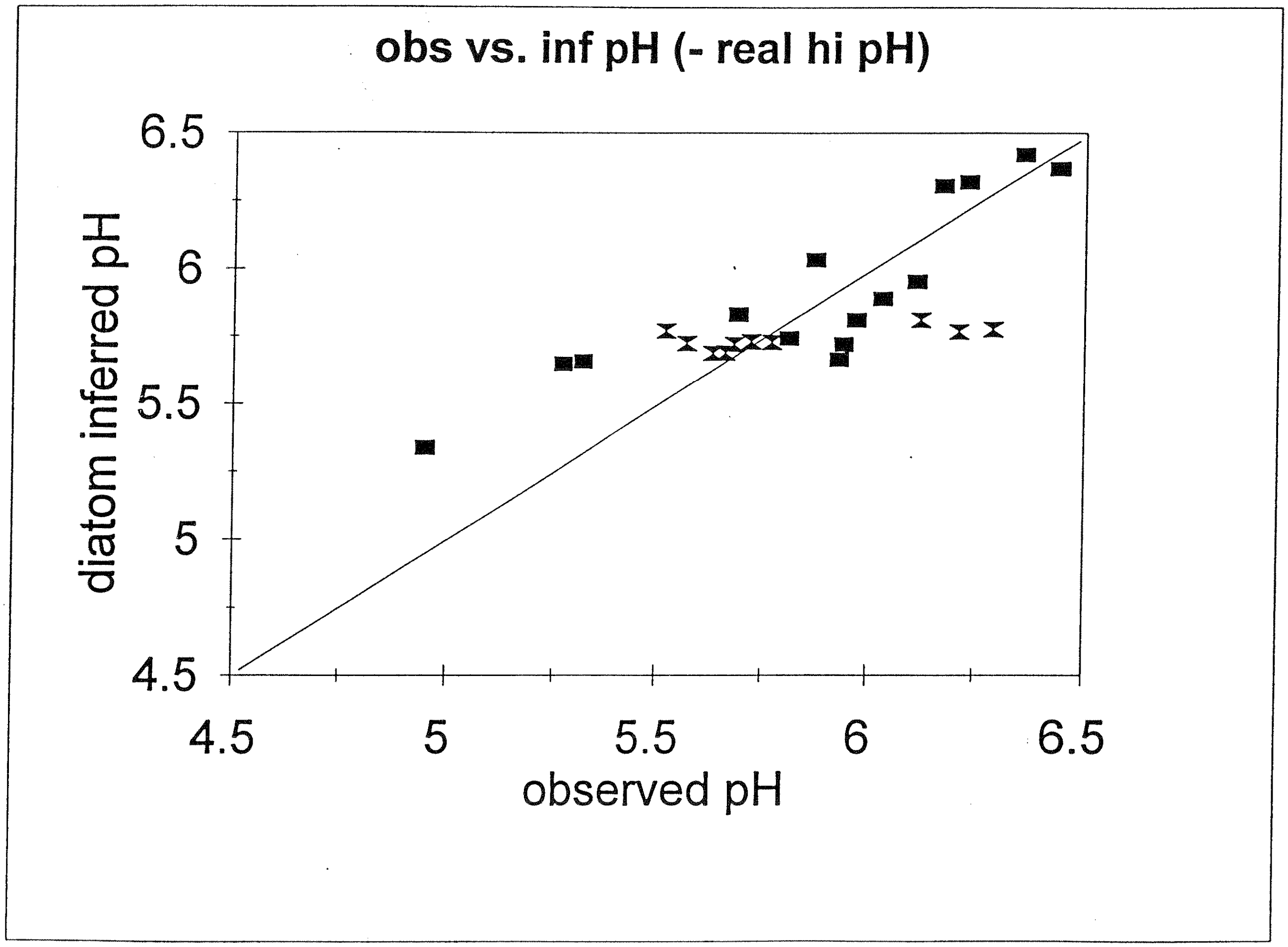



Figure 19. Measured pH versus diatom-inferred pH for lakes with measured pH less than 6.5. Cascade lakes are squares and Rainier lakes are double triangles. Two outliers described in the previous figure are also omitted.

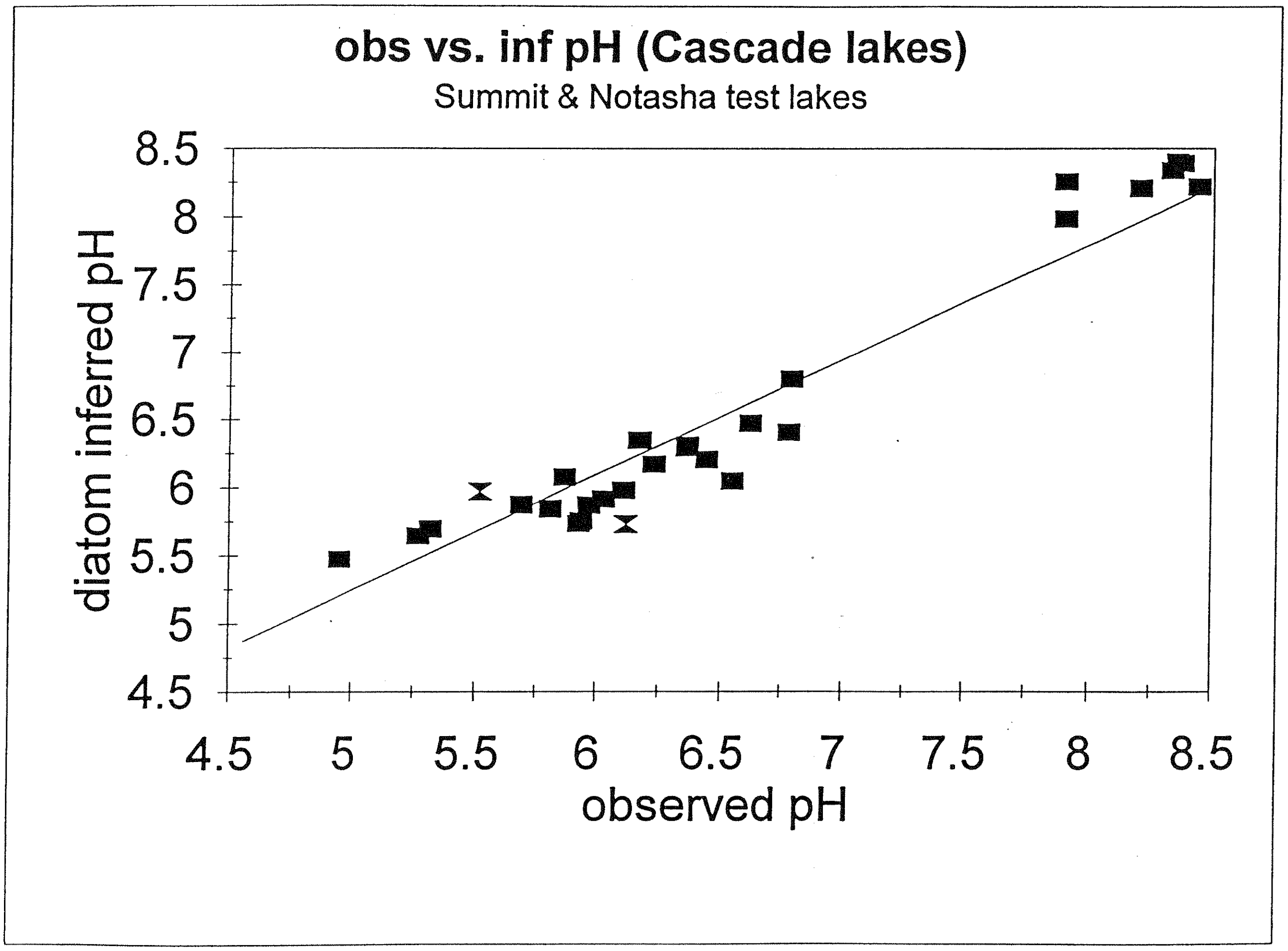



Figure 20. Measured pH versus diatom-inferred pH for lakes in the Cascade-only subset (i.e., all Rainier lakes omitted). Cascade lakes are squares. Summit and Notasha Lakes are plotted on the figure as double triangles, but are not included in the calibration equation.

Table 11. pH calibration regression statistics(weighted-averaging, with tolerance) for the Cascade calibration set.

| | Population Subset | | | | | |
|---|---|---|---|---|---|---|
| | All | All-outliers[a] | pH < 7.5 | pH < 6.5 | Non-Rainier | Non-Rainier - S & N[b] |
| N | 48 | 46 | 38 | 26 | 29 | 27 |
| $r^2$ | 0.84 | 0.89 | 0.76 | 0.58 | 0.94 | 0.95 |
| se | 0.36 | 0.31 | 0.27 | 0.24 | 0.25 | 0.24 |

[a] excludes Unnamed Mt. Rainier Lake (Park Service code ln23, our code RAIN38) and Upper Paradise Lake (Park Service code ln14, our code RAIN28)
[b] excludes Summit and Notasha Lakes

*Conductivity.* Inference statistics for specific conductance indicate that this variable is a strong candidate for inference using diatom assemblages. Using a suite of 44 lakes, WA(tol) equations have a very high $r^2$ (0.93), and a high standard error (24.8). However, $RMSEP_{boot}$ values are significantly higher (84.3) than the WA(tol) results. It is likely that the two lakes with extreme values for conductivity (East and Paulina Lakes are greater than 300 µS whereas all others are generally below 100 µS) may artificially inflate these statistics. However, the graph of observed versus inferred values demonstrates close agreement with the 1:1 line (Figure 21). The initial conductivity inference equation based on all available data yields a high $r^2$ value, but the standard error of the prediction is also high. The standard error from this equation is too large to have any predictive value. The weighted-averaging regression was re-run first excluding the two lakes with conductivity greater than 100 µS and again excluding the two lakes with conductivity between 50 and 100 µS. The resulting regression statistics illustrate the improvement in the smaller standard errors (Table 12). The improvement in the regression statistics comes at the price of a reduced range in which diatom inferences can be made, but a conductivity range of 0 to 50 µS still includes approximately 85% of the lakes in the study area (Eilers et al. 1987).

*Acid Neutralizing Capacity (ANC).* The possibility of reconstructing ANC is somewhat more problematic. Initially based on all lakes, $r^2$ of the WA(tol) inferred versus observed is high (0.86), but the bootstrap values are very high — greater than the standard deviation of the range of observed

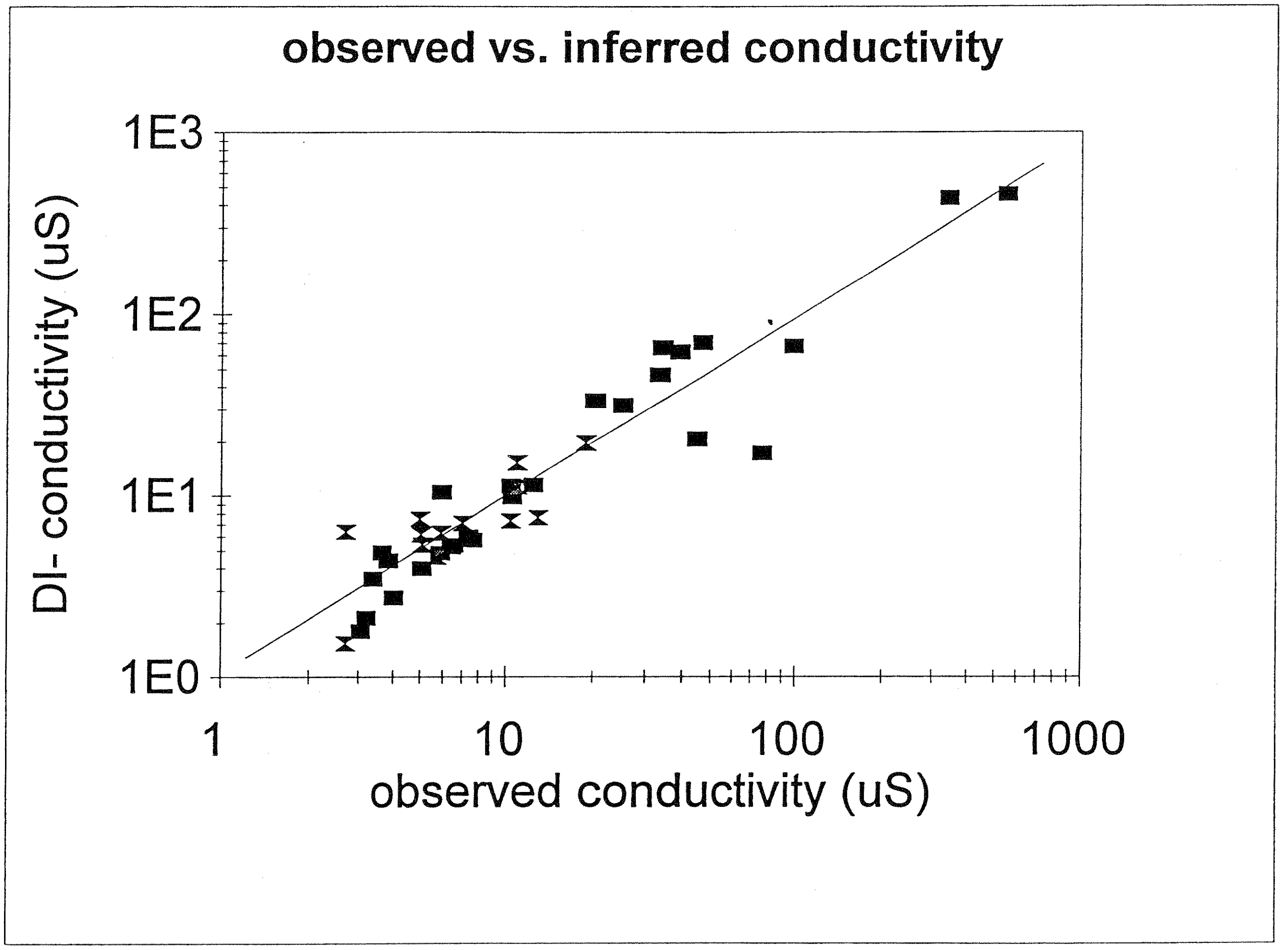



Figure 21. Measured conductivity versus diatom-inferred (DI) conductivity for lakes in the Cascade diatom calibration set. Cascade lakes are squares and Rainier lakes are double triangles.

**Table 12.** Weighted-averaging regression statistics for diatom-inferred conductivity (µS) in the Cascade calibration set.

| Conductivity Range | 2.7-553 | 2.7-98 | 2.7-49 |
|---|---|---|---|
| N | 44 | 42 | 40 |
| $r^2$ | 0.933 | 0.61 | 0.83 |
| RMSE | 24.8 | 12.5 | 4.9 |
| $RMSE_{bootstrap}$ | 84.3 | 17.0 | 7.9 |

values. There are two extreme ANC values in the dataset (East and Paulina Lakes are an order of magnitude above other values). As the inference equation is judged by a regression line between observed and inferred, such disparate values can generate spurious $r^2$ values by drawing a line between two groups of points that are widely separated. The log transformations can assist with these problems, but ANC values can have negative values, and obtaining a normal distribution of points through transformation required adding a constant to each value before converting to log values. This obscures the object of this analysis, which is determining how well diatom assemblages can predict measured ANC values that scientists can easily interpret.

We removed the extreme untransformed values and again plotted the observed values against diatom-inferred values (Figure 22). The resulting $r^2$ (0.67 for WA) is lower than observed for WA(tol), but the equation is improved when considering the standard error. Unfortunately, a standard error of 123 µeq/L is too great to provide useful predictions. It is possible that the removal of the next two extreme values which are also outliers with respect to poor prediction by diatoms may improve this statistic. However, ANC clearly is of limited use as a potential candidate for diatom inference equations in the Cascades.

*Lake Depth.* Lake depth was strongly related to the second axis of the CCA ordination. The $r^2$ of the WA(tol) equation is 0.75 and the standard error is 8.8 m. This is well within the range of the standard deviation of the observed values and represents around 10% of the range of lake depth. Unlike the above environmental values, water depth appears to be a weak independent variable in the diatom prediction. It is more likely that depth is inversely related to ionic strength or related

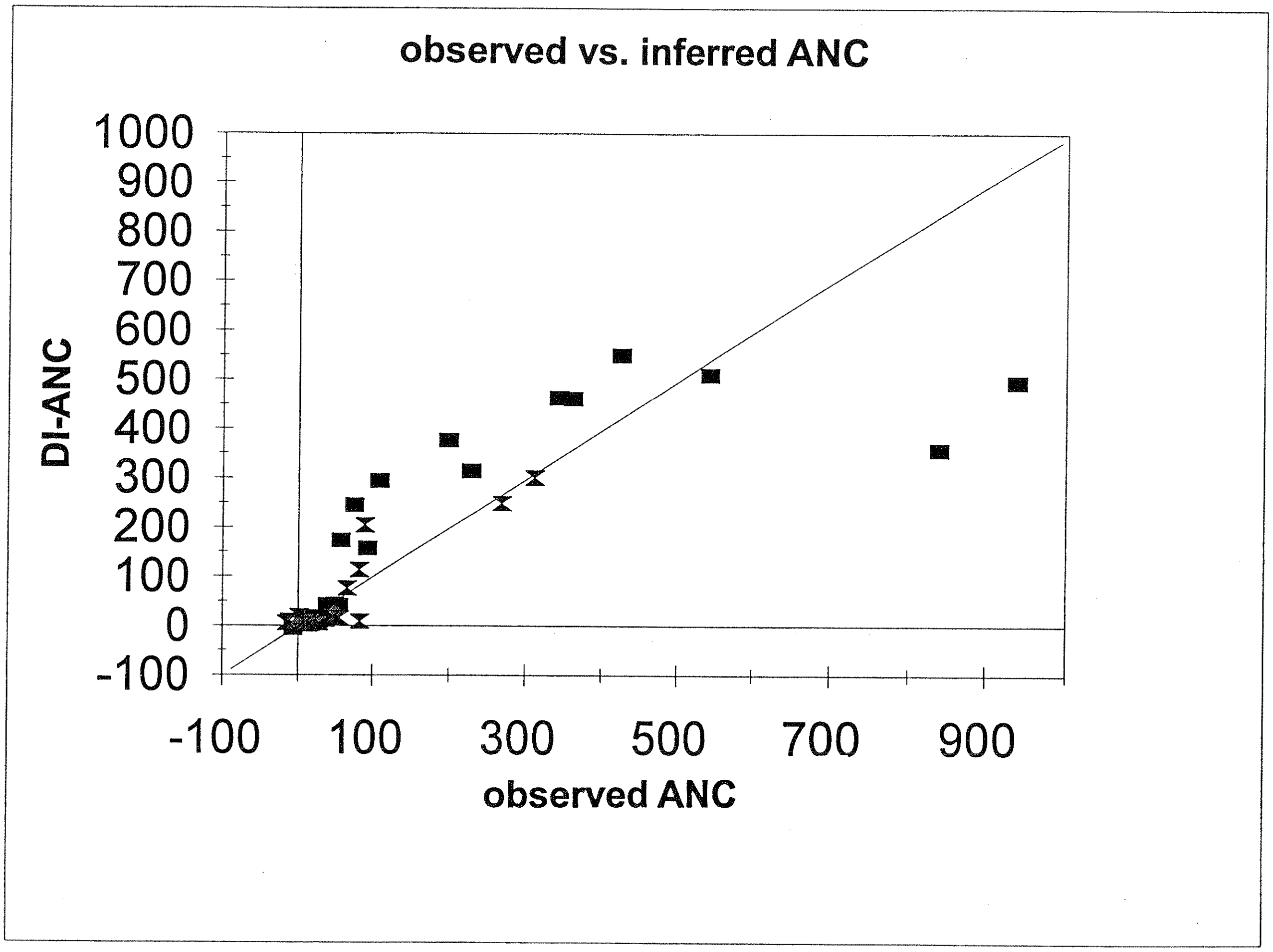



Figure 22. Measured acid neutralizing capacity (ANC) versus diatom-inferred (DI) ANC for lakes in the Cascade diatom calibration set. Cascade lakes are squares and Rainier lakes are double triangles.

through altitude to ionic strength. Figure 23 demonstrates a large spread in the values with many outliers and a well-defined group of values representing shallow lakes.

*Total Phosphorus (TP).* There was no indication in either the CCA or the WACALIB analyses that total phosphorus is an important predictor of diatom variance. WACALIB calibration model results. The total phosphorus results from the 42 available lakes suggests that diatoms cannot be used to predict past TP concentrations with sufficient accuracy at this time (Table 10). However, utilizing the log TP or removing one extreme value (Agency Lake) improves the statistic considerably ($r^2$ of WA(tol) = 0.62, apparent *s*=5.1 µg/L). Figure 24 shows that the higher TP (e.g., TP > 15 µg/L) Cascade lakes do not predict well. Careful screening for outliers or resampling of some lakes may improve the inference equation, but at present, TP calibration results are not yet adequate to provide reliable diatom reconstructions for the Cascades.

## 4. Summit Lake Reconstruction

The calibration set was applied to a sediment core collected from Summit Lake, located in the Clearwater Wilderness of the Mt. Baker-Snoqualmie National Forest. Physical and chemical attributes of Summit Lake are summarized in Tables 13 and 14. Principal diatom taxa in Summit Lake include *Achnanthes marginulata, Aulacoseira distans,* and *Navicula tenuicephala* (Figure 25). Summit Lake is located in relatively close proximity to the Puget Sound urban/industrial corridor and there was some concern that the lake pH may have been reduced as a consequence of atmospheric deposition of sulfur. The reconstructed pH and conductivity for Summit Lake show no statistically significant change over the last 3150 years (Figure 26). Diatom-inferred pH ranged

**Table 13**. Morphometry of Summit Lake, WA (Source: Eilers et al. 1996a)

| Parameter | Units | Metric | English |
|---|---|---|---|
| Elevation | m/ft | 1658 | 5439 |
| Surface Area | ha/ac | 8.82 | 21.8 |
| Total Volume | $m^3$/ac-ft | $1.87 \times 10^6$ | 1521 |
| Mean Depth | m/ft | 21.2 | 69.6 |
| Maximum Depth | m/ft | 50.9 | 167.0 |

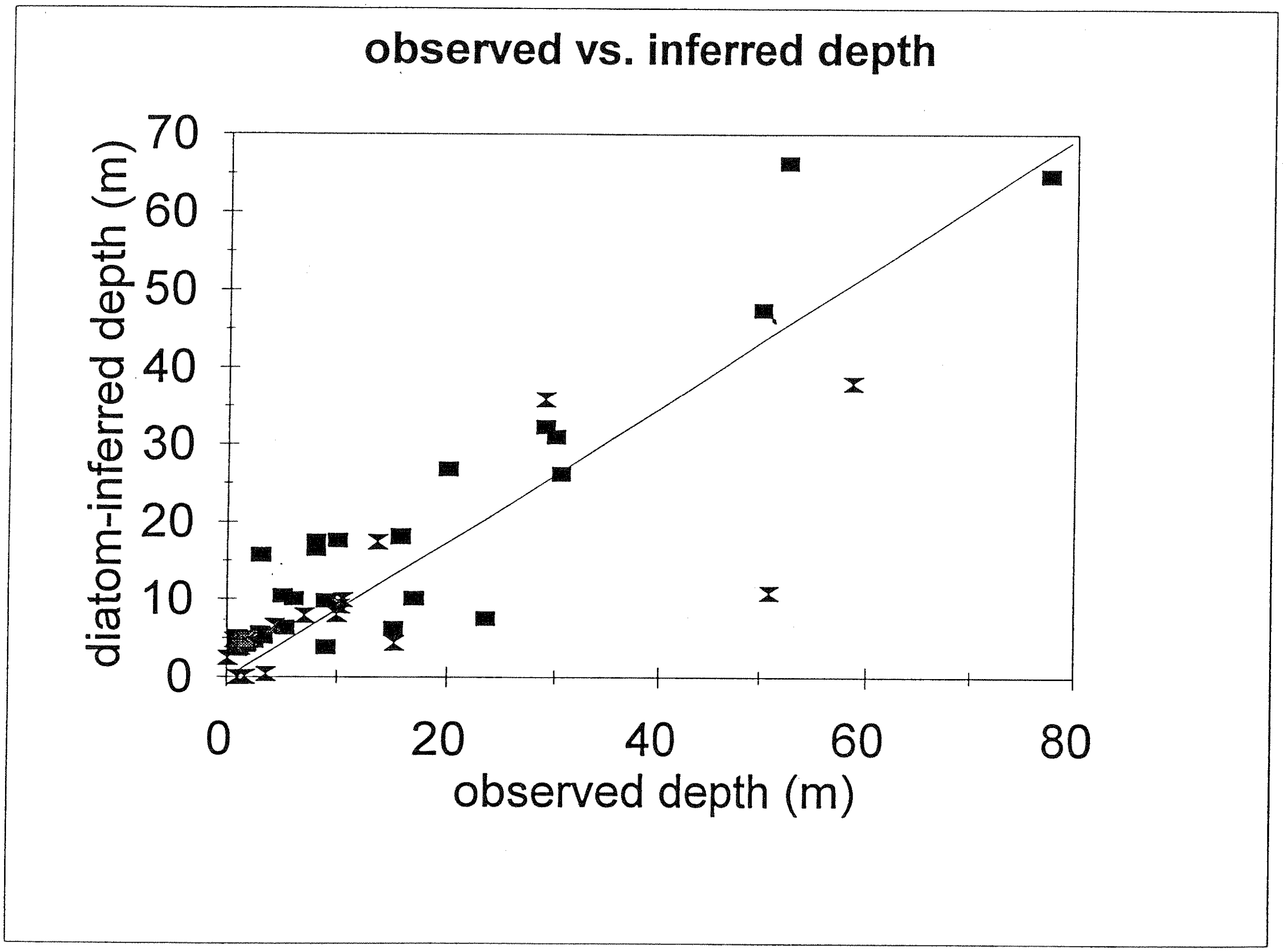



Figure 23. Measured depth versus diatom-inferred depth for lakes in the Cascade diatom calibration set. Cascade lakes are squares and Rainier lakes are double triangles.

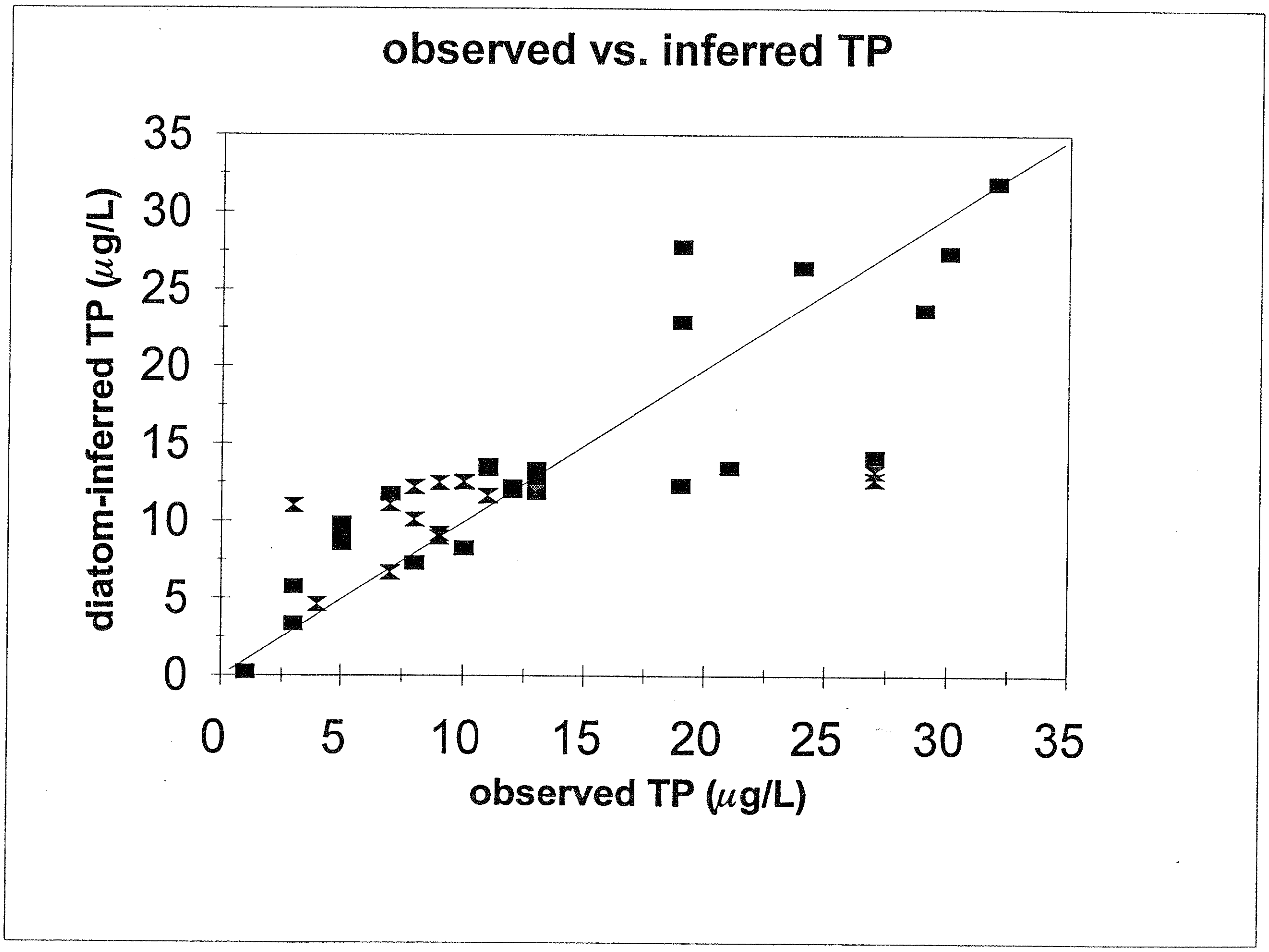



Figure 24. Measured total phosphorus (TP) versus diatom-inferred total phosphorus for lakes in the Cascade diatom calibration set. Cascade lakes are squares and Rainier lakes are double triangles.

**Table 14**. Surface water chemistry of Summit Lake, WA and adjacent pond. (Source: Eilers et al. 1996a)

| | | | | | | 8/24/95 | | 10/26/95 | | 3/21/96 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7/17/73[a] | 9/21/85[b] | 11/20/93 | 4/16/94 | 7/11/95 | Routine | Split[c] | Lake | Pond | Routine | Duplicate | 6/27/96 |
| pH | | 5.94 | 5.74 | 5.53 | 5.24 | 5.37 | 5.95 | 5.30 | 5.29 | 5.27 | 5.28 | 5.30 |
| ANC ($\mu$eq/L) | | 3.9 | 0.8 | 1.3 | -2.6 | 2.3 | 5.8 | -0.6 | -2.3 | -1.2 | -1.0 | -0.5 |
| Conductivity ($\mu$S) | 4 | 2.6 | 3.8 | 4.8 | 3.7 | 3.5 | 4.1 | 3.6 | 3.8 | 3.96 | 3.95 | 4.6 |
| Base Cations ($\mu$eq/L) | | | | | | | | | | | | |
| Ca | | 6.9 | 5.0 | 12.4 | 8.9 | 4.1 | 5.3 | 4.6 | 4.6 | 5.3 | 5.7 | 5.8 |
| Mg | | 3.9 | 3.4 | 8.1 | 4.9 | 1.7 | 3.3 | 3.5 | 3.4 | 3.8 | 4.1 | 3.4 |
| Na | | 11.4 | 14.1 | 12.4 | 12.4 | 11.7 | 10.1 | 10.9 | 9.8 | 13.8 | 14.1 | 12.0 |
| K | | 0.8 | 1.0 | 0.9 | 0.8 | 1.0 | 0.6 | 0.7 | 2.3 | 0.9 | 0.9 | 0.4 |
| $NH_4$ | 1.4 | 0 | 0 | 1.3 | 1.4 | 0 | <0.7 | 0.5 | 0.6 | 0.6 | 0.7 | 0 |
| Acid Anions ($\mu$eq/L) | | | | | | | | | | | | |
| $SO_4$ | | 9.2 | 8.6 | 11.5 | 7.7 | 8.2 | 8.7 | 7.5 | 7.2 | 9.2 | 9.6 | 7.8 |
| Cl | | 12.5 | 12.2 | 18.5 | 10.4 | 9.8 | 10.8 | 11.3 | 9.9 | 9.8 | 9.8 | 10.1 |
| $NO_3$ | 0.7 | 0.1 | 0 | 1 | 0 | 0 | <0.06 | 0 | 0 | 0.6 | 0.9 | 0 |
| Miscellaneous | | | | | | | | | | | | |
| TP ($\mu$g/L) | 6 | 3.8 | | | | | <10 | | | | | 7.0 |
| $SiO_2$ (mg/L) | | 0.24 | | | | | 0.71 | | | | | |
| DOC (mg/L) | | 0.34 | | | | | <1.0 | | | | | |
| Chlorophyll *a* | | | | | | | | | | | | 0.4 |
| QA Checks | | | | | | | | | | | | |
| $pH_{cal}$ | | 6.01 | 5.74 | 5.79 | 5.41 | 5.88 | 6.14 | 5.60 | 5.44 | 5.54 | 5.56 | 5.61 |
| $ANC_{cal}$ ($\mu$eq/L) | | 1.2 | 2.7 | 3.8 | 8.9 | 0.5 | -0.2 | 0.9 | 3.0 | 4.8 | 4.5 | 3.7 |
| $Conductivity_{cal}$ ($\mu$S) | | 3.8 | 3.6 | 5.4 | 5.0 | 4.0 | 3.2 | 4.3 | 4.3 | 4.7 | 4.8 | 4.4 |
| Ion Balance (+/-) (w/o $RCOO^-$) | | 0.89 | 1.17 | 1.24 | 1.89 | 1.12 | 0.81 | 1.34 | 1.51 | 1.52 | 1.52 | 1.49 |

[a] Bortleson et al. (1976)
[b] Source: Eilers et al. (1987)
[c] Split sample with ESE, Gainesville, FL

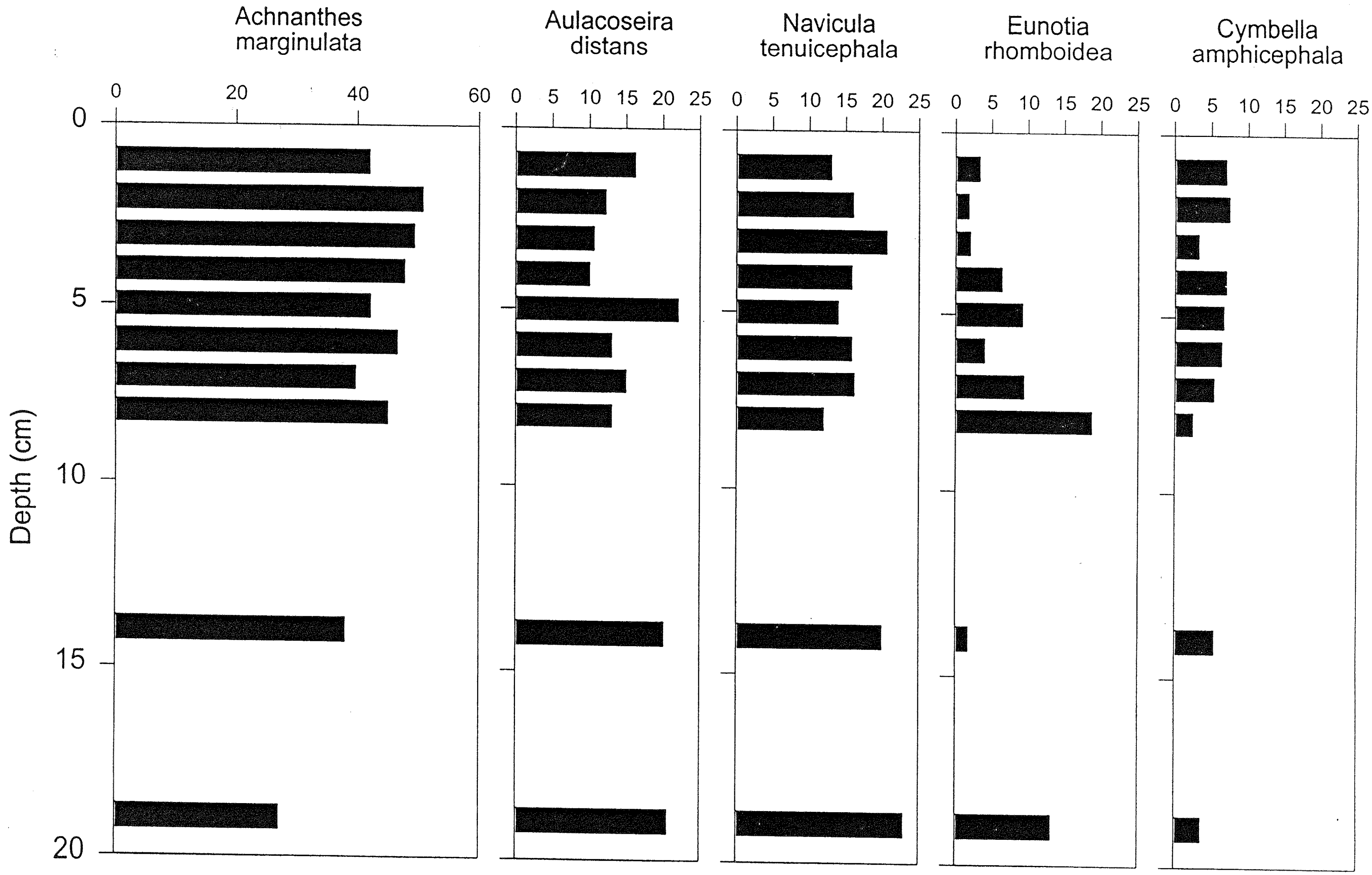
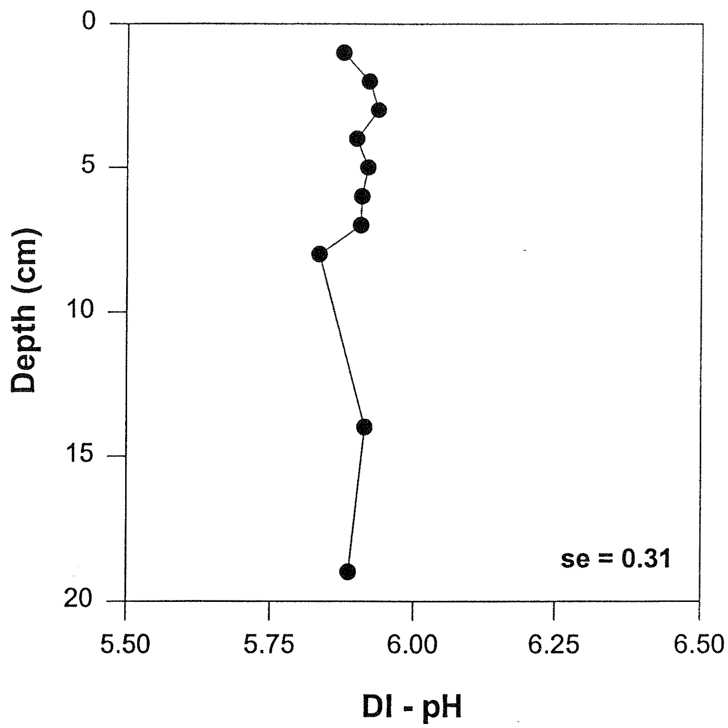



Figure 25. Relative abundance (%) of the five most abundant diatom taxa present in the sediments of Summit Lake. (Source: Eilers et al. 1996a)



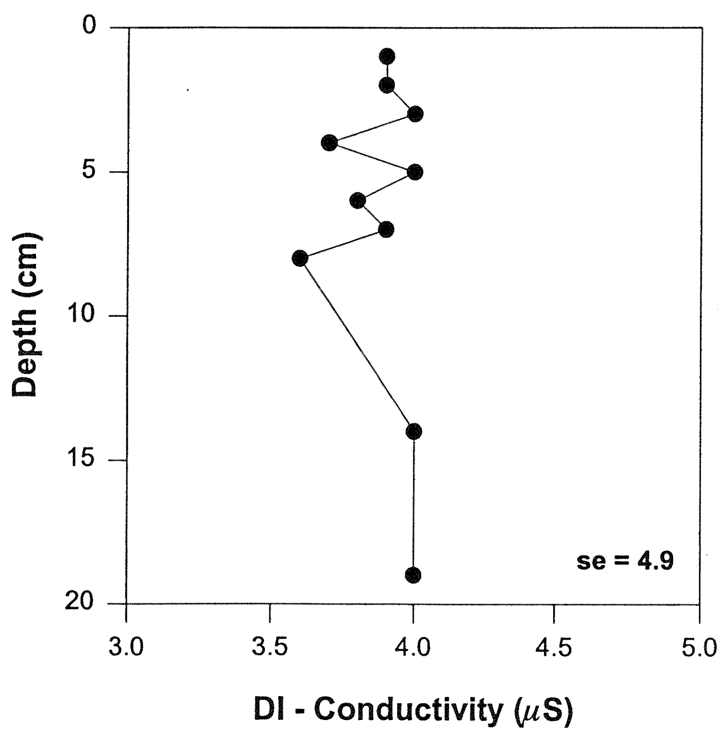




Figure 26. Diatom-inferred (DI) pH (top) and diatom-inferred conductivity (bottom) for sediments from Summit Lake, WA generated by applying the calibration equations developed in this study to diatom data reported in Eilers et al. (1996a).

between 5.83 and 5.94 among the 11 samples analyzed. Although the diatom community composition exhibited some minor changes, the pH optimum of the various taxa was remarkably constant. The diatom-inferred pH of 5.8 to 5.9 matched the pH values measured in the lake on two dates, although measured values from the Forest Service laboratory show pH values between 5.3-5.7 (Table 15). The diatom-inferred conductivity also was very stable with a range of only 3.6 to 4.0 μS. The actual measured range for conductivity in the lake was 2.6 to 4.8 μS (Table 15).

The results from the diatom-inferred reconstruction of pH and conductivity in Summit Lake illustrates that the lake chemistry has been remarkably stable for the previous three thousand years. This is particularly surprising given the inputs of volcanic ash during two events in this period. Factors contributing to this stability may include: (1) depth of the lake (>50 m); (2) small watershed contributing area; and (3) low weathering rates in the basin. The estimated hydraulic residence time is long ($\tau$ = 9 to 14 yr) which would act to dampen fluctuations in climate and other factors. The considerable depth of the lake minimizes recycling from the sediments and promotes permanent burial of settling particles into the sediments. Summit Lake, as its name implies, is located near the crest of a ridge called the Rooster Comb which would minimize watershed inputs from both surface and groundwater. Weathering of the andesite in the watershed is extremely low as shown in the base cation concentrations (sea salt-corrected $C_B$* = 8.5 μeq/L). Thus, inputs from the watershed, including base cations and nutrients, is extraordinarily small.

Another unusual feature of Summit Lake that may have a bearing on its acid-base chemistry is the aquatic bryophyte (moss) present on the lake bottom. Samples of bryophytes were collected from depths of over 35 m in Summit Lake and appear to cover a significant portion of the substrate. Most of the biomass in the lake is probably represented by the bryophytes. These aquatic plants have the capability to act as ion exchangers by sequestering base cations (esp. $Ca^{2+}$) and releasing hydrogen ion. The ability of some bryophytes (e.g., *Sphagnum*) to acidify their environment is well documented (e.g., Clymo 1967, Glime et al. 1982). Whether the bryophytes affect the chemistry of Summit Lake is unknown.

**Table 15.** Diatom-inferred reconstruction of lake pH and conductivity (µS) for Summit Lake, WA using the Cascade calibration set from this study and the Sierra Nevada (Whiting et al. 1989) calibration set.

| Sediment Interval (cm) | pH | | Conductivity | |
|---|---|---|---|---|
| | Cascades | Sierra Nevada | Cascades | Sierra Nevada |
| 0-1 | 5.88 | 6.05 | 6.0 | 6.7 |
| 1-2 | 5.92 | 6.04 | 6.1 | 6.5 |
| 2-3 | 5.94 | 6.10 | 5.9 | 6.8 |
| 3-4 | 5.90 | 6.08 | 5.1 | 6.1 |
| 4-5 | 5.92 | 6.02 | 5.2 | 6.6 |
| 5-6 | 5.91 | 6.05 | 5.7 | 6.6 |
| 6-7 | 5.91 | 6.09 | 4.9 | 6.4 |
| 7-8 | 5.83 | 6.09 | 3.6 | 5.3 |
| 13-14 | 5.91 | 6.08 | 6.5 | 7.6 |
| 18-19 | 5.89 | 6.16 | 4.4 | 7.2 |
| $r^2$ | 0.836 | 0.784 | 0.928 | 0.673 |
| *s* | 0.31 | 0.385 | 4.9 | 13.2 |

The question remains, "Why is the ANC near 0 µeq/L ($\bar{x}$ = 1.0 µeq/L, n=9) when $C_B$* is ~ 9 µeq/L?" The current sulfate concentration (8.7 µeq/L; $SO_4$* = 7.6) may be a recent phenomenon leading to a gradual depletion of ANC. For example, *if* historical ANC[1] were 8 µeq/L then the historical pH would have been about 6.0. The calculated pH if ANC declined from its present 1 µeq/L to -7 µeq/L (equal to the possible historical maximum decline in ANC from 8 µeq/L to 1 µeq/L) would be about 5.6.

The reconstruction of Summit Lake reveals that the use of the new Cascades calibration set provides an improvement in accuracy over the Sierra Nevada calibration set for inferring environmental variables from high altitude lakes in the Pacific Northwest (Table 15). Both pH and conductivity inferred from surface sediments are closer to the observed values. The inferred values from the Cascade calibration set are more accurate for the Cascade lakes than use of the calibration set from the Sierra Nevada. The core assemblages vary greatly in major taxa such as

[1] Organic anions are not included in these calculations because: (1) the measured DOC was 0.3 mg/L (Eilers et al. 1987); (2) the anion deficit (∑cations - ∑anions was small ($\bar{x}$= 1.3 µeq/L, n=10); and Secchi disk transparency was high (21 m).

*Navicula tenuicephala, Achnanthes marginulata,* and *Aulacoseira distans*, however, the optima for these species are not greatly different and so the stratigraphies are remarkably stable (Figure 26).

It is not surprising that the shape of the stratigraphy does not change, even though the accuracy is improved. Sweets *et al.* (1990) noted that Florida diatom pH optima were significantly different from those found in the other regions of the PIRLA project, sometimes by as much as a full pH unit. However, the relative position of the pH optima of the species was largely unchanged. That this holds true between the Sierra Nevada and Cascade data sets is a testament to the robustness of the diatom technique, while also highlighting the importance of using regional diatom calibration sets to improve accuracy in lake reconstructions.

## E. DISCUSSION AND CONCLUSIONS

The results indicate that the Cascade calibration set is a valuable new tool for reconstructing historical water quality chemistry in Cascade lakes. Among the variables examined, pH shows the strongest statistical relationship with the diatom assemblages and exhibits an acceptable standard error of prediction. Conductivity also is strongly related to the diatom assemblages, but it exhibits a high standard error which currently limits its utility for reconstructions to low conductivity (< 50 µS) lakes. Other variables also were strongly related to the diatom assemblages including ANC, individual base cations, total phosphorus, and lake depth. At present, the standard errors of prediction for these variables are still too high to reconstruct historical lake attributes with confidence, but they have considerable potential for future application in the Cascades. Some variables such as total phosphorus are currently hampered by high variability associated with the measured lake concentrations. The annual variability of total phosphorus increases with increasing TP concentrations which means that relatively few samples are required to characterize TP in oligotrophic lakes, but a large number of samples are required to characterize TP in eutrophic lakes assuming equal estimates of precision are required. Additional lakewater chemistry data would likely improve the TP calibrations.

Base cations such as calcium, magnesium, and sodium were highly correlated with conductivity. It is likely that these ions, either individually or collectively, could also be used to develop inferences to the diatom assemblages. However, because both ANC and base cations are so highly correlated with conductivity ($r^2$=0.87 for ANC, for individual base cations all $r^2 > 0.86$) in these lakes, there is likely to be little advantage in further exploring use of base cations and ANC. Individual ions such as sodium, however, could potentially be of interest for lakes with known anthropogenic inputs of sodium-based substances.

Surprisingly, the diatom assemblages showed strong relationships with physical variables such as lake depth. The range in lake depths (77 m) provided a relatively high $r^2$ value (0.75), but again the standard error of the prediction (8.8 m) was so great that there is little value in refining this relationship at this time. It is likely that this relationship was heavily influenced by a number of very shallow lakes and ponds from Mt. Rainier National Park. In general, the Cascade diatom assemblages were dominated by either large percentages of planktonic diatoms in the larger, more productive lakes or by complex groups of benthic diatoms in small, shallow oligotrophic lakes. Other physical variables were not explored in detail although Secchi disk transparency, elevation, and hydraulic residence time may help to resolve some of the unexplained variance in the data set.

The taxonomic challenges in the Cascade calibration set were considerable. Over 13% of the taxa remain undescribed as species. Much of the taxonomic uncertainty is associated with the *Aulacoseira distans* complex, *Achnanthes* spp., and *Cymbella* spp. These taxa are generally associated with low nutrient, clearwater lakes that are slightly acidic (pH optimum near 5.5). Further advances in the use of paleolimnology in the Cascades will probably require resolution of the taxonomic uncertainty of these three genera.

As with any calibration data set, the errors in the diatom-inferred predications often can be improved by adding additional lakes to the data set. The distributions in Figures 2-8 should be helpful in deciding the types of lakes that would be most useful for better representing the population of Cascade lakes. In addition, some consideration should be given to geographic distribution associated with sampling additional data for this calibration set. The current calibration set is heavily weighted towards lakes in the Washington Cascades, particularly those in Mt. Rainier National Park (MORA). Fortunately, the MORA lakes exhibit no particular chemical extremes that unduly influenced the regression equations. However, the geographic distribution could be improved by adding several lakes from the northern Washington Cascades and additional lakes from the Oregon Cascades (Figure 1). Note that only 17 of the 48 study lakes were located in Oregon.

The pH reconstruction of Summit Lake was helpful in resolving some of the uncertainty in the current lake chemistry. The low pH of the lake and its proximity to emission sources raised concern that the lake had begun to acidify from atmospheric deposition. The pH reconstruction showed that Summit Lake has been stable for the last 3150 years. This finding does not exclude the possibility that Summit Lake could acidify in the future, but it clarifies the historical status of the lake. As noted earlier, given its virtual lack of acid neutralizing capacity, Summit Lake could exhibit significant declines in pH with further inputs of acid sulfate ions. It would be desirable to test the calibration set on one or more lakes in the Cascades that have experienced changes in the 20$^{th}$ century. In particular, some of the lakes moderately impacted by ashfall from Mount St. Helens would be excellent candidates for diatom reconstructions. Additionally, lakes that are in national forests subject to the effects of timber harvest or recreational development might be suitable candidates for reconstruction.

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## G. APPENDICES

1. Diatom Counts for the Cascade Diatom Calibration Set

2. Compressed Diatom Taxa List Used in Ordination and Modeling for the Cascade Diatom Calibration Set

# APPENDIX 1

## Diatom Counts for the Cascade Diatom Calibration Set

# Diatom Counts

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Achn sp. 13 | AC13PRL | Chrysophyta | Achnanthes | sp. 13 PIRLA | | | | |
| Achn sp. 14 | AC14PRL | Chrysophyta | Achnanthes | sp. 14 PIRLA | | | | |
| Achn sp. 16 | AC16PRL | Chrysophyta | Achnanthes | sp. 16 PIRLA | | | | |
| Achn sp. 19 | AC19PRL | Chrysophyta | Achnanthes | sp. 19 PIRLA | | | | |
| Achn sp 2 Mt. Rain. | AC2MRNP | Chrysophyta | Achnanthes | sp. 2 | | | | |
| Achn acares | ACACARES | Chrysophyta | Achnanthes | acares | | | | |
| Achn altaica | ACALTAIC | Chrysophyta | Achnanthes | altaica | | | | |
| Achn austriaca | ACaustri | Chrysophyta | Achnanthes | austriaca | | | | |
| Achn bioreti | ACBIORET | Chrysophyta | Achnanthes | bioreti | | | | 0.03200 |
| Achn calcar | ACCALCAR | Chrysophyta | Achnanthes | calcar | | | | |
| Achn chlidanos | ACCHLIDA | Chrysophyta | Achnanthes | chlidanos | | | | |
| Achn clevei | ACCLEVEI | Chrysophyta | Achnanthes | clevei | 0.00400 | | | |
| Achn curtissima | ACCURTIS | Chrysophyta | Achnanthes | curtissima | | | | |
| Achn daui alaskaensi | ACdauala | Chrysophyta | Achnanthes | daui | | | | |
| Achn detha | ACdetha | Chrysophyta | Achnanthes | detha | | | | |
| Achn didyma | ACDIDYMA | Chrysophyta | Achnanthes | didyma | | | | |
| Achn exigua | ACEXIGUA | Chrysophyta | Achnanthes | exigua | | | | |
| Achn flexella | ACflexel | Chrysophyta | Achnanthes | flexella | | | | |
| Achn grana | ACGRANA | Chrysophyta | Achnanthes | grana | | | | |
| Achn grischuna | ACGRISCH | Chrysophyta | Achnanthes | grischuna | 0.00200 | | | |
| Achn helvetica | AChelvet | Chrysophyta | Achnanthes | helvetica | | | | |
| Achn holstii | ACHOLSTI | Chrysophyta | Achnanthes | holstii | | | | |
| Achn hungarica | ACHUNGAR | Chrysophyta | Achnanthes | hungarica | | | | |
| Achn kuelbsii | ACKUELBS | Chrysophyta | Achnanthes | kuelbsii | | | | |
| Achn lanceolata | ACLANCEO | Chrysophyta | Achnanthes | lanceolata | | | 0.00083 | |
| Achn lanceolat dubia | ACLANDUB | Chrysophyta | Achnanthes | lanceolata | | | | |
| Achn lan ssp. frequ | ACLANFRE | Chrysophyta | Achnanthes | lanceolata | | | 0.00083 | |
| Achn laterostrata | ACLATERO | Chrysophyta | Achnanthes | laterostrata | | | | |
| Achn levanderi | ACLEVAND | Chrysophyta | Achnanthes | levanderi | 0.00800 | | | 0.00200 |
| Achn levan helvetica | AClevhel | Chrysophyta | Achnanthes | levanderi | | | | |
| Achn linearis curta | ACLINCUR | Chrysophyta | Achnanthes | linearis | | | | |
| Achn linearis | ACLINEAR | Chrysophyta | Achnanthes | linearis | | | | |
| Achn marginulata | ACMARGIN | Chrysophyta | Achnanthes | marginulata | 0.00600 | | | 0.00800 |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Achn minutissima | ACMINUTI | Chrysophyta | Achnanthes | minutissima | 0.00200 | | | |
| Achn nodosa | ACNODOSA | Chrysophyta | Achnanthes | nodosa | | | | |
| Achn pusilla | ACPUSILL | Chrysophyta | Achnanthes | pusilla | | | | |
| Achn spp. | ACSPP | Chrysophyta | Achnanthes | spp. | | | | |
| Achn subatomoides | ACSUBATO | Chrysophyta | Achnanthes | subatomoides | | | | |
| Achn suchlandti | ACsuchla | Chrysophyta | Achnanthes | suchlandti | | | | |
| Amph sp. A Cascades | AM0Arscs | Chrysophyta | Amphora | sp. PRS 0A | | | | |
| Amph libyca | AMLIBYCA | Chrysophyta | Amphora | libyca | | | 0.00083 | |
| Amph ovalis | AMOVALIS | Chrysophyta | Amphora | ovalis | | 0.00400 | 0.00333 | |
| Amph ovali pediculus | AMovaped | Chrysophyta | Amphora | ovalis | | | | |
| Amph perpusilla | AMPERPUS | Chrysophyta | Amphora | perpusilla | | | | |
| Anom brachysira | ANBRACHY | Chrysophyta | Anomoeoneis | brachysira | | | | 0.04000 |
| Anom serians | ANSERIAN | Chrysophyta | Anomoeoneis | serians | | | | 0.00200 |
| Anom vitrea | ANVITREA | Chrysophyta | Anomoeoneis | vitrea | | | | 0.00200 |
| Aste formosa | ASFORMOS | Chrysophyta | Asterionella | formosa | | 0.04200 | 0.01667 | |
| Aste ralfsii | ASRALFSI | Chrysophyta | Asterionella | ralfsii | | | | |
| Aula sp. A Cascades | AU0Arscs | Chrysophyta | Aulacoseira | sp. PRS 0A | | | | |
| Aula sp. B Cascades | AU0Brscs | Chrysophyta | Aulacoseira | sp. PRS 0B | | | | |
| Aula sp. C Cascades | AU0Crscs | Chrysophyta | Aulacoseira | sp. PRS 0C | | | | |
| Aula sp. D Cascades | AU0Drscs | Chrysophyta | Aulacoseira | sp. PRS 0D | | | | |
| Aula ambigua | AUAMBIGU | Chrysophyta | Aulacoseira | ambigua | 0.02400 | | | |
| Aulo distans humilis | Audishum | Chrysophyta | Aulacoseira | distans | | | | |
| Aulo distans nivalis | AUDISNIV | Chrysophyta | Aulacoseira | distans | | | | 0.00800 |
| Aulo dist nivaloides | AUDISNLO | Chrysophyta | Aulacoseira | distans | | | | |
| Aula distans | AUDISTAN | Chrysophyta | Aulacoseira | distans | 0.00400 | | | 0.03200 |
| Aulo distans tenella | AUdisten | Chrysophyta | Aulacoseira | distans | | | | |
| Aula granulata | AUGRANUL | Chrysophyta | Aulacoseira | granulata | | 0.02800 | 0.00583 | |
| Aula italica | AUITALIC | Chrysophyta | Aulacosiera | italica | 0.01200 | | | |
| Aulo italica subarct | AUitasba | Chrysophyta | Aulacoseira | italica | | | | |
| Aulo itali tenu | AUITATEN | Chrysophyta | Aulacoseira | italica | | | | |
| Aulo lirata | AULIRATA | Chrysophyta | Aulacoseira | lirata | 0.01800 | | | |
| Aula perglabra | AUPERGLA | Chrysophyta | Aulacoseira | perglabra | | | | |
| Aula pfaffiana | AUPFAFFI | Chrysophyta | Aulacoseira | pfaffiana | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Aula species | AUSPP | Chrysophyta | Aulacoseira | spp. | 0.00200 | | | |
| Aula valida | AUVALIDA | Chrysophyta | Aulacosiera | valida | | | | |
| Calo bacillum | CABACILL | Chrysophyta | Caloneis | bacillum | | | | |
| Calo hyalina | CAHYALIN | Chrysophyta | Caloneis | hyalina | | | | |
| Calo silicula | CASILICU | Chrysophyta | Caloneis | silicula | | | | |
| Calo tenuis | CATENUIS | Chrysophyta | Caloneis | tenuis | | | | |
| Cocc placentula | CCPLACEN | Chrysophyta | Cocconeis | placentula | | | | |
| Cocc placen euglypta | CCPLAEUG | Chrysophyta | Cocconeis | placentula | | 0.00600 | | |
| Chae sp. 1? | CH1? | Chrysophyta | Chaetoceros | sp. 1? | | | | |
| Cymb sp. A Cascades | CM0Arscs | Chrysophyta | Cymbella | sp. PRS 0A | | | | |
| Cymb sp. B Cascades | CM0Brscs | Chrysophyta | Cymbella | sp. PRS 0B | | | | |
| Cymb sp. 1 ? | CM1? | Chrysophyta | Cymbella | sp. 1 ? | | | | |
| Cymb sp. 18 | CM18PRL | Chrysophyta | Cymbella | sp. 18 PIRLA | | | | |
| Cymb sp. 2 ? | CM2? | Chrysophyta | Cymbella | sp. 2 ? | | | | |
| Cymb sp. 20 | CM20PRL | Chrysophyta | Cymbella | sp. 20 PIRLA | | | | |
| Cymb sp. 21 | CM21PRL | Chrysophyta | Cymbella | sp. 21 PIRLA | | | | |
| Cymb sp. 6 | CM6PRL | Chrysophyta | Cymbella | sp. 6 PIRLA | | | | |
| Cymb sp. 7 | CM7PRL | Chrysophyta | Cymbella | sp. 7 PIRLA | | | | 0.00200 |
| Cymb aequalis | CMAEQUAL | Chrysophyta | Cymbella | aequalis | | | | 0.02600 |
| Cymb amphicephala | CMAMPHIC | Chrysophyta | Cymbella | amphicephala | | | | |
| Cymb brehmii | CMBREHMI | Chrysophyta | Cymbella | brehmii | | | | 0.06600 |
| Cymb caespitosa | CMCAESPI | Chrysophyta | Cymbella | caespitosa | | | 0.00167 | |
| Cymb cesatii | CMCESATI | Chrysophyta | Cymbella | cesatii | | | | 0.00200 |
| Cymb cistula | CMcistul | Chrysophyta | Cymbella | cistula | | | | |
| Cymb descripta | CMDESCRI | Chrysophyta | Cymbella | descripta | | | | |
| Cymb elginensis | CMELGINE | Chrysophyta | Cymbella | elginensis | | | 0.00333 | |
| Cymb falaisensis | CMFALAIS | Chrysophyta | Cymbella | falaisensis | | | | |
| Cymb gaeumannii | CMGAEUMA | Chrysophyta | Cymbella | gaeumannii | | | | 0.11200 |
| Cymb hauckii | CMHAUCKI | Chrysophyta | Cymbella | hauckii | | | | |
| Cymb hebridica | CMHEBRID | Chrysophyta | Cymbella | hebridica | | | | 0.01200 |
| Cymb heter subrostra | CMhetsub | Chrysophyta | Cymbella | heteropleura | | | | |
| Cymb inaequalis | CMinaequ | Chrysophyta | Cymbella | inaequalis | | | | |
| Cymb lunata | CMLUNATA | Chrysophyta | Cymbella | lunata | 0.00200 | | | 0.01400 |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Cymb mesiana | CMMESIAN | Chrysophyta | Cymbella | mesiana | | | | |
| Cymb mexicana | CMMEXCAN | Chrysophyta | Cymbella | mexicana | | 0.00200 | | |
| Cymb microcephala | CMMICROC | Chrysophyta | Cymbella | microcephala | | | | |
| Cymb minuta latens | CMminlat | Chrysophyta | Cymbella | minuta | | | | |
| Cymb minut silesiaca | CMminsil | Chrysophyta | Cymbella | minuta | | | | |
| Cymb minuta | CMMINUTA | Chrysophyta | Cymbella | minuta | | 0.00200 | 0.00083 | |
| Cymb muelleri | CMMUELLE | Chrysophyta | Cymbella | muelleri | | | | |
| Cymb naviculiformis | CMnavicu | Chrysophyta | Cymbella | naviculiformis | | | | |
| Cymb perpusilla | CMPERPUS | Chrysophyta | Cymbella | perpusilla | | | | |
| Cymb sinuata | CMSINUAT | Chrysophyta | Cymbella | sinuata | | | | |
| Cymb spp. | CMSPP | Chrysophyta | Cymbella | spp. | | | | 0.01400 |
| Cyma solea | CTSOLEA | Chrysophyta | Cymatopleura | solea | | | | |
| Cycl sp. 1 | CY1PRL | Chrysophyta | Cyclotella | sp. 1 PIRLA | | | | |
| Cycl bod lemanica | CYBODLEM | Chrysophyta | Cyclotella | bodanica | | | | |
| Cycl kuetzin radiosa | CYkuetra | Chrysophyta | Cyclotella | kuetzingiana | | | | |
| Cycl ocellata | CYOCELLA | Chrysophyta | Cyclotella | ocellata | | | | |
| Cycl pseudostelliger | CYpseste | Chrysophyta | Cyclotella | pseudostelligera | | | | |
| Cycl stelligera | CYSTELLI | Chrysophyta | Cyclotella | stelligera | 0.11200 | | | |
| Diat anceps | DAANCEPS | Chrysophyta | Diatoma | anceps | | | | |
| Diat hiemale | DAhiemal | Chrysophyta | Diatoma | hiemale | | | | |
| Diat mesodon | DAMESODO | Chrysophyta | Diatoma | mesodon | | | | |
| Diat tenuis | DATENUIS | Chrysophyta | Diatoma | tenue | | | | |
| Dipl sp. 1 ? | DP1? | Chrysophyta | Diploneis | sp. 1 ? | | | | |
| Dipl elliptica | DPELLIPT | Chrysophyta | Diploneis | elliptica | | | | |
| Dipl finnica | DPFINNIC | Chrysophyta | Diploneis | finnica | | | | |
| Dipl marginestriata | DPMARGIN | Chrysophyta | Diploneis | marginestriata | | | | |
| Dipl modica | DPMODICA | Chrysophyta | Diploneis | modica | | | | |
| Epit adnata | EPADNATA | Chrysophyta | Epithemia | adnata | | | | |
| Epit sorex | EPSOREX | Chrysophyta | Epithemia | sorex | | | | |
| Epit turgida | EPTURGID | Chrysophyta | Epithemia | turgida | | | | |
| Epit turgida gracil | EPTURGRA | Chrysophyta | Epithemia | turgida | | | | |
| Euno sp. 1 ? | EU1? | Chrysophyta | Eunotia | sp. 1 ? | | | | |
| Euno sp. 42 | EU42PRL | Chrysophyta | Eunotia | sp. 42 PIRLA | | | | 0.00200 |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Euno sp. 44 | EU44PRL | Chrysophyta | Eunotia | sp. 44 PIRLA | | | | |
| Euno sp. 45 | EU45PRL | Chrysophyta | Eunotia | sp. 45 PIRLA | | | | |
| Euno sp. 46 | EU46PRL | Chrysophyta | Eunotia | sp. 46 PIRLA | | | | |
| Euno arcus | EUARCUS | Chrysophyta | Eunotia | arcus | | | | |
| Euno bidentula var 1 | EUbi1PRL | Chrysophyta | Eunotia | bidentula | | | | |
| Euno bidentula | EUBIDENT | Chrysophyta | Eunotia | bidentula | | | | |
| Euno bilun mucophila | EUBILMUC | Chrysophyta | Eunotia | bilunaris | | | | |
| Euno bilunaris | EUBILUNA | Chrysophyta | Eunotia | bilunaris | | | | 0.01600 |
| Euno curvata | EUcurvat | Chrysophyta | Eunotia | curvata | | | | |
| Euno denticulata | EUdentic | Chrysophyta | Eunotia | denticulata | | | | |
| Euno exigua | EUEXIGUA | Chrysophyta | Eunotia | exigua | | | | 0.01400 |
| Euno flexuosa | EUFLEXUO | Chrysophyta | Eunotia | flexuosa | | | | 0.00400 |
| Euno hemicyclus | EUHEMICY | Chrysophyta | Eunotia | hemicyclus | | | | 0.00400 |
| Euno implicata | EUIMPLIC | Chrysophyta | Eunotia | implicata | | | | |
| Euno incisa var 1 | EUin1PRL | Chrysophyta | Eunotia | incisa | | | | |
| Euno incisa var 2 | EUin2PRL | Chrysophyta | Eunotia | incisa | | | | |
| Euno incisa var 6 | EUin6PRL | Chrysophyta | Eunotia | incisa | | | | |
| Euno incisa | EUINCISA | Chrysophyta | Eunotia | incisa | | | | |
| Euno intermedia | EUinterm | Chrysophyta | Eunotia | intermedia | | | | |
| Euno meisteri | EUMEISTE | Chrysophyta | Eunotia | meisteri | | | | |
| Euno microcephala | EUmicroc | Chrysophyta | Eunotia | microcephala | | | | |
| Euno micr tridentata | EUmictri | Chrysophyta | Eunotia | microcephala | | | | |
| Euno minor | EUMINOR | Chrysophyta | Eunotia | minor | | | | 0.00400 |
| Euno monodon | EUMONODO | Chrysophyta | Eunotia | monodon | | | | |
| Euno musci trident | EUMUSTRI | Chrysophyta | Eunotia | muscicola | | | | |
| Euno naegelii | EUNAEGEL | Chrysophyta | Eunotia | naegelii | | | | 0.00200 |
| Euno palud trinac | EUPALTRI | Chrysophyta | Eunotia | paludosa | | | | |
| Euno paludosa | EUPALUDO | Chrysophyta | Eunotia | paludosa | | | | |
| Euno pectinali minor | EUpecmin | Chrysophyta | Eunotia | pectinalis | | | | |
| Euno pectinalis | EUPECTIN | Chrysophyta | Eunotia | pectinalis | | | | |
| Euno praerupta | EUPRAERU | Chrysophyta | Eunotia | praerupta | | | | |
| Euno quaternaria | EUquater | Chrysophyta | Eunotia | quaternaria | | | | |
| Euno rhomboidea | EURHOMBO | Chrysophyta | Eunotia | rhomboidea | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Euno serra diadema | EUserdia | Chrysophyta | Eunotia | serra | | | | |
| Euno serra | EUSERRA | Chrysophyta | Eunotia | serra | | | | 0.00400 |
| Euno spp. | EUSPP | Chrysophyta | Eunotia | spp. | | | | 0.00200 |
| Euno subarcuatoides | EUSUBARC | Chrysophyta | Eunotia | subarcuatoides | | | | 0.00600 |
| Euno sudetica | EUSUDETI | Chrysophyta | Eunotia | sudetica | | | | |
| Euno tenella | EUTENELL | Chrysophyta | Eunotia | tenella | | | | |
| Euno trinacria | EUTRINAC | Chrysophyta | Eunotia | trinacria | | | | |
| Euno vanheurckii | EUVANHEU | Chrysophyta | Eunotia | vanheurckii | | | | 0.00200 |
| Euno sp. 74 | EUVANINT | Chrysophyta | Eunotia | vanheurckii | | | | |
| Frag sp. A Cascades | FR0Arscs | Chrysophyta | Fragilaria | sp. PRS 0A | | | | |
| Frag sp. B Cascades | FR0Brscs | Chrysophyta | Fragilaria | sp. PRS 0B | | | | |
| Frag sp. 11 | FR11PRL | Chrysophyta | Fragilaria | sp. 11 PIRLA | | | | |
| Frag sp. 15 | FR15PRL | Chrysophyta | Fragilaria | sp. 15 PIRLA | | | | |
| Frag sp. 17 | FR17PRL | Chrysophyta | Fragilaria | sp. 17 PIRLA | | | | |
| Frag sp. 9 | FR9PRL | Chrysophyta | Fragilaria | sp. 9 PIRLA | | | | |
| Frag arcus | FRARCUS | Chrysophyta | Fragilaria | arcus | | | | |
| Frag bidens | FRBIDENS | Chrysophyta | Fragilaria | bidens | | | | |
| Frag brevistriata | FRBREVIS | Chrysophyta | Fragilaria | brevistriata | 0.18000 | 0.07200 | 0.01000 | |
| Frag capu rumpens | FRCAPRUM | Chrysophyta | Fragilaria | capucina | | | | |
| Frag capucina | FRCAPUCI | Chrysophyta | Fragilaria | capucina | | | | |
| Frag capu vaucheriae | FRCAPVAU | Chrysophyta | Fragilaria | capucina | | | | |
| Frag constru binodis | FRCONBIN | Chrysophyta | Fragilaria | construens | | | | |
| Frag construe pumila | FRconpum | Chrysophyta | Fragilaria | construens | | | | |
| Frag construens | FRCONSTU | Chrysophyta | Fragilaria | construens | 0.06200 | 0.02800 | | |
| Frag constru subsali | FRCONSUB | Chrysophyta | Fragilaria | construens | 0.02400 | 0.07800 | 0.09000 | |
| Frag construe venter | FRCONVEN | Chrysophyta | Fragilaria | construens | 0.19200 | 0.06400 | 0.00500 | |
| Frag crotonensis | FRCROTON | Chrysophyta | Fragilaria | crotonensis | | 0.09600 | 0.00667 | |
| Frag constricta | FRctastr | Chrysophyta | Fragilaria | constricta | | | | |
| Frag exigua | FREXIGUA | Chrysophyta | Fragilaria | exigua | | | | |
| Frag fasciculata | FRFASCIC | Chrysophyta | Fragilaria | fasciculata | | | | |
| Frag lapponica | FRlappon | Chrysophyta | Fragilaria | lapponica | | | | |
| Frag leptostau dubia | FRLEPDUB | Chrysophyta | Fragilaria | leptostauron | | | | |
| Frag oldenburgiana | FROLDENB | Chrysophyta | Fragilaria | oldenburgiana | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Frag parasitica | FRPARASI | Chrysophyta | Fragilaria | parasitica | | 0.00200 | | |
| Frag pinn lancettula | FRPINLAN | Chrysophyta | Fragilaria | pinnata | 0.13400 | 0.13600 | 0.43000 | 0.00200 |
| Frag pinnata | FRPINNAT | Chrysophyta | Fragilaria | pinnata | 0.12600 | 0.18000 | 0.32500 | |
| Frag pseudoconstruen | FRPSECON | Chrysophyta | Fragilaria | pseudoconstruens | | 0.01400 | | |
| Frag spp. | FRSPP | Chrysophyta | Fragilaria | spp. | | | | |
| Frag vaucheriae | FRvauche | Chrysophyta | Fragilaria | vaucheriae | | | | |
| Frag virescens | FRVIRESC | Chrysophyta | Fragilaria | virescens | | | | |
| Frag vires exi | FRvirexi | Chrysophyta | Fragilaria | virescens | | | | |
| Frus rhom amphipleur | FSRHOAMP | Chrysophyta | Frustulia | rhomboides | | | | |
| Frus rhomboides CAF | FSrhoCAF | Chrysophyta | Frustulia | rhomboides | | | | |
| Frus rhom crassinerv | FSRHOCRA | Chrysophyta | Frustulia | rhomboides | | | | 0.02600 |
| Frus rhomboides | FSRHOMBO | Chrysophyta | Frustulia | rhomboides | | | | 0.07800 |
| Frus rhombo saxonica | FSrhosax | Chrysophyta | Frustulia | rhomboides | | | | |
| Gomp sp. A Cascades | GO0Arscs | Chrysophyta | Gomhonema | sp. PRS 0A | | | | |
| Gomp sp. 1 ? | GO1? | Chrysophyta | Gomphonema | sp. 1 ? | | | | |
| Gomp sp. 11 | GO11PRL | Chrysophyta | Gomphonema | sp. 11 PIRLA | | | | |
| Gomp sp. 18 | GO18PRL | Chrysophyta | Gomphonema | sp. 18 PIRLA | | | | |
| Gomp sp. 1 | GO1PRL | Chrysophyta | Gomphonema | sp. 1 PIRLA | | | | |
| Gomp angustum | GOANGSTM | Chrysophyta | Gomphonema | angustum | | | | |
| Gomp angustatum | GOANGUST | Chrysophyta | Gomphonema | angustatum | | | | |
| Gomp consector | GOconsec | Chrysophyta | Gomphonema | consector | | | | |
| Gomp gracile | GOGRACIL | Chrysophyta | Gomphonema | gracile | | | | 0.01400 |
| Gomp grovei lingulat | GOGROLIN | Chrysophyta | Gomphonema | grovei | | 0.00200 | | |
| Gomp olivcm mintsmum | GOOLIMIN | Chrysophyta | Gomphonema | olivaceum | | | | |
| Gomp olivaceum | GOOLIVCM | Chrysophyta | Gomphonema | olivaceum | 0.00800 | | | |
| Gomp parvulum | GOPARVUL | Chrysophyta | Gomphonema | parvulum | | | | |
| Gomp puig aequatoria | GOpuiaeq | Chrysophyta | Gomphonema | puiggarianum | | | | |
| Gomp spp. | GOSPP | Chrysophyta | Gomphonema | spp. | | | | |
| Gomp subcl mexicanum | GOsubmex | Chrysophyta | Gomphonema | subclavatum | | | | |
| Gomp tack brevistria | GOtacbre | Chrysophyta | Gomphonema | tackei | | | | |
| Gomp turris | GOTURRIS | Chrysophyta | Gomphonema | turris | | | | |
| Hann arcus | HNarcus | Chrysophyta | Hannaea | arcus | | | | |
| Meri circulare | MDCIRCUL | Chrysophyta | Meridion | circulare | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Melo sp. 1 ? | ME1? | Chrysophyta | Melosira | sp. 1 ? | | | | |
| Melo sp. 13 | ME13PRL | Chrysophyta | Melosira | sp. 13 PIRLA | | | | |
| Melo sp. 4 | ME4PRL | Chrysophyta | Melosira | sp. 4 PIRLA | | | | |
| Melo sp. 8 | ME8PRL | Chrysophyta | Melosira | sp. 8 PIRLA | | | | |
| Navi sp. 1 Mt. Rain. | NA01mwrn | Chrysophyta | Navicula | sp. 1 MW | | | | |
| Navi sp. A Cascades | NA0Arscs | Chrysophyta | Navicula | sp. PRS 0A | | | | 0.00600 |
| Navi sp. B Cascades | NA0Brscs | Chrysophyta | Navicula | sp. PRS 0B | | 0.00200 | | |
| Navi sp. C Cascades | NA0Crscs | Chrysophyta | Navicula | sp. PRS 0C | | | | |
| Navi sp. D Cascades | NA0Drscs | Chrysophyta | Navicula | sp. PRS 0D | | | | |
| Navi sp. E Cascades | NA0Erscs | Chrysophyta | Navicula | sp. 0E | | | | |
| Navi sp. 1 ? | NA1? | Chrysophyta | Navicula | sp. 1 ? | | | | |
| Navi sp. 14 | NA14PRL | Chrysophyta | Navicula | sp. 14 PIRLA | | | | |
| Navi sp. 1 | NA1PRL | Chrysophyta | Navicula | sp. 1 PIRLA | | | | |
| Navi sp. 2 ? | NA2? | Chrysophyta | Navicula | sp. 2 ? | | | | |
| Navi sp. 20 | NA20PRL | Chrysophyta | Navicula | sp. 20 PIRLA | | | | |
| Navi sp. 21 | NA21PRL | Chrysophyta | Navicula | sp. 21 PIRLA | | | | |
| Navi sp. 24 | NA24PRL | Chrysophyta | Navicula | sp. 24 PIRLA | | | | |
| Navi sp. 25 | NA25PRL | Chrysophyta | Navicula | sp. 25 PIRLA | | | | |
| Navi sp. 3 ? | NA3? | Chrysophyta | Navicula | sp. 3 ? | | | | |
| Navi sp. 45 | NA45PRL | Chrysophyta | Navicula | sp. 45 PIRLA | | | | |
| Navi sp. 47 | NA47PRL | Chrysophyta | Navicula | sp. 47 PIRLA | | | | |
| Navi sp. 51 | NA51PRL | Chrysophyta | Navicula | sp. 51 PIRLA | | | | |
| Navi sp. 52 | NA52PRL | Chrysophyta | Navicula | sp. 52 PIRLA | | | | |
| Navi sp. 6 | NA6PRL | Chrysophyta | Navicula | sp. 6 PIRLA | | | | |
| Navi sp. 74 | NA74PRL | Chrysophyta | Navicula | sp. 74 PIRLA | | | | |
| Navi sp. 91 | NA91PRL | Chrysophyta | Navicula | sp. 91 PIRLA | | | | |
| Navi aboensis | NAABOENS | Chrysophyta | Navicula | aboensis | | | | |
| Nav absoluta | NAABSOLU | Chrysophyta | Navicula | absoluta | | | | |
| Navi acceptata | NAACCEPT | Chrysophyta | Navicula | acceptata | | | 0.00250 | |
| Navi accomoda | NAACCOMO | Chrysophyta | Navicula | accomoda | | | | |
| Navi angusta | NAangust | Chrysophyta | Navicula | angusta | | | | |
| Navi arvensis | NAARVENS | Chrysophyta | Navicula | arvensis | | | | |
| Navi bacillum | NABACLUM | Chrysophyta | Navicula | bacillum | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Navi bremensis | NABREMEN | Chrysophyta | Navicula | bremensis | | | | |
| Navi bryophila | NABRYPHL | Chrysophyta | Navicula | bryophila | | | | |
| Navi cincta | NACINCTA | Chrysophyta | Navicula | cincta | | | | |
| Navi cocconeiformis | NACOCCON | Chrysophyta | Navicula | cocconeiformis | | | | |
| Navi cohnii | NACOHNII | Chrysophyta | Navicula | cohnii | | | | |
| Navi concentrica | NACONCEN | Chrysophyta | Navicula | concentrica | 0.00200 | | | |
| Navi crucicula | NACRUCIC | Chrysophyta | Navicula | crucicula | | | | |
| Navi cryptocephala | NACRYPTO | Chrysophyta | Navicula | cryptocephala | 0.00400 | 0.00200 | | |
| Navi cryptotenella | NACRYTEN | Chrysophyta | Navicula | cryptotenella | 0.00200 | 0.01400 | 0.00083 | |
| Navi disjuncta | NAdisjun | Chrysophyta | Navicula | disjuncta | | | | |
| Navi elginensis | NAELGINE | Chrysophyta | Navicula | elginensis | | | | |
| Navi gallica | NAgallic | Chrysophyta | Navicula | gallica | | | | |
| Navi harderii | NAHARDER | Chrysophyta | Navicula | harderii | | | | |
| Navi jaernefeldti | NAJAERNE | Chrysophyta | Navicula | jaernefelti | | | | |
| Navi laevissima | NALAEVIS | Chrysophyta | Navicula | laevissima | | 0.01000 | 0.00167 | |
| Navi leptostriata | NALEPTOS | Chrysophyta | Navicula | leptostriata | | | | 0.00800 |
| Navi libonensis | NALIBONE | Chrysophyta | Navicula | libonensis | 0.00200 | | | |
| Navi medioconvexa | NAMEDCON | Chrysophyta | Navicula | medioconvexa | | | | |
| Navi mediocris | NAMEDIOC | Chrysophyta | Navicula | mediocris | | | | 0.10800 |
| Navi mediopunctata | NAmediop | Chrysophyta | Navicula | mediopunctata | | | | |
| Navi menisculus | NAMENSCL | Chrysophyta | Navicula | menisculus | | | | |
| Navi minima | NAMINIMA | Chrysophyta | Navicula | minima | | | | |
| Navi minuscula v. A | NAminsOA | Chrysophyta | Navicula | minuscula | | | | |
| Navi modica | NAMODICA | Chrysophyta | Navicula | modica | | | | |
| Navi mutica | NAmutica | Chrysophyta | Navicula | mutica | | | | |
| Navi pelliculosa | NAPELLIC | Chrysophyta | Navicula | pelliculosa | 0.00400 | | | |
| Navi placenta | NAplcnta | Chrysophyta | Navicula | placenta | | | | |
| Nav porifera | NAPORIFE | Chrysophyta | Navicula | porifera | | 0.00200 | | |
| Navi pseudomuralis | NAPSEMUR | Chrysophyta | Navicula | pseudomuralis | | | | 0.01000 |
| Navi pseudoscutiform | NAPSESCU | Chrysophyta | Navicula | pseudoscutiformis | 0.00600 | | 0.00083 | |
| Navi pseudoventralis | NAPSEVEN | Chrysophyta | Navicula | pseudoventralis | | | | |
| Navi pupul elliptica | NAPUPELL | Chrysophyta | Navicula | pupula | | 0.00200 | | |
| Navi pup rectangular | NAPUPREC | Chrysophyta | Navicula | pupula | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Navi pupula | NAPUPULA | Chrysophyta | Navicula | pupula | 0.00600 | | | |
| Navi radiosa | NARADIOS | Chrysophyta | Navicula | radiosa | | 0.00400 | 0.00167 | |
| Navi radiosa parva | NARADPAR | Chrysophyta | Navicula | radiosa | | | | |
| Navi rhynchocephala | NARHYNCH | Chrysophyta | Navicula | rhynchocephala | 0.00400 | 0.00200 | | |
| Navi seminuloides | NASEMDES | Chrysophyta | Navicula | seminuloides | 0.00200 | | | |
| Navi seminulum | NASEMLUM | Chrysophyta | Navicula | seminulum | 0.01000 | 0.00400 | | |
| Navi spp. | NASPP | Chrysophyta | Navicula | spp. | | 0.00400 | | |
| Navi cf subtil var 2 | NAsu2PRL | Chrysophyta | Navicula | subtilissima | | | | |
| Navi cf subtil var 4 | NAsu4PRL | Chrysophyta | Navicula | subtilissima | | | | |
| Navi cf subtil var 5 | NAsu5PRL | Chrysophyta | Navicula | subtilissima | | | | 0.01400 |
| Navi subatomoides | NASUBATO | Chrysophyta | Navicula | subatomoides | 0.00200 | 0.00200 | | |
| Navi subhyalina | NASUBHYA | Chrysophyta | Navicula | subhyalina | | | | |
| Navi submuralis | NASUBMUR | Chrysophyta | Navicula | submuralis | | | | |
| Navi subplacentula | NASUBPLA | Chrysophyta | Navicula | subplacentula | | | | |
| Navi subrotundata | NASUBROT | Chrysophyta | Navicula | subrotundata | | | | |
| Navi subtilissima | NASUBTIL | Chrysophyta | Navicula | subtilissima | | | | 0.00600 |
| Navi tenuicephala | NATENUIC | Chrysophyta | Navicula | tenuicephala | 0.01000 | | | 0.11400 |
| Navi tridentula | NATRIDEN | Chrysophyta | Navicula | tridentula | | | | |
| Navi trivialis | NATRIVIA | Chrysophyta | Navicula | trivialis | | | | |
| Nav veneta | NAVENETA | Chrysophyta | Navicula | veneta | | | | |
| Navi viridula | NAVIRDLA | Chrysophyta | Navicula | viridula | | | | |
| Navi vitabunda | NAVITABU | Chrysophyta | Navicula | vitabunda | | | | |
| Neid sp. 13 | NE13PRL | Chrysophyta | Neidium | sp. 13 PIRLA | | | | |
| Neid sp. 4 | NE4PRL | Chrysophyta | Neidium | sp. 4 PIRLA | | | | |
| Neid affine | NEAFFINE | Chrysophyta | Neidium | affine | | | | |
| Neid affin longiceps | NEAFFLON | Chrysophyta | Neidium | affine | | | | |
| Neid alpinum | NEALPINU | Chrysophyta | Neidium | alpinum | | | | |
| Neid alp quadripunct | NEalpqua | Chrysophyta | Neidium | alpinum | | | | |
| Neid bisu baicalense | NEBISBAI | Chrysophyta | Neidium | bisulcatum | | | | 0.00200 |
| Neid bisulcatum | NEBISULC | Chrysophyta | Neidium | bisulcatum | | | | |
| Neid hercyn f subros | NEHERSUB | Chrysophyta | Neidium | hercynicum | | | | |
| Neid iridi ampliatum | NEIRIAMP | Chrysophyta | Neidium | iridis | | | | 0.01200 |
| Neid ir amphigomphus | NEIRIAUS | Chrysophyta | Neidium | iridis | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Neid iridis | NEIRIDIS | Chrysophyta | Neidium | iridis | | | | 0.00200 |
| Neid spp. | NESPP | Chrysophyta | Neidium | spp. | | | | 0.00400 |
| Nitz sp. A Cascades | NI0Arscs | Chrysophyta | Nitzschia | sp. PRS 0A | | | | |
| Nitz sp. 1 ? | NI1? | Chrysophyta | Nitzschia | sp. 1 ? | | | | |
| Nitz sp. 12 | NI12PRL | Chrysophyta | Nitzschia | sp. 12 PIRLA | | | | |
| Nitz sp. 14 | NI14PRL | Chrysophyta | Nitzschia | sp. 14 PIRLA | | | | |
| Nitz sp. 15 | NI15PRL | Chrysophyta | Nitzschia | sp. 15 PIRLA | | | | |
| Nitz sp. 16 | NI16PRL | Chrysophyta | Nitzschia | sp. 16 PIRLA | | | | |
| Nitz sp. 17 | NI17PRL | Chrysophyta | Nitzschia | sp. 17 PIRLA | | | | |
| Nitz sp. 26 | NI26PRL | Chrysophyta | Nitzschia | sp. 26 PIRLA | | | | |
| Nitz sp. 34 | NI34PRL | Chrysophyta | Nitzschia | sp. 34 PIRLA | | | | |
| Nitz sp. 35 | NI35PRL | Chrysophyta | Nitzschia | sp. 35 PIRLA | | | | |
| Nitz sp. 36 | NI36PRL | Chrysophyta | Nitzschia | sp. 36 PIRLA | | | | |
| Nitz sp. 37 | NI37PRL | Chrysophyta | Nitzschia | sp. 37 PIRLA | | | | |
| Nitz sp. 38 | NI38PRL | Chrysophyta | Nitzschia | sp. 38 PIRLA | | | | |
| Nitz alpina | NIALPINA | Chrysophyta | Nitzschia | alpina | | 0.00600 | 0.00750 | |
| Nitz amphibia | NIAMPHIB | Chrysophyta | Nitzschia | amphibia | | 0.00600 | | |
| Nitz bacillariaeform | NIBACFOR | Chrysophyta | Nitzschia | bacillariaeformis | | | | |
| Nitz bruophila | NIBRYOPH | Chrysophyta | Nitzschia | bryophila | | | | |
| Nitz capitellata | NICAPITE | Chrysophyta | Nitzschia | capitellata | | | | |
| Nitz dissipata | NIdissip | Chrysophyta | Nitzschia | dissipata | | | | |
| Nitz dissip undulata | NIdisund | Chrysophyta | Nitzschia | dissipata | | | | |
| Nitz fonticola | NIFONTIC | Chrysophyta | Nitzschia | fonticola | | 0.02200 | 0.00167 | |
| Nitz fossilis | NIFOSSIL | Chrysophyta | Nitzschia | fossilis | | | | |
| Nitz frustulum var 3 | NIfr3PRL | Chrysophyta | Nitzschia | frustulum | | | | |
| Nitz frustulum var 8 | NIfr8PRL | Chrysophyta | Nitzschia | frustulum | | | | |
| Nitz gracilis | NIGRACIL | Chrysophyta | Nitzschia | gracilis | | | | |
| Nitz gracilliformis | NIGRCLFM | Chrysophyta | Nitzschia | gracilliformis | | 0.00400 | | |
| Nitz inconspicua | NIINCONS | Chrysophyta | Nitzschia | inconspicua | | | | |
| Nitz lacuum | NILACUUM | Chrysophyta | Nitzschia | lacuum | | 0.00800 | | |
| Nitz leistikowii | NILEISTI | Chrysophyta | Nitzschia | leistikowii | | | | |
| Nitz modesta | NIMODEST | Chrysophyta | Nitzschia | modesta | | | 0.00250 | |
| Nitz palea debilis | NIPALDEB | Chrysophyta | Nitzschia | palea | | | | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Nitz palea | NIPALEA | Chrysophyta | Nitzschia | palea | 0.00400 | | | |
| Nitz paleaeformis | NIPALEAF | Chrysophyta | Nitzschia | paleaeformis | | | | |
| Nitz perminuta | NIPERMIN | Chrysophyta | Nitzschia | perminuta | | | | |
| Nitz recta | NIRECTA | Chrysophyta | Nitzschia | recta | | | | |
| Nitz spp. | NISPP | Chrysophyta | Nitzschia | spp. | 0.00400 | | | |
| Nitz tropica | NITROPIC | Chrysophyta | Nitzschia | tropica | | | 0.00417 | |
| Nitz vermicularis | NIVERMCL | Chrysophyta | Nitzschia | vermicularis | | | | |
| Opep sp. 1 | OP1PRL | Chrysophyta | Opephora | sp. 1 PIRLA | | | | |
| Opep martyi | OPMARTYI | Chrysophyta | Opephora | martyi | | 0.00200 | | |
| Opep olsenii | OPOLSENI | Chrysophyta | Opephora | olsenii | | | | |
| Pero fibula | PEFIBULA | Chrysophyta | Peronia | fibula | | | | |
| Pinn sp. A Cascades | PI0Arscs | Chrysophyta | Pinnularia | sp. PRS 0A | | | | 0.00200 |
| Pinn sp. B Cascades | PI0Brscs | Chrysophyta | Pinnularia | sp. PRS 0B | | | | 0.01000 |
| Pinn sp. C Cascades | PI0Crscs | Chrysophyta | Pinnularia | sp. PRS 0C | | | | |
| Pinn sp. D Cascades | PI0Drscs | Chrysophyta | Pinnularia | sp. PRS 0D | | | | |
| Pinn sp. 24 | PI24PRL | Chrysophyta | Pinnularia | sp. 24 PIRLA | | | | |
| Pinn sp. 25 | PI25PRL | Chrysophyta | Pinnularia | sp. 25 PIRLA | | | | |
| Pinn sp. 28 | PI28PRL | Chrysophyta | Pinnularia | sp. 28 PIRLA | | | | |
| Pinn sp. 2 PIRLA | PI2PRL | Chrysophyta | Pinnularia | sp. 2 PIRLA | | | | |
| Pinn sp. 30 | PI30PRL | Chrysophyta | Pinnularia | sp. 30 PIRLA | | | | |
| Pinn sp. 32 | PI32PRL | Chrysophyta | Pinnularia | sp. 32 PIRLA | | | | |
| Pinn sp. 36 | PI36PRL | Chrysophyta | Pinnularia | sp. 36 PIRLA | | | | |
| Pinn sp. 46 | PI46PRL | Chrysophyta | Pinnularia | sp. 46 PIRLA | | | | |
| Pinn abaujensi var 2 | PIab2PRL | Chrysophyta | Pinnularia | abaujensis | | | | |
| Pinn abaujensis | PIabauje | Chrysophyta | Pinnularia | abaujensis | | | | |
| Pinn biceps | PIBICEPS | Chrysophyta | Pinnularia | biceps | | | | 0.02600 |
| Pinn borealis rectan | PIBORREC | Chrysophyta | Pinnularia | borealis | | | | |
| Pinn braunii | PIBRAUNI | Chrysophyta | Pinnularia | braunii | | 0.00600 | | 0.01200 |
| Pinn brebissonii | PIbrebis | Chrysophyta | Pinnularia | brebissonii | | | | |
| Pinn divergentissima | PIDIVTIS | Chrysophyta | Pinnularia | divergentissima | | | | |
| Pinn gibba | PIGIBBA | Chrysophyta | Pinnularia | gibba | | | 0.00333 | |
| Pinn gibba mesogong | PIGIBMES | Chrysophyta | Pinnularia | gibba | | | | |
| Pinn hemiptera | PIHEMIPT | Chrysophyta | Pinnularia | hemiptera | | | | 0.00200 |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Pinn maior | PIMAIOR | Chrysophyta | Pinnularia | maior | | | | |
| Pinn micros brebiss | PIMICBRE | Chrysophyta | Pinnularia | microstauton | | | | |
| Pinn microstauron | PIMICROS | Chrysophyta | Pinnularia | microstauron | | | | 0.06600 |
| Pinn nodosa | PINODOSA | Chrysophyta | Pinnularia | nodosa | | | | |
| Pinn obscura | PIOBSCUR | Chrysophyta | Pinnularia | obscura | | | | |
| Pinn rupestris | PIrupest | Chrysophyta | Pinnularia | rupestris | | | | |
| Pinn spp. | PISPP | Chrysophyta | Pinnularia | spp. | | | | 0.01000 |
| Pinn subcapitata | PISUBCAP | Chrysophyta | Pinnularia | subcapitata | | | | |
| Pinn substomatophora | PISUBSTO | Chrysophyta | Pinnularia | substomatophora | | | | 0.00400 |
| Pinn sudetica | PISUDETI | Chrysophyta | Pinnularia | sudetica | | | | |
| Pinn termitina | PItermit | Chrysophyta | Pinnularia | termitina | | | | |
| Pinn viridis | PIVIRIDI | Chrysophyta | Pinnularia | viridis | | | | 0.00200 |
| Unkn penn 1 | PN1UNK | Chrysophyta | Unknown Pennate | sp. 1 | | | | |
| Unkn penn 2 | PN2UNK | Chrysophyta | Unknown Pennate | sp. 2 | | | | |
| Unkn penn 3 | PN3UNK | Chrysophyta | Unknown Pennate | sp. 3 | | | | |
| Unkn penn 5 | PN5UNK | Chrysophyta | Unknown Pennate | sp. 5 | | | | |
| Unkn pennate spp. | PNSPP | Chrysophyta | Unknown Pennate | spp. | | 0.00600 | | |
| Rhiz eriensis | RHeriens | Chrysophyta | Rhizosolenia | eriensis | | | | |
| Rhoi curvata | ROCURVAT | Chrysophyta | Rhoicosphenia | curvata | | | | |
| Rhop gibberula | RPGIBBER | Chrysophyta | Rhopalodia | gibberula | | | | |
| Sten intermedia | SNINTERM | Chrysophyta | Stenopterobia | intermedia | | | | 0.00800 |
| Stau anceps | SSANCEPS | Chrysophyta | Stauroneis | anceps | | | | |
| Stau anceps gracilis | SSANCGRA | Chrysophyta | Stauroneis | anceps | | | | |
| Stau kriegeri | SSKRIEGE | Chrysophyta | Stauroneis | kriegeri | | | | |
| Stau livingstonii | SSliving | Chrysophyta | Stauroneis | livingstonii | | | | |
| Stau phoenicenteron | SSPHOENI | Chrysophyta | Stauroneis | phoenicenteron | | | | |
| Stau phoeni gracilis | SSPHOGRA | Chrysophyta | Stauroneis | phoenicenteron | | | | |
| Stau smithii incisa | SSSMIINC | Chrysophyta | Stauroneis | smithii | | | | |
| Stau spp. | SSSPP | Chrysophyta | Stauroneis | spp. | | | | 0.00200 |
| Stau truncata | SStrunca | Chrysophyta | Stauroneis | truncata | | | | |
| Step hantzschii | STHANTZS | Chrysophyta | Stephanodiscus | hantzschii | | | | |
| Step medius | STMEDIUS | Chrysophyta | Stephanodiscus | medius | | 0.00400 | | |
| Step minutus | STMINUTU | Chrysophyta | Stephanodiscus | minutus | | 0.06200 | 0.02667 | |

| Long name | TAXANAME | Division | Genus | Species | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE |
|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | AC0ARSCS | Chrysophyta | Achnanthes | sp. PRS 0A | 0.00400 | | | |
| Achn sp. 1 ? | AC1? | Chrysophyta | Achnanthes | sp. 1 ? | | | | |
| Achn sp. 11 | AC11PRL | Chrysophyta | Achnanthes | sp. 11 PIRLA | | | | |
| Achn sp. 12 | AC12PRL | Chrysophyta | Achnanthes | sp. 12 PIRLA | | | | |
| Step niagarae | STNIAGAR | Chrysophyta | Stephanodiscus | niagarae | | 0.06800 | 0.01833 | |
| Step parvus | STPARVUS | Chrysophyta | Stephanodiscus | parvus | | | 0.02583 | |
| Suri sp. A Cascades | SU0Arscs | Chrysophyta | Surirella | sp. PRS 0A | | | | |
| Suri sp. B Cascades | SU0Brscs | Chrysophyta | Surirella | sp. PRS 0A | | | | |
| Suri sp. 1 ? | SU1? | Chrysophyta | Surirella | sp. 1 ? | | | | |
| Suri sp. 3 | SU3PRL | Chrysophyta | Surirella | sp. 3 PIRLA | | | | |
| Suri sp. 6 | SU6PRL | Chrysophyta | Surirella | sp. 6 PIRLA | | | | |
| Suri angusta | SUANGUST | Chrysophyta | Surirella | angusta | | | | 0.00600 |
| Suri delicatis var 1 | SUde1PRL | Chrysophyta | Surirella | delicatissima | | | | |
| Suri delicatissima | SUDELICA | Chrysophyta | Surirella | delicatissima | | | | 0.00600 |
| Suri linear constric | SULINCON | Chrysophyta | Surirella | linearis | | | | |
| Suri linearis | SULINEAR | Chrysophyta | Surirella | linearis | | | | |
| Suri splendida | SUSPLEND | Chrysophyta | Surirella | splendida | | | | 0.00200 |
| Suri spp. | SUSPP | Chrysophyta | Surirella | spp. | | | | |
| Syne sp. 1 | SY1PRL | Chrysophyta | Synedra | sp. 1 PIRLA | | | | |
| Syne sp. 8 | SY8PRL | Chrysophyta | Synedra | sp. 8 PIRLA | | | | |
| Syne cyclopum | SYCYCLOP | Chrysophyta | Synedra | cyclopum | | | | |
| Syne delicatissima | SYDELICA | Chrysophyta | Synedra | delicatissima | | | 0.00083 | |
| Syne filiform exilis | SYFILEXI | Chrysophyta | Synedra | filiformis | 0.01200 | 0.00200 | | |
| Syne parasitica | SYparasi | Chrysophyta | Synedra | parasitica | | | | |
| Syne ulna | SYULNA | Chrysophyta | Synedra | ulna | | | 0.00083 | |
| Tabe binalis | TABINALI | Chrysophyta | Tabellaria | binalis | | | | |
| Tabe fenestrata | TAFENEST | Chrysophyta | Tabellaria | fenestrata | | | | |
| Tabe flocculosa | TAFLOCCU | Chrysophyta | Tabellaria | flocculosa | | | | 0.00200 |
| Tabe flocculosa str4 | TAflost4 | Chrysophyta | Tabellaria | flocculosa | | | | |
| | UN1?GOK | (Undetermined) | (Undetermined) | sp. 1? ANS GOK | | | | |
| | UN2?GOK | (Undetermined) | (Undetermined) | sp. 2? ANS GOK | | | | |

# Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn sp. 13 | | | | | | | | | | | |
| Achn sp. 14 | | | | | | | | | | | |
| Achn sp. 16 | | | | | | | | | | | |
| Achn sp. 19 | | | | | | | | | | | |
| Achn sp 2 Mt. Rain. | | | | | | | | | | | |
| Achn acares | | | | | | | | | | | 0.00400 |
| Achn altaica | | | | | | | | | | | |
| Achn austriaca | | | | | | | | | | | |
| Achn bioreti | 0.02400 | 0.00111 | | | | | | | | | |
| Achn calcar | | | | | | | | | | | |
| Achn chlidanos | | | | | | | | | | | |
| Achn clevei | | | | | | | | | | | 0.00200 |
| Achn curtissima | | | | | | | | | | | |
| Achn daui alaskaensi | | | | | | | | | | | |
| Achn detha | | | | | | | | | | | |
| Achn didyma | | | | | | | | | | | 0.00200 |
| Achn exigua | | | | | | | | | | | 0.00600 |
| Achn flexella | | | | | | | | | | | |
| Achn grana | | | 0.00571 | | | | | | | | |
| Achn grischuna | | | | | | | | | | | |
| Achn helvetica | | | | | | | | | | | |
| Achn holstii | | | | | | | | | | | |
| Achn hungarica | | | | | | | | | | | 0.00400 |
| Achn kuelbsii | | | | | 0.00234 | | 0.00600 | | | | |
| Achn lanceolata | | | 0.00143 | | | 0.00200 | | | | | 0.00200 |
| Achn lanceolat dubia | | | | | | | | | | | 0.00400 |
| Achn lan ssp. frequ | | | | | | | | | | | |
| Achn laterostrata | | | | | | | | | | | 0.00400 |
| Achn levanderi | 0.09400 | | | 0.01000 | 0.00935 | 0.00200 | 0.05200 | 0.00667 | 0.08400 | 0.02000 | 0.01000 |
| Achn levan helvetica | | | | | | | | | | | |
| Achn linearis curta | | | | | | | | | | | |
| Achn linearis | | | 0.00143 | | | | | | | | |
| Achn marginulata | | | | 0.00400 | 0.00701 | | | 0.00111 | 0.01000 | | |

# Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn minutissima | | | | | 0.00234 | | | | | | 0.01800 |
| Achn nodosa | | | | | | | | | | | 0.00400 |
| Achn pusilla | | | | | | | | | | | 0.01400 |
| Achn spp. | | | | | | | | | | | |
| Achn subatomoides | | | | | | | | | | | 0.02400 |
| Achn suchlandti | | | | | | | | | | | |
| Amph sp. A Cascades | | | | | | | | | | | |
| Amph libyca | | | | | | | | | | | |
| Amph ovalis | | | | | | 0.00600 | | | | | 0.01000 |
| Amph ovali pediculus | | | | | | | | | | | |
| Amph perpusilla | | 0.01667 | 0.00429 | | | | | | | | |
| Anom brachysira | 0.01400 | | | | 0.00350 | | 0.01600 | 0.00222 | 0.00200 | | 0.00200 |
| Anom serians | | | | | | | | | | | |
| Anom vitrea | | | | | | | | | | | |
| Aste formosa | | 0.06556 | 0.12714 | | | 0.00200 | | | | | |
| Aste ralfsii | | | | | | | | | | | |
| Aula sp. A Cascades | | | | | | | | | | | 0.06600 |
| Aula sp. B Cascades | | | | | | | | | | | |
| Aula sp. C Cascades | | | | | | | | | | | |
| Aula sp. D Cascades | | | | | | | | | | | |
| Aula ambigua | | | | | | 0.01800 | | | | | 0.03000 |
| Aulo distans humilis | | | | | | | | | | | |
| Aulo distans nivalis | 0.00200 | | | | | | | | 0.09400 | | |
| Aulo dist nivaloides | | | | | | | | | 0.00200 | | |
| Aula distans | 0.16000 | | | 0.03600 | 0.00467 | | 0.02000 | 0.03444 | 0.06000 | 0.00800 | 0.00600 |
| Aulo distans tenella | | | | | | | | | | | |
| Aula granulata | | | | | | | | | | | |
| Aula italica | | | 0.00286 | | | 0.02200 | | | | | |
| Aulo italica subarct | | | | | | | | | | | |
| Aulo itali tenu | | 0.00111 | | | | 0.00400 | | | | | |
| Aulo lirata | | | | | | | | | | | |
| Aula perglabra | | | | | | | 0.00600 | | | | |
| Aula pfaffiana | | | | | | | | 0.65333 | 0.16800 | 0.07400 | 0.00400 |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Aula species | | | | | | | | | | | |
| Aula valida | | | | | | | | | | | |
| Calo bacillum | | | | | | | | | | | |
| Calo hyalina | 0.03000 | | | | | | | | | | |
| Calo silicula | | | | | | | | | | | |
| Calo tenuis | | | | | | | | | | | |
| Cocc placentula | | | 0.00571 | | | 0.00800 | | | | | |
| Cocc placen euglypta | | 0.00111 | 0.00714 | | | 0.01000 | | | | | |
| Chae sp. 1? | | | | | | | | | | | |
| Cymb sp. A Cascades | | | | 0.11800 | | | 0.04000 | | 0.01600 | 0.06400 | |
| Cymb sp. B Cascades | | | | | 0.01869 | | | | | | |
| Cymb sp. 1 ? | | | | | | | | | | | |
| Cymb sp. 18 | | | | | | | | | | | |
| Cymb sp. 2 ? | | | | | | | | | | | |
| Cymb sp. 20 | | | | | | | | | | | |
| Cymb sp. 21 | | | | | | | | | | | |
| Cymb sp. 6 | | | | 0.16000 | 0.00234 | | 0.13000 | | 0.05400 | 0.09200 | |
| Cymb sp. 7 | 0.01600 | | | 0.00400 | | | | 0.00111 | | 0.00400 | |
| Cymb aequalis | 0.03200 | | | | 0.00467 | 0.00400 | 0.01600 | 0.05889 | 0.02200 | | 0.00200 |
| Cymb amphicephala | | | | | | | | | | | |
| Cymb brehmii | 0.02800 | | | | | | | | | | |
| Cymb caespitosa | | | | | | | | | | | |
| Cymb cesatii | | | | | | | | | | | |
| Cymb cistula | | | | | | | | | | | |
| Cymb descripta | | | | | | | | | | | |
| Cymb elginensis | | | | | | | | | | | |
| Cymb falaisensis | | | | | | | | | | | |
| Cymb gaeumannii | 0.02800 | | | 0.00200 | 0.01752 | | | | 0.00400 | 0.00400 | |
| Cymb hauckii | | | | | 0.00467 | | | | | | |
| Cymb hebridica | | | | 0.01800 | 0.00117 | | 0.02000 | 0.00667 | 0.01000 | 0.02800 | 0.01000 |
| Cymb heter subrostra | | | | | | | | | | | |
| Cymb inaequalis | | | | | | | | | | | |
| Cymb lunata | 0.00600 | | | | 0.01752 | | | | 0.00600 | 0.00400 | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Cymb mesiana | | 0.00111 | | | | | | | | | |
| Cymb mexicana | | | | 0.00200 | | 0.00200 | | | | | |
| Cymb microcephala | | | | | | | | | | | 0.00400 |
| Cymb minuta latens | | | | | | | | | | | |
| Cymb minut silesiaca | | | | | | | | | | | |
| Cymb minuta | | | | | 0.00234 | | | | 0.00200 | | 0.00400 |
| Cymb muelleri | | | | | | | | | | | |
| Cymb naviculiformis | | | | | | | | | | | |
| Cymb perpusilla | | | | | | | | | | | |
| Cymb sinuata | | | | | | | | | | | |
| Cymb spp. | | 0.00222 | 0.00286 | | | 0.00400 | 0.00200 | | | | |
| Cyma solea | | 0.00111 | | | | 0.00200 | | | | | |
| Cycl sp. 1 | | | | | | 0.00400 | | | | | |
| Cycl bod lemanica | | 0.00111 | 0.00286 | 0.00400 | | | | | | | |
| Cycl kuetzin radiosa | | | | | | | | | | | |
| Cycl ocellata | | | | | | | | | | | 0.00400 |
| Cycl pseudostelliger | | | | | | | | | | | |
| Cycl stelligera | | | | | 0.80491 | 0.00200 | | | | | 0.09600 |
| Diat anceps | | | | | | | | | | | |
| Diat hiemale | | | | | | | | | | | |
| Diat mesodon | | | | | | | | | | | 0.00200 |
| Diat tenuis | | 0.00111 | | | | | | | | | |
| Dipl sp. 1 ? | | | | | | | | | | | |
| Dipl elliptica | | | | | | | | | | | |
| Dipl finnica | | | | | | | | | | | 0.00200 |
| Dipl marginestriata | | | | | | | | | | | |
| Dipl modica | | | 0.00143 | | | | | | | | |
| Epit adnata | | 0.00111 | 0.00143 | | | 0.00800 | | | | | |
| Epit sorex | | | | | | 0.00200 | | | | | |
| Epit turgida | | | | | | 0.00200 | | | | | |
| Epit turgida gracil | | | | | | 0.00600 | | | | | |
| Euno sp. 1 ? | | | | | | | | | | | |
| Euno sp. 42 | | | | | | | | | | 0.02000 | 0.00200 |

## Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno sp. 44 | | | | | | | | | | | |
| Euno sp. 45 | | | | | | | | | | | |
| Euno sp. 46 | | | | | | | | | | | |
| Euno arcus | | | | | 0.00234 | | | | | | |
| Euno bidentula var 1 | | | | | | | | | | | |
| Euno bidentula | | | | | | | | | | | |
| Euno bilun mucophila | | | | | 0.00234 | | | 0.00444 | 0.00600 | 0.01200 | |
| Euno bilunaris | | | | 0.00200 | | 0.00200 | | | | 0.01000 | |
| Euno curvata | | | | | | | | | | | |
| Euno denticulata | | | | | | | | | | | |
| Euno exigua | 0.02200 | | | | | | | | 0.00200 | | |
| Euno flexuosa | | | | | | 0.00200 | | | | | |
| Euno hemicyclus | | | | | | | | | | | |
| Euno implicata | 0.00200 | | | | | | | | | | |
| Euno incisa var 1 | | | | | | | | | | 0.00400 | |
| Euno incisa var 2 | | | | | | | | | | | |
| Euno incisa var 6 | | | | | | | | | | | |
| Euno incisa | | | | | | 0.00200 | | | | | |
| Euno intermedia | | | | | | | | | | | |
| Euno meisteri | | | | | | | | | 0.00200 | | |
| Euno microcephala | | | | | | | | | | | |
| Euno micr tridentata | | | | | | | | | | | |
| Euno minor | | | | | | | | 0.00333 | | | |
| Euno monodon | | | | | | 0.00200 | | 0.00333 | | | |
| Euno musci trident | | | | | | | | | | | 0.01800 |
| Euno naegelii | | | | | 0.00117 | | | | 0.00200 | 0.00200 | |
| Euno palud trinac | | | | | | | | | | | |
| Euno paludosa | | | | | | | | | | | |
| Euno pectinali minor | | | | | | | | | | | |
| Euno pectinalis | | | | | | | | | | | |
| Euno praerupta | | | | | | | | | | | |
| Euno quaternaria | | | | | | | | | | | |
| Euno rhomboidea | | | | | | | | | | | |

# Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno serra diadema | | | | | | | | | | | |
| Euno serra | | | | | 0.00117 | | | 0.01333 | | | |
| Euno spp. | 0.00400 | | | | 0.00234 | | | | | | |
| Euno subarcuatoides | | | | | | | | 0.00111 | 0.00200 | 0.01200 | |
| Euno sudetica | | | | | | | | 0.00333 | | | |
| Euno tenella | | | | | | | | | | | |
| Euno trinacria | | | | | | | | | | | |
| Euno vanheurckii | | | | | | | | | | | |
| Euno sp. 74 | | | | | | | | 0.00111 | | | |
| Frag sp. A Cascades | | | | | | | | | | | |
| Frag sp. B Cascades | | | | | | | | | | | |
| Frag sp. 11 | | | | | | | | | | | |
| Frag sp. 15 | | | | | | | | | | | |
| Frag sp. 17 | | | | | | | | | | | |
| Frag sp. 9 | | | | | | | | | | | |
| Frag arcus | | | | | | | | | | | |
| Frag bidens | | 0.00222 | | | | | | | | | |
| Frag brevistriata | | 0.21556 | 0.06286 | 0.00200 | 0.00117 | 0.12000 | | | | | 0.25600 |
| Frag capu rumpens | | | | | 0.00117 | 0.01200 | | | | | |
| Frag capucina | | | | | | | | | | | 0.02200 |
| Frag capu vaucheriae | | | 0.00286 | | | | | | | | |
| Frag constru binodis | | | 0.00429 | | | 0.00800 | | | | | 0.00200 |
| Frag construe pumila | | | | | | | | | | | |
| Frag construens | | | 0.00143 | | | 0.05800 | | | | | |
| Frag constru subsali | | 0.00222 | | | | 0.08800 | | | | | 0.00400 |
| Frag construe venter | | | | | | 0.08000 | | | | | 0.06600 |
| Frag crotonensis | | 0.02222 | 0.11286 | | | | | | | | 0.00400 |
| Frag constricta | | | | | | | | | | | |
| Frag exigua | | | | | | 0.01000 | | | | | |
| Frag fasciculata | | | | | | | | | | | |
| Frag lapponica | | | | | | | | | | | |
| Frag leptostau dubia | | | 0.00286 | | | 0.01000 | | | | | |
| Frag oldenburgiana | | | | | | | | | | | 0.01400 |

## Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Frag parasitica | | | | | | | | | | | 0.00200 |
| Frag pinn lancettula | | 0.04556 | 0.00857 | | | 0.02200 | | | | | |
| Frag pinnata | | 0.01778 | 0.00429 | | | 0.16200 | | | | | 0.04800 |
| Frag pseudoconstruen | | | | | | | | | | | 0.00400 |
| Frag spp. | | | | | 0.00117 | | | | | | |
| Frag vaucheriae | | | | | | | | | | | |
| Frag virescens | | | | | | 0.02400 | | | | | |
| Frag vires exi | | | | | | | | | | | |
| Frus rhom amphipleur | | | | | | | | | | | |
| Frus rhomboides CAF | | | | | | | | | | | |
| Frus rhom crassinerv | 0.01600 | | | | | | | | | 0.00200 | |
| Frus rhomboides | 0.00600 | | | 0.04400 | 0.00584 | | 0.02000 | 0.00667 | 0.00400 | 0.04800 | 0.00400 |
| Frus rhombo saxonica | | | | | | | | | | | |
| Gomp sp. A Cascades | | | | | 0.00234 | | | | | | |
| Gomp sp. 1 ? | | | | | | | | | | | |
| Gomp sp. 11 | | | | | | | | | | | |
| Gomp sp. 18 | | | | | | | | | | | |
| Gomp sp. 1 | | | | | | 0.01400 | | | | | |
| Gomp angustum | | | | | | | | | | | |
| Gomp angustatum | | | | | 0.00117 | | | | | | |
| Gomp consector | | | | | | | | | | | |
| Gomp gracile | | | | | 0.00701 | 0.00400 | 0.00200 | 0.00222 | | | 0.00400 |
| Gomp grovei lingulat | | | | | | | | | | | |
| Gomp olivcm mintsmum | | | | | | | | | | | |
| Gomp olivaceum | | | | | | | | | | | |
| Gomp parvulum | | | 0.00571 | | | 0.00400 | | | | | 0.00200 |
| Gomp puig aequatoria | | | | | | | | | | | |
| Gomp spp. | | | | | | | | | | | |
| Gomp subcl mexicanum | | | | | | | | | | | |
| Gomp tack brevistria | | | | | | | | | | | |
| Gomp turris | | | | | | | | | | | 0.00200 |
| Hann arcus | | | | | | | | | | | |
| Meri circulare | | | | | | | | | | | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Melo sp. 1 ? | | | | | | | | | | | |
| Melo sp. 13 | | | | | | | | | | | |
| Melo sp. 4 | | | | | | | | | | | |
| Melo sp. 8 | | | | | | | | | | | |
| Navi sp. 1 Mt. Rain. | | | | | | | | | | | |
| Navi sp. A Cascades | 0.00200 | | | | | | | | | | |
| Navi sp. B Cascades | | | | | | | | | | | |
| Navi sp. C Cascades | | | | | | 0.00800 | | | | | |
| Navi sp. D Cascades | | | | | | 0.01200 | | | | | |
| Navi sp. E Cascades | | | | | | | | | | | 0.03800 |
| Navi sp. 1 ? | | | | | | | | | | | |
| Navi sp. 14 | | | | | | | | | | | |
| Navi sp. 1 | | | | | | | | | | | |
| Navi sp. 2 ? | | | | | | | | | | | |
| Navi sp. 20 | | | | | | | | | | | |
| Navi sp. 21 | | | | | | | | | | | |
| Navi sp. 24 | 0.00200 | | | | | | | | | 0.01800 | |
| Navi sp. 25 | | | | | | | | | | | |
| Navi sp. 3 ? | | | | | | | | | | | |
| Navi sp. 45 | | | | | | | | | | | |
| Navi sp. 47 | | | | | | | | | | | |
| Navi sp. 51 | | | | | | | | | | | |
| Navi sp. 52 | | | | | | | | | | | |
| Navi sp. 6 | | | | | | | | | | | |
| Navi sp. 74 | | | | | | | | | | | |
| Navi sp. 91 | | | | | | | | | | | |
| Navi aboensis | | | | | | | | | | | |
| Nav absoluta | | | | | | | | | | | |
| Navi acceptata | | | | | | | | | | | |
| Navi accomoda | | | | | | | | | | | |
| Navi angusta | | | | | | | | | | | |
| Navi arvensis | | | | | | | | | | | |
| Navi bacillum | | | | | | | | | | | |

Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi bremensis | | | | | | | | 0.00222 | | | |
| Navi bryophila | | | | | | | | | | | 0.00200 |
| Navi cincta | | | | | | 0.00400 | | | | | |
| Navi cocconeiformis | | | | | | | | | | | |
| Navi cohnii | | | | | | | | | | | |
| Navi concentrica | | | | | | | | | | | 0.00400 |
| Navi crucicula | | | | | | | | | | | |
| Navi cryptocephala | | 0.00222 | | | | | | | | | 0.00400 |
| Navi cryptotenella | 0.01000 | | | | | | | | | | |
| Navi disjuncta | | | | | | | | | | | |
| Navi elginensis | | | | | | 0.00200 | | | | | |
| Navi gallica | | | | | | | | | | | |
| Navi harderii | | | | | | | | | | | |
| Navi jaernefeldti | | | | | | | | | | | |
| Navi laevissima | | | | | | 0.00200 | | | | | 0.02400 |
| Navi leptostriata | 0.03400 | | | 0.04400 | 0.00117 | 0.00200 | 0.00800 | | 0.01600 | 0.05400 | |
| Navi libonensis | | | | | | | | | | | |
| Navi medioconvexa | | | | | | 0.00400 | | | | | |
| Navi mediocris | 0.00200 | | | | 0.00584 | | 0.00200 | | | | |
| Navi mediopunctata | | | | | | | | | | | |
| Navi menisculus | | | | | | | | | | | |
| Navi minima | | | | | | | | | | | |
| Navi minuscula v. A | | | | | | | | | | | 0.00200 |
| Navi modica | | | | | | | | | | | |
| Navi mutica | | | | | | | | | | | |
| Navi pelliculosa | | | | | | | | | | | |
| Navi placenta | | | | | | | | | | | |
| Nav porifera | | | | | | | | | | | |
| Navi pseudomuralis | | | | | | | | | | | |
| Navi pseudoscutiform | | 0.00111 | | | | | | | | | |
| Navi pseudoventralis | | | | | | | | | | | 0.00200 |
| Navi pupul elliptica | | | | | | | | | | | |
| Navi pup rectangular | | | | | | | | | | | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi pupula | | | 0.00143 | | | | | | | | 0.01800 |
| Navi radiosa | | | | | | | | | | | |
| Navi radiosa parva | | | 0.00143 | | | | | | | | |
| Navi rhynchocephala | | | | | | 0.00200 | | | | | |
| Navi seminuloides | | | | | | | | | | | 0.01800 |
| Navi seminulum | | 0.00111 | 0.00143 | 0.00200 | | 0.00600 | | | | | 0.00800 |
| Navi spp. | | 0.00111 | 0.00143 | | 0.00117 | | | | | | 0.00400 |
| Navi cf subtil var 2 | | | | | | | | | | | |
| Navi cf subtil var 4 | | | | | | | | | | | |
| Navi cf subtil var 5 | | | | | | | | | | | |
| Navi subatomoides | | 0.00111 | | | | | | | | | 0.00200 |
| Navi subhyalina | | | | | | | | | | | |
| Navi submuralis | | | | | | | | | | | |
| Navi subplacentula | | | | | | | | | | | 0.00400 |
| Navi subrotundata | | | | | | | | | | | |
| Navi subtilissima | 0.01200 | | | 0.16000 | | | 0.06400 | 0.01333 | 0.00600 | 0.04600 | |
| Navi tenuicephala | 0.39000 | | | 0.22600 | 0.00935 | | 0.39400 | 0.00333 | 0.35000 | 0.19800 | 0.00600 |
| Navi tridentula | | | | | | | | | | | |
| Navi trivialis | | | | | | 0.00400 | | | | | |
| Nav veneta | | | | | | | | | | | |
| Navi viridula | | | | | | | | | | | |
| Navi vitabunda | | | | | | | | | | | |
| Neid sp. 13 | | | | | | | | | | | |
| Neid sp. 4 | | | | | | | | | | | |
| Neid affine | | | | | | | | | | 0.01200 | |
| Neid affin longiceps | | | | | | | | | | | |
| Neid alpinum | | | | | | | | | | 0.00800 | |
| Neid alp quadripunct | | | | | | | | | | | |
| Neid bisu baicalense | | | | | | | | | | 0.00400 | |
| Neid bisulcatum | | | | 0.00200 | | | | | | | |
| Neid hercyn f subros | | | | | | | | | | 0.00600 | |
| Neid iridi ampliatum | | | | 0.01800 | 0.00234 | | 0.00400 | 0.01778 | 0.00800 | | |
| Neid ir amphigomphus | | | | 0.00400 | | | | | 0.00200 | 0.02000 | |

Diatom Counts

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Neid iridis | 0.00400 | | | | | | 0.00400 | 0.00889 | | | |
| Neid spp. | | | | | | | | | | | |
| Nitz sp. A Cascades | | 0.00222 | | | | | | | | | |
| Nitz sp. 1 ? | | | | | | | | | | | |
| Nitz sp. 12 | | | | | | | | | | | |
| Nitz sp. 14 | | | | | | | | | | | |
| Nitz sp. 15 | | | | | | | | | | | |
| Nitz sp. 16 | | | | | | | | | | | |
| Nitz sp. 17 | | | | | | | | | | | |
| Nitz sp. 26 | | | | | | | | | | | |
| Nitz sp. 34 | | | | | | | | | | | |
| Nitz sp. 35 | | | | | | | | | | | |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz sp. 37 | | | | | | | | | | | |
| Nitz sp. 38 | | | | | | | | | | | |
| Nitz alpina | | 0.00444 | | | | | | | | | |
| Nitz amphibia | | | | | | 0.01800 | | | | | |
| Nitz bacillariaeform | | 0.00111 | | | | | | | | | |
| Nitz bruophila | | | | | 0.00584 | | | | | | |
| Nitz capitellata | | | | | | 0.00200 | | | | | |
| Nitz dissipata | | | | | | | | | | | |
| Nitz dissip undulata | | | | | | | | | | | |
| Nitz fonticola | | 0.00333 | 0.00286 | | | 0.00800 | | | | | 0.00600 |
| Nitz fossilis | | | | | | | | | | | |
| Nitz frustulum var 3 | | | | | | | | | | | |
| Nitz frustulum var 8 | | | | | | | | | | | |
| Nitz gracilis | | | 0.00571 | 0.03000 | 0.00234 | | 0.01200 | | 0.00200 | 0.01000 | 0.00400 |
| Nitz gracilliformis | | | | | | | | | | | |
| Nitz inconspicua | | | | | | 0.00200 | | | | | |
| Nitz lacuum | | | | | | | | | | | 0.00600 |
| Nitz leistikowii | | | | | | | | | | | |
| Nitz modesta | | | | | | | | | | | |
| Nitz palea debilis | | | | | | | | | | | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Nitz palea | | | | | 0.00701 | 0.00600 | | | | | |
| Nitz paleaeformis | | | 0.00429 | | | | | | | | |
| Nitz perminuta | | | | | | | | | | | 0.01200 |
| Nitz recta | | | | | | | | | | | |
| Nitz spp. | | | | | | 0.00200 | | | | | |
| Nitz tropica | | 0.00444 | 0.01571 | | | 0.00200 | | | | | 0.00200 |
| Nitz vermicularis | | | | | | | | | | | |
| Opep sp. 1 | | | | | | | | | | | |
| Opep martyi | | | | | | | | | | | |
| Opep olsenii | | | | | | | | | | | |
| Pero fibula | | 0.00111 | 0.00571 | | | | | | | | |
| Pinn sp. A Cascades | | | | | | | | | | | |
| Pinn sp. B Cascades | | | | | | | | | | | |
| Pinn sp. C Cascades | | | | 0.01200 | | | | 0.00111 | 0.00600 | 0.04200 | |
| Pinn sp. D Cascades | | | | | | | | 0.01333 | | | |
| Pinn sp. 24 | | | | | | | | | | | |
| Pinn sp. 25 | | | | | | | | | | | |
| Pinn sp. 28 | | | | | | | | | | | |
| Pinn sp. 2 PIRLA | | | | | | | | | | | |
| Pinn sp. 30 | | | | | | | | | | | |
| Pinn sp. 32 | | | | | | | | | | | |
| Pinn sp. 36 | | | | | | | | | | | |
| Pinn sp. 46 | | | | | | | | | | | |
| Pinn abaujensi var 2 | | | | | | | | | | | |
| Pinn abaujensis | | | | | | | | | | | |
| Pinn biceps | 0.00600 | | | | 0.00584 | | 0.08800 | | 0.00600 | 0.10200 | 0.01200 |
| Pinn borealis rectan | | | | | | | | | | | |
| Pinn braunii | 0.01800 | | | 0.01600 | | | | | | | |
| Pinn brebissonii | | | | | | | | | | | |
| Pinn divergentissima | | | | | 0.00234 | | | | | | |
| Pinn gibba | | | | | | | | | | | |
| Pinn gibba mesogong | | | | | | | | | | | |
| Pinn hemiptera | | | | | | | | | | | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Pinn maior | | | | | | | | | | | 0.00200 |
| Pinn micros brebiss | | | | | | | | | | | |
| Pinn microstauron | 0.01800 | | | 0.04400 | 0.01285 | | 0.07600 | 0.10000 | 0.01000 | 0.02400 | 0.00400 |
| Pinn nodosa | | | | | | | | | | | 0.00400 |
| Pinn obscura | | | | | | | | | | | |
| Pinn rupestris | | | | | | | | | | | |
| Pinn spp. | 0.00800 | | | | | 0.01400 | 0.01000 | | 0.00400 | 0.00200 | |
| Pinn subcapitata | 0.00400 | | | | | | | 0.00111 | 0.00600 | | |
| Pinn substomatophora | | | | | | | | | | | |
| Pinn sudetica | | | | 0.00600 | | | | | | | |
| Pinn termitina | | | | | | | | | | | |
| Pinn viridis | | | | | | 0.00200 | | | | | |
| Unkn penn 1 | | | | | | | | | | | |
| Unkn penn 2 | | | | | | | | | | | |
| Unkn penn 3 | | | | | | | | | | | |
| Unkn penn 5 | | | | | | | | | | | |
| Unkn pennate spp. | | | | | | | | | | | |
| Rhiz eriensis | | | | | | | | | | | |
| Rhoi curvata | | | 0.00143 | | | 0.00600 | | | | | |
| Rhop gibberula | | | | | | | | | | | 0.00200 |
| Sten intermedia | 0.00200 | | | | 0.00234 | | | | | | 0.00200 |
| Stau anceps | | | | | | | | | | 0.00800 | 0.00200 |
| Stau anceps gracilis | | | | | | | | | | | |
| Stau kriegeri | | | | | | | | | | | |
| Stau livingstonii | | | | | | | | | | | |
| Stau phoenicenteron | | | | | 0.00234 | 0.00400 | | | | | |
| Stau phoeni gracilis | | | | | 0.00117 | | | | | | 0.00200 |
| Stau smithii incisa | | | | | | | | | | | |
| Stau spp. | | | | | | | | | | | |
| Stau truncata | | | | | | | | | | | |
| Step hantzschii | | 0.02667 | 0.00571 | | | 0.00200 | | | | | |
| Step medius | | | 0.00143 | | | 0.08000 | | | | | |
| Step minutus | | 0.51667 | 0.56714 | 0.00200 | | 0.04000 | | | | | |

| Long name | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Step niagarae | | | | | | 0.00200 | | | | | |
| Step parvus | | 0.03333 | 0.01429 | | | 0.02200 | | | | | |
| Suri sp. A Cascades | | | | | | | | 0.01111 | 0.00200 | 0.00200 | |
| Suri sp. B Cascades | | | | | | | | | | | |
| Suri sp. 1 ? | | | | | | | | | | | |
| Suri sp. 3 | | | | 0.00400 | | | | | | | |
| Suri sp. 6 | | | | | 0.00467 | | | | | | |
| Suri angusta | | | | | | | | | | | |
| Suri delicatis var 1 | 0.00400 | | | 0.01600 | | | 0.00400 | | 0.00400 | 0.03000 | |
| Suri delicatissima | | | | 0.00800 | | | 0.00400 | 0.02222 | 0.02400 | 0.00400 | |
| Suri linear constric | | | | | | | | | | | |
| Suri linearis | | | | | | 0.00200 | | | | | |
| Suri splendida | | | | | | | | | | | |
| Suri spp. | | | | | | 0.00200 | | 0.00222 | | 0.00200 | |
| Syne sp. 1 | | | | | | | | | | | |
| Syne sp. 8 | | | | | | | | | | | |
| Syne cyclopum | | 0.00111 | | | | | | | | | |
| Syne delicatissima | | | | | | | | | | | |
| Syne filiform exilis | | | | | | | | | | | |
| Syne parasitica | | | | | | | | | | | |
| Syne ulna | | | | | | 0.00400 | | | | | |
| Tabe binalis | | | | | | | | | | | |
| Tabe fenestrata | | | | | | | | | | | |
| Tabe flocculosa | | | | | 0.00117 | | | | 0.00200 | | 0.01000 |
| Tabe flocculosa str4 | | | | | | | | | | | |

Diatom Counts

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn sp. 13 | | | | | | | | | | | |
| Achn sp. 14 | | | | | | | | | | | |
| Achn sp. 16 | | | | | | | | | | | |
| Achn sp. 19 | | | | | | | | | | | |
| Achn sp 2 Mt. Rain. | | | | | | | | | | | |
| Achn acares | | | | | | | | | | | |
| Achn altaica | | | | 0.00397 | | | | | | | |
| Achn austriaca | | | | | | | | | | | |
| Achn bioreti | | 0.00200 | | 0.01389 | | 0.00200 | | | | | |
| Achn calcar | | | | | | | | | | | 0.00667 |
| Achn chlidanos | | | | 0.04167 | | | 0.01400 | | | 0.00600 | |
| Achn clevei | | | | | | | | | | | |
| Achn curtissima | 0.05000 | | | 0.02976 | 0.00600 | | 0.00400 | | | 0.00800 | |
| Achn daui alaskaensi | | | | | | | | | | | |
| Achn detha | | | | | | | | | | | |
| Achn didyma | | | | | | | | | | | |
| Achn exigua | | | | | 0.01000 | | | | | | 0.00167 |
| Achn flexella | | | | | | | | | | | |
| Achn grana | | | | | 0.00600 | | | 0.02600 | | | |
| Achn grischuna | | | | | | | | | | | |
| Achn helvetica | | | | | | | | | | | |
| Achn holstii | | | | | | 0.00200 | | | | 0.00600 | |
| Achn hungarica | | | | | | | | | | | |
| Achn kuelbsii | | | | | | | | | | 0.00800 | |
| Achn lanceolata | | | | | 0.00200 | | | | | | |
| Achn lanceolat dubia | | | | | 0.02200 | 0.00200 | | | | 0.00200 | |
| Achn lan ssp. frequ | | | | | | | | | | | |
| Achn laterostrata | | | | | | | | | | | |
| Achn levanderi | 0.01200 | 0.00800 | 0.01800 | 0.04365 | 0.00200 | 0.02000 | 0.03600 | 0.02600 | | 0.12800 | 0.00167 |
| Achn levan helvetica | | | | | | | | | | | |
| Achn linearis curta | 0.02400 | | | | 0.00400 | 0.02200 | | | | | |
| Achn linearis | 0.00200 | 0.01600 | | 0.00198 | 0.03400 | 0.01800 | | | | | 0.00500 |
| Achn marginulata | 0.02600 | 0.02600 | 0.06200 | 0.02381 | 0.00200 | 0.03800 | 0.01800 | 0.01200 | 0.00250 | 0.04400 | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn minutissima | | | | 0.00595 | 0.01400 | 0.02600 | 0.00400 | | | | |
| Achn nodosa | | | | | | | | | | | |
| Achn pusilla | | | | | | | | | | | |
| Achn spp. | | | | 0.00198 | | 0.00200 | 0.00200 | | | 0.00200 | |
| Achn subatomoides | 0.06200 | | | 0.02976 | | 0.00600 | | | | 0.00200 | 0.00333 |
| Achn suchlandti | | | | | | | | | | | |
| Amph sp. A Cascades | | | | | | 0.00200 | | | | | |
| Amph libyca | | | | | | | | | | | |
| Amph ovalis | | 0.00200 | | | 0.01000 | | | | | | 0.00167 |
| Amph ovali pediculus | | | | | | | | | | | |
| Amph perpusilla | | | | 0.00198 | | | | | | | 0.00333 |
| Anom brachysira | 0.00800 | 0.00200 | 0.00600 | 0.01190 | 0.00600 | 0.01200 | 0.01600 | 0.02000 | 0.01375 | 0.04200 | |
| Anom serians | | | | | | | | | | 0.00800 | |
| Anom vitrea | | | | | 0.01000 | 0.04200 | | | | 0.00600 | |
| Aste formosa | | | | | | | | | | | 0.35500 |
| Aste ralfsii | | | | | | | 0.00200 | | | | |
| Aula sp. A Cascades | | | | | | | | | | | |
| Aula sp. B Cascades | | 0.00200 | 0.11400 | 0.03175 | 0.01000 | 0.01400 | 0.04600 | 0.03800 | 0.11500 | 0.04000 | |
| Aula sp. C Cascades | | | 0.06400 | 0.00198 | | 0.00400 | 0.04800 | 0.01600 | | | |
| Aula sp. D Cascades | | | | | | | | | | | |
| Aula ambigua | 0.09000 | 0.03800 | | | 0.00200 | 0.00400 | | | | | |
| Aulo distans humilis | | | | | | | | | | | |
| Aulo distans nivalis | | | 0.06400 | 0.03571 | | 0.00800 | 0.03200 | 0.15000 | 0.46000 | 0.02400 | |
| Aulo dist nivaloides | | | | | | | | | | | |
| Aula distans | 0.04400 | 0.01600 | 0.06400 | 0.06548 | 0.01400 | 0.03000 | 0.08400 | 0.02400 | 0.04000 | 0.03000 | |
| Aulo distans tenella | | | | | | | | | | | |
| Aula granulata | | | | 0.00397 | 0.00800 | 0.00400 | 0.00200 | 0.00600 | | 0.02800 | |
| Aula italica | 0.02600 | | | | | | | | | | 0.03333 |
| Aulo italica subarct | | | | | | | | | | | |
| Aulo itali tenu | 0.00800 | | | | | | | | | | 0.02000 |
| Aulo lirata | | | | | | | | | | | |
| Aula perglabra | | | | | | | | | 0.02000 | | |
| Aula pfaffiana | | | 0.04600 | 0.00595 | | 0.00400 | 0.04600 | 0.11400 | 0.20000 | 0.03800 | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROC K LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Aula species | | | | | | | | | | | |
| Aula valida | 0.02000 | | | | | | | | | | |
| Calo bacillum | | | | | | 0.00200 | | | | 0.00800 | |
| Calo hyalina | | | | | | | | | | | |
| Calo silicula | | | | | 0.00400 | | | | | | |
| Calo tenuis | | | | | 0.00400 | | | | | | |
| Cocc placentula | | | | | | | | | | | |
| Cocc placen euglypta | | | | | | | | | | | 0.00167 |
| Chae sp. 1? | | | | | | | | | | | |
| Cymb sp. A Cascades | | | 0.05200 | | | | 0.03400 | 0.06600 | 0.01625 | 0.00400 | |
| Cymb sp. B Cascades | | | | | | | | | | | |
| Cymb sp. 1 ? | | | | | | | | | | | |
| Cymb sp. 18 | | | | | | | | | | | |
| Cymb sp. 2 ? | | | | | | | | | | | |
| Cymb sp. 20 | | | | | | | | | | | |
| Cymb sp. 21 | | | | | | | | | | | |
| Cymb sp. 6 | | | 0.05600 | | | | 0.01600 | 0.01400 | 0.02000 | 0.00600 | |
| Cymb sp. 7 | | | | | | | | | 0.00125 | | |
| Cymb aequalis | | 0.00200 | 0.01400 | | | 0.00400 | 0.03000 | 0.03000 | 0.00500 | 0.00400 | |
| Cymb amphicephala | | | 0.00400 | | | | | | | | |
| Cymb brehmii | | | 0.00800 | | | | 0.01000 | 0.00200 | 0.00250 | 0.00400 | |
| Cymb caespitosa | | | | | | | | | | | |
| Cymb cesatii | | | | | 0.00400 | 0.00800 | | | | 0.00400 | |
| Cymb cistula | | | | | | | | | | | |
| Cymb descripta | | | | | | | | | | | |
| Cymb elginensis | | | | | | | | | | | |
| Cymb falaisensis | | | | | | | | | | | |
| Cymb gaeumannii | 0.00400 | | 0.01200 | | | 0.00400 | 0.06600 | 0.03800 | 0.00500 | 0.03200 | |
| Cymb hauckii | | | | | | | | | | | |
| Cymb hebridica | | | 0.01200 | | | | 0.00400 | 0.03200 | 0.01375 | 0.00400 | |
| Cymb heter subrostra | | | | | | | | | | | |
| Cymb inaequalis | | | | | | | | | | | |
| Cymb lunata | 0.01800 | 0.00600 | 0.00400 | 0.00992 | | 0.01600 | 0.05000 | 0.00800 | | 0.00400 | |

# Diatom Counts

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Cymb mesiana | | 0.00200 | | | | | | | | | |
| Cymb mexicana | | | 0.00200 | | | | | | | | |
| Cymb microcephala | | | | | | | | | | | |
| Cymb minuta latens | | | | | | | | | | | |
| Cymb minut silesiaca | | | | | | | | | | | |
| Cymb minuta | 0.01000 | 0.00800 | | 0.00595 | | 0.01000 | 0.00600 | | | | 0.00333 |
| Cymb muelleri | | | | | | | | | | | |
| Cymb naviculiformis | | | | | | | | | | | |
| Cymb perpusilla | | | | | | | | | | | |
| Cymb sinuata | | | | | | | | | 0.00125 | | |
| Cymb spp. | | 0.00600 | 0.00200 | | 0.00200 | 0.00400 | 0.00400 | 0.00200 | | | |
| Cyma solea | | | | | | | | | | | |
| Cycl sp. 1 | | | | | | | | | | | |
| Cycl bod lemanica | | | | | | | | | | | |
| Cycl kuetzin radiosa | | | | | | | | | | | |
| Cycl ocellata | | | | | | 0.06400 | | | | | |
| Cycl pseudostelliger | | | | | | | | | | | |
| Cycl stelligera | | 0.02800 | | | 0.14600 | 0.38800 | | | | 0.04000 | 0.00667 |
| Diat anceps | | | | 0.00595 | | 0.00600 | | | | | 0.00167 |
| Diat hiemale | | | | | | | | | | | |
| Diat mesodon | | | | | | | | | | | |
| Diat tenuis | | | | | | | | | | | |
| Dipl sp. 1 ? | | | | | | | | | | | 0.00167 |
| Dipl elliptica | | | | | 0.00600 | | | | | | |
| Dipl finnica | | | | | | | | | | | |
| Dipl marginestriata | | | | | 0.02000 | | | | | | |
| Dipl modica | | | | | | | | | | | |
| Epit adnata | | | | | | | | | | | |
| Epit sorex | | | | | | | | | | | |
| Epit turgida | | | | | | | | | | | |
| Epit turgida gracil | | | | | | | | | | | |
| Euno sp. 1 ? | | | | | | | | | | | |
| Euno sp. 42 | | | | | | | | | | | |

# Diatom Counts

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno sp. 44 | | | | 0.01587 | | 0.01000 | | | 0.00125 | | |
| Euno sp. 45 | | | | 0.00198 | | | | | | | |
| Euno sp. 46 | | | | | | | | | | 0.00400 | |
| Euno arcus | | | | | | | | | | 0.00600 | |
| Euno bidentula var 1 | | | | | | | | | | | |
| Euno bidentula | | | | | | | | 0.00200 | 0.00125 | | |
| Euno bilun mucophila | | | | | 0.00200 | | | | | 0.03200 | |
| Euno bilunaris | | | 0.00600 | 0.00397 | | 0.01200 | | | | 0.01800 | |
| Euno curvata | | | | | | | | | | | |
| Euno denticulata | | | | | | | | | | | |
| Euno exigua | 0.00200 | | 0.00200 | 0.00198 | | 0.00400 | | 0.01000 | 0.00250 | 0.01000 | |
| Euno flexuosa | | | | | | 0.00200 | | | | 0.00200 | |
| Euno hemicyclus | | | | | | | | | | 0.01400 | |
| Euno implicata | | | | | | | | | | | |
| Euno incisa var 1 | | | | 0.00595 | | | | | | 0.00400 | |
| Euno incisa var 2 | | | | | | | | | | | |
| Euno incisa var 6 | | | | | | | | | | | |
| Euno incisa | | | | 0.00794 | | 0.00200 | | | 0.00125 | | |
| Euno intermedia | | | | | | | | | | | |
| Euno meisteri | | | | 0.01190 | | | | | | 0.00600 | |
| Euno microcephala | | | | | | | | | | | |
| Euno micr tridentata | | | | | | | | | | | |
| Euno minor | | | | 0.03571 | | 0.00800 | | | | | |
| Euno monodon | | | | | | | | | | | |
| Euno musci trident | | | | 0.00794 | | 0.00200 | | | | | |
| Euno naegelii | | | | | | | | | | 0.00200 | |
| Euno palud trinac | | | 0.00200 | | | | | | | | |
| Euno paludosa | | | | 0.01587 | | | | | | | |
| Euno pectinali minor | | | | | | | | | | | |
| Euno pectinalis | | | | | | | | | | | |
| Euno praerupta | | | | | | | | | | | |
| Euno quaternaria | | | | | | | | | | | |
| Euno rhomboidea | | | | | | 0.00400 | | 0.00200 | | 0.00600 | |

Diatom Counts

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno serra diadema | | | | | | | | | | | |
| Euno serra | | | | | | | | | | | |
| Euno spp. | | | 0.00600 | 0.00595 | | | 0.00400 | 0.00400 | 0.00125 | 0.00600 | |
| Euno subarcuatoides | | | | 0.01587 | | 0.01000 | | | 0.00375 | 0.03800 | |
| Euno sudetica | | | | 0.00397 | | | | | | | |
| Euno tenella | | | | | | 0.00200 | | | | | |
| Euno trinacria | | | | | | | 0.00200 | | | | |
| Euno vanheurckii | | | 0.00200 | 0.01190 | | | | | | | |
| Euno sp. 74 | | | | 0.02183 | | | | | | 0.00800 | |
| Frag sp. A Cascades | | | 0.04600 | | | 0.00400 | | | 0.01000 | 0.00400 | |
| Frag sp. B Cascades | | | | | | | | | | 0.03000 | |
| Frag sp. 11 | | | | | | | | | | | |
| Frag sp. 15 | | | | | | | | | | | |
| Frag sp. 17 | | | | | | | | | | | |
| Frag sp. 9 | | | | | | | | | | | |
| Frag arcus | | | | | | 0.00400 | | | | | |
| Frag bidens | | | | | | | | | | | |
| Frag brevistriata | 0.33400 | 0.00600 | | | 0.17400 | 0.01800 | | | | | 0.03333 |
| Frag capu rumpens | | 0.00800 | | | | | | | | | |
| Frag capucina | | | | | | | | | | | |
| Frag capu vaucheriae | | | | | | 0.00400 | | | | | |
| Frag constru binodis | | 0.01400 | | 0.00397 | | | | | | | |
| Frag construe pumila | | | | | | | | | | | |
| Frag construens | | 0.03000 | | | | | | | | | |
| Frag constru subsali | | | | | | | | | | | 0.00667 |
| Frag construe venter | | 0.26200 | | | | | | | | | |
| Frag crotonensis | | | | | | | | | | | 0.14667 |
| Frag constricta | | | | | | | | | | | |
| Frag exigua | 0.00200 | 0.00400 | | | | | | | 0.00125 | 0.00200 | |
| Frag fasciculata | 0.00400 | | | | | | | | | | |
| Frag lapponica | | | | | | | | | | | |
| Frag leptostau dubia | | 0.00200 | | | 0.01200 | | | | | | |
| Frag oldenburgiana | | | | | | | | | | | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Frag parasitica | | 0.00600 | | | 0.01200 | | | | | | |
| Frag pinn lancettula | | 0.00400 | 0.00400 | | | | | | | | |
| Frag pinnata | 0.01000 | 0.11000 | | | 0.22400 | | | | | | 0.06667 |
| Frag pseudoconstruen | 0.06800 | | | | | | | | | | |
| Frag spp. | | | | 0.00397 | | | | | | | |
| Frag vaucheriae | | | | | | | | | | | |
| Frag virescens | | | | | | | | | | | |
| Frag vires exi | | | | | | | | | | | |
| Frus rhom amphipleur | | | | | | | | | | | |
| Frus rhomboides CAF | | | | | | | | | | | |
| Frus rhom crassinerv | | 0.00200 | 0.00200 | 0.04960 | | 0.00800 | 0.00800 | 0.01600 | 0.00125 | 0.03000 | |
| Frus rhomboides | 0.00200 | 0.00200 | 0.03800 | | | 0.00600 | 0.01600 | 0.06600 | 0.00750 | 0.02000 | |
| Frus rhombo saxonica | | | | | | | | | | | |
| Gomp sp. A Cascades | 0.00200 | | | | | | | | | | |
| Gomp sp. 1 ? | | | | | | | | | | | |
| Gomp sp. 11 | | | | | | | | | | | |
| Gomp sp. 18 | | | | | | | | | | | |
| Gomp sp. 1 | | | | | | | | | | | |
| Gomp angustum | | | | | | 0.00400 | | | | | |
| Gomp angustatum | | | | | | | | 0.00400 | | 0.00200 | |
| Gomp consector | | | | | | | | | | | |
| Gomp gracile | 0.00200 | 0.00200 | | | 0.00200 | 0.00400 | | | 0.00500 | | |
| Gomp grovei lingulat | | | | | | | | | | | |
| Gomp olivcm mintsmum | | | | 0.00198 | | | | | | | |
| Gomp olivaceum | | | | | | | | | | | |
| Gomp parvulum | | | | | | 0.00200 | | | | 0.00400 | 0.00167 |
| Gomp puig aequatoria | | | | | | | | | | | |
| Gomp spp. | | | | | 0.00200 | 0.00400 | | | | | |
| Gomp subcl mexicanum | | | | | | | | | | | |
| Gomp tack brevistria | | | | | | | | | | | |
| Gomp turris | | | | | | | | | | | |
| Hann arcus | | | | | | | | | | | |
| Meri circulare | | | | 0.03968 | | | | | | | 0.00167 |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Melo sp. 1 ? | | | | | | | | | | | |
| Melo sp. 13 | | | | | | | | | | | |
| Melo sp. 4 | | | | | | | | | | | |
| Melo sp. 8 | | | | | | | | | | | |
| Navi sp. 1 Mt. Rain. | | | | | | | | | | | |
| Navi sp. A Cascades | | | | | | | | | | | |
| Navi sp. B Cascades | | | | | | | | | | | |
| Navi sp. C Cascades | | | | | | | | | | | |
| Navi sp. D Cascades | | | | | | | | | | | |
| Navi sp. E Cascades | | 0.00800 | | | 0.00600 | 0.00400 | | | | | |
| Navi sp. 1 ? | | | | | | | | | | | |
| Navi sp. 14 | | | | | | | | | | | |
| Navi sp. 1 | | | | | | | | | | | |
| Navi sp. 2 ? | | | | | | | | | | | |
| Navi sp. 20 | | | | | | | | | | | |
| Navi sp. 21 | | | | | | | | | | | |
| Navi sp. 24 | | 0.00200 | 0.00200 | | | | 0.02200 | 0.00200 | | | |
| Navi sp. 25 | | | | | | | | | | | |
| Navi sp. 3 ? | | | | | | | | | | | |
| Navi sp. 45 | | | | | | | | | | | |
| Navi sp. 47 | | | | | | | | | | | |
| Navi sp. 51 | | | | | | | | | | | |
| Navi sp. 52 | | | | | | | | | | | |
| Navi sp. 6 | | | | | | | | | | | |
| Navi sp. 74 | | | | | | | | | | | |
| Navi sp. 91 | | | | | | | | | | | |
| Navi aboensis | | | | | | 0.00200 | | | | | |
| Nav absoluta | | 0.00200 | | | | | | | | | |
| Navi acceptata | | | | | | | | | | | |
| Navi accomoda | | | | | | | | | | | |
| Navi angusta | | | | | | | | | | | |
| Navi arvensis | | 0.01000 | | | | | | | | | |
| Navi bacillum | | | | | 0.00600 | | | | | | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi bremensis | | | 0.00200 | | | | | | | 0.00200 | |
| Navi bryophila | | | | | | | | | | | |
| Navi cincta | | | | | | | | | | | |
| Navi cocconeiformis | | | | 0.00198 | | | | | | 0.00200 | |
| Navi cohnii | | | | | | 0.00200 | | | | | |
| Navi concentrica | | | | | | | | | | | |
| Navi crucicula | | | | | | 0.00200 | | | | | |
| Navi cryptocephala | | | | | 0.00200 | 0.00400 | 0.01000 | | | | |
| Navi cryptotenella | 0.00400 | | | | 0.00200 | | 0.00800 | | | | 0.00167 |
| Navi disjuncta | | | | | | | | | | | |
| Navi elginensis | | | | | | | | | | | |
| Navi gallica | | | | | | | | | | | |
| Navi harderii | | | | | | | | | | | |
| Navi jaernefeldti | | 0.00600 | | | | | | | | | |
| Navi laevissima | 0.00200 | | | | 0.01400 | | | | | | |
| Navi leptostriata | 0.00400 | 0.01800 | 0.02600 | | | | 0.00800 | 0.03000 | 0.01625 | 0.00600 | |
| Navi libonensis | | | | | | | | | | | |
| Navi medioconvexa | | | | | 0.00600 | | | | | | |
| Navi mediocris | 0.00400 | 0.01600 | 0.02200 | 0.00794 | 0.00400 | 0.00800 | 0.00200 | 0.02200 | 0.00500 | 0.02400 | |
| Navi mediopunctata | | | | | | | | | | | |
| Navi menisculus | | | | | 0.00400 | | | | | | |
| Navi minima | | 0.01600 | | | 0.02000 | | 0.00400 | | | | |
| Navi minuscula v. A | | | | | | | | | | | |
| Navi modica | | 0.01600 | | | | | | | | | |
| Navi mutica | | | | | | | | | | | |
| Navi pelliculosa | | | | | | | | | | | |
| Navi placenta | | | | | | | | | | | |
| Nav porifera | | | | | | | | | | | |
| Navi pseudomuralis | | | | | | | | | | | |
| Navi pseudoscutiform | 0.00200 | 0.00600 | | 0.00595 | 0.00200 | | | | | | |
| Navi pseudoventralis | | | | | | | | | | | |
| Navi pupul elliptica | | | | | | | | | | | |
| Navi pup rectangular | | | | | | 0.00200 | | | | | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi pupula | | 0.01400 | | | 0.01400 | | | | | | |
| Navi radiosa | 0.00200 | | | | 0.00600 | | 0.00400 | | | 0.00400 | |
| Navi radiosa parva | 0.00200 | 0.00200 | | | | | 0.01200 | | | | |
| Navi rhynchocephala | | | | | 0.00400 | | | | | | 0.00167 |
| Navi seminuloides | | 0.05400 | | | | | 0.00800 | 0.00800 | | 0.00400 | |
| Navi seminulum | 0.01600 | 0.02600 | | | 0.00600 | 0.00600 | | | | | |
| Navi spp. | | 0.00400 | | | | 0.00400 | | 0.00400 | | | 0.00500 |
| Navi cf subtil var 2 | | | | | | | | | | | |
| Navi cf subtil var 4 | | | | | | | | | | | |
| Navi cf subtil var 5 | | | | | | | | 0.00400 | | | |
| Navi subatomoides | 0.02200 | 0.01400 | | 0.00198 | 0.00400 | 0.00400 | | | | | |
| Navi subhyalina | | | | | | | | | | | |
| Navi submuralis | 0.02400 | 0.00800 | 0.00800 | | 0.00600 | 0.00600 | 0.00400 | | | | |
| Navi subplacentula | | | | | | | | | | | |
| Navi subrotundata | | | 0.00200 | | | | | | | | |
| Navi subtilissima | | | 0.00200 | | | 0.00200 | | | 0.00500 | 0.01800 | 0.00167 |
| Navi tenuicephala | | 0.04000 | 0.04800 | 0.00992 | 0.05600 | | 0.01800 | 0.04600 | 0.00375 | 0.03800 | |
| Navi tridentula | 0.00400 | | | | | | | | | | |
| Navi trivialis | | | | | | | | | | | |
| Nav veneta | | | | | | | 0.00400 | | | | |
| Navi viridula | | | | | 0.01800 | | | | | | |
| Navi vitabunda | 0.01000 | | | | 0.01200 | 0.00200 | | | | | 0.00167 |
| Neid sp. 13 | | | | | | | | | | | |
| Neid sp. 4 | | | | | | | | | | | |
| Neid affine | | | | | | | 0.00400 | 0.00400 | 0.00250 | 0.01200 | |
| Neid affin longiceps | | | | | | 0.00800 | | 0.00400 | | | |
| Neid alpinum | | | 0.01000 | 0.00595 | | 0.00400 | 0.00800 | 0.00400 | | 0.00600 | |
| Neid alp quadripunct | | | | | | | | | | | |
| Neid bisu baicalense | | 0.00200 | | | | | 0.00600 | | | | |
| Neid bisulcatum | | | | 0.00198 | | | 0.00200 | | | 0.00200 | |
| Neid hercyn f subros | | | | | | | | | | | |
| Neid iridi ampliatum | 0.00200 | | | 0.00595 | | | | | | 0.00200 | |
| Neid ir amphigomphus | | | | 0.00198 | | | 0.00200 | | 0.00125 | 0.00200 | |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Neid iridis | | 0.00600 | | | | | | | | | |
| Neid spp. | 0.00200 | | | | | | | | | | |
| Nitz sp. A Cascades | | | | | | | | | | | |
| Nitz sp. 1 ? | | | | | | | | | | | |
| Nitz sp. 12 | | | | | | | | | | | |
| Nitz sp. 14 | | | | | | | | | | | |
| Nitz sp. 15 | | | | | | | | | | | |
| Nitz sp. 16 | | | | | | | | | | | |
| Nitz sp. 17 | | | | | | | | | | | |
| Nitz sp. 26 | | | | | | | | | | | |
| Nitz sp. 34 | | | | | | | | | | | |
| Nitz sp. 35 | | | | | | | | | | | |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz sp. 37 | | | | | | | | | | | |
| Nitz sp. 38 | | | | | | | | | | | |
| Nitz alpina | | | | | | | | | | | |
| Nitz amphibia | | | | | | | | | | | |
| Nitz bacillariaeform | | | | | | | | | | | |
| Nitz bruophila | | | | | | | | | | | |
| Nitz capitellata | | | | | | | | | | | |
| Nitz dissipata | | | | | | | | | | | |
| Nitz dissip undulata | | | | | | | | | | | |
| Nitz fonticola | 0.00400 | | | | | 0.00600 | 0.01000 | 0.00400 | 0.00250 | | 0.01500 |
| Nitz fossilis | | | | | | | | | | | |
| Nitz frustulum var 3 | | | | | | | | | | | |
| Nitz frustulum var 8 | | | | | | | | | | | |
| Nitz gracilis | | | 0.02800 | 0.00397 | 0.02400 | | 0.01400 | 0.01400 | | | |
| Nitz gracilliformis | | | | | | | | | | | |
| Nitz inconspicua | | | | | | | | | | | 0.00167 |
| Nitz lacuum | 0.00200 | | 0.00800 | | 0.00600 | | 0.00200 | | | | |
| Nitz leistikowii | | | | | | | | | | | |
| Nitz modesta | | | | | | | | | | | |
| Nitz palea debilis | 0.01000 | | | | | | 0.01800 | 0.00200 | | | 0.00333 |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Nitz palea | | 0.00600 | | | 0.00200 | 0.00200 | 0.00600 | | | | 0.00333 |
| Nitz paleaeformis | 0.00600 | 0.00200 | | | | | | | | | 0.00167 |
| Nitz perminuta | 0.00600 | 0.00600 | | | | | | | | | |
| Nitz recta | 0.00200 | | | | | | | | | | |
| Nitz spp. | 0.00400 | | | | | | | | | | |
| Nitz tropica | | | | | | | | | | | |
| Nitz vermicularis | | 0.00800 | | | | | 0.00800 | | | | |
| Opep sp. 1 | | | | | | | | | | | |
| Opep martyi | | | | | | | | | | | |
| Opep olsenii | | 0.01200 | | | | | | | | | |
| Pero fibula | | | | 0.00198 | | | | | | | |
| Pinn sp. A Cascades | | | | | | | | | | | |
| Pinn sp. B Cascades | | | | | | | | | | | |
| Pinn sp. C Cascades | | | | | | | | | | | |
| Pinn sp. D Cascades | | | | | | | | | | | |
| Pinn sp. 24 | | | | | | | | | | | |
| Pinn sp. 25 | | | | | | | | | | | |
| Pinn sp. 28 | | | | | | | | | | | |
| Pinn sp. 2 PIRLA | | 0.02600 | | | | | | | | | |
| Pinn sp. 30 | | | | | | | | | | | |
| Pinn sp. 32 | | | | | | | | | | | |
| Pinn sp. 36 | | | | | | | | | | | |
| Pinn sp. 46 | | | | | | | | | | | |
| Pinn abaujensi var 2 | | | | | | | | | | | |
| Pinn abaujensis | | | | | | | | | | | |
| Pinn biceps | 0.01000 | 0.02000 | 0.02000 | 0.08929 | | | 0.00200 | | | 0.02600 | |
| Pinn borealis rectan | | | | | | | | | | | |
| Pinn braunii | | | 0.07600 | 0.03968 | | | 0.09200 | 0.06000 | | | |
| Pinn brebissonii | | | | | | | | | | | |
| Pinn divergentissima | | | | 0.00198 | | | | | | 0.00400 | |
| Pinn gibba | | | | | | | | | 0.00250 | | |
| Pinn gibba mesogong | | | | | | | | | | | |
| Pinn hemiptera | | | | | | | | | | | |

Diatom Counts

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Pinn maior | | 0.00200 | | 0.00198 | | | | 0.00800 | 0.00125 | | |
| Pinn micros brebiss | | | | | | | 0.02400 | | | | |
| Pinn microstauron | | 0.00800 | 0.00800 | 0.00397 | | 0.01000 | 0.02200 | 0.01400 | 0.00250 | 0.01000 | |
| Pinn nodosa | | | | | | | | | | | |
| Pinn obscura | | | | | | | | | | | |
| Pinn rupestris | | | | | | | | | | | |
| Pinn spp. | | | 0.00400 | | | | | | 0.00125 | 0.00400 | 0.00167 |
| Pinn subcapitata | 0.00400 | | | | | | 0.00200 | | | | |
| Pinn substomatophora | | | | | | | | | | | |
| Pinn sudetica | | | | | | | | | | | |
| Pinn termitina | | | | | | | | | | | |
| Pinn viridis | | | | | | | | | | | |
| Unkn penn 1 | | | | | | | | | | | |
| Unkn penn 2 | | | | | | | | | | | |
| Unkn penn 3 | | | | | | | | | | | |
| Unkn penn 5 | | | | | | | | | | | |
| Unkn pennate spp. | | | | | | | | | | | |
| Rhiz eriensis | | | | | | | | | | | |
| Rhoi curvata | | | | | | | | | | 0.00400 | |
| Rhop gibberula | | | | | | | | | | | |
| Sten intermedia | 0.00400 | | | 0.00198 | | 0.00200 | 0.00200 | 0.00600 | | 0.00600 | |
| Stau anceps | 0.00200 | 0.00200 | | | | | | | | | |
| Stau anceps gracilis | 0.01000 | 0.00400 | | | | 0.00800 | 0.03400 | | | 0.01400 | |
| Stau kriegeri | | 0.00400 | | | | | | | | | |
| Stau livingstonii | | | | | | | | | | | |
| Stau phoenicenteron | | 0.00200 | | | | | | 0.00200 | 0.00125 | | |
| Stau phoeni gracilis | | | | | | 0.00200 | | | | | |
| Stau smithii incisa | | 0.00400 | | | | | | | | | |
| Stau spp. | | | | | | | | | | | |
| Stau truncata | | | | | | | | | | | |
| Step hantzschii | | | | | | | | | | | 0.01167 |
| Step medius | | | | | | | | | | | 0.18667 |
| Step minutus | | | | | | | | | | | 0.02500 |

| Long name | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.16071 | | 0.00400 | | | | 0.01000 | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Step niagarae | | | | | | | | | | | |
| Step parvus | | | | | | | 0.00200 | | | | 0.02667 |
| Suri sp. A Cascades | | 0.00200 | | | | | | | | | |
| Suri sp. B Cascades | | | 0.00600 | 0.00198 | | 0.00400 | 0.00200 | | | 0.00600 | |
| Suri sp. 1 ? | | | | | | | | | | | |
| Suri sp. 3 | | | | | | | | | | | |
| Suri sp. 6 | | | | | | | | | | | |
| Suri angusta | | | | | | | | | | | |
| Suri delicatis var 1 | | | 0.00400 | 0.00198 | | 0.00400 | 0.00800 | | | | |
| Suri delicatissima | 0.00400 | 0.00200 | 0.01000 | 0.00198 | | 0.00200 | 0.02200 | 0.02400 | 0.00250 | 0.00600 | |
| Suri linear constric | 0.00200 | | | | | | | 0.00200 | | 0.00200 | |
| Suri linearis | | | | | | | | | | | |
| Suri splendida | | | | | | | | | | | |
| Suri spp. | | | | | | | | | | | |
| Syne sp. 1 | | | | | | | | | | | |
| Syne sp. 8 | | | | | | | | | | | |
| Syne cyclopum | | | | | | | | | | | 0.00667 |
| Syne delicatissima | | | | | | 0.00600 | | | | | |
| Syne filiform exilis | | 0.00200 | | | | 0.00400 | | | | | 0.00167 |
| Syne parasitica | | | | | | | | | | | |
| Syne ulna | | | | | | | | | | | |
| Tabe binalis | | | | | | | | 0.00800 | | 0.00400 | |
| Tabe fenestrata | | 0.00200 | 0.00200 | | | | | | | | |
| Tabe flocculosa | | | | | | 0.00400 | | | | 0.00200 | |
| Tabe flocculosa str4 | | | | | | | | | | | |

## Diatom Counts

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn sp. 13 | | | | | | | | | | | |
| Achn sp. 14 | | | | | | | | | | | |
| Achn sp. 16 | | | | | | | | | | | |
| Achn sp. 19 | | | | | | | | | | | |
| Achn sp 2 Mt. Rain. | | | | | | | | | | | |
| Achn acares | | | | | | | | | | | |
| Achn altaica | | | | | | | | | | | |
| Achn austriaca | | | | | | | | | | | |
| Achn bioreti | | 0.00984 | 0.05364 | 0.00376 | 0.00396 | 0.00392 | 0.01500 | | | | |
| Achn calcar | | | | | | | | | | | |
| Achn chlidanos | | | | | | | | | | | |
| Achn clevei | | | | | | | | | | | |
| Achn curtissima | | | | | | | | | | | |
| Achn daui alaskaensi | | | | | | | | | | | |
| Achn detha | | | | | | | | | | | |
| Achn didyma | | | | | | | | | | | |
| Achn exigua | 0.00200 | | | | | | | | | | |
| Achn flexella | | | | | | | | | | | |
| Achn grana | | | | | | | | | | | |
| Achn grischuna | | | | | | | | | | | |
| Achn helvetica | | | | | | | | | | | |
| Achn holstii | | | | | | | | | | | |
| Achn hungarica | | | | | | | | | | | |
| Achn kuelbsii | | | | | | | | | | | |
| Achn lanceolata | | | | | | | | | | | |
| Achn lanceolat dubia | | | | | | | | | | | |
| Achn lan ssp. frequ | | | | | | | | | | | |
| Achn laterostrata | | | | | | | | | | | |
| Achn levanderi | | | | | | | | | | | |
| Achn levan helvetica | | | | | | | | | | | |
| Achn linearis curta | | | | | | | | | | | |
| Achn linearis | | | | | | | | | | | |
| Achn marginulata | | 0.09449 | 0.09195 | 0.19737 | 0.08119 | 0.07059 | 0.05167 | 0.03901 | 0.01822 | 0.06958 | 0.01992 |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Achn minutissima | | | | | | | | | | | |
| Achn nodosa | | | | | | | | | | | |
| Achn pusilla | | | | | | | | | | | |
| Achn spp. | | | | | | | | | | | |
| Achn subatomoides | | | | | | | | | | | |
| Achn suchlandti | | | | | | | | | | | |
| Amph sp. A Cascades | | | | | | | | | | | |
| Amph libyca | | | | | | | | | | | |
| Amph ovalis | 0.00400 | | | | | | | | | | |
| Amph ovali pediculus | | | | | | | | | | | |
| Amph perpusilla | 0.00600 | | | | | | | | | | |
| Anom brachysira | | | | | 0.00198 | | | | | 0.00994 | 0.01594 |
| Anom serians | | | | | | | | | | | |
| Anom vitrea | | | | | | | | | | | |
| Aste formosa | 0.09800 | | | | | | | | | | |
| Aste ralfsii | | | | | | | | | | | |
| Aula sp. A Cascades | | | | | | | | | | | |
| Aula sp. B Cascades | | | 0.00766 | 0.02256 | 0.00990 | 0.00196 | 0.07833 | 0.00532 | 0.01822 | | 0.11753 |
| Aula sp. C Cascades | | 0.00197 | | | | | | | | | 0.00398 |
| Aula sp. D Cascades | | 0.00394 | | 0.00940 | 0.00396 | 0.01176 | 0.01667 | | 0.01215 | 0.04175 | 0.05976 |
| Aula ambigua | | | | | | | | | | | |
| Aulo distans humilis | | | | | | | | | | | |
| Aulo distans nivalis | | | | | | | | | | | |
| Aulo dist nivaloides | | | | | | | | | | | |
| Aula distans | | 0.48228 | 0.26437 | 0.32519 | 0.22376 | 0.43529 | 0.57667 | 0.12943 | 0.31579 | 0.48509 | 0.33466 |
| Aulo distans tenella | | | | | | | | | | | |
| Aula granulata | 0.00200 | | | | | | | | | | |
| Aula italica | 0.01600 | | | | | | | | | | |
| Aulo italica subarct | | | | | | | | | | | |
| Aulo itali tenu | | | | | | | | | | | |
| Aulo lirata | | | | | | | | | | | |
| Aula perglabra | | | | | | | | | | | |
| Aula pfaffiana | | | 0.02107 | | | | 0.01500 | | | 0.00994 | 0.06574 |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Aula species | | | | | | | | | | | |
| Aula valida | | | | | | | | | | | |
| Calo bacillum | | | | | | | | | | | |
| Calo hyalina | | | | | | | | | | | |
| Calo silicula | | | | | | | | | | | |
| Calo tenuis | | | | | | | | | | | |
| Cocc placentula | | | | | | | | | | | |
| Cocc placen euglypta | 0.00600 | | | | | | | | | | |
| Chae sp. 1? | | | | | | | | | | | |
| Cymb sp. A Cascades | | 0.00984 | 0.01149 | 0.01504 | 0.06139 | 0.05490 | 0.00667 | 0.06738 | 0.05668 | 0.03976 | 0.01594 |
| Cymb sp. B Cascades | | | | | | | | | | | |
| Cymb sp. 1 ? | | | | | | | | | | | |
| Cymb sp. 18 | | | | | | | | | | | |
| Cymb sp. 2 ? | | | | | | | | | | | |
| Cymb sp. 20 | | | | | | | | | | | |
| Cymb sp. 21 | | | | | | | | | | | |
| Cymb sp. 6 | | | | | | | | | | | |
| Cymb sp. 7 | | | | | | | | | | | |
| Cymb aequalis | | 0.01181 | | 0.00376 | | | | | | 0.00596 | 0.01195 |
| Cymb amphicephala | | | | 0.00188 | | | | | | 0.00199 | |
| Cymb brehmii | | | | 0.00564 | 0.01386 | 0.00392 | 0.00167 | 0.00355 | 0.01417 | 0.00596 | 0.00398 |
| Cymb caespitosa | | | | | | | | | | | |
| Cymb cesatii | | 0.00197 | | | 0.00792 | | | | | | 0.00398 |
| Cymb cistula | | | | | | | | | | | |
| Cymb descripta | | | | | 0.00990 | | | | | | |
| Cymb elginensis | | | | | | | | | | | |
| Cymb falaisensis | | 0.05512 | 0.07663 | 0.01316 | 0.01782 | 0.02157 | 0.06000 | 0.01950 | 0.00810 | 0.01193 | 0.01793 |
| Cymb gaeumannii | | | | | | | | | | | |
| Cymb hauckii | | | | | | | | | | | |
| Cymb hebridica | | 0.00197 | | | 0.00594 | | 0.00167 | 0.01241 | 0.00202 | 0.00398 | 0.00199 |
| Cymb heter subrostra | | | | | | | | | | | |
| Cymb inaequalis | | | | | | | | | | | |
| Cymb lunata | | | | | 0.01386 | | | | | | 0.02191 |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Cymb mesiana | | | | | | | | | | | |
| Cymb mexicana | | | | | | | | | | | |
| Cymb microcephala | | | | | | | | | | | |
| Cymb minuta latens | | | | | | | | | | | |
| Cymb minut silesiaca | | | | | | | | | | | |
| Cymb minuta | | | | | | | | | | | |
| Cymb muelleri | 0.00200 | | | | | | | | | | |
| Cymb naviculiformis | | | | | | | | | | | |
| Cymb perpusilla | | | | | | | | | | 0.01988 | 0.02191 |
| Cymb sinuata | | | | | | | | | | | |
| Cymb spp. | | | | | | | | | | | |
| Cyma solea | | | | | | | | | | | |
| Cycl sp. 1 | | | | | | | | | | | |
| Cycl bod lemanica | | | | | | | | | | | |
| Cycl kuetzin radiosa | | | | | | | | | | | |
| Cycl ocellata | | | | | | | | | | | |
| Cycl pseudostelliger | | | | | | | | | | | |
| Cycl stelligera | 0.00400 | | | | | | | | | | |
| Diat anceps | | | | | | | | | | | |
| Diat hiemale | | | | | | | | | | | |
| Diat mesodon | | | | | | | | | | | |
| Diat tenuis | | | | | | | | | | | |
| Dipl sp. 1 ? | | | | | | | | | | | |
| Dipl elliptica | | | | | | | | | | | |
| Dipl finnica | | | | | | | | | | | |
| Dipl marginestriata | | | | | | | | | | | |
| Dipl modica | | | | | | | | | | | |
| Epit adnata | | | | | | | | | | | |
| Epit sorex | 0.00200 | | | | | | | | | | |
| Epit turgida | | | | | | | | | | | |
| Epit turgida gracil | | | | | | | | | | | |
| Euno sp. 1 ? | | | | | | | | | | | |
| Euno sp. 42 | | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno sp. 44 | | | | | | | | | | | |
| Euno sp. 45 | | | | | | | | | | | |
| Euno sp. 46 | | | | | | | | | | | |
| Euno arcus | | | | | | | | | | | |
| Euno bidentula var 1 | | | | | | | | | | | |
| Euno bidentula | | | | | | | | | | | |
| Euno bilun mucophila | | | | | 0.00198 | | 0.00333 | 0.00355 | | | 0.00199 |
| Euno bilunaris | | | 0.00383 | 0.00376 | 0.00396 | | | | 0.00405 | 0.00199 | 0.00996 |
| Euno curvata | | | | | | | | | | | |
| Euno denticulata | | | | | | | | | | | |
| Euno exigua | | 0.00197 | 0.00575 | | 0.00198 | 0.00196 | 0.00167 | 0.00709 | 0.00202 | | 0.00199 |
| Euno flexuosa | | | | | | | | | | | |
| Euno hemicyclus | | | | | | | | | | | |
| Euno implicata | | | | | | | | | | | 0.01195 |
| Euno incisa var 1 | | | | 0.01880 | 0.00594 | | 0.00500 | | | | |
| Euno incisa var 2 | | | | | | | | | | | |
| Euno incisa var 6 | | | | | | | | | | | |
| Euno incisa | | | | | | | | | | | 0.00398 |
| Euno intermedia | | | | | | | | | | | |
| Euno meisteri | | | | | | | | | | | |
| Euno microcephala | | | | | | | | | | | |
| Euno micr tridentata | | | | | | | | | | | |
| Euno minor | | | | | | | | | | | |
| Euno monodon | | | | | | | | | | | |
| Euno musci trident | | | | | | | | | | | |
| Euno naegelii | | | | | | | | | | | 0.00598 |
| Euno palud trinac | | 0.01969 | 0.00766 | | | | 0.01167 | 0.00532 | | | 0.01195 |
| Euno paludosa | | | | | | | | | | | |
| Euno pectinali minor | | | | | | | | | | | |
| Euno pectinalis | | | | | | | | | | | 0.00199 |
| Euno praerupta | | | 0.00192 | | | | | | | | |
| Euno quaternaria | | | | | | | | | | | |
| Euno rhomboidea | | | 0.00383 | 0.00188 | 0.00198 | 0.00196 | 0.00167 | | | 0.00398 | |

## Diatom Counts

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Euno serra diadema | | | | | | | | | | | |
| Euno serra | | | | | | | | | | | |
| Euno spp. | | | | | 0.00198 | | | | | | |
| Euno subarcuatoides | | | | | | | | | | | |
| Euno sudetica | | | | | | | | | | | |
| Euno tenella | | | | | | | | | | | |
| Euno trinacria | | | | | | | | | | | |
| Euno vanheurckii | | | | | | | | | | | |
| Euno sp. 74 | | | | | | | | | | | |
| Frag sp. A Cascades | | | | | | | | | | 0.00795 | |
| Frag sp. B Cascades | | | | | | | | | | | |
| Frag sp. 11 | | | | | | | | | | | |
| Frag sp. 15 | | | | | | | | | | | |
| Frag sp. 17 | | | | | | | | | | | |
| Frag sp. 9 | | | | | | | | | | | |
| Frag arcus | | | | | | | | | | | |
| Frag bidens | | | | | | | | | | | |
| Frag brevistriata | 0.15200 | | | 0.00188 | | | | | | | |
| Frag capu rumpens | | | | | | | | | | | |
| Frag capucina | | | | | | | | | | | |
| Frag capu vaucheriae | 0.00600 | | | | | | | | | | |
| Frag constru binodis | | | | | | | | | | | |
| Frag construe pumila | | | | | | | | | | | |
| Frag construens | 0.00800 | | | | | | | | | | |
| Frag constru subsali | 0.02400 | | | | | | | | | | |
| Frag construe venter | 0.03600 | | | | | | | | | | |
| Frag crotonensis | 0.34400 | | | | | | | | | | |
| Frag constricta | | | | | | | | | | | |
| Frag exigua | | | | | | | | | | | |
| Frag fasciculata | | | | | | | | | | | |
| Frag lapponica | | | | | | | | | | | |
| Frag leptostau dubia | | | | | | | | | | | |
| Frag oldenburgiana | | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Frag parasitica | | | | | | | | | | | |
| Frag pinn lancettula | | | | | | | | | | | |
| Frag pinnata | 0.15200 | | | | | | | | | | |
| Frag pseudoconstruen | | | | | | | | | | | |
| Frag spp. | | | | | | | | | | | |
| Frag vaucheriae | | | | | | | | | | | |
| Frag virescens | | | | | | | | | | | |
| Frag vires exi | | | | | | | | | | | |
| Frus rhom amphipleur | | | | | | | | | | | 0.00797 |
| Frus rhomboides CAF | | | | | | | | | | | |
| Frus rhom crassinerv | | 0.01181 | 0.00383 | | | 0.00196 | 0.00667 | | | | 0.00797 |
| Frus rhomboides | | 0.00197 | | 0.01128 | | 0.00196 | 0.00167 | | | 0.02584 | 0.00797 |
| Frus rhombo saxonica | | | | | | | | | | | |
| Gomp sp. A Cascades | | | | | | | | | | | |
| Gomp sp. 1 ? | | | | | | | | | | | |
| Gomp sp. 11 | | | | | | | | | | | |
| Gomp sp. 18 | | | | | | | | | | | |
| Gomp sp. 1 | | | | | | | | | | | |
| Gomp angustum | | | | | | | | | | | |
| Gomp angustatum | | | | | | | | | | | |
| Gomp consector | | | | | | | | | | | |
| Gomp gracile | | | | | 0.00198 | 0.00196 | | | | | |
| Gomp grovei lingulat | | | | | | | | | | | |
| Gomp olivcm mintsmum | | | | | | | | | | | |
| Gomp olivaceum | | | | | | | | | | | |
| Gomp parvulum | | | | 0.00940 | | | | | | | |
| Gomp puig aequatoria | | | | | | | | | | | |
| Gomp spp. | | | | | | | | | | | |
| Gomp subcl mexicanum | | | | | | | | | | | |
| Gomp tack brevistria | | | | | | | | | | | |
| Gomp turris | | | | | | | | | | | |
| Hann arcus | | | | | | | | | | | |
| Meri circulare | | | | | | | | | | | |

# Diatom Counts

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Melo sp. 1 ? | | | | | | | | | | | |
| Melo sp. 13 | | | | | | | | | | | |
| Melo sp. 4 | | | | | | | | | | | |
| Melo sp. 8 | | | | | | | | | | | |
| Navi sp. 1 Mt. Rain. | | | | | | | | | | | |
| Navi sp. A Cascades | | | | | | | | | | | |
| Navi sp. B Cascades | | | | | | | | | | | |
| Navi sp. C Cascades | | | | | | | | | | | |
| Navi sp. D Cascades | | | | | | | | | | | |
| Navi sp. E Cascades | | | | | | | | | | | |
| Navi sp. 1 ? | | | | | | | | | | | |
| Navi sp. 14 | | | | | | | | | | | |
| Navi sp. 1 | | | | | | | | | | | |
| Navi sp. 2 ? | | | | | | | | | | | |
| Navi sp. 20 | | | | | | | | | | | |
| Navi sp. 21 | | | | | | | | | | | |
| Navi sp. 24 | | 0.05315 | 0.01724 | 0.02632 | 0.00792 | 0.00196 | 0.01500 | 0.11170 | 0.00607 | 0.01193 | |
| Navi sp. 25 | | | | | | | | | | | |
| Navi sp. 3 ? | | | | | | | | | | | |
| Navi sp. 45 | | | | | | | | | | | |
| Navi sp. 47 | | | | | | | | | | | |
| Navi sp. 51 | | | | | | | | | | | |
| Navi sp. 52 | | | | | | | | | | | |
| Navi sp. 6 | | | | | | | | | | | |
| Navi sp. 74 | | | | | | | | | | | |
| Navi sp. 91 | | | | | | | | | | | |
| Navi aboensis | | | | | | | | | | | |
| Nav absoluta | | | | | | | | | | | |
| Navi acceptata | | | | | | | | | | | |
| Navi accomoda | | | | | | | | | | | |
| Navi angusta | | | | | | | | | | | |
| Navi arvensis | | | | | | | | | | | |
| Navi bacillum | | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi bremensis | | | | | | | | | | | |
| Navi bryophila | | | | | | | | | | | |
| Navi cincta | | | | | | | | | | | |
| Navi cocconeiformis | | | | | | | | | | | |
| Navi cohnii | | | | | | | | | | | |
| Navi concentrica | | | | | | | | | | | |
| Navi crucicula | | | | | | | | | | | |
| Navi cryptocephala | | | | | | | | 0.00709 | 0.00405 | | 0.00797 |
| Navi cryptotenella | 0.00200 | | | | | | | | | | |
| Navi disjuncta | | | | | | | | | | | |
| Navi elginensis | | | | | | | | | | | |
| Navi gallica | | | | | | | | | | | |
| Navi harderii | 0.00600 | | | | | | | | | | |
| Navi jaernefeldti | | | | | | | | | | | |
| Navi laevissima | 0.00200 | | | | | | | | | | |
| Navi leptostriata | | | | 0.00188 | | | 0.00833 | | 0.01822 | 0.01392 | 0.02590 |
| Navi libonensis | | | | | | | | | | | |
| Navi medioconvexa | | | | | | | | | | | |
| Navi mediocris | | 0.00394 | 0.00192 | 0.00376 | 0.00396 | | 0.00333 | 0.00177 | 0.00202 | 0.00199 | 0.01793 |
| Navi mediopunctata | | | | | | | | | | | |
| Navi menisculus | | | | | | | | | | | |
| Navi minima | | | | | | | | | | | |
| Navi minuscula v. A | | | | | | | | | 0.00202 | | |
| Navi modica | | | | | | | | | | | |
| Navi mutica | | | | | | | | | | | |
| Navi pelliculosa | | | | | | | | | | | |
| Navi placenta | | | | | | | | | | | |
| Nav porifera | | | | | | | | | | | |
| Navi pseudomuralis | | | | | | | | | | | |
| Navi pseudoscutiform | | | | | | | | | | | |
| Navi pseudoventralis | | | | | | | | | | | |
| Navi pupul elliptica | | | | | | | | | | | |
| Navi pup rectangular | | | | | | | | | | | |

# Diatom Counts

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Navi pupula | 0.00200 | | | | | | | | | | |
| Navi radiosa | | | | | | | | | | | |
| Navi radiosa parva | | | | | | | | | | | |
| Navi rhynchocephala | | | | | | | | | | | |
| Navi seminuloides | 0.01200 | | | | | | | | | | |
| Navi seminulum | | | | | | | | | | | |
| Navi spp. | | | | | | 0.00196 | | | | | |
| Navi cf subtil var 2 | | | | | | | | | | | |
| Navi cf subtil var 4 | | | | | | | | | | | |
| Navi cf subtil var 5 | | | | | | | | | | | |
| Navi subatomoides | | | | | | | | | | | |
| Navi subhyalina | | | | | | | | | | | |
| Navi submuralis | 0.00800 | | | | | | | | 0.00405 | | |
| Navi subplacentula | | | | | | | | | | | |
| Navi subrotundata | | | | | | | | | | | |
| Navi subtilissima | | 0.00197 | 0.00958 | 0.00188 | 0.00198 | 0.00784 | 0.00500 | 0.01418 | 0.01417 | 0.01193 | 0.00398 |
| Navi tenuicephala | | 0.13780 | 0.40038 | 0.26692 | 0.47327 | 0.32353 | 0.07667 | 0.32447 | 0.43725 | 0.11730 | 0.06972 |
| Navi tridentula | | | | | | | | | | | |
| Navi trivialis | | | | | | | | | | | |
| Nav veneta | 0.00400 | | | | | | | | | | |
| Navi viridula | | | | | | | | | | | |
| Navi vitabunda | | | | | | | | | | | |
| Neid sp. 13 | | | | | | | | | | | |
| Neid sp. 4 | | | | | | | | | | | |
| Neid affine | | | | | | | | | | | |
| Neid affin longiceps | | | | | | | | | | | |
| Neid alpinum | | | | | | 0.01765 | 0.01000 | | | 0.00795 | |
| Neid alp quadripunct | | | | | | | | | | | |
| Neid bisu baicalense | | | | | | | | | | | |
| Neid bisulcatum | | | | | | | | | | | |
| Neid hercyn f subros | | | | | | | | | | | |
| Neid iridi ampliatum | | 0.00394 | 0.00383 | 0.00376 | 0.00594 | | 0.00167 | 0.01241 | 0.00202 | | 0.00598 |
| Neid ir amphigomphus | | | | | | | | | | | |

# Diatom Counts

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Neid iridis | | | | | | | | | | 0.00398 | |
| Neid spp. | | | | | | | | | | | |
| Nitz sp. A Cascades | | | | | | | | | | | |
| Nitz sp. 1 ? | | | | | | | | | | | |
| Nitz sp. 12 | | | | | | | | | | | |
| Nitz sp. 14 | | | | | | | | | | | |
| Nitz sp. 15 | | | | | | | | | | | |
| Nitz sp. 16 | | | | | | | | | | | |
| Nitz sp. 17 | | | | | | | | | | | |
| Nitz sp. 26 | | | | | | | | | | | |
| Nitz sp. 34 | | | | | | | | | | | |
| Nitz sp. 35 | | | | | | | | | | | |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz sp. 37 | | | | | | | | | | | |
| Nitz sp. 38 | | | | | | | | | | | |
| Nitz alpina | 0.00200 | | | | | | | | | | |
| Nitz amphibia | | | | | | | | | | | |
| Nitz bacillariaeform | | | | | | | | | | | |
| Nitz bruophila | | | | | | | | | | | |
| Nitz capitellata | | | | | | | | | | | |
| Nitz dissipata | | | | | | | | | | | |
| Nitz dissip undulata | | | | | | | | | | | |
| Nitz fonticola | 0.00400 | | | | | | | | | | |
| Nitz fossilis | 0.01000 | | | | | | | | | | |
| Nitz frustulum var 3 | | | | | | | | | | | |
| Nitz frustulum var 8 | | | | | | | | | | | |
| Nitz gracilis | 0.00200 | | | | | | | 0.06028 | | 0.00199 | 0.00996 |
| Nitz gracilliformis | | | | | | | | | | | |
| Nitz inconspicua | 0.00400 | | | | | | | | | | |
| Nitz lacuum | | | | | | | | | | | |
| Nitz leistikowii | 0.00200 | | | | | | | | | | |
| Nitz modesta | | | | | | | | | | | |
| Nitz palea debilis | 0.00400 | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Nitz palea | | | | | | | | | | | |
| Nitz paleaeformis | 0.00200 | | | | | | | | | | |
| Nitz perminuta | | | | | | | | | | 0.00199 | 0.00996 |
| Nitz recta | | | | | | | | | | | |
| Nitz spp. | | | | | | | | | | | |
| Nitz tropica | | | | | | | | | | | |
| Nitz vermicularis | | | | | | | | | | | |
| Opep sp. 1 | | | | | | | | | | | |
| Opep martyi | | | | | | | | | | | |
| Opep olsenii | | | | | | | | | | | |
| Pero fibula | | | | | | | | | | | |
| Pinn sp. A Cascades | | | | | | | | | | | |
| Pinn sp. B Cascades | | | | | | | | | | | |
| Pinn sp. C Cascades | | | | | | | | | | | |
| Pinn sp. D Cascades | | | | | | | | | | | |
| Pinn sp. 24 | | | | | | | | | | | |
| Pinn sp. 25 | | | | | | | | | | | |
| Pinn sp. 28 | | | | | | | | | | | |
| Pinn sp. 2 PIRLA | | | | | | | | | | | |
| Pinn sp. 30 | | | | | | | | | | | |
| Pinn sp. 32 | | | | | | | | | | | |
| Pinn sp. 36 | | | | | | | | | | | |
| Pinn sp. 46 | | | | | | | | | | | |
| Pinn abaujensi var 2 | | | | | | | | | | | |
| Pinn abaujensis | | | | | | | | | | | |
| Pinn biceps | | 0.07283 | | 0.01316 | 0.02970 | 0.00980 | 0.02167 | 0.13830 | 0.02632 | 0.03777 | 0.02590 |
| Pinn borealis rectan | | | | | | 0.00196 | | | | | |
| Pinn braunii | | | | | | | | | 0.00405 | | |
| Pinn brebissonii | | | | | | | | | | | |
| Pinn divergentissima | | | | | | | | | | | |
| Pinn gibba | | 0.00197 | 0.00192 | 0.00376 | | | | 0.00177 | | | 0.00199 |
| Pinn gibba mesogong | | 0.00591 | | | | | | | | | 0.00199 |
| Pinn hemiptera | | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Pinn maior | | | | | | | | | | | |
| Pinn micros brebiss | | | 0.00192 | | | | | | | 0.00795 | 0.00598 |
| Pinn microstauron | 0.00400 | 0.00984 | | 0.02820 | 0.00198 | 0.01176 | 0.00167 | 0.01950 | 0.02024 | 0.00398 | |
| Pinn nodosa | | | | | | | | | | | |
| Pinn obscura | | | | | | | 0.00167 | | | | |
| Pinn rupestris | | | | | | | | | | | |
| Pinn spp. | | | 0.00192 | | | 0.00196 | | 0.00177 | | | |
| Pinn subcapitata | | | | | | | | | | | |
| Pinn substomatophora | | | | | | | | | | | |
| Pinn sudetica | | | | | | | | | | | |
| Pinn termitina | | | | | | | | | | | |
| Pinn viridis | | | | | | | | | | | |
| Unkn penn 1 | | | | | | | | | | | |
| Unkn penn 2 | | | | | | | | | | | |
| Unkn penn 3 | | | | | | | | | | | |
| Unkn penn 5 | | | | | | | | | | | |
| Unkn pennate spp. | | | | | | | | | | | |
| Rhiz eriensis | | | | | | | | | | | |
| Rhoi curvata | | | | | | | | | | | |
| Rhop gibberula | | | | | | | | | | | |
| Sten intermedia | | | | | | | | | | | |
| Stau anceps | | | | | | | | | | | |
| Stau anceps gracilis | | | | | | | | 0.00532 | | | 0.00199 |
| Stau kriegeri | | | | | | | | | | | |
| Stau livingstonii | | | | | | | | | | | |
| Stau phoenicenteron | | | | | | | | | | | |
| Stau phoeni gracilis | | | | | | | | | | | |
| Stau smithii incisa | | | | | | | | | | | |
| Stau spp. | | | 0.00192 | | | | | | | | |
| Stau truncata | | | | | | | | | | | |
| Step hantzschii | 0.00400 | | | | | | | | | | |
| Step medius | 0.02200 | | | | | | | | | | |
| Step minutus | 0.02200 | | | | | | | | | | |

| Long name | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn sp. 12 | | | | | | | | | | | |
| Step niagarae | 0.00800 | | | | | | | | | | |
| Step parvus | 0.00400 | | | | | | | | | | |
| Suri sp. A Cascades | | | | | | | | | | | |
| Suri sp. B Cascades | | | | | | | | | | | |
| Suri sp. 1 ? | | | | | | | | | | | |
| Suri sp. 3 | | | | | | | | | | | |
| Suri sp. 6 | | | | | | | | | | | |
| Suri angusta | | | | | | | | | | | |
| Suri delicatis var 1 | | | | | | | | | 0.00810 | | |
| Suri delicatissima | | | 0.00575 | 0.00564 | | 0.00784 | | 0.00887 | | 0.02982 | 0.01992 |
| Suri linear constric | | | | | | | | | | | |
| Suri linearis | | | | | | | | | | | |
| Suri splendida | | | | | | | | | | 0.00199 | |
| Suri spp. | | | | | | | | | | | |
| Syne sp. 1 | | | | | | | | | | | |
| Syne sp. 8 | | | | | | | | | | | |
| Syne cyclopum | | | | | | | | | | | |
| Syne delicatissima | | | | | | | | | | | |
| Syne filiform exilis | | | | | | | | | | | |
| Syne parasitica | | | | | | | | | | | |
| Syne ulna | 0.00600 | | | | | | | | | | |
| Tabe binalis | | | | | | | | | | | |
| Tabe fenestrata | | | | | | | | | | | |
| Tabe flocculosa | | | | | | | | | | | |
| Tabe flocculosa str4 | | | | | | | | | | | |

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Achn sp. 13 | | | | | | | | | | | |
| Achn sp. 14 | | | | 0.02329 | | | | | | | |
| Achn sp. 16 | | | | | | | | 0.00155 | | | |
| Achn sp. 19 | | | | 0.00466 | | | | | | 0.00730 | |
| Achn sp 2 Mt. Rain. | | | | | | | | | | 0.01168 | |
| Achn acares | | | | | | | | | | | |
| Achn altaica | | | | | | | | | | | |
| Achn austriaca | | | | 0.00311 | | 0.00606 | | | 0.00366 | 0.00146 | |
| Achn bioreti | | | | 0.00311 | | | 0.00805 | | | 0.00438 | |
| Achn calcar | | | | | | | | | | | |
| Achn chlidanos | | | | | | | | | | | |
| Achn clevei | | | | | | | | | | | |
| Achn curtissima | | | | | | | | | | | |
| Achn daui alaskaensi | | | | 0.01398 | | | | | | | |
| Achn detha | | | | 0.01398 | | 0.00909 | | 0.02171 | | 0.04818 | |
| Achn didyma | | | | 0.01398 | | | | 0.00155 | | | |
| Achn exigua | | | | | | | | | | | |
| Achn flexella | | | | 0.00311 | | | | | | | |
| Achn grana | | | | | | | | | | | |
| Achn grischuna | | | | | | | | | | | |
| Achn helvetica | | | | | 0.00181 | | 0.02576 | 0.01395 | 0.01648 | 0.00876 | |
| Achn holstii | | | | | | | | | | | |
| Achn hungarica | | | | | | | | | | | 0.00194 |
| Achn kuelbsii | | | | | | | | | | | |
| Achn lanceolata | | | | | | | | | | | |
| Achn lanceolat dubia | | | 0.00151 | | | 0.00606 | | | | | |
| Achn lan ssp. frequ | | | | | | | | | | | |
| Achn laterostrata | | | | 0.00776 | | | | | | | |
| Achn levanderi | | | | 0.00155 | | | | 0.00775 | | | |
| Achn levan helvetica | | | | 0.04037 | | 0.02121 | 0.00644 | | | | |
| Achn linearis curta | | | | | | | | | | | |
| Achn linearis | | | | | | 0.00152 | | | | | |
| Achn marginulata | 0.00980 | 0.05545 | 0.00151 | 0.00932 | 0.02351 | 0.05000 | 0.16264 | 0.01240 | 0.08791 | 0.05255 | 0.28155 |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Achn minutissima | | | 0.03177 | 0.01242 | | 0.00152 | | 0.01860 | | 0.01314 | 0.01359 |
| Achn nodosa | | | | | | | | | | | |
| Achn pusilla | | | 0.01059 | 0.08385 | | | | 0.00620 | | 0.00146 | |
| Achn spp. | | | | | | | | | | | |
| Achn subatomoides | | | | | | | | | | | |
| Achn suchlandti | | | | 0.06211 | | 0.00303 | | | | | |
| Amph sp. A Cascades | | | | | | | | | | | |
| Amph libyca | | | | | | | | | | | |
| Amph ovalis | | | 0.00151 | | | | | | | | |
| Amph ovali pediculus | | | | | | | | 0.00310 | | | |
| Amph perpusilla | | | | | | | | | | | |
| Anom brachysira | 0.00392 | | | 0.00155 | | 0.00758 | 0.01449 | 0.00155 | 0.02198 | 0.00146 | |
| Anom serians | | | | | | | | | | | |
| Anom vitrea | | | 0.00151 | 0.00155 | | 0.00303 | | | 0.00366 | | 0.00388 |
| Aste formosa | | | | | | | | | | | |
| Aste ralfsii | | | | | | | | | | | |
| Aula sp. A Cascades | | | | | | | | | | | |
| Aula sp. B Cascades | 0.37647 | 0.00198 | | | | | | | | | |
| Aula sp. C Cascades | 0.00784 | | | | | | | | | | |
| Aula sp. D Cascades | 0.07255 | 0.00198 | | | | | | | | | |
| Aula ambigua | | | | | | | | | | | |
| Aulo distans humilis | | | | | | 0.00455 | | | | | |
| Aulo distans nivalis | | | | | | 0.04242 | 0.00805 | | 0.03663 | 0.01168 | |
| Aulo dist nivaloides | | | | | | | | | | | |
| Aula distans | 0.19020 | 0.28713 | | 0.01863 | 0.00362 | | | 0.00155 | | | 0.20777 |
| Aulo distans tenella | | | | 0.00311 | | 0.11061 | 0.06441 | | 0.02198 | 0.01314 | |
| Aula granulata | | | | | | | | | | | |
| Aula italica | | | | | | 0.00303 | 0.01610 | | | | |
| Aulo italica subarct | | | 0.00151 | | | | 0.01610 | | | | |
| Aulo itali tenu | | | | | | | | | | | |
| Aulo lirata | | | | | | | | | | | |
| Aula perglabra | | | | | | | | | | | |
| Aula pfaffiana | 0.07255 | | | | | | | | | | |

Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Aula species | | | | | | | | | | | |
| Aula valida | | | | | | | | | | | |
| Calo bacillum | | | | | | | | | | | |
| Calo hyalina | | | | | | | | | | | |
| Calo silicula | | | | | | | | | | | |
| Calo tenuis | | | | | | | | | | | |
| Cocc placentula | | | | | | | | | | | |
| Cocc placen euglypta | | | | | | | | | | | |
| Chae sp. 1? | | | | | | 0.00152 | | | | | |
| Cymb sp. A Cascades | 0.00784 | 0.05743 | | | | | | | | | |
| Cymb sp. B Cascades | | | | | | | | | | | |
| Cymb sp. 1 ? | | | | | | | | 0.00155 | | | |
| Cymb sp. 18 | | | | | 0.00362 | 0.00303 | 0.01932 | | 0.03480 | 0.00292 | |
| Cymb sp. 2 ? | | | | | | | | | | | |
| Cymb sp. 20 | | | | | 0.28029 | | | | | | |
| Cymb sp. 21 | | | | | | | | 0.00155 | | | |
| Cymb sp. 6 | | | | | | | | | | | |
| Cymb sp. 7 | | | | | | | | | | | |
| Cymb aequalis | 0.01373 | | | | | | | 0.00155 | | | |
| Cymb amphicephala | 0.00196 | | | | | | | | | | 0.08932 |
| Cymb brehmii | | | | | | | | | | | |
| Cymb caespitosa | | | | | | | | | | | |
| Cymb cesatii | | | | | | | | 0.00310 | | | |
| Cymb cistula | | | | | | | | 0.00465 | | | |
| Cymb descripta | | | | | | | | | | | |
| Cymb elginensis | | | | | | | | | | | |
| Cymb falaisensis | 0.00980 | 0.02178 | | | | | | | | | |
| Cymb gaeumannii | | | | 0.00155 | | 0.00303 | 0.01288 | 0.00620 | 0.08608 | 0.00146 | |
| Cymb hauckii | | | | | | | | | | | |
| Cymb hebridica | 0.00392 | 0.00990 | | | 0.01266 | 0.00909 | | | | | |
| Cymb heter subrostra | | | | | | 0.00152 | | | | | |
| Cymb inaequalis | | | | | | | 0.00483 | | 0.00183 | | |
| Cymb lunata | 0.00392 | | | | | 0.01818 | 0.00483 | 0.01550 | 0.05861 | | 0.00194 |

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Cymb mesiana | | | | | | | | | | | |
| Cymb mexicana | | | | | | | | | | | |
| Cymb microcephala | | | | | | 0.00152 | 0.00161 | 0.02016 | | | |
| Cymb minuta latens | | | | | | | 0.00322 | | | | |
| Cymb minut silesiaca | | | | 0.00621 | | | 0.00966 | | | 0.00438 | |
| Cymb minuta | | | | 0.01863 | | 0.01667 | 0.01449 | 0.13023 | 0.01099 | 0.02190 | |
| Cymb muelleri | | | | | | | | | | | |
| Cymb naviculiformis | | | | | | | | | | | |
| Cymb perpusilla | 0.00196 | | | | | | | | | | |
| Cymb sinuata | | | | | | | | | | | |
| Cymb spp. | | | | | | | | | | | |
| Cyma solea | | | | | | | | | | | |
| Cycl sp. 1 | | | | | | | | | | | |
| Cycl bod lemanica | | | | | | | | | | | |
| Cycl kuetzin radiosa | | | 0.01210 | | | | | | | | |
| Cycl ocellata | | | | | | | | | | | |
| Cycl pseudostelliger | | | 0.40242 | | | | | | | | |
| Cycl stelligera | | | 0.47050 | 0.13043 | | | | 0.00310 | | | |
| Diat anceps | | | | | | | | | | | |
| Diat hiemale | | | | | | 0.00152 | | | | | |
| Diat mesodon | | | | | | 0.00606 | | | | 0.00146 | |
| Diat tenuis | | | | | | | | | | | |
| Dipl sp. 1 ? | | | | | | | | | | | |
| Dipl elliptica | | | | | | | | | | | |
| Dipl finnica | | | | | | | | | | | |
| Dipl marginestriata | | | | 0.00155 | | | | | | | |
| Dipl modica | | | | | | | | | | | |
| Epit adnata | | | | | | | | | | | |
| Epit sorex | | | | | | | | | | | |
| Epit turgida | | | | | | | | | | | |
| Epit turgida gracil | | | | | | | | | | | |
| Euno sp. 1 ? | | | | 0.00155 | | | | | | | |
| Euno sp. 42 | | | | | | | | | | | |

Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Euno sp. 44 | | | | | | | | | | | |
| Euno sp. 45 | | | | | | | | | | | |
| Euno sp. 46 | | | | | | | | | | | |
| Euno arcus | | | | | | | | | | | |
| Euno bidentula var 1 | | | | | | | | | 0.00183 | | |
| Euno bidentula | | | | | | | 0.00161 | | | | |
| Euno bilun mucophila | | | | | | | | | | | |
| Euno bilunaris | 0.00196 | | | | | | | | | | 0.00194 |
| Euno curvata | | | | | | 0.01212 | | | 0.00183 | 0.00292 | |
| Euno denticulata | | | | | | | | | 0.00183 | | |
| Euno exigua | 0.00392 | 0.00396 | | | | 0.00152 | | | | | 0.00583 |
| Euno flexuosa | | | | | | | | | | | |
| Euno hemicyclus | | | | | | | | | | | |
| Euno implicata | 0.00392 | | | | | | | | | | 0.00583 |
| Euno incisa var 1 | | | | | | | | | | | |
| Euno incisa var 2 | | | | | | | | | | 0.00146 | |
| Euno incisa var 6 | | | | | | | | | | 0.00146 | |
| Euno incisa | | | | | | 0.00303 | | | | | |
| Euno intermedia | | | | | | 0.01212 | | | | 0.00292 | |
| Euno meisteri | | | | | | | | | | | |
| Euno microcephala | | | | | | 0.00152 | | | | | |
| Euno micr tridentata | | | | | | 0.00152 | | | | | |
| Euno minor | | | | | | | | | | | |
| Euno monodon | | | | | | | | | | | |
| Euno musci trident | | | | | | | | | | | |
| Euno naegelii | | | | | | 0.00152 | | | | 0.00146 | |
| Euno palud trinac | 0.00784 | 0.00594 | | | | | | | | | |
| Euno paludosa | | | | | | | | | | | |
| Euno pectinali minor | | | | | | 0.00909 | 0.00161 | | | | 0.04466 |
| Euno pectinalis | | | | | | | | 0.00155 | | | |
| Euno praerupta | | | | | | | | | | | |
| Euno quaternaria | | | | | | 0.00152 | | | | | |
| Euno rhomboidea | | | | | | | | | | 0.00146 | 0.04272 |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Euno serra diadema | | | 0.00151 | | | | | | | | |
| Euno serra | | | | | | | | | | | |
| Euno spp. | | | | | | | | | | | |
| Euno subarcuatoides | | 0.00198 | | | | | | | | | |
| Euno sudetica | | | | | | | | | | | 0.01553 |
| Euno tenella | | | 0.00151 | 0.00311 | | 0.01667 | | 0.00155 | 0.00183 | 0.00292 | |
| Euno trinacria | | | | | | | | | | | |
| Euno vanheurckii | | | | | | | | | | | |
| Euno sp. 74 | | | | | | | | | | | |
| Frag sp. A Cascades | | | | | | | | | | | |
| Frag sp. B Cascades | | | | | | | | | | | |
| Frag sp. 11 | | | | | | 0.01818 | | 0.02171 | | 0.00146 | |
| Frag sp. 15 | | | | 0.17702 | | | | 0.01550 | | 0.00146 | |
| Frag sp. 17 | | | | | | | | 0.02946 | | | |
| Frag sp. 9 | | | | 0.00466 | | | | 0.13023 | | | |
| Frag arcus | | | | | | | | | | | |
| Frag bidens | | | | | | | | | | | |
| Frag brevistriata | | | | | | | | | | | |
| Frag capu rumpens | | | | | | | | | | | |
| Frag capucina | | | | | | | | | | | |
| Frag capu vaucheriae | | | | | | | | | | | |
| Frag constru binodis | | | | | | | | | | | |
| Frag construe pumila | | | 0.00303 | 0.02484 | | | | | | | |
| Frag construens | | | | | | | | | | | |
| Frag constru subsali | | | | | | | | | | | |
| Frag construe venter | | | 0.00908 | 0.00466 | | 0.00909 | | 0.13488 | | 0.03504 | |
| Frag crotonensis | | | | | | | | | | | |
| Frag constricta | | | | | | 0.00303 | | | | | |
| Frag exigua | | | | | | | | | | | |
| Frag fasciculata | | | | | | | | | | | |
| Frag lapponica | | | | | | | | 0.00620 | | | |
| Frag leptostau dubia | | | | | | 0.01970 | | | | | |
| Frag oldenburgiana | | | | | | | | | | | |

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Frag parasitica | | | | | | | | | | | |
| Frag pinn lancettula | | | | | | | | | | | |
| Frag pinnata | | | 0.01059 | 0.00466 | 0.00181 | 0.05606 | | | | | |
| Frag pseudoconstruen | | | | | | | | | | | |
| Frag spp. | | | | | | | | | | | |
| Frag vaucheriae | | | 0.00605 | | | 0.00152 | | 0.00155 | | 0.00292 | |
| Frag virescens | | | | | | | | | | | |
| Frag vires exi | | | | 0.00311 | | 0.00455 | | 0.00310 | | 0.00438 | |
| Frus rhom amphipleur | 0.00392 | | | | | | | | | | |
| Frus rhomboides CAF | | | | | | | | | | | |
| Frus rhom crassinerv | | | | | | | | 0.00155 | | | |
| Frus rhomboides | 0.00196 | | | | 0.00362 | 0.00758 | | 0.00465 | 0.01282 | 0.00146 | 0.00388 |
| Frus rhombo saxonica | | | | | 0.03797 | 0.00303 | 0.00483 | | 0.01832 | | |
| Gomp sp. A Cascades | | | | | | | | | | | |
| Gomp sp. 1 ? | | | | 0.00155 | | | | | | | |
| Gomp sp. 11 | | | | | | 0.00455 | | | | | |
| Gomp sp. 18 | | | | | | | | | | 0.01898 | |
| Gomp sp. 1 | | | | | | | | | | | |
| Gomp angustum | | | | | | | | | | | |
| Gomp angustatum | | | 0.00454 | 0.00621 | | 0.00455 | 0.01449 | 0.01085 | 0.00366 | 0.00292 | |
| Gomp consector | | | | | | 0.00606 | 0.00322 | | | 0.00584 | |
| Gomp gracile | | | | | | 0.00303 | | | | | |
| Gomp grovei lingulat | | | | | | | | | | | |
| Gomp olivcm mintsmum | | | | | | | | | | | |
| Gomp olivaceum | | | | | | | | | | | |
| Gomp parvulum | | | | | | | | | | | 0.00388 |
| Gomp puig aequatoria | | | | | | | | | | | |
| Gomp spp. | | | | | | | | | | | |
| Gomp subcl mexicanum | | | | | | | | | | | |
| Gomp tack brevistria | | | | | | | | | | 0.00146 | |
| Gomp turris | | | | | | | | | | | |
| Hann arcus | | | 0.00908 | | | | | | | 0.00292 | |
| Meri circulare | | | | | | | | | | 0.01022 | |

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Melo sp. 1 ? | | | | | | 0.00303 | | | | | |
| Melo sp. 13 | | | | | | 0.00455 | 0.01288 | | | 0.04380 | |
| Melo sp. 4 | | | | | | 0.08939 | 0.06924 | 0.00155 | 0.05128 | 0.12117 | |
| Melo sp. 8 | | | 0.00908 | 0.01398 | | 0.04848 | 0.22383 | 0.00155 | 0.09341 | 0.22482 | |
| Navi sp. 1 Mt. Rain. | | | 0.00151 | | | | | | 0.00183 | 0.00730 | |
| Navi sp. A Cascades | | | | | | | | | | | |
| Navi sp. B Cascades | | | | | | | | | | | |
| Navi sp. C Cascades | | | | | | | | | | | |
| Navi sp. D Cascades | | | | | | | | | | | |
| Navi sp. E Cascades | | | | | | | | | | | |
| Navi sp. 1 ? | | | 0.00303 | 0.00155 | | 0.00303 | | | 0.00183 | | |
| Navi sp. 14 | | | | 0.00155 | | | | | | 0.00584 | |
| Navi sp. 1 | | | | | | 0.00152 | | | | | |
| Navi sp. 2 ? | | | | 0.00311 | | 0.00152 | | | | | |
| Navi sp. 20 | | | | | | 0.00152 | | | 0.00366 | 0.01606 | |
| Navi sp. 21 | | | | | | 0.00152 | | | | | |
| Navi sp. 24 | | 0.00396 | | | | | | | | | |
| Navi sp. 25 | | | 0.00151 | 0.00621 | | 0.00606 | 0.00322 | | 0.00183 | 0.00876 | |
| Navi sp. 3 ? | | | | 0.00155 | | | | | | | |
| Navi sp. 45 | | | | | | 0.00303 | 0.02415 | | 0.00366 | 0.00584 | |
| Navi sp. 47 | | | | 0.01087 | | 0.00152 | | 0.00155 | | | |
| Navi sp. 51 | | | | | | 0.00303 | | | | 0.00146 | |
| Navi sp. 52 | | | | | | 0.00303 | | | | | |
| Navi sp. 6 | | | | | | | | | | | |
| Navi sp. 74 | | | | | | | | | | | |
| Navi sp. 91 | | | | | | | | | 0.02198 | | |
| Navi aboensis | | | | | | | | | | | |
| Nav absoluta | | | | | | | | | | | |
| Navi acceptata | | | | | | | | | | | |
| Navi accomoda | | | | | | | | | | | 0.00583 |
| Navi angusta | | | | | | 0.00152 | 0.01127 | | 0.00549 | | |
| Navi arvensis | | 0.00198 | | | | | | | | | |
| Navi bacillum | | | | | | | | | | | |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Navi bremensis | | | | | | | | | | | |
| Navi bryophila | | | | | | | | | | | |
| Navi cincta | | | | | | | | | | | |
| Navi cocconeiformis | | | | | | | | | | | |
| Navi cohnii | | | | | | | | | | | |
| Navi concentrica | | | | | | | | | | | |
| Navi crucicula | | | | | | | | | | | |
| Navi cryptocephala | | | | | | 0.00303 | | | | | |
| Navi cryptotenella | | | | 0.01242 | 0.00362 | 0.01061 | 0.00966 | 0.01085 | 0.02381 | | |
| Navi disjuncta | | | | | | 0.00455 | | | | | |
| Navi elginensis | | | | | | | | | | | |
| Navi gallica | | | | | | | | | | 0.00146 | |
| Navi harderii | | | | | | | | | | | |
| Navi jaernefeldti | | | | | | | | | | | |
| Navi laevissima | | | | | 0.00362 | | | | 0.00549 | | |
| Navi leptostriata | 0.00588 | | | | | | | | | | |
| Navi libonensis | | | | | | | | | | | |
| Navi medioconvexa | | | | | | | | | | | |
| Navi mediocris | 0.00196 | | | | 0.00181 | 0.00152 | | | 0.01465 | | |
| Navi mediopunctata | | | | 0.03571 | | | | | | | |
| Navi menisculus | | | | | | | | | | | |
| Navi minima | | | | | | | | | | | |
| Navi minuscula v. A | | | | | | | | | | | |
| Navi modica | | | | | | | | | | | |
| Navi mutica | | | | | | | | 0.00155 | 0.00183 | | 0.00194 |
| Navi pelliculosa | | | | | | | | | | | |
| Navi placenta | | | | 0.00311 | | | | | | | |
| Nav porifera | | | | | | | | | | | |
| Navi pseudomuralis | | | | | | | | | | | |
| Navi pseudoscutiform | | | | | | 0.00303 | | | | 0.00292 | |
| Navi pseudoventralis | | | | | | | | | | | |
| Navi pupul elliptica | | | | | | 0.06515 | | | | | |
| Navi pup rectangular | | | | | | | | | | | |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Navi pupula | | | | | | | 0.00161 | 0.00155 | | 0.00438 | |
| Navi radiosa | | | | 0.00776 | | 0.00303 | | 0.01860 | | | |
| Navi radiosa parva | | | | | | 0.00303 | | 0.01240 | 0.00549 | | |
| Navi rhynchocephala | | | | | | | | | | | |
| Navi seminuloides | | | | | | | | | | | |
| Navi seminulum | | | | | | | | | | | |
| Navi spp. | | | | | | | | | | | |
| Navi cf subtil var 2 | | | | | | 0.00758 | | | | | |
| Navi cf subtil var 4 | | | | | | 0.00152 | | | | | |
| Navi cf subtil var 5 | | | | | | | | | | | |
| Navi subatomoides | | | | | | | | | | | |
| Navi subhyalina | | | | | | | | | | | 0.06602 |
| Navi submuralis | | | | | | | | | | | |
| Navi subplacentula | | | | | | | | | | | |
| Navi subrotundata | | | | | | | | | | | |
| Navi subtilissima | | 0.01188 | | | 0.08318 | | 0.00161 | | | | |
| Navi tenuicephala | 0.10000 | 0.49109 | | | 0.36528 | 0.01212 | 0.00322 | | 0.03114 | 0.00292 | 0.14175 |
| Navi tridentula | | | | | | 0.00152 | | | | 0.00292 | |
| Navi trivialis | | | | | | | | | | | |
| Nav veneta | | | | | | | | | | | |
| Navi viridula | | | | | | | | | | | |
| Navi vitabunda | | | | | | | | | | | |
| Neid sp. 13 | | | | | | | | 0.00155 | | | |
| Neid sp. 4 | | | | | | | | | 0.01099 | 0.00438 | |
| Neid affine | | | | | 0.00723 | 0.00606 | | | 0.03480 | | 0.00194 |
| Neid affin longiceps | | | | 0.00155 | | | | | | | |
| Neid alpinum | | | | | | | | | | | |
| Neid alp quadripunct | | | 0.00151 | | | | | | | | |
| Neid bisu baicalense | | | | | | | | | | | |
| Neid bisulcatum | 0.00196 | | | | | 0.00303 | 0.00483 | | | 0.00146 | |
| Neid hercyn f subros | | | | | | | | | | | |
| Neid iridi ampliatum | | 0.00594 | | | | | | | | | |
| Neid ir amphigomphus | | | | | | 0.01364 | | | | | |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Neid iridis | 0.00196 | | | | 0.00362 | 0.00303 | | | 0.00183 | | |
| Neid spp. | | | | | | | | | | | |
| Nitz sp. A Cascades | | | | | | | | | | | |
| Nitz sp. 1 ? | | | | | | 0.00303 | | | | | |
| Nitz sp. 12 | | | | 0.00776 | | | | | | | |
| Nitz sp. 14 | | | | 0.00155 | | 0.00152 | | | | | |
| Nitz sp. 15 | | | | 0.00311 | | 0.01667 | | | 0.00733 | 0.00730 | |
| Nitz sp. 16 | | | 0.00151 | 0.00621 | | | | | | | |
| Nitz sp. 17 | | | | | | | | 0.00155 | | | |
| Nitz sp. 26 | | | 0.00151 | 0.00466 | | | | | | | |
| Nitz sp. 34 | | | | | | | | 0.01395 | | | |
| Nitz sp. 35 | | | | | | | | 0.00155 | | | |
| Nitz sp. 36 | | | | | | | | 0.14729 | | | |
| Nitz sp. 37 | | | | 0.00155 | | 0.00303 | 0.00161 | 0.00310 | | 0.00146 | |
| Nitz sp. 38 | | | | | | 0.00152 | | | | | |
| Nitz alpina | | | | | | | | | | | |
| Nitz amphibia | | | | | | | | | | | |
| Nitz bacillariaeform | | | | | | | | | | | |
| Nitz bruophila | | | | | | | | | | | |
| Nitz capitellata | | | | | | | | | | | |
| Nitz dissipata | | | | 0.01553 | | | | | | | |
| Nitz dissip undulata | | | | 0.00311 | | 0.00152 | | | | 0.00438 | |
| Nitz fonticola | | | | | | | | | | | |
| Nitz fossilis | | | | | | | | | | | |
| Nitz frustulum var 3 | | | | | | 0.02727 | 0.00322 | 0.10388 | 0.02747 | | |
| Nitz frustulum var 8 | | | | 0.00466 | | | | | | | |
| Nitz gracilis | 0.00392 | | | | | | | | | | |
| Nitz gracilliformis | | | | | | | | | | | |
| Nitz inconspicua | | | | | | | | | | | |
| Nitz lacuum | | | | | | | | | | | |
| Nitz leistikowii | | | | | | | | | | | |
| Nitz modesta | | | | | | | | | | | |
| Nitz palea debilis | | | | | | | | | | | |

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Nitz palea | | | | | | | | | | | |
| Nitz paleaeformis | | | | | | | | | | | |
| Nitz perminuta | 0.05098 | | | | | | | | | | |
| Nitz recta | | | | | | | | | | | |
| Nitz spp. | | | | | | | | | | | |
| Nitz tropica | | | | | | | | | | | |
| Nitz vermicularis | | | | | | | | | | | |
| Opep sp. 1 | | | | | | | | 0.01085 | | | |
| Opep martyi | | | | | | | | | | | |
| Opep olsenii | | | | | | | | | | | |
| Pero fibula | | | | | | | | | | | |
| Pinn sp. A Cascades | | | | | | | | | | | |
| Pinn sp. B Cascades | | | | | | | | | | | |
| Pinn sp. C Cascades | | | | | | | | | | | |
| Pinn sp. D Cascades | | | | | | | | | | | |
| Pinn sp. 24 | | | | | | | | 0.00155 | | | |
| Pinn sp. 25 | | | | | | | | | | | |
| Pinn sp. 28 | | | | 0.00155 | 0.01627 | 0.00606 | 0.14976 | | 0.06410 | 0.02920 | |
| Pinn sp. 2 PIRLA | | | | | | | | | | | |
| Pinn sp. 30 | | | | | | | | | 0.07143 | | |
| Pinn sp. 32 | | | | | | | | 0.00620 | | | |
| Pinn sp. 36 | | | | 0.00155 | | | | | | | |
| Pinn sp. 46 | | | | | 0.00181 | 0.00152 | | | 0.00183 | | |
| Pinn abaujensi var 2 | | | | | | 0.02576 | | | 0.00183 | 0.00292 | |
| Pinn abaujensis | | | | | 0.00904 | 0.00758 | | | 0.00366 | | |
| Pinn biceps | 0.01373 | 0.00792 | | | | | | | | | |
| Pinn borealis rectan | | | | | | | | | | | |
| Pinn braunii | | | | | 0.05063 | | | | | | 0.00388 |
| Pinn brebissonii | | | | | 0.06691 | | | | 0.01099 | | |
| Pinn divergentissima | | | | | | 0.00152 | | | 0.00183 | | |
| Pinn gibba | 0.00196 | | | | | | | | | | |
| Pinn gibba mesogong | 0.00392 | | | | | | | | | | |
| Pinn hemiptera | | | | | | | | | | | |

# Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Pinn maior | | | | | | | | | | | |
| Pinn micros brebiss | | | | | | | | | | | |
| Pinn microstauron | | 0.02376 | | | | | 0.00322 | | | | |
| Pinn nodosa | | | | | | | | | | | |
| Pinn obscura | | | | | | | | | | | |
| Pinn rupestris | | | | | | | | | 0.00733 | | |
| Pinn spp. | | | | | | | | | | | |
| Pinn subcapitata | | | | | | | | | | | 0.05243 |
| Pinn substomatophora | | | | | | | | | | | |
| Pinn sudetica | | | | | | | | | | | |
| Pinn termitina | | | | | | 0.00303 | | | 0.00183 | | |
| Pinn viridis | | | | | | | | | | | |
| Unkn penn 1 | | | | 0.00311 | 0.00181 | 0.00152 | 0.00161 | 0.00155 | 0.00366 | | |
| Unkn penn 2 | | | | 0.00311 | 0.00181 | 0.00303 | 0.00161 | 0.00155 | 0.01099 | | |
| Unkn penn 3 | | | | 0.00155 | 0.00181 | | | 0.00155 | 0.00183 | | |
| Unkn penn 5 | | | | | | | | | 0.00366 | | |
| Unkn pennate spp. | | | | 0.00311 | | | | 0.00155 | 0.00366 | | |
| Rhiz eriensis | | | | | | 0.00152 | | | | | |
| Rhoi curvata | | | | | | | | | | | |
| Rhop gibberula | | | | | | | | | | | |
| Sten intermedia | | | | | | 0.00152 | 0.00644 | 0.00155 | 0.00916 | | |
| Stau anceps | | | | | 0.00181 | | | | 0.00183 | 0.00146 | |
| Stau anceps gracilis | 0.00392 | | | 0.00311 | | 0.01364 | 0.03060 | | 0.00366 | 0.00438 | |
| Stau kriegeri | | | | | | | | | | | |
| Stau livingstonii | | | | | | | | | | 0.00146 | |
| Stau phoenicenteron | | | | | | | 0.00161 | | | | |
| Stau phoeni gracilis | | | | | | | | | | | |
| Stau smithii incisa | | | | | | | | | | | |
| Stau spp. | | | | | | | | | | | |
| Stau truncata | | | | | | | | 0.00155 | | | |
| Step hantzschii | | | | | | | | | | | |
| Step medius | | | | | | | | | | | |
| Step minutus | | | | | | | | | | | |

## Diatom Counts

| Long name | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 1 ? | | | | 0.00155 | | | | | | | |
| Achn sp. 11 | | | | 0.10248 | | 0.02727 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn sp. 12 | | | | 0.00932 | | | | | | | |
| Step niagarae | | | | | | | | | | | |
| Step parvus | | | | | | | | | | | |
| Suri sp. A Cascades | | | | | | | | | | | |
| Suri sp. B Cascades | | | | | | | | | | | |
| Suri sp. 1 ? | | | | | | | | | 0.00183 | | |
| Suri sp. 3 | | | | | | | | | | 0.00292 | |
| Suri sp. 6 | | | | | | | | | | | |
| Suri angusta | | | | | | | | | | | |
| Suri delicatis var 1 | | | | | 0.00181 | | | | | | |
| Suri delicatissima | 0.00980 | 0.00594 | | | 0.00904 | 0.00152 | 0.00161 | | 0.00916 | | 0.00194 |
| Suri linear constric | | | | | | | | | | | |
| Suri linearis | | | | 0.00621 | | | 0.00322 | | | 0.00292 | |
| Suri splendida | | | | | | | | | | | |
| Suri spp. | | | | | | | | | | | |
| Syne sp. 1 | | | | | | | | | | 0.00438 | |
| Syne sp. 8 | | | | | | | | | 0.00183 | | |
| Syne cyclopum | | | | | | | | | | | |
| Syne delicatissima | | | | | | | | | | | |
| Syne filiform exilis | | | | | | | | | | | |
| Syne parasitica | | | | | | | | | | 0.00146 | |
| Syne ulna | | | | | | | | | | | |
| Tabe binalis | | | | | | | | | | | |
| Tabe fenestrata | | | | | | | | | | | |
| Tabe flocculosa | | | | | | | | | | | |
| Tabe flocculosa str4 | | | | | | 0.00152 | | | | | |
| | | | | 0.00311 | | | | | | | |
| | | | | 0.00155 | | | | | | | |

# APPENDIX 2

## Compressed Diatom Taxa List Used in Ordination and Modeling for the Cascade Diatom Calibration Set

| TAXANAME | Long name | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AC0Arscs | Achn sp. A Cascades | | | | | | | | | | |
| AC11PRL | Achn sp. 11 | | | | | | | | | | |
| ACBIORET | Achn bioreti | | | | 0.03200 | 0.02400 | 0.00111 | | | | |
| ACCURTIS | Achn curtissima | | | | | | | | | | |
| ACdetha | Achn detha | | | | | | | | | | |
| ACLANCvs | Achn lanceolata vars | | | 0.00167 | | | | 0.00143 | | | 0.00200 |
| ACLINEvs | Achn linearis vars | | | | | | | 0.00143 | | | |
| ACMAR&LV | Achn margin & levand | 0.01400 | | | 0.01000 | 0.09400 | | | 0.01400 | 0.01636 | 0.00200 |
| ACMINUTI | Achn minutissima | 0.00200 | | | | | | | | 0.00234 | |
| ACpusill | Achn pusilla | | | | | | | | | | |
| ACSUBATO | Achn subatomoides | | | | | | | | | | |
| ACsuchla | Achn suchlandti | | | | | | | | | | |
| AMOVALIS | Amph ovalis | | 0.00400 | 0.00333 | | | | | | | 0.00600 |
| AMPERPUS | Amph perpusilla | | | | | | 0.01667 | 0.00429 | | | |
| ANBRACHY | Anom brachysira | | | | 0.04000 | 0.01400 | | | | 0.00350 | |
| ANVITREA | Anom vitrea | | | | 0.00200 | | | | | | |
| ASFORMOS | Aste formosa | | 0.04200 | 0.01667 | | | 0.06556 | 0.12714 | | | 0.00200 |
| AU0Arscs | Aula sp. A Cascades | 0.00400 | | | | | | | | | |
| AU0Brscs | Aula sp. B Cascades | | | | | | | | | | |
| AU0Crscs | Aula sp. C Cascades | | | | | | | | | | |
| AU0Drscs | Aula sp. D Cascades | | | | | | | | | | |
| AUAMBIGU | Aula ambigua | 0.02400 | | | | | | | | | 0.01800 |
| AUDISTvs | Aula distans vars | 0.00400 | | | 0.04000 | 0.16200 | | | 0.03600 | 0.00467 | |
| AUGRANUL | Aula granulata | | 0.02800 | 0.00583 | | | | | | | |
| AUITALvs | Aula italica vars | 0.01200 | | | | | 0.00111 | 0.00286 | | | 0.02600 |
| AUPFAFFI | Aula pfaffiana | | | | | | | | | | |
| CCPLACvs | Cocc placent vars | | 0.00600 | | | | 0.00111 | 0.01286 | | | 0.01800 |
| CM0Arscs | Cymb sp. A Cascades | | | | | | | | 0.11800 | | |
| CM18PRL | Cymb sp. 18 | | | | | | | | | | |
| CM20PRL | Cymb sp. 20 | | | | | | | | | | |
| CM6PRL | Cymb sp. 6 | | | | | | | | 0.16000 | 0.00234 | |
| CMAEQUAL | Cymb aequalis | | | | 0.02600 | 0.03200 | | | | 0.00467 | 0.00400 |
| CMAMPHIC | Cymb amphicephala | | | | | | | | | | |

| TAXANAME | Long name | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CMBREHMI | Cymb brehmii | | | | 0.06600 | 0.02800 | | | | | |
| CMFALAIS | Cymb falaisensis | | | | | | | | | | |
| CMGAEUMA | Cymb gaeumannii | | | | 0.11200 | 0.02800 | | | 0.00200 | 0.01752 | |
| CMHEBRID | Cymb hebridica | | | | 0.01200 | | | | 0.01800 | 0.00117 | |
| CMLUNATA | Cymb lunata | 0.00200 | | | 0.01400 | 0.00600 | | | | 0.01752 | |
| CMMINUTA | Cymb minuta | | 0.00200 | 0.00083 | | | | | | 0.00234 | |
| CMPERPUS | Cymb perpusilla | | | | | | | | | | |
| CYOCELLA | Cycl ocellata | | | | | | | | | | |
| CYpseste | Cycl pseudostelliger | | | | | | | | | | |
| CYSTELLI | Cycl stelligera | 0.11200 | | | | | | | | 0.80491 | 0.00200 |
| EUBILMUC | Euno bilun mucophila | | | | | | | | | 0.00234 | |
| EUBILUNA | Euno bilunaris | | | | 0.01600 | | | | 0.00200 | | 0.00200 |
| EUEXIGUA | Euno exigua | | | | 0.01400 | 0.02200 | | | | | |
| EUINCIvs | Euno incisa vars | | | | | | | | | | 0.00200 |
| EUMINOR | Euno minor | | | | 0.00400 | | | | | | |
| EUPALTRI | Euno palud trinac | | | | | | | | | | |
| EURHOMBO | Euno rhomboidea | | | | | | | | | | |
| EUSUBARC | Euno subarcuatoides | | | | 0.00600 | | | | | | |
| EUVANHvs | Euno vanheurck vars | | | | 0.00200 | | | | | | |
| FR0Arscs | Frag sp. A Cascades | | | | | | | | | | |
| FR11PRL | Frag sp. 11 | | | | | | | | | | |
| FR15PRL | Frag sp. 15 | | | | | | | | | | |
| FR9PRL | Frag sp. 9 | | | | | | | | | | |
| FRBREVIS | Frag brevistriata | 0.18000 | 0.07200 | 0.01000 | | | 0.21556 | 0.06286 | 0.00200 | 0.00117 | 0.12000 |
| FRCAPUvs | Frag capucina vars | | | | | | | 0.00286 | | 0.00117 | 0.01200 |
| FRCROTON | Frag crotonensis | | 0.09600 | 0.00667 | | | 0.02222 | 0.11286 | | | |
| FRCSRNvs | Frag construens vars | 0.27800 | 0.17000 | 0.09500 | | | 0.00222 | 0.00571 | | | 0.23400 |
| FREXI&VR | Frag exigua & viresc | | | | | | | | | | 0.03400 |
| FRPINLAN | Frag pinn lancettula | 0.13400 | 0.13600 | 0.43000 | 0.00200 | | 0.04556 | 0.00857 | | | 0.02200 |
| FRPINNAT | Frag pinnata | 0.12600 | 0.18000 | 0.32500 | | | 0.01778 | 0.00429 | | | 0.16200 |
| FRPSECON | Frag pseudoconstruen | | 0.01400 | | | | | | | | |
| FSRHOCRA | Frus rhom crassinerv | | | | 0.02600 | 0.01600 | | | | | |
| FSRHOMBO | Frus rhomboides | | | | 0.07800 | 0.00600 | | | 0.04400 | 0.00584 | |

| TAXANAME | Long name | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GOangust | Gomp angustatum | | | | | | | | | | |
| GOGRACIL | Gomp gracile | | | | 0.01400 | | | | | 0.00701 | 0.00400 |
| ME13PRL | Melo sp. 13 | | | | | | | | | | |
| ME4PRL | Melo sp. 4 | | | | | | | | | | |
| ME8PRL | Melo sp. 8 | | | | | | | | | | |
| NA0Erscs | Navi sp. E Cascades | | | | | | | | | | |
| NA20PRL | Navi sp. 20 | | | | | | | | | | |
| NA24PRL | Navi sp. 24 | | | | | 0.00200 | | | | | |
| NA25PRL | Navi sp. 25 | | | | | | | | | | |
| NA45PRL | Navi sp. 45 | | | | | | | | | | |
| NACRYPTO | Navi cryptocephala | 0.00400 | 0.00200 | | | | 0.00222 | | | | |
| NACRYTEN | Navi cryptotenella | 0.00200 | 0.01400 | 0.00083 | | 0.01000 | | | | | |
| NALAEVIS | Navi laevissima | | 0.01000 | 0.00167 | | | | | | | 0.00200 |
| NALEPTOS | Navi leptostriata | | | | 0.00800 | 0.03400 | | | 0.04400 | 0.00117 | 0.00200 |
| NAMEDIOC | Navi mediocris | | | | 0.10800 | 0.00200 | | | | 0.00584 | |
| NAPUPUvs | Navi pupula vars | 0.00600 | 0.00200 | | | | | 0.00143 | | | |
| NARADIvs | Navi radiosa vars | | 0.00400 | 0.00167 | | | | 0.00143 | | | |
| NASEMDES | Navi seminuloides | 0.00200 | | | | | | | | | |
| NASEMLUM | Navi seminulum | 0.01000 | 0.00400 | | | | 0.00111 | 0.00143 | 0.00200 | | 0.00600 |
| NASUBATO | Navi subatomoides | 0.00200 | 0.00200 | | | | 0.00111 | | | | |
| NASUBMUR | Navi submuralis | | | | | | | | | | |
| NASUBTvs | Navi subtil vars | | | | 0.02000 | 0.01200 | | | 0.16000 | | |
| NATENUIC | Navi tenuicephala | 0.01000 | | | 0.11400 | 0.39000 | | | 0.22600 | 0.00935 | |
| NEAFFIvs | Neid affine vars | | | | | | | | | | |
| NEAL&BIv | Neid alp & bslc vars | | | | 0.00200 | | | | 0.00200 | | |
| NEIRIDvs | Neid iridis vars | | | | 0.01400 | 0.00400 | | | 0.02200 | 0.00234 | |
| NI36PRL | Nitz sp. 36 | | | | | | | | | | |
| NIFONTIC | Nitz fonticola | | 0.02200 | 0.00167 | | | 0.00333 | 0.00286 | | | 0.00800 |
| NIfr3PRL | Nitz frustulum var 3 | | | | | | | | | | |
| NIGRACIL | Nitz gracilis | | | | | | | 0.00571 | 0.03000 | 0.00234 | |
| NIPALEvs | Nitz palea vars | 0.00400 | | | | | | | | 0.00701 | 0.00600 |
| NIPERMIN | Nitz perminuta | | | | | | | | | | |
| NITROPIC | Nitz tropica | | | 0.00417 | | | 0.00444 | 0.01571 | | | 0.00200 |

| TAXANAME | Long name | BURNT LAKE | DIAMOND LAKE | LAVA LAKE | MINK LAKE | BIG LAKE | PAULINA | EAST LAKE | LUCKY LAKE | CHARLTON | AGENCY LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PI0Crscs | Pinn sp. C Cascades | | | | | | | | 0.01200 | | |
| PI28PRL | Pinn sp. 28 | | | | | | | | | | |
| PIBICEPS | Pinn biceps | | | | 0.02600 | 0.00600 | | | | 0.00584 | |
| PIBRAUNI | Pinn braunii | | 0.00600 | | 0.01200 | 0.01800 | | | 0.01600 | | |
| PIbrebis | Pinn brebissonii | | | | | | | | | | |
| PIGIBBvs | Pinn gibba vars | | | 0.00333 | | | | | | | |
| PIMICRvs | Pinn micros vars | | | | 0.06600 | 0.01800 | | | 0.04400 | 0.01285 | |
| PISUBCAP | Pinn subcapitata | | | | | | | | | | |
| SNINTERM | Sten intermedia | | | | 0.00800 | 0.00200 | | | | 0.00234 | |
| SSANCEvs | Stau anceps vars | | | | | | | | | | |
| STHANTZS | Step hantzschii | | | | | | 0.02667 | 0.00571 | | | 0.00200 |
| STMEDIUS | Step medius | | 0.00400 | | | | | 0.00143 | | | 0.08000 |
| STMINUTU | Step minutus | | 0.06200 | 0.02667 | | | 0.51667 | 0.56714 | 0.00200 | | 0.04000 |
| STNIAGAR | Step niagarae | | 0.06800 | 0.01833 | | | | | | | 0.00200 |
| STPARVUS | Step parvus | | | 0.02583 | | | 0.03333 | 0.01429 | | | 0.02200 |
| SUde1PRL | Suri delicatis var 1 | | | | | 0.00400 | | | 0.01600 | | |
| SUDELICA | Suri delicatissima | | | | 0.00600 | | | | 0.00800 | | |
| TAspp | Tabe spp. | | | | 0.00200 | | | | | 0.00117 | |

| Long name | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | 0.16071 | | 0.00400 |
| Achn sp. 11 | | | | | | | | | | | |
| Achn bioreti | | | | | | | 0.00200 | | 0.01389 | | 0.00200 |
| Achn curtissima | | | | | | 0.05000 | | | 0.02976 | 0.00600 | |
| Achn detha | | | | | | | | | | | |
| Achn lanceolata vars | | | | | 0.01000 | | | | | 0.04600 | 0.00200 |
| Achn linearis vars | | | | | | 0.02600 | 0.01600 | | 0.00198 | 0.03800 | 0.04000 |
| Achn margin & levand | 0.05200 | 0.00778 | 0.09400 | 0.02000 | 0.01000 | 0.03800 | 0.03400 | 0.08000 | 0.02381 | 0.00400 | 0.05800 |
| Achn minutissima | | | | | 0.01800 | | | | 0.00595 | 0.01400 | 0.02600 |
| Achn pusilla | | | | | | | | | | | |
| Achn subatomoides | | | | | 0.02400 | 0.06200 | | | 0.02976 | | 0.00600 |
| Achn suchlandti | | | | | | | | | | | |
| Amph ovalis | | | | | 0.01000 | | 0.00200 | | | 0.01000 | |
| Amph perpusilla | | | | | | | | | 0.00198 | | |
| Anom brachysira | 0.01600 | 0.00222 | 0.00200 | | 0.00200 | 0.00800 | 0.00200 | 0.00600 | 0.01190 | 0.00600 | 0.01200 |
| Anom vitrea | | | | | | | | | | 0.01000 | 0.04200 |
| Aste formosa | | | | | | | | | | | |
| Aula sp. A Cascades | | | | | 0.06600 | | | | | | |
| Aula sp. B Cascades | 0.00600 | | | | | | 0.00200 | 0.11400 | 0.03175 | 0.01000 | 0.01400 |
| Aula sp. C Cascades | | | | | | | | 0.06400 | 0.00198 | | 0.00400 |
| Aula sp. D Cascades | | | | | | | | | | | |
| Aula ambigua | | | | | 0.03000 | 0.09000 | 0.03800 | | | 0.00200 | 0.00400 |
| Aula distans vars | 0.02000 | 0.03444 | 0.15600 | 0.00800 | 0.00600 | 0.04400 | 0.01600 | 0.12800 | 0.10119 | 0.01400 | 0.03800 |
| Aula granulata | | | | | | | | | 0.00397 | 0.00800 | 0.00400 |
| Aula italica vars | | | | | | 0.03400 | | | | | |
| Aula pfaffiana | | 0.65333 | 0.16800 | 0.07400 | 0.00400 | | | 0.04600 | 0.00595 | | 0.00400 |
| Cocc placent vars | | | | | | | | | | | |
| Cymb sp. A Cascades | 0.04000 | | 0.01600 | 0.06400 | | | | 0.05200 | | | |
| Cymb sp. 18 | | | | | | | | | | | |
| Cymb sp. 20 | | | | | | | | | | | |
| Cymb sp. 6 | 0.13000 | | 0.05400 | 0.09200 | | | | 0.05600 | | | |
| Cymb aequalis | 0.01600 | 0.05889 | 0.02200 | | 0.00200 | | 0.00200 | 0.01400 | | | 0.00400 |
| Cymb amphicephala | | | | | | | | | | | |

| Long name | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cymb brehmii | | | | | | | | 0.00800 | | | |
| Cymb falaisensis | | | | | | | | | | | |
| Cymb gaeumannii | | | 0.00400 | 0.00400 | | 0.00400 | | 0.01200 | | | 0.00400 |
| Cymb hebridica | 0.02000 | 0.00667 | 0.01000 | 0.02800 | 0.01000 | | | 0.01200 | | | |
| Cymb lunata | | | 0.00600 | 0.00400 | | 0.01800 | 0.00600 | 0.00400 | 0.00992 | | 0.01600 |
| Cymb minuta | | | 0.00200 | | 0.00400 | 0.01000 | 0.00800 | | 0.00595 | | 0.01000 |
| Cymb perpusilla | | | | | | | | | | | |
| Cycl ocellata | | | | | 0.00400 | | | | | | 0.06400 |
| Cycl pseudostelliger | | | | | | | | | | | |
| Cycl stelligera | | | | | 0.09600 | | 0.02800 | | | 0.14600 | 0.38800 |
| Euno bilun mucophila | | 0.00444 | 0.00600 | 0.01200 | | | | | | 0.00200 | |
| Euno bilunaris | | | | 0.01000 | | | | 0.00600 | 0.00397 | | 0.01200 |
| Euno exigua | | | 0.00200 | | | 0.00200 | | 0.00200 | 0.00198 | | 0.00400 |
| Euno incisa vars | | | | 0.00400 | | | | | 0.01389 | | 0.00200 |
| Euno minor | | 0.00333 | | | | | | | 0.03571 | | 0.00800 |
| Euno palud trinac | | | | | | | | 0.00200 | | | |
| Euno rhomboidea | | | | | | | | | | | 0.00400 |
| Euno subarcuatoides | | 0.00111 | 0.00200 | 0.01200 | | | | | 0.01587 | | 0.01000 |
| Euno vanheurck vars | | 0.00111 | | | | | | 0.00200 | 0.03373 | | |
| Frag sp. A Cascades | | | | | | | | 0.04600 | | | 0.00400 |
| Frag sp. 11 | | | | | | | | | | | |
| Frag sp. 15 | | | | | | | | | | | |
| Frag sp. 9 | | | | | | | | | | | |
| Frag brevistriata | | | | | 0.25600 | 0.33400 | 0.00600 | | | 0.17400 | 0.01800 |
| Frag capucina vars | | | | | 0.02200 | | 0.00800 | | | | 0.00400 |
| Frag crotonensis | | | | | 0.00400 | | | | | | |
| Frag construens vars | | | | | 0.07200 | | 0.28600 | | 0.00397 | | |
| Frag exigua & viresc | | | | | | 0.00200 | 0.00400 | | | | |
| Frag pinn lancettula | | | | | | | 0.00400 | 0.00400 | | | |
| Frag pinnata | | | | | 0.04800 | 0.01000 | 0.11000 | | | 0.22400 | |
| Frag pseudoconstruen | | | | | 0.00400 | 0.06800 | | | | | |
| Frus rhom crassinerv | | | | 0.00200 | | | 0.00200 | 0.00200 | 0.04960 | | 0.00800 |
| Frus rhomboides | 0.02000 | 0.00667 | 0.00400 | 0.04800 | 0.00400 | 0.00200 | 0.00200 | 0.03800 | | | 0.00600 |

| Long name | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gomp angustatum | | | | | | | | | | | |
| Gomp gracile | 0.00200 | 0.00222 | | | 0.00400 | 0.00200 | 0.00200 | | | 0.00200 | 0.00400 |
| Melo sp. 13 | | | | | | | | | | | |
| Melo sp. 4 | | | | | | | | | | | |
| Melo sp. 8 | | | | | | | | | | | |
| Navi sp. E Cascades | | | | | 0.03800 | | 0.00800 | | | 0.00600 | 0.00400 |
| Navi sp. 20 | | | | | | | | | | | |
| Navi sp. 24 | | | | 0.01800 | | | 0.00200 | 0.00200 | | | |
| Navi sp. 25 | | | | | | | | | | | |
| Navi sp. 45 | | | | | | | | | | | |
| Navi cryptocephala | | | | | 0.00400 | | | | | 0.00200 | 0.00400 |
| Navi cryptotenella | | | | | | 0.00400 | | | | 0.00200 | |
| Navi laevissima | | | | | 0.02400 | 0.00200 | | | | 0.01400 | |
| Navi leptostriata | 0.00800 | | 0.01600 | 0.05400 | | 0.00400 | 0.01800 | 0.02600 | | | |
| Navi mediocris | 0.00200 | | | | | 0.00400 | 0.01600 | 0.02200 | 0.00794 | 0.00400 | 0.00800 |
| Navi pupula vars | | | | | 0.01800 | | 0.01400 | | | 0.01400 | 0.00200 |
| Navi radiosa vars | | | | | | 0.00400 | 0.00200 | | | 0.00600 | |
| Navi seminuloides | | | | | 0.01800 | | 0.05400 | | | | |
| Navi seminulum | | | | | 0.00800 | 0.01600 | 0.02600 | | | 0.00600 | 0.00600 |
| Navi subatomoides | | | | | 0.00200 | 0.02200 | 0.01400 | | 0.00198 | 0.00400 | 0.00400 |
| Navi submuralis | | | | | | 0.02400 | 0.00800 | 0.00800 | | 0.00600 | 0.00600 |
| Navi subtil vars | 0.06400 | 0.01333 | 0.00600 | 0.04600 | | | | 0.00200 | | | 0.00200 |
| Navi tenuicephala | 0.39400 | 0.00333 | 0.35000 | 0.19800 | 0.00600 | | 0.04000 | 0.04800 | 0.00992 | 0.05600 | |
| Neid affine vars | | | | 0.01200 | | | | | | | 0.00800 |
| Neid alp & bslc vars | | | | 0.01200 | | | 0.00200 | 0.01000 | 0.00794 | | 0.00400 |
| Neid iridis vars | 0.00800 | 0.02667 | 0.01000 | 0.02000 | | 0.00200 | 0.00600 | | 0.00794 | | |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz fonticola | | | | | 0.00600 | 0.00400 | | | | | 0.00600 |
| Nitz frustulum var 3 | | | | | | | | | | | |
| Nitz gracilis | 0.01200 | | 0.00200 | 0.01000 | 0.00400 | | | 0.02800 | 0.00397 | 0.02400 | |
| Nitz palea vars | | | | | | 0.01000 | 0.00600 | | | 0.00200 | 0.00200 |
| Nitz perminuta | | | | | 0.01200 | 0.00600 | 0.00600 | | | | |
| Nitz tropica | | | | | 0.00200 | | | | | | |

| Long name | SOUTH HEAVENLY Twin | LITTLE TWIN LAKE | HEAD LAKE | SUMMIT LAKE | CORA LAKE | GERTRUDE LAKE | CASKEY LAKE | NO NAME | MIDDLE THORNTON | PYRAMID LAKE | HEATHER LAKE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pinn sp. C Cascades | | 0.00111 | 0.00600 | 0.04200 | | | | | | | |
| Pinn sp. 28 | | | | | | | | | | | |
| Pinn biceps | 0.08800 | | 0.00600 | 0.10200 | 0.01200 | 0.01000 | 0.02000 | 0.02000 | 0.08929 | | |
| Pinn braunii | | | | | | | | 0.07600 | 0.03968 | | |
| Pinn brebissonii | | | | | | | | | | | |
| Pinn gibba vars | | | | | | | | | | | |
| Pinn micros vars | 0.07600 | 0.10000 | 0.01000 | 0.02400 | 0.00400 | | 0.00800 | 0.00800 | 0.00397 | | 0.01000 |
| Pinn subcapitata | | | | | | | | | | | |
| Sten intermedia | | | | | 0.00200 | 0.00400 | | | 0.00198 | | 0.00200 |
| Stau anceps vars | | | | 0.00800 | 0.00200 | 0.01200 | 0.00600 | | | | 0.00800 |
| Step hantzschii | | | | | | | | | | | |
| Step medius | | | | | | | | | | | |
| Step minutus | | | | | | | | | | | |
| Step niagarae | | | | | | | | | | | |
| Step parvus | | | | | | | | | | | |
| Suri delicatis var 1 | 0.00400 | | 0.00400 | 0.03000 | | | | 0.00400 | 0.00198 | | 0.00400 |
| Suri delicatissima | 0.00400 | 0.02222 | 0.02400 | 0.00400 | | 0.00400 | 0.00200 | 0.01000 | 0.00198 | | 0.00200 |
| Tabe spp. | | | 0.00200 | | 0.00600 | | 0.00200 | 0.00200 | | | 0.00400 |

| Long name | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | 0.01000 | | | | | | | |
| Achn sp. 11 | | | | | | | | | | | |
| Achn bioreti | | | | | | | 0.00984 | 0.05364 | 0.00376 | 0.00396 | 0.00392 |
| Achn curtissima | 0.00400 | | | 0.00800 | | | | | | | |
| Achn detha | | | | | | | | | | | |
| Achn lanceolata vars | | | | 0.00200 | | | | | | | |
| Achn linearis vars | | | | | 0.00500 | | | | | | |
| Achn margin & levand | 0.05400 | 0.03800 | 0.00250 | 0.17200 | 0.00167 | | 0.09449 | 0.09195 | 0.19737 | 0.08119 | 0.07059 |
| Achn minutissima | 0.00400 | | | | | | | | | | |
| Achn pusilla | | | | | | | | | | | |
| Achn subatomoides | | | | 0.00200 | 0.00333 | | | | | | |
| Achn suchlandti | | | | | | | | | | | |
| Amph ovalis | | | | | 0.00167 | 0.00400 | | | | | |
| Amph perpusilla | | | | | 0.00333 | 0.00600 | | | | | |
| Anom brachysira | 0.01600 | 0.02000 | 0.01375 | 0.04200 | | | | | | 0.00198 | |
| Anom vitrea | | | | 0.00600 | | | | | | | |
| Aste formosa | | | | | 0.35500 | 0.09800 | | | | | |
| Aula sp. A Cascades | | | | | | | | | | | |
| Aula sp. B Cascades | 0.04600 | 0.03800 | 0.13500 | 0.04000 | | | | 0.00766 | 0.02256 | 0.00990 | 0.00196 |
| Aula sp. C Cascades | 0.04800 | 0.01600 | | | | | 0.00197 | | | | |
| Aula sp. D Cascades | | | | | | | 0.00394 | | 0.00940 | 0.00396 | 0.01176 |
| Aula ambigua | | | | | | | | | | | |
| Aula distans vars | 0.11600 | 0.17400 | 0.50000 | 0.05400 | | | 0.48228 | 0.26437 | 0.32519 | 0.22376 | 0.43529 |
| Aula granulata | 0.00200 | 0.00600 | | 0.02800 | | 0.00200 | | | | | |
| Aula italica vars | | | | | 0.05333 | 0.01600 | | | | | |
| Aula pfaffiana | 0.04600 | 0.11400 | 0.20000 | 0.03800 | | | | 0.02107 | | | |
| Cocc placent vars | | | | | 0.00167 | 0.00600 | | | | | |
| Cymb sp. A Cascades | 0.03400 | 0.06600 | 0.01625 | 0.00400 | | | 0.00984 | 0.01149 | 0.01504 | 0.06139 | 0.05490 |
| Cymb sp. 18 | | | | | | | | | | | |
| Cymb sp. 20 | | | | | | | | | | | |
| Cymb sp. 6 | 0.01600 | 0.01400 | 0.02000 | 0.00600 | | | | | | | |
| Cymb aequalis | 0.03000 | 0.03000 | 0.00500 | 0.00400 | | | 0.01181 | | 0.00376 | | |
| Cymb amphicephala | | | | | | | | | | | |

| Long name | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cymb brehmii | 0.01000 | 0.00200 | 0.00250 | 0.00400 | | | | | 0.00564 | 0.01386 | 0.00392 |
| Cymb falaisensis | | | | | | | 0.05512 | 0.07663 | 0.01316 | 0.01782 | 0.02157 |
| Cymb gaeumannii | 0.06600 | 0.03800 | 0.00500 | 0.03200 | | | | | | | |
| Cymb hebridica | 0.00400 | 0.03200 | 0.01375 | 0.00400 | | | 0.00197 | | | 0.00594 | |
| Cymb lunata | 0.05000 | 0.00800 | | 0.00400 | | | | | | 0.01386 | |
| Cymb minuta | 0.00600 | | | | 0.00333 | | | | | | |
| Cymb perpusilla | | | | | | | | | | | |
| Cycl ocellata | | | | | | | | | | | |
| Cycl pseudostelliger | | | | | | | | | | | |
| Cycl stelligera | | | | 0.04000 | 0.00667 | 0.00400 | | | | | |
| Euno bilun mucophila | | | | 0.03200 | | | | | | 0.00198 | |
| Euno bilunaris | | | | 0.01800 | | | | 0.00383 | 0.00376 | 0.00396 | |
| Euno exigua | | 0.01000 | 0.00250 | 0.01000 | | | 0.00197 | 0.00575 | | 0.00198 | 0.00196 |
| Euno incisa vars | | | 0.00125 | 0.00400 | | | | | 0.01880 | 0.00594 | |
| Euno minor | | | | | | | | | | | |
| Euno palud trinac | | | | | | | 0.01969 | 0.00766 | | | |
| Euno rhomboidea | | 0.00200 | | 0.00600 | | | | 0.00383 | 0.00188 | 0.00198 | 0.00196 |
| Euno subarcuatoides | | | 0.00375 | 0.03800 | | | | | | | |
| Euno vanheurck vars | | | | 0.00800 | | | | | | | |
| Frag sp. A Cascades | | | 0.01000 | 0.00400 | | | | | | | |
| Frag sp. 11 | | | | | | | | | | | |
| Frag sp. 15 | | | | | | | | | | | |
| Frag sp. 9 | | | | | | | | | | | |
| Frag brevistriata | | | | | 0.03333 | 0.15200 | | | 0.00188 | | |
| Frag capucina vars | | | | | | 0.00600 | | | | | |
| Frag crotonensis | | | | | 0.14667 | 0.34400 | | | | | |
| Frag construens vars | | | | | 0.00667 | 0.06800 | | | | | |
| Frag exigua & viresc | | | 0.00125 | 0.00200 | | | | | | | |
| Frag pinn lancettula | | | | | | | | | | | |
| Frag pinnata | | | | | 0.06667 | 0.15200 | | | | | |
| Frag pseudoconstruen | | | | | | | | | | | |
| Frus rhom crassinerv | 0.00800 | 0.01600 | 0.00125 | 0.03000 | | | 0.01181 | 0.00383 | | | 0.00196 |
| Frus rhomboides | 0.01600 | 0.06600 | 0.00750 | 0.02000 | | | 0.00197 | | 0.01128 | | 0.00196 |

| Long name | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gomp angustatum | | | | | | | | | | | |
| Gomp gracile | | | 0.00500 | | | | | | | 0.00198 | 0.00196 |
| Melo sp. 13 | | | | | | | | | | | |
| Melo sp. 4 | | | | | | | | | | | |
| Melo sp. 8 | | | | | | | | | | | |
| Navi sp. E Cascades | | | | | | | | | | | |
| Navi sp. 20 | | | | | | | | | | | |
| Navi sp. 24 | 0.02200 | 0.00200 | | | | | 0.05315 | 0.01724 | 0.02632 | 0.00792 | 0.00196 |
| Navi sp. 25 | | | | | | | | | | | |
| Navi sp. 45 | | | | | | | | | | | |
| Navi cryptocephala | 0.01000 | | | | | | | | | | |
| Navi cryptotenella | 0.00800 | | | | 0.00167 | 0.00200 | | | | | |
| Navi laevissima | | | | | | 0.00200 | | | | | |
| Navi leptostriata | 0.00800 | 0.03000 | 0.01625 | 0.00600 | | | | | 0.00188 | | |
| Navi mediocris | 0.00200 | 0.02200 | 0.00500 | 0.02400 | | | 0.00394 | 0.00192 | 0.00376 | 0.00396 | |
| Navi pupula vars | | | | | | 0.00200 | | | | | |
| Navi radiosa vars | 0.01600 | | | 0.00400 | | | | | | | |
| Navi seminuloides | 0.00800 | 0.00800 | | 0.00400 | | 0.01200 | | | | | |
| Navi seminulum | | | | | | | | | | | |
| Navi subatomoides | | | | | | | | | | | |
| Navi submuralis | 0.00400 | | | | | 0.00800 | | | | | |
| Navi subtil vars | | 0.00400 | 0.00500 | 0.01800 | 0.00167 | | 0.00197 | 0.00958 | 0.00188 | 0.00198 | 0.00784 |
| Navi tenuicephala | 0.01800 | 0.04600 | 0.00375 | 0.03800 | | | 0.13780 | 0.40038 | 0.26692 | 0.47327 | 0.32353 |
| Neid affine vars | 0.00400 | 0.01200 | 0.00250 | 0.01200 | | | | | | | |
| Neid alp & bslc vars | 0.01600 | 0.00400 | | 0.00800 | | | | | | | 0.01765 |
| Neid iridis vars | 0.00200 | | 0.00125 | 0.00400 | | | 0.00394 | 0.00383 | 0.00376 | 0.00594 | |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz fonticola | 0.01000 | 0.00400 | 0.00250 | | 0.01500 | 0.00400 | | | | | |
| Nitz frustulum var 3 | | | | | | | | | | | |
| Nitz gracilis | 0.01400 | 0.01400 | | | | 0.00200 | | | | | |
| Nitz palea vars | 0.02400 | 0.00200 | | | 0.00667 | 0.00400 | | | | | |
| Nitz perminuta | | | | | | | | | | | |
| Nitz tropica | | | | | | | | | | | |

| Long name | DUMBBELL LAKE | SHELLROCK LAKE | SPHAGNUM | NORDRUM | MARION LAKE | SUTTLE LAKE | Upper Palisades Lake | Unamed Lake | Unnamed Lake3(Lost Lake) | Unnamed Lake4 | Unnamed Lake |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pinn sp. C Cascades | | | | | | | | | | | |
| Pinn sp. 28 | | | | | | | | | | | |
| Pinn biceps | 0.00200 | | | 0.02600 | | | 0.07283 | | 0.01316 | 0.02970 | 0.00980 |
| Pinn braunii | 0.09200 | 0.06000 | | | | | | | | | |
| Pinn brebissonii | | | | | | | | | | | |
| Pinn gibba vars | | | 0.00250 | | | | 0.00787 | 0.00192 | 0.00376 | | |
| Pinn micros vars | 0.04600 | 0.01400 | 0.00250 | 0.01000 | | 0.00400 | 0.00984 | 0.00192 | 0.02820 | 0.00198 | 0.01176 |
| Pinn subcapitata | | | | | | | | | | | |
| Sten intermedia | 0.00200 | 0.00600 | | 0.00600 | | | | | | | |
| Stau anceps vars | 0.03400 | | | 0.01400 | | | | | | | |
| Step hantzschii | | | | | 0.01167 | 0.00400 | | | | | |
| Step medius | | | | | 0.18667 | 0.02200 | | | | | |
| Step minutus | | | | | 0.02500 | 0.02200 | | | | | |
| Step niagarae | | | | | | 0.00800 | | | | | |
| Step parvus | 0.00200 | | | | 0.02667 | 0.00400 | | | | | |
| Suri delicatis var 1 | 0.00800 | | | | | | | | | | |
| Suri delicatissima | 0.02200 | 0.02400 | 0.00250 | 0.00600 | | | | 0.00575 | 0.00564 | | 0.00784 |
| Tabe spp. | | 0.00800 | | 0.00600 | | | | | | | |

| Long name | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | | | | | | | |
| Achn sp. 11 | | | | | | | 0.06452 | | 0.10248 | | 0.02727 |
| Achn bioreti | 0.01500 | | | | | | | | 0.00311 | | |
| Achn curtissima | | | | | | | | | | | |
| Achn detha | | | | | | | 0.03379 | | 0.01398 | | 0.00909 |
| Achn lanceolata vars | | | | | | | | 0.00151 | | | 0.00606 |
| Achn linearis vars | | | | | | | | | | | 0.00152 |
| Achn margin & levand | 0.05167 | 0.03901 | 0.01822 | 0.06958 | 0.01992 | 0.00980 | 0.04147 | 0.00151 | 0.05124 | 0.02351 | 0.08788 |
| Achn minutissima | | | | | | | 0.06452 | 0.03177 | 0.01242 | | 0.00152 |
| Achn pusilla | | | | | | | 0.00307 | 0.01059 | 0.08385 | | |
| Achn subatomoides | | | | | | | | | | | |
| Achn suchlandti | | | | | | | | | 0.06211 | | 0.00303 |
| Amph ovalis | | | | | | | 0.00154 | 0.00151 | | | |
| Amph perpusilla | | | | | | | 0.00307 | | | | |
| Anom brachysira | | | | 0.00994 | 0.01594 | 0.00392 | | | 0.00155 | | 0.00758 |
| Anom vitrea | | | | | | | | 0.00151 | 0.00155 | | 0.00303 |
| Aste formosa | | | | | | | | | | | |
| Aula sp. A Cascades | | | | | | | | | | | |
| Aula sp. B Cascades | 0.07833 | 0.00532 | 0.01822 | | 0.11753 | 0.37647 | | | | | |
| Aula sp. C Cascades | | | | | 0.00398 | 0.00784 | | | | | |
| Aula sp. D Cascades | 0.01667 | | 0.01215 | 0.04175 | 0.05976 | 0.07255 | | | | | |
| Aula ambigua | | | | | | | | | | | |
| Aula distans vars | 0.57667 | 0.12943 | 0.31579 | 0.48509 | 0.33466 | 0.19020 | 0.04916 | | 0.02174 | 0.00362 | 0.15758 |
| Aula granulata | | | | | | | | | | | |
| Aula italica vars | | | | | | | 0.01229 | 0.00151 | | | 0.00303 |
| Aula pfaffiana | 0.01500 | | | 0.00994 | 0.06574 | 0.07255 | | | | | |
| Cocc placent vars | | | | | | | | | | | |
| Cymb sp. A Cascades | 0.00667 | 0.06738 | 0.05668 | 0.03976 | 0.01594 | 0.00784 | | | | | |
| Cymb sp. 18 | | | | | | | | | | 0.00362 | 0.00303 |
| Cymb sp. 20 | | | | | | | | | | 0.28029 | |
| Cymb sp. 6 | | | | | | | | | | | |
| Cymb aequalis | | | | 0.00596 | 0.01195 | 0.01373 | | | | | |
| Cymb amphicephala | | | | | | | | | | | |

| Long name | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cymb brehmii | 0.00167 | 0.00355 | 0.01417 | 0.00596 | 0.00398 | | | | | | |
| Cymb falaisensis | 0.06000 | 0.01950 | 0.00810 | 0.01193 | 0.01793 | 0.00980 | | | | | |
| Cymb gaeumannii | | | | | | | 0.00154 | | 0.00155 | | 0.00303 |
| Cymb hebridica | 0.00167 | 0.01241 | 0.00202 | 0.00398 | 0.00199 | 0.00392 | | | | 0.01266 | 0.00909 |
| Cymb lunata | | | | | 0.02191 | 0.00392 | 0.00768 | | | | 0.01818 |
| Cymb minuta | | | | | | | 0.00461 | | 0.01863 | | 0.01667 |
| Cymb perpusilla | | | | 0.01988 | 0.02191 | 0.00196 | | | | | |
| Cycl ocellata | | | | | | | | | | | |
| Cycl pseudostelliger | | | | | | | 0.10906 | 0.40242 | | | |
| Cycl stelligera | | | | | | | 0.04147 | 0.47050 | 0.13043 | | |
| Euno bilun mucophila | 0.00333 | 0.00355 | | | 0.00199 | | | | | | |
| Euno bilunaris | | | 0.00405 | 0.00199 | 0.00996 | 0.00196 | | | | | 0.01212 |
| Euno exigua | 0.00167 | 0.00709 | 0.00202 | | 0.00199 | 0.00392 | 0.00154 | | | | 0.00152 |
| Euno incisa vars | 0.00500 | | | | 0.00398 | | | | | | 0.00303 |
| Euno minor | | | | | | | 0.00307 | | | | 0.00909 |
| Euno palud trinac | 0.01167 | 0.00532 | | | 0.01195 | 0.00784 | | | | | |
| Euno rhomboidea | 0.00167 | | | 0.00398 | | | | | | | |
| Euno subarcuatoides | | | | | | | | | | | |
| Euno vanheurck vars | | | | | | | | | | | |
| Frag sp. A Cascades | | | | 0.00795 | | | | | | | |
| Frag sp. 11 | | | | | | | | | | | 0.01818 |
| Frag sp. 15 | | | | | | | | | 0.17702 | | |
| Frag sp. 9 | | | | | | | | | 0.00466 | | |
| Frag brevistriata | | | | | | | | | | | |
| Frag capucina vars | | | | | | | | | | | |
| Frag crotonensis | | | | | | | | | | | |
| Frag construens vars | | | | | | | 0.06144 | 0.01210 | 0.02950 | | 0.00909 |
| Frag exigua & viresc | | | | | | | | | 0.00311 | | 0.00455 |
| Frag pinn lancettula | | | | | | | | | | | |
| Frag pinnata | | | | | | | 0.17051 | 0.01059 | 0.00466 | 0.00181 | 0.05606 |
| Frag pseudoconstruen | | | | | | | | | | | |
| Frus rhom crassinerv | 0.00667 | | | | 0.00797 | | | | | 0.03797 | 0.00303 |
| Frus rhomboides | 0.00167 | | | 0.02584 | 0.00797 | 0.00196 | 0.00307 | | | 0.00362 | 0.00758 |

| Long name | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gomp angustatum | | | | | | | 0.00614 | 0.00454 | 0.00621 | | 0.00455 |
| Gomp gracile | | | | | | | | | | | 0.00303 |
| Melo sp. 13 | | | | | | | | | | | 0.00455 |
| Melo sp. 4 | | | | | | | 0.01229 | | | | 0.08939 |
| Melo sp. 8 | | | | | | | 0.06605 | 0.00908 | 0.01398 | | 0.04848 |
| Navi sp. E Cascades | | | | | | | | | | | |
| Navi sp. 20 | | | | | | | 0.03533 | | | | 0.00152 |
| Navi sp. 24 | 0.01500 | 0.11170 | 0.00607 | 0.01193 | | | | | | | |
| Navi sp. 25 | | | | | | | 0.01690 | 0.00151 | 0.00621 | | 0.00606 |
| Navi sp. 45 | | | | | | | | | | | 0.00303 |
| Navi cryptocephala | | 0.00709 | 0.00405 | | 0.00797 | | | | | | 0.00303 |
| Navi cryptotenella | | | | | | | 0.00307 | | 0.01242 | 0.00362 | 0.01061 |
| Navi laevissima | | | | | | | 0.01075 | | | 0.00362 | |
| Navi leptostriata | 0.00833 | | 0.01822 | 0.01392 | 0.02590 | 0.00588 | | | | | |
| Navi mediocris | 0.00333 | 0.00177 | 0.00202 | 0.00199 | 0.01793 | 0.00196 | | | | 0.00181 | 0.00152 |
| Navi pupula vars | | | | | | | 0.00154 | | | | 0.06515 |
| Navi radiosa vars | | | | | | | | | 0.02019 | | 0.00303 |
| Navi seminuloides | | | | | | | | | | | |
| Navi seminulum | | | | | | | | | | | |
| Navi subatomoides | | | | | | | | | | | |
| Navi submuralis | | | 0.00405 | | | | | | | | |
| Navi subtil vars | 0.00500 | 0.01418 | 0.01417 | 0.01193 | 0.00398 | | | | | 0.08318 | 0.00909 |
| Navi tenuicephala | 0.07667 | 0.32447 | 0.43725 | 0.11730 | 0.06972 | 0.10000 | | | | 0.36528 | 0.01212 |
| Neid affine vars | | | | | | | 0.00154 | | 0.00155 | 0.00723 | 0.00606 |
| Neid alp & bslc vars | 0.01000 | | | 0.00795 | | 0.00196 | | 0.00151 | | | 0.00303 |
| Neid iridis vars | 0.00167 | 0.01241 | 0.00202 | 0.00398 | 0.00598 | 0.00784 | | | | 0.00362 | 0.01667 |
| Nitz sp. 36 | | | | | | | | | | | |
| Nitz fonticola | | | | | | | | | | | |
| Nitz frustulum var 3 | | | | | | | 0.00614 | | | | 0.02727 |
| Nitz gracilis | | 0.06028 | | 0.00199 | 0.00996 | 0.00392 | | | | | |
| Nitz palea vars | | | | | | | | | | | |
| Nitz perminuta | | | | 0.00199 | 0.00996 | 0.05098 | | | | | |
| Nitz tropica | | | | | | | | | | | |

| Long name | Unnamed Lake5 | Unnamed Lake7 | Unnamed Lake8 | Reflection Lake A | Unnamed Lake9 | Unnamed Lake10 | Unnamed Lake6 | Green Lake | Mowich Lake | Lake Notasha | Reflection Lake B |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pinn sp. C Cascades | | | | | | | | | | | |
| Pinn sp. 28 | | | | | | | 0.02151 | | 0.00155 | 0.01627 | 0.00606 |
| Pinn biceps | 0.02167 | 0.13830 | 0.02632 | 0.03777 | 0.02590 | 0.01373 | | | | | |
| Pinn braunii | | | 0.00405 | | | | | | | 0.05063 | |
| Pinn brebissonii | | | | | | | | | | 0.06691 | |
| Pinn gibba vars | | 0.00177 | | | 0.00398 | 0.00588 | | | | 0.00904 | 0.03333 |
| Pinn micros vars | 0.00167 | 0.01950 | 0.02024 | 0.01193 | | | | | | | |
| Pinn subcapitata | | | | | | | | | | | |
| Sten intermedia | | | | | | | | | | | 0.00152 |
| Stau anceps vars | | 0.00532 | | | 0.00199 | 0.00392 | 0.00154 | | 0.00311 | 0.00181 | 0.01364 |
| Step hantzschii | | | | | | | | | | | |
| Step medius | | | | | | | | | | | |
| Step minutus | | | | | | | | | | | |
| Step niagarae | | | | | | | | | | | |
| Step parvus | | | | | | | | | | | |
| Suri delicatis var 1 | | | 0.00810 | | | | | | | 0.00181 | |
| Suri delicatissima | | 0.00887 | | 0.02982 | 0.01992 | 0.00980 | | | | 0.00904 | 0.00152 |
| Tabe spp. | | | | | | | 0.00154 | | | | 0.00152 |

| Long name | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|
| Achn sp. A Cascades | | | | | |
| Achn sp. 11 | 0.01127 | 0.00930 | 0.00733 | 0.16934 | |
| Achn bioreti | 0.00805 | | | 0.00438 | |
| Achn curtissima | | | | | |
| Achn detha | | 0.02171 | | 0.04818 | |
| Achn lanceolata vars | | | | | |
| Achn linearis vars | | | | | 0.28155 |
| Achn margin & levand | 0.16908 | 0.02016 | 0.08791 | 0.05255 | 0.01359 |
| Achn minutissima | | 0.01860 | | 0.01314 | |
| Achn pusilla | | 0.00620 | | 0.00146 | |
| Achn subatomoides | | | | | |
| Achn suchlandti | | | | | |
| Amph ovalis | | | | | |
| Amph perpusilla | | | | | |
| Anom brachysira | 0.01449 | 0.00155 | 0.02198 | 0.00146 | 0.00388 |
| Anom vitrea | | | 0.00366 | | |
| Aste formosa | | | | | |
| Aula sp. A Cascades | | | | | |
| Aula sp. B Cascades | | | | | |
| Aula sp. C Cascades | | | | | |
| Aula sp. D Cascades | | | | | |
| Aula ambigua | | | | | 0.20777 |
| Aula distans vars | 0.07246 | 0.00155 | 0.05861 | 0.02482 | |
| Aula granulata | | | | | |
| Aula italica vars | 0.03221 | | | | |
| Aula pfaffiana | | | | | |
| Cocc placent vars | | | | | |
| Cymb sp. A Cascades | | | | | |
| Cymb sp. 18 | 0.01932 | | 0.03480 | 0.00292 | |
| Cymb sp. 20 | | | | | |
| Cymb sp. 6 | | | | | |
| Cymb aequalis | | 0.00155 | | | 0.08932 |
| Cymb amphicephala | | | | | |

| Long name | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|
| Cymb brehmii | | | | | |
| Cymb falaisensis | | | | | |
| Cymb gaeumannii | 0.01288 | 0.00620 | 0.08608 | 0.00146 | |
| Cymb hebridica | | | | | 0.00194 |
| Cymb lunata | 0.00483 | 0.01550 | 0.05861 | | |
| Cymb minuta | 0.01449 | 0.13023 | 0.01099 | 0.02190 | |
| Cymb perpusilla | | | | | |
| Cycl ocellata | | | | | |
| Cycl pseudostelliger | | | | | |
| Cycl stelligera | | 0.00310 | | | |
| Euno bilun mucophila | | | | | 0.00194 |
| Euno bilunaris | | | 0.00183 | 0.00292 | 0.00583 |
| Euno exigua | | | | | |
| Euno incisa vars | | | | 0.00292 | 0.04466 |
| Euno minor | 0.00161 | | | | |
| Euno palud trinac | | | | | 0.04272 |
| Euno rhomboidea | | | | 0.00146 | |
| Euno subarcuatoides | | | | | |
| Euno vanheurck vars | | | | | |
| Frag sp. A Cascades | | | | | |
| Frag sp. 11 | | 0.02171 | | 0.00146 | |
| Frag sp. 15 | | 0.01550 | | 0.00146 | |
| Frag sp. 9 | | 0.13023 | | | |
| Frag brevistriata | | | | | |
| Frag capucina vars | | | | | |
| Frag crotonensis | | | | | |
| Frag construens vars | | 0.13488 | | 0.03504 | |
| Frag exigua & viresc | | 0.00310 | | 0.00438 | |
| Frag pinn lancettula | | | | | |
| Frag pinnata | | | | | |
| Frag pseudoconstruen | | | | | |
| Frus rhom crassinerv | 0.00483 | 0.00155 | 0.01832 | | 0.00388 |
| Frus rhomboides | | 0.00465 | 0.01282 | 0.00146 | |

| Long name | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|
| Gomp angustatum | 0.01449 | 0.01085 | 0.00366 | 0.00292 | |
| Gomp gracile | | | | | |
| Melo sp. 13 | 0.01288 | | | 0.04380 | |
| Melo sp. 4 | 0.06924 | 0.00155 | 0.05128 | 0.12117 | |
| Melo sp. 8 | 0.22383 | 0.00155 | 0.09341 | 0.22482 | |
| Navi sp. E Cascades | | | | | |
| Navi sp. 20 | | | 0.00366 | 0.01606 | |
| Navi sp. 24 | | | | | |
| Navi sp. 25 | 0.00322 | | 0.00183 | 0.00876 | |
| Navi sp. 45 | 0.02415 | | 0.00366 | 0.00584 | |
| Navi cryptocephala | | | | | |
| Navi cryptotenella | 0.00966 | 0.01085 | 0.02381 | | |
| Navi laevissima | | | 0.00549 | | |
| Navi leptostriata | | | | | |
| Navi mediocris | | | 0.01465 | | |
| Navi pupula vars | 0.00161 | 0.00155 | | 0.00438 | |
| Navi radiosa vars | | 0.03101 | 0.00549 | | |
| Navi seminuloides | | | | | |
| Navi seminulum | | | | | |
| Navi subatomoides | | | | | |
| Navi submuralis | | | | | |
| Navi subtil vars | 0.00161 | | | | 0.14175 |
| Navi tenuicephala | 0.00322 | | 0.03114 | 0.00292 | 0.00194 |
| Neid affine vars | | | 0.03480 | | |
| Neid alp & bslc vars | 0.00483 | | | 0.00146 | |
| Neid iridis vars | | | 0.00183 | | |
| Nitz sp. 36 | | 0.14729 | | | |
| Nitz fonticola | | | | | |
| Nitz frustulum var 3 | 0.00322 | 0.10388 | 0.02747 | | |
| Nitz gracilis | | | | | |
| Nitz palea vars | | | | | |
| Nitz perminuta | | | | | |
| Nitz tropica | | | | | |

| Long name | Shadow Lake | Tipsoo Lake | Sunrise Lake | Snow Lake | SUMMIT LAKE |
|---|---|---|---|---|---|
| Pinn sp. C Cascades | | | | | |
| Pinn sp. 28 | 0.14976 | | 0.06410 | 0.02920 | |
| Pinn biceps | | | | | 0.00388 |
| Pinn braunii | | | | | |
| Pinn brebissonii | | | 0.01099 | | |
| Pinn gibba vars | | | 0.00549 | 0.00292 | |
| Pinn micros vars | 0.00322 | | | | 0.05243 |
| Pinn subcapitata | | | | | |
| Sten intermedia | 0.00644 | 0.00155 | 0.00916 | | |
| Stau anceps vars | 0.03060 | | 0.00549 | 0.00584 | |
| Step hantzschii | | | | | |
| Step medius | | | | | |
| Step minutus | | | | | |
| Step niagarae | | | | | |
| Step parvus | | | | | |
| Suri delicatis var 1 | | | | | 0.00194 |
| Suri delicatissima | 0.00161 | | 0.00916 | | |
| Tabe spp. | | | | | |