



Individual Lake Results

From October 1, 2002 to October 31, 2003, citizen volunteers monitored 51 lakes throughout King County (**Table 3-1**). The results of their work are reported as individual subsections within Section 3 for each lake monitored, in alphabetical order.

Information on location, watershed and lake morphology are summarized for each lake (**Table 3-2**), along with public access and some recreational information. Some results from a recent land use analysis project which was based on aerial photos from 2002 have been included in the text for each individual lake.

Level I data such as precipitation, water level, Secchi transparency, and surface temperature are presented as line plots over the water year. Precipitation events are plotted as bars on the same chart for direct comparisons between large-scale rainfall and short-term increases in water level. Level I and Level II measurements are plotted in the same charts for both Secchi depth and temperature, but have different symbols in order to differentiate data collected by different volunteers.

Level II chemistry data, including chlorophyll *a*, total phosphorus, and total nitrogen, are plotted by date throughout the sampling season. Nitrogen and phosphorus are plotted on the same chart, but with different scales, to show their relationships over time. There were two dates on which profile data was collected. These data are presented in Section 2 as part of the regional discussion and synthesis (**Table 2-1**).

Phytoplankton counts were not completed for all sample dates, but all were examined for species composition. Commonly occurring or characteristic species are presented in accompanying tables or discussed in the text.

Tables that report data for each lake, which in previous annual reports were contained in appendices to the report, have been incorporated in each lake subsection. There are one or two tables

for each lake, depending on participation in Level I and Level II monitoring.

The Level I table reports physical data collected daily or weekly throughout the year. Daily data is organized into weekly averages for lake levels and weekly summations for precipitation. If a significant number of values were missing from a particular week and interpolations could not be made, the data are not reported for that week. The original data sheets have been retained and the data entered in electronic format, which can be provided upon request.

The Level II table reports the analytical sample results for each date in the sampling season, as well as physical measurements and observations. Most of the results were within reasonable bounds of variability, but several analyses had to be repeated and may be flagged with a cautionary note.

Many monitors rated algae and particle concentrations in 2003, and this is reported in the table under Algae Observations. The Secchi disc was lowered 6" under the water surface and a rough estimate of particles visible in the two white sections was made. At 6" depth, the two sections correspond to a total of two liters of water volume. A zero corresponded to no particulate algae seen in the water, while a one meant less than 10, a two between 10 and 100, and three corresponded to greater than 100. This exercise was not meant to be a quantitative measurement, but rather as a general indication of how many particles were present at one time.

Bird, aquatic plant, and boat information is not presented in the tables, but the original data has been retained and can be made available by request.

Table 3-1: Volunteer Monitored Lakes

| 2003 Participation | (Oct. 2002 - Sept. 2003) | (Oct. 2002 - Sept. 2003) | (May - Oct. 2003) |
|--------------------|--------------------------|--------------------------|-------------------|
| | LEVEL I | LEVEL I | LEVEL II |
| LAKE NAME | Weekly | Daily | Biweekly |
| Alice | | | X |
| Allen | | | X |
| Ames | X | X | X |
| Angle | X | X | X |
| Beaver-1 | | | X |
| Beaver-2 | X | X | X |
| Bitter | | | X |
| Boren | | X | X |
| Burien | | | X |
| Clark | | | X |
| Cottage | X | X | X |
| Desire | X | X | X |
| Easter | | X | |
| Echo (Shoreline) | 4 | 4 | X |
| Fenwick | | | X |
| Fivemile | | | X |
| Francis | 3,4 | X | X |
| Geneva | X | X | X |
| Grass | X | X | X |
| Haller | X | X | X |
| Horseshoe | | | X |
| Jones | | | X |
| Joy | X | X | X |
| Kathleen | X | 1 | X |
| Killarney | 1,2 | 1,2 | X |
| Langlois | | | X |
| Leota | X | X | X |
| Lucerne | | | X |
| Marcel | X | X | X |
| Margaret | X | X | X |
| McDonald | | X | X |
| Meridian | X | | X |
| Mirror | X | X | X |
| Morton | X | X | X |
| Neilson (Holm) | X | X | X |
| North | X | X | X |
| Paradise | 2 | | X |
| Pine | X | X | X |
| Pipe | X | X | X |
| Ravensdale | | | X |
| Sammamish | X | X | |
| Sawyer | | X | X |
| Shadow | | X | X |
| Shady | X | X | X |
| Spring | X | X | X |
| Star | | | X |
| Steel | X | X | X |
| Trout | 5 dates | X | X |
| Union | 1,2 | 1,2 | |
| Twelve | X | | X |
| Walsh | | | X |
| Welcome | X | | X |
| Wilderness | X | X | X |
| Yellow | 3,4 | | X |

Note: For Level I data, an X indicates the lake was monitored for all four quarters (1: Oct.-Dec.; 2: Jan.-Mar.; 3: Apr.-Jun.; 4: Jul.-Sept.). For Level II data, the X indicates participation during that year for more than 1 date.

Table 3-2: Physical Characteristics of Monitored Lakes

| Lake Name | Location | Watershed (Acres) | Lake Area (Acres) | Mean Depth (Feet) | Max Depth (Feet) | Public Park | Boat Launch | Fish Present |
|----------------------|-------------------------------|--------------------|-------------------|-------------------|------------------|-------------|-------------|--------------|
| Alice | 2.5 miles S of Fall City | 184 | 32 | 8 | 30 | n | Y | ST,B,O |
| Allen | NE border of Sammamish | 230 | 11 | --- | --- | n | n | --- |
| Ames | 1.5 miles W of Carnation | 1133 | 80 | 18 | 28 | n | n | --- |
| Angle | SeaTac | 478 | 102 | 25 | 52 | Y | Y | ST,B,O |
| Beaver 1 | Sammamish | 324 | 12 | 22 | 55 | n | n | --- |
| Beaver 2 | Sammamish | 1037 | 62 | 21 | 54 | Y | Y | ST,B,O |
| Bitter | north Seattle | 331 | 19 | 16 | 31 | Y | ct | B,O |
| Boren | Newcastle | 660 | 15 | 18 | 34 | Y | ct | ST,O |
| Burien | Burien | 230 | 44 | 13 | 29 | n | n | --- |
| Clark | 2.5 miles east of Kent | 339 | 8 | --- | --- | Y | ct | --- |
| Cottage | 1.5 miles E of Woodinville | 4275 | 63 | 15 | 25 | Y | ct | ST,B,O |
| Desire | 4 miles NW of Maple Valley | 865 | 72 | 13 | 21 | Y | Y | ST,B,O |
| Easter | Federal Way | 121 | 11 | --- | --- | n | n | --- |
| Echo (in Shoreline) | Shoreline | 288 | 12 | 14 | 30 | Y | ct | --- |
| Fenwick | Kent | 580 | 22 | 13 | 31 | Y | Y | ST,B,O |
| Fivemile | 1 mile E of Federal Way | 593 | 38 | 18 | 32 | Y | ct | ST,B |
| Francis | 2 miles N of Maple Valley | 377 | 20 | 4 | 9 | n | n | --- |
| Geneva | 0.2 miles E of federal Way | 198 | 29 | 19 | 46 | Y | Y | ST,B |
| Grass | 0.5 mi N of Lake Morton | 160 | 15 | --- | --- | n | n | --- |
| Haller | north Seattle | 260 | 15 | --- | 36 | n | ct | ST,B,O |
| Horseshoe | 0.5 miles W of Black Diamond | 256 | 10 | --- | --- | n | n | --- |
| Jones | Black Diamond | 954 | 22 | 4 | 7 | n | n | --- |
| Joy | 3 miles N of Carnation | 468 | 105 | 23 | 50 | Y | n | --- |
| Kathleen | 2.2 miles E of Renton | 304 | 39 | 7 | 22 | n | n | --- |
| Killarney | E border of Federal way | 185 | 31 | 9 | 15 | Y | Y | ST,B,O |
| Langlois | 1.25 miles east of Carnation | 226 | 39 | 53 | 98 | n | Y | --- |
| Leota | Woodinville | 482 | 10 | 12 | 24 | n | n | --- |
| Lucerne | Maple Valley | 409 | 16 | 18 | 37 | n | n | --- |
| Marcel | 3 miles N of Carnation | 1290 | 33 | --- | 17 | n | n | --- |
| Margaret | 4.25 miles NE of Duvall | 1777 | 53 | 18 | 43 | n | Y | ST,B |
| McDonald | 2.8 miles E of Renton | 82 | 18 | 23 | 47 | n | n | --- |
| Meridian | Kent | 726 | 150 | 41 | 90 | Y | Y | ST,B,O |
| Mirror | Federal Way | 168 | 19 | 12 | 27 | n | n | --- |
| Morton | 2 miles W of Black Diamond | 250 | 66 | 15 | 23 | n | Y | ST,B |
| Neilson (Holm) | 2.5 miles E of Auburn | 166 | 19 | 18 | 31 | n | Y | ST,B |
| North | E border of Federal Way | 425 | 55 | 14 | 34 | n | Y | ST,B,O |
| Paradise | 2 miles E of Woodinville | 2419 | 18 | 17 | 28 | n | n | --- |
| Pine | Sammamish | 469 | 88 | 20 | 39 | Y | ct | ST,B,O |
| Pipe | Maple Valley/Covington | 313 | 52 | 27 | 65 | n | n | --- |
| Ravensdale | 1.75 E of Ravensdale | 660 | 18 | 4 | 14 | n | n | ST |
| Sammamish | Issaquah/Sammamish/Belleve | 62517 | 4893 | 58 | 105 | Y | Y | ST,B,O |
| Sawyer | Black Diamond | 8120 | 279 | 26 | 58 | Y | Y | B,O |
| Shadow | 1 mile N of Covington | 310 | 50 | 22 | 45 | n | Y | ST,B,O |
| Shady | 3.5 miles NW of Maple Valley | 197 | 21 | 21 | 40 | n | Y | ST,B |
| Spring (Otter) | 3 miles NW of Maple Valley | 443 | 68 | 19 | 32 | Y | Y | ST,B,O |
| Star | 0.1 mile E of Federal Way | 376 | 34 | 25 | 50 | n | Y | ST,B,O |
| Steel | Federal Way | 254 | 46 | 13 | 24 | Y | Y | ST,B |
| Trout | 0.3 miles W of Pacific | 1016 | 18 | 17 | 27 | n | Y | ST,B |
| Twelve | 0.5 miles NE of Black Diamond | 449 | 41 | 13 | 28 | n | Y | ST,B,O |
| Union | Seattle | 388000 | 598 | 34 | 50 | Y | Y | B,O |
| Walsh | 4.5 mi NE of Maple Valley | 1905 | 73 | --- | --- | n | n | --- |
| Welcome | 2.55 miles NE of Redmond | 573 | 17 | --- | --- | n | n | --- |
| Wilderness | Maple Valley | 328 | 67 | 21 | 38 | Y | Y | ST,B,O |
| Yellow | 3 miles north of Issaquah | 287 | 11 | --- | --- | Y | n | --- |
| Key: | n = No | SI = Stocked Trout | | | | | | |
| | Y = Yes | B = Bass | | | | | | |
| | ct = Car top boats, no ramp | O = Other fish | | | | | | |

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Alice

Lake Overview

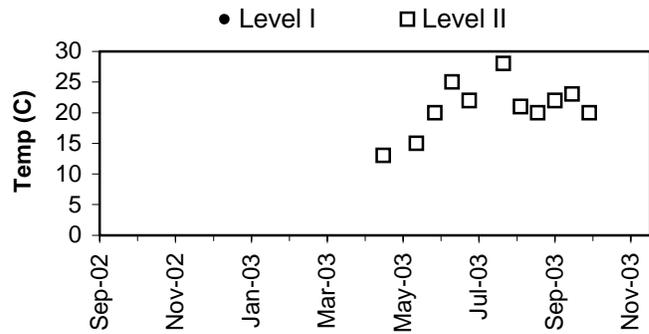
Volunteer monitoring began at Lake Alice in 2000 and continued through 2003. The lake is relatively low in phytoplankton productivity (oligotrophic – mesotrophic) with very good water quality. Lake Alice itself makes up over 20% of the watershed, which means that direct rainfall is an important source of water entering the lake, protecting water quality. There is a large Class 1 wetland in the watershed, which surrounds much of the lake and makes up a large percent of the catchment (King County, 1990). Land use analysis of 2002 aerial photographs showed 59% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Lake Alice has a public access boat ramp and aquatic plants growing around the lake should be tracked to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

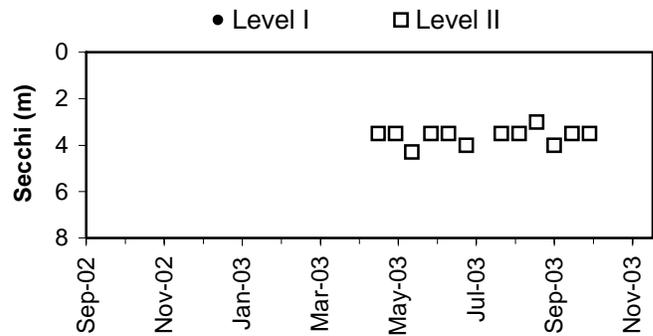
Physical Parameters

Secchi transparency was relatively stable from May through October, varying from 3 to 4.3m. Surface temperatures from May through October were similar to other lakes monitored in 2003, with a maximum of 28.0 deg C. Both the local precipitation and the lake level readings were incomplete for the year.

Lake Temperature



Secchi Depth

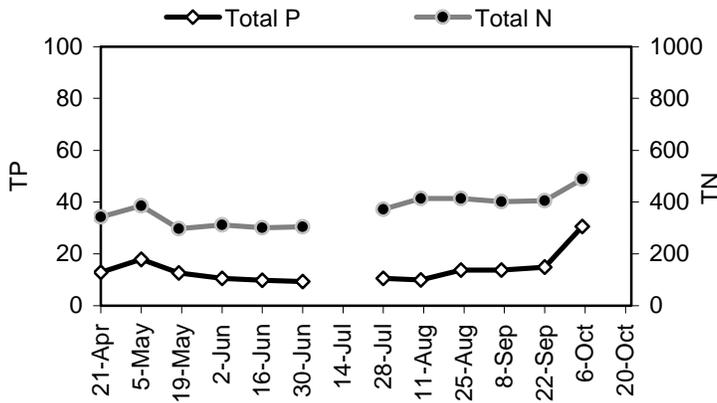


Lake Level and Precipitation

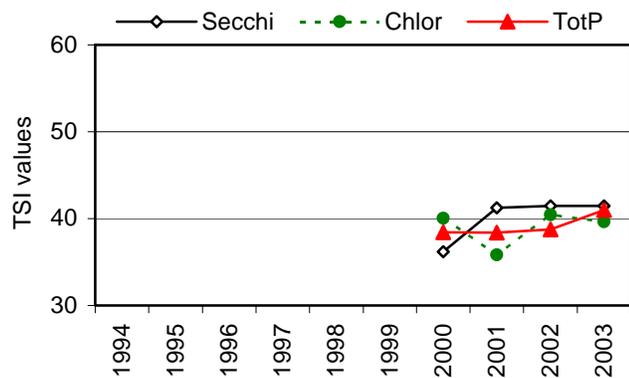


Alice

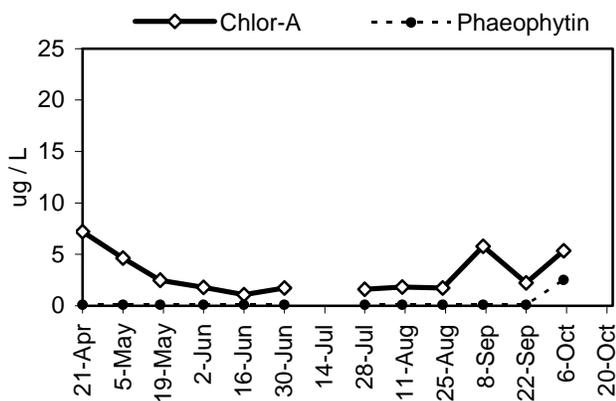
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|------------------------------|----------------|
| <i>Botryococcus braunii</i> | chlorophyte |
| <i>Peridinium</i> sp. | dinoflagellate |
| <i>Ceratium hirundinella</i> | dinoflagellate |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling season, with the N:P ratio ranging from 16 to 41. The ratio was generally above the range considered good for nuisance bluegreen algae. TSI values in 2003 varied near the threshold of 40, which divides the oligotrophic and mesotrophic categories. All three values were close to each other.

Chlorophyll and Algae

Chlorophyll concentrations in the lake remained relatively stable through the sampling season, with the maximum at the beginning and then again in fall. The dominant species in the fall were the chlorophyte *Botryococcus braunii* and an unidentified chlorophyte filament. Other important algae included species of dinoflagellates, with *Peridinium* and *Ceratium* noteworthy. The bluegreen *Anabaena* was present in both spring and autumn samples.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 3.5 | 7.2 | 13.0 | 343 | 1 | 26 | 41.9 | 49.9 | 41.1 | |
| 5-May | | 3.5 | 4.6 | 17.9 | 386 | 0 | 22 | 41.9 | 45.6 | 45.8 | |
| 18-May | 15.0 | 4.3 | 2.5 | 12.7 | 297 | 2 | 23 | 39.0 | 39.5 | 40.8 | |
| 2-Jun | 20.0 | 3.5 | 1.8 | 10.6 | 312 | 2 | 29 | 41.9 | 36.3 | 38.2 | |
| 16-Jun | 25.0 | 3.5 | 1.1 | 9.9 | 300 | 3 | 30 | 41.9 | 31.5 | 37.2 | Large bloom 4ft below surface - looks like bottom. |
| 30-Jun | 22.0 | 4.0 | 1.7 | 9.4 | 304 | 0 | 32 | 40.0 | 36.0 | 36.5 | |
| 14-Jul | | | | | | | | | | | No sample. |
| 28-Jul | 28.0 | 3.5 | 1.6 | 10.6 | 372 | 1 | 35 | 41.9 | 35.2 | 38.2 | |
| 11-Aug | 21.0 | 3.5 | 1.8 | 10.0 | 414 | 1 | 41 | 41.9 | 36.4 | 37.4 | |
| 25-Aug | 20.0 | 3.0 | 1.7 | 13.8 | 414 | 1 | 30 | 44.1 | 36.0 | 42.0 | |
| 8-Sep | 22.0 | 4.0 | 5.8 | 13.8 | 402 | 1 | 29 | 40.0 | 47.8 | 42.0 | |
| 22-Sep | 23.0 | 3.5 | 2.2 | 14.9 | 405 | 1 | 27 | 41.9 | 38.5 | 43.1 | |
| 6-Oct | 20.0 | 3.5 | 5.3 | 30.6 | 489 | 1 | 16 | 41.9 | 47.0 | 53.5 | |
| 20-Oct | | | | | | | | | | | No sample. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.8 | 3.6 | 3.1 | 13.9 | 369.8 | 1.2 | 29 | 41.5 | 40.0 | 41.3 | TSI Average = 40.9 |
| Median | 21.0 | 3.5 | 2.0 | 12.8 | 379.0 | 1 | 29 | 41.9 | 37.5 | 41.0 | |
| Min | 13.0 | 3.0 | 1.1 | 9.4 | 297.0 | 0 | 16 | 39.0 | 31.5 | 36.5 | |
| Max | 28.0 | 4.3 | 7.2 | 30.6 | 489.0 | 3 | 41 | 44.1 | 49.9 | 53.5 | |
| Count | 11 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |

Allen

Lake Overview

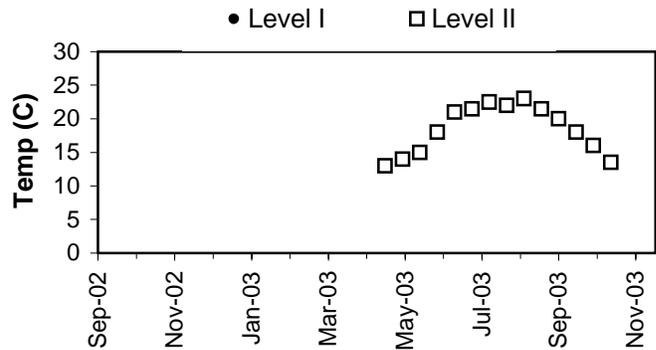
Volunteer monitoring began at Allen Lake in 1994 and continued through 2003. The lake is consistently high in primary productivity (eutrophic), with fair water quality. Since the lake makes up only 2% of the entire catchment area, runoff and groundwater provide most of the water entering the lake. Land use analysis of 2002 aerial photographs showed over 65% of the surrounding watershed has been developed for uses other than agriculture or forestry. The lake may be naturally productive as a part of a large Class 1 wetland system (King County, 1990).

Allen Lake does not have a public access boat ramp. However, residents should monitor aquatic plants to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious aquatic weeds.

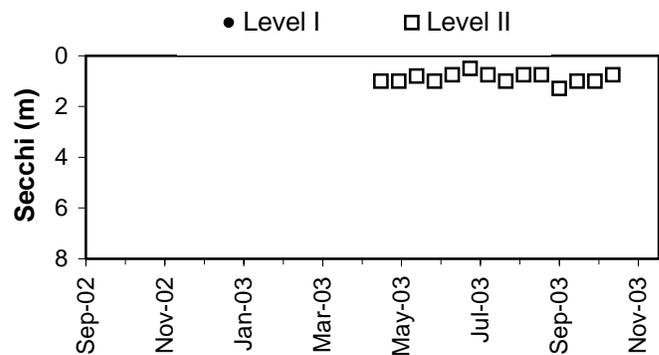
Physical Parameters

Secchi transparency was relatively stable through the sampling period, remaining close to 1m, in part due to the highly colored water. Surface temperatures were similar to other small lakes monitored in 2002, with a maximum reading of 23 degrees Celsius. Both the local precipitation and the lake level readings were incomplete for the year.

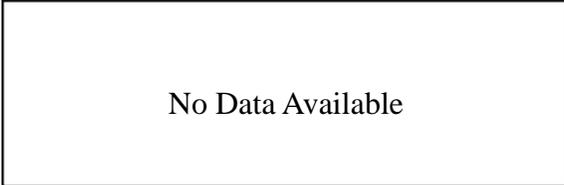
Lake Temperature



Secchi Depth

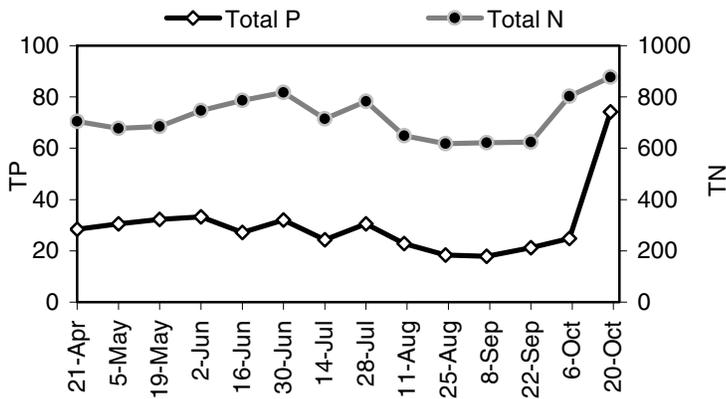


Lake Level and Precipitation

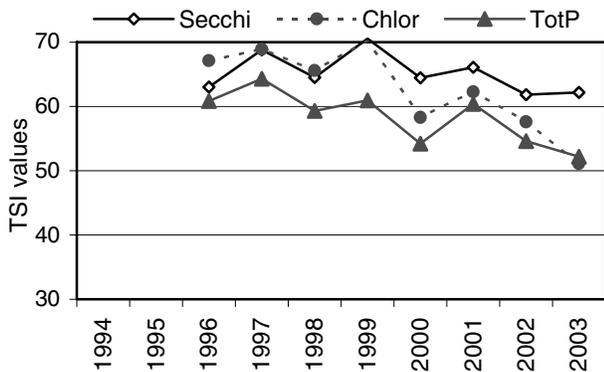


Allen

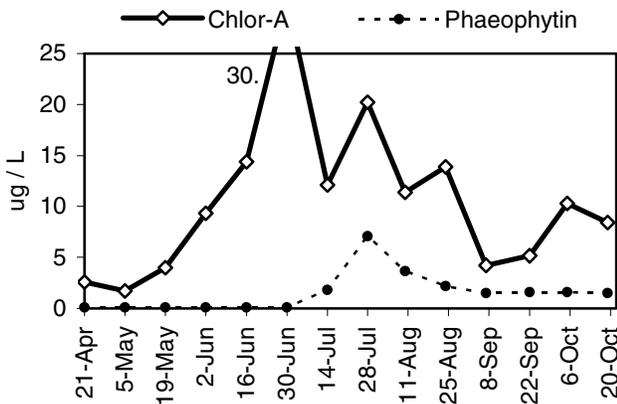
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Common algae

Group

| | |
|---------------------------------|----------------|
| <i>Ceratium hirundinella</i> | dinoflagellate |
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Cryptomonas sp.</i> | cryptophyte |

Nutrient Analysis and TSI Ratings

Both total phosphorus and total nitrogen remained steady through the summer and increased in mid fall. The N:P ratio ranged from 12 to 35, indicating some periods were favorable for bluegreen algal growth. Recent TSI values have suggested a downward trend in productivity, and the 2003 values continued the decline. For the past four years TSI-Secchi has been higher than the other two indicators, suggesting that water color may be affecting the value.

Chlorophyll and Algae

Chlorophyll values reached a peak in late June and declined through the summer, with a small peak in October. Pheophytin (degraded chlorophyll) rose in July, suggesting the sample contained some bottom material. Phytoplankton populations in the lake were dominated by the dinoflagellate *Ceratium*, which was replaced in mid-October by the bluegreen *Aphanizomenon*. Also common were several species of cryptomonads and the chrysophyte *Dinobryon*.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 1.0 | 2.6 | 28.4 | 704 | 1 | 25 | 60.0 | 39.9 | 52.4 | |
| 5-May | 14.0 | 1.0 | 1.7 | 30.6 | 677 | 1 | 22 | 60.0 | 35.9 | 53.5 | Large clumps at shoreline |
| 19-May | 15.0 | 0.8 | 4.0 | 32.3 | 684 | 1 | 21 | 63.2 | 44.2 | 54.3 | |
| 2-Jun | 18.0 | 1.0 | 9.3 | 33.3 | 747 | 1 | 22 | 60.0 | 52.5 | 54.7 | |
| 16-Jun | 21.0 | 0.8 | 14.4 | 27.2 | 786 | 1 | 29 | 64.2 | 56.7 | 51.8 | |
| 30-Jun | 21.5 | 0.5 | 30.3 | 32.1 | 818 | 2 | 25 | 70.0 | 64.0 | 54.2 | |
| 14-Jul | 22.5 | 0.8 | 12.1 | 24.3 | 714 | 1 | 29 | 64.2 | 55.0 | 50.2 | |
| 28-Jul | 22.0 | 1.0 | 20.2 | 30.6 | 782 | | 26 | 60.0 | 60.1 | 53.5 | |
| 11-Aug | 23.0 | 0.8 | 11.4 | 22.9 | 648 | | 28 | 64.2 | 54.4 | 49.3 | |
| 25-Aug | 21.5 | 0.8 | 13.9 | 18.4 | 618 | 1 | 34 | 64.2 | 56.4 | 46.2 | |
| 8-Sep | 20.0 | 1.3 | 4.2 | 17.9 | 621 | 1 | 35 | 56.2 | 44.7 | 45.8 | |
| 22-Sep | 18.0 | 1.0 | 5.2 | 21.2 | 624 | 1 | 29 | 60.0 | 46.6 | 48.2 | |
| 6-Oct | 16.0 | 1.0 | 10.3 | 24.9 | 802 | 1 | 32 | 60.0 | 53.4 | 50.5 | |
| 20-Oct | 13.5 | 0.8 | 8.4 | 74.2 | 877 | | 12 | 64.2 | 51.5 | 66.3 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.5 | 0.9 | 10.6 | 29.9 | 721.6 | 1.1 | 26 | 62.2 | 51.1 | 52.2 | TSI Average = 55.2 |
| Median | 19.0 | 0.9 | 9.8 | 27.8 | 709.0 | 1 | 27 | 61.6 | 53.0 | 52.1 | |
| Min | 13.0 | 0.5 | 1.7 | 17.9 | 618.0 | 1 | 12 | 56.2 | 35.9 | 45.8 | |
| Max | 23.0 | 1.3 | 30.3 | 74.2 | 877.0 | 2 | 35 | 70.0 | 64.0 | 66.3 | |
| Count | 14 | 14 | 14 | 14 | 14 | 11 | 14 | 14 | 14 | 14 | |

Ames

Lake Overview

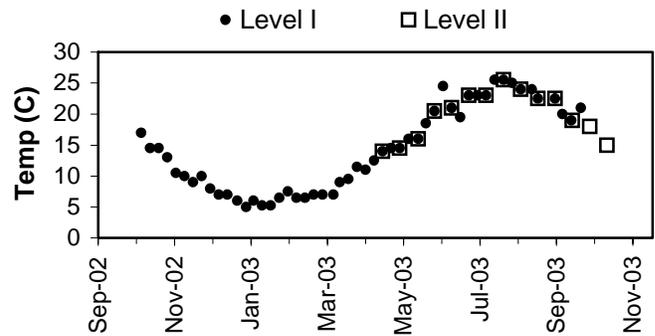
Volunteer monitoring began at Ames Lake in 2000 and continued through 2003. The four years of data collected indicate the lake is low to moderate in primary productivity (oligotrophic to mesotrophic) with very good water quality. The lake surface makes up about 7% of the drainage area, indicating that surface runoff and groundwater likely constitute the majority of water inputs. Land use analysis of 2002 aerial photographs showed 55% of the surrounding watershed has been developed for uses other than agriculture or forestry. The King County Wetland Inventory listed two Class 1 wetlands that drain to the lake (King County, 1990).

Ames Lake does not have a public access boat ramp. However, residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

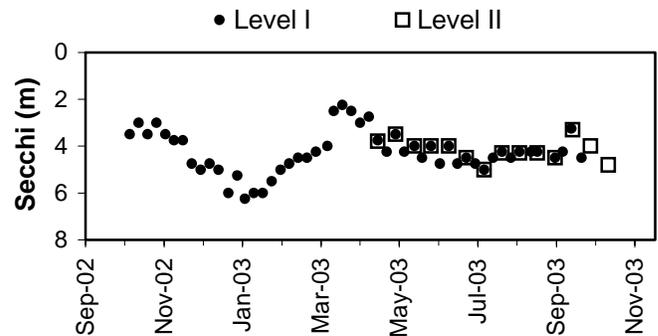
Physical Parameters

Secchi transparency ranged from 2.3 to 6.3m through the year, with the clearest period in mid-winter. Surface water temperatures ranged from 5.0 to 25.5 degrees Celsius. Lake level rose sharply in fall, was relatively stable through the winter and declined slowly in summer to the low stand at the end of the water year.

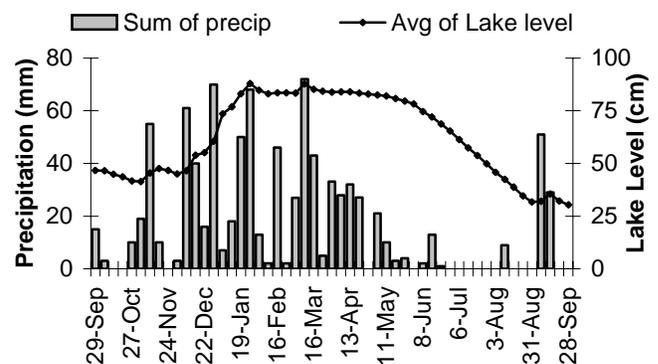
Lake Temperature



Secchi Depth

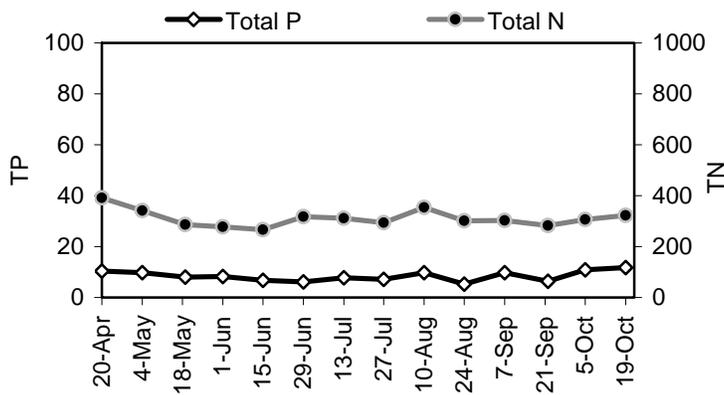


Lake Level and Precipitation

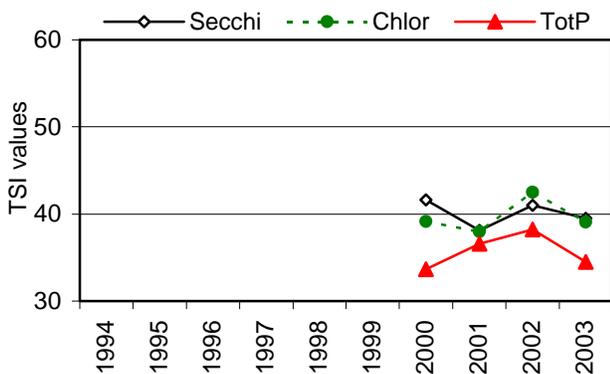


Ames

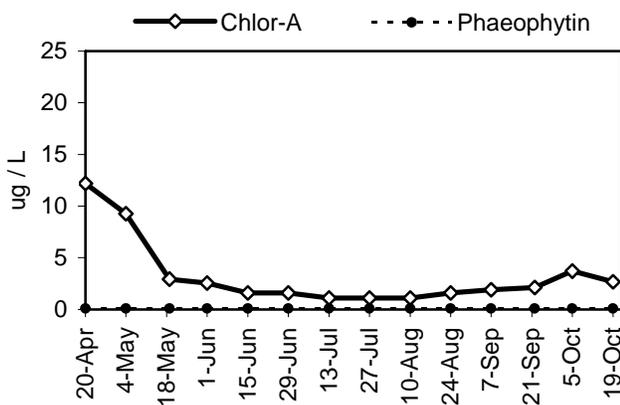
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|--------------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Cyclotella</i> sp. | chrysophyte diatom |
| <i>Trachelomonas</i> sp. | euglenophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained stable and in fairly constant proportion to each other over the season. The N:P ratio ranged from 27 to 58, indicating inhospitable conditions for bluegreens. The TSI values for Secchi and chlorophyll were in good agreement with each other, close to the threshold of mesotrophic productivity, while TSI-TotP was lower.

Chlorophyll and Algae

Chlorophyll concentrations were highest in spring and dropped to low levels through the rest of the sampling season. Algae populations in the lake also reached their maximum in spring, dominated by the diatom *Cyclotella bodanica*, similar to the two previous years. Other dominant algae included an unidentified chrysophyte species and the dinoflagellate *Trachelomonas*. Bluegreens were occasionally present, but uncommon.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 15.0 | 5 | 46.6 | 5 | | | | | | | |
| 6-Oct-02 | 3.0 | 7 | 46.4 | 7 | 6-Oct-02 | 13:35 | 3.5 | 17.0 | P2 | C1 | 0 |
| 13-Oct-02 | 0.1 | 7 | 44.7 | 7 | 13-Oct-02 | 10:40 | 3.0 | 14.5 | NA | C2 | 0 |
| 20-Oct-02 | 0.0 | 7 | 43.6 | 7 | 20-Oct-02 | 11:40 | 3.5 | 14.5 | P1 | C2/P2 | 0 |
| 27-Oct-02 | 10.0 | 7 | 41.6 | 7 | 27-Oct-02 | 13:45 | 3.0 | 13.0 | P1 | C2/P2 | 0 |
| 3-Nov-02 | 19.0 | 7 | 41.3 | 7 | 3-Nov-02 | 13:15 | 3.5 | 10.5 | P1 | C1/P2 | 0 |
| 10-Nov-02 | 55.0 | 7 | 45.4 | 7 | 10-Nov-02 | 15:35 | 3.8 | 10.0 | P1 | C1/P2 | 0 |
| 17-Nov-02 | 10.0 | 7 | 47.6 | 7 | 17-Nov-02 | 14:00 | 3.8 | 9.0 | NA | P1 | 0 |
| 24-Nov-02 | 0.0 | 7 | 46.6 | 7 | 24-Nov-02 | 12:30 | 4.8 | 10.0 | NA | P1 | 0 |
| 1-Dec-02 | 3.1 | 7 | 44.9 | 7 | 1-Dec-02 | 13:15 | 5.0 | 8.0 | NA | P1 | 0 |
| 8-Dec-02 | 61.0 | 7 | 46.4 | 7 | 8-Dec-02 | 14:20 | 4.8 | 7.0 | NA | P1 | 0 |
| 15-Dec-02 | 40.0 | 7 | 53.9 | 7 | 15-Dec-02 | 13:55 | 5.0 | 7.0 | NA | P1 | 0 |
| 22-Dec-02 | 16.0 | 7 | 55.1 | 7 | 23-Dec-02 | 11:00 | 6.0 | 6.0 | P2 | P1 | 0 |
| 29-Dec-02 | 70.0 | 7 | 60.6 | 7 | 30-Dec-02 | 11:30 | 5.3 | 5.0 | NA | P1 | 0 |
| 5-Jan-03 | 7.0 | 7 | 73.6 | 7 | 5-Jan-03 | 11:45 | 6.3 | 6.0 | NA | P1 | 0 |
| 12-Jan-03 | 18.0 | 7 | 76.9 | 7 | 12-Jan-03 | 12:35 | 6.0 | 5.3 | NA | P2 | 0 |
| 19-Jan-03 | 50.0 | 7 | 83.0 | 7 | 19-Jan-03 | 14:10 | 6.0 | 5.3 | NA | P2 | 0 |
| 26-Jan-03 | 68.0 | 7 | 87.9 | 7 | 26-Jan-03 | 14:20 | 5.5 | 6.5 | NA | P2 | 0 |
| 2-Feb-03 | 13.0 | 7 | 84.7 | 7 | 2-Feb-03 | 15:00 | 5.0 | 7.5 | NA | P2 | 0 |
| 9-Feb-03 | 2.0 | 7 | 83.0 | 7 | 9-Feb-03 | 11:30 | 4.8 | 6.5 | NA | P2 | 0 |
| 16-Feb-03 | 46.0 | 7 | 83.6 | 7 | 16-Feb-03 | 16:00 | 4.5 | 6.5 | NA | P2 | 0 |
| 23-Feb-03 | 2.0 | 7 | 83.6 | 7 | 23-Feb-03 | 15:20 | 4.5 | 7.0 | NA | P2 | 0 |
| 2-Mar-03 | 27.0 | 7 | 83.3 | 7 | 2-Mar-03 | 15:15 | 4.3 | 7.0 | NA | P2 | 0 |
| 9-Mar-03 | 72.0 | 7 | 87.7 | 7 | 11-Mar-03 | 16:30 | 4.0 | 7.0 | NA | P2 | 0 |
| 16-Mar-03 | 43.0 | 7 | 85.1 | 7 | 16-Mar-03 | 16:00 | 2.5 | 9.0 | NA | C3/P3 | 0 |
| 23-Mar-03 | 5.0 | 7 | 84.3 | 7 | 23-Mar-03 | 13:15 | 2.3 | 9.5 | NA | C3/P3 | 0 |
| 30-Mar-03 | 33.0 | 7 | 83.9 | 7 | 30-Mar-03 | 16:30 | 2.5 | 11.5 | C1 | C3/P3 | 0 |
| 6-Apr-03 | 28.0 | 7 | 84.0 | 7 | 6-Apr-03 | 15:40 | 3.0 | 11.0 | P3 | P3 | 2 |
| 13-Apr-03 | 32.0 | 2 | 84.0 | 2 | 13-Apr-03 | 16:00 | 2.8 | 12.5 | P3 | P3 | 0 |
| 20-Apr-03 | 27.1 | 7 | 83.4 | 7 | 20-Apr-03 | 11:50 | 3.8 | 14.0 | P3 | P3 | 2 |
| 27-Apr-03 | 0.1 | 7 | 82.9 | 7 | 27-Apr-03 | 16:30 | 4.3 | 14.5 | P3 | P3 | 0 |
| 4-May-03 | 21.0 | 7 | 82.4 | 7 | 4-May-03 | 14:00 | 3.5 | 14.5 | P3 | P3 | 0 |
| 11-May-03 | 10.0 | 7 | 82.0 | 7 | 11-May-03 | 19:30 | 4.3 | 16.0 | P2 | P2 | 0 |
| 18-May-03 | 3.1 | 7 | 80.9 | 7 | 19-May-03 | 17:30 | 4.0 | 16.0 | P1 | P1 | 0 |
| 25-May-03 | 4.0 | 7 | 79.6 | 7 | 25-May-03 | 18:00 | 4.5 | 18.5 | P1 | P1 | 0 |
| 1-Jun-03 | 0.0 | 7 | 78.3 | 7 | 1-Jun-03 | 15:00 | 4.0 | 20.5 | NA | NA | 3 |
| 8-Jun-03 | 2.0 | 7 | 74.6 | 7 | 8-Jun-03 | 16:45 | 4.8 | 24.5 | P1 | P1 | 12 |
| 15-Jun-03 | 13.0 | 7 | 72.0 | 7 | 15-Jun-03 | 12:25 | 4.0 | 21.0 | P1 | P1 | 0 |
| 22-Jun-03 | 1.0 | 7 | 68.7 | 7 | 22-Jun-03 | 16:20 | 4.8 | 19.5 | P1 | P1 | 0 |
| 29-Jun-03 | 0.0 | 7 | 65.3 | 7 | 29-Jun-03 | 18:20 | 4.5 | 23.0 | P1 | P1 | 29 |
| 6-Jul-03 | 0.1 | 7 | 61.3 | 7 | 6-Jul-03 | 17:20 | 4.8 | 23.0 | P1 | P1 | 15 |
| 13-Jul-03 | 0.1 | 7 | 57.3 | 7 | 13-Jul-03 | 19:20 | 5.0 | 23.0 | P1 | P1 | 0 |
| 20-Jul-03 | 0.0 | 7 | 53.7 | 7 | 20-Jul-03 | 19:40 | 4.5 | 25.5 | P1 | P1 | 12 |
| 27-Jul-03 | 0.0 | 7 | 49.7 | 7 | 27-Jul-03 | 18:00 | 4.3 | 25.5 | P1 | P1 | 0 |
| 3-Aug-03 | 0.1 | 7 | 45.7 | 7 | 3-Aug-03 | 17:45 | 4.5 | 25.0 | P2 | P2 | 0 |
| 10-Aug-03 | 9.0 | 7 | 42.4 | 7 | 10-Aug-03 | 19:30 | 4.3 | 24.0 | P2 | P2 | 0 |
| 17-Aug-03 | 0.0 | 7 | 38.7 | 7 | 19-Aug-03 | 17:00 | 4.3 | 24.0 | P2 | P2 | 1 |
| 24-Aug-03 | 0.0 | 7 | 34.7 | 7 | 24-Aug-03 | 12:45 | 4.3 | 22.5 | P2 | P2 | 0 |
| 31-Aug-03 | 0.0 | 7 | 31.7 | 7 | | | | | | | |
| 7-Sep-03 | 51.0 | 7 | 32.0 | 7 | 7-Sep-03 | 14:45 | 4.5 | 22.5 | P1 | P1 | 0 |
| 14-Sep-03 | 29.0 | 7 | 35.6 | 7 | 13-Sep-03 | 10:15 | 4.3 | 20.0 | P1 | P1 | 0 |
| 21-Sep-03 | 0.0 | 7 | 32.3 | 7 | 20-Sep-03 | 17:00 | 3.3 | 19.0 | P1 | P1 | 20 |
| 28-Sep-03 | 0.0 | 3 | 30.3 | 3 | 28-Sep-03 | 15:20 | 4.5 | 21.0 | P1 | P1 | 0 |
| Min | 0.0 | | 30.3 | | Min | | 2.3 | 5.0 | | | 0 |
| Max | 72.0 | | 87.9 | | Max | | 6.3 | 25.5 | | | 29 |
| Total | 918.4 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 3.8 | 12.2 | 10.4 | 392 | 3 | 38 | 40.7 | 55.1 | 37.9 | |
| 4-May | 14.5 | 3.5 | 9.3 | 9.7 | 342 | 3 | 35 | 41.9 | 52.4 | 36.9 | Lots of yellow pollen. |
| 19-May | 16.0 | 4.0 | 2.9 | 8.0 | 286 | 2 | 36 | 40.0 | 41.1 | 34.1 | |
| 1-Jun | 20.5 | 4.0 | 2.6 | 8.3 | 278 | 0 | 33 | 40.0 | 39.8 | 34.7 | |
| 15-Jun | 21.0 | 4.0 | 1.6 | 6.7 | 267 | 1 | 40 | 40.0 | 35.2 | 31.6 | |
| 29-Jun | 23.0 | 4.5 | 1.6 | 6.1 | 318 | 1 | 52 | 38.3 | 35.2 | 30.2 | |
| 13-Jul | 23.0 | 5.0 | 1.1 | 7.8 | 312 | 1 | 40 | 36.8 | 31.5 | 33.8 | |
| 27-Jul | 25.5 | 4.3 | 1.1 | 7.1 | 294 | 1 | 41 | 39.0 | 31.5 | 32.4 | |
| 10-Aug | 24.0 | 4.3 | 1.1 | 9.8 | 354 | 2 | 36 | 39.0 | 31.5 | 37.1 | |
| 24-Aug | 22.5 | 4.3 | 1.6 | 5.2 | 302 | 2 | 58 | 39.0 | 35.2 | 27.9 | |
| 7-Sep | 22.5 | 4.5 | 1.9 | 9.8 | 303 | 1 | 31 | 38.3 | 36.9 | 37.1 | |
| 21-Sep | 19.0 | 3.3 | 2.1 | 6.4 | 283 | 1 | 44 | 42.8 | 38.0 | 30.9 | |
| 5-Oct | 18.0 | 4.0 | 3.7 | 10.9 | 307 | 1 | 28 | 40.0 | 43.4 | 38.6 | Wind blown algae on surface at shore. |
| 19-Oct | 15.0 | 4.8 | 2.7 | 11.8 | 323 | 1 | 27 | 37.4 | 40.3 | 39.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.9 | 4.2 | 3.3 | 8.4 | 311.5 | 1.4 | 39 | 39.5 | 39.1 | 34.5 | TSI Average = 37.7 |
| Median | 20.8 | 4.2 | 2.0 | 8.2 | 305.0 | 1 | 37 | 39.5 | 37.4 | 34.4 | |
| Min | 14.0 | 3.3 | 1.1 | 5.2 | 267.0 | 0 | 27 | 36.8 | 31.5 | 27.9 | |
| Max | 25.5 | 5.0 | 12.2 | 11.8 | 392.0 | 3 | 58 | 42.8 | 55.1 | 39.8 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Angle

Lake Overview

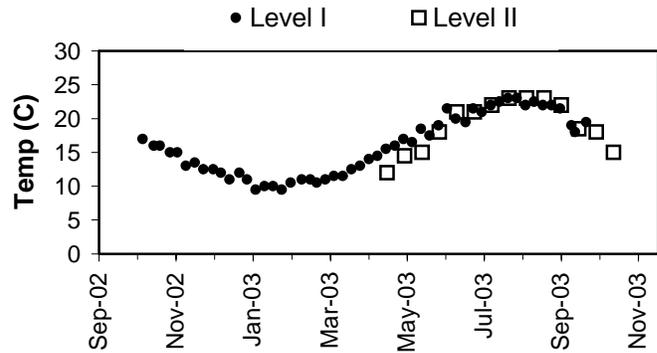
Volunteer monitoring began at Angle Lake in the 1980s and continued through 2003. Collected data show that this lake inside the city of SeaTac is low in primary productivity (oligotrophic), with excellent water quality. However, productivity appears to be increasing over the last six years. Since the lake surface makes up 20% of the total drainage area, direct precipitation is an important input, although stormwater runoff and groundwater also contribute. Land use analysis of 2002 aerial photographs showed 90% of the surrounding watershed has been developed for uses other than agriculture or forestry. There are no inventoried wetlands in the basin (King County, 1990), and the urban nature of area land use is an important factor.

Angle Lake has a public access boat ramp, and residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

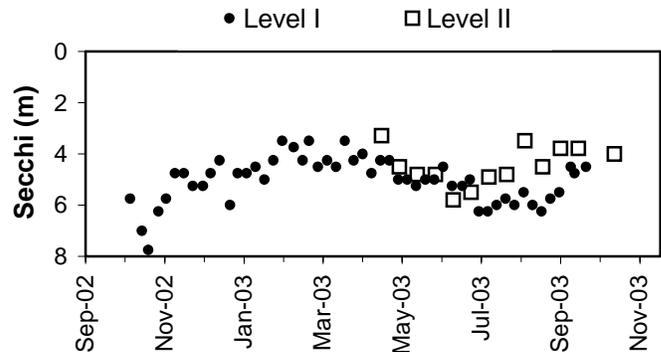
Physical Parameters

Secchi transparency ranged from 3.5 to 7.8m during the year. Surface water temperatures ranged from 9.5 to 23 degrees Celsius. Water levels climbed steadily from a low stand in fall to a high in April, dropping steadily through the rest of the water year. Precipitation was concentrated in November through April typical of the region and consistent with water levels in the lake.

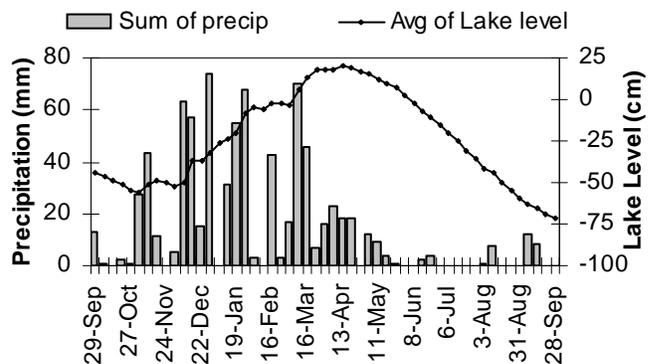
Lake Temperature



Secchi Depth

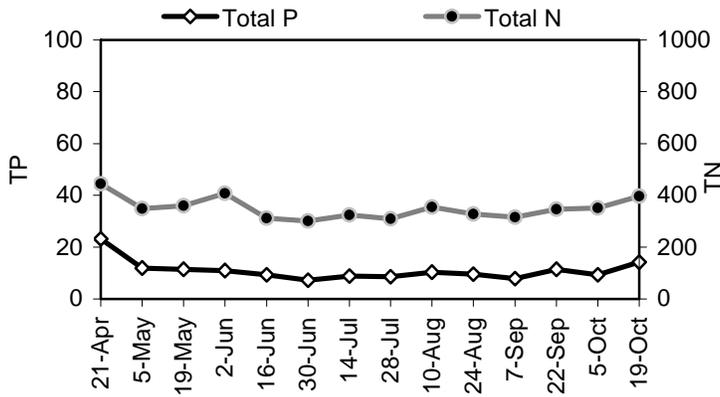


Lake Level and Precipitation

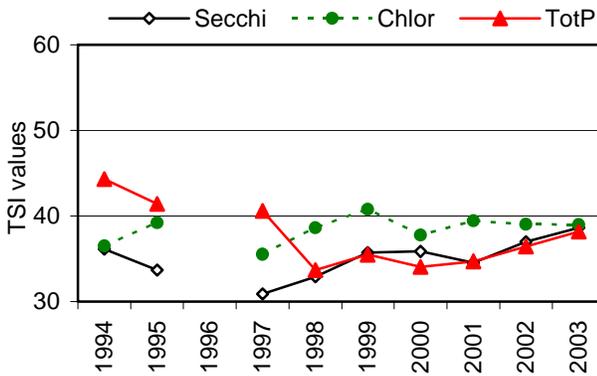


Angle

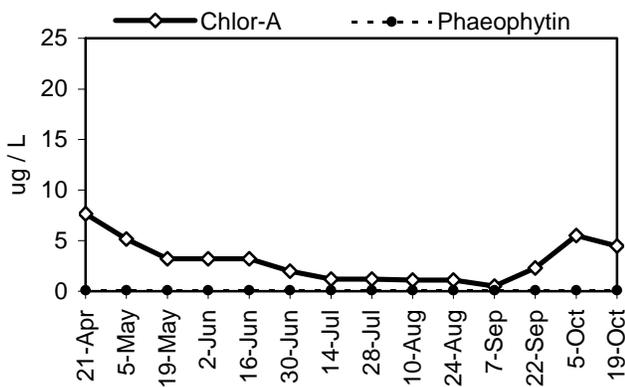
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|------------------------|-------------|
| unidentified species | chrysophyte |
| <i>Staurastrum</i> sp. | chlorophyte |
| <i>Anabaena</i> sp. | bluegreen |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained closely proportional to each other through the period of measurement, with their ratio ranging from 19 to 41, indicating generally poor conditions for bluegreens. The three TSI values were very similar, falling within the higher end of the oligotrophic range.

Chlorophyll and Algae

Chlorophyll concentrations were generally low, with small elevations in spring and fall. There were many species of algae present, with no one species predominating over the others. Bluegreen algae were present, but not common until autumn, when *Anabaena* became prominent in the phytoplankton community.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 13.1 | 5 | -44.4 | 5 | | | | | | | |
| 6-Oct-02 | 0.5 | 7 | -46.0 | 7 | 6-Oct-02 | 13:55 | 5.8 | 17.0 | P1 | P1 | 5 |
| 13-Oct-02 | 0.0 | 7 | -49.1 | 7 | 15-Oct-02 | 11:25 | 7.0 | 16.0 | P1 | C1/P1 | 15 |
| 20-Oct-02 | 2.1 | 7 | -51.5 | 7 | 20-Oct-02 | 11:17 | 7.8 | 16.0 | P1 | P1 | 2 |
| 27-Oct-02 | 1.0 | 7 | -54.3 | 7 | 28-Oct-02 | 12:05 | 6.3 | 15.0 | NA | C1 | 2 |
| 3-Nov-02 | 27.5 | 7 | -55.5 | 7 | 3-Nov-02 | 11:33 | 5.8 | 15.0 | C2 | C2/P1 | 23 |
| 10-Nov-02 | 43.1 | 7 | -50.9 | 7 | 10-Nov-02 | 15:07 | 4.8 | 13.0 | C2 | C2 | 0 |
| 17-Nov-02 | 11.6 | 7 | -48.9 | 7 | 17-Nov-02 | 11:00 | 4.8 | 13.5 | C1 | C1 | 11 |
| 24-Nov-02 | 0.1 | 7 | -50.3 | 7 | 24-Nov-02 | 15:21 | 5.3 | 12.5 | P1 | P1 | 2 |
| 1-Dec-02 | 5.1 | 7 | -52.0 | 7 | 2-Dec-02 | 11:25 | 5.3 | 12.5 | C1 | C1 | 0 |
| 8-Dec-02 | 63.1 | 7 | -49.9 | 7 | 8-Dec-02 | 14:59 | 4.8 | 12.0 | C1 | C1 | 24 |
| 15-Dec-02 | 57.0 | 7 | -37.4 | 7 | 15-Dec-02 | 14:07 | 4.3 | 11.0 | C1 | C2 | 0 |
| 22-Dec-02 | 15.1 | 7 | -36.5 | 7 | 23-Dec-02 | 11:42 | 6.0 | 12.0 | C1 | C1 | 19 |
| 29-Dec-02 | 74.0 | 7 | -31.7 | 7 | 29-Dec-02 | 11:40 | 4.8 | 11.0 | C1 | C1 | 17 |
| 5-Jan-03 | 0.1 | 7 | -26.3 | 7 | 5-Jan-03 | 14:33 | 4.8 | 9.5 | C1/P1 | C1/P1 | 17 |
| 12-Jan-03 | 31.1 | 7 | -24.0 | 7 | 12-Jan-03 | 11:16 | 4.5 | 10.0 | C1/P1 | C1/P1 | 23 |
| 19-Jan-03 | 55.0 | 7 | -20.8 | 7 | 19-Jan-03 | 15:14 | 5.0 | 10.0 | P1 | P1 | 1 |
| 26-Jan-03 | 67.5 | 6 | -8.2 | 6 | 26-Jan-03 | 11:17 | 4.3 | 9.5 | P1 | P1 | 1 |
| 2-Feb-03 | 3.1 | 7 | -4.8 | 7 | 2-Feb-03 | 14:00 | 3.5 | 10.5 | P1 | P1 | 18 |
| 9-Feb-03 | 0.1 | 6 | -6.1 | 6 | 11-Feb-03 | 9:00 | 3.8 | 11.0 | P2 | P2 | 9 |
| 16-Feb-03 | 43.0 | 7 | -2.8 | 7 | 18-Feb-03 | 10:38 | 4.3 | 11.0 | P1 | P1 | 13 |
| 23-Feb-03 | 3.0 | 7 | -2.5 | 7 | 23-Feb-03 | 15:59 | 3.5 | 10.5 | P1 | P1 | 5 |
| 2-Mar-03 | 16.6 | 7 | -3.0 | 7 | 2-Mar-03 | 14:32 | 4.5 | 11.0 | P1 | P1 | 2 |
| 9-Mar-03 | 70.0 | 7 | 5.8 | 7 | 9-Mar-03 | 11:54 | 4.3 | 11.5 | P1 | P1 | 5 |
| 16-Mar-03 | 45.5 | 7 | 12.7 | 7 | 16-Mar-03 | 11:02 | 4.5 | 11.5 | P1 | P2 | 6 |
| 23-Mar-03 | 7.0 | 7 | 17.6 | 7 | 23-Mar-03 | 15:45 | 3.5 | 12.5 | P1 | P2 | 2 |
| 30-Mar-03 | 16.0 | 7 | 17.4 | 7 | 30-Mar-03 | 14:42 | 4.3 | 13.0 | P1 | P2 | 2 |
| 6-Apr-03 | 23.0 | 7 | 18.1 | 7 | 6-Apr-03 | 15:00 | 4.0 | 14.0 | P2 | P2 | 5 |
| 13-Apr-03 | 18.0 | 7 | 20.0 | 7 | 13-Apr-03 | 13:45 | 4.8 | 14.5 | P2 | P2 | 14 |
| 20-Apr-03 | 18.0 | 7 | 18.7 | 7 | 20-Apr-03 | 16:00 | 4.3 | 15.5 | P2 | P2 | 5 |
| 27-Apr-03 | 0.0 | 7 | 17.0 | 7 | 27-Apr-03 | 14:15 | 4.3 | 16.0 | P2 | P2 | 4 |
| 4-May-03 | 12.0 | 7 | 15.0 | 7 | 4-May-03 | 11:10 | 5.0 | 17.0 | P2 | P2 | 10 |
| 11-May-03 | 9.1 | 7 | 11.7 | 7 | 11-May-03 | 12:00 | 5.0 | 16.5 | P2 | P2 | 5 |
| 18-May-03 | 4.0 | 7 | 9.4 | 7 | 18-May-03 | 12:40 | 5.3 | 18.5 | P2 | P2 | 6 |
| 25-May-03 | 1.0 | 7 | 6.7 | 7 | 25-May-03 | 12:30 | 5.0 | 17.5 | P2 | P2 | 5 |
| 1-Jun-03 | 0.0 | 7 | 2.4 | 7 | 1-Jun-03 | 16:55 | 5.0 | 19.0 | P2 | P2 | 38 |
| 8-Jun-03 | 0.1 | 7 | -2.7 | 7 | 8-Jun-03 | 16:30 | 4.5 | 21.5 | P1 | P1 | 36 |
| 15-Jun-03 | 2.1 | 7 | -6.9 | 7 | 15-Jun-03 | 16:10 | 5.3 | 20.0 | P1 | P1 | 62 |
| 22-Jun-03 | 4.0 | 7 | -10.5 | 7 | 23-Jun-03 | 13:31 | 5.3 | 19.5 | P1 | P1 | 43 |
| 29-Jun-03 | 0.0 | 7 | -15.5 | 7 | 29-Jun-03 | 15:19 | 5.0 | 21.5 | P1 | P1 | 64 |
| 6-Jul-03 | 0.0 | 7 | -20.3 | 7 | 6-Jul-03 | 11:25 | 6.3 | 21.0 | P1 | P1 | 68 |
| 13-Jul-03 | 0.0 | 7 | -25.2 | 7 | 13-Jul-03 | 13:30 | 6.3 | 22.0 | P1 | P1 | 38 |
| 20-Jul-03 | 0.0 | 7 | -30.5 | 7 | 20-Jul-03 | 11:30 | 6.0 | 22.5 | P1 | P1 | 13 |
| 27-Jul-03 | 0.0 | 7 | -36.1 | 7 | 27-Jul-03 | 11:15 | 5.8 | 23.0 | P1 | P1 | 25 |
| 3-Aug-03 | 1.0 | 7 | -41.3 | 7 | 3-Aug-03 | 11:20 | 6.0 | 23.0 | P2 | P2 | 2 |
| 10-Aug-03 | 8.0 | 7 | -44.5 | 7 | 10-Aug-03 | 11:55 | 5.5 | 22.0 | P2 | P2 | 0 |
| 17-Aug-03 | 0.0 | 7 | -49.8 | 7 | 17-Aug-03 | 11:25 | 6.0 | 22.5 | P1 | P1 | 33 |
| 24-Aug-03 | 0.0 | 7 | -55.0 | 7 | 24-Aug-03 | 7:55 | 6.3 | 22.0 | P1 | P1 | 40 |
| 31-Aug-03 | 0.0 | 7 | -59.6 | 7 | 31-Aug-03 | 11:18 | 5.8 | 22.0 | P2 | P2 | 24 |
| 7-Sep-03 | 12.0 | 7 | -62.9 | 7 | 7-Sep-03 | 11:20 | 5.5 | 21.5 | P1 | P1 | 3 |
| 14-Sep-03 | 8.1 | 7 | -65.7 | 7 | 16-Sep-03 | 15:35 | 4.5 | 19.0 | P1 | P1 | 2 |
| 21-Sep-03 | 0.0 | 7 | -68.6 | 7 | 19-Sep-03 | 11:53 | 4.8 | 18.0 | P2 | P2 | 7 |
| 28-Sep-03 | 0.0 | 3 | -71.0 | 3 | 28-Sep-03 | 16:00 | 4.5 | 19.5 | P2 | P2 | |
| Min | 0.0 | | -71.0 | | Min | | 3.5 | 9.5 | | | 0 |
| Max | 74.0 | | 20.0 | | Max | | 6.3 | 23.0 | | | 68 |
| Total | 791.0 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 12.0 | 3.3 | 7.7 | 23.1 | 445 | 2 | 19 | 42.8 | 50.5 | 49.4 | |
| 5-May | 14.5 | 4.5 | 5.2 | 12.0 | 349 | 2 | 29 | 38.3 | 46.7 | 40.0 | |
| 19-May | 15.0 | 4.8 | 3.2 | 11.5 | 360 | 2 | 31 | 37.4 | 42.0 | 39.4 | |
| 2-Jun | 18.0 | 4.8 | 3.2 | 10.9 | 408 | 1 | 37 | 37.4 | 42.0 | 38.6 | |
| 16-Jun | 21.0 | 5.8 | 3.2 | 9.4 | 311 | 1 | 33 | 34.6 | 42.0 | 36.5 | No algae. |
| 30-Jun | 21.0 | 5.5 | 2.0 | 7.3 | 300 | 1 | 41 | 35.4 | 37.4 | 32.8 | |
| 14-Jul | 22.0 | 4.9 | 1.2 | 8.9 | 324 | 1 | 36 | 37.1 | 32.4 | 35.7 | |
| 28-Jul | 23.0 | 4.8 | 1.2 | 8.6 | 309 | 1 | 36 | 37.4 | 32.4 | 35.2 | |
| 11-Aug | 23.0 | 3.5 | 1.1 | 10.3 | 355 | | 34 | 41.9 | 31.5 | 37.8 | |
| 25-Aug | 23.0 | 4.5 | 1.1 | 9.6 | 327 | 1 | 34 | 38.3 | 31.5 | 36.8 | |
| 8-Sep | 22.0 | 3.8 | 0.6 | 7.9 | 315 | 1 | 40 | 40.7 | | 34.0 | Chlor-a value was <MDL. Reported as .6µgl. |
| 22-Sep | 18.5 | 3.8 | 2.3 | 11.4 | 346 | 2 | 30 | 40.7 | 38.8 | 39.3 | |
| 6-Oct | 18.0 | | 5.5 | 9.3 | 351 | 1 | 38 | | 47.3 | 36.3 | No secchi recorded. |
| 20-Oct | 15.0 | 4.0 | 4.5 | 14.2 | 397 | 1 | 28 | 40.0 | 45.3 | 42.4 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.0 | 4.5 | 3.0 | 11.0 | 349.8 | 1.3 | 33 | 38.6 | 40.0 | 38.2 | TSI Average = 38.9 |
| Median | 19.8 | 4.5 | 2.8 | 10.0 | 347.5 | 1 | 34 | 38.3 | 42.0 | 37.3 | |
| Min | 12.0 | 3.3 | 0.6 | 7.3 | 300.0 | 1 | 19 | 34.6 | 31.5 | 32.8 | |
| Max | 23.0 | 5.8 | 7.7 | 23.1 | 445.0 | 2 | 41 | 42.8 | 50.5 | 49.4 | |
| Count | 14 | 13 | 14 | 14 | 14 | 13 | 14 | 13 | 13 | 14 | |

Beaver-1

Lake Overview

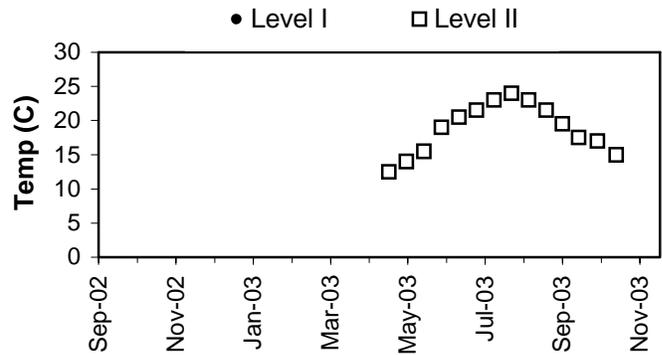
Volunteer monitoring began at Beaver Lake-1 in 1997 and continued through 2003. Monitoring data show that this lake in the city of Sammamish is relatively high in primary productivity (mesotrophic to eutrophic), with fair water quality, which may be improving over time. Since the lake surface makes up only 5% of the drainage area, direct precipitation is less important than runoff or groundwater. Land use analysis of 2002 aerial photographs showed only 19% of the surrounding watershed has been developed for uses other than agriculture or forestry. There are several significant wetlands in the basin (King County, 1990). Enhancement of productivity through human impacts is likely to be occurring.

Beaver-1 has no public access boat ramp, but can be accessed through Beaver-2. Residents should monitor plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious aquatic weeds.

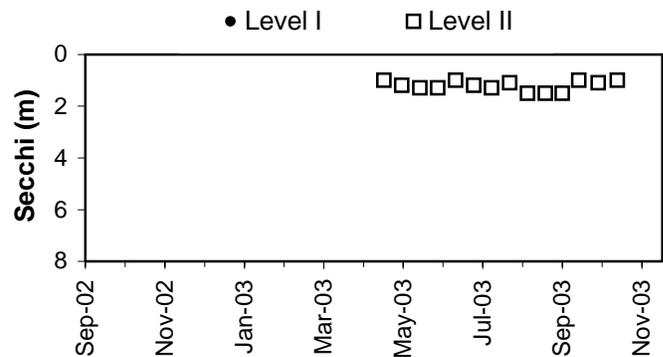
Physical Parameters

Secchi transparency remained steady through the sampling season, ranging from 1.0 to 1.5, affected by the tea-colored water. Surface water temperatures were similar to other small lakes in 2003, with a high of 24.0 degrees Celsius. There were no data collected on lake levels or precipitation.

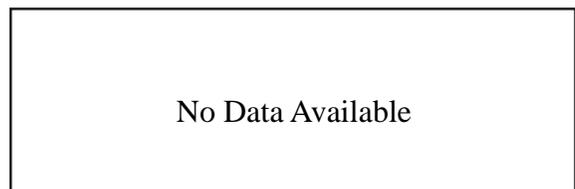
Lake Temperature



Secchi Depth

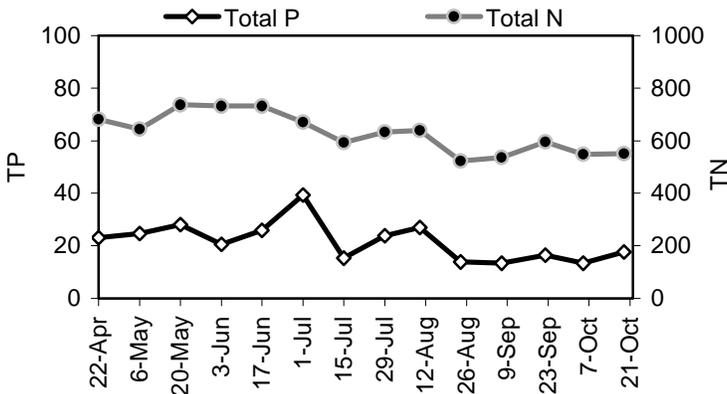


Lake Level and Precipitation

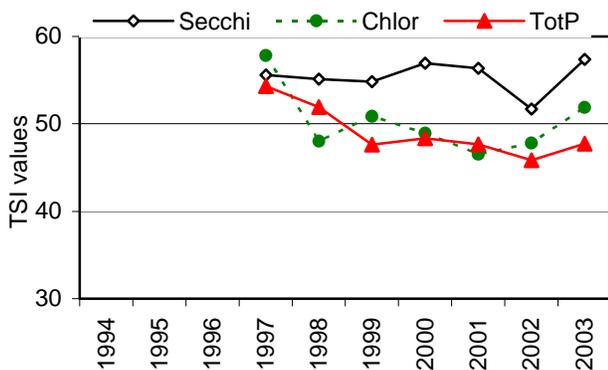


Beaver-1

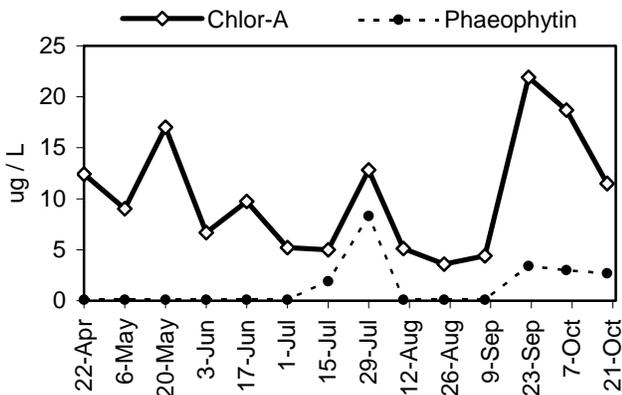
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Botryococcus</i> sp. | chlorophyte |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained generally proportional to each other through the period, the ratio ranging from 17 to 41, indicating that conditions were generally unfavorable for bluegreens. In 2003 the average TSI-Secchi was higher than the other two indicators, similar to the previous five years. If the TSI-Secchi relates more to water color than algae, the other two indicators may be more indicative of trophic state, and place Beaver-1 at the threshold between mesotrophy and eutrophy, slightly higher than the past three years.

Chlorophyll and Algae

Chlorophyll content reached several peaks through the sampling period, with the greatest in late September, which was produced by an increase in several unidentified species of chrysophyte algae. The bluegreen *Aphanizomenon flos-aquae* was predominant early in the season, but became less important as summer progressed. Other bluegreens were present, but not important.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 22-Apr | 12.5 | 1.0 | 12.4 | 23.1 | 682 | 2 | 30 | 60.0 | 55.3 | 49.4 | |
| 6-May | 14.0 | 1.2 | 9.0 | 24.6 | 645 | 2 | 26 | 57.4 | 52.2 | 50.4 | Mild bloom with pollen scum. |
| 20-May | 15.5 | 1.3 | 17.0 | 28.0 | 737 | 2 | 26 | 56.2 | 58.4 | 52.2 | |
| 3-Jun | 19.0 | 1.3 | 6.7 | 20.5 | 732 | 3 | 36 | 56.2 | 49.2 | 47.7 | |
| 17-Jun | 20.5 | 1.0 | 9.8 | 25.9 | 732 | 3 | 28 | 60.0 | 52.9 | 51.1 | Major bloom on Sunday. |
| 1-Jul | 21.5 | 1.2 | 5.2 | 39.3 | 671 | 3 | 17 | 57.4 | 46.8 | 57.1 | Much better today. Had major bloom on 6/25 - 6/26. |
| 15-Jul | 23.0 | 1.3 | 5.0 | 15.3 | 594 | 2 | 39 | 56.2 | 46.4 | 43.5 | |
| 29-Jul | 24.0 | 1.1 | 12.8 | 23.8 | 633 | 3 | 27 | 58.6 | 55.6 | 49.9 | Lots of algae all summer so far! |
| 12-Aug | 23.0 | 1.5 | 5.1 | 26.9 | 639 | 3 | 24 | 54.1 | 46.6 | 51.6 | Noticed another bloom this past week. |
| 26-Aug | 21.5 | 1.5 | 3.6 | 13.8 | 523 | 2 | 38 | 54.1 | 43.1 | 42.0 | Algae noted as P2.5. |
| 8-Sep | 19.5 | 1.5 | 4.4 | 13.4 | 536 | 2 | 40 | 54.1 | 45.1 | 41.6 | |
| 21-Sep | 17.5 | 1.0 | 21.9 | 16.4 | 596 | 3 | 36 | 60.0 | 60.8 | 44.5 | Thick algae 1 foot below surface over much of lake. |
| 6-Oct | 17.0 | 1.1 | 18.7 | 13.4 | 548 | 3 | 41 | 58.6 | 59.3 | 41.6 | Continuous bloom for two weeks. |
| 21-Oct | 15.0 | 1.0 | 11.5 | 17.6 | 551 | 3 | 31 | 60.0 | 54.5 | 45.5 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.8 | 1.2 | 10.2 | 21.6 | 629.9 | 2.6 | 31 | 57.4 | 51.9 | 47.7 | TSI Average = 52.3 |
| Median | 19.3 | 1.2 | 9.4 | 21.8 | 636.0 | 3 | 30 | 57.4 | 52.5 | 48.6 | |
| Min | 12.5 | 1.0 | 3.6 | 13.4 | 523.0 | 2 | 17 | 54.1 | 43.1 | 41.6 | |
| Max | 24.0 | 1.5 | 21.9 | 39.3 | 737.0 | 3 | 41 | 60.0 | 60.8 | 57.1 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Beaver-2

Lake Overview

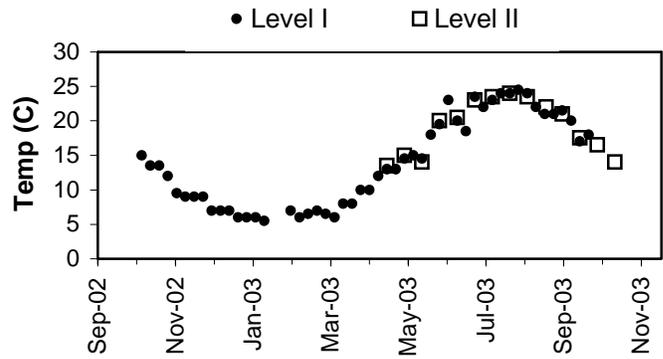
Volunteer monitoring began at Beaver-2 in the 1980s and continued through 2003. The data collected show that this lake in the city of Sammamish is currently moderate in primary productivity (mesotrophic), with good water quality. Since the surface area of the lake makes up only 9% of the drainage area, direct precipitation is less important than runoff, inlet streams and groundwater. Land use analysis of 2002 aerial photographs showed that 45% of the surrounding watershed has been developed for uses other than agriculture or forestry. There are significant wetlands in the basin (King County, 1990). Enhancement of productivity through human impacts is likely to be occurring.

Beaver-2 has a public access boat ramp, and residents should monitor plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

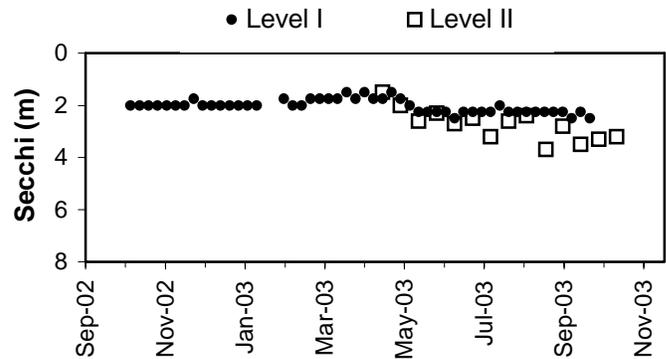
Physical Parameters

Secchi transparency remained steady, ranging from 1.5 to 3.7m in depth, with the deeper values in the fall and significantly deeper than Beaver-1. Surface water temperatures ranged from 5.5 to 24.5 degrees Celsius. Water levels followed the typical regional pattern of a winter high stand, decreasing through the summer.

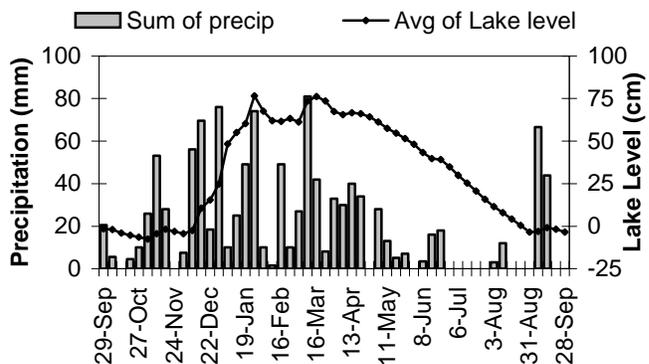
Lake Temperature



Secchi Depth

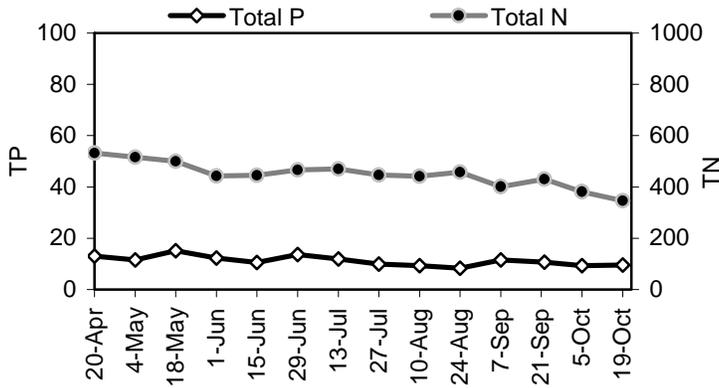


Lake Level and Precipitation

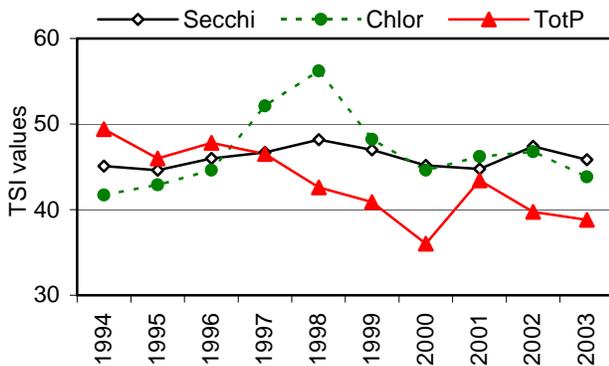


Beaver-2

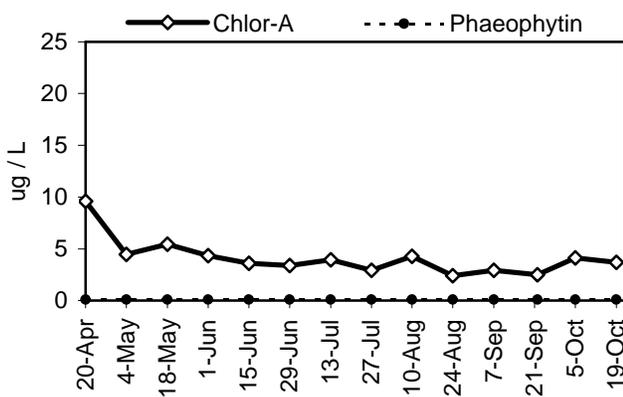
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained fairly constant over the period of measurement and in proportion to each other, with the ratio ranging from 33 to 55. In 2003, the TSI-TP was lower than the other two indicators, similar to values in 1998-2002. The values for TSI-chlor and TSI-Secchi have tracked each other closely since 1999. Beaver-2 continued to be in the mid-mesotrophic range.

Chlorophyll and Algae

Chlorophyll content decreased from the high value on the first sampling date to relatively low values, which persisted through the end of October, with no fall increase recorded. Phytoplankton populations made two peaks in spring and summer. The spring peak was caused by the bluegreens *Aphanizomenon* and *Anabaena* spp., while the chrysophyte *Dinobryon* and several species of cryptophytes were important through the season.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 20.5 | 5 | -1.5 | 5 | | | | | | | |
| 6-Oct-02 | 5.5 | 7 | -1.9 | 7 | 6-Oct-02 | 8:00 | 2.0 | 15.0 | NA | NA | 6 |
| 13-Oct-02 | 0.0 | 7 | -4.0 | 7 | 13-Oct-02 | 8:00 | 2.0 | 13.5 | C1 | C1 | 0 |
| 20-Oct-02 | 4.5 | 7 | -5.3 | 7 | 20-Oct-02 | 8:00 | 2.0 | 13.5 | C1 | C1 | 54 |
| 27-Oct-02 | 10.0 | 7 | -6.5 | 7 | 27-Oct-02 | 7:00 | 2.0 | 12.0 | C1 | C1 | 40 |
| 3-Nov-02 | 26.0 | 7 | -7.5 | 7 | 3-Nov-02 | 8:00 | 2.0 | 9.5 | NA | C1 | 0 |
| 10-Nov-02 | 53.0 | 7 | -4.4 | 7 | 10-Nov-02 | 8:00 | 2.0 | 9.0 | NA | C1 | 31 |
| 17-Nov-02 | 28.0 | 7 | -1.7 | 7 | 17-Nov-02 | 8:00 | 2.0 | 9.0 | NA | C1 | 47 |
| 24-Nov-02 | 0.0 | 7 | -3.1 | 7 | 24-Nov-02 | 8:30 | 1.8 | 9.0 | NA | C1 | 36 |
| 1-Dec-02 | 7.5 | 7 | -4.4 | 7 | 1-Dec-02 | 8:45 | 2.0 | 7.0 | NA | C1 | 6 |
| 8-Dec-02 | 56.0 | 7 | -2.4 | 7 | 8-Dec-02 | 8:00 | 2.0 | 7.0 | C1 | C1 | 37 |
| 15-Dec-02 | 69.5 | 7 | 10.6 | 7 | 15-Dec-02 | 8:00 | 2.0 | 7.0 | C1 | C1 | 0 |
| 22-Dec-02 | 18.5 | 7 | 15.5 | 7 | 22-Dec-02 | 8:30 | 2.0 | 6.0 | C1 | C1 | 6 |
| 29-Dec-02 | 76.0 | 7 | 24.9 | 7 | 29-Dec-02 | 8:15 | 2.0 | 6.0 | NA | NA | 0 |
| 5-Jan-03 | 10.0 | 7 | 48.4 | 7 | 5-Jan-03 | 8:15 | 2.0 | 6.0 | NA | NA | 26 |
| 12-Jan-03 | 25.0 | 7 | 55.0 | 7 | 12-Jan-03 | 8:30 | 2.0 | 5.5 | NA | NA | 6 |
| 19-Jan-03 | 49.0 | 7 | 60.4 | 7 | | | | | | | |
| 26-Jan-03 | 74.0 | 7 | 76.5 | 7 | | | | | | | |
| 2-Feb-03 | 10.0 | 7 | 67.6 | 7 | 2-Feb-03 | 8:00 | 1.8 | 7.0 | C3 | C2 | 2 |
| 9-Feb-03 | 1.5 | 7 | 62.0 | 7 | 9-Feb-03 | 8:15 | 2.0 | 6.0 | NA | NA | 5 |
| 16-Feb-03 | 49.0 | 7 | 61.6 | 7 | 16-Feb-03 | 8:45 | 2.0 | 6.5 | NA | NA | 6 |
| 23-Feb-03 | 10.0 | 7 | 63.3 | 7 | 23-Feb-03 | 7:30 | 1.8 | 7.0 | NA | NA | 2 |
| 2-Mar-03 | 27.1 | 7 | 61.1 | 7 | 2-Mar-03 | 7:45 | 1.8 | 6.5 | NA | C1 | 4 |
| 9-Mar-03 | 81.0 | 7 | 73.6 | 7 | 9-Mar-03 | 8:30 | 1.8 | 6.0 | NA | C1 | 4 |
| 16-Mar-03 | 42.0 | 7 | 76.1 | 7 | 16-Mar-03 | 8:00 | 1.8 | 8.0 | NA | C1 | 2 |
| 23-Mar-03 | 8.1 | 7 | 73.6 | 7 | 23-Mar-03 | 8:00 | 1.5 | 8.0 | NA | C1 | 2 |
| 30-Mar-03 | 33.1 | 7 | 67.4 | 7 | 30-Mar-03 | 7:45 | 1.8 | 10.0 | NA | NA | 2 |
| 6-Apr-03 | 30.1 | 7 | 65.4 | 7 | 6-Apr-03 | 8:00 | 1.5 | 10.0 | NA | NA | 2 |
| 13-Apr-03 | 40.1 | 7 | 66.7 | 7 | 13-Apr-03 | 8:15 | 1.8 | 12.0 | NA | NA | 2 |
| 20-Apr-03 | 34.0 | 7 | 66.0 | 7 | 20-Apr-03 | 8:00 | 1.8 | 13.0 | NA | NA | 2 |
| 27-Apr-03 | 0.0 | 7 | 64.1 | 7 | 27-Apr-03 | 7:30 | 1.5 | 13.0 | NA | NA | 0 |
| 4-May-03 | 28.0 | 7 | 61.3 | 7 | 4-May-03 | 8:00 | 1.8 | 14.5 | NA | NA | 2 |
| 11-May-03 | 13.0 | 7 | 57.4 | 7 | 11-May-03 | 7:50 | 2.0 | 15.0 | NA | NA | 2 |
| 18-May-03 | 5.1 | 7 | 54.6 | 7 | 18-May-03 | 7:30 | 2.3 | 14.5 | NA | NA | 2 |
| 25-May-03 | 7.0 | 7 | 51.5 | 7 | 25-May-03 | 8:00 | 2.3 | 18.0 | NA | NA | 4 |
| 1-Jun-03 | 0.0 | 7 | 48.0 | 7 | 1-Jun-03 | 7:45 | 2.3 | 19.5 | NA | NA | 2 |
| 8-Jun-03 | 3.5 | 7 | 43.3 | 7 | 8-Jun-03 | 7:30 | 2.3 | 23.0 | NA | NA | 6 |
| 15-Jun-03 | 16.0 | 7 | 39.6 | 7 | 15-Jun-03 | 7:30 | 2.5 | 20.0 | NA | NA | 10 |
| 22-Jun-03 | 18.0 | 7 | 39.0 | 7 | 22-Jun-03 | 8:30 | 2.3 | 18.5 | NA | NA | 16 |
| 29-Jun-03 | 0.0 | 7 | 34.7 | 7 | 29-Jun-03 | 8:30 | 2.3 | 23.5 | NA | NA | 8 |
| 6-Jul-03 | 0.0 | 7 | 29.9 | 7 | 6-Jul-03 | 8:00 | 2.3 | 22.0 | NA | NA | 0 |
| 13-Jul-03 | 0.0 | 7 | 25.5 | 7 | 13-Jul-03 | 7:30 | 2.3 | 23.0 | NA | NA | 10 |
| 20-Jul-03 | 0.0 | 7 | 20.6 | 7 | 20-Jul-03 | 7:30 | 2.0 | 24.0 | NA | NA | 25 |
| 27-Jul-03 | 0.0 | 7 | 15.9 | 7 | 27-Jul-03 | 8:30 | 2.3 | 24.0 | NA | NA | 8 |
| 3-Aug-03 | 3.0 | 7 | 11.5 | 7 | 3-Aug-03 | 8:00 | 2.3 | 24.5 | NA | NA | 0 |
| 10-Aug-03 | 12.0 | 7 | 8.1 | 7 | 10-Aug-03 | 8:15 | 2.3 | 24.0 | NA | NA | 6 |
| 17-Aug-03 | 0.0 | 7 | 4.3 | 7 | 17-Aug-03 | 8:00 | 2.3 | 22.0 | NA | NA | 6 |
| 24-Aug-03 | 0.0 | 7 | 0.5 | 7 | 24-Aug-03 | 7:30 | 2.3 | 21.0 | NA | NA | 3 |
| 31-Aug-03 | 0.0 | 7 | -3.4 | 7 | 31-Aug-03 | 8:30 | 2.3 | 21.0 | NA | NA | 12 |
| 7-Sep-03 | 66.5 | 7 | -3.0 | 7 | 7-Sep-03 | 7:45 | 2.3 | 21.5 | NA | NA | 0 |
| 14-Sep-03 | 44.0 | 7 | -0.8 | 7 | 14-Sep-03 | 7:30 | 2.5 | 20.0 | NA | NA | 8 |
| 21-Sep-03 | 0.0 | 7 | -1.8 | 7 | 21-Sep-03 | 7:45 | 2.3 | 17.0 | NA | NA | 18 |
| 28-Sep-03 | 0.0 | 3 | -3.5 | 3 | 28-Sep-03 | 7:30 | 2.5 | 18.0 | NA | NA | 40 |
| Min | 0.0 | | -7.5 | | Min | | 1.5 | 5.5 | | | 0 |
| Max | 81.0 | | 76.5 | | Max | | 2.5 | 24.5 | | | 54 |
| Total | 1114.9 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.5 | 1.5 | 9.6 | 13.1 | 532 | 2 | 41 | 54.1 | 52.8 | 41.3 | Algae visible on surface at lake edge. No bloom. |
| 4-May | 15.0 | 2.0 | 4.5 | 11.6 | 515 | 2 | 44 | 50.0 | 45.2 | 39.5 | |
| 18-May | 14.0 | 2.6 | 5.5 | 15.1 | 500 | 2 | 33 | 46.2 | 47.2 | 43.3 | |
| 1-Jun | 20.0 | 2.3 | 4.3 | 12.3 | 442 | 2 | 36 | 48.0 | 45.0 | 40.4 | |
| 15-Jun | 20.5 | 2.7 | 3.6 | 10.5 | 445 | 2 | 42 | 45.7 | 43.1 | 38.1 | |
| 29-Jun | 23.0 | 2.5 | 3.4 | 13.7 | 466 | 2 | 34 | 46.8 | 42.6 | 41.9 | |
| 13-Jul | 23.5 | 3.2 | 4.0 | 11.9 | 470 | 2 | 39 | 43.2 | 44.0 | 39.9 | |
| 27-Jul | 24.0 | 2.6 | 2.9 | 9.9 | 446 | 2 | 45 | 46.2 | 41.1 | 37.2 | |
| 10-Aug | 23.5 | 2.4 | 4.3 | 9.3 | 441 | 1 | 47 | 47.4 | 44.8 | 36.3 | |
| 25-Aug | 22.0 | 3.7 | 2.4 | 8.3 | 457 | 2 | 55 | 41.1 | 39.2 | 34.7 | |
| 7-Sep | 21.0 | 2.8 | 2.9 | 11.5 | 401 | 2 | 35 | 45.1 | 41.1 | 39.4 | |
| 21-Sep | 17.5 | 3.5 | 2.5 | 10.7 | 430 | 2 | 40 | 41.9 | 39.6 | 38.3 | |
| 5-Oct | 16.5 | 3.3 | 4.1 | 9.3 | 381 | 2 | 41 | 42.8 | 44.5 | 36.3 | |
| 19-Oct | 14.0 | 3.2 | 3.7 | 9.6 | 346 | 2 | 36 | 43.2 | 43.4 | 36.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.1 | 2.7 | 4.1 | 11.2 | 448.0 | 1.9 | 41 | 45.8 | 43.8 | 38.8 | TSI Average = 42.8 |
| Median | 20.3 | 2.7 | 3.8 | 11.1 | 445.5 | 2 | 40 | 45.9 | 43.7 | 38.9 | |
| Min | 13.5 | 1.5 | 2.4 | 8.3 | 346.0 | 1 | 33 | 41.1 | 39.2 | 34.7 | |
| Max | 24.0 | 3.7 | 9.6 | 15.1 | 532.0 | 2 | 55 | 54.1 | 52.8 | 43.3 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Bitter

Lake Overview

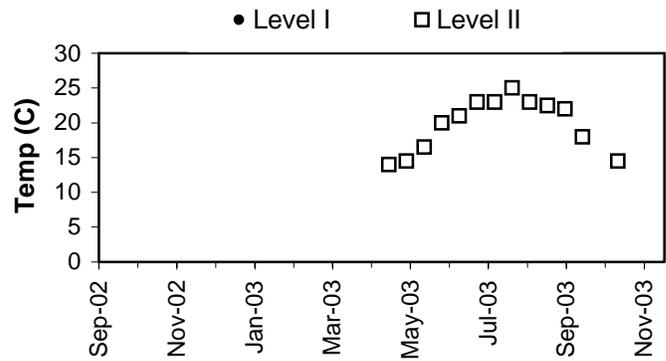
Volunteer monitoring began at Bitter Lake in the 1980s and continued, with a few exceptions, through 2003. The collected data classify this lake in the city of Seattle as moderate in primary productivity (mesotrophic), with good water quality, and remaining stable over time. The lake surface makes up 7% of the drainage area, suggesting that direct precipitation is less important than stormwater runoff and groundwater inputs. Land use analysis of 2002 aerial photographs showed close to 74% of the surrounding watershed has been developed for use. There are no significant wetlands in the basin, and the area is urban. Enhancement of productivity through human impacts is likely to be occurring.

Bitter Lake has no public access boat ramp, but car top boats can be launched through the city park. Residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious aquatic weeds.

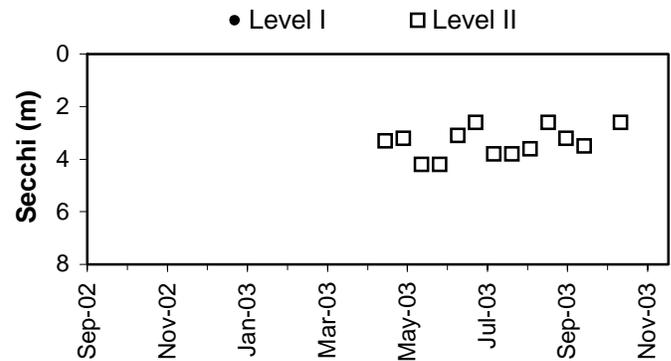
Physical Parameters

Secchi transparency ranged between 2.6 and 4.2m from May through October, similar to 2002. Surface water temperatures were similar to other small lakes in the region, reaching a maximum of 25.0 degrees Celsius. No water levels or precipitation were recorded for the year.

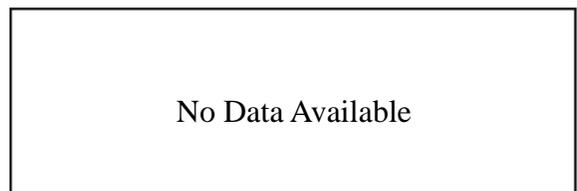
Lake Temperature



Secchi Depth

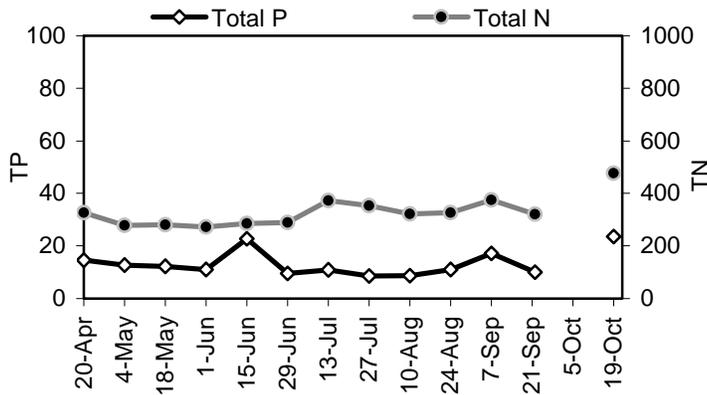


Lake Level and Precipitation

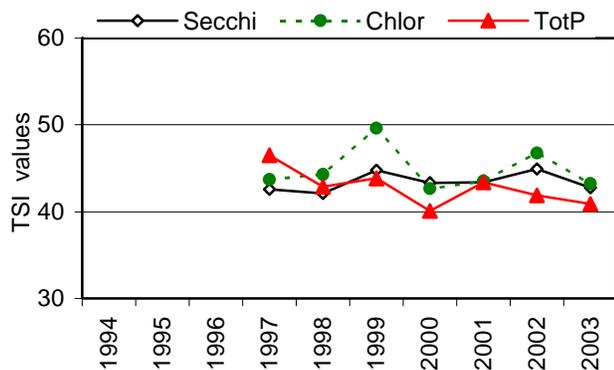


Bitter

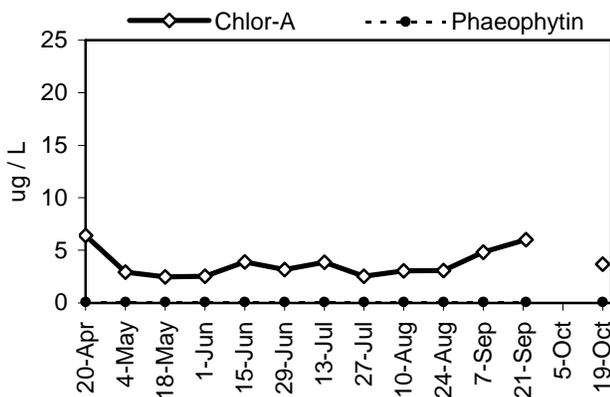
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|----------------|
| <i>Cosmarium</i> sp. | chlorophyte |
| <i>Peridinium</i> sp. | dinoflagellate |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other until late October when phosphorus increased more rapidly than nitrogen. Their ratio ranged from 13 to 41, but most values were well above 20, signifying poor conditions for bluegreen algae. TSI values for the three indicators were close to each other in 2003 and were well within the mesotrophic range, similar to previous years

Chlorophyll and Algae

Chlorophyll content decreased from a high value on the first sample date, remained steady through summer, and began climbing in September. The most common algae present included the chlorophyte *Cosmarium*, the dinoflagellate *Peridinium* and the chrysophyte *Dinobryon*. Bluegreen algae were found only rarely in the samples.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 3.3 | 6.4 | 14.6 | 326 | | 22 | 42.8 | 48.8 | 42.8 | |
| 4-May | 14.5 | 3.2 | 3.0 | 12.8 | 278 | | 22 | 43.2 | 41.2 | 40.9 | |
| 18-May | 16.5 | 4.2 | 2.5 | 12.2 | 280 | | 23 | 39.3 | 39.5 | 40.2 | |
| 1-Jun | 20.0 | 4.2 | 2.5 | 11.1 | 272 | | 25 | 39.3 | 39.7 | 38.9 | |
| 15-Jun | 21.0 | 3.1 | 3.9 | 22.7 | 285 | | 13 | 43.7 | 43.9 | 49.2 | |
| 29-Jun | 23.0 | 2.6 | 3.2 | 9.6 | 289 | | 30 | 46.2 | 42.0 | 36.8 | |
| 13-Jul | 23.0 | 3.8 | 3.9 | 10.9 | 372 | | 34 | 40.7 | 43.8 | 38.6 | |
| 27-Jul | 25.0 | 3.8 | 2.5 | 8.6 | 353 | | 41 | 40.7 | 39.7 | 35.2 | |
| 10-Aug | 23.0 | 3.6 | 3.1 | 8.7 | 321 | | 37 | 41.5 | 41.5 | 35.4 | |
| 24-Aug | 22.5 | 2.6 | 3.1 | 11.1 | 326 | | 29 | 46.2 | 41.7 | 38.9 | |
| 7-Sep | 22.0 | 3.2 | 4.8 | 17.1 | 375 | | 22 | 43.2 | 46.0 | 45.1 | |
| 21-Sep | 18.0 | 3.5 | 6.0 | 10.1 | 320 | | 32 | 41.9 | 48.2 | 37.5 | |
| 5-Oct | | | | | | | | | | | No sample |
| 19-Oct | 14.5 | 2.6 | 3.7 | 23.5 | 477 | | 20 | 46.2 | 43.4 | 49.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.8 | 3.4 | 3.7 | 13.3 | 328.8 | | 27 | 42.7 | 43.0 | 40.7 | TSI Average = 42.1 |
| Median | 21.0 | 3.3 | 3.2 | 11.1 | 321.0 | | 25 | 42.8 | 42.0 | 38.9 | |
| Min | 14.0 | 2.6 | 2.5 | 8.6 | 272.0 | | 13 | 39.3 | 39.5 | 35.2 | |
| Max | 25.0 | 4.2 | 6.4 | 23.5 | 477.0 | | 41 | 46.2 | 48.8 | 49.7 | |
| Count | 13 | 13 | 13 | 13 | 13 | | 13 | 13 | 13 | 13 | |

Boren

Lake Overview

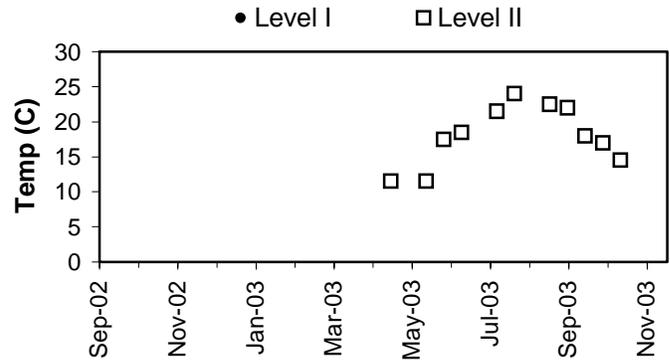
Volunteer monitoring began at Lake Boren in the 1980s and continued, with several gaps, through 2003. Collected data identify this lake in the city of Newcastle as moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up just 2% of the drainage area, direct precipitation is less important than the inlet stream, stormwater runoff and groundwater inputs. Land use analysis of 2002 aerial photographs showed nearly 52% of the surrounding watershed has been developed for uses other than agriculture or forestry. There are significant wetlands present in the basin. Enhancement of productivity through human impacts is likely to occur without careful planning.

Lake Boren has a car top boat launch in the park. Eurasian milfoil has been found in the nearshore environment, and residents should watch the lake for the spread of this species or early infestations of Brazilian elodea and other noxious aquatic weeds.

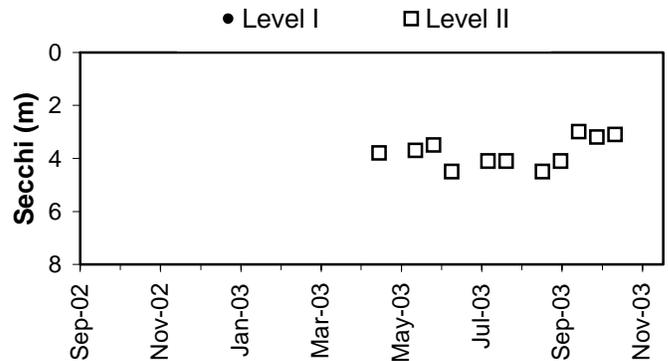
Physical Parameters

Secchi transparency ranged between 3.0 and 4.5m during the Level II sampling season. Level II surface water temperatures were similar to other small lakes in 2003, reaching a maximum of 24.0 degrees Celsius. Excellent precipitation and water level records were available, showing that the lake level is fairly stable through the year, with short-lived

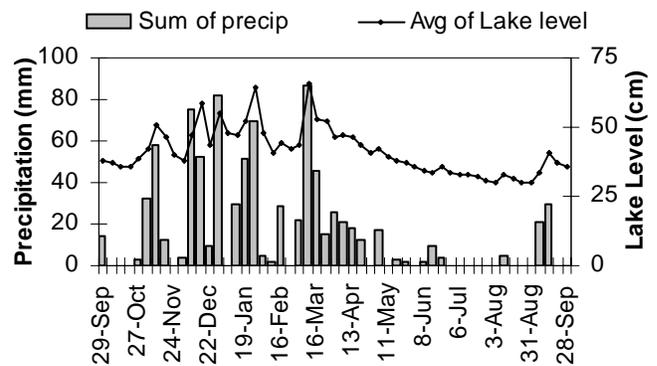
Lake Temperature



Secchi Depth

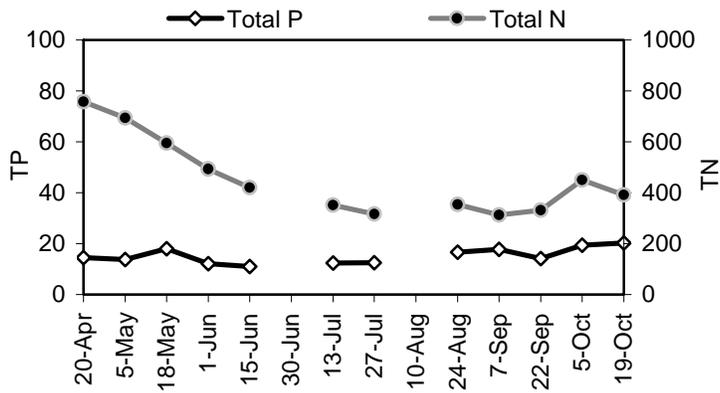


Lake Level and Precipitation

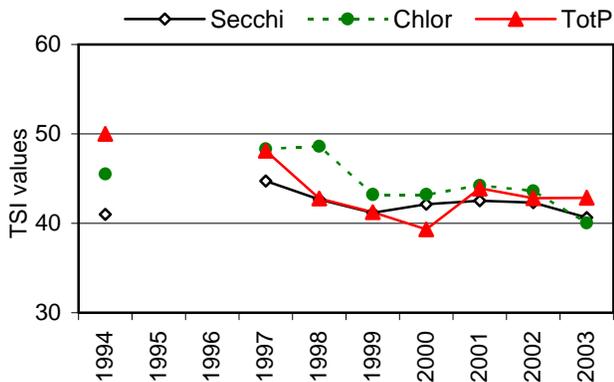


Boren

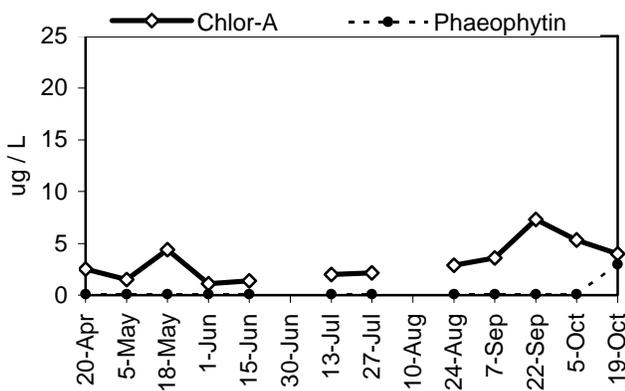
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|-------------|
| <i>Anabaena</i> sp. | bluegreen |
| <i>Dinobryon</i> sp. | chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |

peaks in winter that correspond to rainfall events, and a small decline over the summer through early fall.

Nutrient Analysis and TSI Ratings

Total nitrogen decreased while total phosphorus remained constant for the early part of the season, but remained essentially constant after mid-July. The N:P ratio ranged from 18 to 52. TSI values for 2003 were similar to the previous four years, with the indicators close to each other in the mesotrophic range.

Chlorophyll and Algae

Chlorophyll content remained relatively low until mid-September and then dropped again in October. The September peak was caused by the bluegreen *Anabaena*, followed by the diatom *Melosira*. Algae in the lake earlier in the season included various species of cryptophytes and chrysophytes such as *Dinobryon*.

Boren

2003 Level I Data

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|---------------|-----------------|-------------|
| 29-Sep-02 | 14.0 | 5 | 38.2 | 5 | | | | | | | |
| 6-Oct-02 | 0.0 | 7 | 36.9 | 7 | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | 36.0 | 7 | | | | | | | |
| 20-Oct-02 | 0.0 | 7 | 36.0 | 7 | | | | | | | |
| 27-Oct-02 | 3.0 | 7 | 38.4 | 7 | | | | | | | |
| 3-Nov-02 | 32.0 | 7 | 42.1 | 7 | | | | | | | |
| 10-Nov-02 | 58.0 | 7 | 50.9 | 7 | | | | | | | |
| 17-Nov-02 | 12.0 | 7 | 46.3 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 40.3 | 7 | | | | | | | |
| 1-Dec-02 | 4.0 | 7 | 37.6 | 7 | | | | | | | |
| 8-Dec-02 | 75.0 | 7 | 47.3 | 7 | | | | | | | |
| 15-Dec-02 | 52.0 | 7 | 58.7 | 7 | | | | | | | |
| 22-Dec-02 | 10.0 | 7 | 43.6 | 7 | | | | | | | |
| 29-Dec-02 | 82.0 | 7 | 54.7 | 7 | | | | | | | |
| 5-Jan-03 | 0.0 | 7 | 47.7 | 7 | | | | | | | |
| 12-Jan-03 | 30.0 | 7 | 47.1 | 7 | | | | | | | |
| 19-Jan-03 | 51.0 | 7 | 52.3 | 7 | | | | | | | |
| 26-Jan-03 | 70.0 | 7 | 64.4 | 7 | | | | | | | |
| 2-Feb-03 | 5.0 | 7 | 47.7 | 7 | | | | | | | |
| 9-Feb-03 | 2.0 | 7 | 41.0 | 7 | | | | | | | |
| 16-Feb-03 | 29.0 | 7 | 44.4 | 7 | | | | | | | |
| 23-Feb-03 | 0.0 | 7 | 42.3 | 7 | | | | | | | |
| 2-Mar-03 | 22.0 | 7 | 43.3 | 7 | | | | | | | |
| 9-Mar-03 | 87.0 | 7 | 65.9 | 7 | | | | | | | |
| 16-Mar-03 | 46.0 | 7 | 52.6 | 7 | | | | | | | |
| 23-Mar-03 | 15.0 | 7 | 51.9 | 7 | | | | | | | |
| 30-Mar-03 | 26.0 | 7 | 46.4 | 7 | | | | | | | |
| 6-Apr-03 | 21.0 | 7 | 46.9 | 7 | | | | | | | |
| 13-Apr-03 | 18.0 | 7 | 46.4 | 7 | | | | | | | |
| 20-Apr-03 | 12.0 | 7 | 43.3 | 7 | | | | | | | |
| 27-Apr-03 | 0.0 | 7 | 40.6 | 7 | | | | | | | |
| 4-May-03 | 17.0 | 7 | 42.0 | 7 | | | | | | | |
| 11-May-03 | 0.0 | 7 | 39.1 | 7 | | | | | | | |
| 18-May-03 | 3.0 | 7 | 38.0 | 7 | | | | | | | |
| 25-May-03 | 2.0 | 7 | 37.4 | 7 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 35.7 | 7 | | | | | | | |
| 8-Jun-03 | 2.0 | 7 | 34.6 | 7 | | | | | | | |
| 15-Jun-03 | 10.0 | 7 | 33.9 | 7 | | | | | | | |
| 22-Jun-03 | 4.0 | 7 | 35.4 | 7 | | | | | | | |
| 29-Jun-03 | 0.0 | 7 | 33.3 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 33.0 | 7 | | | | | | | |
| 13-Jul-03 | 0.0 | 7 | 33.0 | 7 | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | 32.0 | 7 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 30.4 | 7 | | | | | | | |
| 3-Aug-03 | 0.0 | 7 | 30.0 | 7 | | | | | | | |
| 10-Aug-03 | 5.0 | 7 | 32.6 | 7 | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | 31.3 | 7 | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | 30.1 | 7 | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | 30.0 | 7 | | | | | | | |
| 7-Sep-03 | 21.0 | 7 | 33.4 | 7 | | | | | | | |
| 14-Sep-03 | 30.0 | 7 | 40.9 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 37.4 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | 36.0 | 3 | | | | | | | |
| Min | 0.0 | | 30.0 | | | Min | 0.0 | 0.0 | | | |
| Max | 87.0 | | 65.9 | | | Max | 0.0 | 0.0 | | | |
| Total | 870.0 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 11.5 | 3.8 | 2.5 | 14.5 | 757 | | 52 | 40.7 | 39.7 | 42.7 | |
| 5-May | | | 1.5 | 13.8 | 693 | | 50 | | 34.5 | 42.0 | K. Messick collected sample from dock. No observations. |
| 18-May | 11.5 | 3.7 | 4.4 | 18.0 | 595 | | 33 | 41.1 | 45.1 | 45.8 | |
| 1-Jun | 17.5 | 3.5 | 1.1 | 12.1 | 493 | | 41 | 41.9 | 31.5 | 40.1 | |
| 15-Jun | 18.5 | 4.5 | 1.4 | 11.0 | 420 | | 38 | 38.3 | 33.9 | 38.7 | |
| 30-Jun | | | | | | | | | | | No sample. |
| 13-Jul | 21.5 | 4.1 | 2.0 | 12.4 | 352 | | 28 | 39.6 | 37.4 | 40.5 | |
| 27-Jul | 24.0 | 4.1 | 2.1 | 12.5 | 317 | | 25 | 39.6 | 38.0 | 40.6 | |
| 10-Aug | | | | | | | | | | | No sample. |
| 24-Aug | 22.5 | 4.5 | 2.9 | 16.6 | 354 | | 21 | 38.3 | 41.0 | 44.7 | |
| 7-Sep | 22.0 | 4.1 | 3.6 | 17.8 | 313 | 1 | 18 | 39.6 | 43.1 | 45.7 | |
| 21-Sep | 18.0 | 3.0 | 7.3 | 14.2 | 332 | 1 | 23 | 44.1 | 50.1 | 42.4 | |
| 5-Oct | 17.0 | 3.2 | 5.3 | 19.5 | 451 | 2 | 23 | 43.2 | 47.0 | 47.0 | |
| 19-Oct | 14.5 | 3.1 | 4.0 | 20.3 | 392 | | 19 | 43.7 | 44.2 | 47.6 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.0 | 3.8 | 3.2 | 15.2 | 455.8 | 1.3 | 31 | 40.9 | 40.5 | 43.2 | TSI Average = 42.1 |
| Median | 18.0 | 3.8 | 2.7 | 14.4 | 406.0 | 1 | 27 | 40.7 | 40.4 | 42.6 | |
| Min | 11.5 | 3.0 | 1.1 | 11.0 | 313.0 | 1 | 18 | 38.3 | 31.5 | 38.7 | |
| Max | 24.0 | 4.5 | 7.3 | 20.3 | 757.0 | 2 | 52 | 44.1 | 50.1 | 47.6 | |
| Count | 11 | 11 | 12 | 12 | 12 | 3 | 12 | 11 | 12 | 12 | |

Burien

Lake Overview

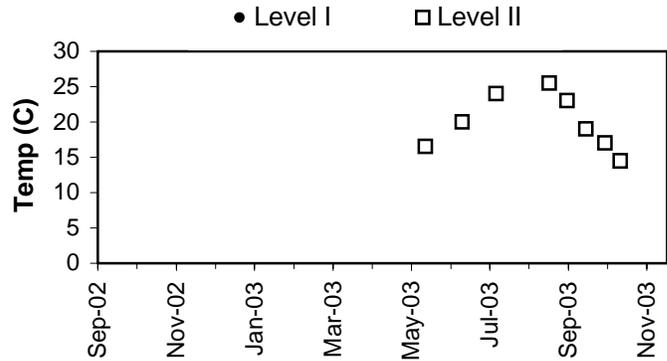
Volunteer monitoring began at Lake Burien in 1994, continued in 1998, and then resumed in 2000 through 2003. The data collected classify this lake in the city of Burien at low to moderate in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up 18% of the relatively large drainage area, direct precipitation is important, as well as stormwater runoff and groundwater inputs. Land use analysis of 2002 aerial photographs showed over 97% of the surrounding watershed has been developed for uses other than agriculture. There are no significant wetlands in the basin other than the lakeshore itself.

Lake Burien has no public access boat ramp, but residents should continue to watch nearshore aquatic plants to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

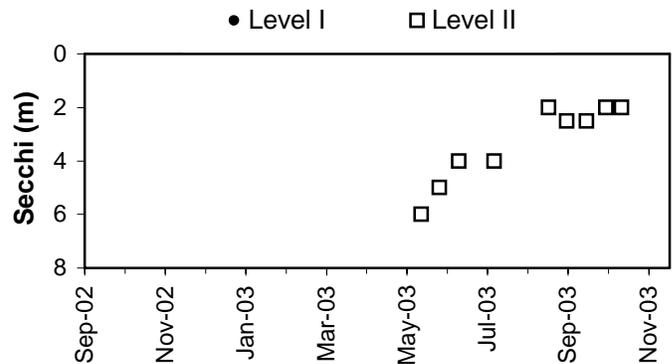
Physical Parameters

The Level II Secchi transparency ranged between 2.0 and 6.0m during the sampling season. Level II surface water temperatures reached a maximum of 25.5 degrees Celsius. No precipitation or water level records were available for the year.

Lake Temperature



Secchi Depth

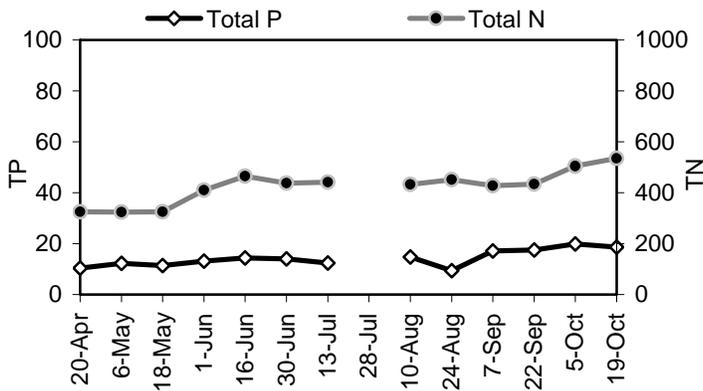


Lake Level and Precipitation

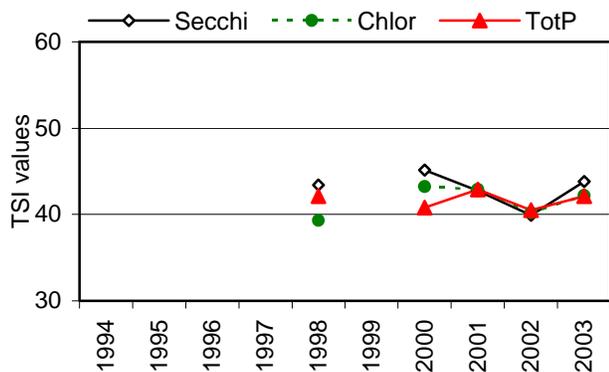


Burien

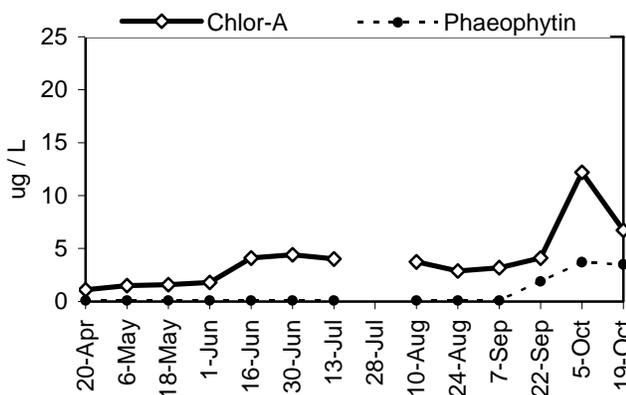
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|------------------------|--------------------|
| <i>Cryptomonas</i> spp | cryptophyte |
| unidentified species | chrysophyte |
| <i>Fragilaria</i> sp | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus remained fairly constant through the season, while total nitrogen rose very slowly. The N:P ratio ranged from 25 to 48, suggesting poor conditions for bluegreens. The 2003 TSI values for the three indicators were almost identical to 2001 values, remaining in the lower part of the mesotrophic range, similar to previous years.

Chlorophyll and Algae

Chlorophyll content was low in spring and rose slightly through summer, then climbed to a peak early in October and declined by the end of the sampling season. The algae were dominated by unidentified chrysophyte species, the cryptophyte *Cryptomonas*, and the diatom *Fragilaria*. The bluegreens *Anabaena* and *Aphanizomenon* were both common in early May, but never made large populations.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | | | 1.1 | 10.4 | 326 | 0 | 31 | | 31.5 | 37.9 | No secchi or temperature. |
| 6-May | | | 1.5 | 12.3 | 324 | | 26 | | 34.5 | 40.4 | |
| 18-May | 16.5 | 6.0 | 1.6 | 11.4 | 325 | 1 | 29 | 34.1 | 35.2 | 39.3 | |
| 1-Jun | | 5.0 | 1.8 | 13.2 | 410 | 1 | 31 | 36.8 | 36.3 | 41.4 | |
| 16-Jun | 20.0 | 4.0 | 4.1 | 14.4 | 466 | 1 | 32 | 40.0 | 44.4 | 42.6 | |
| 30-Jun | | | 4.4 | 14.0 | 438 | | 31 | | 45.1 | 42.2 | No secchi, temperature, or algae observations. |
| 13-Jul | 24.0 | 4.0 | 4.0 | 12.4 | 442 | | 36 | 40.0 | 44.2 | 40.5 | |
| 28-Jul | | | | | | | | | | | No sample. |
| 10-Aug | | | 3.7 | 14.8 | 433 | | 29 | | 43.5 | 43.0 | |
| 24-Aug | 25.5 | 2.0 | 2.9 | 9.4 | 452 | 0 | 48 | 50.0 | 41.0 | 36.5 | |
| 7-Sep | 23.0 | 2.5 | 3.2 | 17.2 | 428 | 1 | 25 | 46.8 | 42.0 | 45.2 | |
| 22-Sep | 19.0 | 2.5 | 4.1 | 17.5 | 434 | 0 | 25 | 46.8 | 44.4 | 45.4 | |
| 7-Oct | 17.0 | 2.0 | 12.2 | 19.9 | 504 | 0 | 25 | 50.0 | 55.1 | 47.3 | |
| 19-Oct | 14.5 | 2.0 | 6.7 | 18.7 | 534 | | 29 | 50.0 | 49.3 | 46.4 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.9 | 3.3 | 4.0 | 14.3 | 424.3 | 0.5 | 31 | 43.8 | 42.0 | 42.2 | TSI Average = 42.7 |
| Median | 19.5 | 2.5 | 3.7 | 14.0 | 434.0 | 1 | 29 | 46.8 | 43.5 | 42.2 | |
| Min | 14.5 | 2.0 | 1.1 | 9.4 | 324.0 | 0 | 25 | 34.1 | 31.5 | 36.5 | |
| Max | 25.5 | 6.0 | 12.2 | 19.9 | 534.0 | 1 | 48 | 50.0 | 55.1 | 47.3 | |
| Count | 8 | 9 | 13 | 13 | 13 | 8 | 13 | 9 | 13 | 13 | |

Clark

Lake Overview

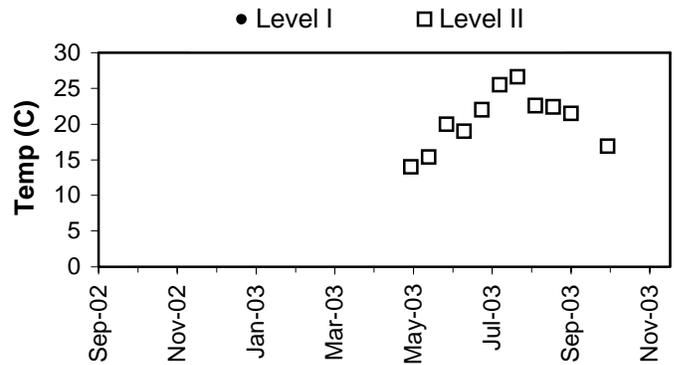
Monitoring began at Clark Lake in 2003. The data collected classify this lake in the city of Kent at moderate to high in primary productivity (mesotrophic - eutrophic) with fair water quality. Since the lake surface makes up only 2% of the 338-acre catchment basin, direct precipitation is less important than stormwater runoff and groundwater inputs. There is a 46 acre Class 1 wetland, which includes the lake and extends west into land historically used as pasture (King County, 1990).

Clark Lake is included in a Kent city park and is open to car top boats. City staff and lake users should watch nearshore aquatic plants to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

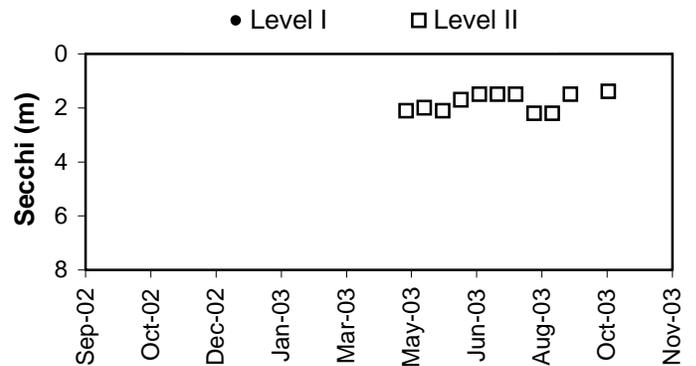
Physical Parameters

The Level II Secchi transparency ranged between 1.4 and 2.2m during the sampling season. The May through October surface water temperatures reached a maximum of 26.6 degrees Celsius. No precipitation or water level records were available for the year.

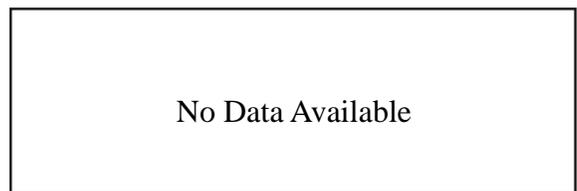
Lake Temperature



Secchi Depth

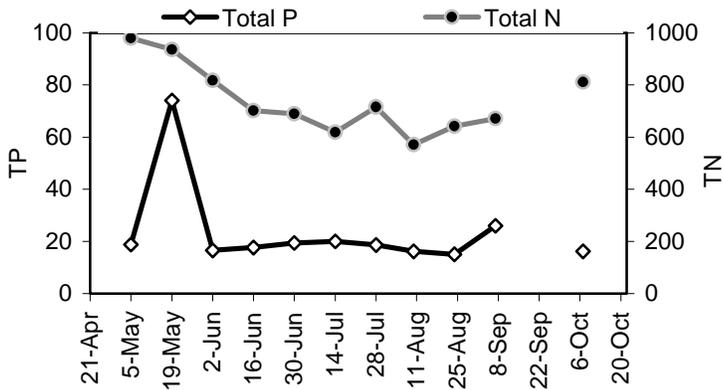


Lake Level and Precipitation

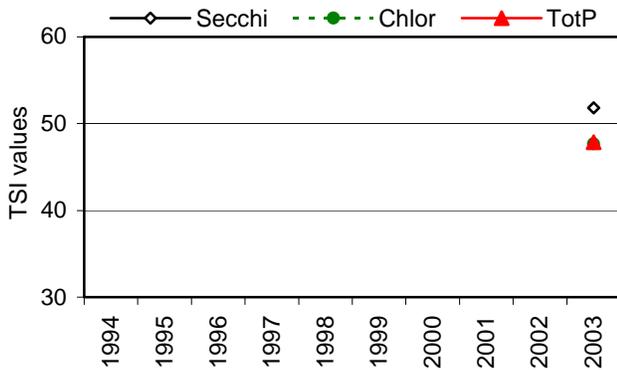


Clark

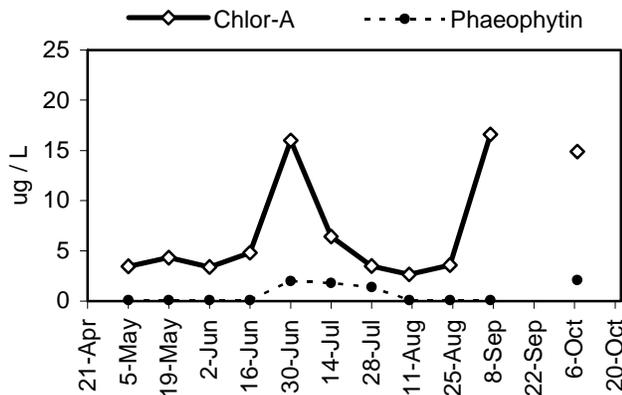
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total phosphorus remained fairly constant through the season, with one anomalous high value in May, while total nitrogen decreased slowly from May through July and then rose again in September. The N:P ratio ranged from 13 to 52, suggesting occasionally good conditions for bluegreens. The 2003 TSI values for the three indicators straddled the line between mesotrophic and eutrophic, with TSI-Secchi higher than the other two indicators. This higher value may be affected by water color.

Chlorophyll and Algae

Chlorophyll content peaked in late June and then rose again in fall. The algae were dominated in the spring peak by *Cryptomonas* species and in fall by the bluegreen *Anabaena*. The chrysophyte *Dinobryon* was also important in the phytoplankton.

| Common algae | Group |
|------------------------|-------------|
| <i>Anabaena</i> sp. | bluegreen |
| <i>Cryptomonas</i> sp. | cryptophyte |
| <i>Dinobryon</i> sp. | chrysophyte |

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | | | | | | | | | | | No Sample. Began monitoring 5-May-03. |
| 5-May | 14.0 | 2.1 | 3.5 | 18.7 | 980 | 1 | 52 | 49.3 | 42.8 | 46.4 | |
| 19-May | 15.4 | 2.0 | 4.3 | 74.0 | 936 | 1 | 13 | 50.0 | 44.9 | 66.2 | |
| 2-Jun | 20.0 | 2.1 | 3.4 | 16.5 | 818 | 1 | 50 | 49.3 | 42.6 | 44.6 | |
| 16-Jun | 19.0 | 1.7 | 4.8 | 17.6 | 702 | 2 | 40 | 52.3 | 46.0 | 45.5 | Chlor-a analysis error. Estimated Chlor-a is 4.8 ug/L |
| 30-Jun | 22.0 | 1.5 | 16.0 | 19.4 | 690 | 2 | 36 | 54.1 | 57.8 | 46.9 | |
| 14-Jul | 25.5 | 1.5 | 6.4 | 19.9 | 619 | 1 | 31 | 54.1 | 48.8 | 47.3 | |
| 28-Jul | 26.6 | 1.5 | 3.5 | 18.6 | 716 | | 38 | 54.1 | 42.9 | 46.3 | |
| 11-Aug | 22.6 | 2.2 | 2.7 | 16.1 | 572 | 1 | 36 | 48.6 | 40.2 | 44.2 | |
| 25-Aug | 22.4 | 2.2 | 3.6 | 15.1 | 642 | 2 | 43 | 48.6 | 43.1 | 43.3 | |
| 8-Sep | 21.5 | 1.5 | 16.6 | 25.9 | 672 | 3 | 26 | 54.1 | 58.1 | 51.1 | |
| 22-Sep | | | | | | | | | | | No sample. |
| 7-Oct | 16.9 | 1.4 | 14.9 | 16.1 | 811 | 3 | 50 | 55.1 | 57.1 | 44.2 | |
| 20-Oct | | | | | | | | | | | No sample. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.5 | 1.8 | 7.2 | 23.4 | 741.6 | 1.7 | 38 | 51.8 | 47.7 | 47.8 | TSI Average = 49.2 |
| Median | 21.5 | 1.7 | 4.3 | 18.6 | 702.0 | 2 | 38 | 52.3 | 44.9 | 46.3 | |
| Min | 14.0 | 1.4 | 2.7 | 15.1 | 572.0 | 1 | 13 | 48.6 | 40.2 | 43.3 | |
| Max | 26.6 | 2.2 | 16.6 | 74.0 | 980.0 | 3 | 52 | 55.1 | 58.1 | 66.2 | |
| Count | 11 | 11 | 11 | 11 | 11 | 10 | 11 | 11 | 11 | 11 | |

Cottage

Lake Overview

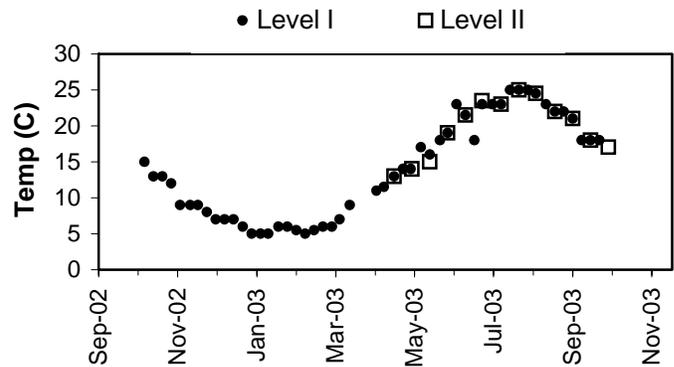
Volunteer monitoring began at Cottage Lake in 1995 and continued through 2003. The data indicate this lake is relatively high in primary productivity (eutrophic) with fair water quality. Since the lake surface makes up less than 2% of the large drainage area, direct precipitation is not as important as inlet streams, stormwater runoff and groundwater inputs. Land use analysis of 2002 aerial photographs showed over 54% of the surrounding watershed has been developed for uses other than agriculture. There are large wetlands in the basin, and land use is largely rural, although parts are currently urbanizing. Enhancement of productivity through human impacts was verified in the lake management plan (King County, 1996).

Cottage Lake has no public access boat ramp, but car top boats may be launched through the county park. Residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious aquatic weeds.

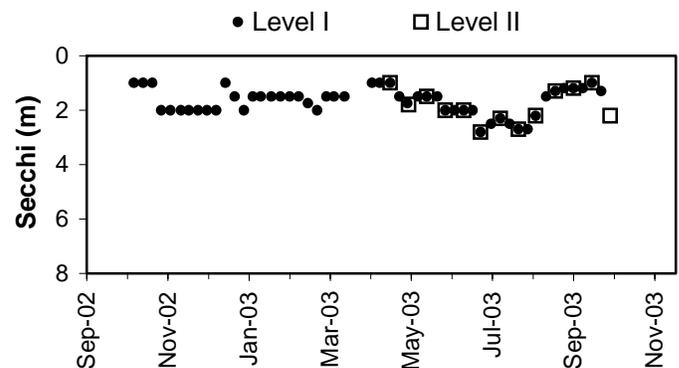
Physical Parameters

Secchi transparency ranged between 1.0 and 2.8m during the year. Surface water temperatures ranged from 5.0 to 25.0 degrees Celsius. Excellent local precipitation and water level records were available for the year, showing that the lake level varied erratically through most of the year, relating to rainfall events in winter, but also remaining at high levels in summer, likely affected by beaver and human activities.

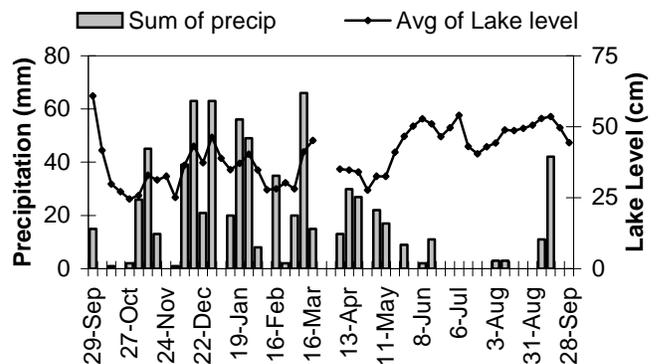
Lake Temperature



Secchi Depth

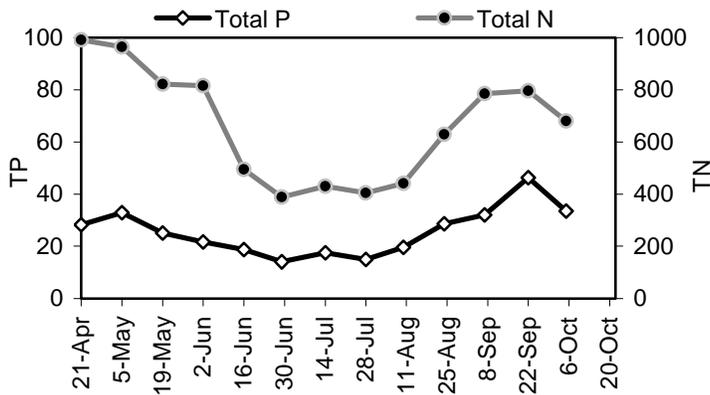


Lake Level and Precipitation

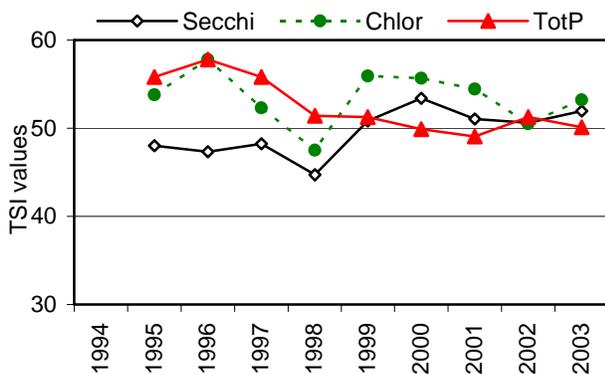


Cottage

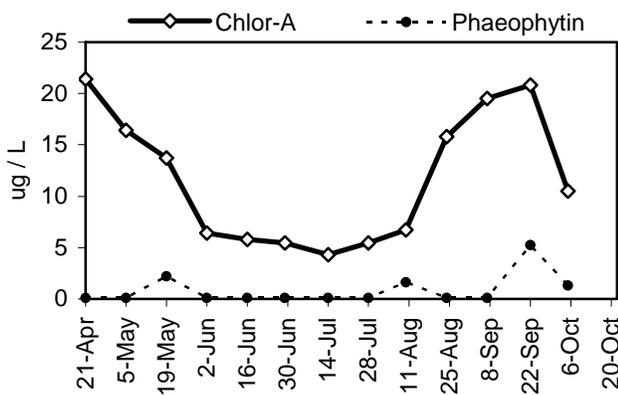
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|--------------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Asterionella formosa</i> | diatom-chrysophyte |
| <i>Anabaena</i> sp. | bluegreen |

Nutrient Analysis and TSI Ratings

Total nitrogen declined through the spring, remained steady in summer, and increased in autumn. Total phosphorus remained fairly steady until August, when it also began to increase. The N:P ratio ranged from 17 to 38, with better conditions for bluegreens indicated in autumn. In 2003, TSI values for the three indicators were close to each other, above the threshold for eutrophic conditions, similar to 2000-2001.

Chlorophyll and Algae

Chlorophyll content decreased from a high in April to low values that remained steady through summer and then increased greatly in September. The diatom *Asterionella formosa* was dominant in spring, but gave way to the bluegreens *Aphanizomenon* and *Anabaena* in the autumn.

Daily Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days |
|--------------|---------------------|-----------|------------------------|-----------|
| 29-Sep-02 | 15.0 | 5 | 60.8 | 5 |
| 6-Oct-02 | 0.0 | 7 | 41.6 | 8 |
| 13-Oct-02 | 1.0 | 7 | 29.9 | 7 |
| 20-Oct-02 | 0.0 | 7 | 27.2 | 6 |
| 27-Oct-02 | 2.0 | 7 | 24.6 | 7 |
| 3-Nov-02 | 26.0 | 7 | 25.9 | 7 |
| 10-Nov-02 | 45.0 | 7 | 32.9 | 7 |
| 17-Nov-02 | 13.0 | 7 | 31.3 | 7 |
| 24-Nov-02 | 0.0 | 7 | 32.6 | 7 |
| 1-Dec-02 | 1.0 | 7 | 25.1 | 7 |
| 8-Dec-02 | 39.0 | 7 | 36.4 | 7 |
| 15-Dec-02 | 63.0 | 7 | 43.1 | 7 |
| 22-Dec-02 | 21.0 | 7 | 37.3 | 7 |
| 29-Dec-02 | 63.0 | 7 | 46.3 | 7 |
| 5-Jan-03 | 0.0 | 7 | 38.9 | 7 |
| 12-Jan-03 | 20.0 | 7 | 34.9 | 7 |
| 19-Jan-03 | 56.0 | 7 | 37.0 | 7 |
| 26-Jan-03 | 49.0 | 7 | 40.3 | 7 |
| 2-Feb-03 | 8.0 | 7 | 34.7 | 7 |
| 9-Feb-03 | 0.0 | 7 | 27.9 | 7 |
| 16-Feb-03 | 35.0 | 7 | 28.1 | 7 |
| 23-Feb-03 | 2.0 | 7 | 30.3 | 7 |
| 2-Mar-03 | 20.0 | 7 | 28.1 | 7 |
| 9-Mar-03 | 66.0 | 7 | 41.1 | 7 |
| 16-Mar-03 | 15.0 | 6 | 45.2 | 6 |
| 23-Mar-03 | | | | |
| 30-Mar-03 | | | | |
| 6-Apr-03 | 13.0 | 4 | 35.0 | 4 |
| 13-Apr-03 | 30.0 | 7 | 34.7 | 7 |
| 20-Apr-03 | 27.0 | 7 | 34.0 | 7 |
| 27-Apr-03 | 0.0 | 7 | 27.7 | 7 |
| 4-May-03 | 22.0 | 7 | 32.6 | 7 |
| 11-May-03 | 17.0 | 7 | 32.6 | 7 |
| 18-May-03 | 0.0 | 7 | 41.0 | 7 |
| 25-May-03 | 9.0 | 7 | 46.6 | 7 |
| 1-Jun-03 | 0.0 | 7 | 50.1 | 7 |
| 8-Jun-03 | 2.0 | 7 | 52.7 | 7 |
| 15-Jun-03 | 11.0 | 7 | 51.0 | 7 |
| 22-Jun-03 | 0.0 | 7 | 46.4 | 7 |
| 29-Jun-03 | 0.0 | 7 | 49.6 | 7 |
| 6-Jul-03 | 0.0 | 7 | 54.0 | 7 |
| 13-Jul-03 | 0.0 | 7 | 43.0 | 7 |
| 20-Jul-03 | 0.0 | 7 | 40.4 | 7 |
| 27-Jul-03 | 0.0 | 7 | 42.9 | 7 |
| 3-Aug-03 | 3.0 | 7 | 44.3 | 7 |
| 10-Aug-03 | 3.0 | 7 | 48.9 | 7 |
| 17-Aug-03 | 0.0 | 7 | 48.6 | 7 |
| 24-Aug-03 | 0.0 | 7 | 49.4 | 7 |
| 31-Aug-03 | 0.0 | 7 | 50.6 | 7 |
| 7-Sep-03 | 11.0 | 7 | 52.9 | 7 |
| 14-Sep-03 | 42.0 | 7 | 53.6 | 7 |
| 21-Sep-03 | 0.0 | 7 | 49.6 | 7 |
| 28-Sep-03 | 0.0 | 3 | 44.3 | 3 |
| Min | 0.0 | | 24.6 | |
| Max | 66.0 | | 60.8 | |
| Total | 750.0 | | | |

Weekly Data Summary

| Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 7-Oct-02 | 13:00 | 1.0 | 15.0 | C3 | C3 | |
| 14-Oct-02 | 13:00 | 1.0 | 13.0 | C3 | C3 | |
| 21-Oct-02 | 13:00 | 1.0 | 13.0 | C3 | C3 | |
| 28-Oct-02 | 13:00 | 2.0 | 12.0 | C1 | C1 | |
| 4-Nov-02 | 12:30 | 2.0 | 9.0 | C1 | C1 | |
| 12-Nov-02 | 12:30 | 2.0 | 9.0 | C1 | C1 | |
| 18-Nov-02 | 13:00 | 2.0 | 9.0 | C1 | C1 | |
| 25-Nov-02 | 13:00 | 2.0 | 8.0 | C1 | C1 | |
| 2-Dec-02 | 13:00 | 2.0 | 7.0 | | | |
| 9-Dec-02 | 13:00 | 2.0 | 7.0 | | | |
| 16-Dec-02 | 13:00 | 1.0 | 7.0 | | | |
| 23-Dec-02 | 13:00 | 1.5 | 6.0 | | | |
| 30-Dec-02 | 13:00 | 2.0 | 5.0 | | | |
| 6-Jan-03 | 13:00 | 1.5 | 5.0 | | | |
| 12-Jan-03 | 13:00 | 1.5 | 5.0 | | | |
| 20-Jan-03 | 13:00 | 1.5 | 6.0 | | | |
| 27-Jan-03 | 12:00 | 1.5 | 6.0 | | | |
| 3-Feb-03 | 13:00 | 1.5 | 5.5 | | | |
| 10-Feb-03 | 13:00 | 1.5 | 5.0 | | | |
| 17-Feb-03 | 13:00 | 1.8 | 5.5 | | | |
| 24-Feb-03 | 12:30 | 2.0 | 6.0 | | | |
| 3-Mar-03 | 13:00 | 1.5 | 6.0 | | | |
| 9-Mar-03 | 13:00 | 1.5 | 7.0 | | | |
| 17-Mar-03 | 13:00 | 1.5 | 9.0 | | | |
| 7-Apr-03 | 14:00 | 1.0 | 11.0 | P1 | P1 | |
| 13-Apr-03 | 14:30 | 1.0 | 11.5 | P1 | P1 | |
| 21-Apr-03 | 14:00 | 1.0 | 13.0 | P1 | P1 | |
| 28-Apr-03 | 12:30 | 1.5 | 14.0 | P1 | P1 | |
| 4-May-03 | 13:00 | 1.8 | 14.0 | P1 | P1 | |
| 12-May-03 | 13:00 | 1.5 | 17.0 | P1 | P1 | |
| 19-May-03 | 12:00 | 1.5 | 16.0 | P1 | P1 | |
| 27-May-03 | 13:00 | 1.5 | 18.0 | P1 | P1 | |
| 2-Jun-03 | 13:00 | 2.0 | 19.0 | P1 | P1 | |
| 9-Jun-03 | 13:00 | 2.0 | 23.0 | P1 | P1 | |
| 16-Jun-03 | 13:30 | 2.0 | 21.5 | P1 | P1 | |
| 23-Jun-03 | 13:00 | 2.0 | 18.0 | P2 | P2 | |
| 29-Jun-03 | 11:45 | 2.8 | 23.0 | P2 | P1 | |
| 7-Jul-03 | 13:30 | 2.5 | 23.0 | P2 | P1 | |
| 14-Jul-03 | 13:00 | 2.3 | 23.0 | P2 | P1 | |
| 21-Jul-03 | 14:00 | 2.5 | 25.0 | P3 | P1 | |
| 28-Jul-03 | 15:00 | 2.7 | 25.0 | P3 | P1 | |
| 4-Aug-03 | 14:00 | 2.7 | 25.0 | P3 | P1 | |
| 10-Aug-03 | 15:00 | 2.2 | 24.5 | P3 | P1 | |
| 18-Aug-03 | 13:00 | 1.5 | 23.0 | P3 | P2 | |
| 25-Aug-03 | 12:00 | 1.3 | 22.0 | P3 | P2 | |
| 1-Sep-03 | 12:00 | 1.2 | 22.0 | P3 | P2 | |
| 8-Sep-03 | 13:00 | 1.2 | 21.0 | P3 | P2 | |
| 15-Sep-03 | 13:00 | 1.2 | 18.0 | P3 | P2 | |
| 22-Sep-03 | 14:00 | 1.0 | 18.0 | P3 | P3 | |
| 29-Sep-03 | 12:00 | 1.3 | 18.0 | P3 | P3 | |
| Min | | 1.0 | 5.0 | | | |
| Max | | 2.8 | 25.0 | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 1.0 | 21.4 | 28.3 | 992 | 1 | 35 | 60.0 | 60.6 | 52.4 | |
| 5-May | 14.0 | 1.8 | 16.4 | 32.9 | 965 | 1 | 29 | 51.5 | 58.0 | 54.5 | |
| 19-May | 15.0 | 1.5 | 13.7 | 25.1 | 821 | 1 | 33 | 54.1 | 56.2 | 50.6 | |
| 2-Jun | 19.0 | 2.0 | 6.4 | 21.6 | 815 | 1 | 38 | 50.0 | 48.8 | 48.5 | |
| 16-Jun | 21.5 | 2.0 | 5.8 | 18.7 | 495 | 1 | 26 | 50.0 | 47.8 | 46.4 | |
| 29-Jun | 23.5 | 2.8 | 5.5 | 14.0 | 389 | 1 | 28 | 45.1 | 47.2 | 42.2 | |
| 14-Jul | 23.0 | 2.3 | 4.3 | 17.5 | 430 | 1 | 25 | 48.0 | 44.9 | 45.4 | |
| 28-Jul | 25.0 | 2.7 | 5.5 | 14.9 | 405 | 1 | 27 | 45.7 | 47.2 | 43.1 | |
| 10-Aug | 24.5 | 2.2 | 6.7 | 19.6 | 441 | 1 | 23 | 48.6 | 49.3 | 47.1 | |
| 25-Aug | 22.0 | 1.3 | 15.8 | 28.6 | 630 | 2 | 22 | 56.2 | 57.6 | 52.5 | Bloom along shore. |
| 8-Sep | 21.0 | 1.2 | 19.5 | 32.0 | 785 | 2 | 25 | 57.4 | 59.7 | 54.1 | |
| 22-Sep | 18.0 | 1.0 | 20.8 | 46.3 | 796 | 3 | 17 | 60.0 | 60.3 | 59.5 | Bloom along shore. |
| 6-Oct | 17.0 | 2.2 | 10.5 | 33.5 | 681 | 2 | 20 | 48.6 | 53.6 | 54.8 | |
| 22-Oct | | | | | | | | | | | No sample. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.7 | 1.8 | 11.7 | 25.6 | 665.0 | 1.4 | 27 | 51.9 | 53.2 | 50.1 | TSI Average = 51.7 |
| Median | 21.0 | 2.0 | 10.5 | 25.1 | 681.0 | 1 | 26 | 50.0 | 53.6 | 50.6 | |
| Min | 13.0 | 1.0 | 4.3 | 14.0 | 389.0 | 1 | 17 | 45.1 | 44.9 | 42.2 | |
| Max | 25.0 | 2.8 | 21.4 | 46.3 | 992.0 | 3 | 38 | 60.0 | 60.6 | 59.5 | |
| Count | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | |

Desire

Lake Overview

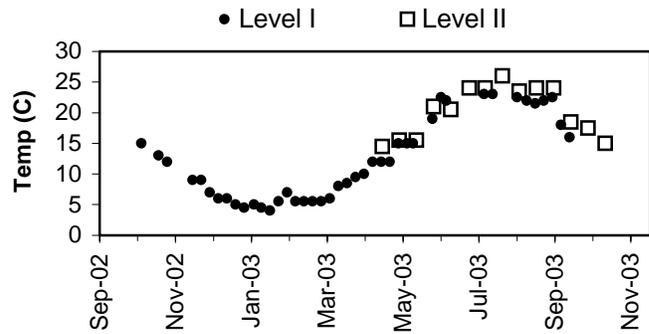
Volunteer monitoring began at Lake Desire before 1985 and continued through 2003. The data identify this lake as moderately high in primary productivity (mesotrophic - eutrophic) with fair to good water quality. Since the lake surface is approximately 8% of the drainage area, direct precipitation is not as important as inlet streams, stormwater runoff and groundwater inputs. Land use analysis of 2002 aerial photographs showed almost 38% of the surrounding watershed has been developed for uses other than agriculture. There are multiple Class 1 and 2 wetlands in the basin, and the area is currently urbanizing. Enhancement of productivity through human impacts was verified in the Lake Management Plan (King County, 1995).

Lake Desire has a public access boat ramp, and Eurasian milfoil has been reported in the lake since 1995, although it has not yet spread aggressively. Residents should watch for an increase in this species, as well as occurrences of elodea or other noxious aquatic weeds.

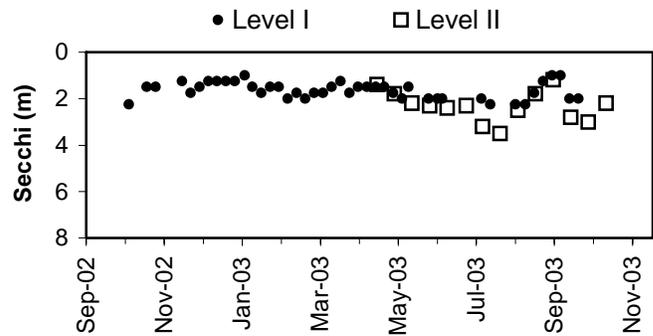
Physical Parameters

Secchi transparency ranged between 1.0 and 3.5m during the year. Surface water temperatures were similar to other small lakes in 2002, ranging from 4.0 to 26.0 degrees Celsius. Good precipitation and water level records were available for 2002, showing

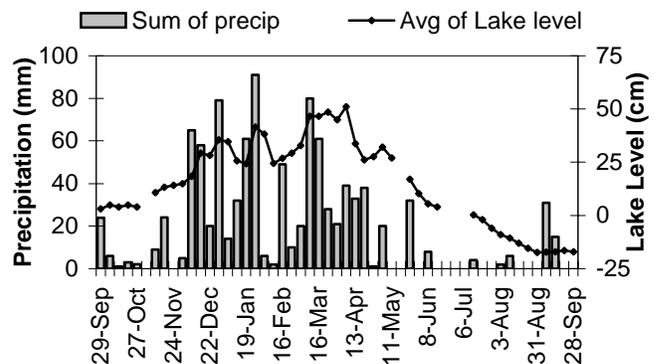
Lake Temperature



Secchi Depth

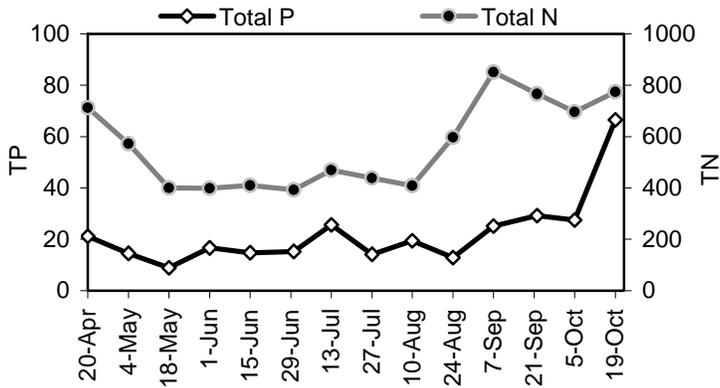


Lake Level and Precipitation

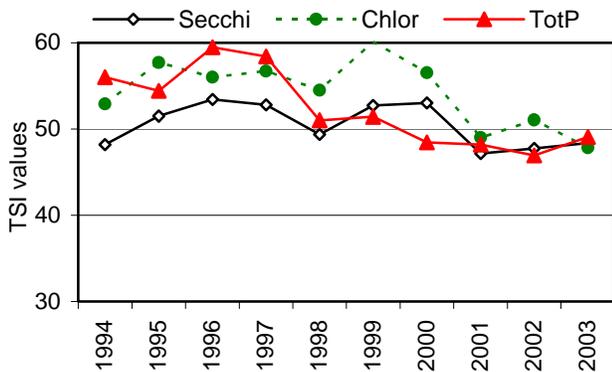


Desire

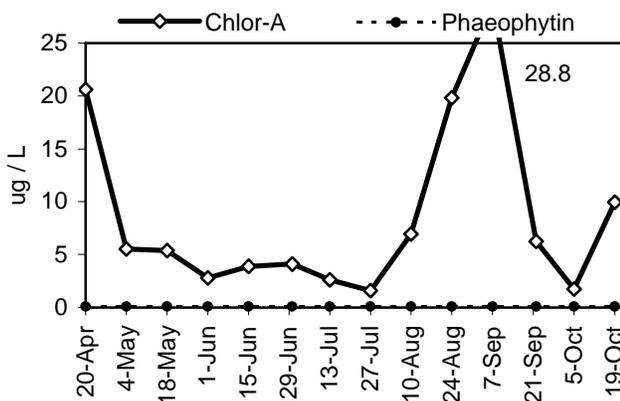
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Dinobryon cylindricum</i> | chrysophyte |
| <i>Anabaena</i> sp. | bluegreen |

that the lake level followed the typical northwest pattern of winter high – summer low, with short term increases in level correlated with rainfall events in winter.

Nutrient Analysis and TSI Ratings

Total nitrogen declined early in the sampling season and then remained in fairly constant proportion to total phosphorus until late summer when both rose in value. The N:P ratio ranged from 10 to 46. The 2003 TSI values for the three indicators were very close together in the upper range of mesotrophy, most similar to 2001.

Chlorophyll and Algae

Chlorophyll content decreased rapidly from the initial sample date, remained stable through July, and rose again to a major peak in early September. The spring maximum was dominated by the chrysophyte *Dinobryon*, while the phytoplankton in autumn was characterized by the bluegreens *Aphanizomenon* and *Anabaena*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 24.0 | 5 | 3.2 | 5 | | | | | | | |
| 6-Oct-02 | 6.0 | 5 | 5.0 | 5 | 5-Oct-02 | 10:00 | 2.3 | 15.0 | NA | NA | 0 |
| 13-Oct-02 | 1.0 | 2 | 4.0 | 2 | | | | | | | |
| 20-Oct-02 | 3.0 | 7 | 5.0 | 7 | 19-Oct-02 | 10:00 | 1.5 | 13.0 | P2 | P1 | 0 |
| 27-Oct-02 | 2.1 | 5 | 4.0 | 5 | 26-Oct-02 | 11:30 | 1.5 | 12.0 | C2 | C1 | 0 |
| 3-Nov-02 | | | | | | | | | | | |
| 10-Nov-02 | 9.0 | 4 | 10.8 | 4 | | | | | | | |
| 17-Nov-02 | 24.1 | 7 | 13.3 | 7 | 16-Nov-02 | 8:30 | 1.3 | 9.0 | P1 | NA | 0 |
| 24-Nov-02 | 0.0 | 7 | 14.3 | 7 | 23-Nov-02 | 7:45 | 1.8 | 9.0 | NA | NA | 0 |
| 1-Dec-02 | 5.0 | 7 | 15.0 | 7 | 30-Nov-02 | 9:15 | 1.5 | 7.0 | P3 | C1 | 0 |
| 8-Dec-02 | 65.0 | 7 | 18.4 | 7 | 7-Dec-02 | 8:30 | 1.3 | 6.0 | P3 | P3 | 0 |
| 15-Dec-02 | 58.0 | 7 | 29.1 | 7 | 14-Dec-02 | 9:45 | 1.3 | 6.0 | NA | NA | 0 |
| 22-Dec-02 | 20.0 | 7 | 28.1 | 7 | 21-Dec-02 | 12:30 | 1.3 | 5.0 | C1 | C1 | 30 |
| 29-Dec-02 | 79.0 | 7 | 35.4 | 7 | 28-Dec-02 | 9:30 | 1.3 | 4.5 | P3 | P3 | 15 |
| 5-Jan-03 | 14.0 | 7 | 34.6 | 7 | 5-Jan-03 | 9:30 | 1.0 | 5.0 | P2 | P2 | 0 |
| 12-Jan-03 | 32.0 | 7 | 25.6 | 7 | 11-Jan-03 | 8:45 | 1.5 | 4.5 | P3 | P1 | 0 |
| 19-Jan-03 | 61.0 | 7 | 24.3 | 7 | 18-Jan-03 | 9:45 | 1.8 | 4.0 | P1 | P1 | 0 |
| 26-Jan-03 | 91.0 | 6 | 41.5 | 6 | 25-Jan-03 | 9:45 | 1.5 | 5.5 | P3 | P3 | 6 |
| 2-Feb-03 | 6.0 | 7 | 38.1 | 7 | 1-Feb-03 | 9:45 | 1.5 | 7.0 | C1 | P1 | 19 |
| 9-Feb-03 | 2.0 | 7 | 24.4 | 7 | 8-Feb-03 | 9:45 | 2.0 | 5.5 | P1 | C1 | 0 |
| 16-Feb-03 | 49.0 | 7 | 26.9 | 7 | 15-Feb-03 | 9:15 | 1.8 | 5.5 | NA | P1 | 2 |
| 23-Feb-03 | 10.0 | 7 | 29.1 | 7 | 22-Feb-03 | 10:00 | 2.0 | 5.5 | NA | P1 | 0 |
| 2-Mar-03 | 20.1 | 7 | 32.9 | 7 | 1-Mar-03 | 9:30 | 1.8 | 5.5 | NA | P1 | 0 |
| 9-Mar-03 | 80.0 | 7 | 46.6 | 7 | 8-Mar-03 | 7:30 | 1.8 | 6.0 | NA | C1 | 0 |
| 16-Mar-03 | 61.0 | 7 | 46.6 | 7 | 15-Mar-03 | 9:00 | 1.5 | 8.0 | NA | P1 | 6 |
| 23-Mar-03 | 28.0 | 7 | 48.6 | 7 | 22-Mar-03 | 9:45 | 1.3 | 8.5 | NA | C1 | 0 |
| 30-Mar-03 | 21.0 | 7 | 44.9 | 7 | 29-Mar-03 | 7:15 | 1.8 | 9.5 | NA | NA | 4 |
| 6-Apr-03 | 39.0 | 7 | 51.0 | 7 | 5-Apr-03 | 8:00 | 1.5 | 10.0 | NA | NA | 0 |
| 13-Apr-03 | 33.0 | 7 | 33.7 | 7 | 12-Apr-03 | 9:00 | 1.5 | 12.0 | P2 | NA | 3 |
| 20-Apr-03 | 38.0 | 7 | 26.0 | 7 | 19-Apr-03 | 8:45 | 1.5 | 12.0 | NA | P1 | 6 |
| 27-Apr-03 | 1.0 | 7 | 27.6 | 7 | 26-Apr-03 | 8:30 | 1.5 | 12.0 | NA | NA | 2 |
| 4-May-03 | 20.0 | 6 | 32.0 | 6 | 3-May-03 | 6:30 | 1.8 | 15.0 | NA | NA | 2 |
| 11-May-03 | 0.1 | 5 | 27.0 | 5 | 10-May-03 | 8:00 | 2.0 | 15.0 | NA | NA | 0 |
| 18-May-03 | | | | | 15-May-03 | 9:00 | 1.5 | 15.0 | NA | NA | 0 |
| 25-May-03 | 32.0 | 3 | 17.0 | 3 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 10.3 | 7 | 31-May-03 | | 2.0 | 19.0 | NA | NA | 13 |
| 8-Jun-03 | 8.0 | 7 | 5.6 | 7 | 7-Jun-03 | 7:30 | 2.0 | 22.5 | NA | NA | 0 |
| 15-Jun-03 | 0.0 | 3 | 4.0 | 3 | 11-Jun-03 | 8:00 | 2.0 | 22.0 | NA | NA | 0 |
| 22-Jun-03 | | | | | | | | | | | |
| 29-Jun-03 | | | | | | | | | | | |
| 6-Jul-03 | | | | | | | | | | | |
| 13-Jul-03 | 4.0 | 7 | 0.3 | 7 | 12-Jul-03 | 8:45 | 2.0 | 23.0 | NA | NA | |
| 20-Jul-03 | 0.0 | 5 | -2.0 | 5 | 19-Jul-03 | 7:15 | 2.3 | 23.0 | NA | NA | |
| 27-Jul-03 | 0.0 | 5 | -6.0 | 5 | | | | | | | |
| 3-Aug-03 | 2.0 | 5 | -9.0 | 5 | | | | | | | |
| 10-Aug-03 | 6.0 | 6 | -10.7 | 6 | 8-Aug-03 | 7:15 | 2.3 | 22.5 | NA | NA | 0 |
| 17-Aug-03 | 0.0 | 7 | -13.0 | 7 | 16-Aug-03 | 8:15 | 2.3 | 22.0 | NA | NA | 0 |
| 24-Aug-03 | 0.0 | 7 | -15.4 | 7 | 23-Aug-03 | 7:45 | 1.8 | 21.5 | NA | P1 | 0 |
| 31-Aug-03 | 0.0 | 7 | -17.4 | 7 | 30-Aug-03 | 9:45 | 1.3 | 22.0 | P1 | P3 | 10 |
| 7-Sep-03 | 31.0 | 7 | -17.3 | 7 | 6-Sep-03 | 8:45 | 1.0 | 22.5 | P2 | P2 | 0 |
| 14-Sep-03 | 15.0 | 7 | -17.0 | 7 | 13-Sep-03 | 8:15 | 1.0 | 18.0 | P2 | P2 | 0 |
| 21-Sep-03 | 0.0 | 7 | -16.4 | 7 | 20-Sep-03 | 8:30 | 2.0 | 16.0 | P3 | P3 | 0 |
| 28-Sep-03 | 0.0 | 3 | -17.0 | 3 | 27-Sep-03 | 9:00 | 2.0 | | NA | NA | 2 |
| Min | 0.0 | | -17.4 | | Min | | 1.0 | 4.0 | | | 0 |
| Max | 91.0 | | 51.0 | | Max | | 2.3 | 23.0 | | | 30 |
| Total | 1000.3 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.5 | 1.4 | 20.6 | 21.1 | 713 | 3 | 34 | 55.1 | 60.2 | 48.1 | |
| 4-May | 15.5 | 1.8 | 5.5 | 14.5 | 573 | | 40 | 51.5 | 47.3 | 42.7 | |
| 18-May | 15.5 | 2.2 | 5.4 | 62.4 | 648 | 3 | 10 | 48.6 | 47.1 | 63.8 | |
| 1-Jun | 21.0 | 2.3 | 2.8 | 16.6 | 399 | 2 | 24 | 48.0 | 40.7 | 44.7 | |
| 15-Jun | 20.5 | 2.4 | 3.9 | 14.8 | 410 | 2 | 28 | 47.4 | 43.9 | 43.0 | |
| 30-Jun | 24.0 | 2.3 | 4.1 | 15.3 | 393 | 2 | 26 | 48.0 | 44.4 | 43.5 | |
| 13-Jul | 24.0 | 3.2 | 2.6 | 25.6 | 470 | 2 | 18 | 43.2 | 40.1 | 50.9 | |
| 27-Jul | 26.0 | 3.5 | 1.6 | 14.2 | 439 | 2 | 31 | 41.9 | 35.2 | 42.4 | |
| 10-Aug | 23.5 | 2.5 | 6.9 | 19.4 | 409 | | 21 | 46.8 | 49.6 | 46.9 | |
| 24-Aug | 24.0 | 1.8 | 19.8 | 12.9 | 598 | 2 | 46 | 51.5 | 59.9 | 41.0 | |
| 7-Sep | 24.0 | 1.2 | 28.8 | 25.1 | 851 | | 34 | 57.4 | 63.5 | 50.6 | |
| 21-Sep | 18.5 | 2.8 | 6.3 | 29.2 | 766 | | 26 | 45.1 | 48.5 | 52.8 | |
| 5-Oct | 17.5 | 3.0 | 1.8 | 27.5 | 697 | 2 | 25 | 44.1 | 36.1 | 52.0 | |
| 19-Oct | 15.0 | 2.2 | 10.0 | 66.6 | 774 | 3 | 12 | 48.6 | 53.1 | 64.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.3 | 2.3 | 8.6 | 26.1 | 581.4 | 2.3 | 27 | 48.4 | 47.8 | 49.1 | TSI Average = 48.4 |
| Median | 20.8 | 2.3 | 5.5 | 20.3 | 585.5 | 2 | 26 | 48.0 | 47.2 | 47.5 | |
| Min | 14.5 | 1.2 | 1.6 | 12.9 | 393.0 | 2 | 10 | 41.9 | 35.2 | 41.0 | |
| Max | 26.0 | 3.5 | 28.8 | 66.6 | 851.0 | 3 | 46 | 57.4 | 63.5 | 64.7 | |
| Count | 14 | 14 | 14 | 14 | 14 | 10 | 14 | 14 | 14 | 14 | |

Easter

Lake Overview

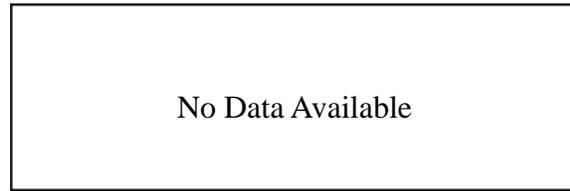
Volunteer monitoring began at Easter Lake in water year 1998 and has continued through 2003. Only Level I data have been collected at this city lake (Federal Way). Since the lake surface makes up 9% of the drainage area, direct precipitation is less important than stormwater runoff and groundwater. Current land use is mixed urban residential and commercial.

Easter Lake has no public access boat launch, but residents should watch for patches of Eurasian milfoil, as well as other noxious weeds.

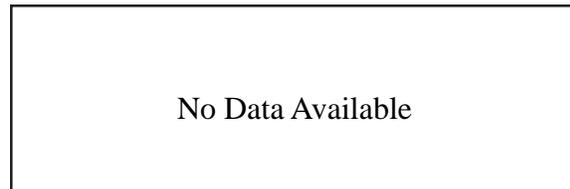
Physical Parameters

Water levels increased from November through January and then began decreasing slowly with some variation to a very low stand at the end of July when the level of the lake went below the fixed gauge. It had not risen to the lake gauge by the end of the water year. No data were available for temperature or Secchi transparency.

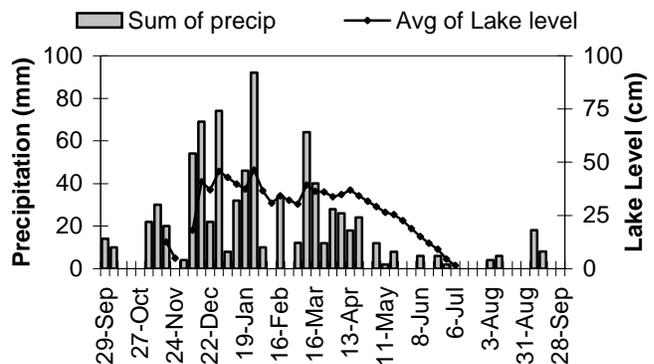
Lake Temperature



Secchi Depth



Lake Level and Precipitation



Easter

Nutrient Analysis

No Data Available

TSI Ratings

No Data Available

Chlorophyll a Concentrations (ug/L)

No Data Available

Algae

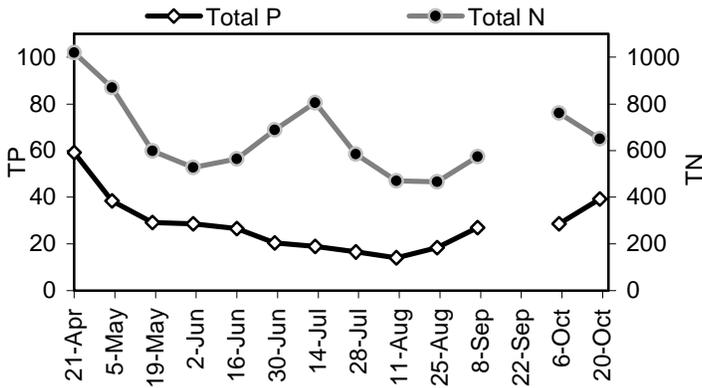
No Data Available

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 14.0 | 5 | | | | | | | | | |
| 6-Oct-02 | 10.1 | 7 | | | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | | | | | | | | | |
| 20-Oct-02 | 0.0 | 7 | | | | | | | | | |
| 27-Oct-02 | 0.1 | 7 | | | | | | | | | |
| 3-Nov-02 | 22.0 | 6 | | | | | | | | | |
| 10-Nov-02 | 30.1 | 7 | | | | | | | | | |
| 17-Nov-02 | 20.1 | 7 | 12.5 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 4.9 | 1 | | | | | | | |
| 1-Dec-02 | 4.0 | 7 | | | | | | | | | |
| 8-Dec-02 | 54.0 | 7 | 18.2 | 5 | | | | | | | |
| 15-Dec-02 | 69.0 | 7 | 40.8 | 7 | | | | | | | |
| 22-Dec-02 | 22.0 | 6 | 37.2 | 6 | | | | | | | |
| 29-Dec-02 | 74.1 | 6 | 45.7 | 7 | | | | | | | |
| 5-Jan-03 | 8.0 | 7 | 43.0 | 7 | | | | | | | |
| 12-Jan-03 | 32.0 | 7 | 39.9 | 7 | | | | | | | |
| 19-Jan-03 | 46.0 | 6 | 37.5 | 6 | | | | | | | |
| 26-Jan-03 | 92.0 | 7 | 46.3 | 7 | | | | | | | |
| 2-Feb-03 | 10.0 | 7 | 36.8 | 7 | | | | | | | |
| 9-Feb-03 | 0.0 | 7 | 30.8 | 7 | | | | | | | |
| 16-Feb-03 | 34.0 | 7 | 34.3 | 7 | | | | | | | |
| 23-Feb-03 | 0.0 | 5 | 32.2 | 5 | | | | | | | |
| 2-Mar-03 | 12.1 | 5 | 30.4 | 5 | | | | | | | |
| 9-Mar-03 | 64.0 | 6 | 39.3 | 6 | | | | | | | |
| 16-Mar-03 | 40.1 | 7 | 36.4 | 7 | | | | | | | |
| 23-Mar-03 | 12.0 | 7 | 36.1 | 7 | | | | | | | |
| 30-Mar-03 | 28.0 | 6 | 33.8 | 5 | | | | | | | |
| 6-Apr-03 | 26.1 | 7 | 34.8 | 7 | | | | | | | |
| 13-Apr-03 | 18.0 | 7 | 37.0 | 7 | | | | | | | |
| 20-Apr-03 | 24.1 | 7 | 34.3 | 7 | | | | | | | |
| 27-Apr-03 | 0.0 | 7 | 31.7 | 7 | | | | | | | |
| 4-May-03 | 12.0 | 7 | 29.3 | 7 | | | | | | | |
| 11-May-03 | 2.0 | 7 | 26.5 | 5 | | | | | | | |
| 18-May-03 | 8.0 | 7 | 25.5 | 7 | | | | | | | |
| 25-May-03 | 0.0 | 7 | 22.6 | 7 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 18.9 | 7 | | | | | | | |
| 8-Jun-03 | 6.0 | 7 | 15.2 | 7 | | | | | | | |
| 15-Jun-03 | 0.0 | 7 | 11.9 | 7 | | | | | | | |
| 22-Jun-03 | 6.1 | 7 | 9.1 | 7 | | | | | | | |
| 29-Jun-03 | 2.0 | 7 | 4.5 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 1.5 | 5 | | | | | | | |
| 13-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 3-Aug-03 | 4.0 | 7 | | | | | | | | | |
| 10-Aug-03 | 6.0 | 7 | | | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 7-Sep-03 | 18.1 | 7 | | | | | | | | | |
| 14-Sep-03 | 8.1 | 7 | | | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | | | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | | | | | | | | | |
| Min | 0.0 | | 1.5 | | | | 0.0 | 0.0 | | | |
| Max | 92.0 | | 46.3 | | | | 0.0 | 0.0 | | | |
| Total | 837.7 | | | | | | | | | | |

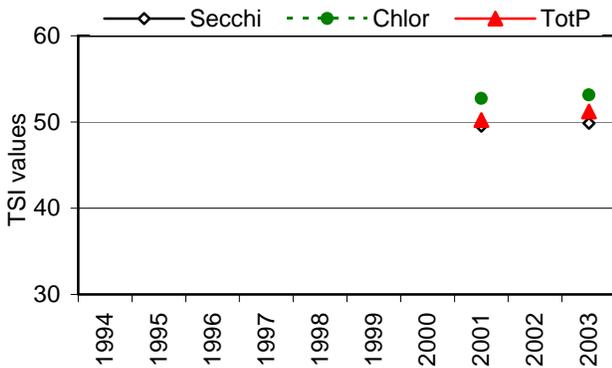
No Level II Data
Available For This Lake

Echo (Shoreline)

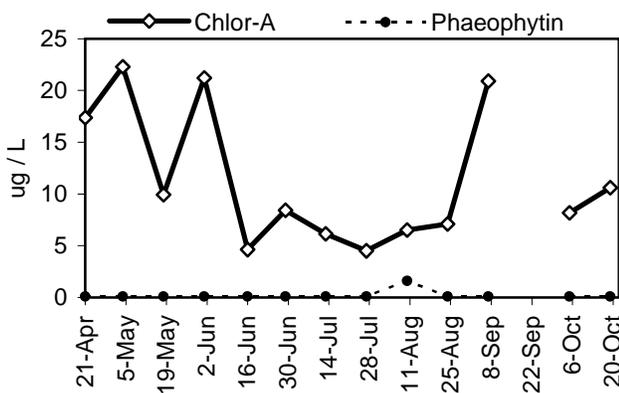
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Staurastrum</i> sp. | chlorophyte |
| unidentified colonial species | bluegreen |

Nutrient Analysis and TSI Ratings

Total nitrogen was at a maximum at the beginning of the period, reached another peak in mid-July and rose again in autumn. Phosphorus remained relatively stable through the sampling period, with higher values in spring and fall. The N:P ratio ranged from 17 to 43. The 2003 TSI-Chlor was slightly higher than the other TSI values, as it was in 2001, but all three values were in the lower range for eutrophy.

Chlorophyll and Algae

Chlorophyll content was high in spring and fall, with mid-season values generally at moderately low levels. The phytoplankton community was dominated in spring and fall by the bluegreen *Aphanizomenon*. Other common algae included a variety of chlorophytes, such as *Staurastrum*, and the dinoflagellate *Ceratium*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | | | | | | | | | | | |
| 13-Oct-02 | | | | | | | | | | | |
| 20-Oct-02 | | | | | | | | | | | |
| 27-Oct-02 | | | | | | | | | | | |
| 3-Nov-02 | | | | | | | | | | | |
| 10-Nov-02 | | | | | | | | | | | |
| 17-Nov-02 | | | | | | | | | | | |
| 24-Nov-02 | | | | | | | | | | | |
| 1-Dec-02 | | | | | | | | | | | |
| 8-Dec-02 | | | | | | | | | | | |
| 15-Dec-02 | | | | | | | | | | | |
| 22-Dec-02 | | | | | | | | | | | |
| 29-Dec-02 | | | | | | | | | | | |
| 5-Jan-03 | | | | | | | | | | | |
| 12-Jan-03 | | | | | | | | | | | |
| 19-Jan-03 | | | | | | | | | | | |
| 26-Jan-03 | | | | | | | | | | | |
| 2-Feb-03 | | | | | | | | | | | |
| 9-Feb-03 | | | | | | | | | | | |
| 16-Feb-03 | | | | | | | | | | | |
| 23-Feb-03 | | | | | | | | | | | |
| 2-Mar-03 | | | | | | | | | | | |
| 9-Mar-03 | | | | | | | | | | | |
| 16-Mar-03 | | | | | | | | | | | |
| 23-Mar-03 | | | | | | | | | | | |
| 30-Mar-03 | | | | | | | | | | | |
| 6-Apr-03 | | | | | | | | | | | |
| 13-Apr-03 | | | | | | | | | | | |
| 20-Apr-03 | | | | | | | | | | | |
| 27-Apr-03 | | | | | | | | | | | |
| 4-May-03 | | | | | | | | | | | |
| 11-May-03 | | | | | | | | | | | |
| 18-May-03 | | | | | | | | | | | |
| 25-May-03 | | | | | | | | | | | |
| 1-Jun-03 | | | | | | | | | | | |
| 8-Jun-03 | | | | | | | | | | | |
| 15-Jun-03 | | | | | | | | | | | |
| 22-Jun-03 | | | | | | | | | | | |
| 29-Jun-03 | | | | | | | | | | | |
| 6-Jul-03 | | | | | | | | | | | |
| 13-Jul-03 | | | | | | | | | | | |
| 20-Jul-03 | | | | | | | | | | | |
| 27-Jul-03 | | | | | | | | | | | |
| 3-Aug-03 | | | | | | | | | | | |
| 10-Aug-03 | | | | | | | | | | | |
| 17-Aug-03 | | | | | | | | | | | |
| 24-Aug-03 | 0.0 | 2 | 27.0 | 2 | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | 24.7 | 7 | 4-Sep-03 | 10:00 | 1.8 | 23.0 | P3 | P3 | |
| 7-Sep-03 | 4.1 | 7 | 21.6 | 7 | 13-Sep-03 | 14:00 | 2.3 | 20.0 | P2 | P2 | |
| 14-Sep-03 | 11.6 | 7 | 21.5 | 7 | 18-Sep-03 | 11:00 | 1.5 | 20.0 | P2 | P2 | |
| 21-Sep-03 | 0.1 | 7 | 21.1 | 7 | 23-Sep-03 | 14:00 | 1.3 | 20.0 | P3 | P3 | |
| 28-Sep-03 | 0.0 | 3 | 20.0 | 3 | 28-Sep-03 | 13:00 | 0.8 | 20.0 | P3 | P3 | |
| Min | 0.0 | | 20.0 | | | Min | 0.8 | 20.0 | | | |
| Max | 11.6 | | 27.0 | | | Max | 2.3 | 23.0 | | | |
| Total | 15.7 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|------------------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 7.0 | 2.7 | 17.4 | 59.1 | 1020 | 3 | 17 | 45.7 | 58.6 | 63.0 | Lots of green suspended particles. |
| 4-May | 9.0 | 1.3 | 22.3 | 38.4 | 869 | 3 | 23 | 56.2 | 61.0 | 56.8 | |
| 18-May | 17.0 | 2.0 | 9.9 | 29.1 | 598 | 1 | 21 | 50.0 | 53.1 | 52.8 | |
| 1-Jun | 19.0 | 1.3 | 21.2 | 28.6 | 528 | 3 | 18 | 56.2 | 60.5 | 52.5 | |
| 16-Jun | 20.5 | 2.5 | 4.6 | 26.5 | 564 | 3 | 21 | 46.8 | 45.6 | 51.4 | |
| 29-Jun | 23.0 | 1.5 | 8.4 | 20.4 | 689 | 1 | 34 | 54.1 | 51.5 | 47.7 | |
| 13-Jul | 22.0 | 2.5 | 6.1 | 18.9 | 805 | 1 | 43 | 46.8 | 48.4 | 46.6 | Water is completely clear. |
| 27-Jul | 25.0 | 2.3 | 4.5 | 16.5 | 585 | | 35 | 48.0 | 45.3 | 44.6 | |
| 10-Aug | 23.0 | 3.0 | 6.5 | 14.1 | 470 | 2 | 33 | 44.1 | 48.9 | 42.3 | |
| 24-Aug | 22.0 | 2.5 | 7.1 | 18.3 | 466 | 2 | 25 | 46.8 | 49.8 | 46.1 | |
| 8-Sep | 22.0 | 2.0 | 20.9 | 26.9 | 574 | 2 | 21 | 50.0 | 60.4 | 51.6 | No sample. |
| 22-Sep | | | | | | | | | | | |
| 6-Oct | 17.2 | 1.5 | 8.2 | 28.6 | 761 | 3 | 27 | 54.1 | 51.2 | 52.5 | |
| 19-Oct | 14.0 | 2.5 | 10.6 | 39.2 | 651 | 2 | 17 | 46.8 | 53.7 | 57.1 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.5 | 2.1 | 11.4 | 28.0 | 660.0 | 2.2 | 26 | 49.7 | 52.9 | 51.2 | TSI Average = 51.2 |
| Median | 20.5 | 2.3 | 8.4 | 26.9 | 598.0 | 2 | 23 | 48.0 | 51.5 | 51.6 | |
| Min | 7.0 | 1.3 | 4.5 | 14.1 | 466.0 | 1 | 17 | 44.1 | 45.3 | 42.3 | |
| Max | 25.0 | 3.0 | 22.3 | 59.1 | 1020.0 | 3 | 43 | 56.2 | 61.0 | 63.0 | |
| Count | 13 | 13 | 13 | 13 | 13 | 12 | 13 | 13 | 13 | 13 | |

Fenwick

Lake Overview

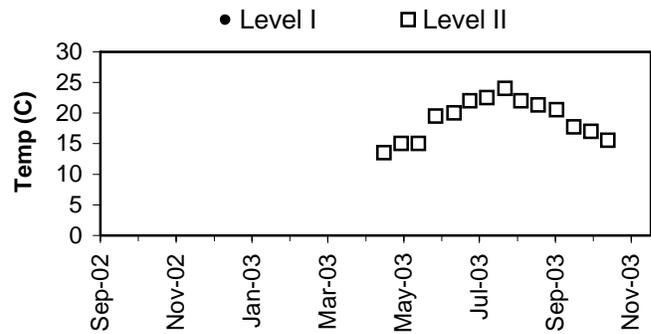
Volunteers monitored Lake Fenwick in 1994 -1995, and again in 2001 and 2003. The data indicate that this lake in the city of Kent is moderate to high in primary productivity (mesotrophic - eutrophic) with good to fair water quality. Since the lake surface makes up only 4% of the drainage area, direct rainfall is not as important as watershed inputs. There are no significant wetlands in the basin, other than the lake itself which is categorized as Class 2 (King County, 1990). Land use analysis of 2002 aerial photographs showed over 74% of the surrounding watershed has been developed for uses other than agriculture. Kent has run a program of artificial aeration of bottom waters for a number of years to limit internal phosphorus recycling.

Lake Fenwick has a public access boat ramp next to the city park. Brazilian elodea has established a large population in the lake, and monitoring for other noxious aquatic weeds should be continued.

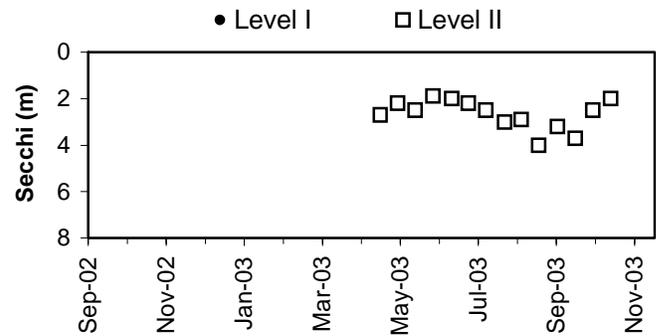
Physical Parameters

The Secchi transparency during the sampling season ranged between 1.9 and 4.0m. Level II surface water temperatures reached 24.0 degrees Celsius in late July. There were no precipitation or water level records for the water year.

Lake Temperature



Secchi Depth

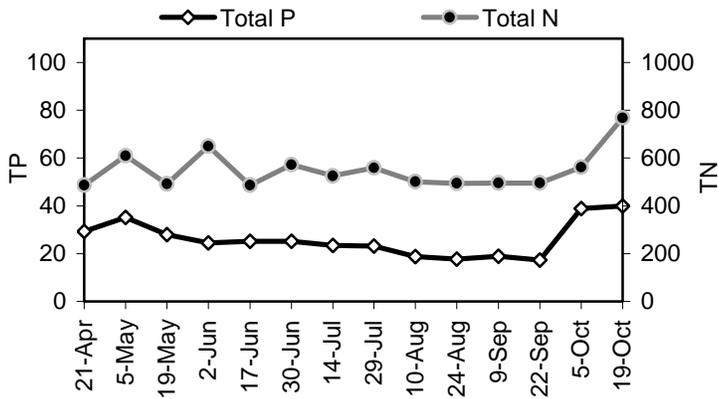


Lake Level and Precipitation

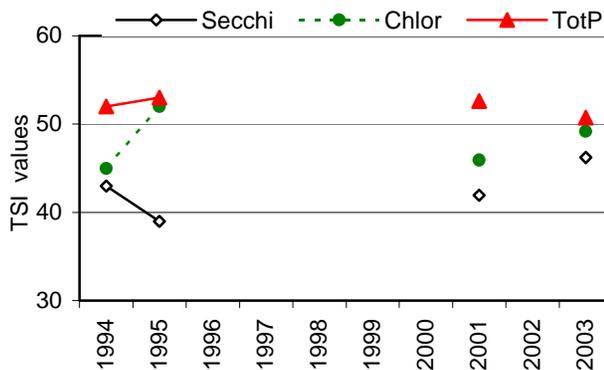


Fenwick

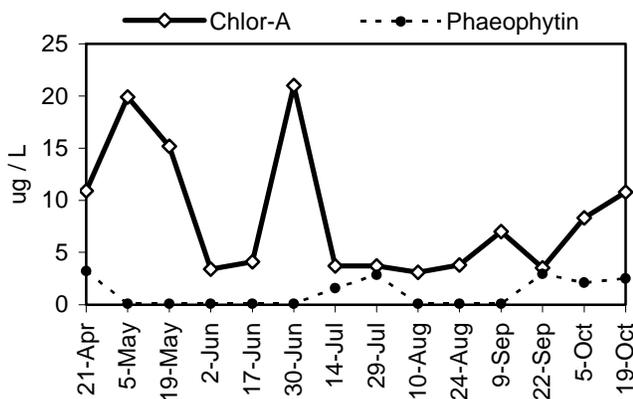
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|------------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| unidentified colonial species | no determination |
| <i>Cryptomonas</i> spp. | cryptophyte |

Nutrient Analysis and TSI Ratings

Both total nitrogen and total phosphorus remained relatively stable through the sampling period until late September, when both made significant increases. The N:P ratio ranged from 14 to 28, and the majority of the time indicated good conditions for bluegreen algal growth. The 2003 TSI-Chlor was slightly higher than the other TSI values, but all were closer together than in earlier years, placing at or just under the threshold for eutrophy.

Chlorophyll and Algae

Chlorophyll made peaks in May and the end of June, with a further, smaller rise in autumn. The phytoplankton species were dominated in spring and fall by the bluegreen *Aphanizomenon*. Other common algae included a variety of cryptophytes and an unidentified colonial species.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|-------------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.5 | 2.7 | 10.9 | 29.4 | 487 | 3 | 17 | 45.7 | 54.0 | 52.9 | |
| 5-May | 15.0 | 2.2 | 19.9 | 35.2 | 610 | 2 | 17 | 48.6 | 59.9 | 55.5 | |
| 19-May | 15.0 | 2.5 | 15.2 | 28.0 | 492 | 3 | 18 | 46.8 | 57.3 | 52.2 | |
| 2-Jun | 19.5 | 1.9 | 3.4 | 24.5 | 649 | 1 | 26 | 50.7 | 42.6 | 50.3 | |
| 17-Jun | 20.0 | 2.0 | 4.1 | 25.2 | 486 | 2 | 19 | 50.0 | 44.4 | 50.7 | |
| 30-Jun | 22.0 | 2.2 | 21.0 | 25.2 | 572 | 2 | 23 | 48.6 | 60.4 | 50.7 | |
| 14-Jul | 22.5 | 2.5 | 3.7 | 23.4 | 525 | 2 | 22 | 46.8 | 43.4 | 49.6 | Tiny stringy algae particles. |
| 29-Jul | 24.0 | 3.0 | 3.7 | 23.2 | 559 | 1 | 24 | 44.1 | 43.4 | 49.5 | |
| 11-Aug | 22.0 | 2.9 | 3.1 | 18.8 | 501 | 2 | 27 | 44.6 | 41.7 | 46.5 | |
| 25-Aug | 21.3 | 4.0 | 3.8 | 17.7 | 495 | 2 | 28 | 40.0 | 43.7 | 45.6 | |
| 9-Sep | 20.5 | 3.2 | 7.0 | 19.0 | 496 | 2 | 26 | 43.2 | 49.7 | 46.6 | |
| 23-Sep | 17.7 | 3.7 | 3.5 | 17.4 | 496 | 2 | 29 | 41.1 | 42.9 | 45.4 | |
| 7-Oct | 17.0 | 2.5 | 8.3 | 38.9 | 562 | 3 | 14 | 46.8 | 51.3 | 57.0 | |
| 21-Oct | 15.5 | 2.0 | 10.8 | 40.0 | 768 | 3 | 19 | 50.0 | 53.9 | 57.4 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.0 | 2.7 | 8.5 | 26.1 | 549.8 | 2.1 | 22 | 46.2 | 49.2 | 50.7 | TSI Average = 48.7 |
| Median | 19.8 | 2.5 | 5.6 | 24.9 | 513.0 | 2 | 23 | 46.8 | 47.1 | 50.5 | |
| Min | 13.5 | 1.9 | 3.1 | 17.4 | 486.0 | 1 | 14 | 40.0 | 41.7 | 45.4 | |
| Max | 24.0 | 4.0 | 21.0 | 40.0 | 768.0 | 3 | 29 | 50.7 | 60.4 | 57.4 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Fivemile

Lake Overview

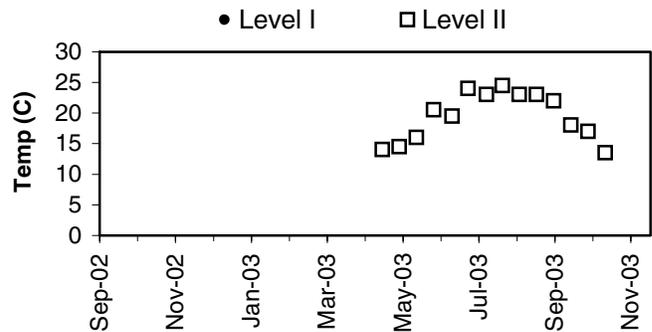
Volunteers monitored Fivemile Lake in the 1980s and continued through 2003, with a four-year gap in the early 1990s. The current data identify this lake as moderately high in primary productivity (mesotrophic) with good water quality. The strong tea color of the water affects clarity, making the TSI-Secchi considerably higher than other trophic indicators. Since the lake surface makes up only 6% of the drainage area, direct precipitation is not as important as watershed inputs. Land use analysis of 2002 aerial photographs showed over 58% of the surrounding watershed has been developed for uses other than agriculture. There are five Class 2 wetlands in the watershed, including one which adjoins the lake along a large portion of the shoreline (King County, 1990).

Fivemile Lake has no public access boat ramp, but car top boats may be launched from the county park on the eastern shoreline. Residents should keep a watch on nearshore aquatic plants to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

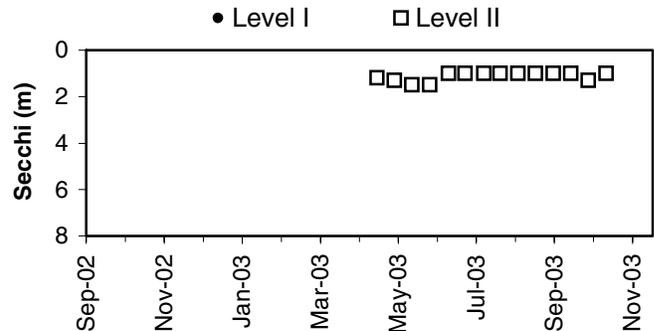
Physical Parameters

The Secchi transparency during the sampling season was very steady, between 1 and 1.5m, consistent with the impact of the water color. Level II surface water temperatures reached 24.5 degrees Celsius in July. There were no precipitation or water level records for the year.

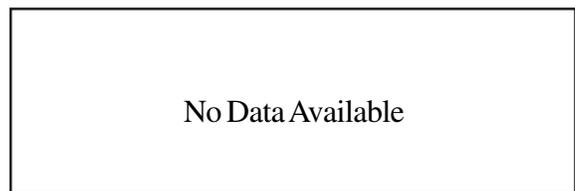
Lake Temperature



Secchi Depth

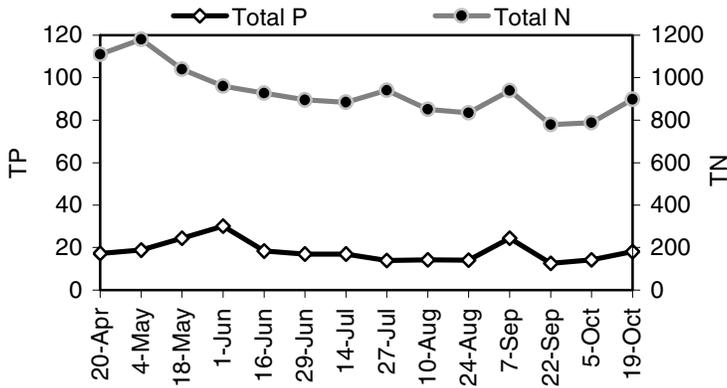


Lake Level and Precipitation

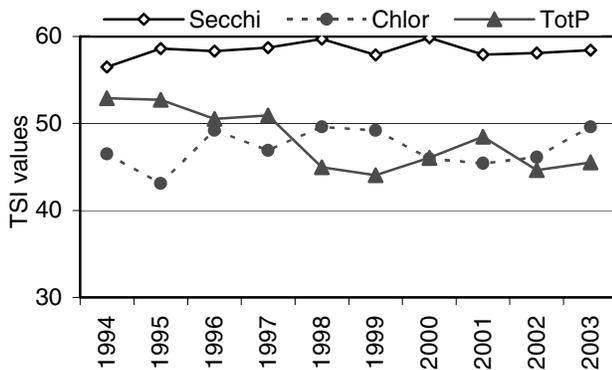


Fivemile

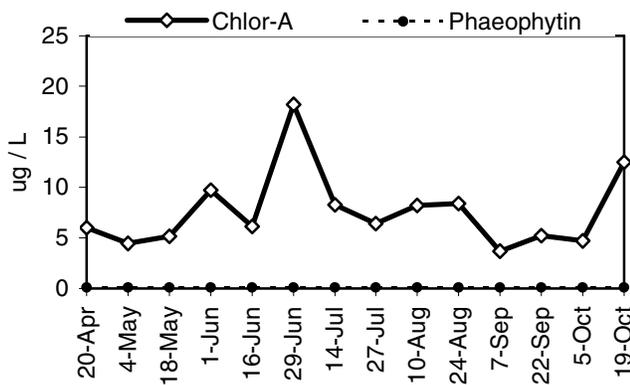
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-------------------------|-------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| unidentified species | chrysophyte |
| <i>Cryptomonas</i> spp. | cryptophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen and phosphorus remained relatively constant through the sampling period, with nitrogen declining slightly in spring. The N:P ratio ranged from 32 to one value of 68. The 2003 TSI-Secchi was considerably higher than other TSI values similar to other years, suggesting it is significantly affected by water color. The other two indicators are in the mesotrophic range.

Chlorophyll and Algae

Chlorophyll reached a peak in late June and was rising again at the end of the sample season in October. The spring peak was dominated by a variety of chrysophytes, in particular the genus *Dinobryon*. Other common species included several *Cryptomonas* species and the dinoflagellate *Ceratium*. The bluegreen *Aphanizomenon flos-aquae* was present in small amounts at times.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 1.2 | 6.0 | 17.3 | 1110 | 3 | 64 | 57.4 | 48.2 | 45.3 | |
| 4-May | 14.5 | 1.3 | 4.5 | 18.7 | 1180 | 1 | 63 | 56.2 | 45.2 | 46.4 | |
| 18-May | 16.0 | 1.5 | 5.1 | 24.4 | 1040 | 1 | 43 | 54.1 | 46.6 | 50.2 | M.Murphy noted P2 from waterbottle left w/ sample. |
| 1-Jun | 20.5 | 1.5 | 9.7 | 30.0 | 959 | 1 | 32 | 54.1 | 52.9 | 53.2 | |
| 16-Jun | 19.5 | 1.0 | 6.1 | 18.3 | 927 | 1 | 51 | 60.0 | 48.3 | 46.1 | |
| 29-Jun | 24.0 | 1.0 | 18.2 | 16.9 | 895 | 1 | 53 | 60.0 | 59.0 | 44.9 | KC Staff noted P2. |
| 14-Jul | 23.0 | 1.0 | 8.3 | 17.0 | 885 | 1 | 52 | 60.0 | 51.3 | 45.0 | |
| 27-Jul | 24.5 | 1.0 | 6.4 | 13.9 | 940 | 2 | 68 | 60.0 | 48.8 | 42.1 | |
| 10-Aug | 23.0 | 1.0 | 8.2 | 14.3 | 852 | 1 | 60 | 60.0 | 51.2 | 42.5 | |
| 24-Aug | 23.0 | 1.0 | 8.4 | 14.1 | 835 | 1 | 59 | 60.0 | 51.5 | 42.3 | At the higher range of P1 this week. |
| 7-Sep | 22.0 | 1.0 | 3.7 | 24.3 | 938 | 1 | 39 | 60.0 | 43.4 | 50.2 | |
| 21-Sep | 18.0 | 1.0 | 5.2 | 12.6 | 780 | 1 | 62 | 60.0 | 46.8 | 40.7 | Fewer noticeable particles this week. |
| 5-Oct | 17.0 | 1.3 | 4.7 | 14.2 | 788 | 1 | 55 | 56.2 | 45.8 | 42.4 | |
| 19-Oct | 13.5 | 1.0 | 12.5 | 18.0 | 898 | 1 | 50 | 60.0 | 55.3 | 45.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.5 | 1.1 | 7.6 | 18.1 | 930.5 | 1.2 | 54 | 58.4 | 49.6 | 45.5 | TSI Average = 51.2 |
| Median | 20.0 | 1.0 | 6.3 | 17.2 | 912.5 | 1 | 54 | 60.0 | 48.6 | 45.1 | |
| Min | 13.5 | 1.0 | 3.7 | 12.6 | 780.0 | 1 | 32 | 54.1 | 43.4 | 40.7 | |
| Max | 24.5 | 1.5 | 18.2 | 30.0 | 1180.0 | 3 | 68 | 60.0 | 59.0 | 53.2 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Francis

Lake Overview

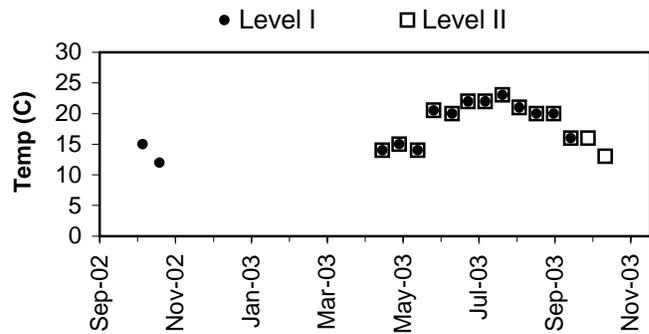
Volunteer monitoring began at Lake Francis in the 1996 and continued through 2003. The data indicate that this lake is fairly high in primary productivity (mesotrophic to threshold eutrophic) with good to fair water quality. Since the lake surface makes up 5% of the drainage area, direct precipitation is not as important as watershed inputs. There are several significant wetlands in the basin and much of the lake shoreline is considered Class 1 wetland, in addition to water inputs from Webster Lake upstream (King County, 1990). Land use analysis of 2002 aerial photographs showed almost 29% of the surrounding watershed has been developed for uses other than agriculture.

Lake Francis has no public access, but residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

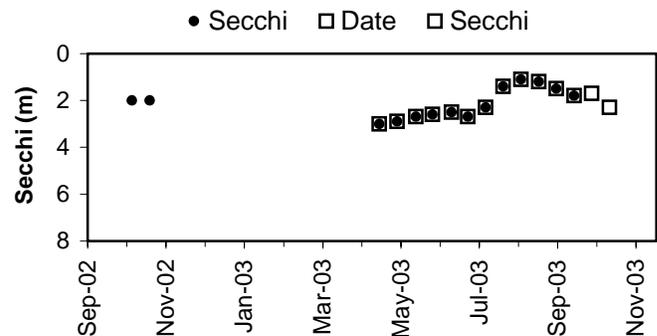
Physical Parameters

The Secchi transparency during the sampling season was fairly steady, ranging between 1.1 and 3.0m. Water level was recorded periodically. The lake conforms to the winter high – summer low pattern of the region. Level II surface water temperatures reached a maximum of 23 degrees Celsius in late July.

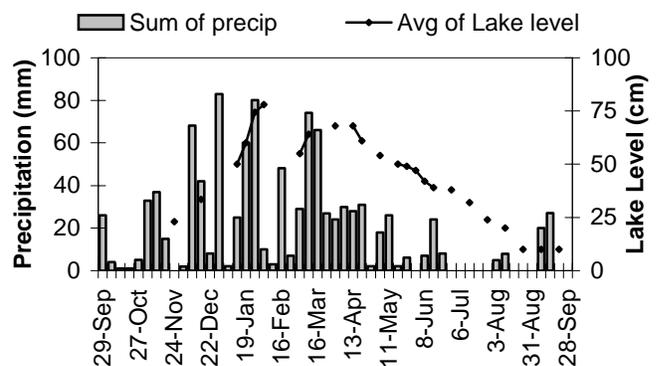
Lake Temperature



Secchi Depth

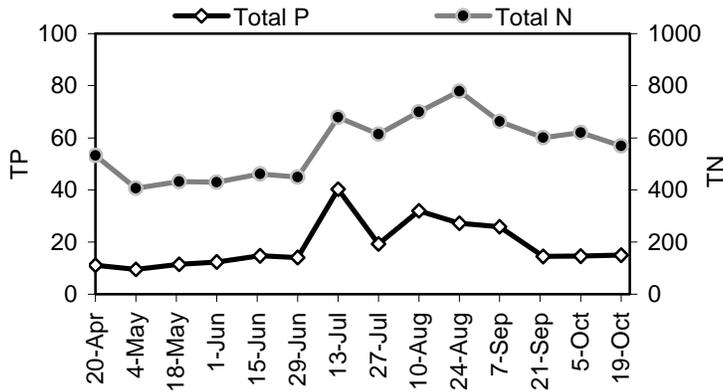


Lake Level and Precipitation

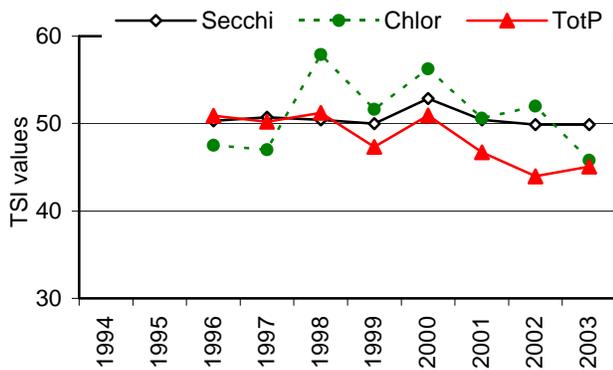


Francis

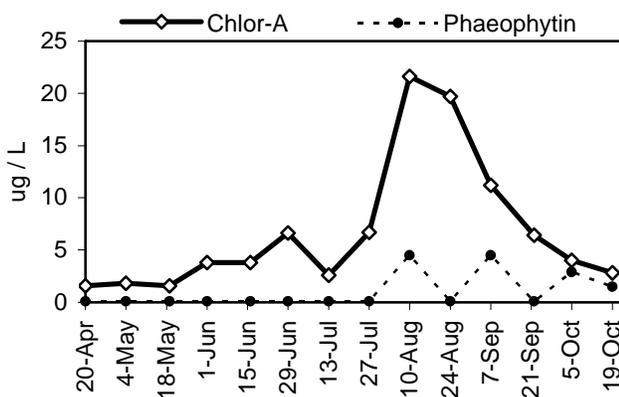
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|--------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| unidentified species | chrysophyte |
| <i>Euglena acus</i> | euglenophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly close proportion to each other through the sampling period. The N:P ratio ranged from 17 to 48. The 2003 TSI-Secchi was higher than the other two indicators, which were in the midrange for mesotrophy and in close agreement with each other.

Chlorophyll and Algae

Chlorophyll content was low through the first half of the sampling season, but reached a peak quickly in early August and then declined through the rest of the season. The August phytoplankton was dominated by the euglenophyte species *Euglena acus*. Other algae common through the season were several species of the chrysophyte *Dinobryon* and various species of chlorophytes and cryptophytes. Several species of coccoid bluegreen species were reported as occurring rarely.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 26.0 | 5 | | | | | | | | | |
| 6-Oct-02 | 4.0 | 7 | | | | | | | | | |
| 13-Oct-02 | 1.0 | 7 | | | | | | | | | |
| 20-Oct-02 | 1.0 | 7 | | | | | | | | | |
| 27-Oct-02 | 5.1 | 7 | | | | | | | | | |
| 3-Nov-02 | 33.0 | 7 | | | | | | | | | |
| 10-Nov-02 | 37.0 | 7 | | | | | | | | | |
| 17-Nov-02 | 15.0 | 7 | | | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 23.0 | 1 | | | | | | | |
| 1-Dec-02 | 2.0 | 7 | | | | | | | | | |
| 8-Dec-02 | 68.1 | 7 | | | | | | | | | |
| 15-Dec-02 | 42.0 | 7 | 33.5 | 2 | | | | | | | |
| 22-Dec-02 | 8.1 | 5 | | | | | | | | | |
| 29-Dec-02 | 83.0 | 7 | | | | | | | | | |
| 5-Jan-03 | 2.1 | 7 | | | | | | | | | |
| 12-Jan-03 | 25.0 | 7 | 50.0 | 1 | | | | | | | |
| 19-Jan-03 | 60.0 | 7 | 60.0 | 1 | | | | | | | |
| 26-Jan-03 | 80.1 | 7 | 74.3 | 3 | | | | | | | |
| 2-Feb-03 | 10.0 | 7 | 78.0 | 1 | | | | | | | |
| 9-Feb-03 | 3.1 | 7 | | | | | | | | | |
| 16-Feb-03 | 48.1 | 7 | | | | | | | | | |
| 23-Feb-03 | 7.0 | 7 | | | | | | | | | |
| 2-Mar-03 | 29.1 | 6 | 55.0 | 1 | | | | | | | |
| 9-Mar-03 | 74.1 | 7 | 64.0 | 1 | | | | | | | |
| 16-Mar-03 | 66.0 | 7 | | | | | | | | | |
| 23-Mar-03 | 27.0 | 5 | | | | | | | | | |
| 30-Mar-03 | 24.1 | 7 | 68.0 | 1 | | | | | | | |
| 6-Apr-03 | 30.0 | 7 | | | | | | | | | |
| 13-Apr-03 | 28.1 | 7 | 68.0 | 1 | | | | | | | |
| 20-Apr-03 | 31.1 | 7 | 61.0 | 1 | 20-Apr-03 | 11:21 | 3.0 | 14.0 | P1 | P1 | 8 |
| 27-Apr-03 | 2.1 | 7 | | | | | | | | | |
| 4-May-03 | 18.0 | 7 | 54.0 | 1 | 4-May-03 | 18:00 | 2.9 | 15.0 | P1 | P1 | 10 |
| 11-May-03 | 26.1 | 7 | | | | | | | | | |
| 18-May-03 | 2.1 | 7 | 50.0 | 1 | 19-May-03 | 9:30 | 2.7 | 14.0 | P1 | P1 | 0 |
| 25-May-03 | 6.1 | 7 | 49.0 | 1 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 47.0 | 1 | 1-Jun-03 | 13:30 | 2.6 | 20.5 | P2 | P2 | 2 |
| 8-Jun-03 | 7.1 | 7 | 42.0 | 1 | | | | | | | |
| 15-Jun-03 | 24.1 | 7 | 39.0 | 1 | 16-Jun-03 | 15:00 | 2.5 | 20.0 | P2 | P2 | 10 |
| 22-Jun-03 | 8.1 | 7 | | | | | | | | | |
| 29-Jun-03 | 0.0 | 7 | 38.0 | 1 | 29-Jun-03 | 20:00 | 2.7 | 22.0 | P2 | P2 | 0 |
| 6-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 13-Jul-03 | 0.1 | 7 | 32.0 | 1 | 13-Jul-03 | 20:20 | 2.3 | 22.0 | P2 | P2 | 0 |
| 20-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 24.0 | 1 | 27-Jul-03 | 18:45 | 1.4 | 23.0 | P2 | P2 | 4 |
| 3-Aug-03 | 5.0 | 7 | | | | | | | | | |
| 10-Aug-03 | 8.0 | 7 | 20.0 | 1 | 10-Aug-03 | 18:00 | 1.1 | 21.0 | P2 | P2 | 8 |
| 17-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | 10.0 | 1 | 24-Aug-03 | 18:00 | 1.2 | 20.0 | P2 | P2 | 2 |
| 31-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 7-Sep-03 | 20.0 | 7 | 10.0 | 1 | 7-Sep-03 | 19:50 | 1.5 | 20.0 | P2 | P2 | 60 |
| 14-Sep-03 | 27.1 | 7 | | | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 10.0 | 1 | 21-Sep-03 | 14:50 | 1.8 | 16.0 | P2 | P2 | 6 |
| 28-Sep-03 | 0.0 | 3 | | | | | | | | | |
| Min | 0.0 | | 10.0 | | | Min | 1.1 | 14.0 | | | 0 |
| Max | 83.0 | | 78.0 | | | Max | 3.0 | 23.0 | | | 60 |
| Total | 1023.3 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 3.0 | 1.6 | 11.1 | 532 | 1 | 48 | 44.1 | 35.2 | 38.9 | |
| 4-May | 15.0 | 2.9 | 1.8 | 9.6 | 406 | | 42 | 44.6 | 36.5 | 36.8 | |
| 19-May | 14.0 | 2.7 | 1.6 | 11.5 | 432 | 1 | 38 | 45.7 | 35.2 | 39.4 | |
| 1-Jun | 20.5 | 2.6 | 3.8 | 12.4 | 430 | 2 | 35 | 46.2 | 43.7 | 40.5 | |
| 16-Jun | 20.0 | 2.5 | 3.8 | 14.7 | 462 | | 31 | 46.8 | 43.7 | 42.9 | |
| 29-Jun | 22.0 | 2.7 | 6.6 | 14.1 | 449 | 2 | 32 | 45.7 | 49.1 | 42.3 | |
| 13-Jul | 22.0 | 2.3 | 2.6 | 40.3 | 679 | 2 | 17 | 48.0 | 39.9 | 57.5 | |
| 27-Jul | 23.0 | 1.4 | 6.7 | 19.2 | 614 | 2 | 32 | 55.1 | 49.2 | 46.8 | |
| 10-Aug | 21.0 | 1.1 | 21.6 | 31.9 | 700 | 1 | 22 | 58.6 | 60.7 | 54.1 | |
| 24-Aug | 20.0 | 1.2 | 19.7 | 27.2 | 779 | 2 | 29 | 57.4 | 59.8 | 51.8 | |
| 7-Sep | 20.0 | 1.5 | 11.2 | 25.8 | 664 | 2 | 26 | 54.1 | 54.3 | 51.0 | |
| 21-Sep | 16.0 | 1.8 | 6.4 | 14.5 | 601 | 2 | 41 | 51.5 | 48.8 | 42.7 | |
| 5-Oct | 16.0 | 1.7 | 4.0 | 14.6 | 621 | 2 | 43 | 52.3 | 44.2 | 42.8 | |
| 19-Oct | 13.0 | 2.3 | 2.8 | 14.9 | 569 | 1 | 38 | 48.0 | 40.7 | 43.1 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.3 | 2.1 | 6.7 | 18.7 | 567.0 | 1.7 | 34 | 49.9 | 45.8 | 45.0 | TSI Average = 46.9 |
| Median | 20.0 | 2.3 | 3.9 | 14.7 | 585.0 | 2 | 33 | 48.0 | 43.9 | 42.9 | |
| Min | 13.0 | 1.1 | 1.6 | 9.6 | 406.0 | 1 | 17 | 44.1 | 35.2 | 36.8 | |
| Max | 23.0 | 3.0 | 21.6 | 40.3 | 779.0 | 2 | 48 | 58.6 | 60.7 | 57.5 | |
| Count | 14 | 14 | 14 | 14 | 14 | 12 | 14 | 14 | 14 | 14 | |

Geneva

Lake Overview

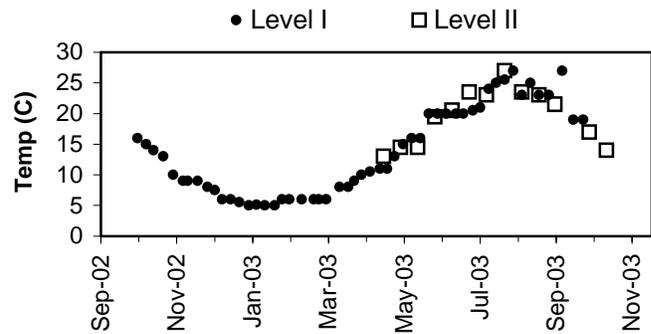
Volunteer monitoring began at Lake Geneva in the 1980s and continued through 2003, with a four-year hiatus in the early 1990s. The data indicate that this lake is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up nearly 13% of the drainage area, direct precipitation is an important water source in addition to watershed inputs. There are no significant wetlands in the basin. Land use analysis of 2002 aerial photographs showed 92% of the surrounding watershed has been developed for uses other than agriculture.

Lake Geneva has a public access boat ramp, and residents have funded efforts to control water lilies in the past. Eurasian milfoil has recently been identified in the lake and discussions for control are underway.

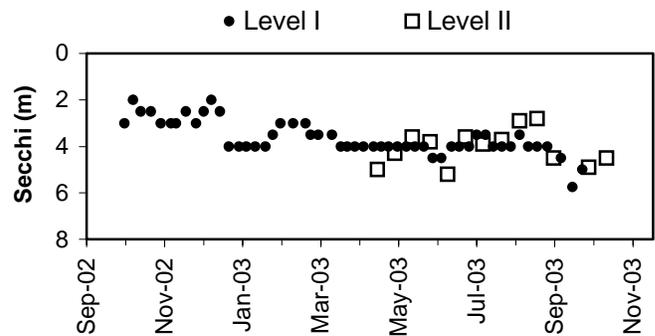
Physical Parameters

Secchi transparency ranged between 2.0 and 5.8m through the year. Annual surface water temperatures ranged between 5.0 and 27.0 degrees Celsius. Excellent records were available for water levels and precipitation. Water levels were consistent with the regional pattern of winter high - autumn low stands.

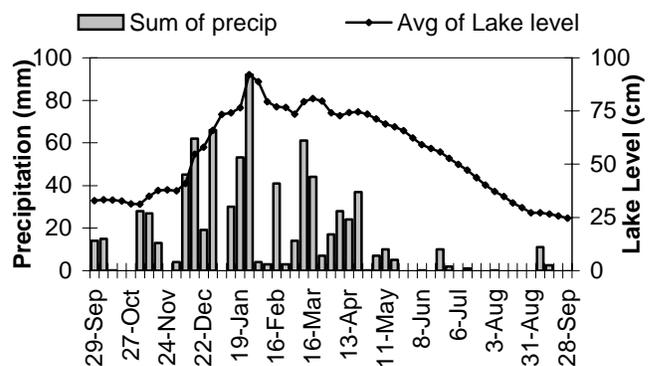
Lake Temperature



Secchi Depth

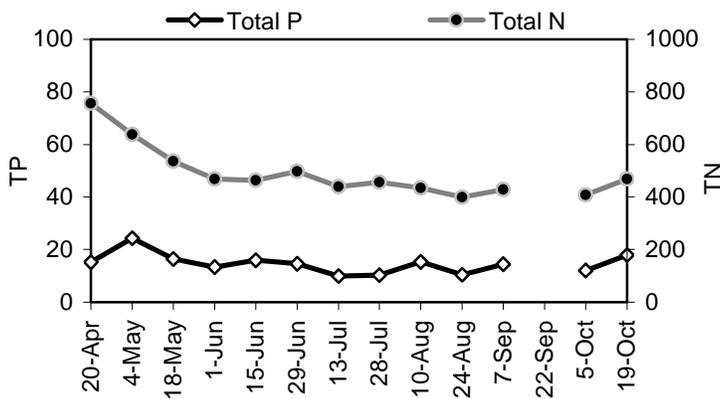


Lake Level and Precipitation

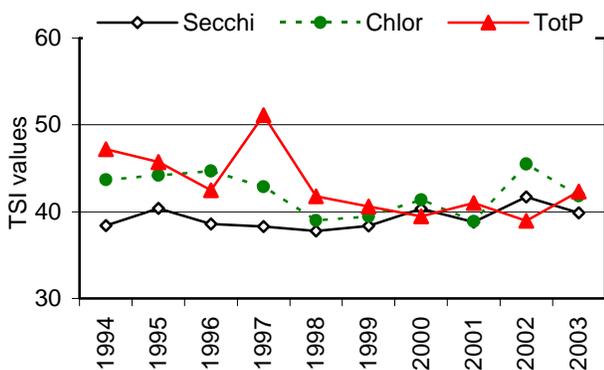


Geneva

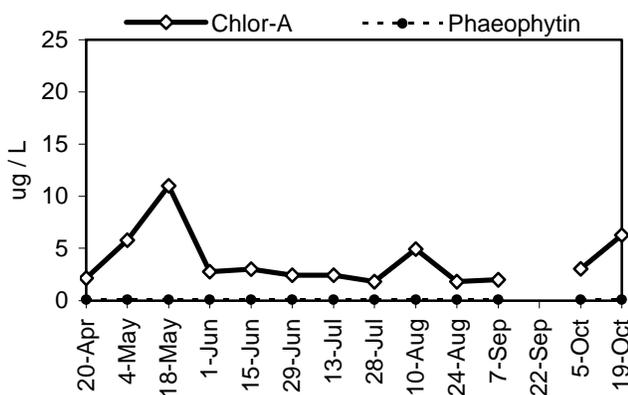
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Common algae

Group

| | |
|----------------------------------|--------------------|
| <i>Botryococcus braunii</i> | chlorophyte |
| <i>Aphanizomenon flos-aquae.</i> | bluegreen |
| <i>Cyclotella</i> sp. | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in reasonably constant proportion to each other through the sampling period, with total nitrogen slightly higher in spring. The N:P ratio ranged from 26 to 50. The 2003 TSI indicators were very close to each other, slightly above the threshold between oligotrophy and mesotrophy.

Chlorophyll and Algae

Chlorophyll peaked in mid-May, remained low through summer, and rose slightly at the end of the sample season. Phytoplankton was dominated in the spring by the chlorophyte *Botryococcus braunii* and in the fall by the bluegreen *Aphanizomenon flos-aquae*. Other important species included the diatom *Cyclotella* and a variety of cryptophyte species. The bluegreen *Anabaena* was a rare component of the plankton.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 14.0 | 4 | 33.0 | 5 | 1-Oct-02 | 12:30 | 3.0 | 16.0 | | | |
| 6-Oct-02 | 15.0 | 7 | 33.4 | 7 | 8-Oct-02 | 15:00 | 2.0 | 15.0 | | | 0 |
| 13-Oct-02 | 0.1 | 7 | 33.3 | 7 | 14-Oct-02 | 14:30 | 2.5 | 14.0 | | | 0 |
| 20-Oct-02 | 0.0 | 7 | 32.9 | 7 | 22-Oct-02 | 15:00 | 2.5 | 13.0 | | | 5 |
| 27-Oct-02 | 0.0 | 7 | 31.4 | 7 | 30-Oct-02 | 15:00 | 3.0 | 10.0 | | | 16 |
| 3-Nov-02 | 28.0 | 7 | 31.3 | 7 | 7-Nov-02 | 11:30 | 3.0 | 9.0 | | | |
| 10-Nov-02 | 27.0 | 7 | 35.0 | 7 | 11-Nov-02 | 14:30 | 3.0 | 9.0 | | | |
| 17-Nov-02 | 13.0 | 7 | 37.7 | 7 | 19-Nov-02 | 14:30 | 2.5 | 9.0 | | | 0 |
| 24-Nov-02 | 0.0 | 7 | 38.0 | 7 | 27-Nov-02 | 14:00 | 3.0 | 8.0 | | | 0 |
| 1-Dec-02 | 4.0 | 7 | 37.6 | 7 | 3-Dec-02 | 14:30 | 2.5 | 7.5 | P3 | P2 | 0 |
| 8-Dec-02 | 45.0 | 7 | 41.0 | 7 | 9-Dec-02 | 13:00 | 2.0 | 6.0 | P3 | P2 | 0 |
| 15-Dec-02 | 62.1 | 7 | 54.6 | 7 | 16-Dec-02 | 13:50 | 2.5 | 6.0 | | | 0 |
| 22-Dec-02 | 19.1 | 7 | 58.0 | 7 | 23-Dec-02 | 13:30 | 4.0 | 5.5 | P2 | P3 | 0 |
| 29-Dec-02 | 66.0 | 7 | 65.9 | 7 | 31-Dec-02 | 12:00 | 4.0 | 5.0 | NA | NA | 6 |
| 5-Jan-03 | 0.1 | 7 | 73.3 | 7 | 6-Jan-03 | 15:30 | 4.0 | 5.1 | | | 4 |
| 12-Jan-03 | 30.1 | 7 | 74.1 | 7 | 13-Jan-03 | 13:00 | 4.0 | 5.0 | | | 15 |
| 19-Jan-03 | 53.1 | 7 | 76.6 | 7 | 21-Jan-03 | 13:00 | 4.0 | 5.0 | | | 19 |
| 26-Jan-03 | 92.0 | 7 | 92.0 | 7 | 27-Jan-03 | 13:00 | 3.5 | 6.0 | | | 6 |
| 2-Feb-03 | 4.1 | 7 | 88.7 | 7 | 2-Feb-03 | 16:00 | 3.0 | 6.0 | | | 8 |
| 9-Feb-03 | 3.0 | 7 | 79.3 | 7 | 12-Feb-03 | 10:45 | 3.0 | 6.0 | | | |
| 16-Feb-03 | 41.0 | 7 | 77.0 | 7 | 22-Feb-03 | 13:30 | 3.0 | 6.0 | | | |
| 23-Feb-03 | 3.1 | 7 | 76.7 | 7 | 26-Feb-03 | 13:00 | 3.5 | 6.0 | | | |
| 2-Mar-03 | 14.0 | 7 | 73.6 | 7 | 4-Mar-03 | 15:00 | 3.5 | 6.0 | | | 4 |
| 9-Mar-03 | 61.1 | 7 | 79.3 | 7 | 15-Mar-03 | 11:30 | 3.5 | 8.0 | | | 2 |
| 16-Mar-03 | 44.1 | 7 | 80.9 | 7 | 22-Mar-03 | 11:30 | 4.0 | 8.0 | | | 8 |
| 23-Mar-03 | 7.1 | 7 | 79.7 | 7 | 27-Mar-03 | 16:00 | 4.0 | 9.0 | | | 3 |
| 30-Mar-03 | 17.1 | 7 | 74.1 | 7 | 2-Apr-03 | 11:30 | 4.0 | 10.0 | | | 6 |
| 6-Apr-03 | 28.1 | 7 | 72.7 | 7 | 9-Apr-03 | 14:00 | 4.0 | 10.5 | | | 4 |
| 13-Apr-03 | 24.1 | 7 | 74.3 | 7 | 17-Apr-03 | 14:00 | 4.0 | 11.0 | | | 7 |
| 20-Apr-03 | 37.0 | 7 | 74.6 | 7 | 23-Apr-03 | 14:00 | 4.0 | 11.0 | | | 4 |
| 27-Apr-03 | 0.2 | 7 | 73.6 | 7 | 29-Apr-03 | 14:30 | 4.0 | 13.0 | | | 6 |
| 4-May-03 | 7.1 | 7 | 71.3 | 7 | 6-May-03 | 14:00 | 4.0 | 15.0 | | | 4 |
| 11-May-03 | 10.0 | 7 | 68.9 | 7 | 13-May-03 | 14:30 | 4.0 | 16.0 | | | 4 |
| 18-May-03 | 5.2 | 7 | 67.6 | 7 | 20-May-03 | 12:00 | 4.0 | 16.0 | | | 5 |
| 25-May-03 | 0.0 | 7 | 65.7 | 7 | 27-May-03 | 15:00 | 4.0 | 20.0 | | | 4 |
| 1-Jun-03 | 0.0 | 7 | 62.3 | 7 | 3-Jun-03 | 13:30 | 4.5 | 20.0 | | | |
| 8-Jun-03 | 0.1 | 7 | 59.1 | 7 | 10-Jun-03 | 14:30 | 4.5 | 20.0 | NA | NA | |
| 15-Jun-03 | 0.1 | 7 | 57.3 | 7 | 18-Jun-03 | 14:00 | 4.0 | 20.0 | NA | NA | |
| 22-Jun-03 | 10.0 | 7 | 55.7 | 7 | 24-Jun-03 | 14:00 | 4.0 | 20.0 | NA | NA | |
| 29-Jun-03 | 2.0 | 7 | 52.7 | 7 | 2-Jul-03 | 11:00 | 4.0 | 20.5 | NA | NA | |
| 6-Jul-03 | 0.1 | 7 | 49.9 | 7 | 8-Jul-03 | 14:00 | 3.5 | 21.0 | NA | NA | |
| 13-Jul-03 | 1.1 | 7 | 47.1 | 7 | 15-Jul-03 | 14:00 | 3.5 | 24.0 | NA | NA | |
| 20-Jul-03 | 0.0 | 7 | 43.7 | 7 | 21-Jul-03 | 12:00 | 4.0 | 25.0 | NA | NA | |
| 27-Jul-03 | 0.0 | 7 | 40.3 | 7 | 28-Jul-03 | 14:30 | 4.0 | 25.5 | NA | NA | |
| 3-Aug-03 | 0.1 | 7 | 37.3 | 7 | 4-Aug-03 | 12:00 | 4.0 | 27.0 | NA | NA | |
| 10-Aug-03 | 0.1 | 7 | 34.9 | 7 | 11-Aug-03 | 14:00 | 3.5 | 23.0 | P1 | NA | |
| 17-Aug-03 | 0.0 | 7 | 31.9 | 7 | 18-Aug-03 | 15:00 | 4.0 | 25.0 | P2 | P1 | |
| 24-Aug-03 | 0.0 | 7 | 29.6 | 7 | 25-Jan-03 | 16:33 | 4.0 | 23.0 | P2 | P2 | |
| 31-Aug-03 | 0.0 | 7 | 27.3 | 7 | 2-Sep-03 | 16:00 | 4.0 | 23.0 | P2 | P2 | |
| 7-Sep-03 | 11.1 | 7 | 27.3 | 7 | 13-Sep-03 | 16:00 | 4.5 | 27.0 | | P1 | |
| 14-Sep-03 | 2.5 | 7 | 26.6 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 25.8 | 7 | 22-Sep-03 | 17:30 | 5.8 | 19.0 | | P2 | |
| 28-Sep-03 | 0.0 | 3 | 24.7 | 3 | 30-Sep-03 | 16:00 | 5.0 | 19.0 | | P2 | |
| Min | 0.0 | | 24.7 | | Min | | 2.0 | 5.0 | | | 0 |
| Max | 92.0 | | 92.0 | | Max | | 5.8 | 27.0 | | | 19 |
| Total | 801.4 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.0 | 5.0 | 2.1 | 15.2 | 756 | 1 | 50 | 36.8 | 38.0 | 43.4 | |
| 4-May | 14.5 | 4.3 | 5.8 | 24.3 | 638 | 2 | 26 | 39.0 | 47.8 | 50.2 | |
| 18-May | 14.5 | 3.6 | 11.0 | 16.4 | 537 | 2 | 33 | 41.5 | 54.1 | 44.5 | |
| 1-Jun | 19.5 | 3.8 | 2.8 | 13.4 | 468 | 2 | 35 | 40.7 | 40.5 | 41.6 | |
| 15-Jun | 20.5 | 5.2 | 3.0 | 15.9 | 464 | 2 | 29 | 36.2 | 41.3 | 44.1 | |
| 29-Jun | 23.5 | 3.6 | 2.4 | 14.6 | 498 | 2 | 34 | 41.5 | 39.2 | 42.8 | |
| 13-Jul | 23.0 | 3.9 | 2.4 | 9.9 | 439 | 2 | 44 | 40.4 | 39.2 | 37.2 | |
| 28-Jul | 27.0 | 3.7 | 1.8 | 10.3 | 456 | 2 | 44 | 41.1 | 36.3 | 37.8 | |
| 11-Aug | 23.5 | 2.9 | 4.9 | 15.3 | 434 | | 28 | 44.6 | 46.2 | 43.5 | |
| 25-Aug | 23.0 | 2.8 | 1.8 | 10.4 | 399 | 2 | 38 | 45.1 | 36.3 | 37.9 | |
| 7-Sep | 21.5 | 4.5 | 2.0 | 14.4 | 428 | 2 | 30 | 38.3 | 37.4 | 42.6 | |
| 22-Sep | | | | | | | | | | | No sample. |
| 5-Oct | 17.0 | 4.9 | 3.0 | 12.0 | 408 | 2 | 34 | 37.1 | 41.5 | 40.0 | |
| 19-Oct | 14.0 | 4.5 | 6.3 | 17.9 | 468 | 3 | 26 | 38.3 | 48.6 | 45.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.6 | 4.1 | 3.8 | 14.6 | 491.8 | 2.0 | 35 | 40.0 | 42.0 | 42.4 | TSI Average = 41.5 |
| Median | 20.5 | 3.9 | 2.8 | 14.6 | 464.0 | 2 | 34 | 40.4 | 40.5 | 42.8 | |
| Min | 13.0 | 2.8 | 1.8 | 9.9 | 399.0 | 1 | 26 | 36.2 | 36.3 | 37.2 | |
| Max | 27.0 | 5.2 | 11.0 | 24.3 | 756.0 | 3 | 50 | 45.1 | 54.1 | 50.2 | |
| Count | 13 | 13 | 13 | 13 | 13 | 12 | 13 | 13 | 13 | 13 | |

Grass

Lake Overview

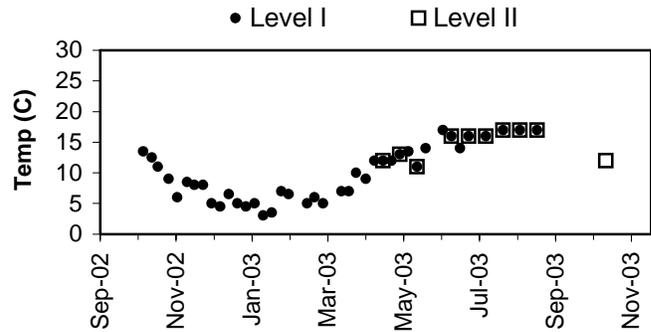
Volunteer monitoring began at Grass Lake in 2002 and continued through 2003. The data indicate that this lake is high in primary productivity (eutrophic) with fair water quality. Since the lake surface makes up 9% of the drainage area, direct precipitation is less important than watershed inputs. There are several wetlands in the basin, including much of the land adjacent to the lake. Land use analysis of 2002 aerial photographs showed over 43% of the surrounding watershed has been developed for uses other than agriculture.

Grass Lake has no public access boat ramp, but residents should monitor aquatic plants growing nearshore to catch early infestations of Eurasian watermilfoil, Brazilian elodea or other noxious aquatic weeds.

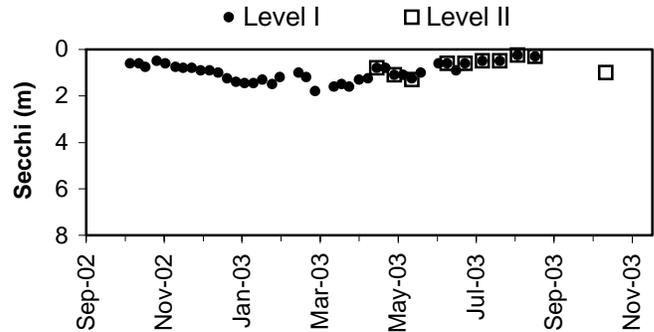
Physical Parameters

Secchi transparency ranged between 0.3 and 1.3m through the year. Surface water temperatures ranged between 3.0 and 17.0 degrees Celsius, somewhat lower than other monitored lakes in the region. Excellent precipitation and water level records were kept. The water levels were consistent with the regional pattern of winter high - autumn low stands.

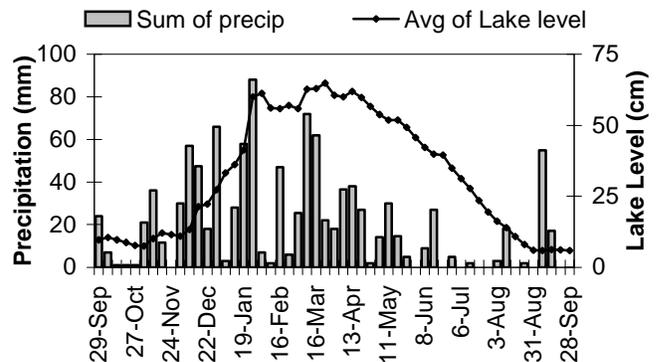
Lake Temperature



Secchi Depth

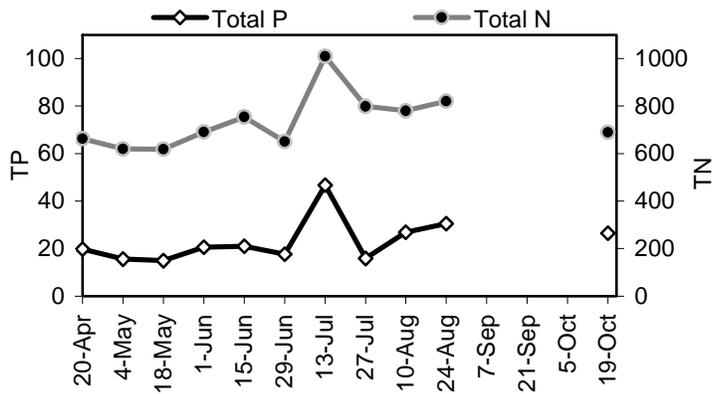


Lake Level and Precipitation

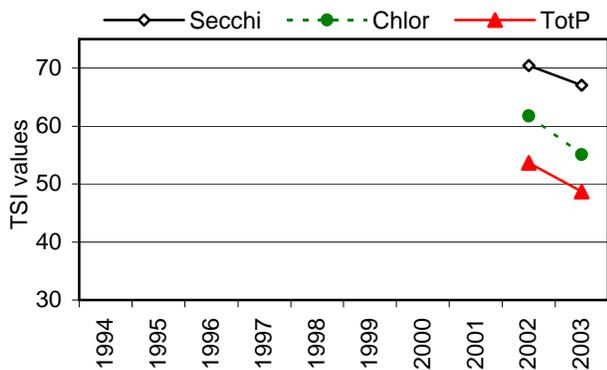


Grass

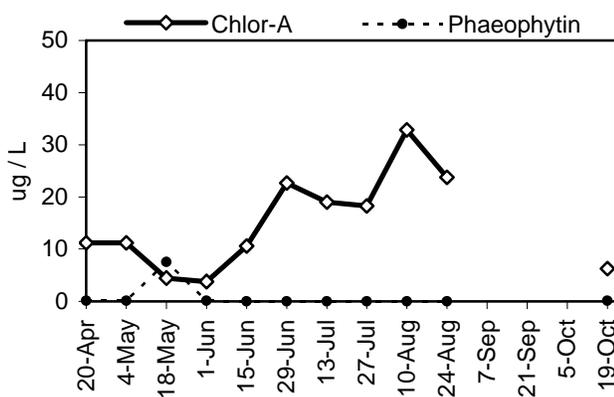
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in reasonably constant proportion to each other through the sampling period. The N:P ratio ranged from 22 to 50. The 2003 TSI-chlor and TSI-Secchi indicators were above the threshold for eutrophy, but the TSI-TotP was slightly below. All three indicators were lower than in 2002.

Chlorophyll and Algae

Chlorophyll rose in steps through the season to a peak in mid-August. A gap in sampling occurred in September through early October, but the data from the last date in October indicated levels were near their lowest values for the year. Phytoplankton were dominated by a variety of chrysophyte algae, many of them not identified to species, the cryptophyte *Cryptomonas*, and diatoms such as *Tabellaria fenestrata*. Bluegreen algae were rare.

Common algae

Group

| | |
|------------------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Cryptomonas</i> spp. | cryptophyte |
| <i>Tabellaria fenestrata</i> | diatom-chrysophyte |

Grass

2003 Level I Data

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 24.0 | 5 | 9.7 | 5 | | | | | | | |
| 6-Oct-02 | 7.0 | 7 | 10.4 | 7 | 6-Oct-02 | 16:30 | 0.6 | 13.5 | C3/P3 | C3/P2 | 10 |
| 13-Oct-02 | 1.0 | 6 | 9.6 | 6 | 13-Oct-02 | 16:50 | 0.6 | 12.5 | C3/P3 | C3/P2 | 0 |
| 20-Oct-02 | 1.0 | 6 | 8.8 | 6 | 18-Oct-02 | 14:30 | 0.8 | 11.0 | C3/P3 | C3/P2 | 0 |
| 27-Oct-02 | 1.1 | 7 | 7.7 | 7 | 27-Oct-02 | 16:50 | 0.5 | 9.0 | C3/P3 | C3/P3 | 0 |
| 3-Nov-02 | 21.0 | 7 | 7.5 | 7 | 3-Nov-02 | 14:40 | 0.6 | 6.0 | C3/P3 | C3/P2 | 2 |
| 10-Nov-02 | 36.1 | 7 | 10.1 | 7 | 11-Nov-02 | 11:45 | 0.8 | 8.5 | C3/P2 | C2/P2 | 0 |
| 17-Nov-02 | 11.8 | 7 | 12.0 | 7 | 17-Nov-02 | 14:25 | 0.8 | 8.0 | C3/P3 | C2/P2 | 0 |
| 24-Nov-02 | 0.0 | 7 | 11.4 | 7 | 24-Nov-02 | 14:00 | 0.8 | 8.0 | C3/P3 | C2/P2 | 0 |
| 1-Dec-02 | 30.0 | 7 | 10.9 | 7 | 1-Dec-02 | 13:30 | 0.9 | 5.0 | C3/P3 | C3/P3 | 0 |
| 8-Dec-02 | 57.0 | 7 | 13.2 | 7 | 8-Dec-02 | 15:50 | 0.9 | 4.5 | C3/P3 | C3/P3 | 0 |
| 15-Dec-02 | 47.5 | 7 | 21.4 | 7 | 15-Dec-02 | 12:15 | 1.0 | 6.5 | C3/P3 | C2/P3 | 0 |
| 22-Dec-02 | 18.0 | 7 | 22.2 | 7 | 22-Dec-02 | 14:15 | 1.3 | 5.0 | C3/P3 | C2/P2 | 0 |
| 29-Dec-02 | 66.0 | 7 | 27.3 | 7 | 29-Dec-02 | 11:50 | 1.4 | 4.5 | C3/P2 | C2/P1 | 0 |
| 5-Jan-03 | 3.0 | 7 | 33.3 | 7 | 5-Jan-03 | 12:30 | 1.5 | 5.0 | C3/P2 | C2/P2 | 0 |
| 12-Jan-03 | 28.0 | 7 | 36.2 | 7 | 12-Jan-03 | 12:30 | 1.5 | 3.0 | C3/P2 | C2/P2 | 0 |
| 19-Jan-03 | 58.0 | 7 | 41.3 | 7 | 19-Jan-03 | 13:30 | 1.3 | 3.5 | C2/P2 | C2/P2 | 0 |
| 26-Jan-03 | 88.0 | 7 | 60.0 | 7 | 27-Jan-03 | 14:00 | 1.5 | 7.0 | C2/P2 | C2/P2 | 0 |
| 2-Feb-03 | 7.0 | 7 | 61.1 | 7 | 2-Feb-03 | 15:50 | 1.2 | 6.5 | C2/P2 | C2/P2 | 0 |
| 9-Feb-03 | 2.0 | 7 | 56.1 | 7 | | | | | | | |
| 16-Feb-03 | 47.0 | 7 | 55.8 | 7 | 17-Feb-03 | 8:45 | 1.0 | 5.0 | C2/P2 | C2/P2 | 0 |
| 23-Feb-03 | 6.0 | 7 | 56.9 | 7 | 23-Feb-03 | 15:00 | 1.2 | 6.0 | | | 0 |
| 2-Mar-03 | 25.5 | 7 | 55.8 | 7 | 2-Mar-03 | 16:50 | 1.8 | 5.0 | C2/P2 | C2/P1 | 10 |
| 9-Mar-03 | 72.0 | 5 | 62.6 | 6 | | | | | | | |
| 16-Mar-03 | 62.0 | 6 | 62.9 | 6 | 17-Mar-03 | 12:00 | 1.6 | 7.0 | C2/P2 | C1/P2 | |
| 23-Mar-03 | 22.0 | 7 | 64.8 | 7 | 23-Mar-03 | 14:00 | 1.5 | 7.0 | C2/P2 | C2/P2 | 6 |
| 30-Mar-03 | 18.0 | 7 | 60.5 | 7 | 29-Mar-03 | 14:10 | 1.6 | 10.0 | C2/P2 | C2/P2 | 6 |
| 6-Apr-03 | 36.5 | 6 | 60.0 | 6 | 6-Apr-03 | 16:20 | 1.3 | 9.0 | C2/P2 | C2/P2 | |
| 13-Apr-03 | 38.0 | 7 | 61.8 | 7 | 13-Apr-03 | 17:00 | 1.3 | 12.0 | P3 | P3 | 4 |
| 20-Apr-03 | 27.0 | 7 | 59.7 | 7 | 20-Apr-03 | 13:30 | 0.8 | 12.0 | P3 | P3 | 1 |
| 27-Apr-03 | 2.0 | 7 | 56.6 | 7 | 27-Apr-03 | 16:30 | 0.8 | 12.0 | P3 | P3 | 6 |
| 4-May-03 | 14.0 | 7 | 53.8 | 7 | 4-May-03 | 12:00 | 1.1 | 13.0 | P3 | P3 | 2 |
| 11-May-03 | 30.0 | 7 | 51.9 | 7 | 11-May-03 | 18:30 | 1.1 | 13.5 | P3 | P3 | 2 |
| 18-May-03 | 14.5 | 7 | 51.9 | 7 | 18-May-03 | 12:00 | 1.3 | 11.0 | P3 | P3 | |
| 25-May-03 | 5.0 | 7 | 49.3 | 6 | 25-May-03 | 12:00 | 1.0 | 14.0 | P3 | P3 | |
| 1-Jun-03 | 0.0 | 7 | 45.7 | 7 | | | | | | | |
| 8-Jun-03 | 9.0 | 7 | 42.2 | 7 | 8-Jun-03 | 16:00 | 0.6 | 17.0 | P3 | P3 | |
| 15-Jun-03 | 27.0 | 7 | 39.9 | 7 | 15-Jun-03 | 15:00 | 0.6 | 16.0 | P3 | P3 | 4 |
| 22-Jun-03 | 0.0 | 7 | 39.5 | 7 | 22-Jun-03 | 15:00 | 0.9 | 14.0 | P3 | P3 | |
| 29-Jun-03 | 5.0 | 7 | 35.0 | 7 | 29-Jun-03 | 19:45 | 0.6 | 16.0 | P3 | P3 | 0 |
| 6-Jul-03 | 0.0 | 7 | 31.2 | 7 | | | | | | | |
| 13-Jul-03 | 2.0 | 7 | 27.7 | 7 | 13-Jul-03 | 17:00 | 0.5 | 16.0 | P3 | P3 | |
| 20-Jul-03 | 0.0 | 7 | 23.5 | 7 | 20-Jul-06 | 17:00 | NA | NA | P3 | | |
| 27-Jul-03 | 0.0 | 7 | 19.4 | 7 | 27-Jul-03 | 11:30 | 0.5 | 17.0 | P3 | P3 | |
| 3-Aug-03 | 3.0 | 7 | 16.1 | 7 | | | | | | | |
| 10-Aug-03 | 18.1 | 7 | 14.0 | 7 | 10-Aug-03 | 16:30 | 0.3 | 17.0 | P3 | P3 | |
| 17-Aug-03 | 0.0 | 7 | 10.8 | 7 | | | | | | | |
| 24-Aug-03 | 2.0 | 7 | 8.1 | 7 | 24-Aug-03 | 19:00 | 0.3 | 17.0 | P3 | P3 | |
| 31-Aug-03 | 0.0 | 7 | 6.1 | 7 | | | | | | | |
| 7-Sep-03 | 55.0 | 7 | 6.0 | 7 | | | | | | | |
| 14-Sep-03 | 17.0 | 7 | 6.3 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 6.2 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | 6.0 | 3 | | | | | | | |
| Min | 0.0 | | 6.0 | | | Min | 0.3 | 3.0 | | | 0 |
| Max | 88.0 | | 64.8 | | | Max | 1.8 | 17.0 | | | 10 |
| Total | 1065.0 | | | | | | | | | | |

Grass

2003 Level II Data

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 12.0 | 0.8 | 11.2 | 19.8 | 664 | 3 | 34 | 63.2 | 54.3 | 47.2 | |
| 4-May | 13.0 | 1.1 | 11.2 | 15.6 | 621 | 3 | 40 | 58.6 | 54.3 | 43.8 | |
| 18-May | 11.0 | 1.3 | 4.5 | 14.9 | 619 | 3 | 42 | 56.2 | 45.3 | 43.1 | Less clear spherical pinhead sized particles. |
| 1-Jun | | | 3.8 | 20.5 | 692 | 3 | 34 | | 43.6 | 47.7 | Large clumps of algae in water. |
| 15-Jun | 16.0 | 0.6 | 10.6 | 20.9 | 755 | 3 | 36 | 67.4 | 53.7 | 48.0 | Large clumps of algae floating. |
| 29-Jun | 16.0 | 0.6 | 22.7 | 17.6 | 651 | 3 | 37 | 67.4 | 61.2 | 45.5 | |
| 13-Jul | 16.0 | 0.5 | 19.0 | 46.7 | 1010 | 3 | 22 | 70.0 | 59.5 | 59.6 | Large floating brownish-green clumps. |
| 27-Jul | 17.0 | 0.5 | 18.3 | 15.9 | 799 | 3 | 50 | 70.0 | 59.1 | 44.1 | Large blue-green-brown clumps floating at surface. |
| 10-Aug | 17.0 | 0.3 | 32.9 | 26.9 | 781 | 3 | 29 | 80.0 | 64.8 | 51.6 | Lots of blue-green clumps of "dirt" floating on surface. |
| 24-Aug | 17.0 | 0.3 | 23.8 | 30.5 | 820 | 3 | 27 | 77.4 | 61.7 | 53.5 | Clumps floating. |
| 7-Sep | | | | | | | | | | | No sample - water too low. |
| 21-Sep | | | | | | | | | | | No sample - water too low. |
| 5-Oct | | | | | | | | | | | No sample - water too low. |
| 19-Oct | 12.0 | 1.0 | 6.2 | 26.5 | 691 | 3 | 26 | 60.0 | 48.5 | 51.4 | Algae noted as P3+. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 14.7 | 0.7 | 14.9 | 23.3 | 736.6 | 3.0 | 34 | 67.0 | 55.1 | 48.7 | TSI Average = 56.9 |
| Median | 16.0 | 0.6 | 11.2 | 20.5 | 692.0 | 3 | 34 | 67.4 | 54.3 | 47.7 | |
| Min | 11.0 | 0.3 | 3.8 | 14.9 | 619.0 | 3 | 22 | 56.2 | 43.6 | 43.1 | |
| Max | 17.0 | 1.3 | 32.9 | 46.7 | 1010.0 | 3 | 50 | 80.0 | 64.8 | 59.6 | |
| Count | 10 | 10 | 11 | 11 | 11 | 11 | 11 | 10 | 11 | 11 | |

Haller

Lake Overview

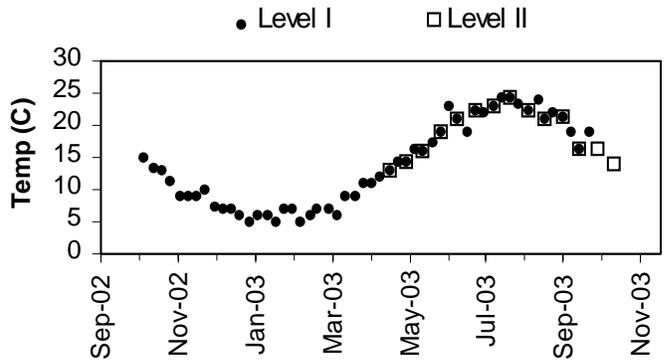
Volunteer monitoring began at Haller Lake in 1997 and continued through 2003. The data collected suggest that this city lake (Seattle) is moderate in primary productivity (mesotrophic), with good water quality. Since the lake surface makes up approximately 5% of the drainage area, direct precipitation is less important than watershed inputs. There are no significant wetlands in the basin. Land use analysis of 2002 aerial photographs showed over 92% of the surrounding watershed has been developed for uses other than agriculture.

Haller Lake has two public access street ends, where boats may be hand launched. Residents should keep a watch on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious weeds.

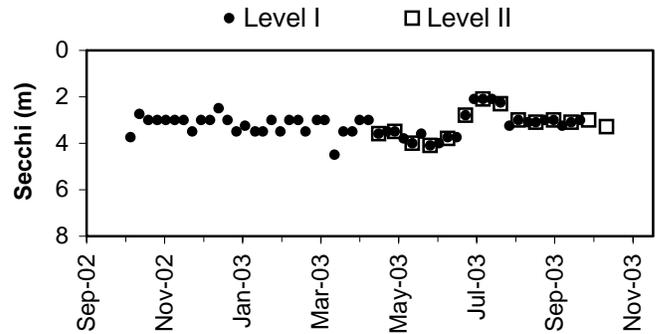
Physical Parameters

Secchi transparency ranged between 2.1 and 4.5m through the year. Annual surface water temperatures ranged between 5.0 and 24.5 degrees Celsius. Excellent precipitation and water level records were compiled during the year. Water levels were consistent with the regional pattern of winter high - autumn low stands.

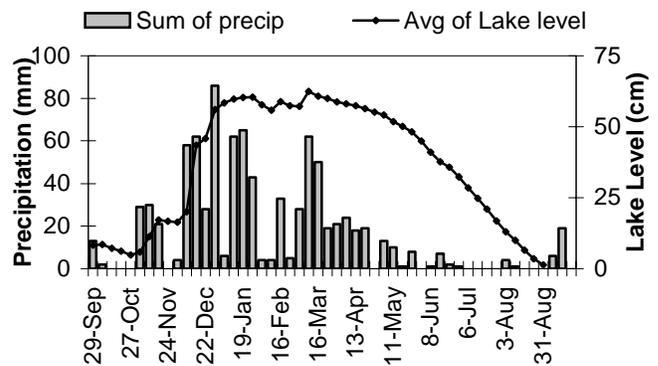
Lake Temperature



Secchi Depth

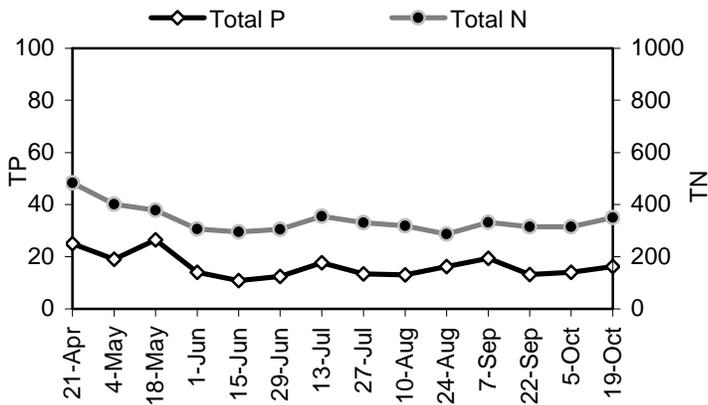


Lake Level and Precipitation

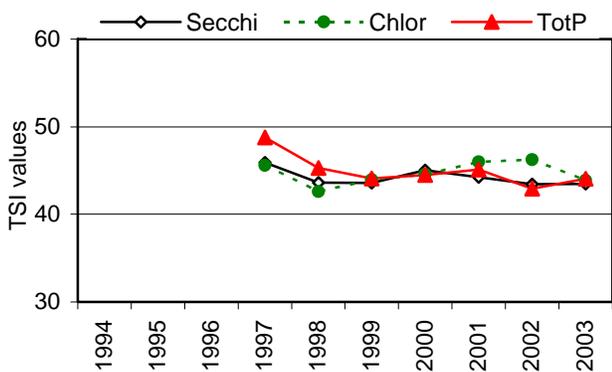


Haller

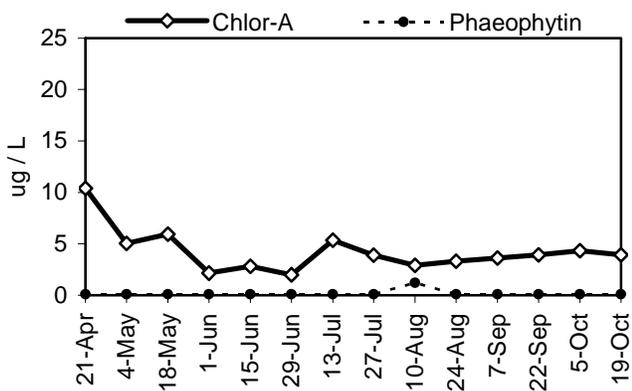
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|------------------------------|----------------|
| <i>Cryptomonas</i> spp. | cryptophyte |
| <i>Ceratium hirundinella</i> | dinoflagellate |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in relatively constant proportion to each other through most of the sampling period, with nitrogen slightly higher in the spring. The N:P ratio ranged from 14 to 27. The 2003 TSI indicators were very close to each other, located in the midrange for mesotrophy, similar to most of the years of monitoring.

Chlorophyll and Algae

Chlorophyll was relatively constant through the sample season, with slightly higher values in late April. The lowest values were found in June. Common algae found included several species of cryptophytes, the dinoflagellate *Ceratium*, several species of the chrysophyte *Dinobryon*, and a variety of green algae species. The bluegreen *Aphanizomenon* was occasionally present in low concentrations.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 13.0 | 5 | 8.3 | 5 | | | | | | | |
| 6-Oct-02 | 2.0 | 7 | 8.5 | 7 | 6-Oct-02 | 11:40 | 3.8 | 15.0 | C1 | P2 | 0 |
| 13-Oct-02 | 0.0 | 7 | 7.2 | 7 | 13-Oct-02 | 11:00 | 2.8 | 13.5 | C1 | | 0 |
| 20-Oct-02 | 0.0 | 7 | 6.1 | 7 | 20-Oct-02 | 11:50 | 3.0 | 13.0 | C1 | P2 | 2 |
| 27-Oct-02 | 0.0 | 7 | 4.9 | 7 | 27-Oct-02 | 11:20 | 3.0 | 11.5 | C1 | P1 | 0 |
| 3-Nov-02 | 29.0 | 7 | 5.9 | 7 | 3-Nov-02 | 11:10 | 3.0 | 9.0 | NA | P1 | 0 |
| 10-Nov-02 | 30.0 | 7 | 11.4 | 7 | 10-Nov-02 | 10:25 | 3.0 | 9.0 | C1 | P2 | 0 |
| 17-Nov-02 | 21.0 | 7 | 17.1 | 7 | 17-Nov-02 | 11:00 | 3.0 | 0.0 | C1 | P1 | 0 |
| 24-Nov-02 | 0.0 | 6 | 16.8 | 6 | 24-Nov-02 | 11:00 | 3.5 | 0.0 | C1 | P1 | 0 |
| 1-Dec-02 | 4.0 | 7 | 16.4 | 7 | 1-Dec-02 | 10:00 | 3.0 | 7.5 | C1 | P1 | 1 |
| 8-Dec-02 | 58.0 | 7 | 20.1 | 7 | 8-Dec-02 | 11:00 | 3.0 | 7.0 | C1/P3 | C1/P1 | 12 |
| 15-Dec-02 | 62.0 | 7 | 43.4 | 7 | 15-Dec-02 | 11:30 | 2.5 | 7.0 | C1 | P1 | 0 |
| 22-Dec-02 | 28.0 | 7 | 45.8 | 7 | 22-Dec-02 | 11:30 | 3.0 | 6.0 | C1 | P2 | 2 |
| 29-Dec-02 | 86.0 | 7 | 56.0 | 7 | 29-Dec-02 | 11:20 | 3.5 | 5.0 | C1 | P1 | 0 |
| 5-Jan-03 | 6.0 | 7 | 58.4 | 7 | 5-Jan-03 | 10:45 | 3.3 | 6.0 | P1 | C1 | 0 |
| 12-Jan-03 | 62.0 | 7 | 59.7 | 7 | 13-Jan-03 | 12:00 | 3.5 | 6.0 | P1 | C1 | 0 |
| 19-Jan-03 | 65.0 | 7 | 60.3 | 7 | 19-Jan-03 | 12:00 | 3.5 | 5.0 | P1 | C1 | 0 |
| 26-Jan-03 | 43.0 | 7 | 60.4 | 7 | 26-Jan-03 | 11:00 | 3.0 | 7.0 | P1 | | 10 |
| 2-Feb-03 | 4.0 | 7 | 57.7 | 7 | 2-Feb-03 | 10:00 | 3.5 | 7.0 | P1 | P1 | 0 |
| 9-Feb-03 | 4.0 | 7 | 55.8 | 7 | 9-Feb-03 | 10:00 | 3.0 | 5.0 | P1 | P1 | 0 |
| 16-Feb-03 | 33.0 | 7 | 58.9 | 7 | 16-Feb-03 | 10:00 | 3.0 | 6.0 | P2 | P2 | 10 |
| 23-Feb-03 | 5.0 | 7 | 57.4 | 7 | 22-Feb-03 | 15:00 | 3.5 | 7.0 | P2 | P2 | 0 |
| 2-Mar-03 | 28.0 | 7 | 57.1 | 7 | 3-Mar-03 | 16:00 | 3.0 | 7.0 | P1 | P1 | 2 |
| 9-Mar-03 | 62.0 | 7 | 62.4 | 7 | 9-Mar-03 | 10:00 | 3.0 | 6.0 | P1 | P1 | 6 |
| 16-Mar-03 | 50.0 | 7 | 60.7 | 7 | 17-Mar-03 | 10:00 | 4.5 | 9.0 | P1 | P1 | 3 |
| 23-Mar-03 | 19.0 | 7 | 60.0 | 7 | 24-Mar-03 | 10:00 | 3.5 | 9.0 | P1 | P1 | 6 |
| 30-Mar-03 | 21.0 | 7 | 58.7 | 7 | 31-Mar-03 | 10:00 | 3.5 | 11.0 | P1 | P1 | 3 |
| 6-Apr-03 | 24.0 | 7 | 58.0 | 7 | 6-Apr-03 | 10:00 | 3.0 | 11.0 | P1 | P1 | 8 |
| 13-Apr-03 | 18.0 | 6 | 57.4 | 7 | 13-Apr-03 | 14:00 | 3.0 | 12.0 | P1 | P1 | |
| 20-Apr-03 | 19.0 | 7 | 56.4 | 7 | 21-Apr-03 | 14:00 | 3.6 | 13.0 | P1 | P1 | |
| 27-Apr-03 | 0.0 | 7 | 55.1 | 7 | 28-Apr-03 | 14:50 | 3.5 | 14.5 | P1 | P1 | |
| 4-May-03 | 13.0 | 7 | 54.1 | 7 | 4-May-03 | 14:30 | 3.5 | 14.5 | P1 | P1 | |
| 11-May-03 | 10.0 | 7 | 51.8 | 7 | 11-May-03 | 14:20 | 3.8 | 16.5 | P1 | P1 | |
| 18-May-03 | 1.0 | 7 | 50.1 | 7 | 18-May-03 | 14:20 | 4.0 | 16.0 | P1 | P1 | |
| 25-May-03 | 8.0 | 7 | 48.2 | 7 | 25-May-03 | 14:10 | 3.6 | 17.5 | P1 | P1 | |
| 1-Jun-03 | 0.0 | 7 | 44.9 | 7 | 1-Jun-03 | 11:50 | 4.1 | 19.0 | P1 | P1 | |
| 8-Jun-03 | 1.0 | 7 | 41.0 | 7 | 8-Jun-03 | 16:10 | 4.0 | 23.0 | P1 | P1 | |
| 15-Jun-03 | 7.0 | 7 | 37.6 | 7 | 15-Jun-03 | 14:40 | 3.8 | 21.0 | P1 | P1 | |
| 22-Jun-03 | 2.0 | 7 | 35.7 | 7 | 22-Jun-03 | 14:20 | 3.8 | 19.0 | P1 | P1 | |
| 29-Jun-03 | 1.0 | 7 | 32.3 | 7 | 29-Jun-03 | 14:15 | 2.8 | 22.5 | P2 | P2 | |
| 6-Jul-03 | 0.0 | 7 | 28.5 | 7 | 6-Jul-03 | 14:10 | 2.1 | 22.0 | P1 | P1 | |
| 13-Jul-03 | 0.0 | 7 | 24.8 | 7 | 13-Jul-03 | 11:20 | 2.1 | 23.0 | P1 | P1 | |
| 20-Jul-03 | 0.0 | 7 | 21.0 | 7 | 20-Jul-03 | 15:45 | 2.1 | 24.5 | P1 | P1 | |
| 27-Jul-03 | 0.0 | 7 | 16.9 | 7 | 27-Jul-03 | 13:10 | 2.3 | 24.5 | P1 | P1 | |
| 3-Aug-03 | 4.0 | 7 | 13.1 | 7 | 3-Aug-03 | 10:14 | 3.3 | 23.5 | P1 | P1 | |
| 10-Aug-03 | 1.0 | 7 | 10.0 | 7 | 10-Aug-03 | 14:20 | 3.0 | 22.5 | P1 | P1 | |
| 17-Aug-03 | 0.0 | 7 | 6.5 | 7 | 18-Aug-03 | 14:40 | 3.1 | 24.0 | P1 | P1 | |
| 24-Aug-03 | 0.0 | 7 | 3.5 | 7 | 24-Aug-03 | 2:24 | 3.1 | 21.0 | P1 | P1 | |
| 31-Aug-03 | 0.0 | 7 | 1.3 | 5 | 31-Aug-03 | 16:15 | 3.0 | 22.0 | P1 | P1 | |
| 7-Sep-03 | 6.1 | 7 | | | 7-Sep-03 | 14:30 | 3.0 | 21.5 | P1 | P1 | |
| 14-Sep-03 | 19.0 | 7 | | | 14-Sep-03 | 12:00 | 3.3 | 19.0 | P1 | P1 | |
| 21-Sep-03 | 0.0 | 7 | | | 21-Sep-03 | 15:00 | 3.1 | 16.5 | P1 | P1 | |
| 28-Sep-03 | 0.0 | 1 | | | 28-Sep-03 | 14:15 | 3.0 | 19.0 | P1 | P1 | |
| Min | 0.0 | | 1.3 | | Min | | 2.1 | 5.0 | | | 0 |
| Max | 86.0 | | 62.4 | | Max | | 4.5 | 24.5 | | | 12 |
| Total | 869.1 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 3.6 | 10.4 | 25.0 | 483 | 1 | 19 | 41.5 | 53.5 | 50.6 | |
| 4-May | 14.5 | 3.5 | 5.0 | 19.0 | 402 | 1 | 21 | 41.9 | 46.4 | 46.6 | |
| 18-May | 16.0 | 4.0 | 5.9 | 26.4 | 378 | 1 | 14 | 40.0 | 48.0 | 51.4 | |
| 1-Jun | 19.0 | 4.1 | 2.1 | 14.0 | 306 | 1 | 22 | 39.6 | 38.0 | 42.2 | |
| 15-Jun | 21.0 | 3.8 | 2.8 | 10.8 | 295 | 2 | 27 | 40.7 | 40.7 | 38.5 | |
| 29-Jun | 22.5 | 2.8 | 2.0 | 12.4 | 305 | 1 | 25 | 45.1 | 37.4 | 40.5 | |
| 13-Jul | 23.0 | 2.1 | 5.3 | 17.6 | 355 | 2 | 20 | 49.3 | 47.0 | 45.5 | |
| 27-Jul | 24.5 | 2.3 | 3.9 | 13.3 | 331 | 1 | 25 | 48.0 | 43.8 | 41.5 | |
| 10-Aug | 22.5 | 3.0 | 2.9 | 13.0 | 318 | 1 | 24 | 44.1 | 40.9 | 41.2 | |
| 24-Aug | 21.0 | 3.1 | 3.3 | 16.1 | 287 | 1 | 18 | 43.7 | 42.3 | 44.2 | |
| 7-Sep | 21.5 | 3.0 | 3.6 | 19.4 | 332 | 1 | 17 | 44.1 | 43.1 | 46.9 | |
| 21-Sep | 16.5 | 3.1 | 3.9 | 13.1 | 315 | 1 | 24 | 43.7 | 43.9 | 41.3 | |
| 5-Oct | 16.5 | 3.0 | 4.3 | 13.9 | 314 | 1 | 23 | 44.1 | 44.9 | 42.1 | |
| 19-Oct | 14.0 | 3.3 | 3.9 | 16.2 | 350 | 2 | 22 | 42.8 | 44.0 | 44.3 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.0 | 3.2 | 4.2 | 16.4 | 340.8 | 1.2 | 22 | 43.5 | 43.9 | 44.1 | TSI Average = 43.8 |
| Median | 20.0 | 3.1 | 3.9 | 15.1 | 324.5 | 1 | 22 | 43.7 | 43.9 | 43.2 | |
| Min | 13.0 | 2.1 | 2.0 | 10.8 | 287.0 | 1 | 14 | 39.6 | 37.4 | 38.5 | |
| Max | 24.5 | 4.1 | 10.4 | 26.4 | 483.0 | 2 | 27 | 49.3 | 53.5 | 51.4 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Horseshoe

Lake Overview

Volunteer monitoring began at Horseshoe Lake in water year 1999 and has continued through 2003. The data indicate that this rural lake is moderate in primary productivity (mesotrophic), with good water quality. Since the lake surface makes up approximately 5% of the drainage area, direct precipitation is less important than watershed inputs. Land use analysis of 2002 aerial photographs showed that 37% of the surrounding watershed has been developed for uses other than agriculture.

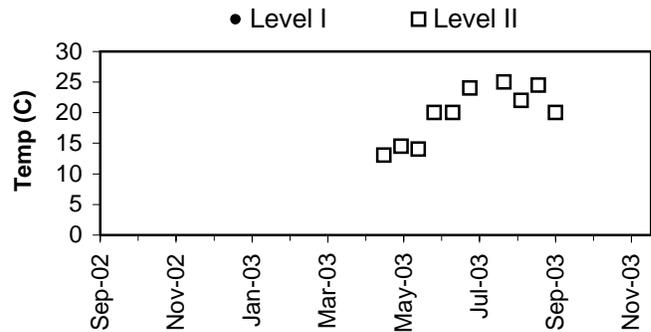
Horseshoe Lake has no public access boat launch, and widely fluctuating water levels may make invasion by noxious aquatic weeds unlikely over the long term.

Sampling was discontinued after early September in 2003 because the lake was too shallow to allow navigation to the sample site.

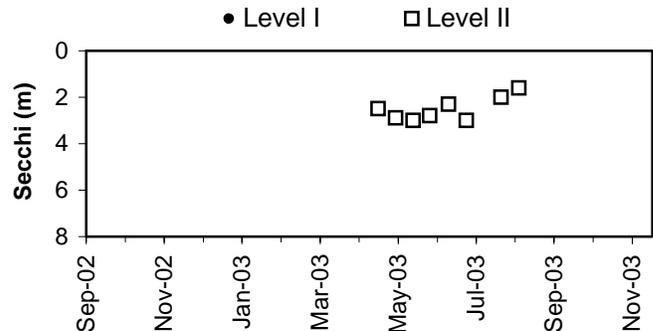
Physical Parameters

Secchi transparency ranged between 1.6 and 3.0m through the sampling season, while surface water temperatures ranged between 13.0 and 25.0 degrees Celsius. There were no precipitation or lake level records for the year.

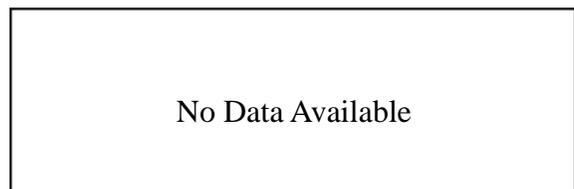
Lake Temperature



Secchi Depth

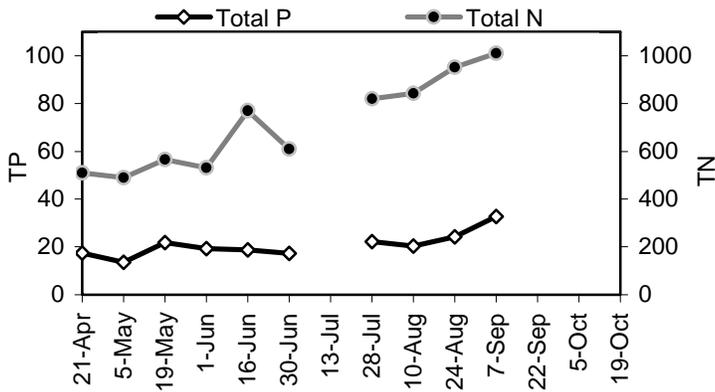


Lake Level and Precipitation

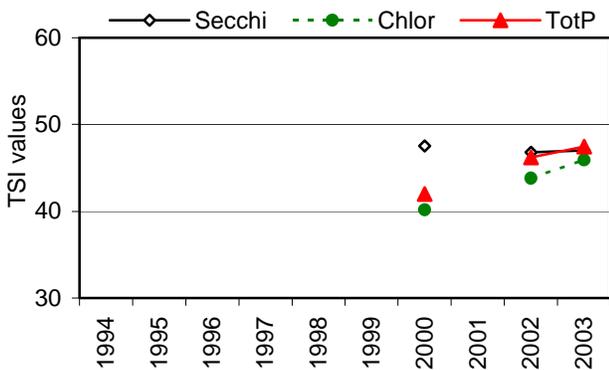


Horseshoe

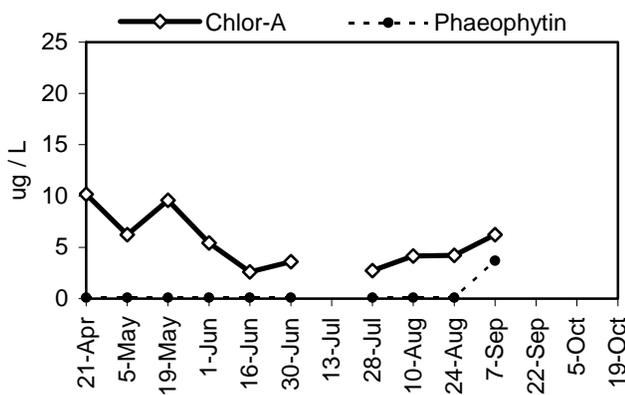
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total nitrogen rose steadily through the sample period, while total phosphorus remained steady until mid-August after which it also began to rise. The N:P ratio ranged from 26 to 42, generally unfavorable for bluegreen growth. The 2003 TSI indicators were very close to each other in the midrange for mesotrophy, very similar to 2002.

Chlorophyll and Algae

Chlorophyll content was higher in spring and declined to its minimum levels in early summer, beginning to rise again in early fall when sampling ceased. The dominant algae included several unidentified species of chrysophytes, the colony-forming chlorophyte *Botryococcus braunii* and the dinoflagellate *Ceratium*. Bluegreen algae were extremely rare.

| Common algae | Group |
|------------------------------|----------------|
| unidentified species | chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |
| <i>Ceratium hirundinella</i> | dinoflagellate |

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 2.5 | 10.2 | 17.4 | 510 | 1 | 29 | 46.8 | 53.4 | 45.4 | |
| 5-May | 14.5 | 2.9 | 6.3 | 13.5 | 490 | 1 | 36 | 44.6 | 48.5 | 41.7 | |
| 19-May | 14.0 | 3.0 | 9.6 | 21.8 | 566 | 1 | 26 | 44.1 | 52.8 | 48.6 | |
| 1-Jun | 20.0 | 2.8 | 5.4 | 19.2 | 531 | 1 | 28 | 45.1 | 47.1 | 46.8 | |
| 16-Jun | 20.0 | 2.3 | 2.6 | 18.7 | 770 | 1 | 41 | 48.0 | 39.9 | 46.4 | |
| 30-Jun | 24.0 | 3.0 | 3.6 | 17.2 | 610 | 1 | 35 | 44.1 | 43.1 | 45.2 | |
| 13-Jul | | | | | | | | | | | No sample. |
| 28-Jul | 25.0 | 2.0 | 2.7 | 22.2 | 819 | 1 | 37 | 50.0 | 40.4 | 48.9 | |
| 11-Aug | 22.0 | 1.6 | 4.2 | 20.3 | 843 | 1 | 42 | 53.2 | 44.6 | 47.6 | |
| 25-Aug | 24.5 | | 4.2 | 24.1 | 952 | 1 | 40 | | 44.7 | 50.1 | |
| 8-Sep | 20.0 | | 6.2 | 32.7 | 1010 | 1 | 31 | | 48.5 | 54.5 | |
| 21-Sep | | | | | | | | | | | No sample. |
| 5-Oct | | | | | | | | | | | No sample. |
| 19-Oct | | | | | | | | | | | No sample. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.7 | 2.5 | 5.5 | 20.7 | 710.1 | 1.0 | 34 | 47.0 | 46.3 | 47.5 | TSI Average = 46.9 |
| Median | 20.0 | 2.7 | 4.8 | 19.8 | 690.0 | 1 | 36 | 46.0 | 45.9 | 47.2 | |
| Min | 13.0 | 1.6 | 2.6 | 13.5 | 490.0 | 1 | 26 | 44.1 | 39.9 | 41.7 | |
| Max | 25.0 | 3.0 | 10.2 | 32.7 | 1010.0 | 1 | 42 | 53.2 | 53.4 | 54.5 | |
| Count | 10 | 8 | 10 | 10 | 10 | 10 | 10 | 8 | 10 | 10 | |

Jones

Lake Overview

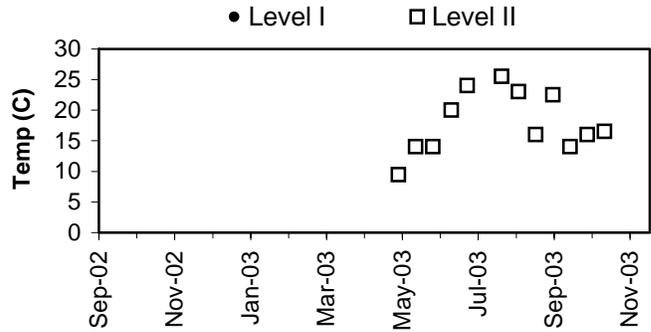
Volunteer monitoring began at Jones Lake in 2000 and continued through 2003. The data indicate that this city lake (Black Diamond) is moderate to high in primary productivity (mesotrophic - eutrophic), with good to fair water quality. Since the lake surface makes up only 3% of the drainage area, direct precipitation is less important than watershed inputs. There is one Class 2 wetland in the basin (King County, 1990). Land use analysis of 2002 aerial photographs showed less than 10% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Jones Lake currently has no public access points, but users should keep an eye on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious weeds.

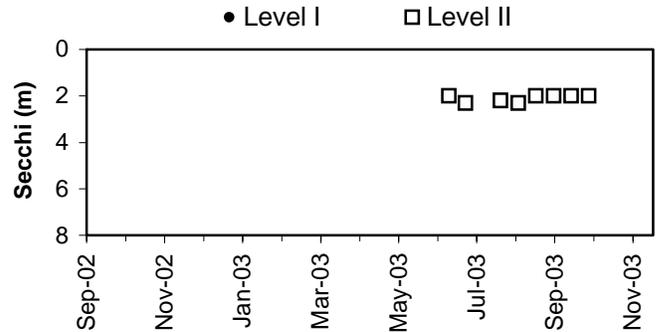
Physical Parameters

Secchi transparency was stable, ranging between 2.0 and 2.3m through the Level II sampling season. Level II surface water temperatures reached a maximum of 25.5 degrees Celsius in late July. There were no precipitation or water levels records for the year.

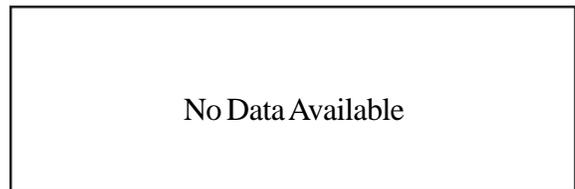
Lake Temperature



Secchi Depth

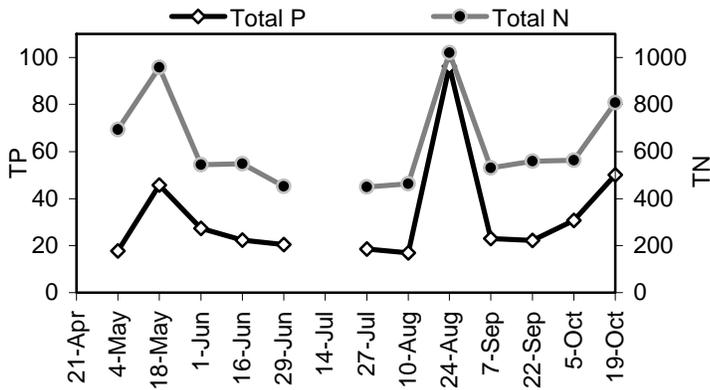


Lake Level and Precipitation

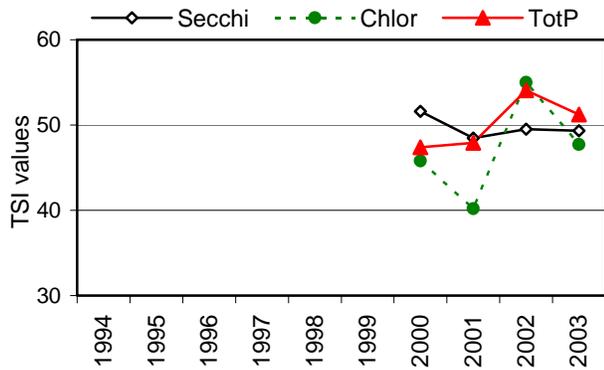


Jones

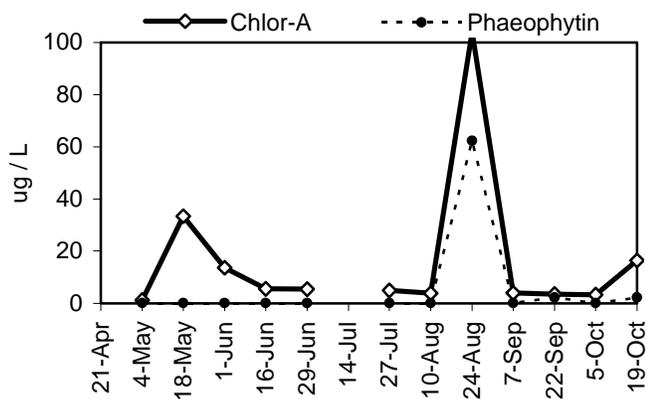
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|--------------------------|-------------|
| unidentified species | chrysophyte |
| <i>Cryptomonas</i> spp. | cryptophyte |
| <i>Trachelomonas</i> sp. | euglenoid |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen maintained similar proportions to each other during the sampling season, with the exception of one date in August, when the sample contained abnormally high concentrations of nutrients, suggesting it was contaminated with bottom sediments. The N:P ratio ranged from 11 to 39. The 2003 indicators were in close agreement with each other, putting the lake on the threshold between mesotrophy and eutrophy.

Chlorophyll and Algae

Chlorophyll peaked in mid-May and was at low levels for the rest of the season, with the exception of one anomalous date, which coincided with very high nutrients and a high pheophytin (degraded chlorophyll) value, indicating that the sample was probably contaminated with bottom sediments. Commonly found algae included *Cryptomonas* species and unidentified chrysophyte algae. The August 24 sample contained many bottom-dwelling diatom species that were not present in the other samples. Bluegreen algae were very rare.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | | | | | | | | | | | No sample. |
| 4-May | 9.5 | | 1.2 | 17.7 | 694 | 1 | 39 | | 32.4 | 45.6 | |
| 18-May | 14.0 | | 33.4 | 45.8 | 958 | | 21 | | 65.0 | 59.3 | |
| 1-Jun | 14.0 | | 13.6 | 27.3 | 545 | | 20 | | 56.2 | 51.9 | |
| 16-Jun | 20.0 | 2.0 | 5.5 | 22.3 | 548 | 3 | 25 | 50.0 | 47.3 | 48.9 | |
| 29-Jun | 24.0 | 2.3 | 5.3 | 20.4 | 452 | 3 | 22 | 48.0 | 47.0 | 47.7 | |
| 14-Jul | | | | | | | | | | | No sample. |
| 27-Jul | 25.5 | 2.2 | 4.9 | 18.5 | 450 | 2 | 24 | 48.6 | 46.2 | 46.2 | |
| 10-Aug | 23.0 | 2.3 | 3.7 | 16.9 | 463 | 2 | 27 | 48.0 | 43.5 | 44.9 | |
| 24-Aug | 16.0 | 2.0 | 104.0 | 96.2 | 1020 | 3 | 11 | 50.0 | 76.1 | 70.0 | |
| 7-Sep | 22.5 | 2.0 | 3.9 | 23.0 | 531 | 3 | 23 | 50.0 | 43.8 | 49.4 | |
| 21-Sep | 14.0 | 2.0 | 3.5 | 22.2 | 559 | 2 | 25 | 50.0 | 42.9 | 48.9 | |
| 5-Oct | 16.0 | 2.0 | 3.4 | 30.8 | 563 | 2 | 18 | 50.0 | 42.5 | 53.6 | |
| 19-Oct | 16.5 | | 16.4 | 50.1 | 808 | 2 | 16 | | 58.0 | 60.6 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 17.9 | 2.1 | 16.6 | 32.6 | 632.6 | 2.3 | 23 | 49.3 | 50.1 | 52.3 | TSI Average = 50.6 |
| Median | 16.3 | 2.0 | 5.1 | 22.7 | 553.5 | 2 | 23 | 50.0 | 46.6 | 49.2 | |
| Min | 9.5 | 2.0 | 1.2 | 16.9 | 450.0 | 1 | 11 | 48.0 | 32.4 | 44.9 | |
| Max | 25.5 | 2.3 | 104.0 | 96.2 | 1020.0 | 3 | 39 | 50.0 | 76.1 | 70.0 | |
| Count | 12 | 8 | 12 | 12 | 12 | 10 | 12 | 8 | 12 | 12 | |

Lake Overview

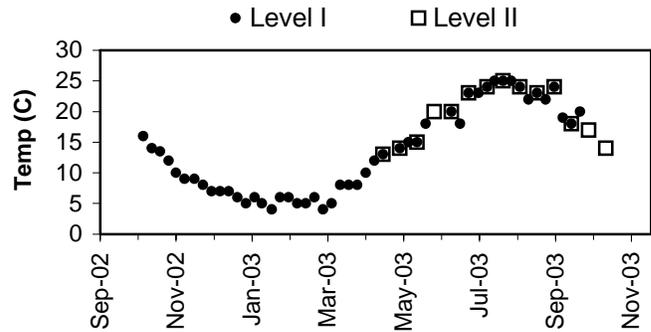
Volunteer monitoring began at Lake Joy in 2000 and continued through 2003. The data indicate that this lake is low to moderate in primary productivity (oligotrophic - mesotrophic), with excellent to good water quality. Since the lake surface makes up 22% of the drainage area, direct precipitation is important, in addition to watershed inputs. There are no wetlands designated by King County in the basin. Land use analysis of 2002 aerial photographs showed that 41% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Lake Joy has only a walk-in public access point, but residents should keep an eye on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious weeds.

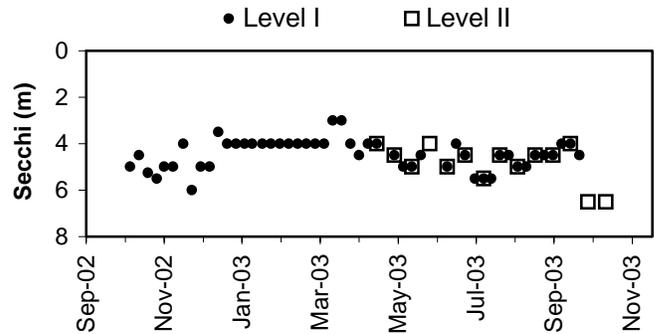
Physical Parameters

Secchi transparency ranged between 3.0 and 6.5m through the year. Annual surface water temperatures ranged between 4.0 and 25.0 degrees Celsius. Excellent records of water level and precipitation were kept, showing that water levels followed the regional pattern of winter high – autumn low stands. Levels responded sensitively to large rain events.

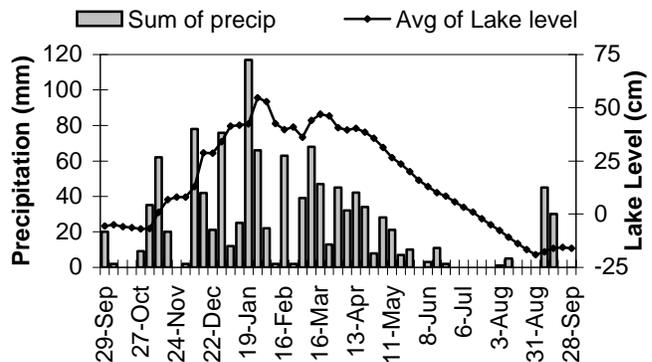
Lake Temperature



Secchi Depth

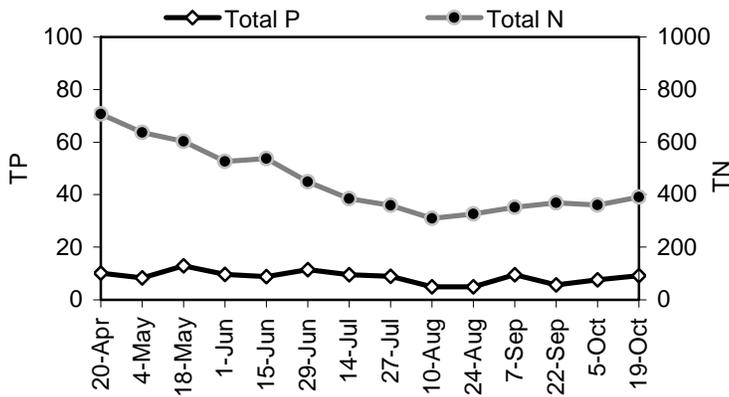


Lake Level and Precipitation

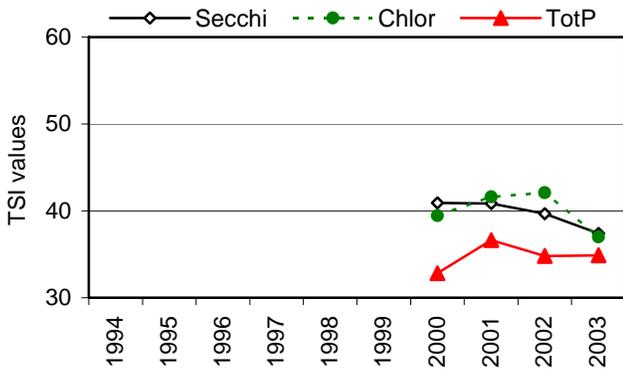


Joy

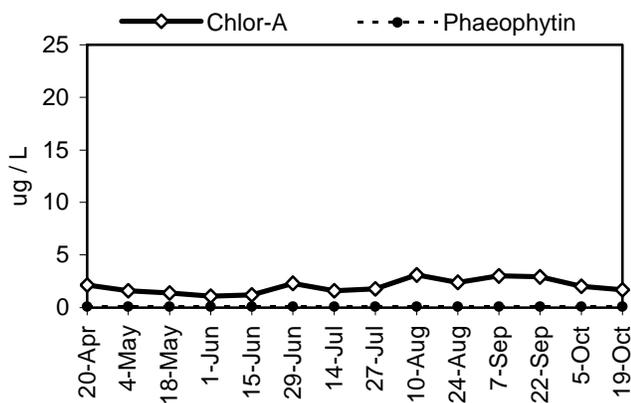
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total nitrogen decreased from an initial high to a consistent proportion relative to total phosphorus from mid-summer to the end of the sample period. The N:P ratio ranged from 37 to 76. The 2003 TSI values were close to each other, with TSI-TotP slightly lower than the other two indicators. However, all were below the oligotrophic - mesotrophic threshold.

Chlorophyll and Algae

Chlorophyll remained at uniformly low values through the sample season. The planktonic algae were characterized by the cryptophyte *Cryptomonas* and unidentified species of chrysophytes, with the small colonial chlorophyte *Crucigenia* also found commonly. Bluegreen algae were extremely rare.

| Common algae | Group |
|-------------------------|-------------|
| <i>Cryptomonas</i> spp. | cryptophyte |
| unidentified species | chrysophyte |
| <i>Crucigenia</i> spp. | chlorophyte |

Daily Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days |
|--------------|---------------------|-----------|------------------------|-----------|
| 29-Sep-02 | 20.0 | 5 | -5.6 | 5 |
| 6-Oct-02 | 2.0 | 7 | -5.0 | 7 |
| 13-Oct-02 | 0.0 | 7 | -6.0 | 7 |
| 20-Oct-02 | 0.0 | 7 | -6.4 | 7 |
| 27-Oct-02 | 9.1 | 7 | -7.1 | 7 |
| 3-Nov-02 | 35.0 | 7 | -6.9 | 7 |
| 10-Nov-02 | 62.0 | 7 | 0.7 | 7 |
| 17-Nov-02 | 20.1 | 7 | 6.7 | 7 |
| 24-Nov-02 | 0.0 | 7 | 8.0 | 7 |
| 1-Dec-02 | 2.0 | 7 | 8.0 | 7 |
| 8-Dec-02 | 78.0 | 7 | 12.9 | 7 |
| 15-Dec-02 | 42.0 | 7 | 28.9 | 7 |
| 22-Dec-02 | 21.0 | 7 | 28.7 | 7 |
| 29-Dec-02 | 76.0 | 7 | 34.1 | 7 |
| 5-Jan-03 | 12.0 | 7 | 41.4 | 7 |
| 12-Jan-03 | 25.0 | 7 | 41.9 | 7 |
| 19-Jan-03 | 117.0 | 7 | 42.4 | 7 |
| 26-Jan-03 | 66.0 | 7 | 54.6 | 7 |
| 2-Feb-03 | 22.0 | 7 | 52.9 | 7 |
| 9-Feb-03 | 2.1 | 7 | 42.6 | 7 |
| 16-Feb-03 | 63.0 | 7 | 39.7 | 7 |
| 23-Feb-03 | 2.0 | 7 | 41.0 | 7 |
| 2-Mar-03 | 39.0 | 7 | 36.1 | 7 |
| 9-Mar-03 | 68.0 | 7 | 44.1 | 7 |
| 16-Mar-03 | 47.0 | 7 | 47.0 | 7 |
| 23-Mar-03 | 13.0 | 7 | 46.1 | 7 |
| 30-Mar-03 | 45.0 | 7 | 40.7 | 7 |
| 6-Apr-03 | 32.0 | 7 | 39.6 | 7 |
| 13-Apr-03 | 42.1 | 7 | 40.4 | 7 |
| 20-Apr-03 | 34.1 | 7 | 38.6 | 7 |
| 27-Apr-03 | 8.0 | 7 | 35.7 | 7 |
| 4-May-03 | 28.0 | 7 | 31.4 | 7 |
| 11-May-03 | 21.0 | 7 | 26.6 | 7 |
| 18-May-03 | 7.0 | 7 | 23.6 | 7 |
| 25-May-03 | 10.0 | 7 | 20.0 | 7 |
| 1-Jun-03 | 0.0 | 7 | 16.0 | 7 |
| 8-Jun-03 | 3.0 | 7 | 12.9 | 7 |
| 15-Jun-03 | 11.1 | 7 | 10.1 | 7 |
| 22-Jun-03 | 2.0 | 7 | 8.5 | 7 |
| 29-Jun-03 | 0.0 | 7 | 5.7 | 7 |
| 6-Jul-03 | 0.0 | 7 | 3.1 | 7 |
| 13-Jul-03 | 0.0 | 7 | 1.0 | 7 |
| 20-Jul-03 | 0.0 | 7 | -2.1 | 7 |
| 27-Jul-03 | 0.0 | 7 | -5.0 | 7 |
| 3-Aug-03 | 1.1 | 7 | -7.7 | 7 |
| 10-Aug-03 | 5.0 | 7 | -10.9 | 7 |
| 17-Aug-03 | 0.0 | 7 | -13.7 | 7 |
| 24-Aug-03 | 0.0 | 7 | -16.6 | 7 |
| 31-Aug-03 | 0.1 | 7 | -19.0 | 7 |
| 7-Sep-03 | 45.0 | 7 | -17.7 | 7 |
| 14-Sep-03 | 30.0 | 7 | -16.0 | 7 |
| 21-Sep-03 | 0.0 | 7 | -15.6 | 7 |
| 28-Sep-03 | 0.0 | 3 | -16.0 | 3 |
| Min | 0.0 | | -19.0 | |
| Max | 117.0 | | 54.6 | |
| Total | 1167.5 | | | |

Weekly Data Summary

| Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 6-Oct-02 | 18:30 | 5.0 | 16.0 | C1/P1 | C1/P1 | 0 |
| 13-Oct-02 | 11:00 | 4.5 | 14.0 | C1/P1 | C1/P1 | 0 |
| 20-Oct-02 | 17:45 | 5.3 | 13.5 | C1/P1 | C1/P1 | 0 |
| 27-Oct-02 | 12:00 | 5.5 | 12.0 | C1/P1 | C1/P1 | 0 |
| 2-Nov-02 | 12:00 | 5.0 | 10.0 | C1/P1 | C1/P1 | 0 |
| 9-Nov-02 | 16:30 | 5.0 | 9.0 | C1/P1 | C1/P1 | 0 |
| 17-Nov-02 | 16:30 | 4.0 | 9.0 | C1/P1 | C1/P1 | 0 |
| 24-Nov-02 | 12:30 | 6.0 | 8.0 | C1/P1 | NA | 7 |
| 1-Dec-02 | 16:00 | 5.0 | 7.0 | NA | NA | 0 |
| 8-Dec-02 | 10:00 | 5.0 | 7.0 | NA | NA | 0 |
| 15-Dec-02 | 11:00 | 3.5 | 7.0 | NA | NA | 0 |
| 22-Dec-02 | 13:00 | 4.0 | 6.0 | NA | NA | 0 |
| 29-Dec-02 | 12:00 | 4.0 | 5.0 | NA | NA | 0 |
| 5-Jan-03 | 15:00 | 4.0 | 6.0 | NA | NA | 0 |
| 11-Jan-03 | 12:00 | 4.0 | 5.0 | NA | NA | 0 |
| 19-Jan-03 | 10:00 | 4.0 | 4.0 | NA | NA | 14 |
| 26-Jan-03 | 15:00 | 4.0 | 6.0 | NA | NA | 0 |
| 2-Feb-03 | 15:00 | 4.0 | 6.0 | NA | NA | 1 |
| 9-Feb-03 | 16:00 | 4.0 | 5.0 | NA | NA | 0 |
| 16-Feb-03 | 14:00 | 4.0 | 5.0 | NA | NA | 2 |
| 23-Feb-03 | 11:00 | 4.0 | 6.0 | NA | NA | 2 |
| 2-Mar-03 | 15:00 | 4.0 | 4.0 | NA | NA | 2 |
| 9-Mar-03 | 9:00 | 4.0 | 5.0 | NA | NA | 0 |
| 16-Mar-03 | 12:00 | 3.0 | 8.0 | NA | NA | 0 |
| 23-Mar-03 | 15:00 | 3.0 | 8.0 | NA | NA | 0 |
| 30-Mar-03 | 10:00 | 4.0 | 8.0 | P1 | P1 | 0 |
| 6-Apr-03 | 12:00 | 4.5 | 10.0 | P1 | P1 | 0 |
| 13-Apr-03 | 16:30 | 4.0 | 12.0 | NA | NA | 0 |
| 20-Apr-03 | 14:45 | 4.0 | 13.0 | P1 | P1 | 0 |
| 27-Apr-03 | | | | | | |
| 4-May-03 | 17:30 | 4.5 | 14.0 | NA | P1 | 0 |
| 11-May-03 | 17:30 | 5.0 | 15.0 | | NA | 0 |
| 18-May-03 | 18:15 | 5.0 | 15.0 | P1 | P2 | 0 |
| 25-May-03 | 20:00 | 4.5 | 18.0 | P1 | P1 | 1 |
| 1-Jun-03 | | | | | | |
| 8-Jun-03 | | | | | | |
| 15-Jun-03 | 13:30 | 5.0 | 20.0 | P1 | P1 | 0 |
| 22-Jun-03 | 19:00 | 4.0 | 18.0 | P1 | P1 | |
| 29-Jun-03 | 17:30 | 4.5 | 23.0 | P1 | P1 | 2 |
| 7-Jul-03 | 20:30 | 5.5 | 23.0 | NA | P1 | 0 |
| 14-Jul-03 | 20:30 | 5.5 | 24.0 | NA | P1 | 0 |
| 20-Jul-03 | 21:00 | 5.5 | 25.0 | NA | P1 | 0 |
| 27-Jul-03 | 20:45 | 4.5 | 25.0 | NA | P2 | 0 |
| 3-Aug-03 | 18:00 | 4.5 | 25.0 | P1 | P1 | 0 |
| 10-Aug-03 | 18:30 | 5.0 | 24.0 | P1 | P2 | 0 |
| 17-Aug-03 | 9:00 | 5.0 | 22.0 | P1 | P1 | 0 |
| 24-Aug-03 | 19:00 | 4.5 | 23.0 | P1 | P1 | 0 |
| 31-Aug-03 | 17:00 | 4.5 | 22.0 | P1 | P1 | 0 |
| 7-Sep-03 | 2:45 | 4.5 | 24.0 | P1 | P1 | 0 |
| 14-Sep-03 | 3:00 | 4.0 | 19.0 | P1 | P1 | 0 |
| 21-Sep-03 | 12:30 | 4.0 | 18.0 | P1 | P1 | 0 |
| 28-Sep-03 | 18:00 | 4.5 | 20.0 | P1 | P1 | 0 |
| Min | | 3.0 | 4.0 | | | 0 |
| Max | | 5.5 | 25.0 | | | 14 |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.0 | 4.0 | 2.1 | 10.2 | 707 | 1 | 69 | 40.0 | 38.0 | 37.7 | |
| 4-May | 14.0 | 4.5 | 1.6 | 8.4 | 637 | 2 | 76 | 38.3 | 35.2 | 34.8 | |
| 18-May | 15.0 | 5.0 | 1.4 | 13.0 | 603 | 2 | 46 | 36.8 | 33.9 | 41.2 | |
| 1-Jun | 20.0 | 4.0 | 1.1 | 9.7 | 527 | 1 | 54 | 40.0 | 31.5 | 36.9 | |
| 15-Jun | 20.0 | 5.0 | 1.2 | 8.8 | 538 | 1 | 61 | 36.8 | 32.4 | 35.5 | |
| 29-Jun | 23.0 | 4.5 | 2.3 | 11.5 | 449 | 1 | 39 | 38.3 | 38.7 | 39.4 | |
| 14-Jul | 24.0 | 5.5 | 1.6 | 9.6 | 385 | 1 | 40 | 35.4 | 35.2 | 36.8 | |
| 27-Jul | 25.0 | 4.5 | 1.8 | 9.0 | 359 | 2 | 40 | 38.3 | 36.3 | 35.8 | |
| 10-Aug | 24.0 | 5.0 | 3.1 | 5.0 | 310 | 2 | 62 | 36.8 | 41.7 | 27.4 | |
| 24-Aug | 23.0 | 4.5 | 2.4 | 5.0 | 327 | 1 | 65 | 38.3 | 39.2 | 27.4 | |
| 7-Sep | 24.0 | 4.5 | 3.0 | 9.6 | 352 | 1 | 37 | 38.3 | 41.3 | 36.8 | |
| 21-Sep | 18.0 | 4.0 | 2.9 | 5.7 | 369 | 1 | 65 | 40.0 | 41.0 | 29.3 | |
| 5-Oct | 17.0 | 6.5 | 2.0 | 7.7 | 361 | 1 | 47 | 33.0 | 37.5 | 33.6 | |
| 19-Oct | 14.0 | 6.5 | 1.7 | 9.2 | 391 | 1 | 43 | 33.0 | 35.8 | 36.2 | Great water clarity! |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.6 | 4.9 | 2.0 | 8.7 | 451.1 | 1.3 | 53 | 37.4 | 37.0 | 34.9 | TSI Average = 36.4 |
| Median | 20.0 | 4.5 | 1.9 | 9.1 | 388.0 | 1 | 51 | 38.3 | 36.9 | 36.0 | |
| Min | 13.0 | 4.0 | 1.1 | 5.0 | 310.0 | 1 | 37 | 33.0 | 31.5 | 27.4 | |
| Max | 25.0 | 6.5 | 3.1 | 13.0 | 707.0 | 2 | 76 | 40.0 | 41.7 | 41.2 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Kathleen

Lake Overview

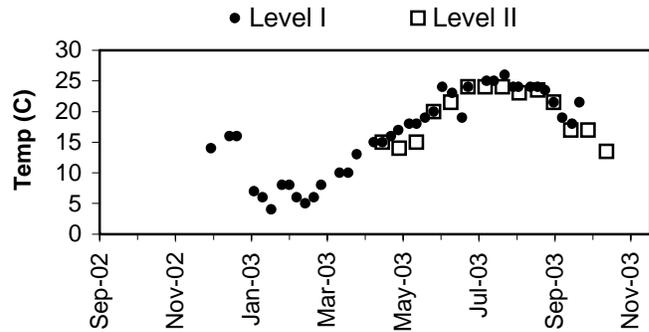
Volunteer monitoring began at Lake Kathleen in 1996 and continued through 2003. The data indicate that this lake is moderate in primary productivity (mesotrophic) with good quality. Since the lake surface makes up 12% of the drainage area, direct precipitation is less important than watershed inputs. Wetlands in the basin include a significant amount of the lake shoreline. Land use analysis of 2002 aerial photographs showed over 61% of the surrounding watershed has been developed for uses other than agriculture.

Lake Kathleen has no public boat launch, but residents should keep a watch on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious weeds.

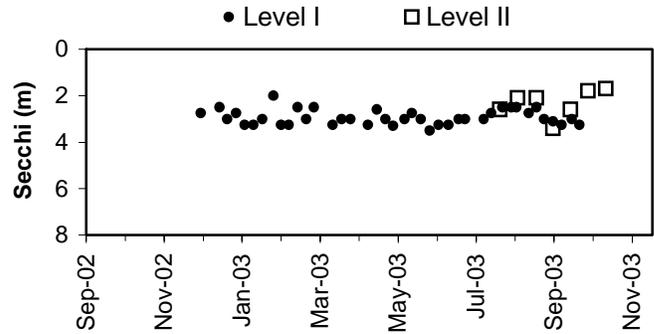
Physical Parameters

Secchi transparency measurements ranged between 1.6 and 3.5m through the year. Surface water temperature ranged between 4.0 and 26.0 degrees Celsius. Excellent precipitation and water level records were kept, showing decided responsiveness to rain events in winter. Water levels followed the regional pattern of winter high – autumn low stands.

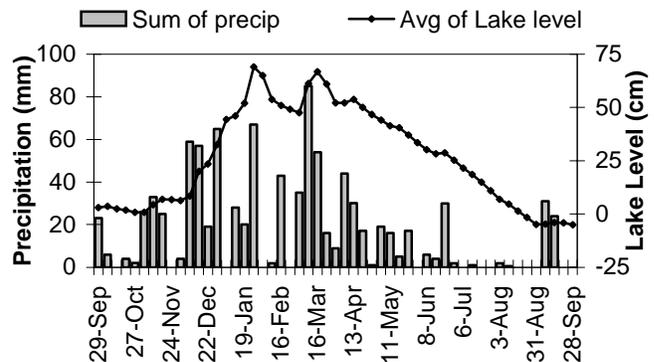
Lake Temperature



Secchi Depth

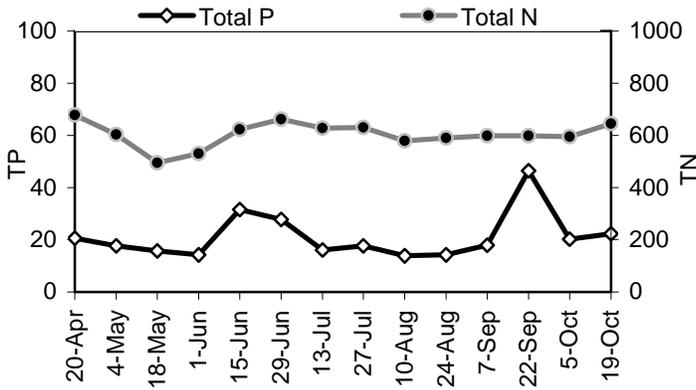


Lake Level and Precipitation

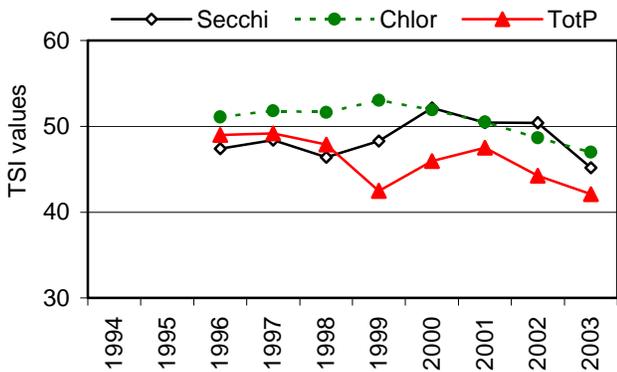


Kathleen

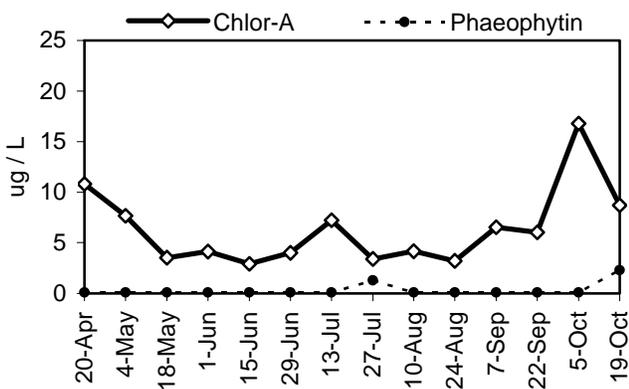
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-------------------------------|--------------------|
| unidentified species | chrysophyte |
| unidentified colonial species | unidentified group |
| <i>Botryococcus braunii</i> | chlorophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period, with the exception of increased phosphorus values in June and one date in September. The N:P ratio ranged from 13 to 42, with the value of 13 occurring in September. The 2003 TSI-TotP value was lower than the other two, similar to the four previous years, but all three indicators were in the mesotrophic range.

Chlorophyll and Algae

Chlorophyll decreased in spring from a high value in April, remained more or less constant through summer and increased again in the autumn. Dominant algae in the phytoplankton included unidentified varieties of chrysophyte and other groups. Some other commonly appearing algae included *Cryptomonas*, *Botryococcus braunii*, and *Dinobryon* species. Bluegreen algae were very rare.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 23.1 | 5 | 3.0 | 5 | | | | | | | |
| 6-Oct-02 | 6.1 | 7 | 3.6 | 7 | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | 2.4 | 7 | | | | | | | |
| 20-Oct-02 | 4.0 | 7 | 1.8 | 7 | | | | | | | |
| 27-Oct-02 | 2.1 | 7 | 0.8 | 7 | | | | | | | |
| 3-Nov-02 | 26.0 | 7 | 0.7 | 7 | | | | | | | |
| 10-Nov-02 | 33.0 | 7 | 4.3 | 7 | | | | | | | |
| 17-Nov-02 | 25.0 | 7 | 6.9 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 6.7 | 7 | | | | | | | |
| 1-Dec-02 | 4.0 | 7 | 6.2 | 7 | 1-Dec-02 | 14:00 | 2.8 | 14.0 | NA | NA | 0 |
| 8-Dec-02 | 59.0 | 7 | 8.4 | 7 | | | | | | | |
| 15-Dec-02 | 57.0 | 7 | 20.1 | 7 | 16-Dec-02 | 14:00 | 2.5 | 16.0 | NA | NA | 0 |
| 22-Dec-02 | 19.0 | 7 | 23.4 | 7 | 22-Dec-02 | 16:00 | 3.0 | 16.0 | P3 | NA | 0 |
| 29-Dec-02 | 65.0 | 7 | 32.6 | 7 | 29-Dec-02 | 14:00 | 2.8 | | NA | NA | 0 |
| 5-Jan-03 | 0.0 | 7 | 44.4 | 7 | 5-Jan-03 | 14:00 | 3.3 | 7.0 | NA | NA | 0 |
| 12-Jan-03 | 28.0 | 7 | 46.1 | 7 | 12-Jan-03 | 14:00 | 3.3 | 6.0 | NA | NA | 0 |
| 19-Jan-03 | 20.1 | 4 | 51.9 | 5 | 19-Jan-03 | 12:00 | 3.0 | 4.0 | NA | NA | 0 |
| 26-Jan-03 | 67.0 | 6 | 69.1 | 7 | 28-Jan-03 | 14:00 | 2.0 | 8.0 | NA | NA | 0 |
| 2-Feb-03 | 0.0 | 5 | 65.0 | 7 | 3-Feb-03 | 13:00 | 3.3 | 8.0 | NA | NA | 0 |
| 9-Feb-03 | 2.0 | 7 | 53.7 | 7 | 9-Feb-03 | 14:00 | 3.3 | 6.0 | NA | NA | 0 |
| 16-Feb-03 | 43.0 | 7 | 50.9 | 7 | 16-Feb-03 | 11:30 | 2.5 | 5.0 | NA | NA | 2 |
| 23-Feb-03 | 0.0 | 7 | 49.1 | 7 | 23-Feb-03 | 14:00 | 3.0 | 6.0 | NA | NA | 0 |
| 2-Mar-03 | 35.0 | 7 | 47.6 | 7 | 1-Mar-03 | 16:00 | 2.5 | 8.0 | NA | NA | 0 |
| 9-Mar-03 | 85.0 | 7 | 61.3 | 7 | | | | | | | |
| 16-Mar-03 | 54.0 | 4 | 66.8 | 5 | 16-Mar-03 | 15:30 | 3.3 | 10.0 | NA | NA | 0 |
| 23-Mar-03 | 16.0 | 7 | 60.9 | 7 | 23-Mar-03 | 12:30 | 3.0 | 10.0 | NA | NA | 0 |
| 30-Mar-03 | 9.0 | 7 | 52.1 | 6 | 30-Mar-03 | 13:00 | 3.0 | 13.0 | NA | NA | 0 |
| 6-Apr-03 | 44.1 | 7 | 52.1 | 7 | | | | | | | |
| 13-Apr-03 | 30.1 | 7 | 53.7 | 7 | 13-Apr-03 | 16:00 | 3.3 | 15.0 | NA | NA | 0 |
| 20-Apr-03 | 17.1 | 7 | 50.0 | 7 | 20-Apr-03 | 16:30 | 2.6 | 15.0 | NA | NA | 4 |
| 27-Apr-03 | 1.0 | 7 | 46.7 | 7 | 27-Apr-03 | 15:00 | 3.0 | 16.0 | NA | NA | 4 |
| 4-May-03 | 19.0 | 7 | 44.1 | 7 | 3-May-03 | 16:00 | 3.3 | 17.0 | NA | NA | 4 |
| 11-May-03 | 16.1 | 7 | 41.4 | 7 | 12-May-03 | 14:00 | 3.0 | 18.0 | C1 | NA | 3 |
| 18-May-03 | 5.1 | 7 | 40.5 | 7 | 18-May-03 | 14:00 | 2.8 | 18.0 | C1 | NA | 10 |
| 25-May-03 | 17.0 | 7 | 37.1 | 7 | 25-May-03 | 16:00 | 3.0 | 19.0 | C1 | NA | 10 |
| 1-Jun-03 | 0.0 | 7 | 33.5 | 7 | 1-Jun-03 | 17:50 | 3.5 | 20.0 | C1 | NA | 10 |
| 8-Jun-03 | 6.1 | 7 | 30.2 | 7 | 8-Jun-03 | 12:00 | 3.3 | 24.0 | C1 | NA | 0 |
| 15-Jun-03 | 4.1 | 7 | 28.4 | 7 | 16-Jun-03 | 14:00 | 3.3 | 23.0 | C1 | NA | 28 |
| 22-Jun-03 | 30.0 | 7 | 28.8 | 7 | 24-Jun-03 | 17:30 | 3.0 | 19.0 | C1 | NA | 33 |
| 29-Jun-03 | 2.0 | 7 | 25.3 | 7 | 29-Jun-03 | 17:30 | 3.0 | 24.0 | C1 | NA | 40 |
| 6-Jul-03 | 0.0 | 7 | 21.5 | 7 | | | | | | | |
| 13-Jul-03 | 1.0 | 7 | 18.6 | 7 | 14-Jul-03 | 14:00 | 3.0 | 25.0 | NA | P1 | 17 |
| 20-Jul-03 | 0.0 | 7 | 15.0 | 7 | 20-Jul-03 | 17:00 | 2.8 | 25.0 | NA | P1 | 8 |
| 27-Jul-03 | 0.0 | 7 | 10.9 | 7 | 29-Jul-03 | 14:00 | 2.5 | 26.0 | NA | P1 | 26 |
| 3-Aug-03 | 2.0 | 7 | 6.8 | 7 | 5-Aug-03 | 14:00 | 2.5 | 24.0 | NA | P1 | 16 |
| 10-Aug-03 | 0.6 | 7 | 4.7 | 7 | 9-Aug-03 | 14:00 | 2.5 | 24.0 | NA | P1 | 2 |
| 17-Aug-03 | 0.0 | 7 | 1.3 | 7 | 19-Aug-03 | 13:00 | 2.8 | 24.0 | NA | P1 | |
| 24-Aug-03 | 0.1 | 7 | -1.6 | 7 | 25-Aug-03 | 13:00 | 2.5 | 24.0 | NA | P1 | 26 |
| 31-Aug-03 | 0.0 | 7 | -5.0 | 7 | 31-Aug-03 | 13:00 | 3.0 | 23.5 | C1 | P1 | 40 |
| 7-Sep-03 | 31.0 | 7 | -4.8 | 7 | 7-Sep-03 | 17:30 | 3.1 | 21.5 | C1 | P1 | 60 |
| 14-Sep-03 | 24.0 | 7 | -4.1 | 7 | 14-Sep-03 | 14:30 | 3.3 | 19.0 | P1 | P1 | 60 |
| 21-Sep-03 | 0.0 | 7 | -4.3 | 7 | 22-Sep-03 | 14:30 | 3.0 | 18.0 | P1 | P2 | 40 |
| 28-Sep-03 | 0.0 | 3 | -5.1 | 3 | 28-Sep-03 | 17:00 | 3.3 | 21.5 | P1 | P2 | 20 |
| Min | 0.0 | | -5.1 | | Min | | 2.0 | 4.0 | | | 0 |
| Max | 85.0 | | 69.1 | | Max | | 3.5 | 26.0 | | | 60 |
| Total | 932.3 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---------------------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 15.0 | 2.6 | 10.8 | 20.5 | 678 | 1 | 33 | 46.2 | 53.9 | 47.7 | |
| 4-May | 14.0 | 2.1 | 7.7 | 17.6 | 604 | 1 | 34 | 49.3 | 50.6 | 45.5 | |
| 18-May | 15.0 | 2.1 | 3.5 | 15.6 | 495 | 1 | 32 | 49.3 | 42.9 | 43.8 | |
| 1-Jun | 20.0 | 3.4 | 4.1 | 14.2 | 531 | 1 | 37 | 42.3 | 44.5 | 42.4 | |
| 15-Jun | 21.5 | 2.6 | 2.9 | 31.6 | 623 | 1 | 20 | 46.2 | 41.1 | 54.0 | Algae colonies present near shore. |
| 29-Jun | 24.0 | 1.8 | 4.0 | 27.7 | 662 | 2 | 24 | 51.5 | 44.2 | 52.1 | Algae present on lake bottom at dock. |
| 13-Jul | 24.0 | 1.7 | 7.2 | 16.0 | 628 | 1 | 39 | 52.3 | 49.9 | 44.1 | |
| 27-Jul | 24.0 | 1.7 | 3.4 | 17.6 | 631 | 1 | 36 | 52.3 | 42.6 | 45.5 | |
| 10-Aug | 23.0 | 1.6 | 4.2 | 13.8 | 579 | | 42 | 53.2 | 44.6 | 42.0 | |
| 25-Aug | 23.5 | 1.7 | 3.2 | 14.2 | 590 | 1 | 42 | 52.3 | 42.0 | 42.4 | |
| 7-Sep | 21.5 | 3.1 | 6.5 | 17.8 | 599 | 1 | 34 | 43.7 | 49.0 | 45.7 | |
| 21-Sep | 17.0 | 2.0 | 6.0 | 46.5 | 599 | 2 | 13 | 50.0 | 48.2 | 59.5 | |
| 5-Oct | 17.0 | 2.3 | 16.8 | 20.2 | 595 | 2 | 29 | 48.0 | 58.2 | 47.5 | |
| 20-Oct | 13.5 | 3.0 | 8.7 | 22.2 | 646 | 1 | 29 | 44.1 | 51.8 | 48.9 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.5 | 2.3 | 6.4 | 21.1 | 604.3 | 1.2 | 32 | 48.6 | 47.4 | 47.2 | TSI Average = 47.8 |
| Median | 20.8 | 2.1 | 5.1 | 17.7 | 601.5 | 1 | 33 | 49.3 | 46.4 | 45.6 | |
| Min | 13.5 | 1.6 | 2.9 | 13.8 | 495.0 | 1 | 13 | 42.3 | 41.1 | 42.0 | |
| Max | 24.0 | 3.4 | 16.8 | 46.5 | 678.0 | 2 | 42 | 53.2 | 58.2 | 59.5 | |
| Count | 14 | 14 | 14 | 14 | 14 | 13 | 14 | 14 | 14 | 14 | |

Killarney

Lake Overview

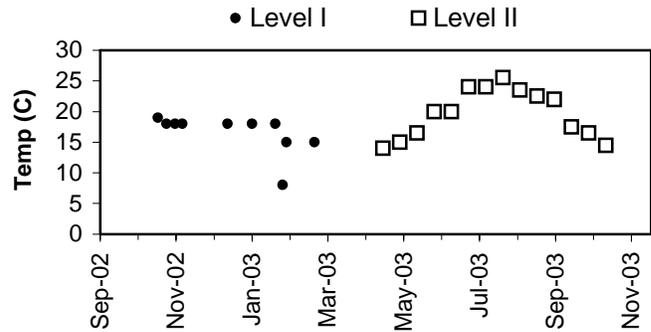
Volunteer monitoring began at Lake Killarney in the late 1980s and continued through 2003. The data indicate that this lake, partly in the city of Federal Way, is relatively high in primary productivity (borderline eutrophic) with good water quality. Since the lake surface makes up 20% of the drainage area, direct precipitation is important, in addition to watershed inputs. The northern shoreline has some wetland functions (King County, 1997). Land use analysis of 2002 aerial photographs showed almost 84% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Lake Killarney has a public boat launch and in the past has been heavily infested with Eurasian water milfoil. Though herbicide treatments were successful, residents should keep an eye on aquatic plants growing nearshore to catch early new infestations.

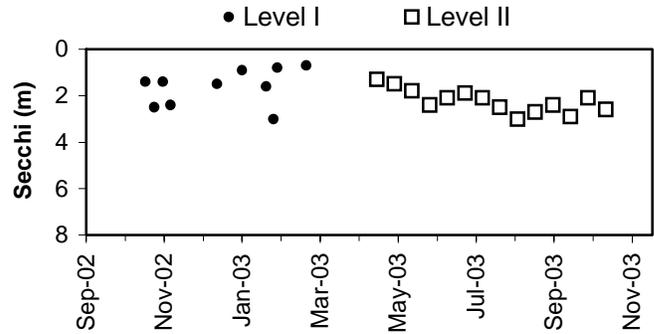
Physical Parameters

Secchi transparency ranged between 0.7 and 3.0m from January through October. Surface water temperatures ranged between 8.0 and 25.5 degrees Celsius for the same period. Water level and precipitation data were collected for October 2002 through February 2003, which showed a rise from an autumn low stand to a winter high.

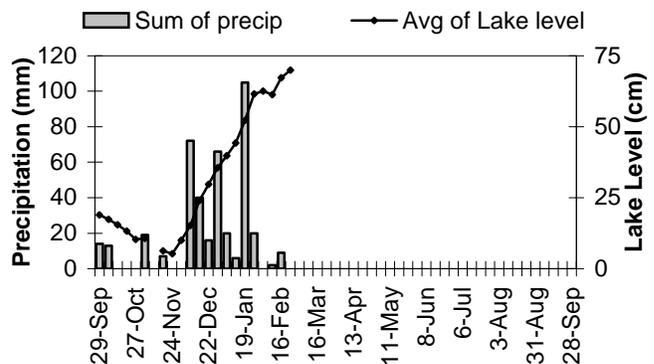
Lake Temperature



Secchi Depth

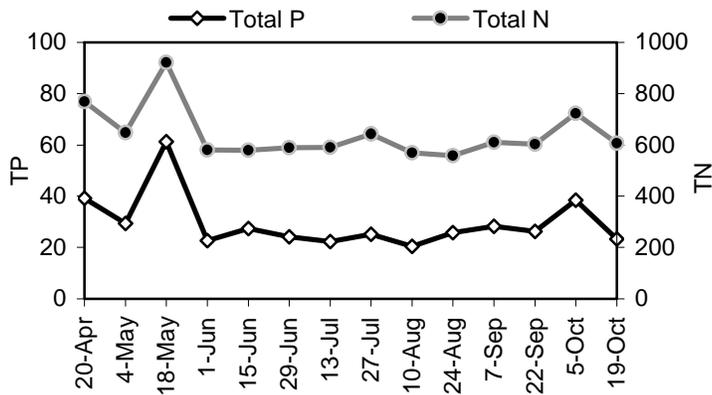


Lake Level and Precipitation

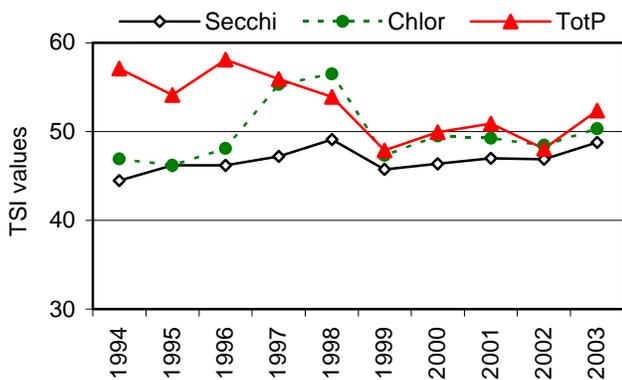


Killarney

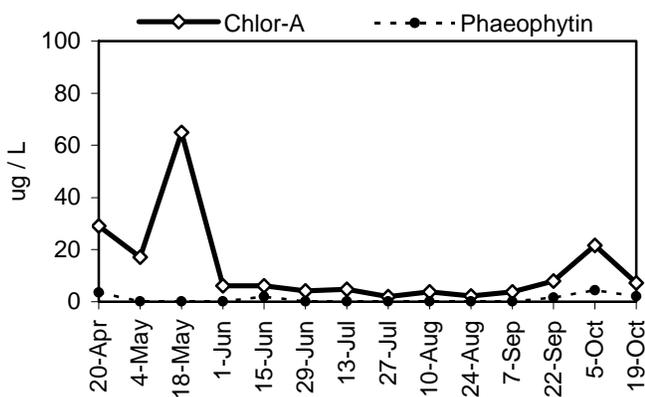
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|-------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| unidentified species | chrysophyte |
| <i>Anacystis</i> spp. | bluegreen |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period. The N:P ratio ranged from 15 to 28. The 2003 TSI values were close to each other and somewhat higher than the last four years, at the threshold of eutrophy.

Chlorophyll and Algae

Chlorophyll content reached a peak in mid-May, followed by low values until October when it rose again. Algae were dominated by several species of the chrysophyte *Dinobryon*, as well as several other chrysophyte species. The colonial bluegreen *Anacystis* was also common in several samples.

Residents on Lake Killarney have controlled algae in the past, including the use of copper-based algaecides to control blooms. Copper has been found in high concentrations in the bottom sediments (King County, 1997).

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 1.3 | 29.1 | 39.2 | 769 | 3 | 20 | 56.2 | 63.6 | 57.1 | Streaky brown algae in greater amounts than usual. |
| 4-May | 15.0 | 1.5 | 17.1 | 29.4 | 648 | 3 | 22 | 54.1 | 58.4 | 52.9 | |
| 18-May | 16.5 | 1.8 | 64.9 | 61.3 | 922 | 3 | 15 | 51.5 | 71.5 | 63.5 | Chlor-a value is abnormally high; no explanation. |
| 1-Jun | 20.0 | 2.4 | 6.1 | 22.6 | 581 | 3 | 26 | 47.4 | 48.2 | 49.1 | |
| 15-Jun | 20.0 | 2.1 | 6.1 | 27.4 | 580 | 3 | 21 | 49.3 | 48.3 | 51.9 | Floating bright blue-green algae in small clumps. |
| 29-Jun | 24.0 | 1.9 | 4.2 | 24.1 | 589 | 3 | 24 | 50.7 | 44.7 | 50.1 | |
| 13-Jul | 24.0 | 2.1 | 4.8 | 22.3 | 591 | 3 | 27 | 49.3 | 46.0 | 48.9 | Sprayed the lake Saturday for weeds. |
| 27-Jul | 25.5 | 2.5 | 1.9 | 25.1 | 643 | 2 | 26 | 46.8 | 36.9 | 50.6 | |
| 10-Aug | 23.5 | 3.0 | 3.7 | 20.4 | 570 | 3 | 28 | 44.1 | 43.5 | 47.7 | |
| 24-Aug | 22.5 | 2.7 | 2.1 | 25.8 | 559 | 2 | 22 | 45.7 | 38.0 | 51.0 | |
| 7-Sep | 22.0 | 2.4 | 3.7 | 28.2 | 611 | 3 | 22 | 47.4 | 43.5 | 52.3 | |
| 21-Sep | 17.5 | 2.9 | 7.9 | 26.2 | 603 | 3 | 23 | 44.6 | 50.9 | 51.3 | |
| 5-Oct | 16.5 | 2.1 | 21.6 | 38.4 | 723 | 3 | 19 | 49.3 | 60.7 | 56.8 | |
| 19-Oct | 14.5 | 2.6 | 7.2 | 23.2 | 607 | 2 | 26 | 46.2 | 49.9 | 49.5 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.7 | 2.2 | 12.9 | 29.5 | 642.5 | 2.8 | 23 | 48.8 | 50.3 | 52.3 | TSI Average = 50.5 |
| Median | 20.0 | 2.3 | 6.1 | 26.0 | 605.0 | 3 | 23 | 48.3 | 48.3 | 51.2 | |
| Min | 14.0 | 1.3 | 1.9 | 20.4 | 559.0 | 2 | 15 | 44.1 | 36.9 | 47.7 | |
| Max | 25.5 | 3.0 | 64.9 | 61.3 | 922.0 | 3 | 28 | 56.2 | 71.5 | 63.5 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Langlois

Lake Overview

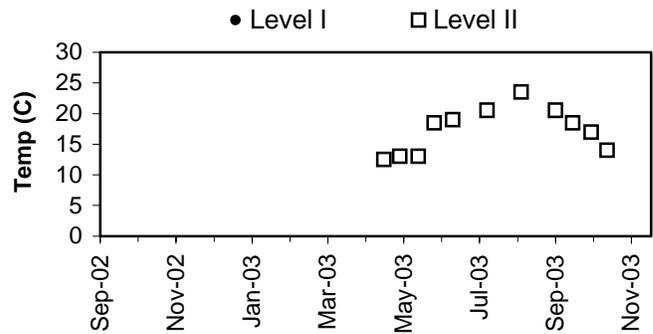
Volunteer monitoring began at Lake Langlois in water year 2001 and continued through 2003. The data indicate that this lake is relatively low in primary productivity (oligotrophic) with excellent water quality. Since the lake surface makes up 17% of the drainage area, direct precipitation is important, in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed less than 1% of the surrounding watershed has been developed for uses other than agriculture or forestry, with a Girl Scout camp occupying a large portion of the watershed and shoreline.

Lake Langlois has a public access boat launch. Lake users and residents should monitor the shallow areas for Eurasian milfoil, Brazilian elodea and other noxious aquatic weed invaders.

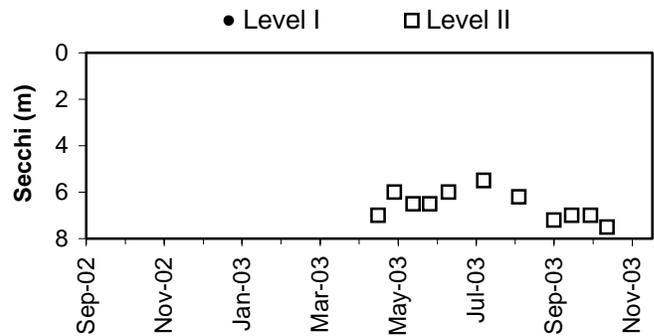
Physical Parameters

Secchi transparency ranged between 5.5 and 8.2m through the sample season. Surface water temperatures reached 23.5 degrees Celsius during the same period. Water level and precipitation data were not collected for the year.

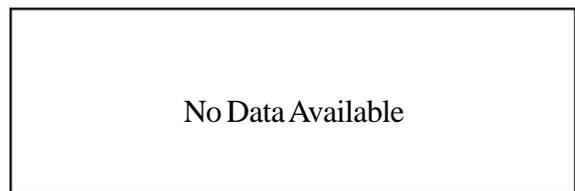
Lake Temperature



Secchi Depth

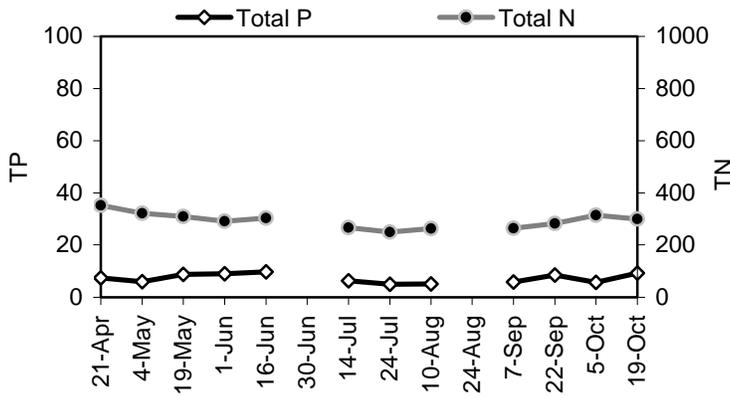


Lake Level and Precipitation

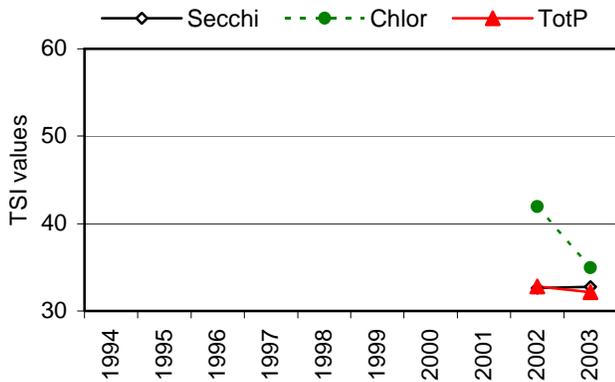


Langlois

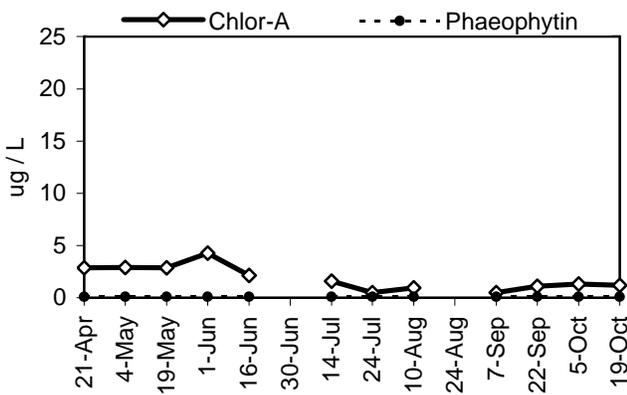
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|--------------------|
| <i>Cyclotella</i> sp. | diatom-chrysophyte |
| <i>Dinobryon</i> spp. | chrysophyte |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained stable and in relatively constant proportion to each other through the sampling period. The N:P ratio ranged from 31 to 54. The 2003 TSI values were close together, well below the threshold for oligotrophy.

Midsummer samples collected by King County Lake Stewardship Program staff in 2003 confirmed that the water in Langlois does not completely mix on an annual basis. Deep water in the lake is anoxic and contains high amounts of nutrients and sulfur compounds that remain in the deep water and do not mix up into water that contains planktonic algae.

Chlorophyll and Algae

Chlorophyll content was higher in April through early June, but generally remained at low values throughout the sample season. The algae were dominated by the diatom-chrysophyte *Cyclotella* and by *Dinobryon* species, with a variety of other diatoms, dinoflagellates, chlorophytes and unidentified algae also represented. Bluegreen algae were present only in trace amounts.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 12.5 | 7.0 | 2.9 | 7.4 | 352 | | 48 | 31.9 | 40.9 | 33.0 | Lots of plankton on surface. |
| 4-May | 13.0 | 6.0 | 2.9 | 6.0 | 321 | 2 | 54 | 34.1 | 41.0 | 30.0 | |
| 19-May | 13.0 | 6.5 | 2.9 | 8.8 | 309 | | 35 | 33.0 | 40.9 | 35.5 | |
| 1-Jun | 18.5 | 6.5 | 4.3 | 9.0 | 291 | 2 | 32 | 33.0 | 44.8 | 35.8 | |
| 16-Jun | 19.0 | 6.0 | 2.1 | 9.8 | 303 | 1 | 31 | 34.1 | 38.0 | 37.1 | |
| 30-Jun | | | | | | | | | | | No sample. |
| 14-Jul | 20.5 | 5.5 | 1.6 | 6.3 | 267 | 1 | 42 | 35.4 | 35.2 | 30.7 | Logs in lake growing thick algae. |
| 28-Jul | | | | | | | | | | | No sample. |
| 11-Aug | 23.5 | 6.2 | 1.0 | 5.1 | 263 | 1 | 52 | 33.7 | 30.2 | 27.6 | |
| 24-Aug | 21.5 | 8.0 | | | | 1 | | | | | Samples were lost; missing data. |
| 8-Sep | 20.5 | 7.2 | 0.6 | 5.9 | 264 | 1 | 45 | 31.5 | | 29.8 | Chlor-a value was <MDL. Reported as .6µgl. |
| 22-Sep | 18.5 | 7.0 | 1.1 | 8.5 | 283 | 1 | 33 | 31.9 | 31.5 | 35.0 | |
| 6-Oct | 17.0 | 7.0 | 1.3 | 5.8 | 314 | 0 | 54 | 31.9 | 33.1 | 29.5 | |
| 20-Oct | 14.0 | 7.5 | 1.2 | 9.3 | 300 | 1 | 32 | 30.9 | 32.4 | 36.3 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 17.6 | 6.7 | 2.0 | 7.4 | 297.0 | 1.1 | 42 | 32.9 | 36.8 | 32.8 | TSI Average = 33.8 |
| Median | 18.5 | 6.8 | 1.6 | 7.4 | 300.0 | 1 | 42 | 33.0 | 36.6 | 33.0 | |
| Min | 12.5 | 5.5 | 0.6 | 5.1 | 263.0 | 0 | 31 | 30.9 | 30.2 | 27.6 | |
| Max | 23.5 | 8.0 | 4.3 | 9.8 | 352.0 | 2 | 54 | 35.4 | 44.8 | 37.1 | |
| Count | 12 | 12 | 11 | 11 | 11 | 10 | 11 | 11 | 10 | 11 | |

Leota

Lake Overview

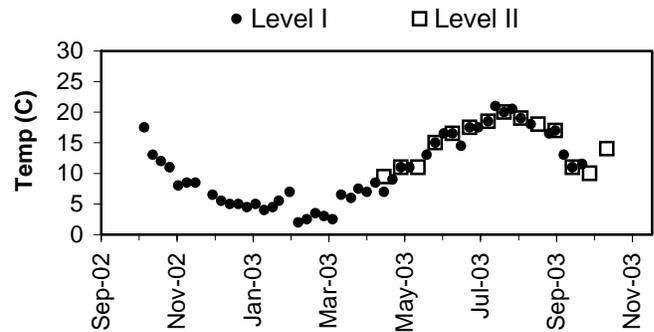
Volunteer monitoring began at Lake Leota in 1998 and continued through 2003. Earlier data suggested that this city lake (Woodinville) was relatively high in primary productivity (borderline eutrophic) with fair to good water quality. Productivity dropped in 2002 and continued at the same level in 2003. Since the lake surface makes up only 2% of the drainage area, direct precipitation is not as important as watershed inputs. There is one Class 2 wetland in the basin. Land use analysis of 2002 aerial photographs showed almost 90% of the surrounding watershed has been developed for uses other than agriculture.

Lake Leota has no public access points, though residents should keep an eye on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea or other noxious aquatic weeds.

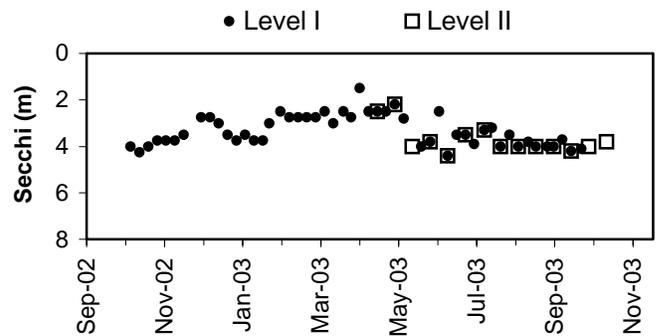
Physical Parameters

Secchi transparency ranged between 1.5 and 4.4m through the year. Annual water temperatures ranged from 5 to 23 degrees Celsius. Excellent precipitation and water level records were compiled for the year. Water levels were consistent with the regional pattern of winter-high levels, dropping slowly through the summer to a low stand in early fall.

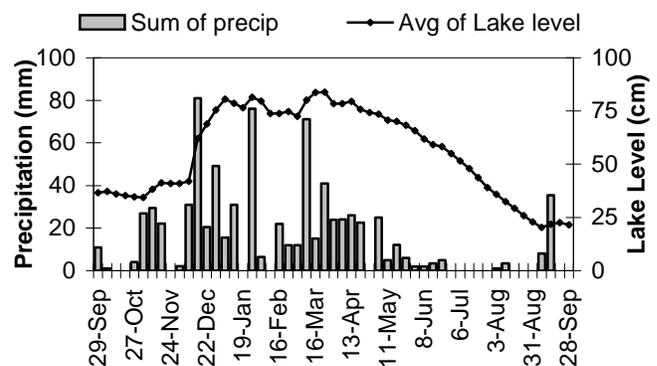
Lake Temperature



Secchi Depth

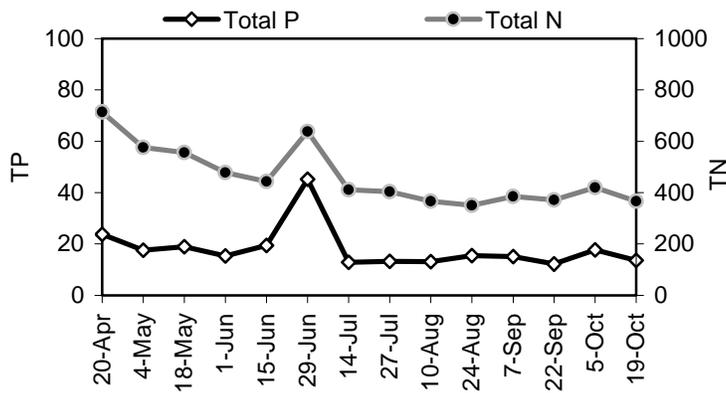


Lake Level and Precipitation

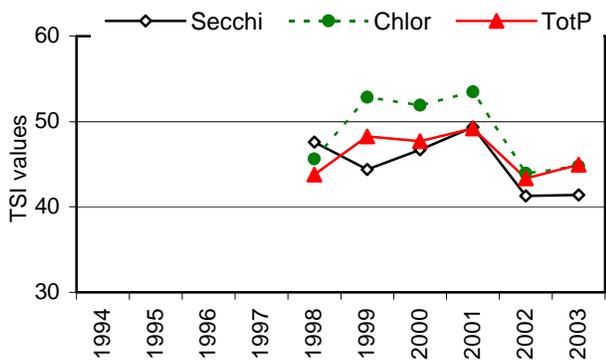


Leota

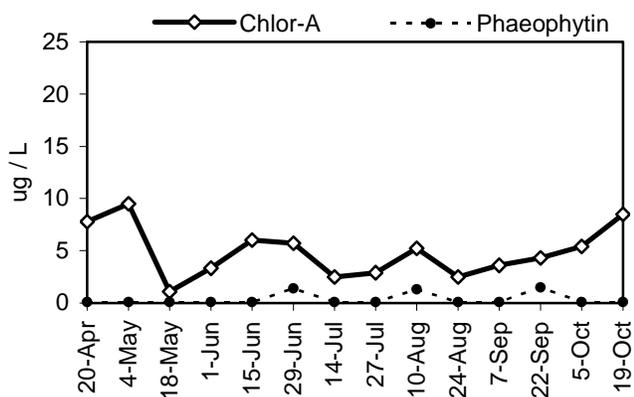
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|------------------------------|----------------|
| unidentified species | chrysophyte |
| <i>Ceratium hirundinella</i> | dinoflagellate |
| <i>Botryococcus braunii</i> | chlorophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen and phosphorus tracked each other closely through the season, with nitrogen generally decreasing through the period. The N:P ratio ranged from 14 to 33. The 2003 TSI values were fairly close to each other in the mesotrophic range, with TSI-Secchi somewhat lower than the other two indicators.

Chlorophyll and Algae

Chlorophyll remained fairly low through the sampling period, with higher values found in spring and autumn. Commonly found algae included an unidentified chrysophyte species, the colonial chlorophyte *Botryococcus*, and several species of *Cryptomonas*. Bluegreens were noted, but were never abundant.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|---------------|-----------------|-------------|
| 29-Sep-02 | 11.0 | 4 | 36.8 | 4 | | | | | | | |
| 6-Oct-02 | 1.1 | 7 | 37.3 | 7 | 6-Oct-02 | 15:00 | 4.0 | 17.5 | P2 | P2 | 0 |
| 13-Oct-02 | 0.1 | 7 | 36.1 | 7 | 13-Oct-02 | 13:30 | 4.3 | 13.0 | P2 | P2 | 0 |
| 20-Oct-02 | 0.1 | 7 | 35.3 | 7 | 20-Oct-02 | 13:30 | 4.0 | 12.0 | P2 | P2 | 0 |
| 27-Oct-02 | 4.0 | 7 | 34.7 | 7 | 27-Oct-02 | 13:00 | 3.8 | 11.0 | P2 | P2 | 0 |
| 3-Nov-02 | 27.0 | 7 | 34.4 | 7 | 3-Nov-02 | 13:30 | 3.8 | 8.0 | P2 | P2 | 0 |
| 10-Nov-02 | 29.5 | 7 | 38.3 | 7 | 10-Nov-02 | 13:30 | 3.8 | 8.5 | P2 | P2 | 0 |
| 17-Nov-02 | 22.1 | 7 | 41.3 | 7 | 17-Nov-02 | 13:00 | 3.5 | 8.5 | P2 | P2 | 0 |
| 24-Nov-02 | 0.0 | 7 | 41.0 | 7 | | | | | | | |
| 1-Dec-02 | 2.1 | 7 | 41.0 | 7 | 1-Dec-02 | 13:00 | 2.8 | 6.5 | P2 | P2 | 0 |
| 8-Dec-02 | 31.0 | 7 | 42.0 | 7 | 8-Dec-02 | 13:30 | 2.8 | 5.5 | P2 | P2 | 0 |
| 15-Dec-02 | 81.0 | 7 | 62.0 | 7 | 15-Dec-02 | 13:00 | 3.0 | 5.0 | P2 | P2 | 0 |
| 22-Dec-02 | 20.5 | 7 | 68.9 | 7 | 22-Dec-02 | 12:00 | 3.5 | 5.0 | P2 | P2 | 0 |
| 29-Dec-02 | 49.1 | 7 | 75.4 | 7 | 29-Dec-02 | 12:30 | 3.8 | 4.5 | P2 | P2 | 0 |
| 5-Jan-03 | 15.6 | 7 | 80.6 | 7 | 5-Jan-03 | 13:00 | 3.5 | 5.0 | P2 | P2 | 0 |
| 12-Jan-03 | 31.0 | 7 | 78.6 | 7 | 12-Jan-03 | 15:00 | 3.8 | 4.0 | P2 | P2 | 0 |
| 19-Jan-03 | 0.0 | 2 | 76.5 | 2 | 19-Jan-03 | 13:00 | 3.8 | 4.5 | P2 | P2 | 0 |
| 26-Jan-03 | 76.0 | 5 | 81.5 | 4 | 24-Jan-03 | 13:00 | 3.0 | 5.5 | P2 | P2 | 2 |
| 2-Feb-03 | 6.5 | 7 | 79.6 | 7 | 2-Feb-03 | 13:00 | 2.5 | 7.0 | P2 | P2 | 2 |
| 9-Feb-03 | 0.0 | 7 | 73.9 | 7 | 9-Feb-03 | 13:00 | 2.8 | 2.0 | P2 | P2 | 6 |
| 16-Feb-03 | 22.1 | 7 | 73.9 | 7 | 16-Feb-03 | 13:00 | 2.8 | 2.5 | P2 | P2 | 0 |
| 23-Feb-03 | 12.1 | 7 | 74.7 | 7 | 23-Feb-03 | 13:30 | 2.8 | 3.5 | P2 | P2 | 2 |
| 2-Mar-03 | 12.0 | 7 | 72.4 | 7 | 2-Mar-03 | 11:45 | 2.8 | 3.0 | P2 | P2 | 4 |
| 9-Mar-03 | 71.1 | 7 | 80.1 | 7 | 9-Mar-03 | 13:00 | 2.5 | 2.5 | P2 | P2 | 2 |
| 16-Mar-03 | 15.1 | 7 | 83.7 | 7 | 16-Mar-03 | 13:00 | 3.0 | 6.5 | P2 | P2 | 2 |
| 23-Mar-03 | 41.0 | 7 | 83.9 | 7 | 24-Mar-03 | 17:00 | 2.5 | 6.0 | P2 | P2 | 0 |
| 30-Mar-03 | 24.0 | 7 | 78.4 | 7 | 30-Mar-03 | 13:00 | 2.8 | 7.5 | P2 | P2 | 5 |
| 6-Apr-03 | 24.1 | 7 | 78.4 | 7 | 6-Apr-03 | 16:30 | 1.5 | 7.0 | P3 | P3 | 4 |
| 13-Apr-03 | 26.1 | 7 | 79.4 | 7 | 13-Apr-03 | 15:00 | 2.5 | 8.5 | P3 | P3 | 4 |
| 20-Apr-03 | 22.6 | 7 | 75.7 | 7 | 20-Apr-03 | 16:30 | 2.5 | 7.0 | P3 | P3 | 2 |
| 27-Apr-03 | 0.0 | 7 | 74.3 | 7 | 27-Apr-03 | 17:00 | 2.5 | 9.0 | P3 | P3 | 2 |
| 4-May-03 | 25.0 | 7 | 73.4 | 7 | 4-May-03 | 16:30 | 2.2 | 11.0 | P3 | P3 | 7 |
| 11-May-03 | 5.0 | 7 | 70.7 | 7 | 11-May-03 | 15:40 | 2.8 | 11.0 | P1 | P1 | 3 |
| 18-May-03 | 12.2 | 7 | 70.0 | 7 | | | | | | | 5 |
| 25-May-03 | 6.0 | 7 | 68.3 | 7 | 25-May-03 | 15:30 | 4.0 | 13.0 | P1 | P1 | 27 |
| 1-Jun-03 | 2.0 | 7 | 65.7 | 7 | 1-Jun-03 | 14:00 | 3.8 | 15.0 | P1 | P1 | 14 |
| 8-Jun-03 | 2.0 | 7 | 61.9 | 7 | 8-Jun-03 | 19:00 | 2.5 | 16.5 | P1 | P1 | 7 |
| 15-Jun-03 | 3.5 | 7 | 59.1 | 7 | 15-Jun-03 | 15:30 | 4.4 | 16.5 | P1 | P1 | 7 |
| 22-Jun-03 | 5.0 | 7 | 58.3 | 7 | 22-Jun-03 | 15:00 | 3.5 | 14.5 | P1 | P1 | 7 |
| 29-Jun-03 | 0.1 | 7 | 55.0 | 7 | 29-Jun-03 | 16:30 | 3.5 | 17.5 | P2 | P2 | 7 |
| 6-Jul-03 | 0.0 | 7 | 51.6 | 7 | 6-Jul-03 | 16:30 | 3.9 | 17.5 | P1 | P1 | 6 |
| 13-Jul-03 | 0.0 | 7 | 47.9 | 7 | 14-Jul-03 | 19:15 | 3.3 | 18.5 | P2 | P2 | 6 |
| 20-Jul-03 | 0.0 | 7 | 43.7 | 7 | 20-Jul-03 | 19:30 | 3.2 | 21.0 | P1 | P1 | 6 |
| 27-Jul-03 | 0.0 | 7 | 39.1 | 7 | 27-Jul-03 | 15:00 | 4.0 | 20.0 | P1 | P1 | 6 |
| 3-Aug-03 | 1.0 | 6 | 36.0 | 3 | 3-Aug-03 | 16:00 | 3.5 | 20.5 | P1 | P1 | 0 |
| 10-Aug-03 | 3.5 | 7 | 32.4 | 7 | 10-Aug-03 | 16:00 | 4.0 | 19.0 | P1 | P1 | 0 |
| 17-Aug-03 | 0.0 | 7 | 29.3 | 7 | 18-Aug-03 | 17:30 | 3.8 | 18.0 | P1 | P1 | 0 |
| 24-Aug-03 | 0.0 | 7 | 25.9 | 7 | 24-Aug-03 | 15:30 | 4.0 | | P1 | P1 | 0 |
| 31-Aug-03 | 0.0 | 7 | 22.9 | 7 | 2-Sep-03 | 18:30 | 4.0 | 16.5 | P1 | P1 | 20 |
| 7-Sep-03 | 8.2 | 7 | 20.3 | 7 | 7-Sep-03 | 16:30 | 4.0 | 17.0 | P1 | P1 | 2 |
| 14-Sep-03 | 35.6 | 7 | 21.9 | 7 | 14-Sep-03 | 14:00 | 3.7 | 13.0 | P1 | P1 | 7 |
| 21-Sep-03 | 0.1 | 7 | 22.6 | 7 | 21-Sep-03 | 15:00 | 4.2 | 11.0 | P1 | P1 | 0 |
| 28-Sep-03 | 0.1 | 4 | 21.5 | 4 | 29-Sep-03 | 17:00 | 4.1 | 11.5 | P1 | P1 | 2 |
| Min | 0.0 | | 20.3 | | Min | | 1.5 | 2.0 | | | 0 |
| Max | 81.0 | | 83.9 | | Max | | 4.4 | 21.0 | | | 27 |
| Total | 786.3 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 9.5 | 2.5 | 7.8 | 23.7 | 714 | 3 | 30 | 46.8 | 50.7 | 49.8 | Thousands of little guys. |
| 4-May | 11.0 | 2.2 | 9.5 | 17.5 | 576 | 3 | 33 | 48.6 | 52.6 | 45.4 | |
| 18-May | 11.0 | 4.0 | 1.1 | 18.9 | 556 | 1 | 29 | 40.0 | 31.5 | 46.6 | |
| 1-Jun | 15.0 | 3.8 | 3.3 | 15.3 | 478 | 2 | 31 | 40.7 | 42.3 | 43.5 | |
| 15-Jun | 16.5 | 4.4 | 6.0 | 19.4 | 443 | 1 | 23 | 38.6 | 48.2 | 46.9 | |
| 29-Jun | 17.5 | 3.5 | 5.7 | 45.2 | 639 | 2 | 14 | 41.9 | 47.7 | 59.1 | |
| 14-Jul | 18.5 | 3.3 | 2.5 | 12.8 | 411 | 2 | 32 | 42.8 | 39.6 | 40.9 | |
| 27-Jul | 20.0 | 4.0 | 2.9 | 13.2 | 404 | 1 | 31 | 40.0 | 41.0 | 41.4 | |
| 10-Aug | 19.0 | 4.0 | 5.2 | 13.0 | 367 | 1 | 28 | 40.0 | 46.8 | 41.2 | |
| 24-Aug | 18.0 | 4.0 | 2.5 | 15.4 | 350 | 1 | 23 | 40.0 | 39.6 | 43.6 | |
| 7-Sep | 17.0 | 4.0 | 3.6 | 15.0 | 385 | 1 | 26 | 40.0 | 43.1 | 43.2 | |
| 21-Sep | 11.0 | 4.2 | 4.3 | 12.2 | 371 | 1 | 30 | 39.3 | 44.9 | 40.2 | |
| 5-Oct | 10.0 | 4.0 | 5.4 | 17.7 | 420 | 1 | 24 | 40.0 | 47.1 | 45.6 | |
| 19-Oct | 14.0 | 3.8 | 8.5 | 13.5 | 366 | 1 | 27 | 40.7 | 51.5 | 41.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 14.9 | 3.7 | 4.9 | 18.1 | 462.9 | 1.5 | 27 | 41.4 | 44.8 | 44.9 | TSI Average = 43.7 |
| Median | 15.8 | 4.0 | 4.8 | 15.4 | 415.5 | 1 | 29 | 40.0 | 45.9 | 43.5 | |
| Min | 9.5 | 2.2 | 1.1 | 12.2 | 350.0 | 1 | 14 | 38.6 | 31.5 | 40.2 | |
| Max | 20.0 | 4.4 | 9.5 | 45.2 | 714.0 | 3 | 33 | 48.6 | 52.6 | 59.1 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Lucerne

Lake Overview

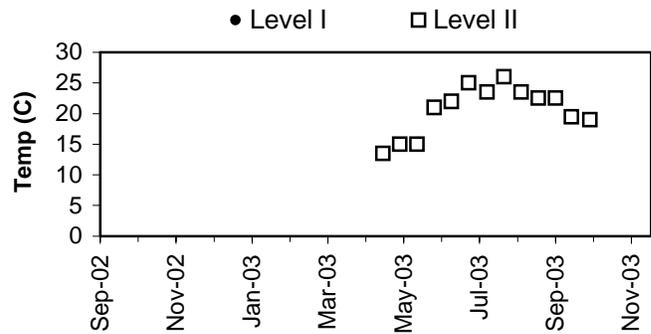
Volunteer monitoring began at Lake Lucerne in the 1980s and continued through 2003, with a gap in the early 1990s. The data indicate that this city lake (Maple Valley) is relatively low in primary productivity (oligotrophic - mesotrophic) with good to excellent water quality. Since the lake surface makes up 4% of the drainage area, direct precipitation is not as important as watershed inputs. It connects to Pipe Lake through a shallow channel, and the outlet stream from both lakes exits from Lucerne. Land use analysis of 2002 aerial photographs showed over 78% of the surrounding watershed has been developed for uses other than agriculture.

Lake Lucerne has no public access, but has a history of both milfoil and *Hydrilla* infestations for which eradication efforts have been funded by the Washington State Department of Ecology, Maple Valley and Covington since 1995. Residents should keep a close eye on aquatic plants growing nearshore to catch new or expanding patches of these and other noxious weeds.

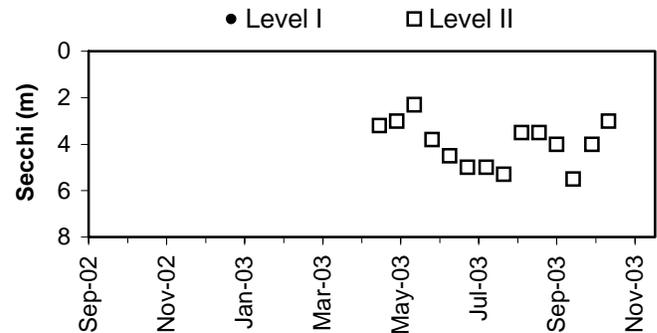
Physical Parameters

Secchi transparency ranged between 2.3 and 5.5m from April through October. Level II surface water temperatures reached 26.0 degrees Celsius in August. There were no precipitation or water level records, but records for Pipe Lake should be very similar.

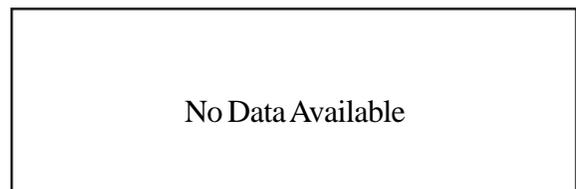
Lake Temperature



Secchi Depth

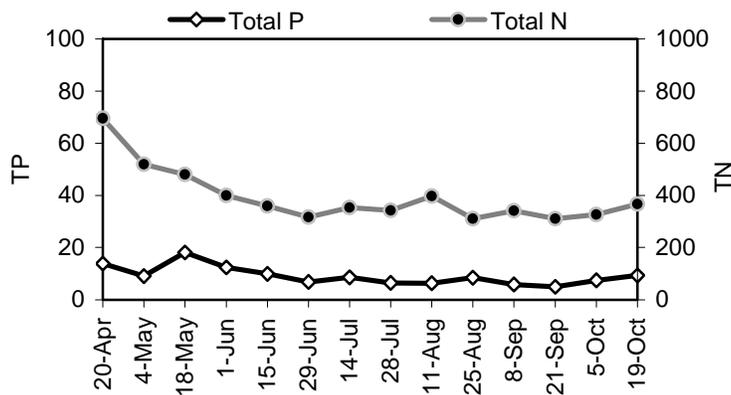


Lake Level and Precipitation

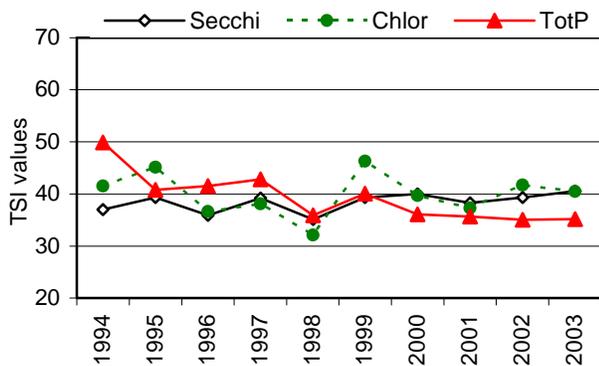


Lucerne

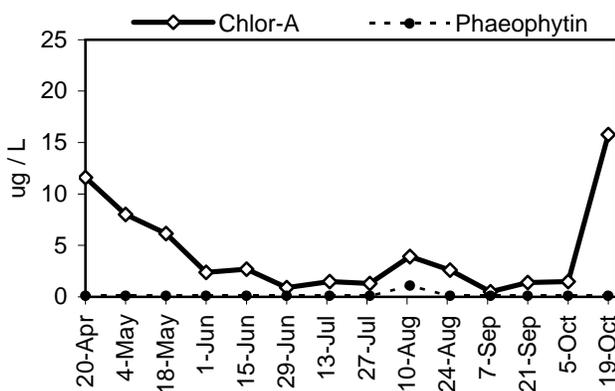
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|----------------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Dinobryon divergens</i> | chrysophyte |
| <i>Cyclotella</i> sp | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in generally consistent proportion to each other through the sampling period. The N:P ratio ranged from 27 to 63. The 2003 TSI values were slightly spread out in the upper range of oligotrophy. TSI-TotP was lower than the values for chlorophyll and Secchi, which were on the threshold of mesotrophy.

Chlorophyll and Algae

Chlorophyll was at high values in spring and fall, but dropped considerably through the summer months. The algae in spring were dominated by an unidentified chrysophyte species and the diatom-chrysophyte *Cyclotella*. Autumn populations also included the dinoflagellate *Peridinium* and the diatom *Melosira*. Small numbers of the bluegreen *Anabaena* were found both early and late in the sampling period.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.5 | 3.2 | 11.6 | 13.8 | 695 | 3 | 50 | 43.2 | 54.6 | 42.0 | Algae heavy at 1-2 ft below under surface. |
| 4-May | 15.0 | 3.0 | 8.0 | 9.1 | 520 | 3 | 57 | 44.1 | 51.0 | 36.0 | Thick layer about 25-30 cm. |
| 18-May | 15.0 | 2.3 | 6.1 | 18.1 | 481 | 3 | 27 | 48.0 | 48.4 | 45.9 | |
| 1-Jun | 21.0 | 3.8 | 2.4 | 12.3 | 400 | 1 | 33 | 40.7 | 39.2 | 40.4 | |
| 15-Jun | 22.0 | 4.5 | 2.7 | 9.9 | 360 | 1 | 36 | 38.3 | 40.3 | 37.2 | |
| 29-Jun | 25.0 | 5.0 | 0.9 | 6.9 | 317 | 1 | 46 | 36.8 | 29.5 | 32.0 | There was a spot treatment for <i>Hydrilla</i> on 6/28. |
| 14-Jul | 23.5 | 5.0 | 1.5 | 8.5 | 353 | 1 | 42 | 36.8 | 34.5 | 35.0 | |
| 28-Jul | 26.0 | 5.3 | 1.3 | 6.5 | 342 | 1 | 53 | 35.9 | 33.1 | 31.1 | |
| 11-Aug | 23.5 | 3.5 | 3.9 | 6.3 | 397 | | 63 | 41.9 | 44.0 | 30.7 | |
| 25-Aug | 22.5 | 3.5 | 2.6 | 8.4 | 311 | 1 | 37 | 41.9 | 39.9 | 34.8 | |
| 8-Sep | 22.5 | 4.0 | 0.6 | 5.9 | 341 | 1 | 58 | 40.0 | | 29.8 | Chlor-a value was <MDL. Reported as .6µg/l. |
| 21-Sep | 19.5 | 5.5 | 1.4 | 5.0 | 311 | 1 | 62 | 35.4 | 33.9 | | TP value was < MDL. Reported as 5µg/L. |
| 6-Oct | 19.0 | 4.0 | 1.5 | 7.4 | 327 | | 44 | 40.0 | 34.5 | 33.0 | |
| 19-Oct | | 3.0 | 15.8 | 9.3 | 367 | 1 | 39 | 44.1 | 57.6 | 36.3 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.6 | 4.0 | 4.3 | 9.1 | 394.4 | 1.5 | 46 | 40.5 | 41.6 | 35.7 | TSI Average = 38.9 |
| Median | 22.0 | 3.9 | 2.5 | 8.5 | 356.5 | 1 | 45 | 40.4 | 39.9 | 35.0 | |
| Min | 13.5 | 2.3 | 0.6 | 5.0 | 311.0 | 1 | 27 | 35.4 | 29.5 | 29.8 | |
| Max | 26.0 | 5.5 | 15.8 | 18.1 | 695.0 | 3 | 63 | 48.0 | 57.6 | 45.9 | |
| Count | 13 | 14 | 14 | 14 | 14 | 12 | 14 | 14 | 13 | 13 | |

Marcel

Lake Overview

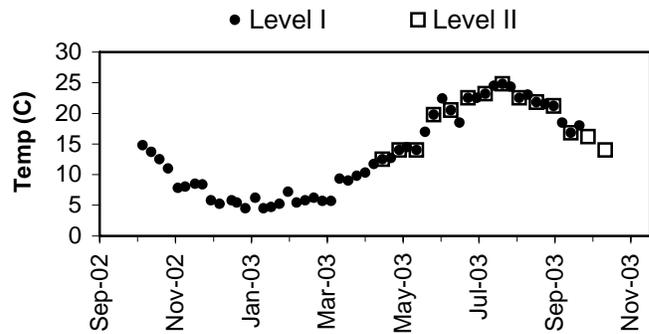
Volunteer monitoring began at Lake Marcel in 2000 and continued through 2003. The data indicate that this rural lake is relatively high in primary productivity (eutrophic) with fair water quality. Since the lake surface makes up only 3% of the drainage area, direct precipitation is not as important as watershed inputs. Land use analysis of 2002 aerial photographs showed almost 45% of the surrounding watershed has been developed for uses other than agriculture.

Lake Marcel has no public access boat launch, but has a history of aquatic weed management, including stocking with grass carp. Residents should keep an eye on aquatic plants growing nearshore to catch early infestations of noxious weeds.

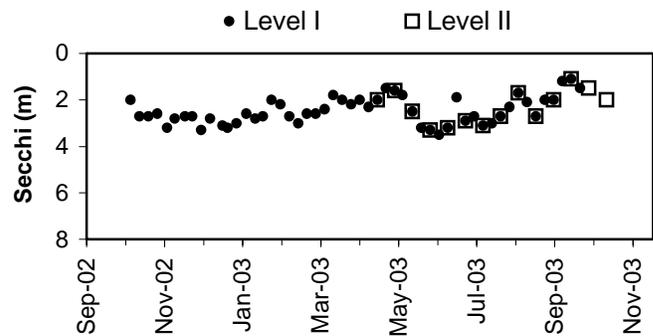
Physical Parameters

Secchi transparency ranged from 1.1 to 3.5m through the year. Annual water temperatures ranged from 4.5 to 24.8 degrees Celsius. Excellent precipitation and water level records were kept over the year, showing that water levels remained steady through the year without major seasonal fluctuations or rapid responses to storms.

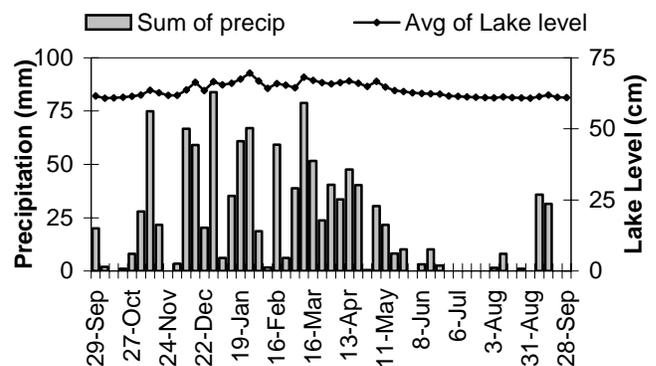
Lake Temperature



Secchi Depth

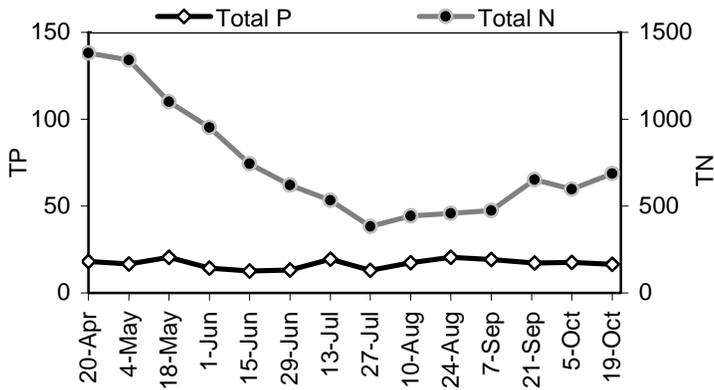


Lake Level and Precipitation

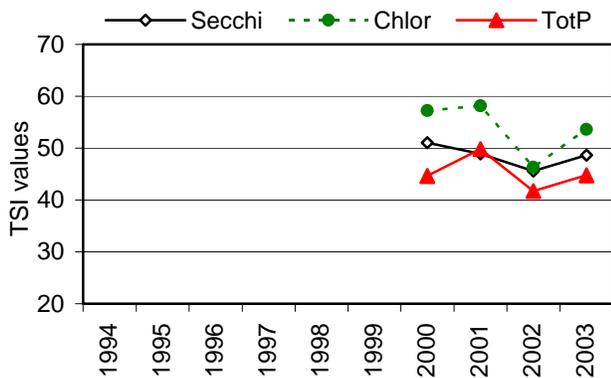


Marcel

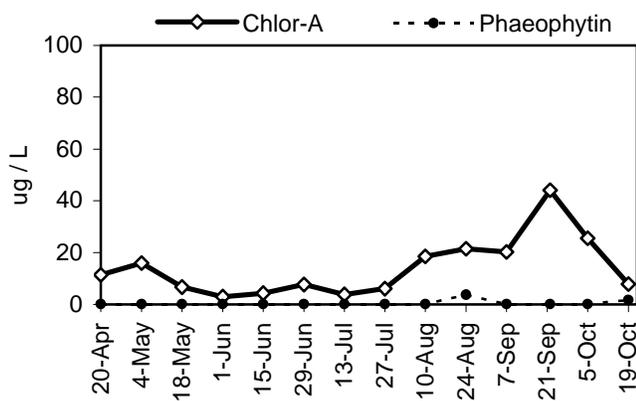
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|--------------------------------|--------------|
| <i>Dinobryon sociale</i> | chrysophyte |
| unidentified species | chrysophyte |
| <i>Trachelomonas volvocina</i> | euglenophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen changed proportion to each other slowly as Total N decreased through spring and then rose slowly through October. The N:P ratio ranged from 22 to 80. The 2003 TSI indicators spanned the mesotrophic – eutrophic threshold, with chlorophyll higher than the other two indicators, higher than in 2002.

Chlorophyll and Algae

Chlorophyll remained relatively low until early August, when it began climbing to a peak in late September. The autumn bloom was dominated by the chrysophyte *Dinobryon sociale*, which made up 95% of the algae biovolume at its peak. Other common algae included the euglenophyte *Trachelomonas* and several species of cryptophytes. Bluegreens were noted, but never became common.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 20.0 | 5 | 61.6 | 5 | | | | | | | |
| 6-Oct-02 | 2.0 | 7 | 60.8 | 7 | 6-Oct-02 | 14:55 | 2.0 | 14.8 | C1 | C1 | 10 |
| 13-Oct-02 | 0.0 | 7 | 60.9 | 7 | 13-Oct-02 | 14:30 | 2.7 | 13.7 | C1 | C1 | 40 |
| 20-Oct-02 | 1.0 | 7 | 61.1 | 7 | 20-Oct-02 | 13:30 | 2.7 | 12.5 | C2 | C2 | 0 |
| 27-Oct-02 | 8.1 | 7 | 61.4 | 7 | 27-Oct-02 | 13:15 | 2.6 | 11.0 | C2 | C2 | 16 |
| 3-Nov-02 | 28.0 | 7 | 61.9 | 7 | 4-Nov-02 | 14:20 | 3.2 | 7.8 | P1 | C1 | 0 |
| 10-Nov-02 | 74.9 | 7 | 63.5 | 7 | 10-Nov-02 | 14:30 | 2.8 | 8.0 | C1 | C1 | 0 |
| 17-Nov-02 | 21.6 | 7 | 62.6 | 7 | 18-Nov-02 | 15:05 | 2.7 | 8.5 | C1 | C1 | 0 |
| 24-Nov-02 | 0.0 | 7 | 61.8 | 7 | 24-Nov-02 | 16:10 | 2.7 | 8.4 | C1 | C1 | 0 |
| 1-Dec-02 | 3.5 | 7 | 61.8 | 7 | 1-Dec-02 | 15:15 | 3.3 | 5.8 | C1 | C1 | 0 |
| 8-Dec-02 | 66.6 | 7 | 63.7 | 7 | 8-Dec-02 | 13:55 | 2.8 | 5.2 | C1 | C1 | 0 |
| 15-Dec-02 | 59.0 | 7 | 66.3 | 7 | 18-Dec-02 | 15:07 | 3.1 | 5.8 | C1 | C1 | 0 |
| 22-Dec-02 | 20.3 | 7 | 63.5 | 7 | 22-Dec-02 | 15:25 | 3.2 | 5.4 | C1 | C1 | 0 |
| 29-Dec-02 | 83.8 | 7 | 66.6 | 7 | 29-Dec-02 | 15:10 | 3.0 | 4.5 | C1 | C1 | 0 |
| 5-Jan-03 | 6.1 | 7 | 65.5 | 7 | 6-Jan-03 | 15:25 | 2.6 | 6.2 | C1 | C1 | 0 |
| 12-Jan-03 | 35.3 | 7 | 66.0 | 7 | 13-Jan-03 | 13:05 | 2.8 | 4.5 | C1 | C1 | 0 |
| 19-Jan-03 | 60.9 | 7 | 67.5 | 7 | 19-Jan-03 | 15:05 | 2.7 | 4.7 | NA | NA | 30 |
| 26-Jan-03 | 67.0 | 7 | 69.6 | 7 | 26-Jan-03 | 15:50 | 2.0 | 5.2 | NA | NA | 0 |
| 2-Feb-03 | 18.7 | 7 | 66.9 | 7 | 2-Feb-03 | 14:55 | 2.2 | 7.2 | C2 | C2 | 0 |
| 9-Feb-03 | 1.6 | 7 | 64.2 | 7 | 9-Feb-03 | 15:20 | 2.7 | 5.4 | C1 | C1 | 0 |
| 16-Feb-03 | 59.2 | 7 | 65.9 | 7 | 16-Feb-03 | 15:00 | 3.0 | 5.8 | C1 | C1 | 0 |
| 23-Feb-03 | 6.1 | 7 | 65.4 | 7 | 23-Feb-03 | 15:10 | 2.6 | 6.2 | C1 | C1 | 0 |
| 2-Mar-03 | 38.8 | 7 | 64.5 | 7 | 2-Mar-03 | 14:15 | 2.6 | 5.7 | C1 | C1 | 0 |
| 9-Mar-03 | 78.7 | 7 | 68.1 | 7 | 9-Mar-03 | 14:30 | 2.4 | 5.7 | C1 | C1 | 0 |
| 16-Mar-03 | 51.5 | 7 | 67.0 | 7 | 16-Mar-03 | 14:00 | 1.8 | 9.3 | C2 | C2 | 0 |
| 23-Mar-03 | 23.7 | 7 | 66.2 | 7 | 23-Mar-03 | 15:35 | 2.0 | 9.0 | C2 | C2 | 0 |
| 30-Mar-03 | 40.5 | 7 | 65.9 | 7 | 30-Mar-03 | 14:45 | 2.2 | 9.8 | C2 | C2 | 0 |
| 6-Apr-03 | 33.7 | 7 | 66.2 | 7 | 6-Apr-03 | 14:40 | 2.0 | 10.3 | C2 | C3 | 0 |
| 13-Apr-03 | 47.5 | 7 | 66.8 | 7 | 13-Apr-03 | 15:25 | 2.3 | 11.7 | NA | NA | 0 |
| 20-Apr-03 | 40.3 | 7 | 66.1 | 7 | 20-Apr-03 | 15:45 | 2.0 | 12.5 | P1 | P1 | 0 |
| 27-Apr-03 | 0.5 | 7 | 64.9 | 7 | 27-Apr-03 | 14:40 | 1.5 | 12.7 | P1 | P1 | 0 |
| 4-May-03 | 30.5 | 7 | 66.7 | 7 | 4-May-03 | 14:00 | 1.6 | 14.0 | C1 | C2 | 0 |
| 11-May-03 | 21.6 | 7 | 64.7 | 7 | 10-May-03 | 15:50 | 1.8 | 14.5 | P2 | P2 | 0 |
| 18-May-03 | 8.2 | 7 | 63.5 | 7 | 18-May-03 | 14:45 | 2.5 | 14.0 | P1 | P1 | 0 |
| 25-May-03 | 10.1 | 7 | 63.1 | 7 | 25-May-03 | 15:20 | 3.2 | 17.0 | P1 | P1 | 30 |
| 1-Jun-03 | 0.0 | 7 | 62.7 | 7 | 1-Jun-03 | 15:07 | 3.3 | 19.8 | P1 | NA | 30 |
| 8-Jun-03 | 3.2 | 7 | 62.4 | 7 | 8-Jun-03 | 14:25 | 3.5 | 22.4 | NA | NA | 25 |
| 15-Jun-03 | 10.1 | 7 | 62.4 | 7 | 15-Jun-03 | 14:30 | 3.2 | 20.5 | NA | NA | 25 |
| 22-Jun-03 | 2.6 | 7 | 62.2 | 7 | 22-Jun-03 | 14:20 | 1.9 | 18.5 | P2 | P2 | 3 |
| 29-Jun-03 | 0.0 | 7 | 61.6 | 7 | 29-Jun-03 | 14:35 | 2.9 | 22.5 | P1 | P1 | 1 |
| 6-Jul-03 | 0.0 | 7 | 61.5 | 7 | 6-Jul-03 | 16:45 | 2.7 | 22.5 | P1 | P1 | 1 |
| 13-Jul-03 | 0.0 | 7 | 61.2 | 7 | 13-Jul-03 | 15:55 | 3.1 | 23.2 | NA | NA | 0 |
| 20-Jul-03 | 0.0 | 7 | 61.1 | 7 | 20-Jul-03 | 15:40 | 3.0 | 24.5 | NA | NA | 0 |
| 27-Jul-03 | 0.0 | 7 | 61.0 | 7 | 27-Jul-03 | 17:00 | 2.7 | 24.8 | P1 | P1 | 0 |
| 3-Aug-03 | 1.6 | 7 | 60.9 | 7 | 3-Aug-03 | 15:30 | 2.3 | 24.3 | P1 | P1 | 0 |
| 10-Aug-03 | 8.1 | 7 | 61.2 | 7 | 10-Aug-03 | 16:40 | 1.7 | 22.5 | P1 | P1 | 0 |
| 17-Aug-03 | 0.0 | 7 | 61.0 | 7 | 17-Aug-03 | 16:40 | 2.1 | 23.0 | P2 | P2 | 0 |
| 24-Aug-03 | 1.0 | 7 | 60.8 | 7 | 24-Aug-03 | 15:00 | 2.7 | 21.8 | P2 | P2 | 0 |
| 31-Aug-03 | 0.0 | 6 | 60.7 | 7 | 31-Aug-03 | 14:50 | 2.0 | 21.5 | P2 | P2 | 0 |
| 7-Sep-03 | 35.9 | 7 | 61.3 | 7 | 7-Sep-03 | 15:10 | 2.0 | 21.2 | P2 | P2 | 0 |
| 14-Sep-03 | 31.5 | 7 | 61.8 | 7 | 14-Sep-03 | 13:15 | 1.2 | 18.5 | C3 | C3 | 0 |
| 21-Sep-03 | 0.0 | 7 | 61.1 | 7 | 21-Sep-03 | 15:00 | 1.1 | 16.8 | C3 | P1 | 2 |
| 28-Sep-03 | 0.0 | 3 | 61.0 | 3 | 28-Sep-03 | 13:15 | 1.5 | 18.0 | C3 | P1 | 0 |
| Min | 0.0 | | 60.7 | | Min | | 1.1 | 4.5 | | | 0 |
| Max | 83.8 | | 69.6 | | Max | | 3.5 | 24.8 | | | 30 |
| Total | 1163.2 | 364.0 | | | | | 52.0 | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 12.5 | 2.0 | 11.3 | 18.2 | 1380 | 1 | 76 | 50.0 | 54.4 | 46.0 | |
| 4-May | 14.0 | 1.6 | 15.9 | 16.7 | 1340 | 1 | 80 | 53.2 | 57.7 | 44.8 | |
| 18-May | 14.0 | 2.5 | 6.6 | 20.5 | 1100 | 1 | 54 | 46.8 | 49.1 | 47.7 | |
| 1-Jun | 19.8 | 3.3 | 2.9 | 14.3 | 953 | 1 | 67 | 42.8 | 41.1 | 42.5 | |
| 15-Jun | 20.5 | 3.2 | 4.3 | 12.6 | 744 | 1 | 59 | 43.2 | 44.8 | 40.7 | |
| 29-Jun | 22.5 | 2.9 | 7.6 | 13.3 | 620 | 1 | 47 | 44.6 | 50.5 | 41.5 | |
| 13-Jul | 23.2 | 3.1 | 3.8 | 19.5 | 533 | 1 | 27 | 43.7 | 43.7 | 47.0 | |
| 27-Jul | 24.8 | 2.7 | 6.0 | 13.0 | 381 | 1 | 29 | 45.7 | 48.2 | 41.2 | |
| 10-Aug | 22.5 | 1.7 | 18.5 | 17.4 | 442 | 1 | 25 | 52.3 | 59.2 | 45.4 | Globs of black-brown-green floating on top (sparse). |
| 24-Aug | 21.8 | 2.7 | 21.4 | 20.5 | 457 | 2 | 22 | 45.7 | 60.6 | 47.7 | Few globs - black, brown, green - floating on top. |
| 7-Sep | 21.2 | 2.0 | 20.2 | 19.3 | 473 | 2 | 25 | 50.0 | 60.1 | 46.9 | |
| 21-Sep | 16.8 | 1.1 | 44.1 | 17.2 | 651 | 1 | 38 | 58.6 | 67.7 | 45.2 | Fine green algae float on surface like paint splotches. |
| 5-Oct | 16.2 | 1.5 | 25.5 | 17.6 | 597 | 2 | 34 | 54.1 | 62.3 | 45.5 | Light green clouds floating on 1/6 of lk srfc. Blown to NE. |
| 19-Oct | 14.0 | 2.0 | 7.7 | 16.6 | 686 | 2 | 41 | 50.0 | 50.6 | 44.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.8 | 2.3 | 14.0 | 16.9 | 739.8 | 1.3 | 45 | 48.6 | 53.6 | 44.8 | TSI Average = 49.0 |
| Median | 20.2 | 2.3 | 9.5 | 17.3 | 635.5 | 1 | 40 | 48.4 | 52.5 | 45.3 | |
| Min | 12.5 | 1.1 | 2.9 | 12.6 | 381.0 | 1 | 22 | 42.8 | 41.1 | 40.7 | |
| Max | 24.8 | 3.3 | 44.1 | 20.5 | 1380.0 | 2 | 80 | 58.6 | 67.7 | 47.7 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Margaret

Lake Overview

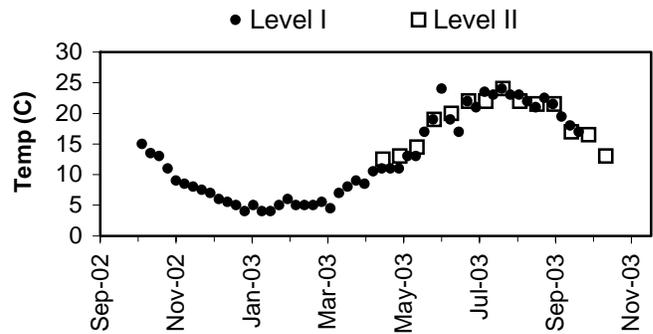
Volunteer monitoring began at Lake Margaret in 2000 and continued through 2003. The data indicate that this lake is relatively low in primary productivity (oligotrophic) with excellent water quality. Since the lake surface makes up only 3% of the drainage area, direct precipitation is not as important as watershed inputs, much of which is in Snohomish County. Land use analysis of 2002 aerial photographs showed less than 6% of the surrounding watershed has been developed for use. Lake Margaret is a source of domestic water for homes nearby, making water quality a paramount concern.

Lake Margaret has a public access boat launch, and residents should keep a watch on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, or other noxious weeds.

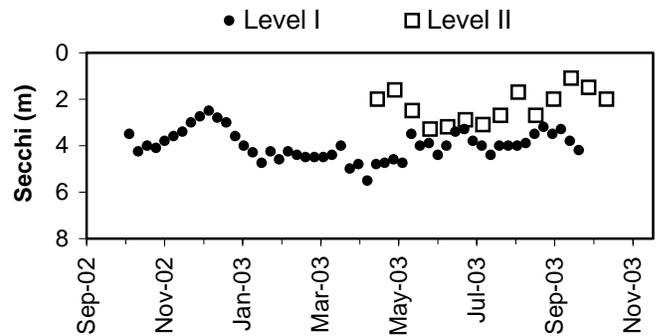
Physical Parameters

Secchi transparency ranged from 2.5 to 5.5m through the year. Annual water temperatures ranged from 4.0 to 24.0 degrees Celsius. Excellent records were kept of precipitation and of water levels, which illustrate control by the water district at the outlet to minimize storm impacts and maximize water availability.

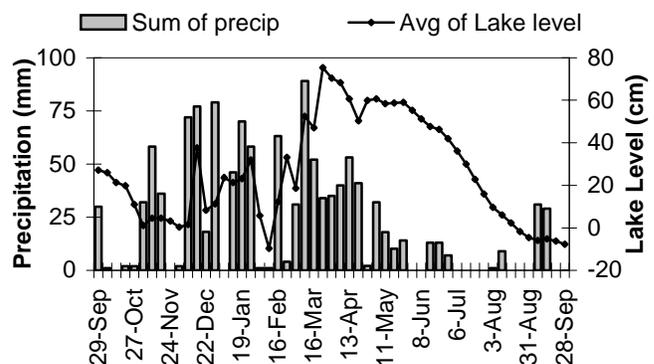
Lake Temperature



Secchi Depth

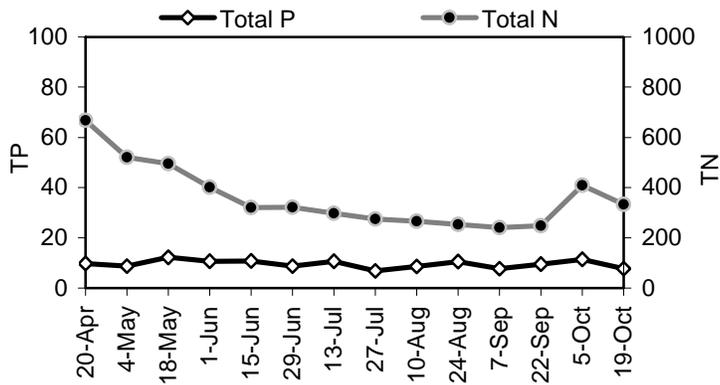


Lake Level and Precipitation

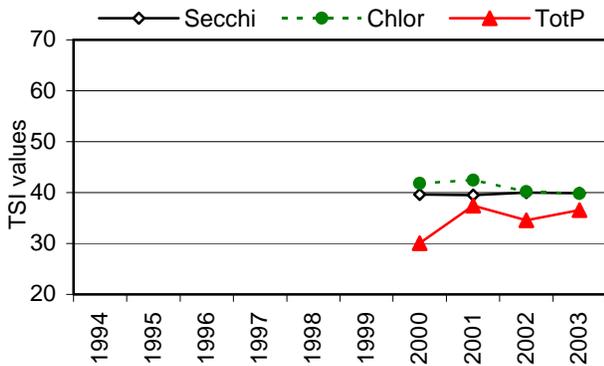


Margaret

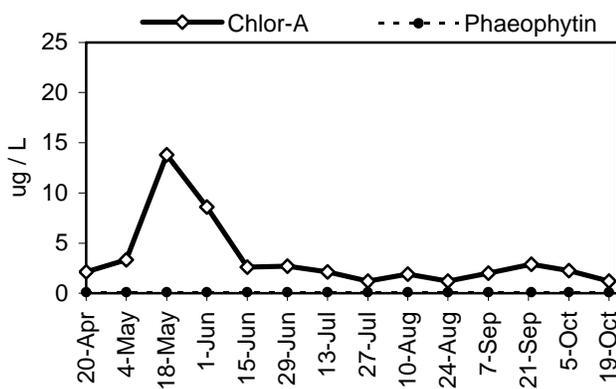
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|--------------------|
| unidentified chrysophyte | chrysophyte |
| <i>Anacystis</i> sp. | bluegreen |
| <i>Asterionella formosa</i> | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased slowly from an initial high in the sample period, with one high value in October, while total phosphorus remained steady throughout. The N:P ratio ranged from 24 to 68. The 2003 TSI values were in close agreement with each other in the upper range of oligotrophy.

Chlorophyll and Algae

Chlorophyll made a peak in mid-May and then remained at low levels throughout the rest of the sample period. The phytoplankton during May were dominated by an unidentified chrysophyte species, with dinoflagellate species also common. Algae found at other times included the diatoms *Asterionella* and *Cyclotella*, as well as several species of *Cryptomonas*. The bluegreens *Anacystis* and *Anabaena* were present, but rare.

Daily Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days |
|--------------|---------------------|-----------|------------------------|-----------|
| 29-Sep-02 | 30.0 | 5 | 27.1 | 5 |
| 6-Oct-02 | 1.1 | 7 | 25.9 | 7 |
| 13-Oct-02 | 0.1 | 7 | 21.4 | 7 |
| 20-Oct-02 | 2.0 | 7 | 19.9 | 7 |
| 27-Oct-02 | 2.0 | 7 | 11.0 | 7 |
| 3-Nov-02 | 32.1 | 7 | 1.1 | 7 |
| 10-Nov-02 | 58.1 | 7 | 4.6 | 7 |
| 17-Nov-02 | 36.1 | 7 | 4.6 | 7 |
| 24-Nov-02 | 0.0 | 7 | 3.3 | 7 |
| 1-Dec-02 | 2.0 | 7 | 0.4 | 7 |
| 8-Dec-02 | 72.0 | 7 | 1.6 | 7 |
| 15-Dec-02 | 77.0 | 7 | 37.6 | 7 |
| 22-Dec-02 | 18.1 | 7 | 8.3 | 7 |
| 29-Dec-02 | 79.0 | 7 | 11.3 | 7 |
| 5-Jan-03 | 0.1 | 7 | 23.6 | 7 |
| 12-Jan-03 | 46.1 | 7 | 21.4 | 7 |
| 19-Jan-03 | 70.1 | 7 | 23.1 | 7 |
| 26-Jan-03 | 58.1 | 7 | 31.9 | 7 |
| 2-Feb-03 | 1.1 | 7 | 5.9 | 7 |
| 9-Feb-03 | 1.0 | 7 | -9.7 | 7 |
| 16-Feb-03 | 63.1 | 7 | 12.3 | 7 |
| 23-Feb-03 | 4.0 | 7 | 33.0 | 7 |
| 2-Mar-03 | 31.1 | 7 | 18.7 | 7 |
| 9-Mar-03 | 89.0 | 7 | 52.4 | 7 |
| 16-Mar-03 | 52.1 | 7 | 47.0 | 7 |
| 23-Mar-03 | 34.1 | 6 | 75.3 | 7 |
| 30-Mar-03 | 35.1 | 7 | 70.4 | 7 |
| 6-Apr-03 | 40.1 | 7 | 68.3 | 7 |
| 13-Apr-03 | 53.1 | 7 | 60.7 | 7 |
| 20-Apr-03 | 41.1 | 7 | 50.3 | 7 |
| 27-Apr-03 | 2.1 | 7 | 59.9 | 7 |
| 4-May-03 | 32.1 | 7 | 60.7 | 7 |
| 11-May-03 | 18.1 | 7 | 58.4 | 7 |
| 18-May-03 | 10.2 | 7 | 58.6 | 7 |
| 25-May-03 | 14.1 | 7 | 59.0 | 7 |
| 1-Jun-03 | 0.0 | 7 | 55.3 | 7 |
| 8-Jun-03 | 0.1 | 7 | 51.3 | 7 |
| 15-Jun-03 | 13.1 | 7 | 47.6 | 7 |
| 22-Jun-03 | 13.1 | 7 | 46.3 | 7 |
| 29-Jun-03 | 7.1 | 7 | 41.9 | 7 |
| 6-Jul-03 | 0.0 | 7 | 36.0 | 7 |
| 13-Jul-03 | 0.1 | 7 | 30.0 | 7 |
| 20-Jul-03 | 0.0 | 7 | 22.9 | 7 |
| 27-Jul-03 | 0.0 | 7 | 16.0 | 7 |
| 3-Aug-03 | 1.0 | 7 | 9.7 | 7 |
| 10-Aug-03 | 9.0 | 7 | 6.1 | 7 |
| 17-Aug-03 | 0.0 | 7 | 2.3 | 7 |
| 24-Aug-03 | 0.0 | 7 | -1.7 | 7 |
| 31-Aug-03 | 0.0 | 7 | -4.6 | 7 |
| 7-Sep-03 | 31.1 | 7 | -5.9 | 7 |
| 14-Sep-03 | 29.1 | 7 | -5.1 | 7 |
| 21-Sep-03 | 0.0 | 7 | -6.1 | 7 |
| 28-Sep-03 | 0.0 | 3 | -7.7 | 3 |
| Min | 0.0 | | -9.7 | |
| Max | 89.0 | | 75.3 | |
| Total | 1208.1 | 364.0 | | |

Weekly Data Summary

| Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 5-Oct-02 | 11:00 | 3.5 | 15.0 | C1/P1 | C1/P1 | 0 |
| 12-Oct-02 | 13:00 | 4.3 | 13.5 | C1/P1 | C1/P1 | 0 |
| 19-Oct-02 | 11:00 | 4.0 | 13.0 | C1/P1 | C1/P1 | 0 |
| 26-Oct-02 | 12:00 | 4.1 | 11.0 | C1/P1 | C1/P1 | 0 |
| 2-Nov-02 | 13:30 | 3.8 | 9.0 | C1/P1 | C1/P1 | 0 |
| 9-Nov-02 | 13:00 | 3.6 | 8.5 | C1/P2 | C1/P2 | 0 |
| 16-Nov-02 | 14:00 | 3.4 | 8.0 | C1/P1 | C1/P1 | 0 |
| 23-Nov-02 | 12:00 | 3.0 | 7.5 | C1/P1 | C1/P1 | 0 |
| 30-Nov-02 | 15:00 | 2.8 | 7.0 | | | 0 |
| 7-Dec-02 | 14:00 | 2.5 | 6.0 | C2/P1 | C2/P1 | 0 |
| 14-Dec-02 | 13:30 | 2.8 | 5.5 | C2/P1 | C2/P1 | 0 |
| 21-Dec-02 | 14:00 | 3.0 | 5.0 | C1 | C1 | 0 |
| 28-Dec-02 | 15:30 | 3.6 | 4.0 | C1 | C1 | 0 |
| 4-Jan-03 | 14:00 | 4.0 | 5.0 | C1 | C1 | 0 |
| 11-Jan-03 | 13:00 | 4.3 | 4.0 | C1 | C1 | 0 |
| 18-Jan-03 | 12:00 | 4.8 | 4.0 | C1 | C1 | 0 |
| 25-Jan-03 | 14:30 | 4.3 | 5.0 | C1 | C1 | 0 |
| 1-Feb-03 | 13:00 | 4.6 | 6.0 | C1 | C1 | 0 |
| 8-Feb-03 | 14:00 | 4.3 | 5.0 | C1 | C1 | 28 |
| 15-Feb-03 | 14:30 | 4.4 | 5.0 | C1 | C1 | 0 |
| 22-Feb-03 | 14:00 | 4.5 | 5.0 | C1 | C1 | 0 |
| 1-Mar-03 | 15:30 | 4.5 | 5.5 | C1 | C1 | 4 |
| 8-Mar-03 | 12:00 | 4.5 | 4.5 | C1 | C1 | 0 |
| 15-Mar-03 | 13:30 | 4.4 | 7.0 | C1 | C1 | 0 |
| 22-Mar-03 | 16:00 | 4.0 | 8.0 | C1 | C1 | 0 |
| 29-Mar-03 | 10:30 | 5.0 | 9.0 | C1 | C1 | 2 |
| 5-Apr-03 | 15:30 | 4.8 | 8.5 | C1 | C1 | 1 |
| 12-Apr-03 | 16:00 | 5.5 | 10.5 | NA | NA | 2 |
| 19-Apr-03 | 14:00 | 4.8 | 11.0 | NA | NA | 0 |
| 26-Apr-03 | 15:00 | 4.8 | 11.0 | P1 | P1 | 0 |
| 3-May-03 | 14:00 | 4.6 | 11.0 | P1 | P1 | 2 |
| 10-May-03 | 14:30 | 4.8 | 13.0 | P2 | P2 | 0 |
| 17-May-03 | 17:05 | 3.5 | 13.0 | P2 | P2 | 4 |
| 24-May-03 | 16:00 | 4.0 | 17.0 | P3 | P3 | 0 |
| 31-May-03 | 13:00 | 3.9 | 19.0 | P3 | P3 | 0 |
| 7-Jun-03 | 17:00 | 4.4 | 24.0 | P2 | P2 | 0 |
| 14-Jun-03 | 19:00 | 4.0 | 19.0 | P2 | P2 | 0 |
| 21-Jun-03 | 19:00 | 3.4 | 17.0 | P2 | P2 | 0 |
| 28-Jun-03 | 14:00 | 3.3 | 22.0 | P1 | P1 | 16 |
| 5-Jul-03 | 13:00 | 3.8 | 21.0 | P2 | P2 | 0 |
| 12-Jul-03 | 16:00 | 4.0 | 23.5 | P1 | P1 | 16 |
| 19-Jul-03 | 12:30 | 4.4 | 23.0 | P1 | P1 | 14 |
| 26-Jul-03 | 16:30 | 4.0 | 24.0 | P1 | P1 | 0 |
| 2-Aug-03 | 12:00 | 4.0 | 23.0 | P1 | P1 | 0 |
| 9-Aug-03 | 14:00 | 4.0 | 23.0 | P1 | P1 | 0 |
| 16-Aug-03 | 14:30 | 3.9 | 22.0 | P1 | P1 | 0 |
| 23-Aug-03 | 13:00 | 3.5 | 21.0 | P1 | P1 | 0 |
| 30-Aug-03 | 19:00 | 3.2 | 22.5 | P2 | P2 | 0 |
| 6-Sep-03 | 14:00 | 3.5 | 21.5 | P1 | P1 | 0 |
| 13-Sep-03 | 16:30 | 3.3 | 19.5 | P1 | P1 | 0 |
| 20-Sep-03 | 14:30 | 3.8 | 18.0 | P1 | P1 | 0 |
| 27-Sep-03 | 13:00 | 4.2 | 17.0 | P1 | P1 | 0 |
| Min | | 2.5 | 4.0 | | | 0 |
| Max | | 5.5 | 24.0 | | | 16 |
| | | 52.0 | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 12.5 | 5.0 | 2.1 | 9.8 | 668 | 1 | 68 | 36.8 | 38.0 | 37.1 | |
| 4-May | 13.0 | 4.6 | 3.3 | 8.8 | 521 | 1 | 59 | 38.0 | 42.3 | 35.5 | |
| 18-May | 14.5 | 3.5 | 13.8 | 12.2 | 495 | 2 | 41 | 41.9 | 56.3 | 40.2 | |
| 1-Jun | 19.0 | 3.9 | 8.6 | 10.7 | 401 | 3 | 37 | 40.4 | 51.7 | 38.3 | |
| 15-Jun | 20.0 | 4.0 | 2.6 | 10.8 | 320 | 1 | 30 | 40.0 | 39.9 | 38.5 | |
| 29-Jun | 22.0 | 4.2 | 2.7 | 8.8 | 322 | 1 | 37 | 39.3 | 40.3 | 35.5 | |
| 13-Jul | 22.0 | 4.0 | 2.1 | 10.7 | 297 | 1 | 28 | 40.0 | 38.0 | 38.3 | |
| 27-Jul | 24.0 | 3.7 | 1.2 | 6.8 | 274 | 1 | 40 | 41.1 | 32.4 | 31.8 | |
| 10-Aug | 22.0 | 4.1 | 1.9 | 8.7 | 266 | 1 | 31 | 39.6 | 37.0 | 35.4 | |
| 24-Aug | 21.5 | 3.5 | 1.2 | 10.5 | 253 | 1 | 24 | 41.9 | 32.4 | 38.1 | |
| 7-Sep | 21.5 | 3.5 | 2.0 | 7.7 | 240 | 1 | 31 | 41.9 | 37.4 | 33.6 | |
| 21-Sep | 17.0 | 3.5 | 2.9 | 9.5 | 248 | 1 | 26 | 41.9 | 40.9 | 36.6 | |
| 5-Oct | 16.5 | 5.0 | 2.2 | 11.4 | 409 | 1 | 36 | 36.8 | 38.5 | 39.3 | |
| 19-Oct | 13.0 | 4.4 | 1.2 | 7.8 | 333 | 1 | 43 | 38.6 | 32.4 | 33.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.5 | 4.1 | 3.4 | 9.6 | 360.5 | 1.2 | 38 | 39.9 | 39.8 | 36.6 | TSI Average = 38.8 |
| Median | 19.5 | 4.0 | 2.2 | 9.7 | 321.0 | 1 | 36 | 40.0 | 38.3 | 36.8 | |
| Min | 12.5 | 3.5 | 1.2 | 6.8 | 240.0 | 1 | 24 | 36.8 | 32.4 | 31.8 | |
| Max | 24.0 | 5.0 | 13.8 | 12.2 | 668.0 | 3 | 68 | 41.9 | 56.3 | 40.2 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

McDonald

Lake Overview

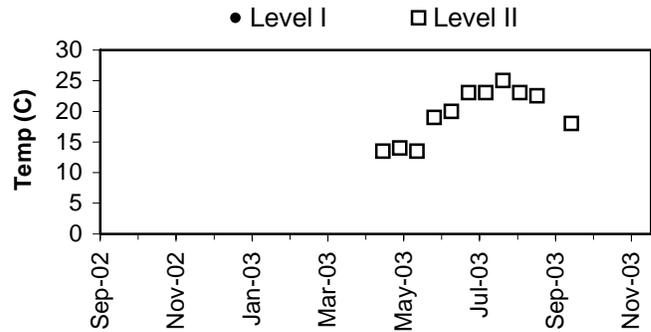
Volunteer monitoring began at Lake McDonald in 1996 and continued through 2003. The data indicate that this lake has decreased recently in primary productivity (eutrophic to mesotrophic); currently it has good water quality. Since the lake surface makes up 19% of the drainage area, direct precipitation is important, in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed over 69% of the surrounding watershed has been developed for uses other than agriculture. Seagulls attracted to King County's Cedar Hills Landfill were reported on the lake in the past, which may have contributed nutrients to the water. Changes in landfill practices have resulted in a decrease in use of the lake by the gulls.

Lake McDonald has no public access boat launch, but residents should keep an eye on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil or other noxious weeds.

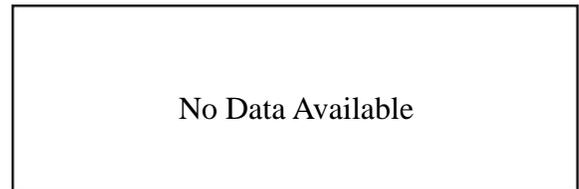
Physical Parameters

Secchi transparency was not measured. Water temperatures reached a maximum of 25.0 degrees Celsius. Excellent precipitation and water level records were kept, corresponding with the regional pattern of winter high - autumn low stands.

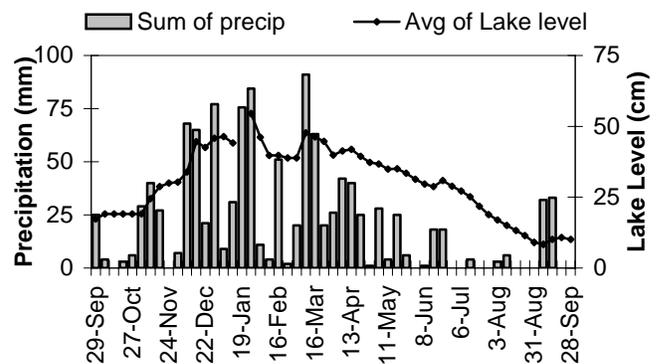
Lake Temperature



Secchi Depth

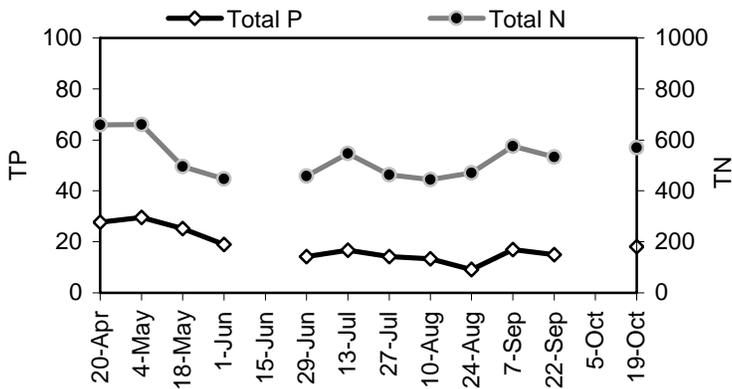


Lake Level and Precipitation

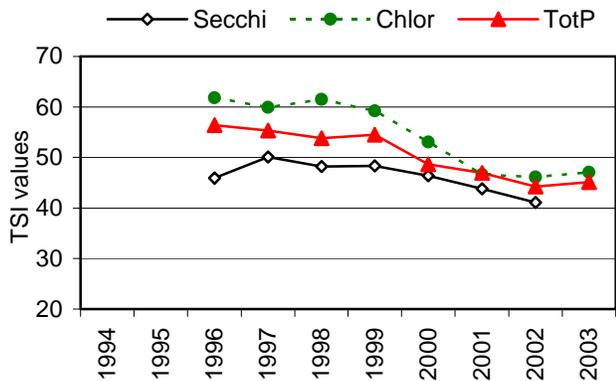


McDonald

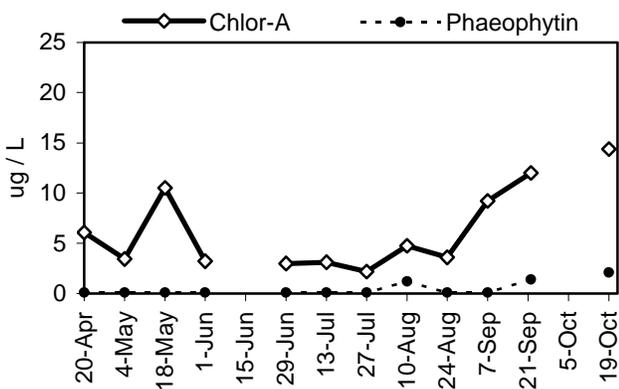
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|--------------------|
| <i>Anabaena</i> spp. | bluegreen |
| <i>Tabellaria fenestrata</i> | diatom-chrysophyte |
| <i>Aphanizomenon flos-aquae</i> | bluegreen |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen tracked each other closely through the sampling period. The N:P ratio ranged from 20 to 52. The 2003 TSI values were in close agreement with each other, similar to values in 2001 and 2002. TSI-Secchi could not be calculated.

Chlorophyll and Algae

Chlorophyll concentrations peaked in mid-May and rose again in early September, with the highest concentrations occurring on the last date of the sampling season. The spring peak was dominated by colonial chlorophyte species and the chrysophyte *Dinobryon*, while the fall bloom was characterized by the bluegreens *Anabaena* and *Aphanizomenon*, as well as the diatom *Tabellaria*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 25.0 | 5 | 17.2 | 5 | | | | | | | |
| 6-Oct-02 | 4.0 | 7 | 19.0 | 7 | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | 19.0 | 7 | | | | | | | |
| 20-Oct-02 | 3.0 | 7 | 19.0 | 7 | | | | | | | |
| 27-Oct-02 | 6.0 | 7 | 19.0 | 7 | | | | | | | |
| 3-Nov-02 | 29.0 | 7 | 19.0 | 7 | | | | | | | |
| 10-Nov-02 | 40.0 | 7 | 24.4 | 7 | | | | | | | |
| 17-Nov-02 | 27.0 | 7 | 28.7 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 30.0 | 7 | | | | | | | |
| 1-Dec-02 | 7.0 | 7 | 30.3 | 7 | | | | | | | |
| 8-Dec-02 | 68.0 | 7 | 33.9 | 7 | | | | | | | |
| 15-Dec-02 | 65.0 | 7 | 44.6 | 7 | | | | | | | |
| 22-Dec-02 | 21.0 | 7 | 42.6 | 7 | | | | | | | |
| 29-Dec-02 | 77.0 | 7 | 45.9 | 7 | | | | | | | |
| 5-Jan-03 | 9.0 | 7 | 46.4 | 7 | | | | | | | |
| 12-Jan-03 | 31.0 | 5 | 44.2 | 5 | | | | | | | |
| 19-Jan-03 | 75.5 | ** | | | | | | | | | |
| 26-Jan-03 | 84.4 | 6 | 54.5 | 6 | | | | | | | |
| 2-Feb-03 | 11.0 | 7 | 46.1 | 7 | | | | | | | |
| 9-Feb-03 | 4.0 | 7 | 39.7 | 7 | | | | | | | |
| 16-Feb-03 | 51.0 | 7 | 39.7 | 7 | | | | | | | |
| 23-Feb-03 | 2.0 | 7 | 38.9 | 7 | | | | | | | |
| 2-Mar-03 | 20.0 | 7 | 38.9 | 7 | | | | | | | |
| 9-Mar-03 | 91.0 | 7 | 47.7 | 7 | | | | | | | |
| 16-Mar-03 | 63.0 | 7 | 46.3 | 7 | | | | | | | |
| 23-Mar-03 | 20.0 | 7 | 44.7 | 7 | | | | | | | |
| 30-Mar-03 | 26.0 | 7 | 39.9 | 7 | | | | | | | |
| 6-Apr-03 | 42.0 | 7 | 41.3 | 7 | | | | | | | |
| 13-Apr-03 | 40.0 | 7 | 41.9 | 7 | | | | | | | |
| 20-Apr-03 | 25.0 | 7 | 39.4 | 7 | | | | | | | |
| 27-Apr-03 | 1.0 | 7 | 37.3 | 7 | | | | | | | |
| 4-May-03 | 28.0 | 7 | 36.7 | 7 | | | | | | | |
| 11-May-03 | 4.0 | 7 | 34.9 | 7 | | | | | | | |
| 18-May-03 | 25.0 | 7 | 35.0 | 7 | | | | | | | |
| 25-May-03 | 6.0 | 7 | 33.5 | 6 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 31.3 | 7 | | | | | | | |
| 8-Jun-03 | 1.0 | 7 | 29.6 | 7 | | | | | | | |
| 15-Jun-03 | 18.0 | 7 | 28.7 | 7 | | | | | | | |
| 22-Jun-03 | 18.0 | 7 | 30.9 | 7 | | | | | | | |
| 29-Jun-03 | 0.0 | 7 | 28.9 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 27.1 | 7 | | | | | | | |
| 13-Jul-03 | 4.0 | 7 | 25.1 | 7 | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | 21.7 | 7 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 18.9 | 7 | | | | | | | |
| 3-Aug-03 | 3.0 | 7 | 16.9 | 7 | | | | | | | |
| 10-Aug-03 | 6.0 | 7 | 15.0 | 7 | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | 13.1 | 7 | | | | | | | |
| 24-Aug-03 | | 0 | 11.4 | 7 | | | | | | | |
| 31-Aug-03 | 0.0 | 6 | 9.0 | 7 | | | | | | | |
| 7-Sep-03 | 32.0 | 7 | 8.3 | 7 | | | | | | | |
| 14-Sep-03 | 33.0 | 7 | 10.0 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 10.7 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | 10.0 | 3 | | | | | | | |
| Min | 0.0 | | 8.3 | | | Min | 0.0 | 0.0 | | | |
| Max | 91.0 | | 54.5 | | | Max | 0.0 | 0.0 | | | |
| Total | 1145.9 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.5 | | 6.1 | 27.7 | 660 | | 24 | | 48.2 | 52.1 | |
| 4-May | 14.0 | | 3.4 | 29.5 | 661 | | 22 | | 42.7 | 53.0 | |
| 18-May | 13.5 | | 10.5 | 25.1 | 496 | | 20 | | 53.6 | 50.6 | |
| 1-Jun | 19.0 | | 3.2 | 18.9 | 447 | | 24 | | 42.0 | 46.6 | |
| 15-Jun | 20.0 | | | | | 1 | | | | | Written observations, but no water sample. |
| 29-Jun | 23.0 | | 3.0 | 14.1 | 458 | 3 | 32 | | 41.3 | 42.3 | |
| 13-Jul | 23.0 | | 3.1 | 16.6 | 547 | 1 | 33 | | 41.7 | 44.7 | |
| 27-Jul | 25.0 | | 2.2 | 14.1 | 463 | 1 | 33 | | 38.3 | 42.3 | |
| 10-Aug | 23.0 | | 4.7 | 13.3 | 444 | | 33 | | 45.8 | 41.5 | |
| 24-Aug | 22.5 | | 3.6 | 9.1 | 471 | 1 | 52 | | 43.1 | 36.0 | |
| 8-Sep | NR | | 9.2 | 16.9 | 576 | 1 | 34 | | 52.4 | 44.9 | |
| 21-Sep | 18.0 | | 12.0 | 14.9 | 533 | 2 | 36 | | 54.9 | 43.1 | |
| 7-Oct | | | | | | | | | | | No sample. |
| 20-Oct | NR | | 14.4 | 18.0 | 570 | | 32 | | 56.7 | 45.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.5 | - | 6.3 | 18.2 | 527.2 | 1.4 | 31 | - | 46.7 | 45.2 | TSI Average** = 46.0 |
| Median | 20.0 | - | 4.2 | 16.8 | 514.5 | 1 | 33 | - | 44.5 | 44.8 | **Secchi not included in TSI calculations. |
| Min | 13.5 | - | 2.2 | 9.1 | 444.0 | 1 | 20 | - | 38.3 | 36.0 | |
| Max | 25.0 | - | 14.4 | 29.5 | 661.0 | 3 | 52 | - | 56.7 | 53.0 | |
| Count | 11 | 0 | 12 | 12 | 12 | 7 | 12 | 0 | 12 | 12 | |

Meridian

Lake Overview

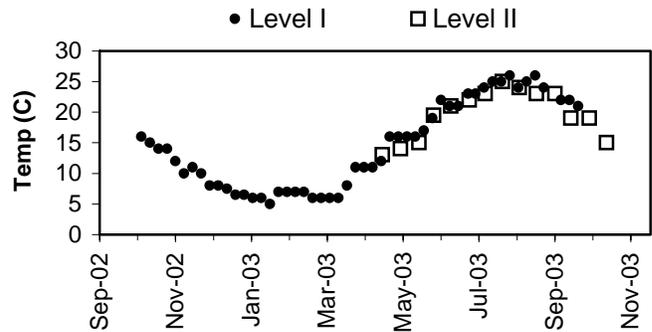
Volunteer monitoring began at Lake Meridian in the early 1980s and continued through 2003, missing only 1996. The data indicate that this city lake (Kent) is low in primary productivity (oligotrophic) with excellent water quality. Since the lake surface makes up 20% of the drainage area, direct precipitation is important, in addition to watershed inputs. The shoreline is surrounded by Class 2 shoreline wetlands according to the King County Wetland Inventory (King County, 1990). Land use analysis of 2002 aerial photographs showed almost 80% of the surrounding watershed has been developed for uses other than agriculture.

Lake Meridian has a public access boat launch. Eurasian milfoil is established in the lake, and plans have been made to control it. However, residents should watch for other noxious weeds growing in the nearshore environment of the lake.

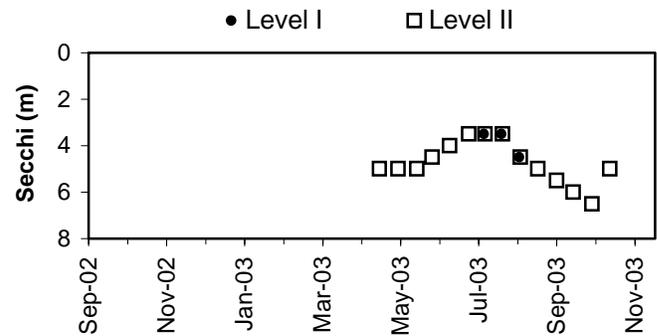
Physical Parameters

Secchi transparency ranged from 3.5 to 6.5m from April - October. Annual water temperatures ranged from 5.0 to 25.0 degrees Celsius. Precipitation and water levels were nearly complete, with the data corresponding to the regional pattern of winter high-summer low stands.

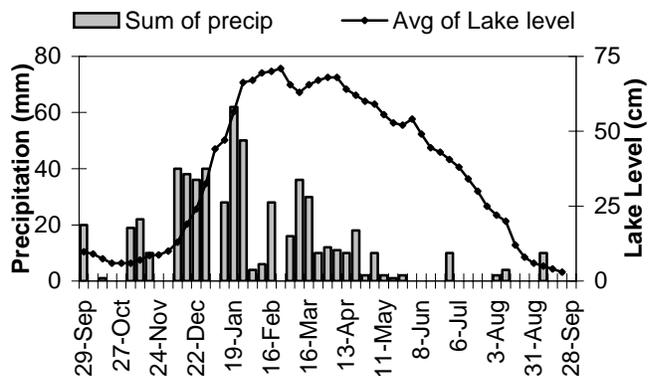
Lake Temperature



Secchi Depth

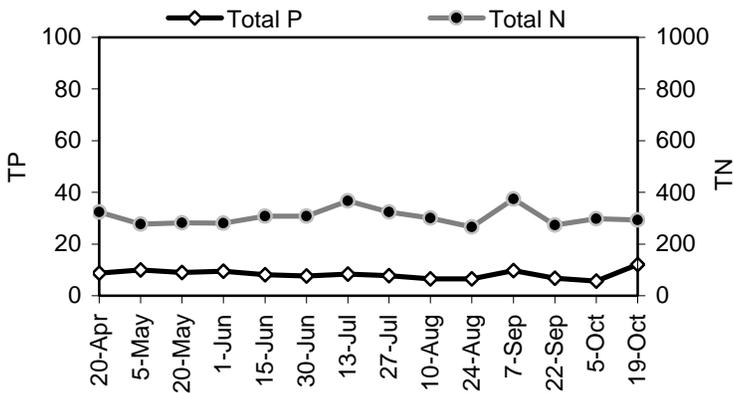


Lake Level and Precipitation

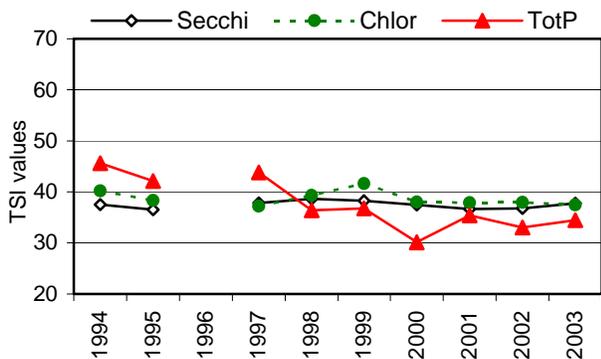


Meridian

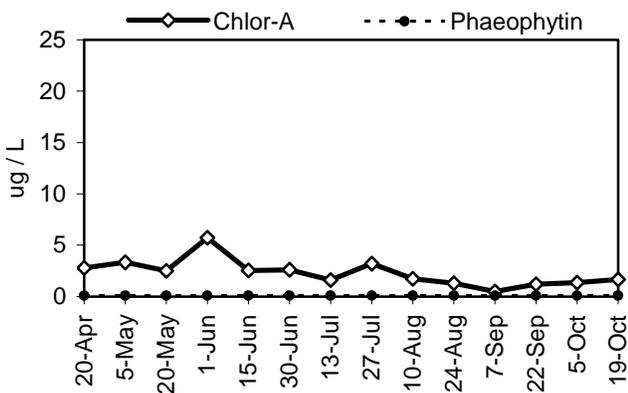
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|--------------------|
| <i>Cyclotella</i> spp. | diatom-chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period, while the N:P ratio ranged from 24 to 52. The 2003 TSI values were in close agreement with each other in the upper range of oligotrophy.

Chlorophyll and Algae

Chlorophyll concentrations remained low through the sample season, with a small peak produced in early June. The peak was characterized by a combination of the diatom *Cyclotella* and the large colonial chlorophyte *Botryococcus braunii*. The phytoplankton contained a wide variety of algal species, including several bluegreens that were present in small amounts through the season.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 20.0 | 1 | 9.8 | 1 | | | | | | | 0 |
| 6-Oct-02 | 0.0 | 1 | 9.0 | 1 | 5-Oct-02 | 15:00 | | 16.0 | NA | C1 | 0 |
| 13-Oct-02 | 1.0 | 1 | 7.5 | 1 | 12-Oct-02 | 13:00 | | 15.0 | NA | NA | 0 |
| 20-Oct-02 | 0.0 | 1 | 6.0 | 1 | 19-Oct-02 | 15:00 | | 14.0 | NA | NA | 0 |
| 27-Oct-02 | 0.0 | 1 | 6.0 | 1 | 26-Oct-02 | 16:00 | | 14.0 | NA | NA | 0 |
| 3-Nov-02 | 19.0 | 1 | 6.0 | 1 | 2-Nov-02 | 15:00 | | 12.0 | NA | NA | 0 |
| 10-Nov-02 | 22.0 | 1 | 7.0 | 1 | 9-Nov-02 | 14:00 | | 10.0 | NA | NA | 0 |
| 17-Nov-02 | 10.0 | 1 | 8.5 | 1 | 16-Nov-02 | 12:00 | | 11.0 | NA | NA | 0 |
| 24-Nov-02 | 0.0 | 1 | 8.8 | 1 | 23-Nov-02 | 13:00 | | 10.0 | NA | NA | 0 |
| 1-Dec-02 | 0.0 | 1 | 10.0 | 1 | 30-Nov-02 | 13:00 | | 8.0 | NA | NA | 0 |
| 8-Dec-02 | 40.0 | 1 | 13.0 | 1 | 7-Dec-02 | 13:00 | | 8.0 | NA | NA | 0 |
| 15-Dec-02 | 38.0 | 1 | 19.0 | 1 | 14-Dec-02 | 15:30 | | 7.5 | NA | NA | 0 |
| 22-Dec-02 | 36.0 | 1 | 24.0 | 1 | 21-Dec-02 | 13:00 | | 6.5 | NA | NA | 0 |
| 29-Dec-02 | 40.0 | 1 | 32.5 | 1 | 28-Dec-02 | 14:30 | | 6.5 | NA | NA | 0 |
| 5-Jan-03 | 0.0 | 1 | 44.0 | 1 | 4-Jan-03 | 11:30 | | 6.0 | NA | NA | 0 |
| 12-Jan-03 | 28.0 | 1 | 47.0 | 1 | 11-Jan-03 | 15:00 | | 6.0 | NA | NA | 0 |
| 19-Jan-03 | 62.0 | 1 | 56.5 | 1 | 18-Jan-03 | 11:30 | | 5.0 | NA | NA | 0 |
| 26-Jan-03 | 50.0 | 1 | 66.3 | 1 | 25-Jan-03 | 11:30 | | 7.0 | NA | NA | 0 |
| 2-Feb-03 | 4.0 | 1 | 67.0 | 1 | 1-Feb-03 | 12:00 | | 7.0 | NA | NA | 0 |
| 9-Feb-03 | 6.0 | 1 | 69.5 | 1 | 8-Feb-03 | 12:30 | | 7.0 | NA | NA | 0 |
| 16-Feb-03 | 28.0 | 1 | 70.0 | 1 | 15-Feb-03 | 12:30 | | 7.0 | NA | NA | 0 |
| 23-Feb-03 | 0.0 | 1 | 71.0 | 1 | 22-Feb-03 | 13:00 | | 6.0 | NA | NA | 0 |
| 2-Mar-03 | 16.0 | 1 | 65.5 | 1 | 1-Mar-03 | 13:00 | | 6.0 | NA | NA | 0 |
| 9-Mar-03 | 36.0 | 1 | 63.0 | 1 | 8-Mar-03 | 13:30 | | 6.0 | NA | NA | 0 |
| 16-Mar-03 | 30.0 | 1 | 65.5 | 1 | 15-Mar-03 | 13:00 | | 6.0 | NA | NA | 0 |
| 23-Mar-03 | 10.0 | 1 | 67.0 | 1 | 22-Mar-03 | 11:30 | | 8.0 | NA | NA | 7 |
| 30-Mar-03 | 12.0 | 1 | 68.0 | 1 | 29-Mar-03 | 14:30 | | 11.0 | C1 | C1 | 0 |
| 6-Apr-03 | 11.0 | 1 | 68.0 | 1 | 5-Apr-03 | 14:30 | | 11.0 | C1 | C1 | 0 |
| 13-Apr-03 | 10.0 | 1 | 64.0 | 1 | 12-Apr-03 | 12:00 | | 11.0 | | | 0 |
| 20-Apr-03 | 18.0 | 1 | 62.0 | 1 | 19-Apr-03 | 13:00 | | 12.0 | P1 | P1 | 0 |
| 27-Apr-03 | 2.0 | 1 | 60.0 | 1 | 26-Apr-03 | 14:00 | | 16.0 | P1 | P1 | 0 |
| 4-May-03 | 10.0 | 1 | 59.0 | 1 | 3-May-03 | 11:00 | | 16.0 | P1 | P1 | 2 |
| 11-May-03 | 2.0 | 1 | 55.5 | 1 | 10-May-03 | 11:30 | | 16.0 | P1 | P1 | 0 |
| 18-May-03 | 1.0 | 1 | 52.8 | 1 | 17-May-03 | 13:00 | | 16.0 | P1 | P1 | 0 |
| 25-May-03 | 2.0 | 1 | 52.0 | 1 | 24-May-03 | 13:30 | | 17.0 | P1 | P1 | 0 |
| 1-Jun-03 | 0.0 | 1 | 54.0 | 1 | 31-May-03 | 13:30 | | 19.0 | P1 | P1 | 0 |
| 8-Jun-03 | 0.0 | 1 | 49.0 | 1 | 7-Jun-03 | 13:30 | | 22.0 | P1 | P1 | 0 |
| 15-Jun-03 | 0.0 | 1 | 44.5 | 1 | 14-Jun-03 | 14:30 | | 21.0 | P1 | P1 | 0 |
| 22-Jun-03 | 0.0 | 1 | 43.0 | 1 | 21-Jun-03 | 13:30 | | 21.0 | P1 | P1 | 0 |
| 29-Jun-03 | 10.0 | 1 | 40.5 | 1 | 29-Jun-03 | 12:00 | | 23.0 | P1 | P1 | 0 |
| 6-Jul-03 | 0.0 | 1 | 38.0 | 1 | 5-Jul-03 | 12:00 | | 23.0 | P1 | P1 | 0 |
| 13-Jul-03 | 0.0 | 1 | 34.0 | 1 | 12-Jul-03 | 12:30 | 3.5 | 24.0 | P1 | P1 | 7 |
| 20-Jul-03 | 0.0 | 1 | 30.0 | 1 | 19-Jul-03 | 12:30 | | 25.0 | P1 | P1 | 9 |
| 27-Jul-03 | 0.0 | 1 | 25.0 | 1 | 26-Jul-03 | 14:30 | 3.5 | 25.0 | P1 | P1 | 0 |
| 3-Aug-03 | 2.0 | 1 | 22.0 | 1 | 2-Aug-03 | 14:30 | | 26.0 | P1 | P1 | 0 |
| 10-Aug-03 | 4.0 | 1 | 20.0 | 1 | 9-Aug-03 | 18:00 | 4.5 | 24.0 | P1 | P1 | 0 |
| 17-Aug-03 | 0.0 | 1 | 12.0 | 1 | 16-Aug-03 | 18:00 | | 25.0 | P1 | P1 | 0 |
| 24-Aug-03 | 0.0 | 1 | 8.0 | 1 | 23-Aug-03 | 18:00 | | 26.0 | P1 | P1 | 0 |
| 31-Aug-03 | 0.0 | 1 | 6.0 | 1 | 30-Aug-03 | 18:00 | | 24.0 | P1 | P1 | 0 |
| 7-Sep-03 | 10.0 | 1 | 5.0 | 1 | 6-Sep-03 | | | | | | 0 |
| 14-Sep-03 | 0.0 | 1 | 4.0 | 1 | 13-Sep-03 | 16:30 | | 22.0 | P1 | P1 | 0 |
| 21-Sep-03 | 0.0 | 1 | 3.0 | 1 | 20-Sep-03 | 14:30 | | 22.0 | P1 | P1 | 0 |
| 28-Sep-03 | | | | | 27-Sep-03 | 14:30 | | 21.0 | P1 | P1 | 0 |
| Min | 0.0 | | 3.0 | | Min | | 3.5 | 5.0 | | | 0 |
| Max | 62.0 | | 71.0 | | Max | | 4.5 | 26.0 | | | 9 |
| Total | 590.0 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|----------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 13.0 | 5.0 | 2.8 | 8.8 | 324 | 1 | 37 | 36.8 | 40.7 | 35.5 | |
| 5-May | 14.0 | 5.0 | 3.3 | 10.0 | 277 | 1 | 28 | 36.8 | 42.3 | 37.4 | |
| 20-May | 15.0 | 5.0 | 2.5 | 9.0 | 281 | 1 | 31 | 36.8 | 39.6 | 35.8 | |
| 1-Jun | 19.5 | 4.5 | 5.7 | 9.5 | 280 | 1 | 29 | 38.3 | 47.7 | 36.6 | Still heavy algae near launch site. |
| 15-Jun | 21.0 | 4.0 | 2.6 | 8.2 | 308 | 1 | 38 | 40.0 | 39.8 | 34.5 | |
| 30-Jun | 22.0 | 3.5 | 2.6 | 7.6 | 308 | 1 | 41 | 41.9 | 39.9 | 33.4 | Algae colonies around launch area disappearing. |
| 13-Jul | 23.0 | 3.5 | 1.6 | 8.4 | 367 | 1 | 44 | 41.9 | 35.2 | 34.8 | |
| 27-Jul | 25.0 | 3.5 | 3.2 | 7.8 | 323 | 1 | 41 | 41.9 | 42.0 | 33.8 | |
| 10-Aug | 24.0 | 4.5 | 1.7 | 6.6 | 300 | 1 | 45 | 38.3 | 36.0 | 31.4 | |
| 24-Aug | 23.0 | 5.0 | 1.3 | 6.5 | 266 | 1 | 41 | 36.8 | 33.1 | 31.1 | |
| 8-Sep | 23.0 | 5.5 | 0.6 | 9.7 | 374 | 1 | 39 | 35.4 | | 36.9 | Chlor-a value was <MDL. Reported as .6µgl. |
| 21-Sep | 19.0 | 6.0 | 1.2 | 6.8 | 273 | 1 | 40 | 34.1 | 32.4 | 31.8 | |
| 6-Oct | 19.0 | 6.5 | 1.4 | 5.7 | 297 | | 52 | 33.0 | 33.6 | 29.3 | |
| 20-Oct | 15.0 | 5.0 | 1.7 | 12.1 | 293 | 1 | 24 | 36.8 | 35.7 | 40.1 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.7 | 4.8 | 2.3 | 8.3 | 305.1 | 1.0 | 38 | 37.8 | 38.3 | 34.5 | TSI Average = 36.5 |
| Median | 20.3 | 5.0 | 2.1 | 8.3 | 298.5 | 1 | 39 | 36.8 | 39.6 | 34.7 | |
| Min | 13.0 | 3.5 | 0.6 | 5.7 | 266.0 | 1 | 24 | 33.0 | 32.4 | 29.3 | |
| Max | 25.0 | 6.5 | 5.7 | 12.1 | 374.0 | 1 | 52 | 41.9 | 47.7 | 40.1 | |
| Count | 14 | 14 | 14 | 14 | 14 | 13 | 14 | 14 | 13 | 14 | |

Mirror

Lake Overview

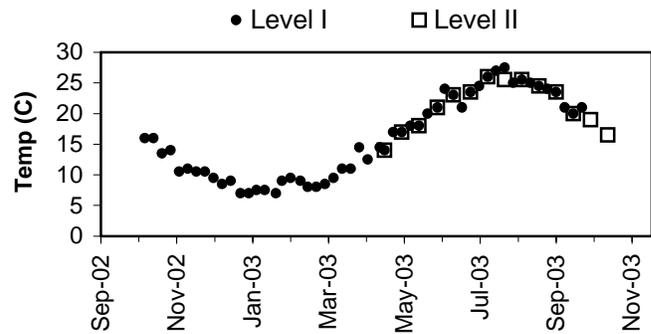
Volunteer monitoring began at Mirror Lake in early 1997 and continued through 2003. The data indicate this city lake (Federal Way) is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 11% of the drainage area, direct precipitation is fairly important in addition to watershed inputs. There are no inventoried wetlands in the basin, although there is a hydrological connection with Fishers Bog. Land use analysis of 2002 aerial photographs showed almost 88% of the surrounding watershed has been developed for uses other than agriculture.

Mirror Lake has no public access boat launch, but residents should watch the nearshore environment for Eurasian milfoil, Brazilian elodea, and other noxious weeds.

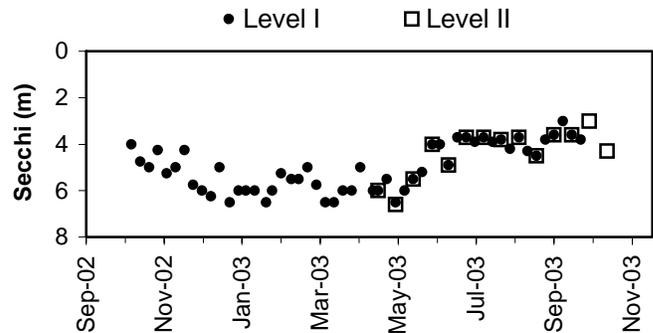
Physical Parameters

Secchi transparency ranged from 3.0 to 6.6m through the year. Annual water temperatures ranged from 5 to 25 degrees Celsius. Excellent records were kept for precipitation and water levels. The lake level followed the winter high - summer low pattern, consistent with other small lakes in the region.

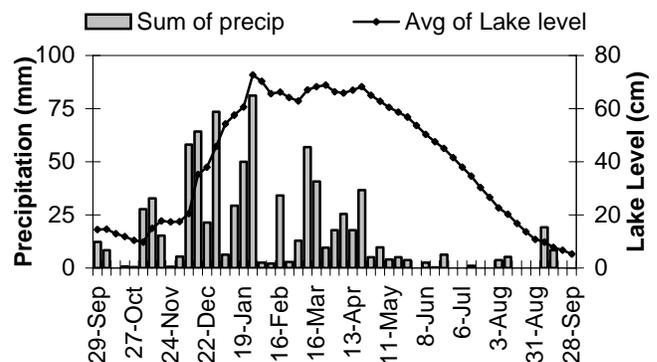
Lake Temperature



Secchi Depth

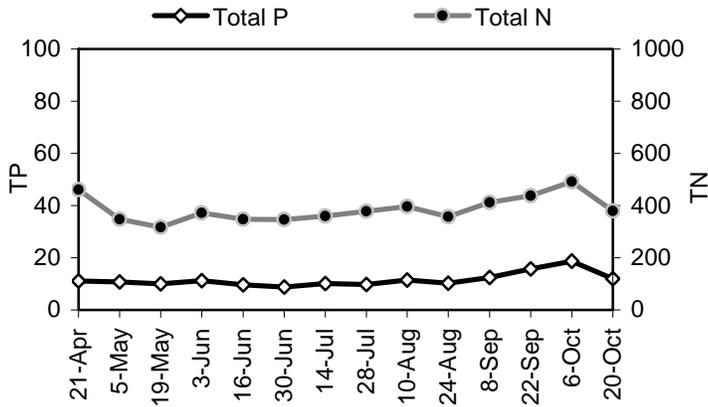


Lake Level and Precipitation

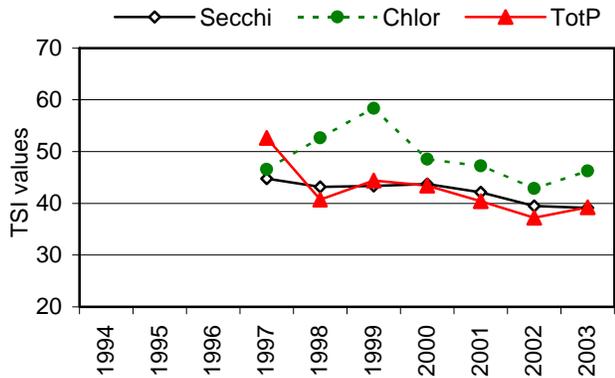


Mirror

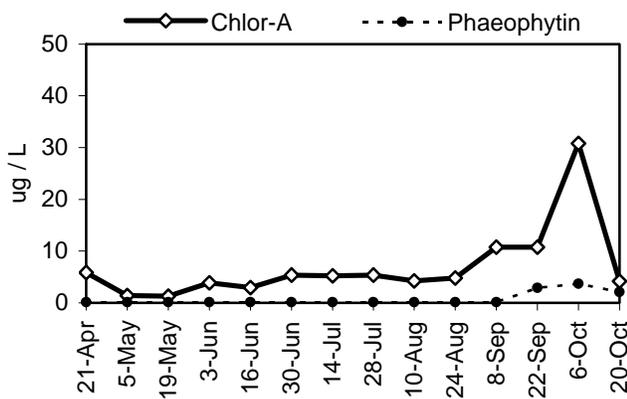
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|--------------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Mallomonas</i> sp. | chrysophyte |
| unidentified species | unidentified group |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in relatively constant proportion to each other through much of the sampling period, rising slightly in the autumn. The N:P ratio ranged from 26 to 42. In 2003 the average TSI-chlor was in the mid-range for mesotrophy, higher than the other two indicators, and similar to the pattern over the past five years. Average TSI values for Secchi and total phosphorus were on the threshold between mesotrophy and oligotrophy.

Chlorophyll and Algae

Chlorophyll concentrations were at low levels through most of the sampling period, but made a large peak in early October that dropped off quickly. Dominant algae included the chrysophytes *Dinobryon* and *Mallomonas*. An unidentified colonial species was responsible for the large peak in autumn. Very few bluegreen algae were found in the samples, and all were in trace amounts.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 12.2 | 5 | 14.4 | 5 | | | | | | | |
| 6-Oct-02 | 8.4 | 7 | 14.6 | 7 | 7-Oct-02 | 11:00 | 4.0 | 16.0 | NA | P1 | 0 |
| 13-Oct-02 | 0.0 | 7 | 12.9 | 7 | 14-Oct-02 | 11:00 | 4.8 | 16.0 | NA | NA | 1 |
| 20-Oct-02 | 0.8 | 7 | 11.7 | 7 | 21-Oct-02 | 11:00 | 5.0 | 13.5 | NA | P1 | 0 |
| 27-Oct-02 | 0.5 | 7 | 10.3 | 7 | 28-Oct-02 | 10:30 | 4.3 | 14.0 | NA | P2 | 0 |
| 3-Nov-02 | 27.7 | 7 | 9.7 | 7 | 4-Nov-02 | 10:00 | 5.3 | 10.5 | NA | P1 | 0 |
| 10-Nov-02 | 32.8 | 7 | 14.9 | 7 | 11-Nov-02 | 10:30 | 5.0 | 11.0 | NA | P1 | 0 |
| 17-Nov-02 | 15.2 | 7 | 17.7 | 7 | 18-Nov-02 | 11:45 | 4.3 | 10.5 | NA | NA | 0 |
| 24-Nov-02 | 0.6 | 7 | 17.3 | 7 | 25-Nov-02 | 11:15 | 5.8 | 10.5 | NA | P1 | 1 |
| 1-Dec-02 | 5.3 | 7 | 17.4 | 7 | 2-Dec-02 | 11:45 | 6.0 | 9.5 | NA | P1 | 0 |
| 8-Dec-02 | 58.2 | 7 | 20.4 | 7 | 9-Dec-02 | 14:45 | 6.3 | 8.5 | NA | P1 | 0 |
| 15-Dec-02 | 64.3 | 7 | 35.1 | 7 | 16-Dec-02 | 11:00 | 5.0 | 9.0 | NA | P1 | 0 |
| 22-Dec-02 | 21.3 | 7 | 38.0 | 7 | 24-Dec-02 | 11:30 | 6.5 | 7.0 | NA | P1 | 0 |
| 29-Dec-02 | 73.4 | 7 | 45.7 | 7 | 31-Dec-02 | 11:45 | 6.0 | 7.0 | NA | P1 | 0 |
| 5-Jan-03 | 6.4 | 3 | 54.3 | 3 | 6-Jan-03 | 10:30 | 6.0 | 7.5 | NA | P1 | 0 |
| 12-Jan-03 | 29.2 | 7 | 57.6 | 7 | 13-Jan-03 | 10:30 | 6.0 | 7.5 | NA | P1 | 0 |
| 19-Jan-03 | 50.0 | 7 | 60.6 | 7 | 22-Jan-03 | 10:30 | 6.5 | 7.0 | NA | P1 | 0 |
| 26-Jan-03 | 81.0 | 7 | 72.7 | 7 | 27-Jan-03 | 10:30 | 6.0 | 9.0 | NA | C1 | 0 |
| 2-Feb-03 | 2.5 | 7 | 70.3 | 7 | 3-Feb-03 | 12:00 | 5.3 | 9.5 | NA | P1 | 5 |
| 9-Feb-03 | 2.0 | 7 | 65.6 | 7 | 11-Feb-03 | 15:00 | 5.5 | 9.0 | NA | P1 | 6 |
| 16-Feb-03 | 34.1 | 7 | 66.1 | 7 | 17-Feb-03 | 10:30 | 5.5 | 8.0 | NA | P1 | 6 |
| 23-Feb-03 | 2.8 | 7 | 64.1 | 7 | 24-Feb-03 | 11:00 | 5.0 | 8.0 | C3* | P1 | 6 |
| 2-Mar-03 | 12.7 | 7 | 62.9 | 7 | 3-Mar-03 | 10:30 | 5.8 | 8.5 | C3* | P1 | 6 |
| 9-Mar-03 | 56.9 | 7 | 67.0 | 7 | 10-Mar-03 | 11:00 | 6.5 | 9.5 | C3* | P1 | 1 |
| 16-Mar-03 | 40.6 | 7 | 68.3 | 7 | 17-Mar-03 | 10:30 | 6.5 | 11.0 | C3* | P1 | 6 |
| 23-Mar-03 | 9.7 | 7 | 68.9 | 7 | 24-Mar-03 | 10:15 | 6.0 | 11.0 | C3* | P1 | 1 |
| 30-Mar-03 | 17.8 | 7 | 66.3 | 7 | 31-Mar-03 | 10:45 | 6.0 | 14.5 | NA | P1 | 2 |
| 6-Apr-03 | 25.4 | 7 | 65.9 | 7 | 7-Apr-03 | 11:00 | 5.0 | 12.5 | NA | P1 | 4 |
| 13-Apr-03 | 17.8 | 4 | 66.9 | 7 | 17-Apr-03 | 10:15 | 6.0 | 14.5 | NA | P1 | 4 |
| 20-Apr-03 | 36.6 | 7 | 68.3 | 7 | 21-Apr-03 | 15:30 | 6.0 | 14.0 | NA | P1 | 3 |
| 27-Apr-03 | 5.1 | 7 | 65.0 | 7 | 28-Apr-03 | 11:30 | 5.5 | 17.0 | NA | P1 | 3 |
| 4-May-03 | 9.7 | 7 | 62.7 | 7 | 5-May-03 | 14:30 | 6.5 | 17.0 | | P2 | 2 |
| 11-May-03 | 4.1 | 7 | 60.4 | 7 | 12-May-03 | 11:00 | 6.0 | 18.0 | NA | P2 | 8 |
| 18-May-03 | 5.1 | 7 | 58.6 | 7 | 19-May-03 | 11:45 | 5.5 | 18.0 | NA | P2 | 4 |
| 25-May-03 | 3.8 | 7 | 56.9 | 7 | 26-May-03 | 11:00 | 5.2 | 20.0 | NA | P2 | 10 |
| 1-Jun-03 | 0.0 | 7 | 53.7 | 7 | 3-Jun-03 | 9:45 | 4.0 | 21.0 | NA | P2 | 22 |
| 8-Jun-03 | 2.6 | 7 | 50.3 | 7 | 9-Jun-03 | 15:30 | 4.0 | 24.0 | NA | P2 | 10 |
| 15-Jun-03 | 0.3 | 7 | 47.6 | 7 | 16-Jun-03 | 15:30 | 4.9 | 23.0 | NA | P2 | 14 |
| 22-Jun-03 | 6.4 | 7 | 45.0 | 7 | 23-Jun-03 | 11:00 | 3.7 | 21.0 | NA | P3 | 13 |
| 29-Jun-03 | 0.0 | 7 | 41.6 | 7 | 30-Jun-03 | 12:15 | 3.7 | 23.5 | NA | P3 | 19 |
| 6-Jul-03 | 0.0 | 7 | 38.0 | 7 | 7-Jul-03 | 11:00 | 3.9 | 24.5 | NA | C3 | 17 |
| 13-Jul-03 | 1.0 | 7 | 34.6 | 7 | 14-Jul-03 | 17:00 | 3.7 | 26.0 | NA | C3 | 12 |
| 20-Jul-03 | 0.0 | 7 | 30.3 | 7 | 21-Jul-03 | 14:00 | 3.9 | 27.0 | NA | C3 | 19 |
| 27-Jul-03 | 0.0 | 7 | 26.6 | 7 | 28-Jul-03 | 14:00 | 3.8 | 27.5 | NA | C3 | 12 |
| 3-Aug-03 | 3.8 | 7 | 22.6 | 7 | 4-Aug-03 | 11:00 | 4.2 | 25.0 | NA | P2 | 6 |
| 10-Aug-03 | 5.2 | 7 | 20.1 | 7 | 11-Aug-03 | 14:30 | 3.7 | 25.5 | NA | C3 | 0 |
| 17-Aug-03 | 0.0 | 7 | 16.7 | 7 | 18-Aug-03 | 11:30 | 4.3 | 25.0 | NA | C2 | 0 |
| 24-Aug-03 | 0.0 | 7 | 13.6 | 7 | 25-Aug-03 | 15:00 | 4.5 | 24.5 | NA | P2 | 0 |
| 31-Aug-03 | 0.0 | 7 | 10.7 | 7 | 1-Sep-03 | 10:30 | 3.8 | 24.0 | NA | P3 | 0 |
| 7-Sep-03 | 19.1 | 7 | 9.7 | 7 | 8-Sep-03 | 12:00 | 3.6 | 23.5 | NA | P1 | 0 |
| 14-Sep-03 | 8.4 | 7 | 7.9 | 7 | 15-Sep-03 | 11:30 | 3.0 | 21.0 | NA | C2 | 2 |
| 21-Sep-03 | 0.0 | 7 | 6.7 | 7 | 22-Sep-03 | 11:30 | 3.6 | 20.0 | NA | P2 | 0 |
| 28-Sep-03 | 0.0 | 3 | 5.3 | 3 | 29-Sep-03 | 11:15 | 3.8 | 21.0 | NA | P2 | 0 |
| Min | 0.0 | | 5.3 | | Min | | 3.0 | 7.0 | | | 0 |
| Max | 81.0 | | 72.7 | | Max | | 6.5 | 27.5 | | | 22 |
| Total | 820.7 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 14.0 | 6.0 | 5.9 | 11.1 | 461 | 1 | 42 | 34.1 | 47.9 | 38.9 | |
| 5-May | 17.0 | 6.6 | 1.4 | 10.8 | 347 | 2 | 32 | 32.8 | 33.8 | 38.5 | |
| 19-May | 18.0 | 5.5 | 1.3 | 10.0 | 317 | 2 | 32 | 35.4 | 33.1 | 37.4 | |
| 3-Jun | 21.0 | 4.0 | 3.9 | 11.3 | 372 | 2 | 33 | 40.0 | 43.9 | 39.1 | |
| 16-Jun | 23.0 | 4.9 | 2.9 | 9.7 | 347 | 2 | 36 | 37.1 | 41.1 | 36.9 | |
| 30-Jun | 23.5 | 3.7 | 5.3 | 8.8 | 346 | 3 | 39 | 41.1 | 47.0 | 35.5 | |
| 14-Jul | 26.0 | 3.7 | 5.2 | 10.2 | 360 | 3 | 35 | 41.1 | 46.8 | 37.7 | |
| 28-Jul | 25.5 | 3.8 | 5.3 | 9.8 | 378 | 3 | 39 | 40.7 | 47.0 | 37.1 | |
| 11-Aug | 25.5 | 3.7 | 4.3 | 11.5 | 396 | 3 | 34 | 41.1 | 44.8 | 39.4 | |
| 25-Aug | 24.5 | 4.5 | 4.8 | 10.3 | 357 | 2 | 35 | 38.3 | 46.0 | 37.8 | |
| 8-Sep | 23.5 | 3.6 | 10.7 | 12.5 | 412 | 1 | 33 | 41.5 | 53.8 | 40.6 | |
| 22-Sep | 20.0 | 3.6 | 10.7 | 15.8 | 438 | 2 | 28 | 41.5 | 53.8 | 44.0 | |
| 6-Oct | 19.0 | 3.0 | 30.9 | 18.7 | 492 | 3 | 26 | 44.1 | 64.2 | 46.4 | |
| 20-Oct | 16.5 | 4.3 | 4.2 | 12.0 | 379 | 1 | 32 | 39.0 | 44.7 | 40.0 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 21.2 | 4.4 | 6.9 | 11.6 | 385.8 | 2.1 | 34 | 39.1 | 46.3 | 39.2 | TSI Average = 41.5 |
| Median | 22.0 | 3.9 | 5.0 | 11.0 | 375.0 | 2 | 34 | 40.4 | 46.4 | 38.7 | |
| Min | 14.0 | 3.0 | 1.3 | 8.8 | 317.0 | 1 | 26 | 32.8 | 33.1 | 35.5 | |
| Max | 26.0 | 6.6 | 30.9 | 18.7 | 491.5 | 3 | 42 | 44.1 | 64.2 | 46.4 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Morton

Lake Overview

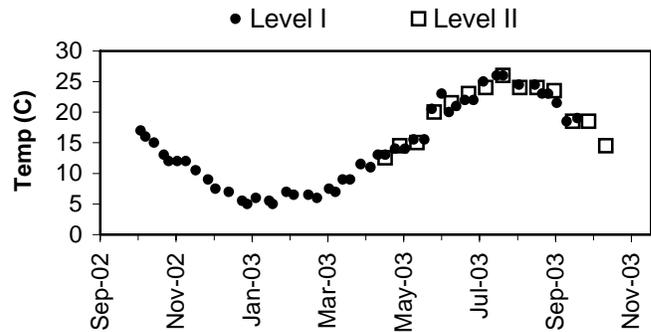
Volunteer monitoring began at Lake Morton in the early 1980s and has continued through 2003. The data indicate this lake is fairly low in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up 26% of the drainage area, direct precipitation is very important, in addition to watershed inputs. There are no Class 1 or 2 wetlands in the basin (King County, 1990). Land use analysis of 2002 aerial photographs showed over 74% of the surrounding watershed has been developed for uses other than agriculture.

Lake Morton has a public access boat launch, and residents should keep a watch for early infestations of Eurasian milfoil, Brazilian elodea, and other noxious weeds.

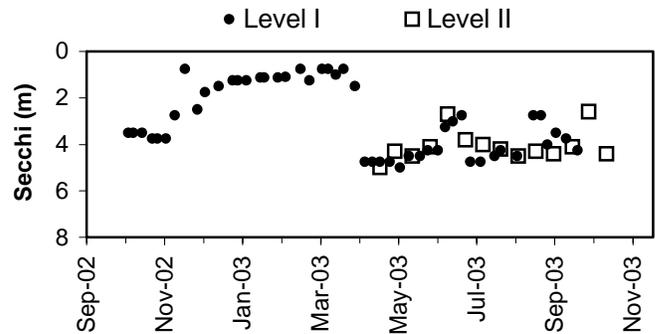
Physical Parameters

Secchi transparency through the year ranged from 0.8 to 5.0m. Water temperatures ranged from 5.0 to 26.0 degrees Celsius. Excellent records of precipitation and water level were kept over the year. The lake level followed the winter high - summer low pattern, consistent with other small lakes in the region.

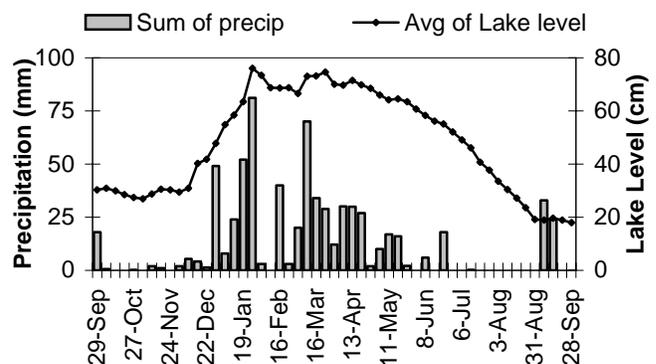
Lake Temperature



Secchi Depth

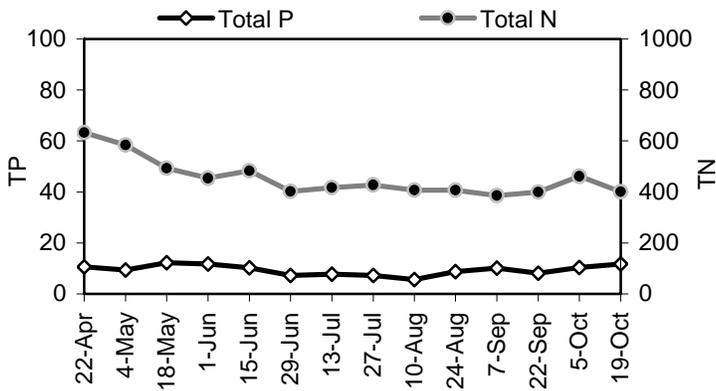


Lake Level and Precipitation

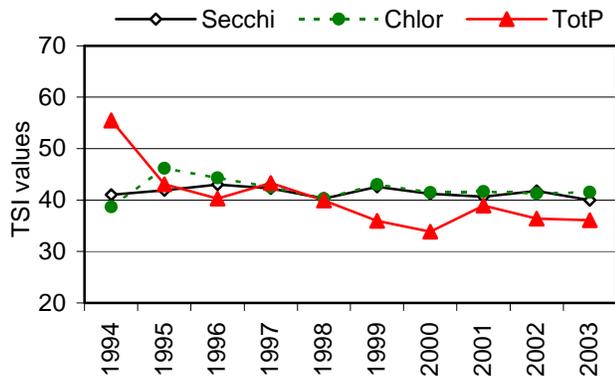


Morton

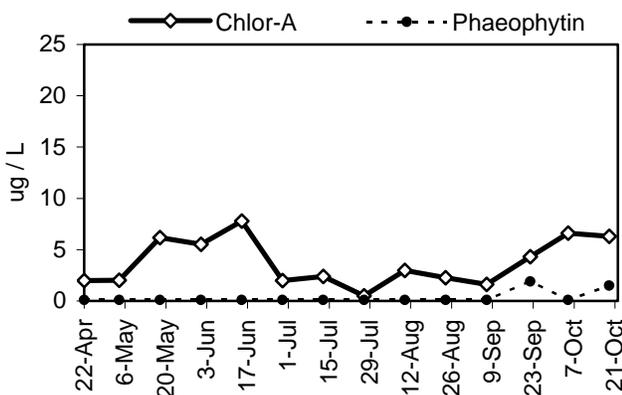
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Dinobryon</i> sp. | chrysophyte |
| <i>Asterionella formosa</i> | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased slightly through spring and remained steady throughout the rest of the sample season, while total phosphorus remained fairly constant. The N:P ratio ranged from 34 to 73. The 2003 average TSI values were similar to recent years, on the threshold between oligotrophy and mesotrophy.

Chlorophyll and Algae

Chlorophyll concentrations varied through the season, remaining generally low, but with higher values in late spring and again in fall. Algae commonly occurring in the plankton included the diatom *Asterionella* and the chrysophyte *Dinobryon*, as well as an unidentified chrysophyte species. Bluegreen algae were very rarely encountered.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | 18.1 | 5 | 30.4 | 5 | | | | | | | |
| 6-Oct-02 | 0.6 | 7 | 31.0 | 7 | 4-Oct-02 | 14:00 | 3.5 | 17.0 | P1 | P1 | 1 |
| 13-Oct-02 | 0.0 | 7 | 30.0 | 7 | 8-Oct-02 | 10:00 | 3.5 | 16.0 | P2 | P2 | 0 |
| 20-Oct-02 | 0.1 | 7 | 28.6 | 7 | 15-Oct-02 | 10:00 | 3.5 | 15.0 | P1 | P1 | 0 |
| 27-Oct-02 | 0.1 | 7 | 27.4 | 7 | 23-Oct-02 | 9:30 | 3.8 | 13.0 | P1 | P1 | 0 |
| 3-Nov-02 | 0.0 | 1 | 27.0 | 1 | 27-Oct-02 | 8:00 | 3.8 | 12.0 | P2 | P2 | 0 |
| 10-Nov-02 | 2.0 | 5 | 28.8 | 6 | 3-Nov-02 | 8:45 | 3.8 | 12.0 | P1 | P2 | 0 |
| 17-Nov-02 | 1.0 | 7 | 30.6 | 7 | 10-Nov-02 | 18:30 | 2.8 | 12.0 | P2 | P3 | 0 |
| 24-Nov-02 | 0.0 | 7 | 30.3 | 7 | 18-Nov-02 | 15:00 | 0.8 | 10.5 | P1 | P3 | 0 |
| 1-Dec-02 | 2.0 | 7 | 29.5 | 7 | 28-Nov-02 | 15:30 | 2.5 | 9.0 | | P3 | 7 |
| 8-Dec-02 | 5.4 | 7 | 31.0 | 7 | 4-Dec-02 | 12:30 | 1.8 | 7.5 | P3 | P3 | 0 |
| 15-Dec-02 | 4.2 | 7 | 40.2 | 7 | | | | | | | |
| 22-Dec-02 | 1.4 | 7 | 41.7 | 7 | 15-Dec-02 | 9:15 | 1.5 | 7.0 | P3 | P2 | 0 |
| 29-Dec-02 | 49.0 | 6 | 47.8 | 6 | 26-Dec-02 | 12:45 | 1.3 | 5.5 | P3 | P2 | 0 |
| 5-Jan-03 | 8.0 | 7 | 54.9 | 7 | 30-Dec-02 | 12:30 | 1.3 | 5.0 | P3 | P2 | 0 |
| 12-Jan-03 | 24.1 | 7 | 58.4 | 7 | 6-Jan-03 | 14:15 | 1.3 | 6.0 | P2 | P3 | 0 |
| 19-Jan-03 | 52.0 | 7 | 63.4 | 7 | 17-Jan-03 | 14:30 | 1.1 | 5.5 | P3 | P3 | 0 |
| 26-Jan-03 | 81.1 | 6 | 76.1 | 6 | 20-Jan-03 | 12:10 | 1.1 | 5.0 | P1 | P3 | 0 |
| 2-Feb-03 | 3.0 | 7 | 73.4 | 7 | 31-Jan-03 | 14:50 | 1.1 | 7.0 | P1 | P3 | 0 |
| 9-Feb-03 | 0.0 | 3 | 68.7 | 3 | 6-Feb-03 | 12:32 | 1.1 | 6.5 | P2 | P3 | 0 |
| 16-Feb-03 | 40.1 | 5 | 68.6 | 5 | | | | | | | |
| 23-Feb-03 | 3.0 | 6 | 68.7 | 6 | 18-Feb-03 | 11:45 | 0.8 | 6.5 | P1 | P4 | 0 |
| 2-Mar-03 | 20.1 | 6 | 66.6 | 7 | 25-Feb-03 | 13:20 | 1.3 | 6.0 | P1 | P3 | 0 |
| 9-Mar-03 | 70.0 | 6 | 73.0 | 7 | 7-Mar-03 | 11:00 | 0.8 | 7.5 | P2 | P3 | 0 |
| 16-Mar-03 | 34.1 | 7 | 73.1 | 7 | 12-Mar-03 | 9:45 | 0.8 | 7.0 | P1 | P3 | 0 |
| 23-Mar-03 | 29.0 | 6 | 74.6 | 7 | 18-Mar-03 | 16:30 | 1.0 | 9.0 | P2 | P3 | 0 |
| 30-Mar-03 | 12.1 | 5 | 70.0 | 6 | 24-Mar-03 | 11:50 | 0.8 | 9.0 | P1 | P3 | 0 |
| 6-Apr-03 | 30.1 | 7 | 69.7 | 7 | 2-Apr-03 | 10:15 | 1.5 | 11.5 | P1 | P1 | 0 |
| 13-Apr-03 | 30.1 | 7 | 71.4 | 7 | 10-Apr-03 | 11:50 | 4.8 | 11.0 | NA | NA | 0 |
| 20-Apr-03 | 27.0 | 7 | 69.9 | 7 | 16-Apr-03 | 13:45 | 4.8 | 13.0 | P1 | P1 | 0 |
| 27-Apr-03 | 2.0 | 1 | 68.4 | 7 | 22-Apr-03 | 17:10 | 4.8 | 13.0 | P1 | P1 | 0 |
| 4-May-03 | 10.0 | 3 | 65.9 | 7 | 30-Apr-03 | 11:40 | 4.8 | 14.0 | P1 | P1 | 0 |
| 11-May-03 | 17.0 | 1 | 64.2 | 6 | 8-May-03 | 10:30 | 5.0 | 14.0 | P1 | P1 | 0 |
| 18-May-03 | 16.0 | 4 | 64.6 | 7 | 15-May-03 | 9:45 | 4.5 | 15.5 | P2 | P1 | 0 |
| 25-May-03 | 2.1 | 7 | 63.4 | 7 | 24-May-03 | 16:45 | 4.5 | 15.5 | P1 | P1 | 0 |
| 1-Jun-03 | 0.0 | 7 | 60.7 | 7 | 30-May-03 | 11:05 | 4.3 | 20.5 | P1 | P2 | 0 |
| 8-Jun-03 | 6.1 | 7 | 58.3 | 7 | 7-Jun-03 | 18:20 | 4.3 | 23.0 | P2 | P2 | 0 |
| 15-Jun-03 | 0.0 | 5 | 56.2 | 6 | 13-Jun-03 | 17:25 | 3.3 | 20.0 | P3 | P3 | 0 |
| 22-Jun-03 | 18.0 | 7 | 55.0 | 7 | 19-Jun-03 | 12:30 | 3.0 | 21.0 | P2 | P2 | 0 |
| 29-Jun-03 | 0.0 | 7 | 52.0 | 6 | 26-Jun-03 | 15:05 | 2.8 | 22.0 | P2 | P3 | 0 |
| 6-Jul-03 | 0.0 | 7 | 49.0 | 7 | 3-Jul-03 | 8:45 | 4.8 | 22.0 | NA | P1 | 0 |
| 13-Jul-03 | 0.1 | 7 | 46.0 | 5 | 11-Jul-03 | 15:40 | 4.8 | 25.0 | P1 | P1 | 0 |
| 20-Jul-03 | 0.0 | 7 | 40.6 | 5 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 37.7 | 7 | 22-Jul-03 | 17:15 | 4.5 | 26.0 | P1 | P1 | 0 |
| 3-Aug-03 | 0.1 | 6 | 33.6 | 7 | 27-Jul-03 | 15:50 | 4.3 | 26.0 | NA | P1 | 0 |
| 10-Aug-03 | 0.1 | 1 | 30.4 | 7 | 9-Aug-03 | 14:40 | 4.5 | 24.5 | P1 | P1 | 0 |
| 17-Aug-03 | | | 27.3 | 7 | | | | | | | |
| 24-Aug-03 | | | 23.6 | 5 | 22-Aug-03 | 16:30 | 2.8 | 24.5 | P1 | P1 | 0 |
| 31-Aug-03 | 0.0 | 6 | 19.3 | 4 | 28-Aug-03 | 16:30 | 2.8 | 23.0 | P1 | P1 | 0 |
| 7-Sep-03 | 33.0 | 7 | 19.0 | 7 | 2-Sep-03 | 16:35 | 4.0 | 23.0 | P1 | P1 | 0 |
| 14-Sep-03 | 24.0 | 7 | 19.7 | 7 | 9-Sep-03 | 15:50 | 3.5 | 21.5 | P1 | P1 | 0 |
| 21-Sep-03 | 0.0 | 7 | 19.0 | 7 | 17-Sep-03 | 16:30 | 3.8 | 18.5 | P1 | P1 | 0 |
| 28-Sep-03 | 0.0 | 3 | 18.0 | 3 | 26-Sep-03 | 14:50 | 4.3 | 19.0 | P1 | NA | 0 |
| Min | 0.0 | | 18.0 | | Min | | 0.8 | 5.0 | | | 0 |
| Max | 81.1 | | 76.1 | | Max | | 5.0 | 26.0 | | | 7 |
| Total | 675.7 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|----------------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 22-Apr | 12.5 | 5.0 | 2.0 | 10.6 | 633 | 3 | 60 | 36.8 | 37.4 | 38.2 | |
| 4-May | 14.5 | 4.3 | 2.0 | 9.4 | 584 | 2 | 62 | 39.0 | 37.5 | 36.5 | |
| 18-May | 15.0 | 4.5 | 6.2 | 12.2 | 493 | 3 | 40 | 38.3 | 48.4 | 40.2 | |
| 1-Jun | 20.0 | 4.1 | 5.5 | 11.7 | 454 | | 39 | 39.6 | 47.3 | 39.6 | |
| 15-Jun | 21.5 | 2.7 | 7.8 | 10.3 | 483 | 3 | 47 | 45.7 | 50.7 | 37.8 | Cloudy patches of algae on lake. |
| 29-Jun | 23.0 | 3.8 | 2.0 | 7.3 | 402 | 3 | 55 | 40.7 | 37.4 | 32.8 | More than 100 particles present. |
| 13-Jul | 24.0 | 4.0 | 2.4 | 7.7 | 417 | 1 | 54 | 40.0 | 39.2 | 33.6 | |
| 27-Jul | 26.0 | 4.2 | 0.6 | 7.2 | 428 | 1 | 59 | 39.3 | 26.0 | 32.6 | |
| 10-Aug | 24.0 | 4.5 | 3.0 | 5.6 | 408 | 1 | 73 | 38.3 | 41.3 | 29.0 | |
| 24-Aug | 24.0 | 4.3 | 2.3 | 8.7 | 408 | 1 | 47 | 39.0 | 38.6 | 35.4 | |
| 7-Sep | 23.5 | 4.4 | 1.6 | 10.1 | 386 | | 38 | 38.6 | 35.2 | 37.5 | Staff neglected to assess algae. |
| 22-Sep | 18.5 | 4.1 | 4.3 | 8.1 | 400 | 1 | 49 | 39.6 | 44.9 | 34.3 | |
| 5-Oct | 18.5 | 2.6 | 6.6 | 10.4 | 461 | 1 | 44 | 46.2 | 49.1 | 37.9 | |
| 19-Oct | 14.5 | 4.4 | 6.3 | 11.8 | 401 | 1 | 34 | 38.6 | 48.6 | 39.8 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.0 | 4.1 | 3.8 | 9.4 | 454.1 | 1.8 | 50 | 40.0 | 41.5 | 36.1 | TSI Average = 39.2 |
| Median | 20.8 | 4.3 | 2.7 | 9.8 | 422.5 | 1 | 48 | 39.1 | 40.2 | 37.0 | |
| Min | 12.5 | 2.6 | 0.6 | 5.6 | 386.0 | 1 | 34 | 36.8 | 26.0 | 29.0 | |
| Max | 26.0 | 5.0 | 7.8 | 12.2 | 633.0 | 3 | 73 | 46.2 | 50.7 | 40.2 | |
| Count | 14 | 14 | 14 | 14 | 14 | 12 | 14 | 14 | 14 | 14 | |

Neilson (Holm)

Lake Overview

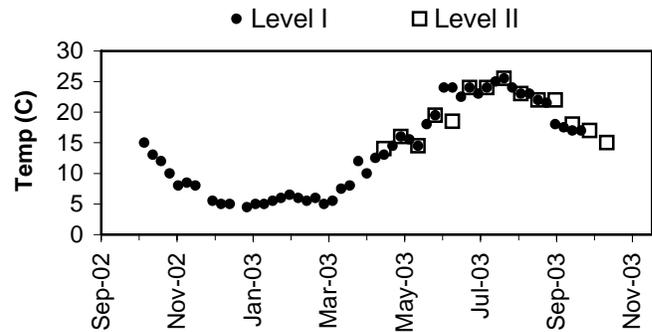
Volunteer monitoring began at Neilson (Holm) Lake in early 1997 and has continued through 2003. The data indicate this lake is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 10% of the drainage area, direct precipitation is less important than watershed inputs. The north and west shorelines of the lake are considered to be Class 2 wetland (King County, 1990). Land use analysis of 2002 aerial photographs showed nearly 53% of the surrounding watershed has been developed for uses other than agriculture.

Neilson (Holm) Lake has a public access boat launch, and pioneering infestations of Eurasian milfoil were observed in the summer of 2001 (King County, 2002). Residents should watch the nearshore environment for further infestations of milfoil, Brazilian elodea, and other noxious weeds.

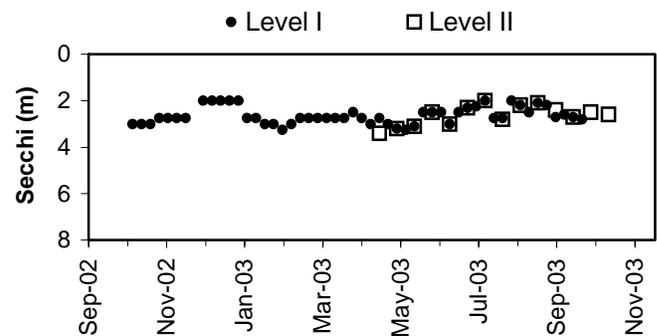
Physical Parameters

Secchi transparency was stable, ranging from 2.0 to 3.4m through the year. Annual water temperatures ranged from 4.5 to 25.5 degrees Celsius. Excellent record keeping showed that water levels followed a winter high - summer low pattern consistent with other small lakes in the region.

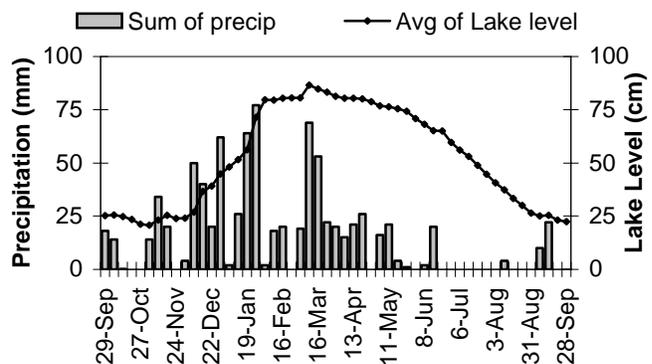
Lake Temperature



Secchi Depth

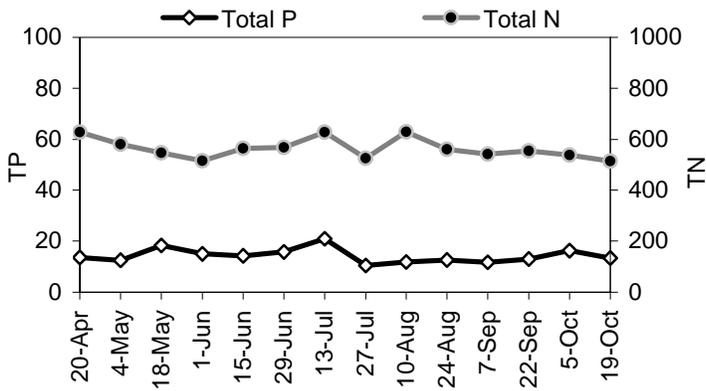


Lake Level and Precipitation

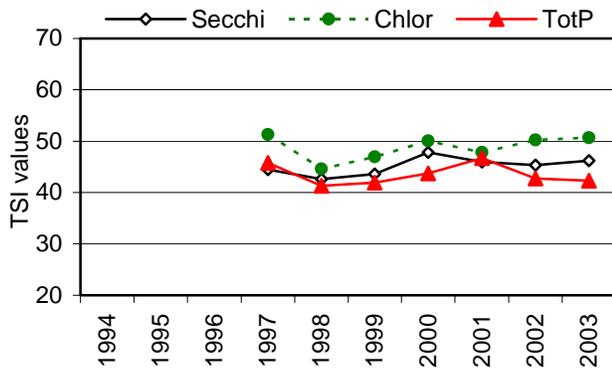


Neilson (Holm)

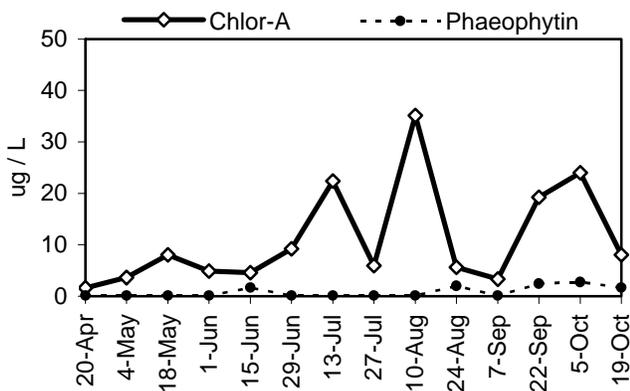
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|--------------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |
| unidentified species | unidentified group |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period. The N:P ratio ranged from 30 to 53, discouraging growth of bluegreen algae. In 2003 the spread of the average TSI values was similar to that of 2000 and 2002 across the range for mesotrophy. Similar to past years, the average TSI-Chlor is higher than the other two indicators.

Chlorophyll and Algae

Chlorophyll concentrations remained low in spring, but reached several peaks during the summer and autumn. The algae in the plankton were dominated by several species of the chrysophyte *Dinobryon* throughout the sample period, with both the chlorophyte *Botryococcus braunii* and an unidentified chrysophyte species commonly occurring as well. Bluegreen algae were extremely scarce.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 18.0 | 5 | 25.2 | 5 | | | | | | | |
| 6-Oct-02 | 14.0 | 7 | 25.4 | 7 | 6-Oct-02 | 14:00 | 3.0 | 15.0 | C2/P1 | C2/P1 | 0 |
| 13-Oct-02 | 0.1 | 7 | 24.7 | 7 | 13-Oct-02 | 14:30 | 3.0 | 13.0 | C2/P1 | C2/P1 | 0 |
| 20-Oct-02 | 0.0 | 7 | 23.4 | 7 | 20-Oct-02 | 15:15 | 3.0 | 12.0 | C1/P1 | C1/P1 | 0 |
| 27-Oct-02 | 0.0 | 7 | 21.1 | 7 | 27-Oct-02 | 12:50 | 2.8 | 10.0 | C2/P1 | C1/P1 | |
| 3-Nov-02 | 14.0 | 7 | 20.7 | 7 | 3-Nov-02 | 12:30 | 2.8 | 8.0 | C1/P1 | C1/P1 | 0 |
| 10-Nov-02 | 34.0 | 7 | 23.1 | 7 | 10-Nov-02 | 13:50 | 2.8 | 8.5 | C1/P1 | C1/P1 | 0 |
| 17-Nov-02 | 20.0 | 7 | 25.3 | 7 | 17-Nov-02 | 13:30 | 2.8 | 8.0 | C1/P1 | C1/P1 | 0 |
| 24-Nov-02 | 0.0 | 7 | 23.9 | 7 | | | | | | | |
| 1-Dec-02 | 4.0 | 7 | 24.0 | 7 | 1-Dec-02 | 13:00 | 2.0 | 5.5 | C2/P1 | C2 P2 | 0 |
| 8-Dec-02 | 50.0 | 7 | 26.9 | 7 | 8-Dec-02 | 14:00 | 2.0 | 5.0 | C3/P1 | C3/P1 | 0 |
| 15-Dec-02 | 40.0 | 7 | 36.6 | 7 | 15-Dec-02 | 13:00 | 2.0 | 5.0 | C3/P1 | C3/P1 | |
| 22-Dec-02 | 20.0 | 6 | 39.1 | 7 | 22-Dec-02 | 13:10 | 2.0 | | C2/P1 | C2/P1 | |
| 29-Dec-02 | 62.0 | 7 | 44.9 | 7 | 29-Dec-02 | 15:30 | 2.0 | 4.5 | C2/P1 | C2/P1 | 45 |
| 5-Jan-03 | 2.0 | 7 | 48.1 | 7 | 5-Jan-03 | 15:30 | 2.8 | 5.0 | P1 | P1 | 40 |
| 12-Jan-03 | 26.0 | 7 | 51.6 | 7 | 12-Jan-03 | 14:15 | 2.8 | 5.0 | P1 | P1 | 0 |
| 19-Jan-03 | 64.1 | 7 | 56.3 | 7 | 19-Jan-03 | 14:45 | 3.0 | 5.5 | NA | NA | 0 |
| 26-Jan-03 | 77.0 | 7 | 71.6 | 7 | 26-Jan-03 | 16:00 | 3.0 | 6.0 | NA | NA | 12 |
| 2-Feb-03 | 2.0 | 7 | 79.6 | 7 | 2-Feb-03 | 14:15 | 3.3 | 6.5 | P1 | P1 | |
| 9-Feb-03 | 18.0 | 7 | 79.4 | 7 | 9-Feb-03 | 15:30 | 3.0 | 6.0 | | | |
| 16-Feb-03 | 20.0 | 7 | 80.4 | 7 | 16-Feb-03 | 13:50 | 2.8 | 5.5 | P1 | P1 | 4 |
| 23-Feb-03 | 0.0 | 7 | 80.6 | 7 | 23-Feb-03 | 14:15 | 2.8 | 6.0 | P1 | P1 | 12 |
| 2-Mar-03 | 19.0 | 7 | 80.6 | 7 | 2-Mar-03 | 16:30 | 2.8 | 5.0 | P1 | P1 | 0 |
| 9-Mar-03 | 69.0 | 6 | 86.6 | 7 | 9-Mar-03 | 16:15 | 2.8 | 5.5 | P1 | P1 | 4 |
| 16-Mar-03 | 53.0 | 7 | 84.7 | 7 | 16-Mar-03 | 15:00 | 2.8 | 7.5 | P1 | P1 | 0 |
| 23-Mar-03 | 22.0 | 7 | 83.1 | 7 | 23-Mar-03 | 14:20 | 2.8 | 8.0 | P1 | P1 | 12 |
| 30-Mar-03 | 20.0 | 6 | 81.3 | 6 | 30-Mar-03 | 14:15 | 2.5 | 12.0 | C1/P1 | C1/P1 | 10 |
| 6-Apr-03 | 15.1 | 7 | 80.3 | 7 | 6-Apr-03 | 14:00 | 2.8 | 10.0 | P2 | P2 | |
| 13-Apr-03 | 21.0 | 7 | 80.4 | 7 | 13-Apr-03 | 14:15 | 3.0 | 12.5 | P2 | P2 | |
| 20-Apr-03 | 26.0 | 7 | 80.0 | 7 | 20-Apr-03 | 14:30 | 2.8 | 13.0 | P2 | P2 | |
| 27-Apr-03 | 0.1 | 7 | 78.7 | 7 | 27-Apr-03 | 17:15 | 3.0 | 14.5 | P2 | P2 | |
| 4-May-03 | 16.0 | 7 | 76.7 | 7 | 4-May-03 | 15:15 | 3.2 | 16.0 | P2 | P2 | 30 |
| 11-May-03 | 21.0 | 7 | 76.3 | 7 | 11-May-03 | 14:00 | 3.3 | 15.5 | P2 | P2 | 5 |
| 18-May-03 | 4.0 | 7 | 75.4 | 7 | 18-May-03 | 12:38 | 3.1 | 14.5 | P2 | P2 | 25 |
| 25-May-03 | 1.0 | 7 | 74.1 | 7 | 25-May-03 | 16:00 | 2.5 | 18.0 | P3 | P3 | 4 |
| 1-Jun-03 | 0.0 | 7 | 70.9 | 7 | 1-Jun-03 | 12:30 | 2.5 | 19.5 | P3 | P3 | 4 |
| 8-Jun-03 | 2.0 | 7 | 68.1 | 7 | 8-Jun-03 | 15:45 | 2.5 | 24.0 | P3 | P3 | 14 |
| 15-Jun-03 | 20.0 | 7 | 65.3 | 7 | 15-Jun-03 | 12:20 | 3.0 | 24.0 | P3 | P3 | 14 |
| 22-Jun-03 | 0.0 | 6 | 65.0 | 7 | 22-Jun-03 | 15:00 | 2.5 | 22.5 | P3 | P3 | 18 |
| 29-Jun-03 | 0.0 | 5 | 59.7 | 7 | 29-Jun-03 | 14:00 | 2.3 | 24.0 | P3 | P3 | 18 |
| 6-Jul-03 | 0.0 | 7 | 56.1 | 7 | 6-Jul-03 | 14:30 | 2.3 | 23.0 | P3 | P3 | |
| 13-Jul-03 | 0.0 | 6 | 53.1 | 7 | 13-Jul-03 | 13:00 | 2.0 | 24.0 | P3 | P3 | 20 |
| 20-Jul-03 | 0.0 | 7 | 48.9 | 7 | 20-Jul-03 | 16:30 | 2.8 | 25.0 | P3 | P3 | 14 |
| 27-Jul-03 | 0.0 | 7 | 44.7 | 7 | 27-Jul-03 | 14:00 | 2.8 | 25.5 | P3 | P3 | 16 |
| 3-Aug-03 | 0.0 | 7 | 40.6 | 7 | 3-Aug-03 | 14:00 | 2.0 | 24.0 | P3 | P3 | 13 |
| 10-Aug-03 | 4.1 | 7 | 37.3 | 7 | 10-Aug-03 | 15:15 | 2.2 | 23.0 | P3 | P3 | 46 |
| 17-Aug-03 | 0.0 | 7 | 33.3 | 7 | 17-Aug-03 | 17:00 | 2.5 | 23.0 | P3 | P3 | |
| 24-Aug-03 | 0.0 | 7 | 30.0 | 7 | 24-Aug-03 | 16:00 | 2.1 | 22.0 | P3 | P3 | 21 |
| 31-Aug-03 | 0.0 | 2 | 26.4 | 7 | 31-Aug-03 | 16:15 | 2.2 | 21.5 | P3 | P3 | 38 |
| 7-Sep-03 | 10.0 | 2 | 25.0 | 7 | 7-Sep-03 | 15:30 | 2.7 | 18.0 | P3 | P3 | |
| 14-Sep-03 | 22.0 | 2 | 25.3 | 7 | 14-Sep-03 | 16:10 | 2.6 | 17.5 | P3 | P3 | |
| 21-Sep-03 | | | 23.1 | 7 | 21-Sep-03 | 14:30 | 2.7 | 17.0 | P2 | P2 | |
| 28-Sep-03 | | | 22.3 | 3 | 28-Sep-03 | 14:50 | 2.8 | 17.0 | P2 | P2 | |
| Min | 0.0 | | 20.7 | | Min | | 2.0 | 4.5 | | | 0 |
| Max | 77.0 | | 86.6 | | Max | | 3.3 | 25.5 | | | 46 |
| Total | 830.3 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|----------------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.0 | 3.4 | 1.6 | 13.7 | 628 | 2 | 46 | 42.3 | 35.2 | 41.9 | |
| 4-May | 16.0 | 3.2 | 3.6 | 12.5 | 581 | 2 | 46 | 43.2 | 43.2 | 40.6 | |
| 18-May | 14.5 | 3.1 | 8.0 | 18.3 | 547 | 2 | 30 | 43.7 | 51.0 | 46.1 | |
| 1-Jun | 19.5 | 2.5 | 4.8 | 15.0 | 516 | 3 | 34 | 46.8 | 46.0 | 43.2 | |
| 15-Jun | 18.5 | 3.0 | 4.5 | 14.3 | 565 | 2 | 40 | 44.1 | 45.3 | 42.5 | Algae blooming at sunset. |
| 29-Jun | 24.0 | 2.3 | 9.2 | 15.8 | 568 | 3 | 36 | 48.0 | 52.4 | 44.0 | |
| 13-Jul | 24.0 | 2.0 | 22.4 | 20.9 | 628 | 3 | 30 | 50.0 | 61.1 | 48.0 | |
| 27-Jul | 25.5 | 2.8 | 5.9 | 10.5 | 526 | 3 | 50 | 45.1 | 47.9 | 38.1 | Bloom occurs in late afternoons. |
| 10-Aug | 23.0 | 2.2 | 35.1 | 11.9 | 629 | 3 | 53 | 48.6 | 65.5 | 39.9 | Algae bloom continues. |
| 24-Aug | 22.0 | 2.1 | 5.6 | 12.6 | 561 | 3 | 45 | 49.3 | 47.5 | 40.7 | |
| 7-Sep | 22.0 | 2.4 | 3.3 | 11.8 | 542 | 3 | 46 | 47.4 | 42.3 | 39.8 | |
| 21-Sep | 18.0 | 2.7 | 19.2 | 13.0 | 554 | 2 | 43 | 45.7 | 59.6 | 41.2 | |
| 5-Oct | 17.0 | 2.5 | 24.0 | 16.3 | 538 | 3 | 33 | 46.8 | 61.7 | 44.4 | |
| 19-Oct | 15.0 | 2.6 | 8.0 | 13.4 | 514 | 2 | 38 | 46.2 | 51.0 | 41.6 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.5 | 2.6 | 11.1 | 14.3 | 564.1 | 2.6 | 41 | 46.2 | 50.7 | 42.3 | TSI Average = 46.4 |
| Median | 19.0 | 2.6 | 6.9 | 13.6 | 557.5 | 3 | 41 | 46.5 | 49.5 | 41.7 | |
| Min | 14.0 | 2.0 | 1.6 | 10.5 | 514.0 | 2 | 30 | 42.3 | 35.2 | 38.1 | |
| Max | 25.5 | 3.4 | 35.1 | 20.9 | 629.0 | 3 | 53 | 50.0 | 65.5 | 48.0 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

North

Lake Overview

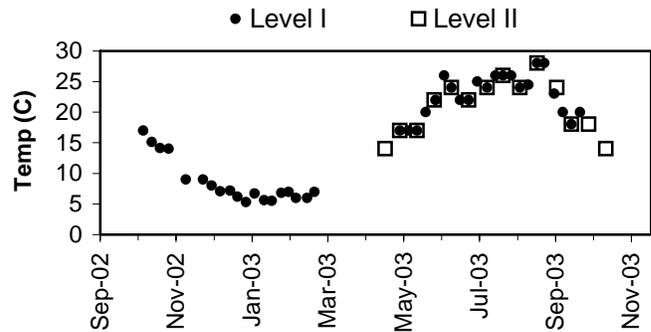
Volunteer monitoring began at North Lake in the early 1980s, was resumed in 1995 through 1998 after a hiatus and began again in 2001 through 2003. Collected data indicate this lake, partially in the city of Federal Way, is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 12% of the drainage area, direct precipitation is important, in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed almost 53% of the surrounding watershed has been developed for uses other than agriculture. Most of the western shoreline is currently in open space.

North Lake has a public access boat launch and Eurasian milfoil has been identified in the lake. Residents should watch the nearshore environment for the spread of milfoil, as well as new infestations of Brazilian elodea or other noxious weeds.

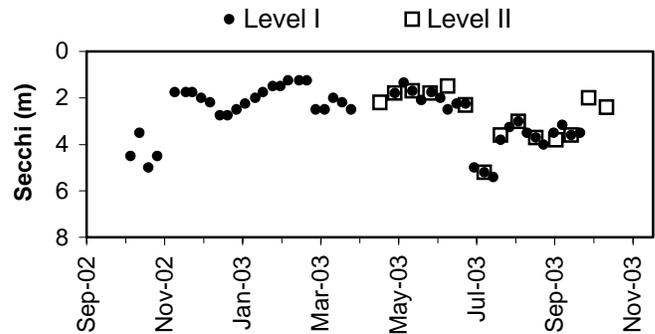
Physical Parameters

Secchi transparency ranged from 1.3 to 5.4m through the year. Annual water temperatures ranged from 5.3 to 28.0 degrees Celsius. Excellent precipitation and water records were kept for the year. Water levels followed a pronounced winter high - summer low pattern, consistent with other small lakes in the region.

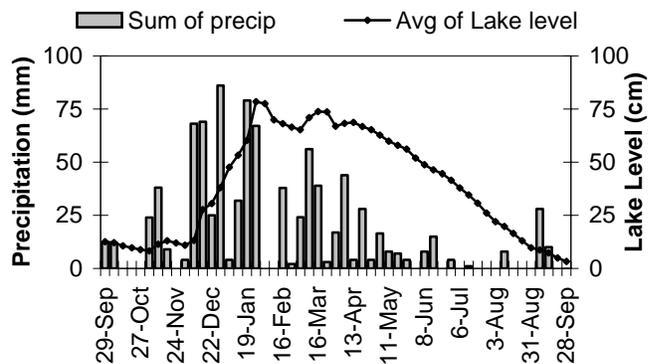
Lake Temperature



Secchi Depth

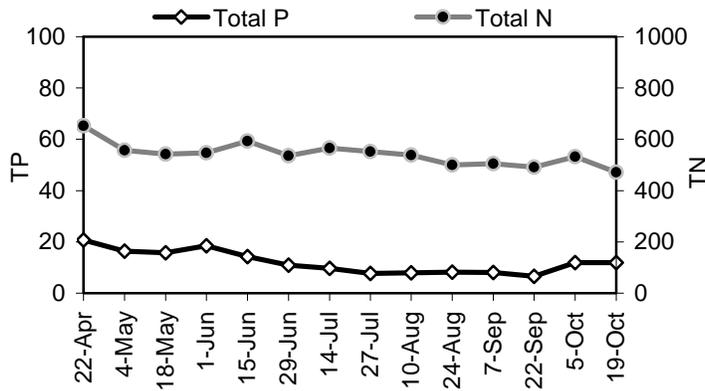


Lake Level and Precipitation

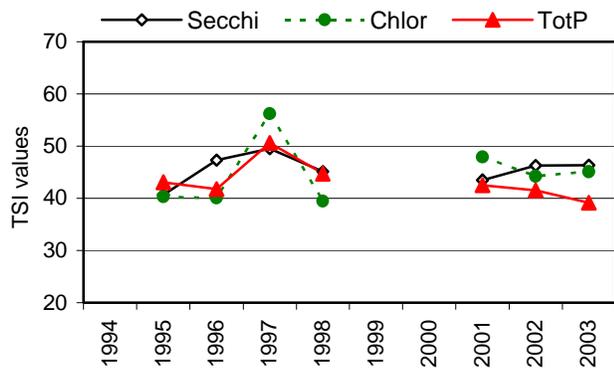


North

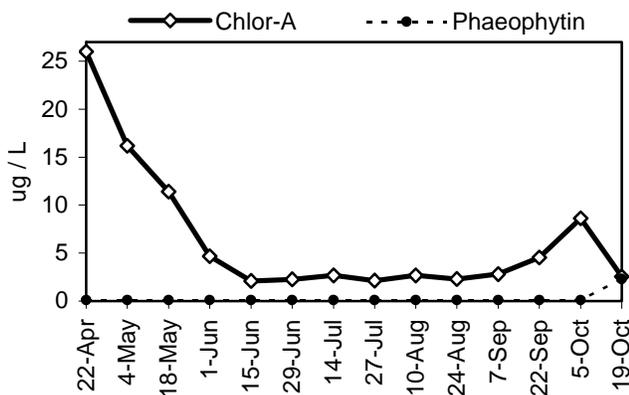
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|-------------|
| <i>Dinobryon sociale</i> | chrysophyte |
| unidentified species | chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period, with the N:P ratio ranging from 30 to 74.

In 2003, the average TSI values were in the mid-range for mesotrophy, similar to recent years.

Chlorophyll and Algae

Chlorophyll was at its highest value on the first sample date of the season, declining to low values through the summer, reaching a smaller peak in early October. Both the spring bloom and the fall increase were dominated by a combination of the chrysophyte *Dinobryon* and another unidentified chrysophyte species. Other commonly occurring species included the large colonial chlorophyte *Botryococcus braunii* and several species of cryptomonads. Bluegreen algae were extremely rare.

Daily Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days |
|--------------|---------------------|-----------|------------------------|-----------|
| 29-Sep-02 | 12.0 | 5 | 12.6 | 5 |
| 6-Oct-02 | 12.0 | 7 | 12.1 | 7 |
| 13-Oct-02 | 0.0 | 7 | 10.7 | 7 |
| 20-Oct-02 | 0.0 | 7 | 9.7 | 7 |
| 27-Oct-02 | 0.0 | 7 | 8.8 | 7 |
| 3-Nov-02 | 24.0 | 7 | 8.2 | 7 |
| 10-Nov-02 | 38.1 | 7 | 11.4 | 7 |
| 17-Nov-02 | 9.1 | 7 | 13.0 | 7 |
| 24-Nov-02 | 0.0 | 7 | 12.0 | 7 |
| 1-Dec-02 | 4.1 | 7 | 11.0 | 7 |
| 8-Dec-02 | 68.0 | 7 | 13.1 | 7 |
| 15-Dec-02 | 69.0 | 7 | 27.7 | 7 |
| 22-Dec-02 | 25.1 | 7 | 30.6 | 7 |
| 29-Dec-02 | 86.0 | 7 | 38.1 | 7 |
| 5-Jan-03 | 4.0 | 7 | 47.6 | 7 |
| 12-Jan-03 | 32.0 | 7 | 53.2 | 7 |
| 19-Jan-03 | 79.0 | 7 | 60.2 | 7 |
| 26-Jan-03 | 67.0 | 7 | 78.4 | 7 |
| 2-Feb-03 | 0.1 | 7 | 77.5 | 7 |
| 9-Feb-03 | 0.0 | 4 | 69.8 | 3 |
| 16-Feb-03 | 38.0 | 6 | 68.1 | 6 |
| 23-Feb-03 | 2.1 | 7 | 66.4 | 7 |
| 2-Mar-03 | 24.1 | 7 | 65.2 | 7 |
| 9-Mar-03 | 56.0 | 7 | 70.9 | 7 |
| 16-Mar-03 | 39.1 | 7 | 73.7 | 7 |
| 23-Mar-03 | 3.1 | 7 | 73.6 | 7 |
| 30-Mar-03 | 17.0 | 7 | 66.9 | 7 |
| 6-Apr-03 | 44.0 | 7 | 68.1 | 7 |
| 13-Apr-03 | 4.1 | 7 | 68.7 | 6 |
| 20-Apr-03 | 28.0 | 7 | 66.7 | 6 |
| 27-Apr-03 | 4.1 | 7 | 65.1 | 7 |
| 4-May-03 | 16.5 | 7 | 62.7 | 7 |
| 11-May-03 | 8.0 | 7 | 59.9 | 7 |
| 18-May-03 | 7.0 | 7 | 57.9 | 7 |
| 25-May-03 | 4.0 | 7 | 56.1 | 7 |
| 1-Jun-03 | 0.0 | 7 | 51.9 | 7 |
| 8-Jun-03 | 8.0 | 7 | 48.7 | 7 |
| 15-Jun-03 | 15.0 | 7 | 46.4 | 7 |
| 22-Jun-03 | 0.0 | 7 | 44.5 | 7 |
| 29-Jun-03 | 4.0 | 7 | 41.5 | 7 |
| 6-Jul-03 | 0.0 | 7 | 37.9 | 7 |
| 13-Jul-03 | 1.1 | 7 | 34.6 | 7 |
| 20-Jul-03 | 0.0 | 7 | 30.7 | 7 |
| 27-Jul-03 | 0.0 | 7 | 26.1 | 7 |
| 3-Aug-03 | 0.1 | 7 | 22.0 | 7 |
| 10-Aug-03 | 8.0 | 7 | 19.8 | 7 |
| 17-Aug-03 | 0.0 | 7 | 16.5 | 7 |
| 24-Aug-03 | 0.0 | 7 | 13.0 | 7 |
| 31-Aug-03 | 0.0 | 7 | 9.7 | 7 |
| 7-Sep-03 | 28.1 | 7 | 8.7 | 5 |
| 14-Sep-03 | 10.1 | 7 | 7.4 | 7 |
| 21-Sep-03 | 0.0 | 7 | 5.0 | 7 |
| 28-Sep-03 | 0.0 | 3 | 3.3 | 3 |
| Min | 0.0 | | 3.3 | |
| Max | 86.0 | | 78.4 | |
| Total | 898.4 | | | |

Weekly Data Summary

| Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 6-Oct-02 | 15:00 | 4.5 | 17.0 | C3 | C1 | 0 |
| 13-Oct-02 | 16:30 | 3.5 | 15.1 | C3 | C2 | 0 |
| 20-Oct-02 | 15:40 | 5.0 | 14.1 | P1 | NA | 6 |
| 27-Oct-02 | 15:00 | 4.5 | 14.0 | P1 | NA | 0 |
| 3-Nov-02 | | | | | | 0 |
| 10-Nov-02 | 13:30 | 1.8 | 9.0 | P1 | P1 | 0 |
| 19-Nov-02 | 11:00 | 1.8 | 0.0 | P1 | P1 | 0 |
| 24-Nov-02 | 14:30 | 1.8 | 9.0 | P1 | P1 | 0 |
| 1-Dec-02 | 12:30 | 2.0 | 8.0 | NA | NA | 10 |
| 8-Dec-02 | 13:30 | 2.2 | 7.1 | NA | NA | 4 |
| 16-Dec-02 | 14:00 | 2.8 | 7.2 | NA | NA | 0 |
| 22-Dec-02 | 11:30 | 2.8 | 6.2 | NA | NA | 0 |
| 29-Dec-02 | 11:45 | 2.5 | 5.3 | NA | NA | 35 |
| 5-Jan-03 | 16:00 | 2.3 | 6.7 | NA | NA | 0 |
| 13-Jan-03 | 11:35 | 2.0 | 5.6 | NA | NA | 0 |
| 19-Jan-03 | 14:00 | 1.8 | 5.5 | NA | NA | 0 |
| 27-Jan-03 | 13:00 | 1.5 | 6.8 | P2 | P1 | 0 |
| 2-Feb-03 | 10:10 | 1.5 | 7.0 | P1 | P1 | 7 |
| 8-Feb-03 | 12:46 | 1.3 | 6.0 | P1 | P1 | 3 |
| 17-Feb-03 | 13:43 | 1.3 | 6.0 | P2 | P2 | 3 |
| 23-Feb-03 | 13:14 | 1.3 | 7.0 | P2 | P2 | 2 |
| 2-Mar-03 | 13:30 | 2.5 | 0.0 | P2 | P2 | 4 |
| 9-Mar-03 | 14:00 | 2.5 | 0.0 | P2 | P2 | 5 |
| 16-Mar-03 | 14:00 | 2.0 | 0.0 | P2 | P2 | 0 |
| 23-Mar-03 | 14:00 | 2.2 | 0.0 | P2 | P2 | 0 |
| 30-Mar-03 | 14:00 | 2.5 | 0.0 | P2 | P2 | 5 |
| 6-Apr-03 | | | | | | |
| 13-Apr-03 | | | | | | 5 |
| 20-Apr-03 | | | | | | |
| 27-Apr-03 | | | | | | |
| 4-May-03 | 14:00 | 1.8 | 17.0 | P2 | P3 | 14 |
| 11-May-03 | 13:30 | 1.4 | 17.0 | P3 | P3 | 20 |
| 18-May-03 | 14:00 | 1.7 | 17.0 | P3 | P3 | |
| 25-May-03 | 15:00 | 2.1 | 20.0 | P3 | P3 | 40 |
| 2-Jun-03 | 19:00 | 1.8 | 22.0 | P2 | P2 | 20 |
| 9-Jun-03 | 17:00 | 2.0 | 26.0 | P2 | P2 | 42 |
| 15-Jun-03 | 18:00 | 2.5 | 24.0 | P2 | P2 | 35 |
| 22-Jun-03 | 14:41 | 2.3 | 22.0 | P2 | P2 | 40 |
| 29-Jun-03 | 16:00 | 2.3 | 22.0 | P2 | P2 | 41 |
| 6-Jul-03 | 19:00 | 5.0 | 25.0 | P1 | NA | 42 |
| 14-Jul-03 | 8:00 | 5.2 | 24.0 | P1 | NA | 40 |
| 21-Jul-03 | 14:00 | 5.4 | 26.0 | P1 | NA | 30 |
| 27-Jul-03 | 14:15 | 3.8 | 26.0 | P1 | NA | 18 |
| 3-Aug-03 | 13:45 | 3.3 | 26.0 | | NA | 12 |
| 10-Aug-03 | 13:00 | 3.0 | 24.0 | | NA | 12 |
| 17-Aug-03 | 13:05 | 3.5 | 24.5 | | NA | |
| 24-Aug-03 | 12:00 | 3.7 | 28.0 | | NA | 12 |
| 31-Aug-03 | 11:15 | 4.0 | 28.0 | | NA | |
| 7-Sep-03 | 13:00 | 3.5 | 23.0 | P2 | P2 | 0 |
| 14-Sep-03 | 12:15 | 3.2 | 20.0 | P2 | P2 | |
| 21-Sep-03 | 12:10 | 3.6 | 18.0 | P2 | P2 | 11 |
| 28-Sep-03 | 17:00 | 3.5 | 20.0 | P2 | P2 | |
| Min | | 1.3 | 0.0 | | | 0 |
| Max | | 5.4 | 28.0 | | | 42 |

North

2003 Level II Data

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 22-Apr | 14.0 | 2.2 | 26.0 | 20.8 | 652 | 3 | 31 | 48.6 | 62.5 | 47.9 | |
| 4-May | 17.0 | 1.8 | 16.2 | 16.4 | 557 | 2 | 34 | 51.5 | 57.9 | 44.5 | |
| 18-May | 17.0 | 1.7 | 11.4 | 15.8 | 542 | 3 | 34 | 52.3 | 54.4 | 44.0 | |
| 1-Jun | 22.0 | 1.8 | 4.7 | 18.5 | 547 | 2 | 30 | 51.5 | 45.6 | 46.2 | |
| 15-Jun | 24.0 | 1.5 | 2.1 | 14.3 | 593 | 2 | 41 | 54.1 | 37.8 | 42.5 | |
| 29-Jun | 22.0 | 2.3 | 2.3 | 10.9 | 535 | 2 | 49 | 48.0 | 38.6 | 38.6 | |
| 14-Jul | 24.0 | | 2.7 | 9.7 | 565 | 1 | 58 | | 40.2 | 36.9 | Secchi recorded as 5.2m. This is very unlikely. |
| 27-Jul | 26.0 | 3.6 | 2.1 | 7.7 | 551 | 1 | 72 | 41.5 | 38.0 | 33.6 | |
| 10-Aug | 24.0 | 3.0 | 2.7 | 7.9 | 538 | 1 | 68 | 44.1 | 40.2 | 34.0 | |
| 24-Aug | 28.0 | 3.7 | 2.3 | 8.2 | 499 | 0 | 61 | 41.1 | 38.7 | 34.5 | Water appears very clear. |
| 9-Sep | 24.0 | 3.8 | 2.8 | 8.1 | 504 | 2 | 62 | 40.7 | 40.7 | 34.3 | |
| 21-Sep | 18.0 | 3.6 | 4.5 | 6.6 | 491 | 2 | 74 | 41.5 | 45.3 | 31.4 | |
| 5-Oct | 18.0 | 2.0 | 8.6 | 11.9 | 532 | | 45 | 50.0 | 51.7 | 39.9 | |
| 19-Oct | 14.0 | 2.4 | 2.5 | 11.9 | 471 | 1 | 40 | 47.4 | 39.7 | 39.9 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.9 | 2.6 | 6.5 | 12.1 | 541.2 | 1.7 | 50 | 47.1 | 45.1 | 39.2 | TSI Average = 43.8 |
| Median | 22.0 | 2.3 | 2.7 | 11.4 | 540.0 | 2 | 47 | 48.0 | 40.4 | 39.2 | |
| Min | 14.0 | 1.5 | 2.1 | 6.6 | 471.0 | 0 | 30 | 40.7 | 37.8 | 31.4 | |
| Max | 28.0 | 3.8 | 26.0 | 20.8 | 652.0 | 3 | 74 | 54.1 | 62.5 | 47.9 | |
| Count | 14 | 13 | 14 | 14 | 14 | 13 | 14 | 13 | 14 | 14 | |

Paradise

Lake Overview

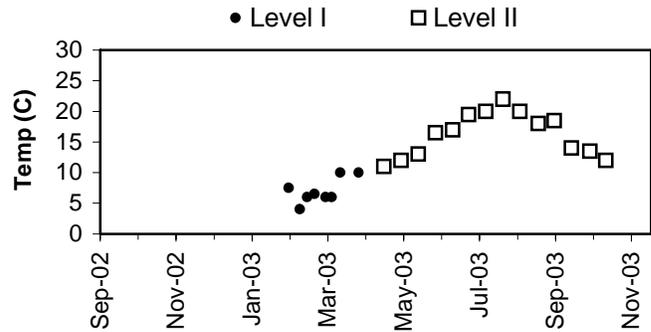
Volunteer monitoring began at Paradise Lake in 1996 and has continued through 2003. The data indicate this lake, whose watershed extends into Snohomish County, is high in primary productivity (eutrophic) with fairly good water quality. Since the lake surface makes up less than 1% of the drainage area, direct precipitation is not nearly as important as watershed inputs. Land use analysis of 2002 aerial photographs showed almost 54% of the surrounding watershed has been developed for uses other than agriculture.

Paradise Lake has no public access boat launch, but residents should watch the nearshore environment for early infestations of Eurasian milfoil, Brazilian elodea, and other noxious weeds.

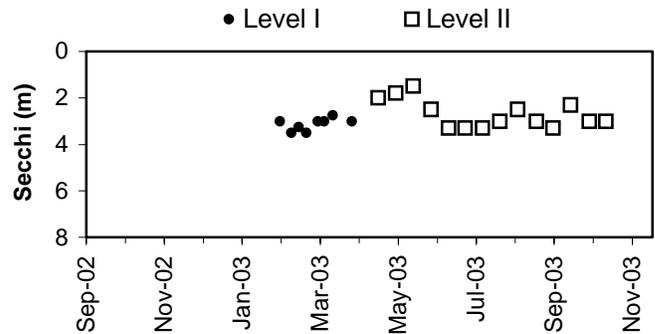
Physical Parameters

Secchi transparency ranged from 2.8 to 3.5m from February through October. Water temperatures, recorded for the same interval as Secchi, ranged from 4.0 to 22.0 degrees Celsius. Water levels were recorded only in February and March.

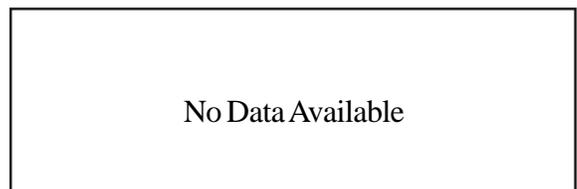
Lake Temperature



Secchi Depth

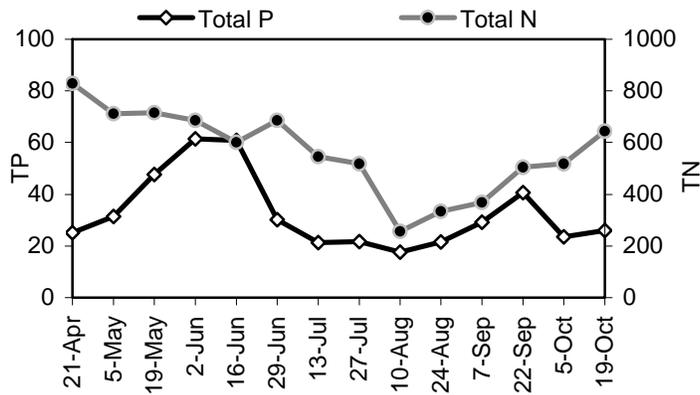


Lake Level and Precipitation

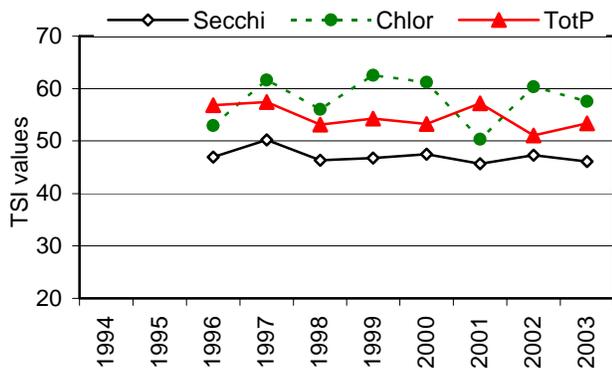


Paradise

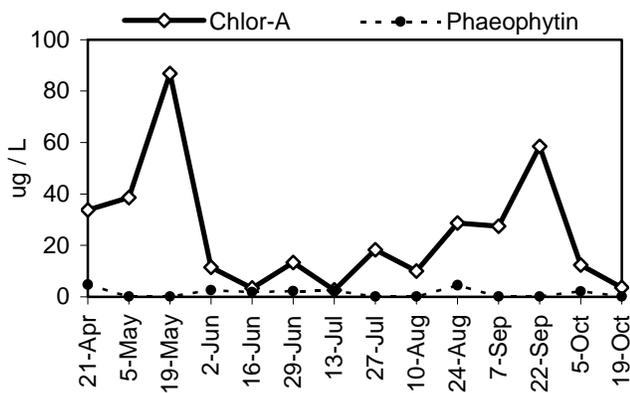
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|--------------------|
| chrysophyte (unicell) | chrysophyte |
| <i>Asterionella formosa</i> | diatom-chrysophyte |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

The patterns followed by total nitrogen and total phosphorus were somewhat different from each other through the season, with peaks occurring at differing times. The N:P ratio ranged from 10 to 33. In 2003 the TSI values for chlorophyll and TP indicated eutrophy, while the Secchi was in the mesotrophic range, a pattern similar to other years.

Chlorophyll and Algae

Chlorophyll concentrations reached two major peaks during the sample season, one in late May and the second in late September. Both were dominated by the chrysophyte *Dinobryon* and another unidentified chrysophyte species. Other commonly occurring algae included the diatom *Asterionella* and a variety of cryptophyte species. No bluegreens were found in the samples.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|---------------|-----------------|-------------|
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | | | | | | | | | | | |
| 13-Oct-02 | | | | | | | | | | | |
| 20-Oct-02 | | | | | | | | | | | |
| 27-Oct-02 | | | | | | | | | | | |
| 3-Nov-02 | | | | | | | | | | | |
| 10-Nov-02 | | | | | | | | | | | |
| 17-Nov-02 | | | | | | | | | | | |
| 24-Nov-02 | | | | | | | | | | | |
| 1-Dec-02 | | | | | | | | | | | |
| 8-Dec-02 | | | | | | | | | | | |
| 15-Dec-02 | | | | | | | | | | | |
| 22-Dec-02 | | | | | | | | | | | |
| 29-Dec-02 | | | | | | | | | | | |
| 5-Jan-03 | | | | | | | | | | | |
| 12-Jan-03 | | | | | | | | | | | |
| 19-Jan-03 | | | | | | | | | | | |
| 26-Jan-03 | | | | | | | | | | | |
| 2-Feb-03 | | | 39.7 | 3 | 2-Feb-03 | 14:30 | 3.0 | 7.5 | | | |
| 9-Feb-03 | | | 31.9 | 4 | 11-Feb-03 | 9:45 | 3.5 | 4.0 | NA | NA | |
| 16-Feb-03 | | | 37.5 | 5 | 17-Feb-03 | 13:00 | 3.3 | 6.0 | | NA | |
| 23-Feb-03 | | | 35.5 | 2 | 23-Feb-03 | 12:30 | 3.5 | 6.5 | | NA | |
| 2-Mar-03 | | | 31.0 | 1 | 4-Mar-03 | 16:45 | 3.0 | 6.0 | | NA | |
| 9-Mar-03 | | | 49.3 | 5 | 9-Mar-03 | 15:30 | 3.0 | 6.0 | | | |
| 16-Mar-03 | | | 42.8 | 3 | 16-Mar-03 | 16:30 | 2.8 | 10.0 | | | |
| 23-Mar-03 | | | 45.0 | 1 | | | | | | | |
| 30-Mar-03 | | | 38.0 | 1 | 31-Mar-03 | 9:45 | 3.0 | 10.0 | | | |
| 6-Apr-03 | | | | | | | | | | | |
| 13-Apr-03 | | | | | | | | | | | |
| 20-Apr-03 | | | | | | | | | | | |
| 27-Apr-03 | | | | | | | | | | | |
| 4-May-03 | | | | | | | | | | | |
| 11-May-03 | | | | | | | | | | | |
| 18-May-03 | | | | | | | | | | | |
| 25-May-03 | | | | | | | | | | | |
| 1-Jun-03 | | | | | | | | | | | |
| 8-Jun-03 | | | | | | | | | | | |
| 15-Jun-03 | | | | | | | | | | | |
| 22-Jun-03 | | | | | | | | | | | |
| 29-Jun-03 | | | | | | | | | | | |
| 6-Jul-03 | | | | | | | | | | | |
| 13-Jul-03 | | | | | | | | | | | |
| 20-Jul-03 | | | | | | | | | | | |
| 27-Jul-03 | | | | | | | | | | | |
| 3-Aug-03 | | | | | | | | | | | |
| 10-Aug-03 | | | | | | | | | | | |
| 17-Aug-03 | | | | | | | | | | | |
| 24-Aug-03 | | | | | | | | | | | |
| 31-Aug-03 | | | | | | | | | | | |
| 7-Sep-03 | | | | | | | | | | | |
| 14-Sep-03 | | | | | | | | | | | |
| 21-Sep-03 | | | | | | | | | | | |
| 28-Sep-03 | | | | | | | | | | | |
| Min | 0.0 | | 31.0 | | | | Min | 2.8 | 4.0 | | |
| Max | 0.0 | | 49.3 | | | | Max | 3.5 | 10.0 | | |
| Total | 0.0 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 11.0 | 2.0 | 33.8 | 25.2 | 828 | 1 | 33 | 50.0 | 65.1 | 50.7 | |
| 5-May | 12.0 | 1.8 | 38.6 | 31.4 | 711 | 1 | 23 | 51.5 | 66.4 | 53.9 | |
| 19-May | 13.0 | 1.5 | 86.8 | 47.7 | 715 | 1 | 15 | 54.1 | 74.4 | 59.9 | Chlor-a seems very high; no explanation. |
| 2-Jun | 16.5 | 2.5 | 11.4 | 61.4 | 686 | 1 | 11 | 46.8 | 54.4 | 63.6 | |
| 16-Jun | 17.0 | 3.3 | 3.3 | 60.8 | 600 | 1 | 10 | 42.8 | 42.3 | 63.4 | |
| 29-Jun | 19.5 | 3.3 | 13.3 | 30.2 | 686 | 3 | 23 | 42.8 | 56.0 | 53.3 | |
| 13-Jul | 20.0 | 3.3 | 2.6 | 21.3 | 545 | 1 | 26 | 42.8 | 39.9 | 48.3 | |
| 27-Jul | 22.0 | 3.0 | 18.2 | 21.8 | 518 | 1 | 24 | 44.1 | 59.0 | 48.6 | |
| 10-Aug | 20.0 | 2.5 | 9.9 | 17.6 | 256 | 1 | 15 | 46.8 | 53.1 | 45.5 | |
| 25-Aug | 18.0 | 3.0 | 28.6 | 21.6 | 334 | 3 | 15 | 44.1 | 63.5 | 48.5 | Mostly tiny particles with a few large zooplankton. |
| 7-Sep | 18.5 | 3.3 | 27.4 | 29.2 | 369 | 1 | 13 | 42.8 | 63.0 | 52.8 | Many tiny white particles. |
| 21-Sep | 14.0 | 2.3 | 58.5 | 40.7 | 504 | 1 | 12 | 48.0 | 70.5 | 57.6 | |
| 6-Oct | 13.5 | 3.0 | 12.3 | 23.5 | 518 | 1 | 22 | 44.1 | 55.2 | 49.7 | |
| 19-Oct | 12.0 | 3.0 | 3.6 | 26.0 | 644 | 2 | 25 | 44.1 | 43.1 | 51.2 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 16.2 | 2.7 | 24.9 | 32.7 | 565.3 | 1.4 | 19 | 46.1 | 57.6 | 53.4 | TSI Average = 52.3 |
| Median | 16.8 | 3.0 | 15.8 | 27.6 | 572.5 | 1 | 19 | 44.1 | 57.5 | 52.0 | |
| Min | 11.0 | 1.5 | 2.6 | 17.6 | 256.0 | 1 | 10 | 42.8 | 39.9 | 45.5 | |
| Max | 22.0 | 3.3 | 86.8 | 61.4 | 828.0 | 3 | 33 | 54.1 | 74.4 | 63.6 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Pine

Lake Overview

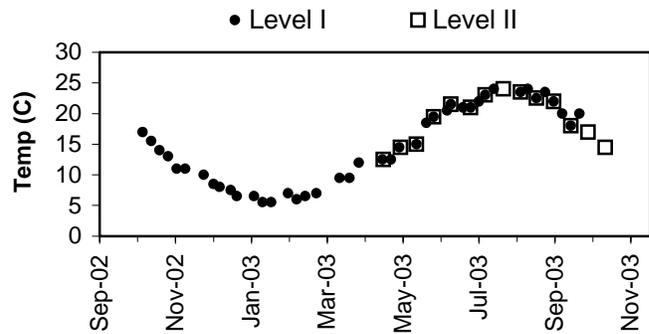
Volunteer monitoring began at Pine Lake in the 1980s and has continued through 2003, with a gap from 1990 to 1992 and in 1994. The data indicate this city lake (Sammamish) is currently low in primary productivity (oligotrophic) with very good water quality. Diversion of wetland flow from the western catchment was completed in 1988 to decrease phosphorus input, reducing the functional watershed from 640 acres to 487. Since the lake surface makes up 18% of the current drainage area, direct precipitation is very important in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed slightly less than 80% of the surrounding watershed has been developed for uses other than agriculture.

Pine Lake has a public access boat launch, and residents should watch the nearshore environment for early infestations of Eurasian milfoil, Brazilian elodea, and other noxious weeds.

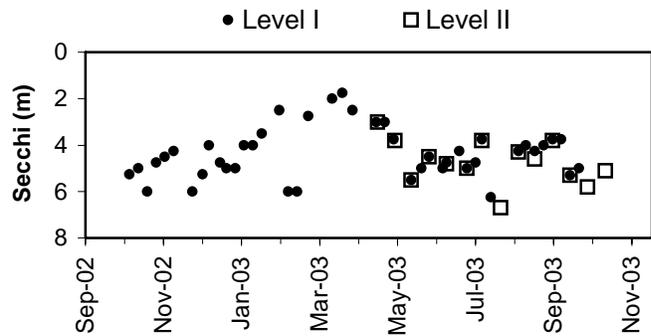
Physical Parameters

Secchi transparency ranged from 1.8 to 6.7m through the year, with a distinct minimum in March. Annual water temperatures ranged from 5.5 to 24.0 degrees Celsius. Excellent records of precipitation and water level were kept over the year. The lake level followed the winter high - summer low pattern, consistent with other small lakes in the region.

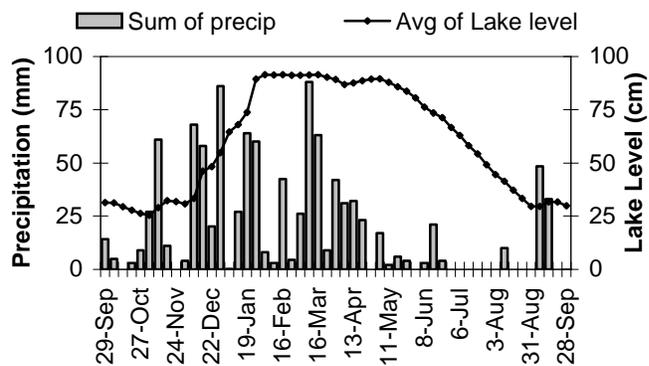
Lake Temperature



Secchi Depth

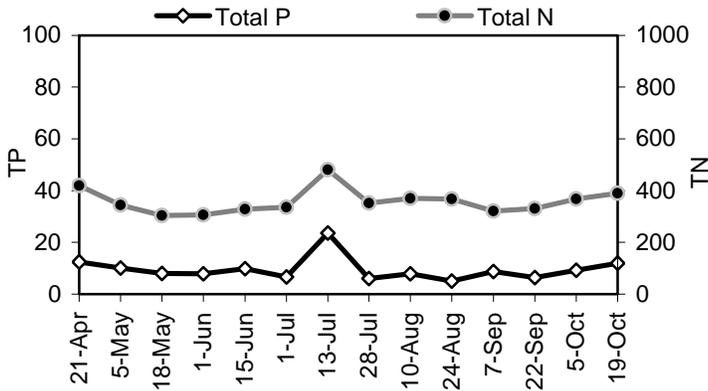


Lake Level and Precipitation

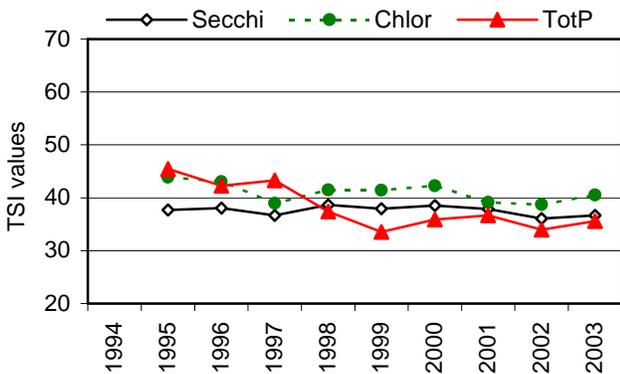


Pine

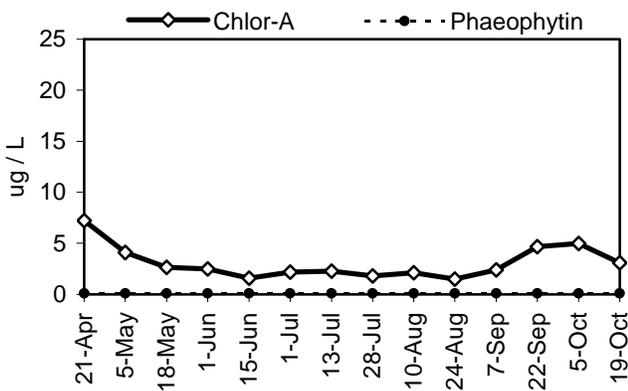
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in stable proportions to each other through the sampling period, with little change in values except for one date in mid-July. The N:P ratio ranged from 20 to 74. The 2003 TSI values were close to each other at the high end of the oligotrophic range, similar to recent years in which TSI-chlor has been slightly higher than the other two indicators.

Chlorophyll and Algae

Chlorophyll remained at low values throughout the sample season, but was slightly higher in April and again in early autumn. The spring algae were dominated by diatoms such as *Asterionella* and *Tabellaria*, while the autumn increase was due to the bluegreens *Aphanizomenon* and *Anabaena*, accompanied by the dinoflagellate *Ceratium*.

| Common algae | Group |
|---------------------------------|--------------------|
| <i>Asterionella formosa</i> | diatom-chrysophyte |
| <i>Tabellaria fenestrata</i> | diatom-chrysophyte |
| <i>Aphanizomenon flos-aquae</i> | bluegreen |

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 14.1 | 5 | 31.3 | 5 | | | | | | | |
| 6-Oct-02 | 5.0 | 7 | 31.2 | 7 | 6-Oct-02 | 15:30 | 5.3 | 17.0 | P2 | P1 | 0 |
| 13-Oct-02 | 0.0 | 7 | 29.4 | 7 | 13-Oct-02 | 15:30 | 5.0 | 15.5 | P2 | P1 | 0 |
| 20-Oct-02 | 3.0 | 7 | 27.8 | 7 | 20-Oct-02 | 12:00 | 6.0 | 14.0 | NA | NA | 29 |
| 27-Oct-02 | 9.0 | 7 | 26.3 | 7 | 27-Oct-02 | 12:00 | 4.8 | 13.0 | P1 | NA | 0 |
| 3-Nov-02 | 27.0 | 7 | 25.4 | 7 | 3-Nov-02 | 14:00 | 4.5 | 11.0 | P3 | NA | 25 |
| 10-Nov-02 | 61.0 | 7 | 29.0 | 6 | 10-Nov-02 | 12:45 | 4.3 | 11.0 | P2 | NA | 0 |
| 17-Nov-02 | 11.1 | 7 | 32.3 | 6 | 17-Nov-02 | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 31.7 | 7 | 25-Nov-02 | 14:00 | 6.0 | 10.0 | P2 | P1 | 0 |
| 1-Dec-02 | 4.0 | 7 | 30.7 | 7 | 3-Dec-02 | 15:00 | 5.3 | 8.5 | P2 | P2 | 0 |
| 8-Dec-02 | 68.1 | 7 | 33.3 | 4 | 8-Dec-02 | 15:15 | 4.0 | 8.0 | P3 | P2 | 0 |
| 15-Dec-02 | 58.1 | 7 | 46.2 | 3 | 17-Dec-02 | 15:15 | 4.8 | 7.5 | P2 | P2 | 0 |
| 22-Dec-02 | 20.1 | 7 | 48.3 | 4 | 22-Dec-02 | 15:30 | 5.0 | 6.5 | P3 | P2 | 0 |
| 29-Dec-02 | 86.0 | 7 | 54.9 | 7 | 29-Dec-02 | 12:30 | 5.0 | | P3 | P2 | 0 |
| 5-Jan-03 | 0.1 | 7 | 64.6 | 7 | 5-Jan-03 | 13:30 | 4.0 | 6.5 | P3 | P2 | 0 |
| 12-Jan-03 | 27.1 | 7 | 68.1 | 7 | 12-Jan-03 | 13:30 | 4.0 | 5.5 | P3 | P3 | 0 |
| 19-Jan-03 | 64.0 | 7 | 73.8 | 7 | 19-Jan-03 | 15:20 | 3.5 | 5.5 | P3 | P3 | 0 |
| 26-Jan-03 | 60.1 | 7 | 89.4 | 6 | | | | | | | |
| 2-Feb-03 | 8.1 | 7 | 91.5 | 7 | 2-Feb-03 | 15:00 | 2.5 | 7.0 | P3 | P3 | 0 |
| 9-Feb-03 | 3.0 | 7 | 91.4 | 7 | 9-Feb-03 | 15:00 | 6.0 | 6.0 | P3 | P3 | 0 |
| 16-Feb-03 | 42.5 | 7 | 91.5 | 7 | 16-Feb-03 | 14:30 | 6.0 | 6.5 | P3 | P3 | 0 |
| 23-Feb-03 | 4.5 | 7 | 91.1 | 7 | 25-Feb-03 | 16:45 | 2.8 | 7.0 | P3 | P3 | 0 |
| 2-Mar-03 | 26.1 | 7 | 91.2 | 7 | | | | | | | |
| 9-Mar-03 | 88.0 | 7 | 91.4 | 7 | | | | | | | |
| 16-Mar-03 | 63.1 | 7 | 91.5 | 7 | 16-Mar-03 | 14:00 | 2.0 | 9.5 | P3 | P3 | 0 |
| 23-Mar-03 | 9.0 | 7 | 90.3 | 7 | 24-Mar-03 | 14:45 | 1.8 | 9.5 | P3 | P3 | 0 |
| 30-Mar-03 | 42.0 | 7 | 89.2 | 6 | 1-Apr-03 | 17:15 | 2.5 | 12.0 | | | 0 |
| 6-Apr-03 | 31.0 | 7 | 86.9 | 7 | | | | | | | |
| 13-Apr-03 | 32.1 | 7 | 87.5 | 6 | | | | | | | |
| 20-Apr-03 | 23.1 | 7 | 88.6 | 6 | 20-Apr-03 | 16:00 | 3.0 | 12.5 | P1 | P2 | 2 |
| 27-Apr-03 | 0.1 | 7 | 89.4 | 6 | 27-Apr-03 | 17:00 | 3.0 | 12.5 | P3 | P2 | 0 |
| 4-May-03 | 17.0 | 7 | 89.5 | 5 | 4-May-03 | 17:20 | 3.8 | 14.5 | | | 2 |
| 11-May-03 | 2.1 | 7 | 87.9 | 6 | | | | | | | |
| 18-May-03 | 6.1 | 7 | 85.8 | 7 | 18-May-03 | 16:30 | 5.5 | 15.0 | P1 | P1 | 2 |
| 25-May-03 | 4.0 | 7 | 83.6 | 7 | 26-May-03 | 16:15 | 5.0 | 18.5 | | | |
| 1-Jun-03 | 0.0 | 7 | 80.5 | 7 | 1-Jun-03 | 14:40 | 4.5 | 19.5 | | | |
| 8-Jun-03 | 3.0 | 7 | 76.2 | 7 | 12-Jun-03 | 8:20 | 5.0 | 20.5 | P2 | P1 | |
| 15-Jun-03 | 21.0 | 7 | 73.4 | 6 | 15-Jun-03 | 18:00 | 4.8 | 21.5 | P3 | P1 | |
| 22-Jun-03 | 4.0 | 7 | 71.4 | 7 | 25-Jun-03 | 15:30 | 4.3 | 21.0 | | | |
| 29-Jun-03 | 0.0 | 7 | 66.8 | 6 | 1-Jul-03 | 10:30 | 5.0 | 21.0 | P1 | P1 | |
| 6-Jul-03 | 0.0 | 7 | 63.0 | 7 | 8-Jul-03 | 16:00 | 4.8 | 22.0 | | P1 | 42 |
| 13-Jul-03 | 0.0 | 7 | 58.2 | 6 | 13-Jul-03 | 16:30 | 3.8 | 23.0 | | NA | |
| 20-Jul-03 | 0.0 | 7 | 54.3 | 7 | 20-Jul-03 | 19:30 | 6.3 | 24.0 | | | |
| 27-Jul-03 | 0.0 | 7 | 49.1 | 7 | | | | | | | |
| 3-Aug-03 | 0.0 | 7 | 44.5 | 7 | | | | | | | |
| 10-Aug-03 | 10.0 | 7 | 41.4 | 7 | 11-Aug-03 | 16:45 | 4.3 | 23.5 | NA | NA | |
| 17-Aug-03 | 0.0 | 7 | 37.2 | 7 | 17-Aug-03 | 16:00 | 4.0 | 24.0 | P2 | P1 | |
| 24-Aug-03 | 0.0 | 7 | 33.3 | 7 | 24-Aug-03 | 14:40 | 4.3 | 22.5 | P2 | P1 | |
| 31-Aug-03 | 0.0 | 7 | 29.5 | 7 | 31-Aug-03 | 15:45 | 4.0 | 23.5 | P3 | P1 | |
| 7-Sep-03 | 48.5 | 7 | 29.6 | 7 | 7-Sep-03 | 16:30 | 3.8 | 22.0 | P1 | P1 | |
| 14-Sep-03 | 33.0 | 7 | 31.6 | 7 | 14-Sep-03 | 15:15 | 3.8 | 20.0 | P1 | P1 | |
| 21-Sep-03 | 0.0 | 7 | 31.7 | 7 | 21-Sep-03 | 11:30 | 5.3 | 18.0 | P1 | P1 | |
| 28-Sep-03 | 0.0 | 3 | 29.8 | 3 | 28-Sep-03 | 16:45 | 5.0 | 20.0 | P3 | P2 | 41 |
| Min | 0.0 | | 25.4 | | Min | | 1.8 | 5.5 | | | 0 |
| Max | 88.0 | | 91.5 | | Max | | 6.3 | 24.0 | | | 42 |
| Total | 1038.5 | | | | | | | | | | |

Pine

2003 Level II Data

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 12.5 | 3.0 | 7.2 | 12.5 | 419 | 1 | 34 | 44.1 | 49.9 | 40.6 | |
| 5-May | 14.5 | 3.8 | 4.1 | 10.1 | 344 | | 34 | 40.7 | 44.4 | 37.5 | Too much wind and debris to determine algae. |
| 18-May | 15.0 | 5.5 | 2.7 | 8.0 | 303 | 1 | 38 | 35.4 | 40.2 | 34.1 | |
| 1-Jun | 19.5 | 4.5 | 2.5 | 7.9 | 306 | | 39 | 38.3 | 39.6 | 34.0 | Cottonwood confuses algae count. |
| 15-Jun | 21.5 | 4.8 | 1.6 | 9.9 | 328 | 1 | 33 | 37.4 | 35.2 | 37.2 | |
| 1-Jul | 21.0 | 5.0 | 2.2 | 6.6 | 336 | 1 | 51 | 36.8 | 38.3 | 31.4 | |
| 13-Jul | 23.0 | 3.8 | 2.3 | 23.6 | 481 | 1 | 20 | 40.7 | 38.6 | 49.8 | |
| 28-Jul | 24.0 | 22.0 | 1.8 | 6.0 | 351 | | 59 | 15.4 | 36.3 | 30.0 | |
| 11-Aug | 23.5 | 4.3 | 2.1 | 7.9 | 371 | 1 | 47 | 39.0 | 38.0 | 33.9 | |
| 24-Aug | 22.5 | 4.6 | 1.5 | 5.0 | 368 | 1 | 74 | 38.0 | 34.5 | 27.4 | |
| 7-Sep | 22.0 | 3.8 | 2.4 | 8.7 | 320 | 1 | 37 | 40.7 | 39.2 | 35.4 | |
| 21-Sep | 18.0 | 5.3 | 4.7 | 6.4 | 330 | 1 | 52 | 35.9 | 45.6 | 30.9 | |
| 5-Oct | 17.0 | 5.8 | 5.0 | 9.3 | 368 | 1 | 40 | 34.6 | 46.3 | 36.3 | |
| 19-Oct | 14.5 | 5.1 | 3.1 | 11.9 | 390 | 1 | 33 | 36.5 | 41.7 | 39.9 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.2 | 5.8 | 3.1 | 9.6 | 358.2 | 1.0 | 42 | 36.7 | 40.6 | 35.6 | TSI Average = 37.6 |
| Median | 20.3 | 4.7 | 2.5 | 8.4 | 347.5 | 1 | 38 | 37.7 | 39.4 | 34.8 | |
| Min | 12.5 | 3.0 | 1.5 | 5.0 | 303.0 | 1 | 20 | 15.4 | 34.5 | 27.4 | |
| Max | 24.0 | 22.0 | 7.2 | 23.6 | 481.0 | 1 | 74 | 44.1 | 49.9 | 49.8 | |
| Count | 14 | 14 | 14 | 14 | 14 | 11 | 14 | 14 | 14 | 14 | |

Pipe

Lake Overview

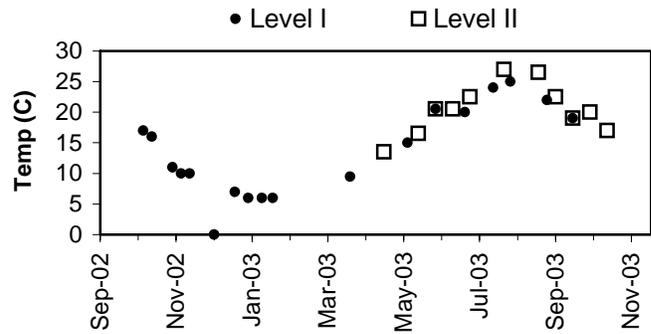
Volunteer monitoring began at Pipe Lake in the 1980s and has continued through 2003, with a gap from 1989–1992. The data indicate this city lake (Maple Valley–Covington) is low to moderate in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up 17% of the drainage area, direct precipitation is important in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed almost 66% of the surrounding watershed has been developed for uses other than agriculture.

Pipe Lake has no public access boat launch, but has a history of both milfoil and hydrilla infestations for which eradication efforts have been funded by government agencies since 1995. Residents should watch aquatic plants growing nearshore to catch growing patches of these and other noxious weeds.

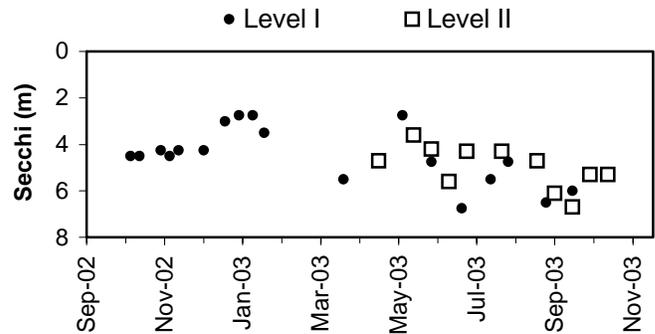
Physical Parameters

Secchi transparency through the year ranged from 2.8 to 6.8m. Water temperatures for the same period ranged from 6.0 to 27.0 degrees Celsius. Local precipitation was measured through the year, but was not accompanied by water level observations.

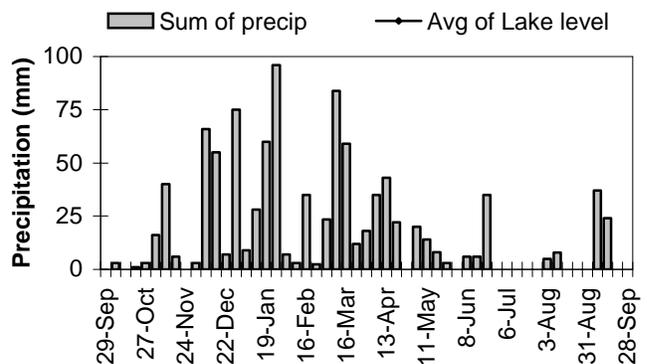
Lake Temperature



Secchi Depth

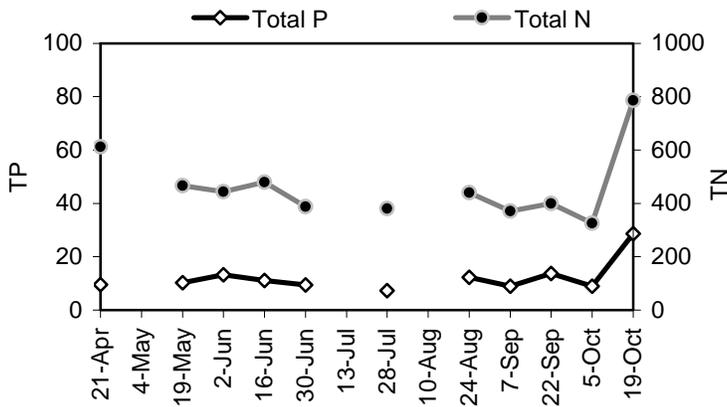


Lake Level and Precipitation

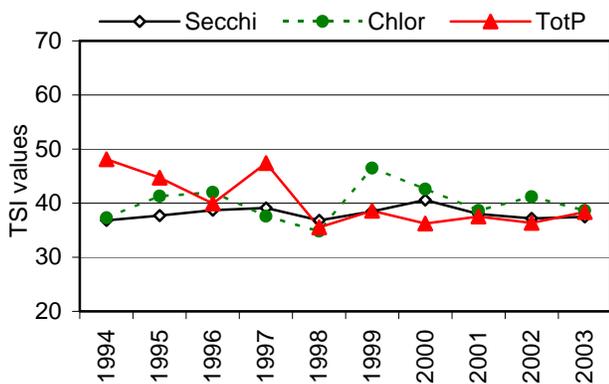


Pipe

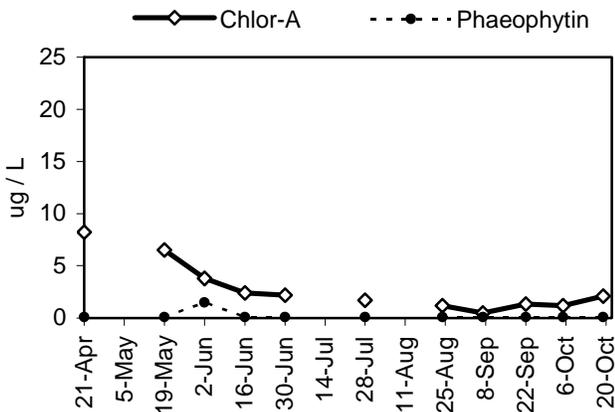
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-------------------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Botryococcus braunii</i> | chlorophyte |
| <i>Fragilaria crotonensis</i> | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in fairly constant proportion to each other through the sampling period, with both showing a sharp increase on the last sample date. The N:P ratio ranged from 28 to 64. The 2003 TSI values were very close to each other at the high end of the oligotrophic range, similar to 2001. In some other years, the indicators have not been in close agreement with each other, but with no distinct pattern to the divergence.

Chlorophyll and Algae

Chlorophyll was high at the beginning of the sample season, declining to low values through the rest of the period. The most common species included the large colonial chlorophyte *Botryococcus braunii* and an unidentified chrysophyte species, along with the diatom *Fragilaria*. The bluegreens *Anacystis*, *Aphanizomenon*, and *Snowella* were also frequently encountered in the samples, but did not make large populations.

Pipe

2003 Level I Data

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|----------------|------------------|--------------|
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | 3.0 | 7 | | | 6-Oct-02 | 13:00 | 4.5 | 17.0 | C1 | C1 | 0 |
| 13-Oct-02 | 0.0 | 7 | | | 13-Oct-02 | 14:00 | 4.5 | 16.0 | C1 | C1 | 0 |
| 20-Oct-02 | 1.0 | 7 | | | | | | | | | |
| 27-Oct-02 | 3.0 | 7 | | | 30-Oct-02 | 13:00 | 4.3 | 11.0 | C1 | C1 | 0 |
| 3-Nov-02 | 16.0 | 7 | | | 6-Nov-02 | 13:00 | 4.5 | 10.0 | C1 | C1 | 0 |
| 10-Nov-02 | 40.0 | 7 | | | 13-Nov-02 | 14:00 | 4.3 | 10.0 | C1 | C1 | 0 |
| 17-Nov-02 | 6.0 | 7 | | | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | | | | | | | | | |
| 1-Dec-02 | 3.0 | 7 | | | 3-Dec-02 | 14:00 | 4.3 | | C1 | C1 | 50 |
| 8-Dec-02 | 66.0 | 5 | | | | | | | | | |
| 15-Dec-02 | 55.0 | 7 | | | | | | | | | |
| 22-Dec-02 | 7.0 | 5 | | | 20-Dec-02 | 13:00 | 3.0 | 7.0 | C1 | C1 | 10 |
| 29-Dec-02 | 75.0 | 7 | | | 31-Dec-02 | 11:00 | 2.8 | 6.0 | C1 | C1 | 0 |
| 5-Jan-03 | 9.0 | 7 | | | | | | | | | |
| 12-Jan-03 | 28.0 | 7 | | | 11-Jan-03 | 11:00 | 2.8 | 6.0 | C1 | C1 | 0 |
| 19-Jan-03 | 60.0 | 7 | | | 20-Jan-03 | 13:00 | 3.5 | 6.0 | C1 | C1 | 0 |
| 26-Jan-03 | 96.0 | 7 | | | | | | | | | |
| 2-Feb-03 | 7.0 | 7 | | | | | | | | | |
| 9-Feb-03 | 3.0 | 7 | | | | | | | | | |
| 16-Feb-03 | 35.0 | 4 | | | | | | | | | |
| 23-Feb-03 | 2.4 | ** | | | | | | | | | |
| 2-Mar-03 | 23.4 | ** | | | | | | | | | |
| 9-Mar-03 | 83.8 | 6 | | | | | | | | | |
| 16-Mar-03 | 59.0 | 7 | | | | | | | | | |
| 23-Mar-03 | 12.0 | 7 | | | 24-Mar-03 | 13:00 | 5.5 | 9.5 | C1 | C1 | 0 |
| 30-Mar-03 | 18.0 | 7 | | | | | | | | | |
| 6-Apr-03 | 35.0 | 7 | | | | | | | | | |
| 13-Apr-03 | 43.0 | 7 | | | | | | | | | |
| 20-Apr-03 | 22.0 | 7 | | | | | | | | | |
| 27-Apr-03 | 0.0 | 4 | | | | | | | | | |
| 4-May-03 | 20.0 | 6 | | | | | | | | | |
| 11-May-03 | 14.0 | 7 | | | 10-May-03 | 11:00 | 2.8 | 15.0 | C2 | C2 | 0 |
| 18-May-03 | 8.1 | 7 | | | | | | | | | |
| 25-May-03 | 3.0 | 7 | | | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | | | 2-Jun-03 | 16:00 | 4.8 | 20.5 | C1 | C1 | 0 |
| 8-Jun-03 | 6.0 | 7 | | | | | | | | | |
| 15-Jun-03 | 6.0 | 7 | | | | | | | | | |
| 22-Jun-03 | 35.0 | 5 | | | 26-Jun-03 | 8:00 | 6.8 | 20.0 | C1 | C1 | 0 |
| 29-Jun-03 | 0.0 | 0 | | | | | | | | | |
| 6-Jul-03 | 0.0 | 6 | | | | | | | | | |
| 13-Jul-03 | 0.1 | 7 | | | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | | | 19-Jul-03 | 9:00 | 5.5 | 24.0 | C1 | C1 | 40 |
| 27-Jul-03 | 0.0 | 7 | | | | | | | | | |
| 3-Aug-03 | 5.0 | 7 | | | 2-Aug-03 | 9:00 | 4.8 | 25.0 | C1 | C1 | 3 |
| 10-Aug-03 | 8.0 | 7 | | | | | | | | | |
| 17-Aug-03 | 0.1 | 7 | | | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | | | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | | | 1-Sep-03 | 9:00 | 6.5 | 22.0 | C1 | C1 | 0 |
| 7-Sep-03 | 37.0 | 6 | | | | | | | | | |
| 14-Sep-03 | 24.0 | 7 | | | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | | | 22-Sep-03 | 13:00 | 6.0 | 19.0 | C1 | C1 | 35 |
| 28-Sep-03 | 0.0 | 3 | | | | | | | | | |
| Min | 0.0 | | 0.0 | | | Min | 2.8 | 6.0 | | | 0 |
| Max | 96.0 | | 0.0 | | | Max | 6.8 | 25.0 | | | 50 |
| Total | 977.7 | | | | | | | | | | |

Pipe

2003 Level II Data

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.5 | 4.7 | 8.2 | 9.5 | 613 | 3 | 65 | 37.7 | 51.2 | 36.6 | Something is blooming. |
| 5-May | | | | | | | | | | | No sample. |
| 19-May | 16.5 | 3.6 | 6.5 | 10.2 | 466 | | 46 | 41.5 | 49.0 | 37.7 | |
| 2-Jun | 20.5 | 4.2 | 3.8 | 13.2 | 444 | 1 | 34 | 39.3 | 43.7 | 41.4 | |
| 16-Jun | 20.5 | 5.6 | 2.4 | 11.0 | 480 | 1 | 44 | 35.1 | 39.2 | 38.7 | |
| 30-Jun | 22.5 | 4.3 | 2.2 | 9.3 | 388 | 1 | 42 | 39.0 | 38.3 | 36.3 | |
| 13-Jul | | | | | | | | | | | No sample. |
| 28-Jul | 27.0 | 4.3 | 1.7 | 7.2 | 380 | 0 | 53 | 39.0 | 35.8 | 32.6 | |
| 11-Aug | | | | | | | | | | | No sample. |
| 25-Aug | 26.5 | 4.7 | 1.2 | 12.2 | 440 | 2 | 36 | 37.7 | 32.4 | 40.2 | Chlor-a might be high; Spirogyra included in |
| 8-Sep | 22.5 | 6.1 | 0.6 | 8.8 | 371 | 0 | 42 | 33.9 | | 35.5 | Chlor-a value was <MDL. Reported as .6µgl. |
| 22-Sep | 19.0 | 6.7 | 1.4 | 13.6 | 399 | 2 | 29 | 32.6 | 33.6 | 41.8 | |
| 6-Oct | 20.0 | 5.3 | 1.2 | 8.9 | 325 | 0 | 37 | 35.9 | 32.4 | 35.7 | |
| 20-Oct | 17.0 | 5.3 | 2.1 | 28.6 | 786 | 0 | 28 | 35.9 | 37.8 | 52.5 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.5 | 5.0 | 2.8 | 12.0 | 462.9 | 1.0 | 41 | 37.0 | 39.3 | 39.0 | TSI Average = 38.0 |
| Median | 20.5 | 4.7 | 2.1 | 10.2 | 440.0 | 1 | 42 | 37.7 | 38.1 | 37.7 | |
| Min | 13.5 | 3.6 | 0.6 | 7.2 | 325.0 | 0 | 28 | 32.6 | 32.4 | 32.6 | |
| Max | 27.0 | 6.7 | 8.2 | 28.6 | 786.0 | 3 | 65 | 41.5 | 51.2 | 52.5 | |
| Count | 11 | 11 | 11 | 11 | 11 | 10 | 11 | 11 | 10 | 11 | |

Ravensdale

Lake Overview

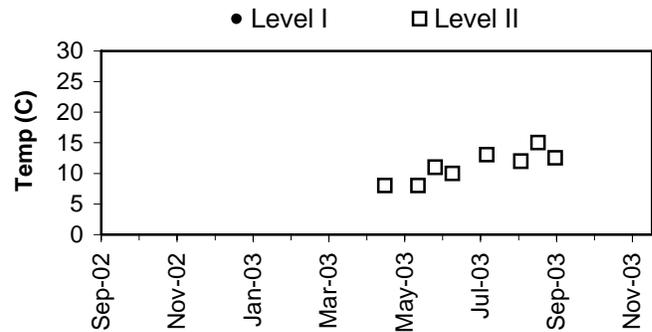
Volunteers monitored Ravensdale Lake from 1996 – 1998, and again in 2002-2003. The data collected suggest that this lake is relatively low in primary productivity (oligotrophic - mesotrophic) with very good water quality. There is one Class 1 and two Class 2 wetlands in the watershed, while the shoreline of the lake is part of a Class 2 wetland system (King County, 1990). Land use analysis of 2002 aerial photographs showed less than 1% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Ravensdale Lake has no public access boat launch. Lake users should keep a close eye on aquatic plants growing nearshore to catch infestations of Eurasian milfoil, Brazilian elodea or other aquatic noxious weeds.

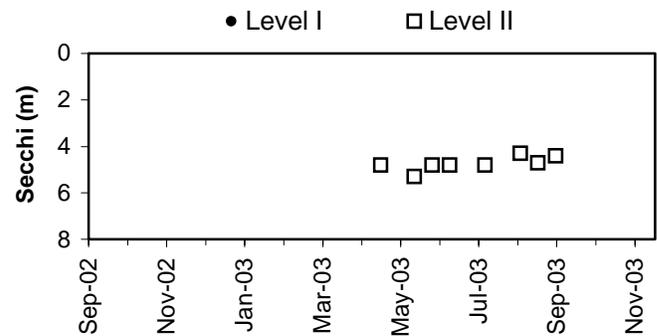
Physical Parameters

Secchi transparency was collected from late April through early September, ranging between 4.3 and 5.3m through the period. Surface water temperatures reached a maximum of 15.0 degrees Celsius during the same time. There were no precipitation or water level records.

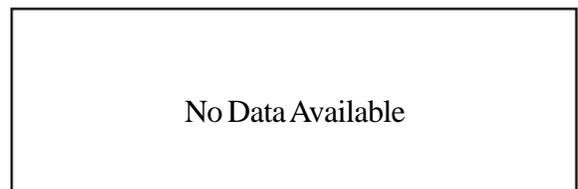
Lake Temperature



Secchi Depth

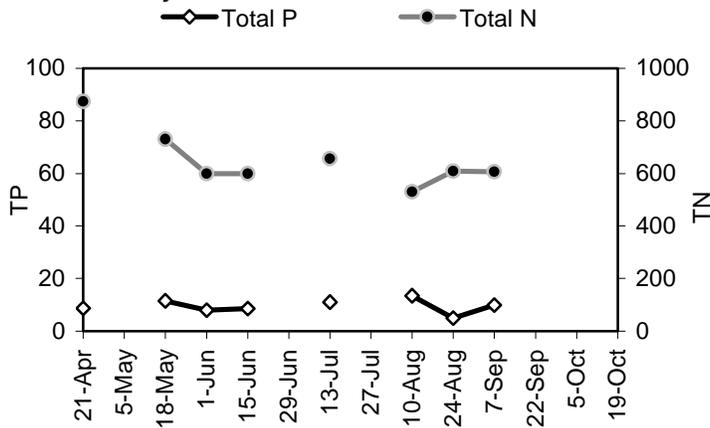


Lake Level and Precipitation

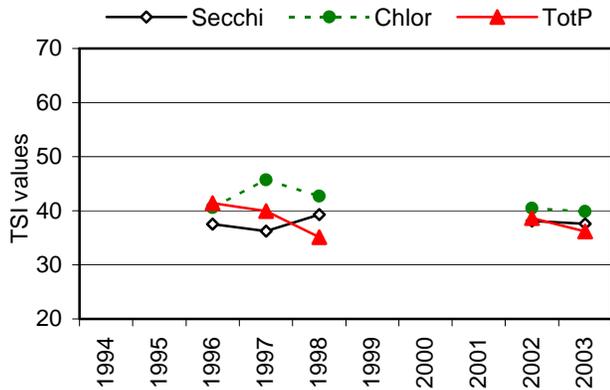


Ravensdale

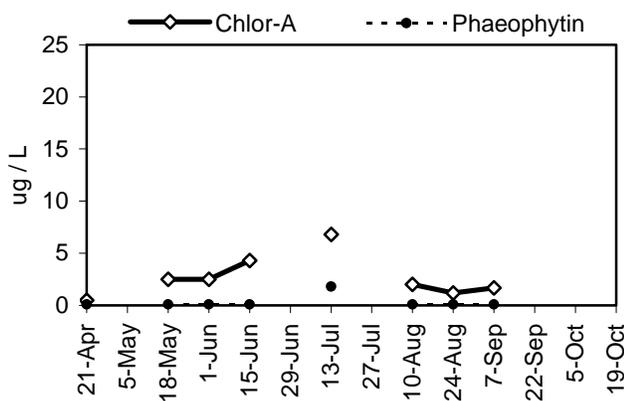
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|--------------------------------|-------------|
| unidentified species | chrysophyte |
| <i>Cryptomonas</i> spp | cryptophyte |
| unidentified filamentous algae | chlorophyte |

Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained relatively stable through the period sampled, although the N:P ratio ranged from 39 to 122. In 2003 the three average TSI values were close together in the upper range of oligotrophy, slightly lower than in 2002.

Chlorophyll and Algae

Chlorophyll was generally low through the sample period, reaching a small peak in mid-July. The algae in the plankton were dominated by unidentified chrysophyte species, various *Cryptomonas* species, and an unidentified filament in the chlorophyte group. Dinoflagellates such as *Ceratium* and *Peridinium* were common, as well as several different bottom-dwelling diatom species.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 8.0 | 4.8 | 0.6 | 8.7 | 874 | 0 | 100 | 37.4 | | 35.4 | Chlor-a value was <MDL. Reported as .6µgl. |
| 5-May | | | | | | | | | | | No sample. |
| 18-May | 8.0 | 5.3 | 2.5 | 11.5 | 731 | 1 | 64 | 35.9 | 39.6 | 39.4 | |
| 1-Jun | 11.0 | 4.8 | 2.5 | 8.0 | 600 | 1 | 75 | 37.4 | 39.6 | 34.1 | |
| 15-Jun | 10.0 | 4.8 | 4.3 | 8.6 | 600 | 1 | 70 | 37.4 | 44.9 | 35.2 | |
| 29-Jun | | | | | | | | | | | No sample. |
| 13-Jul | 13.0 | 4.8 | 6.8 | 11.1 | 657 | 1 | 59 | 37.4 | 49.4 | 38.9 | |
| 27-Jul | | | | | | | | | | | No sample. |
| 10-Aug | 12.0 | 4.3 | 2.0 | 13.5 | 530 | 1 | 39 | 39.0 | 37.5 | 41.7 | |
| 24-Aug | 15.0 | 4.7 | 1.2 | 5.0 | 610 | 1 | 122 | 37.7 | 32.4 | 27.4 | |
| 7-Sep | 12.5 | 4.4 | 1.7 | 10.0 | 607 | 1 | 61 | 38.6 | 35.7 | 37.4 | |
| 21-Sep | | | | | | | | | | | No sample. |
| 6-Oct | | | | | | | | | | | No sample. |
| 20-Oct | | | | | | | | | | | No sample. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 11.2 | 4.7 | 2.7 | 9.6 | 651.1 | 0.9 | 74 | 37.6 | 39.9 | 36.2 | TSI Average = 37.9 |
| Median | 11.5 | 4.8 | 2.3 | 9.4 | 608.5 | 1 | 67 | 37.4 | 39.6 | 36.4 | |
| Min | 8.0 | 4.3 | 0.6 | 5.0 | 530.0 | 0 | 39 | 35.9 | 32.4 | 27.4 | |
| Max | 15.0 | 5.3 | 6.8 | 13.5 | 874.0 | 1 | 122 | 39.0 | 49.4 | 41.7 | |
| Count | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 8 | |

Sammamish

Lake Overview

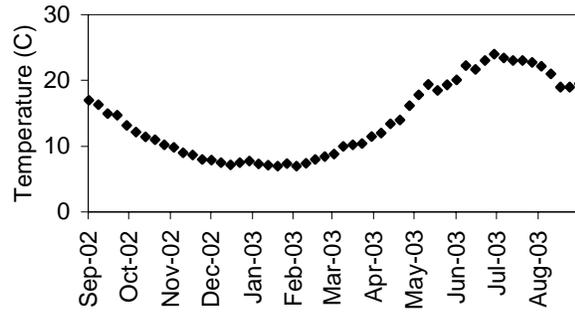
Volunteer monitoring for Level I began at Lake Sammamish in 1999 and has continued through 2003. The lake surface makes up less than 8% of the drainage area, so direct precipitation is less important than inlet streams, stormwater runoff and groundwater. There are multiple jurisdictions around the lake and in the watershed. Two major inlets (Issaquah and Tibbetts Creeks) run through the city of Issaquah, while the outlet exits through King County at Marymoor Park. Current land use is complex and mixed, but much of the watershed is currently experiencing development.

Lake Sammamish has a public access boat launch and several large parks. There is a history of Eurasian milfoil infestation and control efforts in various locations. Residents should watch for new patches of Eurasian milfoil, Brazilian elodea, as well as other listed noxious weeds.

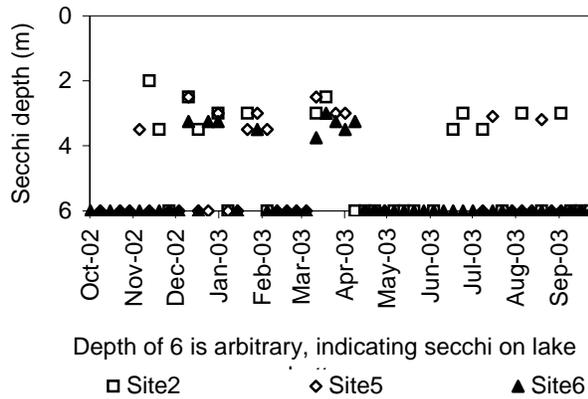
Physical Parameters

Multiple volunteers measured Secchi transparency off their docks, and when the Secchi could still be seen at lake bottom, it is marked as “6” on the chart. Water levels showed a response to several large precipitation events in January and February, receding slowly through the summer months. Annual water temperatures ranged from 6 to 25.0 degrees Celsius, with close agreement among the volunteer data.

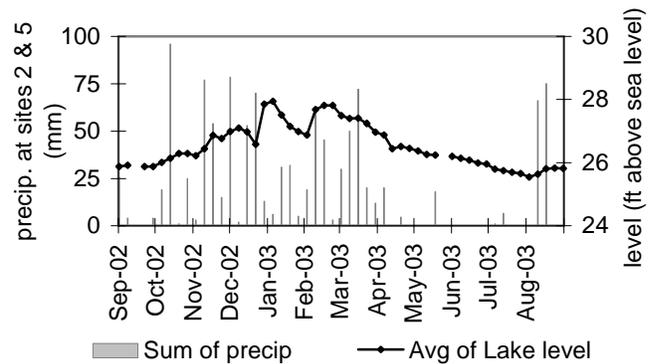
Lake Temperature



Secchi Depth



Lake Level and Precipitation



Sammamish Sites 2,5

2003 Level I Data

| Site 2 Data Summary* | | | | | Site 5 Data Summary* | | | | |
|----------------------|---------------------|------------------------|-------------------|------------------|----------------------|---------------------|------------------------|-------------------|------------------|
| Week of | Sum of precip. (mm) | Avg of lake level (ft) | Weekly Secchi (m) | Avg of Temp (°C) | Week of | Sum of precip. (mm) | Avg of lake level (ft) | Weekly Secchi (m) | Avg of Temp (°C) |
| 29-Sep-02 | | | | | 29-Sep-02 | 26.0 | 25.9 | | |
| 6-Oct-02 | | | | | 6-Oct-02 | 4.0 | 25.9 | + | 16.0 |
| 13-Oct-02 | | | | | 13-Oct-02 | | | | |
| 20-Oct-02 | | | | | 20-Oct-02 | 0.0 | 25.9 | + | 14.0 |
| 27-Oct-02 | | | | | 27-Oct-02 | 4.0 | 25.9 | + | 12.5 |
| 3-Nov-02 | | | | | 3-Nov-02 | 19.0 | 26.0 | 3.5 | 11.5 |
| 10-Nov-02 | 52.0 | 26.0 | 2.0 | 11.0 | 10-Nov-02 | 44.0 | 26.2 | + | 11.0 |
| 17-Nov-02 | 1.0 | | 3.5 | 11.0 | 17-Nov-02 | 0.0 | | | |
| 24-Nov-02 | 9.0 | 26.3 | + | 10.0 | 24-Nov-02 | 16.0 | 26.3 | + | 11.5 |
| 1-Dec-02 | 4.0 | 26.2 | | 9.0 | 1-Dec-02 | 2.0 | 26.2 | + | 10.0 |
| 8-Dec-02 | 29.0 | 26.4 | 2.5 | 9.0 | 8-Dec-02 | 48.0 | 26.5 | 2.5 | 9.0 |
| 15-Dec-02 | | | 3.5 | | 15-Dec-02 | 54.0 | 26.9 | + | 8.5 |
| 22-Dec-02 | 15.0 | 26.8 | | 8.0 | 22-Dec-02 | 0.0 | 26.7 | + | 8.0 |
| 29-Dec-02 | 82.0 | 27.1 | 3.0 | 7.0 | 29-Dec-02 | 75.0 | 27.1 | 3.0 | 8.0 |
| 5-Jan-03 | 2.0 | 27.2 | + | | 5-Jan-03 | 0.0 | 27.0 | + | 7.5 |
| 12-Jan-03 | 29.0 | 27.0 | | 7.0 | 12-Jan-03 | 24.0 | 26.9 | + | 7.5 |
| 19-Jan-03 | 72.0 | 27.2 | 3.0 | 8.0 | 19-Jan-03 | 68.0 | 27.4 | 3.5 | 8.0 |
| 26-Jan-03 | 13.0 | | | 8.0 | 26-Jan-03 | 0.0 | 28.1 | 3.0 | 7.5 |
| 2-Feb-03 | | | + | | 2-Feb-03 | 6.0 | 27.8 | 3.5 | 7.0 |
| 9-Feb-03 | 30.0 | 27.4 | | 7.0 | 9-Feb-03 | 1.0 | 27.6 | + | 7.5 |
| 16-Feb-03 | | | | | 16-Feb-03 | 32.0 | 27.1 | + | 7.0 |
| 23-Feb-03 | | | | | 23-Feb-03 | 5.0 | 26.9 | + | 7.5 |
| 2-Mar-03 | | | | | 2-Mar-03 | 19.0 | 26.9 | + | 7.0 |
| 9-Mar-03 | 128.0 | 28.2 | 3.0 | 7.0 | 9-Mar-03 | 60.0 | 27.9 | 2.5 | 8.0 |
| 16-Mar-03 | 49.0 | 28.1 | 2.5 | 8.0 | 16-Mar-03 | 42.0 | 27.9 | | |
| 23-Mar-03 | 2.0 | | | | 23-Mar-03 | 1.0 | 27.9 | 3.0 | 9.5 |
| 30-Mar-03 | | | | | 30-Mar-03 | 30.0 | 27.5 | 3.0 | 8.5 |
| 6-Apr-03 | 50.0 | | + | 10.0 | 6-Apr-03 | 0.0 | | | |
| 13-Apr-03 | 30.0 | 27.4 | + | 10.0 | 13-Apr-03 | 42.0 | 27.4 | + | 11.0 |
| 20-Apr-03 | 4.0 | 27.2 | + | 11.0 | 20-Apr-03 | 16.0 | 27.3 | + | 10.5 |
| 27-Apr-03 | 12.0 | | | 11.0 | 27-Apr-03 | 0.0 | | + | 12.0 |
| 4-May-03 | 20.0 | | + | | 4-May-03 | 0.0 | | | |
| 11-May-03 | 0.0 | | + | 14.0 | 11-May-03 | 0.0 | | | |
| 18-May-03 | 4.5 | | + | 14.0 | 18-May-03 | 0.0 | | | |
| 25-May-03 | 0.0 | | | 15.0 | 25-May-03 | 0.0 | | | |
| 1-Jun-03 | 0.0 | | + | 18.0 | 1-Jun-03 | 0.0 | | | |
| 8-Jun-03 | 0.0 | | | 20.0 | 8-Jun-03 | 0.0 | | | |
| 15-Jun-03 | 18.0 | | 3.5 | 18.0 | 15-Jun-03 | 0.0 | | | |
| 22-Jun-03 | | | 3.0 | | 22-Jun-03 | | | | |
| 29-Jun-03 | | | | 20.0 | 29-Jun-03 | 0.0 | 26.2 | | |
| 6-Jul-03 | 0.0 | 26.1 | 3.5 | 22.0 | 6-Jul-03 | 0.0 | 26.2 | + | 23.5 |
| 13-Jul-03 | | | | | 13-Jul-03 | 0.0 | 26.1 | 3.1 | 22.0 |
| 20-Jul-03 | 0.0 | | + | 24.0 | 20-Jul-03 | 0.0 | | | |
| 27-Jul-03 | 0.0 | 25.9 | | | 27-Jul-03 | 0.0 | 26.0 | + | |
| 3-Aug-03 | 0.0 | 25.8 | 3.0 | 24.0 | 3-Aug-03 | 1.0 | 25.8 | + | 22.5 |
| 10-Aug-03 | 6.0 | 25.7 | | | 10-Aug-03 | 1.0 | 25.8 | + | 23.0 |
| 17-Aug-03 | | | + | | 17-Aug-03 | 0.0 | 25.7 | 3.2 | 23.0 |
| 24-Aug-03 | 0.0 | 25.7 | | 24.0 | 24-Aug-03 | 0.0 | 25.7 | + | 23.0 |
| 31-Aug-03 | 0.0 | 25.5 | 3.0 | 22.0 | 31-Aug-03 | 0.0 | 25.6 | + | 22.0 |
| 7-Sep-03 | 30.0 | 25.6 | + | | 7-Sep-03 | 36.0 | 25.7 | + | 20.0 |
| 14-Sep-03 | 62.0 | 25.8 | + | 20.0 | 14-Sep-03 | 34.0 | 25.9 | + | 19.0 |
| 21-Sep-03 | 0.0 | | + | 20.0 | 21-Sep-03 | 0.0 | | | |
| 28-Sep-03 | | | | 20.0 | 28-Sep-03 | 0.0 | | | |
| Min | 0.0 | 25.5 | 2.0 | 7.0 | Min | 0.0 | 25.6 | 2.5 | 7.0 |
| Max | 128.0 | 28.2 | 3.5 | 24.0 | Max | 75.0 | 28.1 | 3.5 | 23.5 |
| Total | 753.5 | | | | Total | 710.0 | | | |

Sammamish Site 6

2003 Level I Data

Sammamish Site 6 Data Summary*

| Week of | Sum of precip. (mm) | Avg of lake level (ft) | Weekly Secchi (m) | Avg of Temp (°C) |
|--------------|---------------------|------------------------|-------------------|------------------|
| 29-Sep-02 | | 25.9 | + | 17.0 |
| 6-Oct-02 | | 25.9 | + | 16.5 |
| 13-Oct-02 | | | + | 15.0 |
| 20-Oct-02 | | 25.9 | + | 15.0 |
| 27-Oct-02 | | 25.9 | + | 13.5 |
| 3-Nov-02 | | 25.9 | + | 12.5 |
| 10-Nov-02 | | 26.2 | + | 11.5 |
| 17-Nov-02 | | 26.3 | + | 11.0 |
| 24-Nov-02 | | 26.3 | + | 10.0 |
| 1-Dec-02 | | 26.2 | + | 10.0 |
| 8-Dec-02 | | 26.3 | 3.3 | 9.0 |
| 15-Dec-02 | | 26.9 | + | 8.8 |
| 22-Dec-02 | | 26.7 | 3.3 | 8.0 |
| 29-Dec-02 | | 26.9 | 3.3 | 8.0 |
| 5-Jan-03 | | 27.1 | | 7.5 |
| 12-Jan-03 | | 27.0 | + | 7.0 |
| 19-Jan-03 | | 26.4 | | 7.3 |
| 26-Jan-03 | | 27.8 | 3.5 | 7.7 |
| 2-Feb-03 | | 28.0 | + | 7.5 |
| 9-Feb-03 | | 27.5 | + | 7.0 |
| 16-Feb-03 | | 27.2 | + | 7.0 |
| 23-Feb-03 | | 27.0 | + | 7.3 |
| 2-Mar-03 | | 26.9 | + | 7.0 |
| 9-Mar-03 | | 27.5 | 3.8 | 7.3 |
| 16-Mar-03 | | 27.7 | 3.0 | 8.0 |
| 23-Mar-03 | | 27.8 | 3.3 | 8.3 |
| 30-Mar-03 | | 27.6 | 3.5 | 9.0 |
| 6-Apr-03 | | 27.4 | 3.3 | 10.0 |
| 13-Apr-03 | | 27.5 | + | 10.0 |
| 20-Apr-03 | | 27.3 | + | 10.3 |
| 27-Apr-03 | | 27.1 | + | 11.5 |
| 4-May-03 | | 26.9 | + | 12.0 |
| 11-May-03 | | 26.7 | + | 13.3 |
| 18-May-03 | | 26.6 | + | 14.0 |
| 25-May-03 | | 26.5 | + | 16.8 |
| 1-Jun-03 | | 26.4 | + | 17.8 |
| 8-Jun-03 | | 26.3 | + | 19.2 |
| 15-Jun-03 | | 26.2 | + | 19.0 |
| 22-Jun-03 | | | + | 19.3 |
| 29-Jun-03 | | 26.2 | + | 20.2 |
| 6-Jul-03 | | 26.1 | + | 21.8 |
| 13-Jul-03 | | 26.0 | + | 21.5 |
| 20-Jul-03 | | 26.0 | + | 22.8 |
| 27-Jul-03 | | 25.9 | + | 24.0 |
| 3-Aug-03 | | 25.8 | + | 23.5 |
| 10-Aug-03 | | 25.8 | + | 23.0 |
| 17-Aug-03 | | 25.7 | + | 23.0 |
| 24-Aug-03 | | 25.6 | + | 22.0 |
| 31-Aug-03 | | 25.6 | + | 22.3 |
| 7-Sep-03 | | 25.6 | + | 21.5 |
| 14-Sep-03 | | 25.8 | + | 18.0 |
| 21-Sep-03 | | 25.8 | + | 18.5 |
| 28-Sep-03 | | 25.8 | 3.0 | 19.3 |
| Min | 0.0 | 25.6 | 3.0 | 7.0 |
| Max | 0.0 | 28.0 | 3.8 | 24.0 |
| Total | 0.0 | | | |

No Level II Data
Available For This Lake

Sawyer

Lake Overview

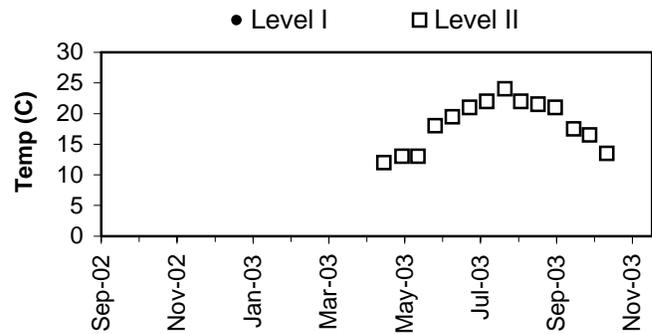
Volunteer monitoring began at Lake Sawyer in the 1980s, continuing through 2003. The data indicate this city lake (Black Diamond) is low to moderate in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up only 3% of the drainage area, direct precipitation is much less important than watershed inputs. Land use analysis of 2002 aerial photographs showed slightly more than 20% of the surrounding watershed has been developed for uses other than agriculture or forestry. A Lake Management Plan has been completed (King County, 2000).

Lake Sawyer has a popular public access boat launch. Eurasian milfoil has invaded the lake and established a growing population. Residents should keep a close eye on aquatic plants growing nearshore to catch growing patches of this, Brazilian elodea, and other noxious weeds.

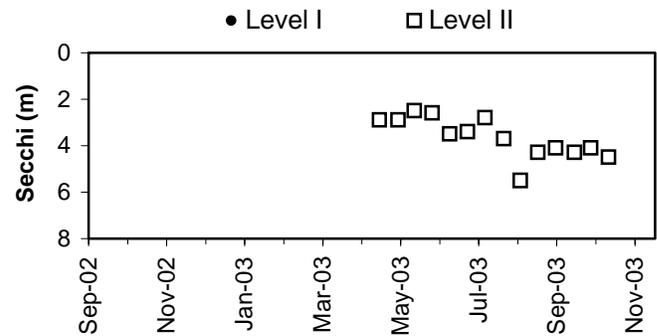
Physical Parameters

Secchi transparency ranged from 2.5 to 5.5m from late April through October. Water temperatures during the same period reached 24.0 degrees Celsius. Excellent records were kept of local precipitation and water levels, showing that levels rose in December and remained high until August, slightly different from many lakes in the region. This may be due to lake size, since large volumes of water can be less impacted by storms.

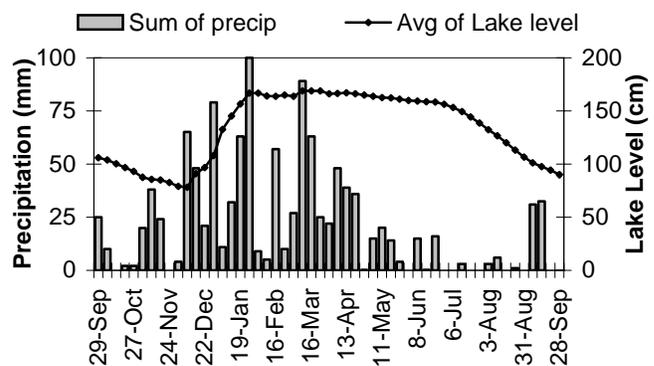
Lake Temperature



Secchi Depth

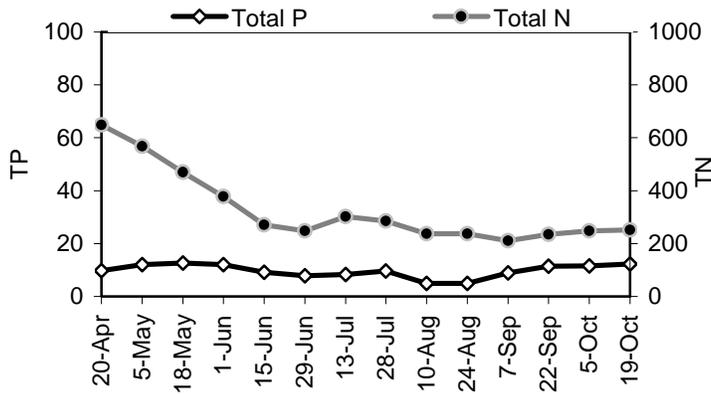


Lake Level and Precipitation

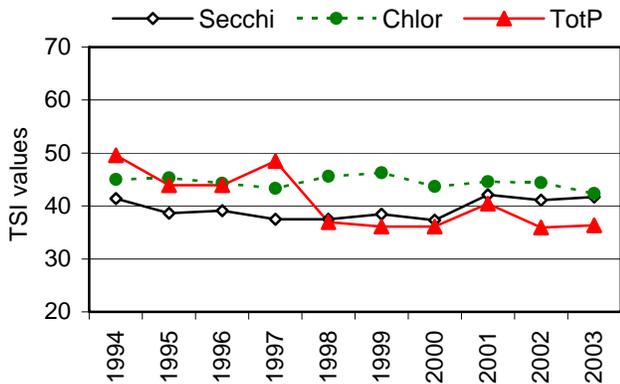


Sawyer

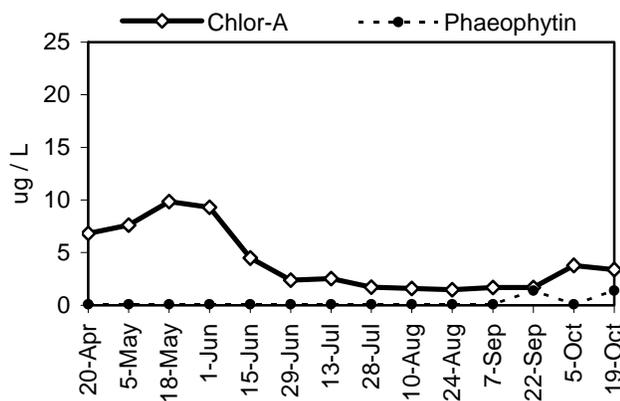
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|--------------------|
| <i>Cyclotella</i> sp. | diatom-chrysophyte |
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased over spring and then remained constant relative to total phosphorus through the remaining sampling period. The N:P ratio ranged from 20 to 67. In 2003 the average TSI values were spread across the threshold between oligotrophy and mesotrophy. TSI-TP was lower than the other two average values, similar to past years since 1998.

Chlorophyll and Algae

Chlorophyll concentrations were highest in the spring, decreasing to low values in summer and rising again slightly in October. The spring algae were dominated by the diatom-chrysophyte *Cyclotella*, with a smaller amount of the chrysophyte *Dinobryon*. The much smaller peak in the autumn was characterized by bluegreens, including *Aphanizomenon*, *Lyngbya*, and *Anabaena*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 25.0 | 5 | 105.8 | 5 | | | | | | | |
| 6-Oct-02 | 10.1 | 7 | 103.7 | 7 | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | 100.3 | 7 | | | | | | | |
| 20-Oct-02 | 2.1 | 7 | 96.4 | 7 | | | | | | | |
| 27-Oct-02 | 2.1 | 7 | 92.9 | 7 | | | | | | | |
| 3-Nov-02 | 20.0 | 7 | 87.4 | 7 | | | | | | | |
| 10-Nov-02 | 38.1 | 7 | 85.9 | 7 | | | | | | | |
| 17-Nov-02 | 24.1 | 7 | 85.3 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 82.7 | 7 | | | | | | | |
| 1-Dec-02 | 4.0 | 7 | 79.1 | 7 | | | | | | | |
| 8-Dec-02 | 65.0 | 7 | 78.1 | 7 | | | | | | | |
| 15-Dec-02 | 48.1 | 7 | 90.7 | 7 | | | | | | | |
| 22-Dec-02 | 21.0 | 7 | 96.4 | 7 | | | | | | | |
| 29-Dec-02 | 79.0 | 7 | 107.9 | 7 | | | | | | | |
| 5-Jan-03 | 11.0 | 7 | 132.4 | 7 | | | | | | | |
| 12-Jan-03 | 32.1 | 7 | 145.1 | 7 | | | | | | | |
| 19-Jan-03 | 63.0 | 7 | 156.4 | 7 | | | | | | | |
| 26-Jan-03 | 100.0 | 7 | 166.9 | 7 | | | | | | | |
| 2-Feb-03 | 9.1 | 7 | 166.6 | 7 | | | | | | | |
| 9-Feb-03 | 5.1 | 7 | 164.0 | 7 | | | | | | | |
| 16-Feb-03 | 57.0 | 7 | 163.7 | 7 | | | | | | | |
| 23-Feb-03 | 10.0 | 7 | 164.9 | 7 | | | | | | | |
| 2-Mar-03 | 27.1 | 7 | 163.7 | 7 | | | | | | | |
| 9-Mar-03 | 89.0 | 7 | 168.7 | 7 | | | | | | | |
| 16-Mar-03 | 63.0 | 7 | 168.7 | 7 | | | | | | | |
| 23-Mar-03 | 25.0 | 7 | 168.7 | 7 | | | | | | | |
| 30-Mar-03 | 22.0 | 7 | 166.1 | 7 | | | | | | | |
| 6-Apr-03 | 48.0 | 7 | 166.3 | 7 | | | | | | | |
| 13-Apr-03 | 39.0 | 7 | 167.0 | 7 | | | | | | | |
| 20-Apr-03 | 36.0 | 7 | 166.0 | 7 | | | | | | | |
| 27-Apr-03 | 0.1 | 7 | 165.0 | 7 | | | | | | | |
| 4-May-03 | 15.0 | 7 | 163.9 | 7 | | | | | | | |
| 11-May-03 | 20.1 | 7 | 162.6 | 7 | | | | | | | |
| 18-May-03 | 14.1 | 7 | 162.3 | 7 | | | | | | | |
| 25-May-03 | 4.0 | 7 | 161.1 | 7 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 159.7 | 7 | | | | | | | |
| 8-Jun-03 | 15.0 | 7 | 159.1 | 7 | | | | | | | |
| 15-Jun-03 | 0.1 | 7 | 158.6 | 7 | | | | | | | |
| 22-Jun-03 | 16.0 | 7 | 158.4 | 7 | | | | | | | |
| 29-Jun-03 | 0.1 | 7 | 156.1 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 153.3 | 7 | | | | | | | |
| 13-Jul-03 | 3.0 | 7 | 149.4 | 7 | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | 144.3 | 7 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 138.4 | 7 | | | | | | | |
| 3-Aug-03 | 3.0 | 7 | 132.1 | 7 | | | | | | | |
| 10-Aug-03 | 6.0 | 7 | 126.4 | 7 | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | 120.0 | 7 | | | | | | | |
| 24-Aug-03 | 1.0 | 7 | 113.0 | 7 | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | 106.6 | 7 | | | | | | | |
| 7-Sep-03 | 31.0 | 7 | 101.1 | 7 | | | | | | | |
| 14-Sep-03 | 32.6 | 7 | 97.6 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | 94.1 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | 90.0 | 3 | | | | | | | |
| Min | 0.0 | | 78.1 | | | | 0.0 | 0.0 | | | |
| Max | 100.0 | | 168.7 | | | | 0.0 | 0.0 | | | |
| Total | 1135.5 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 12.0 | 2.9 | 6.8 | 9.7 | 648 | 0 | 67 | 44.6 | 49.4 | 36.9 | |
| 5-May | 13.0 | 2.9 | 7.6 | 12.0 | 568 | 1 | 47 | 44.6 | 50.5 | 40.0 | |
| 18-May | 13.0 | 2.5 | 9.8 | 12.6 | 470 | 1 | 37 | 46.8 | 53.0 | 40.7 | |
| 1-Jun | 18.0 | 2.6 | 9.3 | 12.1 | 378 | 1 | 31 | 46.2 | 52.4 | 40.1 | |
| 15-Jun | 19.5 | 3.5 | 4.5 | 9.2 | 271 | 1 | 29 | 41.9 | 45.3 | 36.2 | |
| 29-Jun | 21.0 | 3.4 | 2.4 | 7.8 | 248 | 1 | 32 | 42.3 | 39.2 | 33.8 | |
| 13-Jul | 22.0 | 2.8 | 2.5 | 8.3 | 303 | 1 | 37 | 45.1 | 39.7 | 34.7 | |
| 28-Jul | 24.0 | 3.7 | 1.7 | 13.8 | 271 | 1 | 20 | 41.1 | 36.0 | 42.0 | |
| 10-Aug | 22.0 | 5.5 | 1.6 | 9.6 | 285 | 1 | 30 | 35.4 | 35.2 | 36.8 | |
| 24-Aug | 21.5 | 4.3 | 1.5 | 5.0 | 237 | 1 | 47 | 39.0 | 34.5 | 27.4 | |
| 7-Sep | 21.0 | 4.1 | 1.7 | 8.9 | 211 | 1 | 24 | 39.6 | 35.8 | 35.7 | |
| 22-Sep | 17.5 | 4.3 | 1.7 | 11.4 | 235 | 1 | 21 | 39.0 | 35.8 | 39.3 | |
| 5-Oct | 16.5 | 4.1 | 3.8 | 11.6 | 248 | 1 | 21 | 39.6 | 43.7 | 39.5 | |
| 19-Oct | 13.5 | 4.5 | 3.4 | 12.3 | 252 | 1 | 20 | 38.3 | 42.6 | 40.4 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.2 | 3.7 | 4.2 | 10.3 | 330.4 | 0.9 | 33 | 41.7 | 42.4 | 37.4 | TSI Average = 40.5 |
| Median | 18.8 | 3.6 | 3.0 | 10.6 | 271.0 | 1 | 30 | 41.5 | 41.1 | 38.1 | |
| Min | 12.0 | 2.5 | 1.5 | 5.0 | 211.0 | 0 | 20 | 35.4 | 34.5 | 27.4 | |
| Max | 24.0 | 5.5 | 9.8 | 13.8 | 648.0 | 1 | 67 | 46.8 | 53.0 | 42.0 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Shadow

Lake Overview

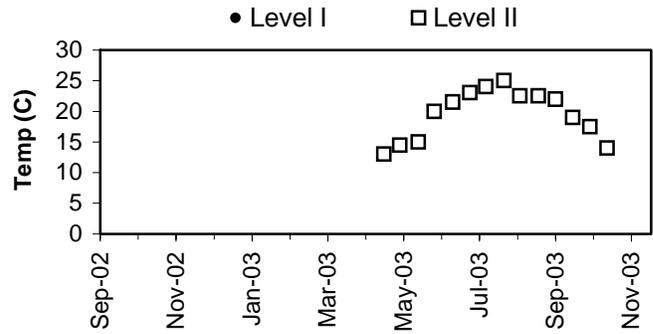
Volunteer monitoring began at Shadow Lake in the 1980s and has continued through 2003, with two gaps. The data indicate this lake is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 12% of the drainage area, direct precipitation is important in addition to watershed inputs. There is one large Class 1 wetland in the watershed adjacent to the lake, from which a creek exits (King County, 1990). Land use analysis of 2002 aerial photographs showed over 66% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Shadow Lake has a public access boat launch. Eurasian milfoil has been found in the lake since 1995, but does not appear to be increasing. Residents should keep an eye on aquatic plants growing nearshore to catch any increases in patches of this, Brazilian elodea, and other noxious weeds.

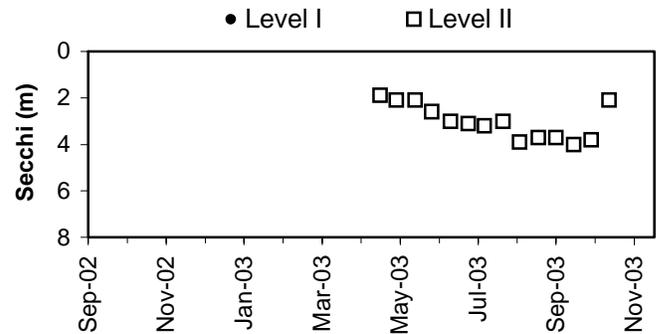
Physical Parameters

Secchi transparency ranged from 1.9 to 4.0m from late April through October. Water temperatures reached 25.0 degrees Celsius during the same period. Excellent local precipitation and water level records detailed a pattern similar to the winter-high, summer-low stands characteristic of the region, but through a smaller vertical change than many other lakes.

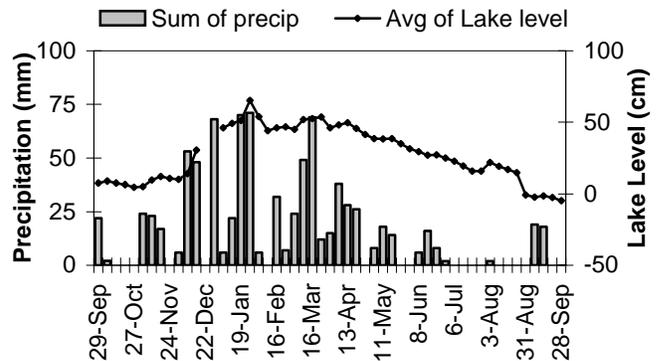
Lake Temperature



Secchi Depth

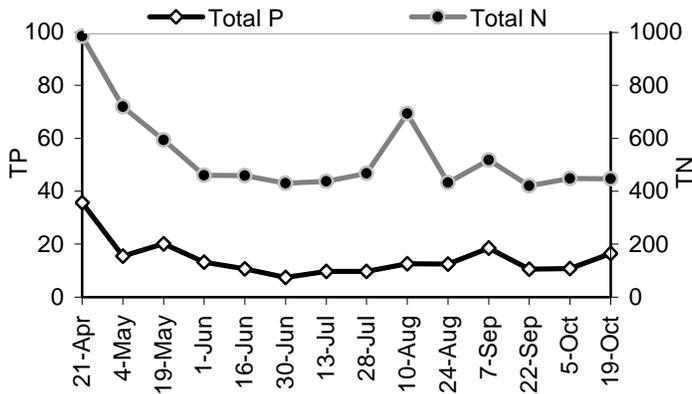


Lake Level and Precipitation

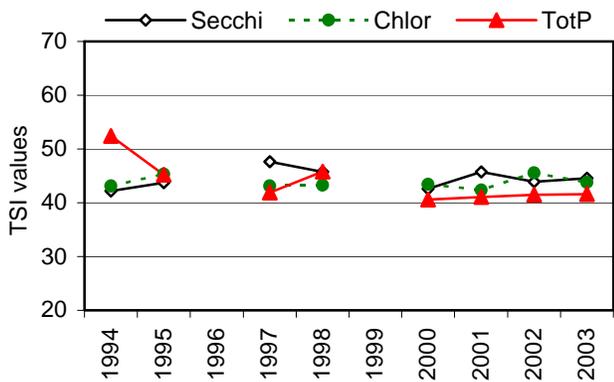


Shadow

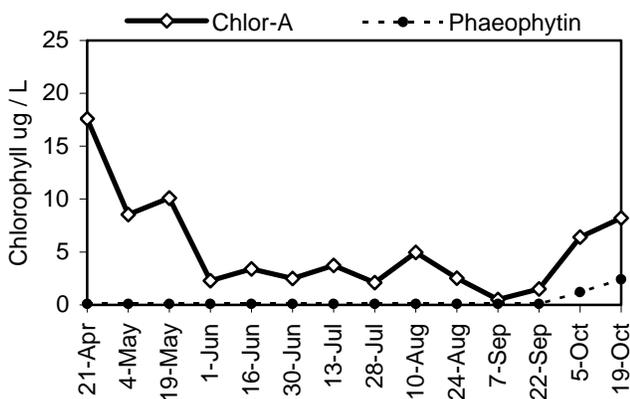
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Dinobryon</i> spp. | chrysophyte |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased early in the season and then remained in relatively constant proportion to total phosphorus, with the exception of one higher nitrogen value in August (see chart). The N:P ratio ranged from 27 to 57. In 2003 the average TSI values were close together in the lower midrange of mesotrophy, similar to recent years.

Chlorophyll and Algae

Chlorophyll concentrations were highest at the beginning of the sample period, descending to moderately low values through summer and rising to a smaller peak in autumn. The spring algae were dominated by a combination of the bluegreen *Aphanizomenon flos-aquae* and several chrysophyte *Dinobryon* species. The smaller fall increase was co-dominated by *Aphanizomenon* and an unidentified chrysophyte species. Other commonly occurring algae included the diatoms *Asterionella* and *Tabellaria*, as well as the bluegreens *Anabaena*, *Aphanothece* and *Chroococcus*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 22.0 | 5 | 7.6 | 5 | | | | | | | |
| 6-Oct-02 | 2.1 | 7 | 8.9 | 7 | | | | | | | |
| 13-Oct-02 | 0.0 | 7 | 7.6 | 7 | | | | | | | |
| 20-Oct-02 | 0.0 | 7 | 6.4 | 7 | | | | | | | |
| 27-Oct-02 | 0.1 | 7 | 4.7 | 7 | | | | | | | |
| 3-Nov-02 | 24.0 | 7 | 5.0 | 7 | | | | | | | |
| 10-Nov-02 | 23.1 | 7 | 9.4 | 7 | | | | | | | |
| 17-Nov-02 | 17.0 | 7 | 12.0 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 10.6 | 7 | | | | | | | |
| 1-Dec-02 | 6.0 | 7 | 10.0 | 7 | | | | | | | |
| 8-Dec-02 | 53.0 | 7 | 13.9 | 7 | | | | | | | |
| 15-Dec-02 | 48.0 | 4 | 30.5 | 4 | | | | | | | |
| 22-Dec-02 | | | | | | | | | | | |
| 29-Dec-02 | 68.0 | 1 | | | | | | | | | |
| 5-Jan-03 | 6.0 | 2 | 46.0 | 1 | | | | | | | |
| 12-Jan-03 | 22.0 | 7 | 49.3 | 7 | | | | | | | |
| 19-Jan-03 | 70.0 | 7 | 51.3 | 7 | | | | | | | |
| 26-Jan-03 | 71.0 | 7 | 65.1 | 7 | | | | | | | |
| 2-Feb-03 | 6.0 | 7 | 53.9 | 7 | | | | | | | |
| 9-Feb-03 | 0.0 | 7 | 44.0 | 7 | | | | | | | |
| 16-Feb-03 | 32.0 | 7 | 46.1 | 7 | | | | | | | |
| 23-Feb-03 | 7.0 | 7 | 46.7 | 7 | | | | | | | |
| 2-Mar-03 | 24.0 | 7 | 45.0 | 7 | | | | | | | |
| 9-Mar-03 | 49.0 | 4 | 51.8 | 4 | | | | | | | |
| 16-Mar-03 | 69.0 | 7 | 52.6 | 7 | | | | | | | |
| 23-Mar-03 | 12.0 | 7 | 53.6 | 7 | | | | | | | |
| 30-Mar-03 | 15.0 | 7 | 46.0 | 7 | | | | | | | |
| 6-Apr-03 | 38.0 | 7 | 48.1 | 7 | | | | | | | |
| 13-Apr-03 | 28.1 | 7 | 49.7 | 7 | | | | | | | |
| 20-Apr-03 | 26.1 | 7 | 45.6 | 7 | | | | | | | |
| 27-Apr-03 | 0.0 | 7 | 41.3 | 7 | | | | | | | |
| 4-May-03 | 8.0 | 2 | 38.5 | 2 | | | | | | | |
| 11-May-03 | 18.1 | 7 | 38.3 | 7 | | | | | | | |
| 18-May-03 | 14.1 | 7 | 38.4 | 7 | | | | | | | |
| 25-May-03 | 0.1 | 7 | 34.9 | 7 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 31.4 | 7 | | | | | | | |
| 8-Jun-03 | 6.0 | 7 | 29.4 | 7 | | | | | | | |
| 15-Jun-03 | 16.1 | 7 | 27.0 | 7 | | | | | | | |
| 22-Jun-03 | 8.0 | 7 | 27.1 | 7 | | | | | | | |
| 29-Jun-03 | 2.0 | 7 | 25.0 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 22.7 | 7 | | | | | | | |
| 13-Jul-03 | 0.1 | 7 | 19.3 | 7 | | | | | | | |
| 20-Jul-03 | 0.0 | 7 | 15.7 | 7 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 15.7 | 7 | | | | | | | |
| 3-Aug-03 | 2.0 | 7 | 21.7 | 7 | | | | | | | |
| 10-Aug-03 | 0.0 | 7 | 19.1 | 7 | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | 16.8 | 6 | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | 14.6 | 7 | | | | | | | |
| 31-Aug-03 | 0.0 | 6 | -0.8 | 6 | | | | | | | |
| 7-Sep-03 | 19.1 | 7 | -2.3 | 7 | | | | | | | |
| 14-Sep-03 | 18.0 | 7 | -1.4 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | -2.6 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | -4.7 | 3 | | | | | | | |
| Min | 0.0 | | -4.7 | | | Min | 0.0 | 0.0 | | | |
| Max | 71.0 | | 65.1 | | | Max | 0.0 | 0.0 | | | |
| Total | 849.7 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.0 | 1.9 | 17.6 | 35.7 | 985 | 2 | 28 | 50.7 | 58.7 | 55.7 | |
| 4-May | 14.5 | 2.1 | 8.5 | 15.5 | 719 | 2 | 46 | 49.3 | 51.6 | 43.7 | |
| 19-May | 15.0 | 2.1 | 10.1 | 20.1 | 594 | 2 | 30 | 49.3 | 53.3 | 47.4 | |
| 1-Jun | 20.0 | 2.6 | 2.3 | 13.3 | 460 | 2 | 35 | 46.2 | 38.7 | 41.5 | |
| 16-Jun | 21.5 | 3.0 | 3.4 | 10.7 | 459 | 2 | 43 | 44.1 | 42.6 | 38.3 | |
| 30-Jun | 23.0 | 3.1 | 2.5 | 7.5 | 430 | 2 | 57 | 43.7 | 39.6 | 33.2 | |
| 13-Jul | 24.0 | 3.2 | 3.7 | 9.7 | 437 | 2 | 45 | 43.2 | 43.5 | 36.9 | |
| 28-Jul | 25.0 | 3.0 | 2.1 | 9.7 | 468 | 1 | 48 | 44.1 | 37.8 | 36.9 | |
| 10-Aug | 22.5 | 3.9 | 5.0 | 12.6 | 694 | 2 | 55 | 40.4 | 46.3 | 40.7 | |
| 25-Aug | 22.5 | 3.7 | 2.5 | 12.5 | 432 | 2 | 35 | 41.1 | 39.7 | 40.6 | |
| 8-Sep | 22.0 | 3.7 | 0.6 | 18.6 | 518 | 2 | 28 | 41.1 | | 46.3 | Chlor-a value was <MDL. Reported as .6µgl. |
| 22-Sep | 19.0 | 4.0 | 1.5 | 10.6 | 420 | 2 | 40 | 40.0 | 34.7 | 38.2 | |
| 6-Oct | 17.5 | 3.8 | 6.4 | 10.9 | 448 | 2 | 41 | 40.7 | 48.8 | 38.6 | |
| 20-Oct | 14.0 | 2.1 | 8.2 | 16.5 | 447 | 2 | 27 | 49.3 | 51.2 | 44.6 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.5 | 3.0 | 5.3 | 14.6 | 536.5 | 1.9 | 40 | 44.5 | 45.1 | 41.6 | TSI Average = 43.3 |
| Median | 20.8 | 3.1 | 3.6 | 12.6 | 459.5 | 2 | 40 | 43.9 | 43.5 | 40.6 | |
| Min | 13.0 | 1.9 | 0.6 | 7.5 | 420.0 | 1 | 27 | 40.0 | 34.7 | 33.2 | |
| Max | 25.0 | 4.0 | 17.6 | 35.7 | 985.0 | 2 | 57 | 50.7 | 58.7 | 55.7 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 14 | |

Shady

Lake Overview

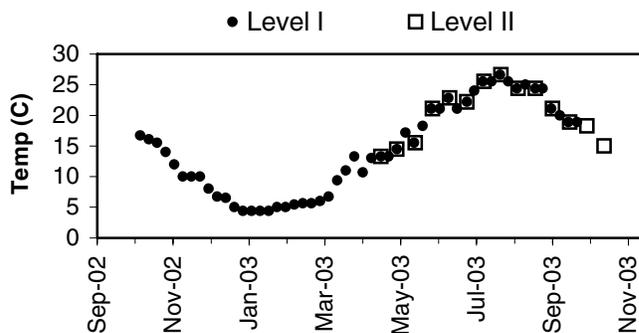
Volunteer monitoring began at Shady Lake in the 1980s and has continued through 2003. The data indicate this lake is low to moderate in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up about 10% of the drainage area, direct precipitation is important in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed over 40% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Shady Lake has a public access boat launch, and patches of Eurasian milfoil were found in 2001. Nuisance populations of *Potamogeton* (pondweed) have also been reported. Residents should keep a close eye on aquatic plants growing nearshore to catch increases in these species, Brazilian elodea, or other aquatic noxious weeds.

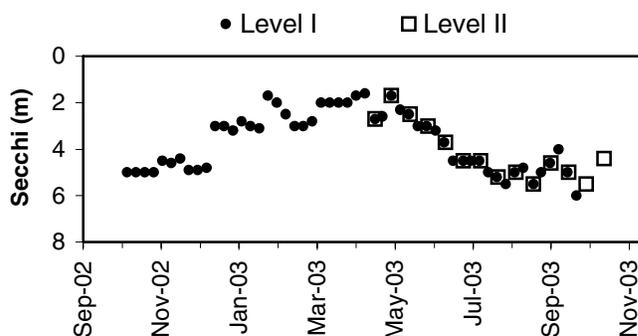
Physical Parameters

Secchi transparency ranged from 1.6 to 6.0m through the year. Annual surface water temperatures ranged from 4.4 to 26.6 degrees Celsius. Excellent precipitation and water level records were kept, showing that the lake level responded sensitively to precipitation, achieving high stands in the winter and decreasing slowly over spring and summer.

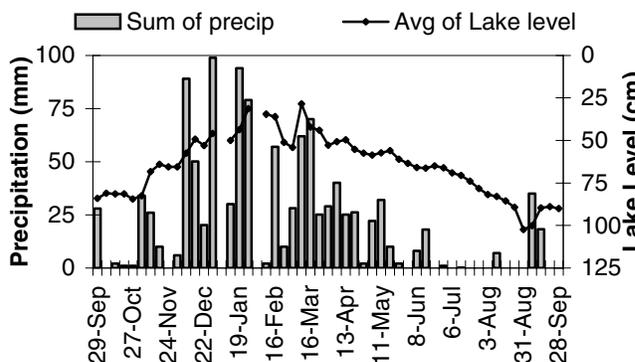
Lake Temperature



Secchi Depth

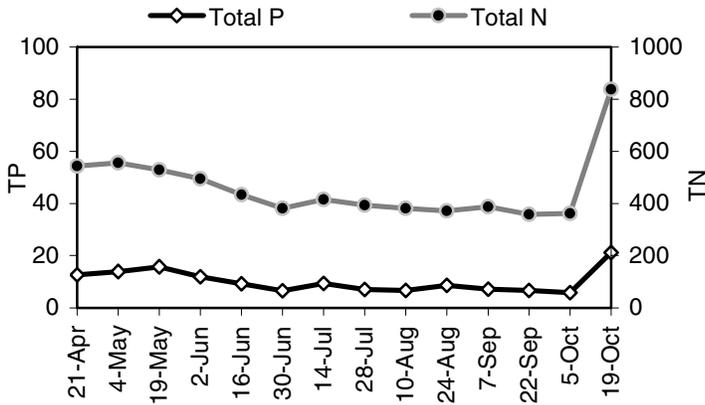


Lake Level and Precipitation

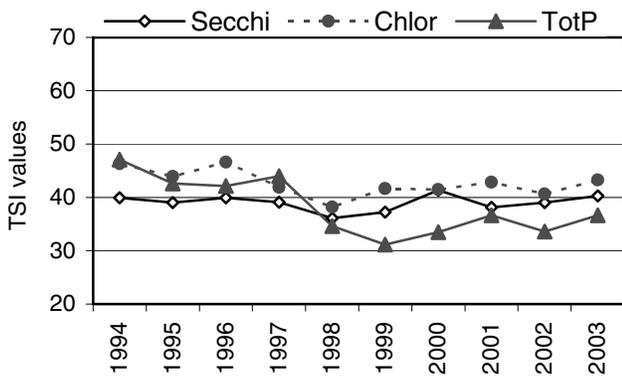


Shady

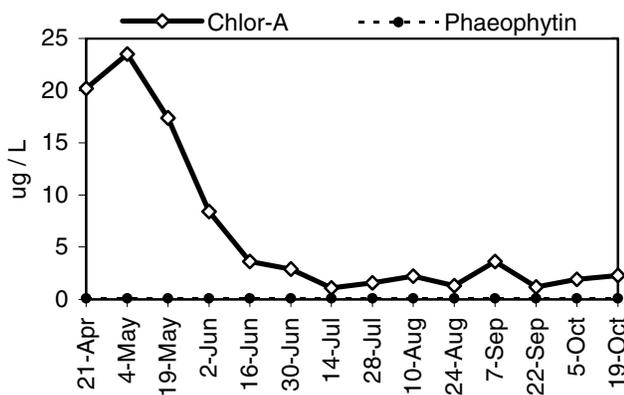
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Common algae

Group

| | |
|-----------------------|-------------|
| unidentified species | chrysophyte |
| <i>Dinobryon spp.</i> | chrysophyte |
| <i>Anacystis spp.</i> | bluegreen |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased slightly through spring and then remained stable until the last sample date, when it rose dramatically. Total phosphorus was stable until the last date as well. The N:P ratio ranged from 34 to 61. In 2003, the TSI-Chlor values were spread across the border between oligotrophy and mesotrophy, with the TSI-TP substantially lower, similar to recent years.

Chlorophyll and Algae

Chlorophyll concentrations peaked in early May and dropped by July to low values, which were maintained through the rest of the sample season. The algae in the plankton were dominated by the chrysophytes *Dinobryon* and an unidentified solitary species. Other commonly occurring algae included the diatoms *Asterionella* and *Synedra*, as well as the bluegreen *Anacystis* and the chlorophytes *Ankistrodesmus* and *Botryococcus*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|---------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) ** | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 28.0 | 5 | 84.0 | 1 | | | | | | | |
| 6-Oct-02 | 0.0 | 7 | 81.0 | 1 | 6-Oct-02 | 17:40 | 5.0 | 16.7 | NA | NA | 2 |
| 13-Oct-02 | 2.1 | 7 | 81.5 | 1 | 13-Oct-02 | 16:00 | 5.0 | 16.1 | NA | NA | 2 |
| 20-Oct-02 | 1.0 | 7 | 81.5 | 1 | 20-Oct-02 | 17:30 | 5.0 | 15.5 | NA | NA | 3 |
| 27-Oct-02 | 1.0 | 7 | 84.5 | 2 | 27-Oct-02 | 16:00 | 5.0 | 14.0 | NA | NA | 12 |
| 3-Nov-02 | 34.0 | 7 | 82.5 | 2 | 3-Nov-02 | 16:00 | 4.5 | 12.0 | P1 | P1 | 6 |
| 10-Nov-02 | 26.0 | 7 | 68.3 | 3 | 10-Nov-02 | 15:00 | 4.6 | 10.0 | P2 | P2 | 12 |
| 17-Nov-02 | 10.0 | 7 | 64.0 | 1 | 17-Nov-02 | 16:00 | 4.4 | 10.0 | P1 | P1 | 12 |
| 24-Nov-02 | 0.0 | 7 | 65.5 | 2 | 24-Nov-02 | 15:30 | 4.9 | 10.0 | P1 | P1 | 12 |
| 1-Dec-02 | 6.0 | 7 | 65.5 | 1 | 1-Dec-03 | 14:30 | 4.9 | 8.0 | P1 | P1 | 12 |
| 8-Dec-02 | 89.0 | 7 | 57.5 | 2 | 8-Dec-03 | 15:30 | 4.8 | 6.7 | P1 | P1 | 24 |
| 15-Dec-02 | 50.1 | 7 | 49.3 | 2 | 15-Dec-03 | 15:00 | 3.0 | 6.5 | P1 | P1 | 24 |
| 22-Dec-02 | 20.1 | 7 | 53.0 | 1 | 22-Dec-03 | 14:00 | 3.0 | 5.0 | P1 | P1 | 24 |
| 29-Dec-02 | 99.0 | 7 | 45.8 | 4 | 29-Dec-03 | 14:30 | 3.2 | 4.4 | P1 | P1 | 20 |
| 5-Jan-03 | 0.0 | 7 | | | 5-Jan-03 | 14:00 | 2.8 | 4.4 | P1 | P1 | 20 |
| 12-Jan-03 | 30.0 | 7 | 50.0 | 1 | 12-Jan-03 | 14:00 | 3.0 | 4.4 | P1 | P1 | 20 |
| 19-Jan-03 | 94.1 | 7 | 43.5 | 2 | 19-Jan-03 | 14:00 | 3.1 | 4.4 | P1 | P1 | 24 |
| 26-Jan-03 | 79.0 | 7 | 31.3 | 3 | 26-Jan-03 | 12:30 | 1.7 | 5.0 | P1 | P1 | 24 |
| 2-Feb-03 | 0.0 | 7 | | | 2-Feb-03 | 12:30 | 2.0 | 5.0 | P1 | P1 | 24 |
| 9-Feb-03 | 2.1 | 7 | 34.5 | 1 | 9-Feb-03 | 14:00 | 2.5 | 5.4 | P1 | P1 | 24 |
| 16-Feb-03 | 57.1 | 7 | 36.0 | 1 | 16-Feb-03 | 12:20 | 3.0 | 5.6 | P1 | P1 | 12 |
| 23-Feb-03 | 10.1 | 7 | 51.0 | 4 | 23-Feb-03 | 12:00 | 3.0 | 5.6 | P1 | P1 | 12 |
| 2-Mar-03 | 28.1 | 7 | 54.0 | 1 | 2-Mar-03 | 14:00 | 2.8 | 6.0 | P1 | P1 | 6 |
| 9-Mar-03 | 62.1 | 7 | 28.5 | 1 | 9-Mar-03 | 14:30 | 2.0 | 6.7 | C2 | C2 | 4 |
| 16-Mar-03 | 70.1 | 7 | 42.0 | 2 | 16-Mar-03 | 15:00 | 2.0 | 9.4 | P2 | P2 | 4 |
| 23-Mar-03 | 25.1 | 7 | 44.0 | 1 | 23-Mar-03 | 15:30 | 2.0 | 11.0 | P2 | P2 | 4 |
| 30-Mar-03 | 29.0 | 7 | 52.7 | 4 | 30-Mar-03 | 14:20 | 2.0 | 13.3 | P3 | P3 | 6 |
| 6-Apr-03 | 40.1 | 7 | 50.8 | 2 | 6-Apr-03 | 15:14 | 1.7 | 10.7 | P3 | P3 | 6 |
| 13-Apr-03 | 25.2 | 7 | 49.5 | 3 | 13-Apr-03 | 13:20 | 1.6 | 13.0 | P3 | P3 | 6 |
| 20-Apr-03 | 26.2 | 7 | 55.3 | 2 | 21-Apr-03 | 14:30 | 2.7 | 13.3 | P3 | P3 | 6 |
| 27-Apr-03 | 2.1 | 7 | 57.5 | 3 | 27-Apr-03 | 11:39 | 2.6 | 13.3 | P3 | P3 | 5 |
| 4-May-03 | 22.0 | 7 | 58.5 | 4 | 4-May-03 | 17:00 | 1.7 | 14.5 | P3 | P3 | 2 |
| 11-May-03 | 32.0 | 7 | 57.3 | 2 | 11-May-03 | 14:30 | 2.3 | 17.2 | P3 | P3 | 10 |
| 18-May-03 | 10.0 | 7 | 56.0 | 2 | 18-May-03 | 14:30 | 2.5 | 15.5 | P2 | P2 | 10 |
| 25-May-03 | 2.1 | 7 | 61.0 | 3 | 25-May-03 | 11:45 | 3.0 | 18.3 | P1 | P1 | 10 |
| 1-Jun-03 | 0.1 | 7 | 63.5 | 2 | 1-Jun-03 | 14:20 | 3.0 | 21.1 | P2 | P2 | 24 |
| 8-Jun-03 | 8.1 | 7 | 65.9 | 4 | 8-Jun-03 | 15:00 | 3.2 | 21.1 | P1 | P1 | 19 |
| 15-Jun-03 | 18.1 | 7 | 66.3 | 2 | 15-Jun-03 | 14:25 | 3.7 | 22.8 | P1 | P1 | 19 |
| 22-Jun-03 | 0.1 | 7 | 65.0 | 2 | 22-Jun-03 | 14:00 | 4.5 | 21.1 | P1 | P1 | 19 |
| 29-Jun-03 | 1.0 | 7 | 66.0 | 2 | 30-Jun-03 | 16:13 | 4.5 | 22.2 | P1 | P1 | 14 |
| 6-Jul-03 | 0.0 | 7 | 69.0 | 1 | 6-Jul-03 | 14:00 | 4.5 | 24.0 | P1 | P1 | 1 |
| 13-Jul-03 | 0.1 | 7 | 70.5 | 2 | 13-Jul-03 | 18:27 | 4.5 | 25.5 | P1 | P1 | 6 |
| 20-Jul-03 | 0.0 | 7 | 74.0 | 1 | 20-Jul-03 | 14:30 | 5.0 | 25.5 | P1 | P1 | 16 |
| 27-Jul-03 | 0.0 | 7 | 78.2 | 4 | 27-Jul-03 | 18:40 | 5.2 | 26.6 | | | 14 |
| 3-Aug-03 | 0.1 | 7 | 81.8 | 3 | 3-Aug-03 | 15:30 | 5.5 | 25.5 | P1 | P1 | 14 |
| 10-Aug-03 | 7.0 | 7 | 83.0 | 1 | 10-Aug-03 | 13:40 | 5.0 | 24.4 | P1 | P1 | 16 |
| 17-Aug-03 | 0.0 | 7 | 85.6 | 2 | 17-Aug-03 | 16:30 | 4.8 | 25.0 | P1 | P1 | 16 |
| 24-Aug-03 | 0.0 | 7 | 89.3 | 2 | 25-Aug-03 | 18:20 | 5.5 | 24.4 | P1 | P1 | 16 |
| 31-Aug-03 | 0.0 | 7 | 102.5 | 7 | 31-Aug-03 | 18:30 | 5.0 | 24.4 | P1 | P1 | 24 |
| 7-Sep-03 | 35.0 | 7 | 100.3 | 6 | 7-Sep-03 | 19:00 | 4.6 | 21.1 | P1 | P1 | 25 |
| 14-Sep-03 | 18.1 | 7 | 89.8 | 2 | 14-Sep-03 | 16:00 | 4.0 | 20.0 | P1 | P1 | 20 |
| 21-Sep-03 | 0.0 | 7 | 89.0 | 1 | 21-Sep-03 | 14:30 | 5.0 | 18.9 | P1 | P1 | 20 |
| 28-Sep-03 | 0.0 | 3 | 90.0 | 3 | 28-Sep-03 | 15:00 | 6.0 | 18.9 | NA | NA | 30 |
| Min | 0.0 | | 28.5 | | Min | | 1.6 | 4.4 | | | 1 |
| Max | 99.0 | | 102.5 | | Max | | 6.0 | 26.6 | | | 30 |
| Total | 1099.8 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 13.3 | 2.7 | 20.2 | 12.7 | 544 | 3 | 43 | 45.7 | 60.1 | 40.8 | Algae has been decreasing last 4 weeks. |
| 4-May | 14.5 | 1.7 | 23.5 | 13.9 | 556 | 3 | 40 | 52.3 | 61.5 | 42.1 | Very heavy brownish algae. |
| 19-May | 15.5 | 2.5 | 17.4 | 15.8 | 529 | 2 | 33 | 46.8 | 58.6 | 44.0 | Algae is decreasing in count. |
| 2-Jun | 21.1 | 3.0 | 8.4 | 12.0 | 495 | 2 | 41 | 44.1 | 51.5 | 40.0 | |
| 16-Jun | 22.8 | 3.7 | 3.6 | 9.3 | 434 | 1 | 47 | 41.1 | 43.1 | 36.3 | |
| 30-Jun | 22.2 | 4.5 | 2.9 | 6.6 | 382 | 1 | 58 | 38.3 | 41.0 | 31.4 | |
| 14-Jul | 25.5 | 4.5 | 1.1 | 9.4 | 416 | 1 | 44 | 38.3 | 31.5 | 36.5 | |
| 28-Jul | 26.6 | 5.2 | 1.6 | 7.1 | 394 | 1 | 55 | 36.2 | 35.2 | 32.4 | |
| 11-Aug | 24.4 | 5.0 | 2.2 | 6.7 | 381 | 1 | 57 | 36.8 | 38.5 | 31.6 | |
| 25-Aug | 24.4 | 5.5 | 1.3 | 8.7 | 372 | 1 | 43 | 35.4 | 33.1 | 35.4 | |
| 8-Sep | 21.1 | 4.6 | 3.6 | 7.2 | 388 | 1 | 54 | 38.0 | 43.1 | 32.6 | |
| 22-Sep | 18.9 | 5.0 | 1.2 | 6.7 | 358 | 1 | 53 | 36.8 | 32.4 | 31.6 | |
| 6-Oct | 18.3 | 5.5 | 1.9 | 5.9 | 362 | 1 | 61 | 35.4 | 37.0 | 29.8 | Clear water; P1 or lower. |
| 20-Oct | 15.0 | 4.4 | 2.3 | 21.2 | 838 | 1 | 40 | 38.6 | 38.7 | 48.2 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.3 | 4.1 | 6.5 | 10.2 | 460.6 | 1.4 | 48 | 40.3 | 43.2 | 36.6 | TSI Average = 40.0 |
| Median | 21.1 | 4.5 | 2.6 | 9.0 | 405.0 | 1 | 45 | 38.3 | 39.9 | 35.8 | |
| Min | 13.3 | 1.7 | 1.1 | 5.9 | 358.0 | 1 | 33 | 35.4 | 31.5 | 29.8 | |
| Max | 26.6 | 5.5 | 23.5 | 21.2 | 838.0 | 3 | 61 | 52.3 | 61.5 | 48.2 | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Spring

Lake Overview

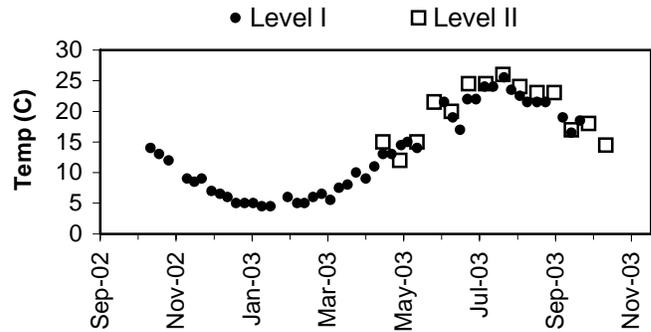
Volunteer monitoring began at Spring Lake in the 1980s and has continued through 2003, with the exception of 1995. The data indicate this lake is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 15% of the drainage area, direct precipitation is important in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed over 44% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Spring Lake has a public access boat launch, and a moderate infestation of Eurasian milfoil was found in 2001. King County and area residents completed an Integrated Aquatic Vegetation Management Plan and received a grant from the Washington Department of Ecology to control noxious weeds.

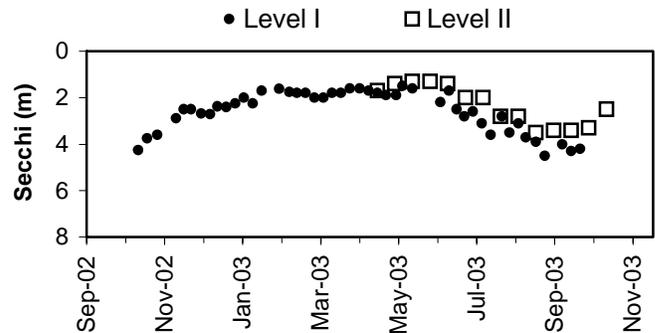
Physical Parameters

Secchi transparency ranged from 1.3 to 4.5m through the year. Water temperatures ranged from 4.5 to 26.0 degrees Celsius during the same period. Precipitation and water level records were excellent, showing that water levels follow the typical pattern of winter-high stands dropping to fall low-stands. Beaver activities have been found on the outlet stream, which may impact water levels in the future.

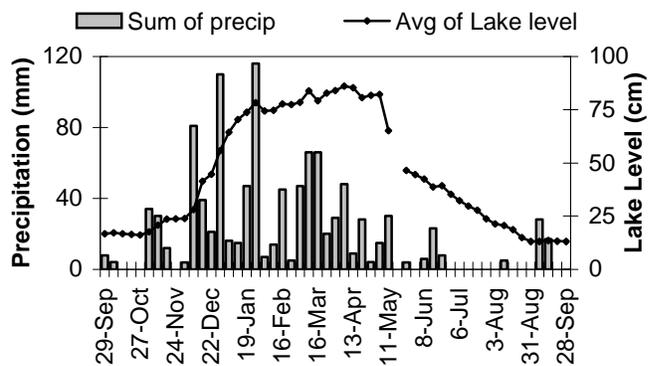
Lake Temperature



Secchi Depth

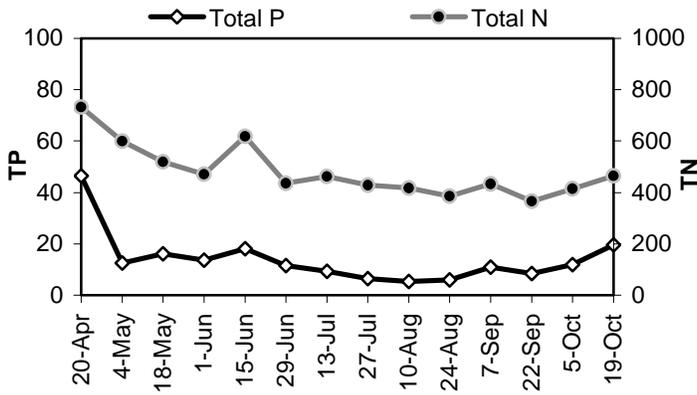


Lake Level and Precipitation

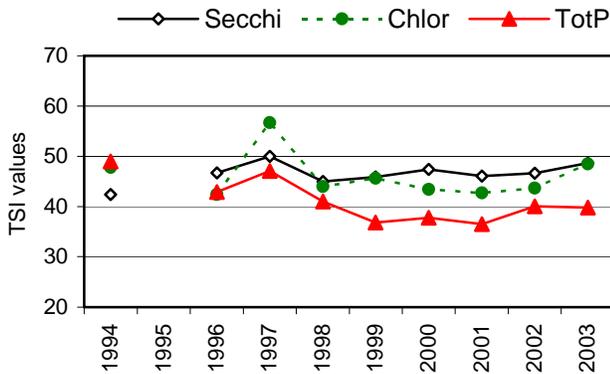


Spring

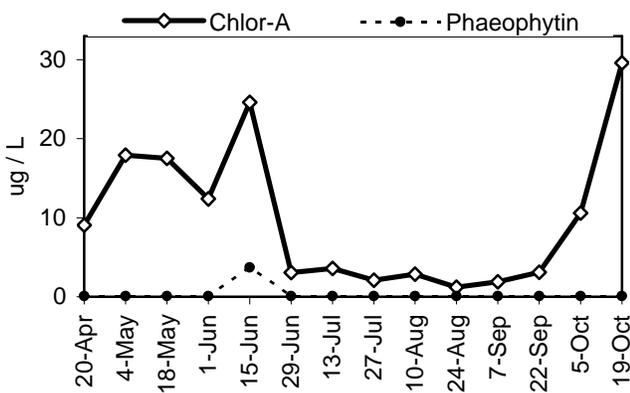
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------|-------------|
| unidentified species | chrysophyte |
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Anabaena</i> sp. | bluegreen |

Nutrient Analysis and TSI Ratings

Both nitrogen and phosphorus declined from peak values on the first sample date, but maintained relatively close proportions to each other. The N:P ratio ranged from 16 to 79. In 2003, the average TSI values spanned the mesotrophic range, with TSI-TP lower than the other two indicators.

Chlorophyll and Algae

Chlorophyll concentration was relatively high in spring, reaching a peak in mid-June and then decreasing to low values until October, when it rose again to the highest value of the sample season. Spring algae were dominated by the chrysophyte *Dinobryon* and an unidentified chrysophyte species, while the fall algae contained a significant amount of the bluegreen *Anabaena*. Other commonly occurring algae included several species of cryptophyte algae, the large colonial chlorophyte *Botryococcus* and the bluegreens *Aphanizomenon flos-aquae* and *Anacystis*.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 8.0 | 5 | 16.7 | 5 | | | | | | | |
| 6-Oct-02 | 4.1 | 7 | 17.1 | 7 | | | | | | | |
| 13-Oct-02 | 0.1 | 7 | 16.6 | 7 | 12-Oct-02 | 16:15 | 4.3 | 14.0 | NA | NA | 0 |
| 20-Oct-02 | 0.1 | 7 | 16.3 | 7 | 19-Oct-02 | 14:00 | 3.8 | 13.0 | NA | NA | 0 |
| 27-Oct-02 | 0.1 | 4 | 16.0 | 4 | 27-Oct-02 | 10:30 | 3.6 | 12.0 | C1 | P1 | 0 |
| 3-Nov-02 | 34.0 | 4 | 17.5 | 4 | | | | | | | |
| 10-Nov-02 | 30.1 | 7 | 20.7 | 7 | 11-Nov-02 | 12:00 | 2.9 | 9.0 | NA | P2 | 6 |
| 17-Nov-02 | 12.1 | 7 | 23.6 | 7 | 17-Nov-02 | 12:00 | 2.5 | 8.5 | C1 | P2 | 0 |
| 24-Nov-02 | 0.0 | 7 | 23.6 | 7 | 23-Nov-02 | 12:00 | 2.5 | 9.0 | C1 | P2 | 0 |
| 1-Dec-02 | 4.0 | 7 | 23.9 | 7 | 1-Dec-02 | 12:00 | 2.7 | 7.0 | C2/P1 | P1 | 6 |
| 8-Dec-02 | 81.0 | 7 | 28.0 | 7 | 8-Dec-02 | 12:00 | 2.7 | 6.5 | C2/P1 | P1 | 0 |
| 15-Dec-02 | 39.1 | 7 | 41.4 | 7 | 14-Dec-02 | 11:00 | 2.4 | 6.0 | C1/P2 | C1/P2 | 21 |
| 22-Dec-02 | 21.1 | 7 | 44.7 | 7 | 21-Dec-02 | 10:00 | 2.4 | 5.0 | C2/P2 | C1/P2 | 6 |
| 29-Dec-02 | 110.0 | 7 | 55.7 | 7 | 28-Dec-02 | 11:30 | 2.3 | 5.0 | C2/P2 | C1/P2 | 5 |
| 5-Jan-03 | 16.0 | 7 | 64.4 | 7 | 4-Jan-03 | 11:00 | 2.0 | 5.0 | P1 | P2 | |
| 12-Jan-03 | 15.0 | 7 | 70.5 | 7 | 11-Jan-03 | 12:00 | 2.3 | 4.5 | P2 | P2 | 14 |
| 19-Jan-03 | 47.0 | 4 | 73.8 | 4 | 18-Jan-03 | 14:00 | 1.7 | 4.5 | C3/P3 | P3 | |
| 26-Jan-03 | 116.1 | 7 | 78.2 | 7 | | | | | | | |
| 2-Feb-03 | 7.0 | 7 | 74.4 | 7 | 1-Feb-03 | 10:30 | 1.6 | 6.0 | P2 | P2 | |
| 9-Feb-03 | 14.0 | 7 | 74.6 | 7 | 9-Feb-03 | 13:30 | 1.8 | 5.0 | P3 | P2 | |
| 16-Feb-03 | 45.0 | 7 | 77.7 | 7 | 15-Feb-03 | 9:00 | 1.8 | 5.0 | P1 | P2 | |
| 23-Feb-03 | 5.1 | 7 | 77.4 | 7 | 22-Feb-03 | 14:30 | 1.8 | 6.0 | P1 | P2 | 2 |
| 2-Mar-03 | 47.0 | 7 | 78.4 | 7 | 1-Mar-03 | 13:30 | 2.0 | 6.5 | P3 | P3 | |
| 9-Mar-03 | 66.0 | 7 | 83.8 | 7 | 8-Mar-03 | 9:30 | 2.0 | 5.5 | P3 | P3 | |
| 16-Mar-03 | 66.0 | 7 | 79.1 | 7 | 15-Mar-03 | 14:00 | 1.8 | 7.5 | P3 | P3 | 2 |
| 23-Mar-03 | 20.0 | 5 | 82.7 | 5 | 22-Mar-03 | 10:00 | 1.8 | 8.0 | P3 | P3 | 5 |
| 30-Mar-03 | 29.1 | 7 | 84.0 | 7 | 29-Mar-03 | 13:30 | 1.6 | 10.0 | P3 | P3 | |
| 6-Apr-03 | 48.0 | 7 | 86.0 | 7 | 6-Apr-03 | 10:00 | 1.6 | 9.0 | P3 | P3 | 2 |
| 13-Apr-03 | 9.0 | 7 | 85.4 | 7 | 13-Apr-03 | 12:00 | 1.7 | 11.0 | P3 | P3 | 2 |
| 20-Apr-03 | 28.0 | 7 | 80.6 | 7 | 20-Apr-03 | 12:00 | 1.8 | 13.0 | P1 | P1 | |
| 27-Apr-03 | 4.1 | 7 | 81.7 | 7 | 27-Apr-03 | 17:00 | 1.9 | 13.0 | P1 | P1 | 6 |
| 4-May-03 | 15.0 | 7 | 82.2 | 7 | 5-May-03 | 12:00 | 1.9 | 14.5 | P1 | P1 | |
| 11-May-03 | 30.1 | 7 | 65.2 | 7 | 10-May-03 | 12:00 | 1.5 | 15.0 | P1 | P1 | |
| 18-May-03 | | | | | 18-May-03 | 12:00 | 1.6 | 14.0 | NA | NA | |
| 25-May-03 | 4.0 | 6 | 46.4 | 6 | | | | | | | 46 |
| 1-Jun-03 | 0.0 | 7 | 44.5 | 7 | | | | | | | |
| 8-Jun-03 | 6.0 | 7 | 42.4 | 7 | 9-Jun-03 | 12:00 | 2.2 | 21.5 | NA | P1 | 12 |
| 15-Jun-03 | 23.0 | 7 | 38.7 | 7 | 16-Jun-03 | 12:00 | 1.7 | 19.0 | p2 | P3 | |
| 22-Jun-03 | 8.0 | 7 | 39.3 | 7 | 22-Jun-03 | 12:00 | 2.5 | 17.0 | NA | P1 | |
| 29-Jun-03 | 0.0 | 7 | 35.3 | 7 | 28-Jun-03 | 12:00 | 2.8 | 22.0 | NA | NA | 1 |
| 6-Jul-03 | 0.1 | 7 | 32.2 | 7 | 5-Jul-03 | 16:00 | 2.6 | 22.0 | NA | NA | 1 |
| 13-Jul-03 | 0.0 | 7 | 29.6 | 7 | 12-Jul-03 | 12:30 | 3.1 | 24.0 | NA | NA | |
| 20-Jul-03 | 0.0 | 7 | 27.8 | 7 | 19-Jul-03 | 15:00 | 3.6 | 24.0 | NA | NA | |
| 27-Jul-03 | 0.0 | 7 | 23.6 | 7 | 28-Jul-03 | 20:00 | 2.8 | 25.5 | NA | NA | |
| 3-Aug-03 | 0.0 | 7 | 21.4 | 7 | 3-Aug-03 | 12:30 | 3.5 | 23.5 | NA | NA | |
| 10-Aug-03 | 5.0 | 7 | 20.6 | 7 | 10-Aug-03 | | 3.1 | 22.5 | NA | NA | |
| 17-Aug-03 | 0.0 | 7 | 18.6 | 7 | 16-Aug-03 | | 3.7 | 21.5 | NA | NA | |
| 24-Aug-03 | 0.0 | 7 | 14.8 | 7 | 24-Aug-03 | | 3.9 | 21.5 | P2 | NA | |
| 31-Aug-03 | 0.0 | 3 | 13.0 | 3 | 31-Aug-03 | | 4.5 | 21.5 | P2 | NA | |
| 7-Sep-03 | 28.0 | 2 | 13.0 | 2 | | | | | | | 12 |
| 14-Sep-03 | 17.0 | 7 | 13.5 | 7 | 14-Sep-03 | | 4.0 | 19.0 | P2 | P1 | |
| 21-Sep-03 | 0.0 | 7 | 13.2 | 7 | 21-Sep-03 | | 4.3 | 16.5 | NA | NA | |
| 28-Sep-03 | 0.0 | 2 | 13.0 | 2 | 28-Sep-03 | | 4.2 | 18.5 | NA | NA | |
| Min | 0.0 | | 13.0 | | Min | | 1.5 | 4.5 | | | 0 |
| Max | 116.1 | | 86.0 | | Max | | 4.5 | 25.5 | | | 46 |
| Total | 1061.7 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|---------------|------------------|-------------------|---------------------|------------------|------------------|--------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 15.0 | 1.7 | 9.1 | 46.4 | 732 | 3 | 16 | 52.3 | 52.2 | 59.5 | |
| 4-May | 12.0 | 1.4 | 17.9 | 12.5 | 599 | 3 | 48 | 55.1 | 58.9 | 40.6 | There was a number of rotifers in sample. |
| 18-May | 15.0 | 1.3 | 17.5 | 16.1 | 519 | 3 | 32 | 56.2 | 58.6 | 44.2 | |
| 1-Jun | 21.5 | 1.3 | 12.4 | 13.7 | 470 | 3 | 34 | 56.2 | 55.3 | 41.9 | |
| 15-Jun | 20.0 | 1.4 | 24.6 | 18.1 | 618 | 3 | 34 | 55.1 | 62.0 | 45.9 | Distinct swirls of algae in water. |
| 29-Jun | 24.5 | 2.0 | 3.1 | 11.6 | 435 | 3 | 38 | 50.0 | 41.6 | 39.5 | Not nearly as dense as two weeks ago. |
| 13-Jul | 24.5 | 2.0 | 3.6 | 9.3 | 461 | 3 | 50 | 50.0 | 43.1 | 36.3 | |
| 27-Jul | 26.0 | 2.8 | 2.1 | 6.4 | 428 | 3 | 67 | 45.1 | 37.8 | 30.9 | |
| 10-Aug | 24.0 | 2.8 | 2.9 | 5.3 | 417 | 3 | 79 | 45.1 | 40.9 | 28.2 | |
| 24-Aug | 23.0 | 3.5 | 1.2 | 6.0 | 386 | 3 | 64 | 41.9 | 32.4 | 30.0 | |
| 7-Sep | 23.0 | 3.4 | 1.9 | 10.9 | 433 | 2 | 40 | 42.3 | 36.9 | 38.6 | |
| 21-Sep | 17.0 | 3.4 | 3.1 | 8.4 | 366 | 3 | 44 | 42.3 | 41.7 | 34.8 | Surface bloom at dock, not at sample site. |
| 5-Oct | 18.0 | 3.3 | 10.6 | 11.9 | 415 | | 35 | 42.8 | 53.7 | 39.9 | |
| 19-Oct | 14.5 | 2.5 | 29.6 | 19.6 | 464 | 3 | 24 | 46.8 | 63.8 | 47.1 | Surface bloom at dock, not at sample site. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.9 | 2.3 | 10.0 | 14.0 | 481.6 | 2.9 | 43 | 48.7 | 48.5 | 39.8 | TSI Average = 45.7 |
| Median | 20.8 | 2.3 | 6.3 | 11.8 | 448.0 | 3 | 39 | 48.4 | 47.7 | 39.7 | |
| Min | 12.0 | 1.3 | 1.2 | 5.3 | 366.0 | 2 | 16 | 41.9 | 32.4 | 28.2 | |
| Max | 26.0 | 3.5 | 29.6 | 46.4 | 732.0 | 3 | 79 | 56.2 | 63.8 | 59.5 | |
| Count | 14 | 14 | 14 | 14 | 14 | 13 | 14 | 14 | 14 | 14 | |

Star

Lake Overview

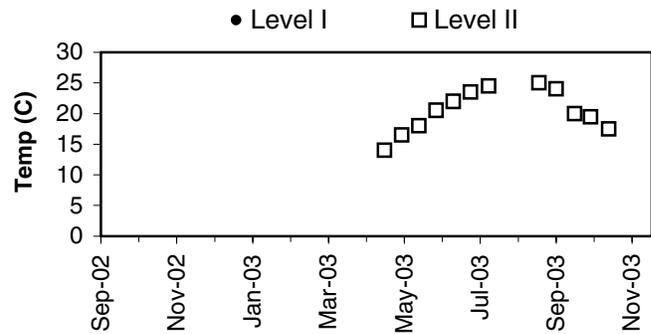
Volunteer monitoring began at Star Lake in the 1980s and has continued through 2003, with gaps in 1992 and 1994. The data indicate this lake is relatively low in primary productivity (high oligotrophic) with very good water quality. Since the lake surface makes up 9% of the drainage area, direct precipitation is less important than watershed inputs. Land use analysis of 2002 aerial photographs showed over 92% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Star Lake has a public access boat launch, and the lake has been recently treated for a Eurasian milfoil infestation. Residents should watch aquatic plants growing nearshore to catch remaining patches of this, Brazilian elodea or other aquatic noxious weeds.

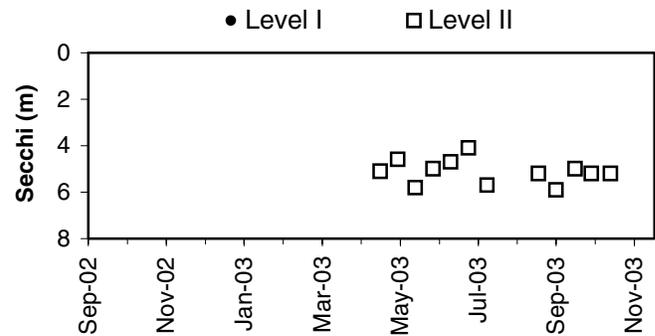
Physical Parameters

Secchi transparency was measured from April - October, ranging from 4.1 to 5.9m. Surface water temperatures reached 25.0 degrees Celsius during the same period. Water level and precipitation observations were not recorded.

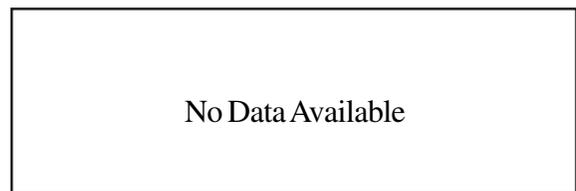
Lake Temperature



Secchi Depth

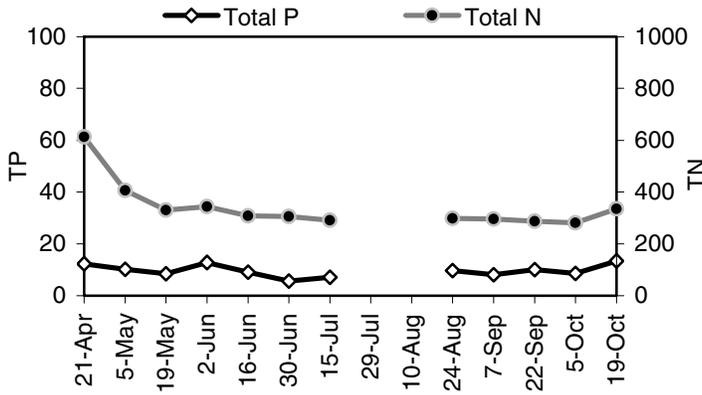


Lake Level and Precipitation



Star

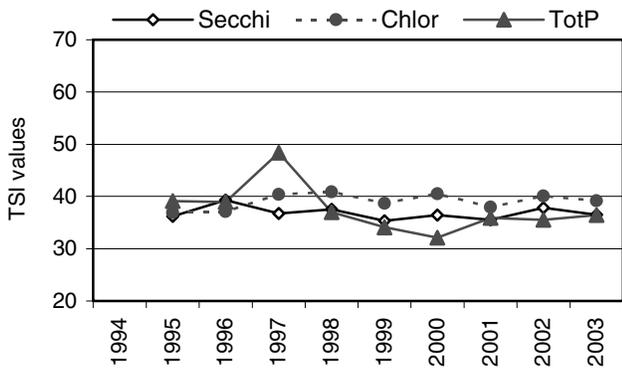
Nutrient Analysis



Nutrient Analysis and TSI Ratings

Total nitrogen decreased through spring and then remained steady, while total phosphorus did not vary much over the period. The N:P ratio ranged from 25 to 54. In 2003 the average TSI indicators were fairly close together in the upper range of oligotrophy.

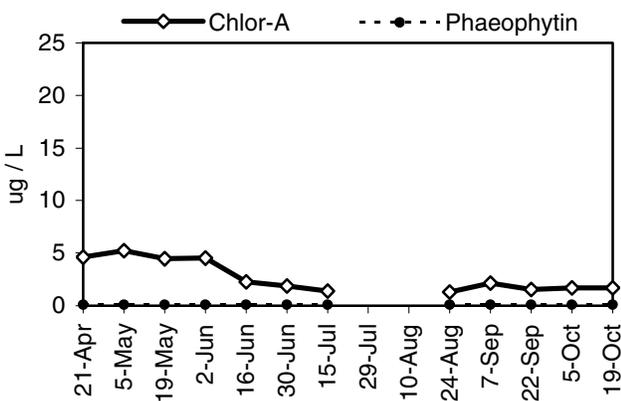
TSI Ratings



Chlorophyll and Algae

Chlorophyll concentration remained low through the entire sample season, but values were slightly higher in spring than the rest of the period. Algae in the spring plankton were dominated by the colonial chlorophyte *Botryococcus braunii* and the chrysophyte *Dinobryon*. Other algae found frequently through the sample period included the bluegreen *Anabaena*, the chlorophytes *Ankistrodesmus* and *Pediastrum*, and the chrysophyte *Gloeobotrys*.

Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|-------------|
| <i>Botryococcus braunii</i> | chlorophyte |
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Anabaena</i> sp. | bluegreen |

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 14.0 | 5.1 | 4.6 | 12.3 | 613 | 2 | 50 | 36.5 | 45.6 | 40.4 | |
| 5-May | 16.5 | 4.6 | 5.2 | 10.2 | 406 | 2 | 40 | 38.0 | 46.8 | 37.7 | |
| 19-May | 18.0 | 5.8 | 4.5 | 8.5 | 330 | 2 | 39 | 34.6 | 45.2 | 35.0 | |
| 2-Jun | 20.5 | 5.0 | 4.5 | 12.8 | 343 | 2 | 27 | 36.8 | 45.3 | 40.9 | |
| 16-Jun | 22.0 | 4.7 | 2.3 | 9.1 | 308 | 2 | 34 | 37.7 | 38.6 | 36.0 | |
| 30-Jun | 23.5 | 4.1 | 1.9 | 5.7 | 306 | 2 | 54 | 39.6 | 36.7 | 29.3 | |
| 15-Jul | 24.5 | 5.7 | 1.4 | 7.2 | 291 | 2 | 40 | 34.9 | 33.9 | 32.6 | |
| 29-Jul | | | | | | | | | | | No sample. |
| 11-Aug | | | | | | | | | | | No sample. |
| 25-Aug | 25.0 | 5.2 | 1.3 | 9.7 | 298 | 2 | 31 | 36.2 | 33.1 | 36.9 | |
| 8-Sep | 24.0 | 5.9 | 2.1 | 8.1 | 295 | 2 | 36 | 34.4 | 38.0 | 34.3 | |
| 23-Sep | 20.0 | 5.0 | 1.6 | 10.1 | 287 | 1 | 28 | 36.8 | 34.9 | 37.5 | |
| 6-Oct | 19.5 | 5.2 | 1.7 | 8.6 | 281 | 1 | 33 | 36.2 | 35.8 | 35.2 | |
| 21-Oct | 17.5 | 5.2 | 1.7 | 13.4 | 335 | 1 | 25 | 36.2 | 35.8 | 41.6 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.4 | 5.1 | 2.7 | 9.6 | 341.1 | 1.8 | 36 | 36.5 | 39.1 | 36.4 | TSI Average = 37.4 |
| Median | 20.3 | 5.2 | 2.0 | 9.4 | 307.0 | 2 | 35 | 36.3 | 37.4 | 36.5 | |
| Min | 14.0 | 4.1 | 1.3 | 5.7 | 281.0 | 1 | 25 | 34.4 | 33.1 | 29.3 | |
| Max | 25.0 | 5.9 | 5.2 | 13.4 | 613.0 | 2 | 54 | 39.6 | 46.8 | 41.6 | |
| Count | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | |

Steel

Lake Overview

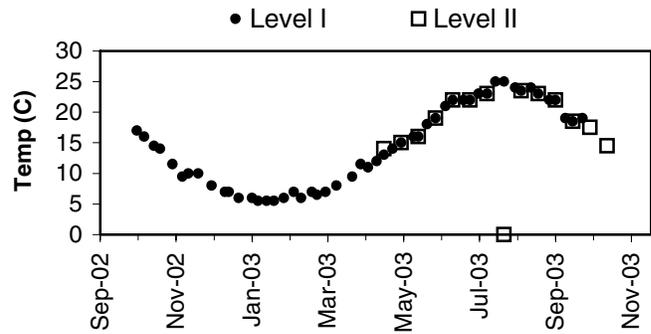
Volunteer monitoring began at Steel Lake in the 1980s and has continued through 2003, with a gap from 1991 through 1993. The data indicate this city lake (Federal Way) is relatively low in primary productivity (low mesotrophic) with very good water quality. Since the lake surface makes up 18% of the drainage area, direct precipitation is important in addition to watershed inputs. Land use analysis of 2002 aerial photographs showed slightly over 92% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Steel Lake has a public access boat launch, and the lake has been recently treated for a pioneering Eurasian milfoil infestation, with a long-term plan adopted for control, including funding through the formation of a Lake Management District.

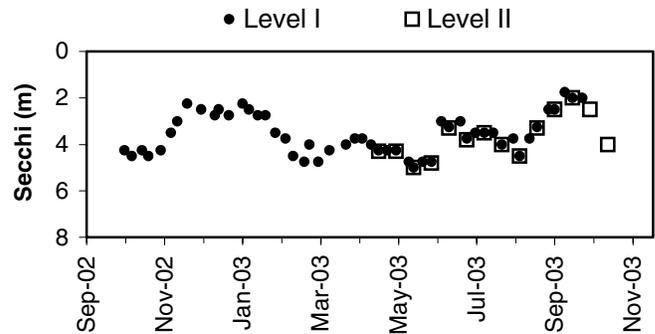
Physical Parameters

Secchi transparency ranged from 1.8 to 5.0m through the year. Annual water temperatures ranged from 5.5 to 25.0 degrees Celsius. Excellent records were kept of local precipitation and water levels. The lake level followed the regional pattern of winter high - summer low stands related to climate.

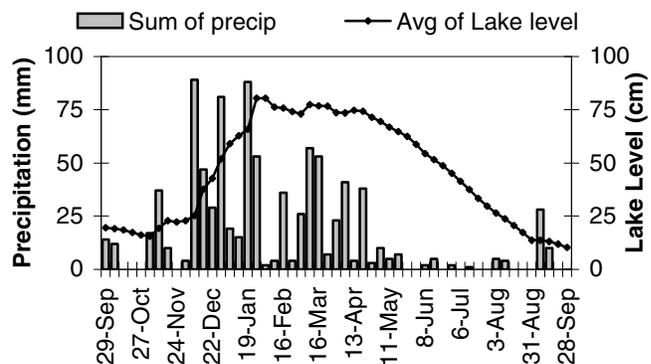
Lake Temperature



Secchi Depth

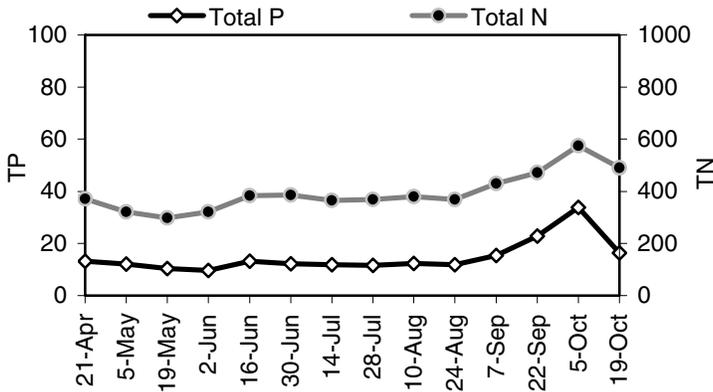


Lake Level and Precipitation

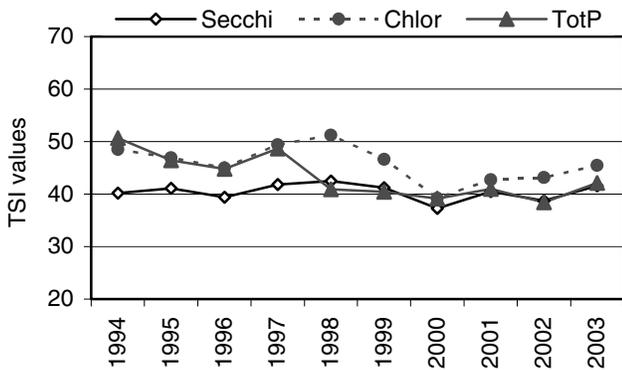


Steel

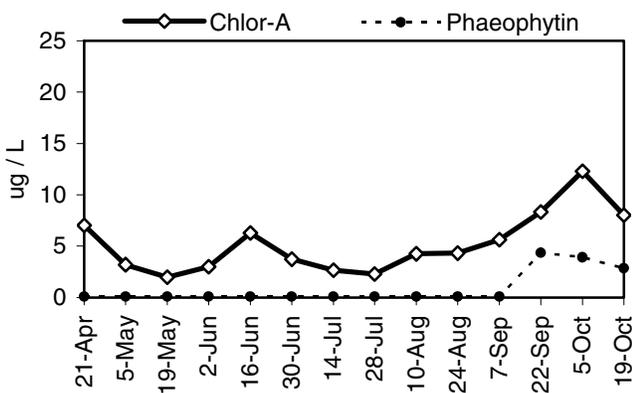
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Nutrient Analysis and TSI Ratings

Total phosphorus and total nitrogen remained in stable proportion to each other through the sampling period, both increasing in late summer to a maximum in early October. The N:P ratio ranged from 17 to 33. In 2003 the average TSI-Chlor was higher than the other two indicators, but all were in the lower range of mesotrophy.

Chlorophyll and Algae

Chlorophyll concentrations were moderately low through much of the season, with small peaks at the end of April and in mid-June, and a larger peak in early October. The chrysophyte *Dinobryon* and the bluegreen *Anabaena* were dominant in spring, while several cryptophyte species were common in the autumn. Other frequently occurring algae included the chlorophyte *Botryococcus braunii*, the bluegreen *Anacystis*, and the euglenophyte *Trachelomonas*.

| Common algae | Group |
|-----------------------------|-------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Anabaena</i> sp. | bluegreen |
| <i>Botryococcus braunii</i> | chlorophyte |

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 14.0 | 5 | 19.5 | 2 | | | | | | | |
| 6-Oct-02 | 12.0 | 7 | 19.0 | 4 | 1-Oct-02 | 12:00 | 4.3 | 17.0 | C1/P1 | C1/P1 | 0 |
| 13-Oct-02 | 0.0 | 6 | 18.5 | 4 | 7-Oct-02 | 12:00 | 4.5 | 16.0 | C1/P1 | C1/P1 | 0 |
| 20-Oct-02 | 0.0 | 7 | 17.3 | 4 | 15-Oct-02 | 14:00 | 4.3 | 14.5 | C1/P2 | C1/P2 | 0 |
| 27-Oct-02 | 0.0 | 6 | 16.0 | 5 | 20-Oct-02 | 15:30 | 4.5 | 14.0 | C1/P2 | C1/P2 | 0 |
| 3-Nov-02 | 17.0 | 7 | 15.5 | 6 | 30-Oct-02 | 13:30 | 4.3 | 11.5 | C1/P2 | C1/P2 | 0 |
| 10-Nov-02 | 37.0 | 6 | 19.2 | 6 | 7-Nov-02 | 15:00 | 3.5 | 9.5 | C2/P2 | C2/P2 | 0 |
| 17-Nov-02 | 10.0 | 7 | 22.8 | 4 | 12-Nov-02 | | 3.0 | 10.0 | C2/P2 | C2/P2 | 0 |
| 24-Nov-02 | 0.0 | 6 | 22.1 | 4 | 20-Nov-02 | 14:15 | 2.3 | 10.0 | C3/P2 | C3/P2 | 0 |
| 1-Dec-02 | 4.0 | 6 | 22.8 | 4 | 1-Dec-02 | 12:30 | 2.5 | 8.0 | C3/P2 | C3/P2 | 0 |
| 8-Dec-02 | 89.0 | 7 | 25.2 | 6 | 12-Dec-02 | 12:00 | 2.8 | 7.0 | C3/P2 | C3/P2 | 0 |
| 15-Dec-02 | 47.0 | 7 | 37.6 | 7 | 15-Dec-02 | 13:30 | 2.5 | 7.0 | C3/P2 | C3/P2 | 12 |
| 22-Dec-02 | 29.0 | 7 | 42.8 | 7 | 23-Dec-02 | 14:00 | 2.8 | 6.0 | C3/P2 | C3/P2 | 0 |
| 29-Dec-02 | 81.0 | 7 | 51.9 | 7 | 3-Jan-03 | 14:00 | 2.3 | 6.0 | C3/P2 | C3/P3 | 0 |
| 5-Jan-03 | 19.0 | 7 | 59.0 | 7 | 8-Jan-03 | 13:30 | 2.5 | 5.5 | C2/P3 | C2/P3 | 0 |
| 12-Jan-03 | 15.0 | 7 | 62.8 | 7 | 15-Jan-03 | 14:00 | 2.8 | 5.5 | C2/P2 | C2/P2 | 0 |
| 19-Jan-03 | 88.0 | 7 | 65.8 | 7 | 21-Jan-03 | 14:00 | 2.8 | 5.5 | C2/P2 | C2/P2 | 0 |
| 26-Jan-03 | 53.0 | 7 | 80.4 | 7 | 29-Jan-03 | 12:00 | 3.5 | 6.0 | C1/P1 | C1/P1 | 0 |
| 2-Feb-03 | 2.0 | 7 | 80.3 | 7 | 6-Feb-03 | 12:00 | 3.8 | 7.0 | C1/P1 | C1/P1 | 0 |
| 9-Feb-03 | 4.0 | 7 | 76.1 | 7 | 12-Feb-03 | 13:50 | 4.5 | 6.0 | C1/P1 | C1/P1 | 0 |
| 16-Feb-03 | 36.0 | 7 | 75.8 | 7 | 21-Feb-03 | 13:00 | 4.8 | 7.0 | C1/P1 | C1/P1 | 0 |
| 23-Feb-03 | 4.0 | 7 | 74.0 | 7 | 25-Feb-03 | 14:30 | 4.0 | 6.5 | C2/P2 | C1/P2 | 0 |
| 2-Mar-03 | 26.0 | 7 | 73.0 | 6 | 4-Mar-03 | 12:30 | 4.8 | 7.0 | C1/P1 | C1/P1 | 4 |
| 9-Mar-03 | 57.0 | 7 | 77.4 | 7 | 13-Mar-03 | 13:00 | 4.3 | 8.0 | C1/P1 | C1/P1 | 0 |
| 16-Mar-03 | 53.0 | 7 | 76.7 | 7 | | | | | | | |
| 23-Mar-03 | 7.1 | 7 | 76.6 | 7 | 26-Mar-03 | 11:30 | 4.0 | 9.5 | C1/P2 | C1/P2 | |
| 30-Mar-03 | 23.0 | 7 | 73.6 | 7 | 2-Apr-03 | 12:45 | 3.8 | 11.5 | C1/P2 | C1/P2 | |
| 6-Apr-03 | 41.0 | 5 | 73.4 | 7 | 8-Apr-03 | 12:30 | 3.8 | 11.0 | P2 | P2 | |
| 13-Apr-03 | 4.0 | 6 | 74.7 | 7 | 15-Apr-03 | 12:00 | 4.0 | 12.0 | P2 | P2 | |
| 20-Apr-03 | 38.0 | 6 | 74.1 | 7 | 21-Apr-03 | 14:00 | 4.3 | 13.0 | P2 | P2 | 3 |
| 27-Apr-03 | 3.0 | 3 | 71.6 | 7 | 28-Apr-03 | 16:00 | 4.3 | 14.0 | P2 | P2 | 6 |
| 4-May-03 | 10.0 | 7 | 69.6 | 7 | 5-May-03 | 14:00 | 4.3 | 15.0 | P1 | P1 | |
| 11-May-03 | 5.0 | 7 | 66.9 | 7 | 15-May-03 | 15:00 | 4.8 | 16.0 | P1 | P1 | |
| 18-May-03 | 7.0 | 7 | 64.7 | 7 | 19-May-03 | 15:00 | 5.0 | 16.0 | P2 | P2 | |
| 25-May-03 | 0.0 | 7 | 62.6 | 7 | 26-May-03 | 14:30 | 4.8 | 18.0 | P3 | P2 | |
| 1-Jun-03 | 0.0 | 7 | 58.7 | 7 | 2-Jun-03 | 16:00 | 4.8 | 19.0 | P2 | P2 | 11 |
| 8-Jun-03 | 2.0 | 7 | 54.4 | 7 | 10-Jun-03 | 16:00 | 3.0 | 21.0 | P2 | P2 | 21 |
| 15-Jun-03 | 5.0 | 7 | 51.6 | 7 | 16-Jun-03 | 16:00 | 3.3 | 22.0 | P2 | P2 | 23 |
| 22-Jun-03 | 0.0 | 7 | 48.7 | 7 | 25-Jun-03 | 16:00 | 3.0 | 22.0 | P2 | P2 | 22 |
| 29-Jun-03 | 2.0 | 1 | 45.1 | 7 | 30-Jun-03 | 13:00 | 3.8 | 22.0 | P2 | P2 | 12 |
| 6-Jul-03 | | | 41.4 | 7 | 7-Jul-03 | 16:00 | 3.5 | 23.0 | P3 | P3 | 6 |
| 13-Jul-03 | 1.0 | 1 | 37.4 | 7 | 14-Jul-03 | 15:30 | 3.5 | 23.0 | P2 | P2 | 0 |
| 20-Jul-03 | | | 33.3 | 7 | 21-Jul-03 | 16:30 | 3.5 | 25.0 | P2 | P2 | 0 |
| 27-Jul-03 | 0.0 | 2 | 29.7 | 7 | 28-Jul-03 | 16:30 | 4.0 | 25.0 | P1 | P1 | 0 |
| 3-Aug-03 | 5.0 | 7 | 26.4 | 7 | 6-Aug-03 | 16:00 | 3.8 | 24.0 | P2 | P2 | 0 |
| 10-Aug-03 | 4.0 | 7 | 23.7 | 7 | 11-Aug-03 | 12:00 | 4.5 | 23.5 | P1 | P1 | 0 |
| 17-Aug-03 | 0.0 | 7 | 20.6 | 7 | 19-Aug-03 | 16:00 | 3.8 | 24.0 | P2 | P2 | 0 |
| 24-Aug-03 | 0.0 | 7 | 17.3 | 7 | 25-Aug-03 | 16:15 | 3.3 | 23.0 | P2 | P2 | 0 |
| 31-Aug-03 | 0.0 | 7 | 13.7 | 7 | 3-Sep-03 | 16:00 | 2.5 | 22.0 | P2 | P2 | 0 |
| 7-Sep-03 | 28.0 | 6 | 13.7 | 7 | 8-Sep-03 | 15:30 | 2.5 | 22.0 | P1 | P1 | 0 |
| 14-Sep-03 | 10.0 | 7 | 13.0 | 7 | 16-Aug-03 | 17:00 | 1.8 | 19.0 | P2 | P2 | 2 |
| 21-Sep-03 | 0.0 | 7 | 11.9 | 7 | 22-Sep-03 | 14:00 | 2.0 | 18.5 | P2 | P2 | 0 |
| 28-Sep-03 | 0.0 | 2 | 10.3 | 3 | 30-Sep-03 | 14:00 | 2.0 | 19.0 | P2 | P2 | 24 |
| Min | 0.0 | | 10.3 | | Min | | 1.8 | 5.5 | | | 0 |
| Max | 89.0 | | 80.4 | | Max | | 5.0 | 25.0 | | | 24 |
| Total | 892.1 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 14.0 | 4.3 | 7.0 | 13.3 | 372 | 2 | 28 | 39.0 | 49.7 | 41.4 | |
| 5-May | 15.0 | 4.3 | 3.2 | 12.1 | 322 | 1 | 27 | 39.0 | 42.0 | 40.1 | |
| 19-May | 16.0 | 5.0 | 2.0 | 10.4 | 298 | 2 | 29 | 36.8 | 37.4 | 37.9 | Larger whitish globules than last week. |
| 2-Jun | 19.0 | 4.8 | 3.0 | 9.7 | 321 | 2 | 33 | 37.4 | 41.3 | 36.9 | More plants growing under volunteer's launch site. |
| 16-Jun | 22.0 | 3.3 | 6.3 | 13.2 | 384 | 2 | 29 | 42.8 | 48.6 | 41.4 | |
| 30-Jun | 22.0 | 3.8 | 3.7 | 12.2 | 386 | 2 | 32 | 40.7 | 43.5 | 40.2 | |
| 14-Jul | 23.0 | 3.5 | 2.7 | 11.8 | 365 | 2 | 31 | 41.9 | 40.2 | 39.8 | |
| 28-Jul | | 4.0 | 2.3 | 11.6 | 369 | 1 | 32 | 40.0 | 38.7 | 39.5 | |
| 11-Aug | 23.5 | 4.5 | 4.3 | 12.4 | 380 | 1 | 31 | 38.3 | 44.8 | 40.5 | |
| 25-Aug | 23.0 | 3.3 | 4.3 | 11.9 | 369 | 2 | 31 | 42.8 | 44.9 | 39.9 | |
| 8-Sep | 22.0 | 2.5 | 5.6 | 15.4 | 430 | 1 | 28 | 46.8 | 47.5 | 43.6 | Water is murky, but few particles visible. |
| 22-Sep | 18.5 | 2.0 | 8.3 | 22.8 | 472 | 2 | 21 | 50.0 | 51.4 | 49.3 | Lake is cloudy brown, but still only a P2 rating. |
| 6-Oct | 17.5 | 2.5 | 12.3 | 33.9 | 575 | 2 | 17 | 46.8 | 55.2 | 55.0 | |
| 20-Oct | 14.5 | 4.0 | 8.0 | 16.4 | 490 | 1 | 30 | 40.0 | 51.0 | 44.5 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.2 | 3.7 | 5.2 | 14.8 | 395.2 | 1.6 | 28 | 41.6 | 45.4 | 42.1 | TSI Average = 43.1 |
| Median | 19.0 | 3.9 | 4.3 | 12.3 | 375.8 | 2 | 29 | 40.4 | 44.9 | 40.4 | |
| Min | 14.0 | 2.0 | 2.0 | 9.7 | 298.0 | 1 | 17 | 36.8 | 37.4 | 36.9 | |
| Max | 23.5 | 5.0 | 12.3 | 33.9 | 575.0 | 2 | 33 | 50.0 | 55.2 | 55.0 | |
| Count | 13 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | |

Trout

Lake Overview

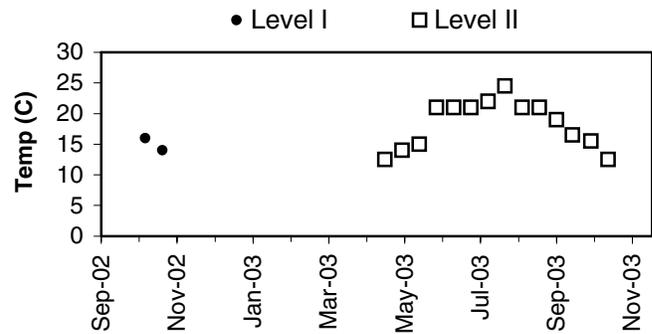
Volunteer monitoring began at Trout Lake in 1996 and has continued through 2003. The data indicate this lake is relatively high in primary productivity (borderline eutrophic) with good to fair water quality. Since the lake surface makes up less than 2% of the drainage area, direct precipitation is relatively unimportant compared to watershed inputs. Both Fivemile and Spider Lakes are upstream from Trout Lake. Land use analysis of 2002 aerial photographs showed that 63% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Trout Lake has a street end public access, and residents should keep a close eye on aquatic plants growing nearshore to catch early infestations of Eurasian milfoil, Brazilian elodea, and other aquatic noxious weeds.

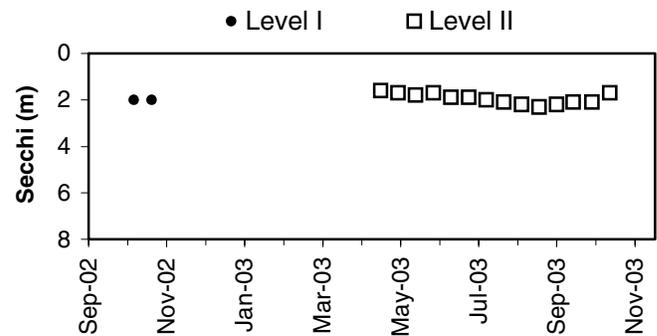
Physical Parameters

Secchi transparency ranged from 1.6 to 2.3m from April through October. Water temperatures reached 24.5 degrees Celsius over the same period. Excellent precipitation and water level records were kept, describing a winter-high stand dropping steadily after April to an autumn-low stand, similar to many lakes in the region.

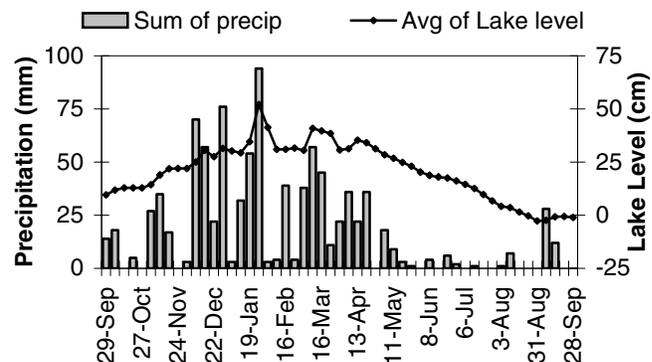
Lake Temperature



Secchi Depth

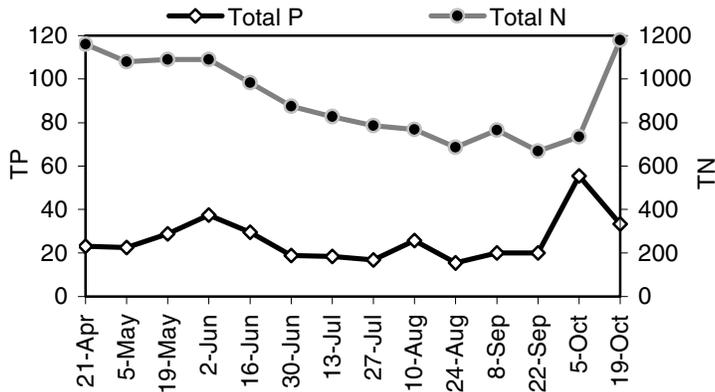


Lake Level and Precipitation

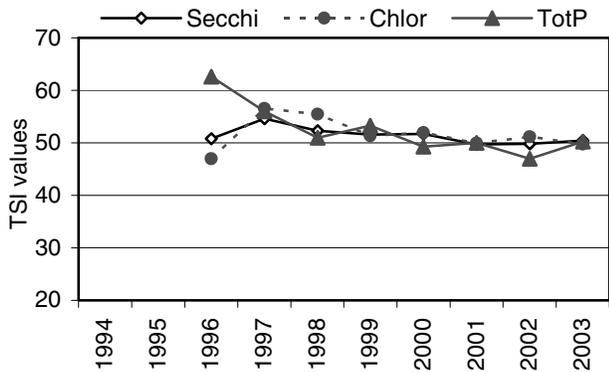


Trout

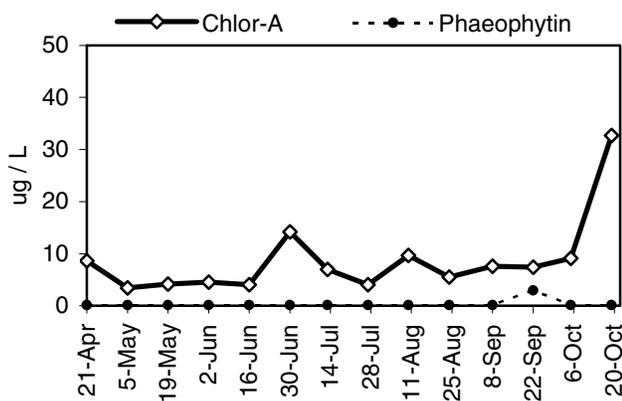
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Cryptomonas</i> spp. | cryptophyte |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased steadily until the end of September, while total phosphorus remained relatively stable. Both parameters increased in autumn. The N:P ratio ranged from 13 to 50. In 2003, the averages of the three TSI indicators were very close together, on the borderline between mesotrophy and eutrophy.

Chlorophyll and Algae

Chlorophyll concentrations remained moderate from late April through early October, with small peaks at the end of June and mid-August. In late October, chlorophyll rose dramatically. This was caused by a bloom of the bluegreen *Aphanizomenon flos-aquae*, which made a major peak in biovolume on the last sample date. Other important algae through the season included the cryptophyte *Cryptomonas*, the chrysophyte *Dinobryon*, and the euglenophyte *Trachelomonas volvocina*.

Trout

2003 Level I Data

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|---------------|-----------------|-------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
| 29-Sep-02 | 14.0 | 5 | 9.6 | 5 | | | | | | | |
| 6-Oct-02 | 18.0 | 7 | 11.9 | 7 | 7-Oct-02 | 16:00 | 2.0 | 16.0 | | | |
| 13-Oct-02 | 0.0 | 7 | 13.0 | 7 | | | | | | | |
| 20-Oct-02 | 5.0 | 7 | 13.0 | 7 | 21-Oct-02 | 12:00 | 2.0 | 14.0 | | | |
| 27-Oct-02 | 0.0 | 7 | 13.0 | 7 | | | | | | | |
| 3-Nov-02 | 27.0 | 7 | 14.4 | 7 | | | | | | | |
| 10-Nov-02 | 35.0 | 7 | 18.9 | 7 | | | | | | | |
| 17-Nov-02 | 17.0 | 7 | 21.7 | 7 | | | | | | | |
| 24-Nov-02 | 0.0 | 7 | 22.0 | 7 | | | | | | | |
| 1-Dec-02 | 3.0 | 7 | 22.0 | 7 | | | | | | | |
| 8-Dec-02 | 70.0 | 7 | 25.0 | 7 | | | | | | | |
| 15-Dec-02 | 57.0 | 7 | 30.4 | 7 | | | | | | | |
| 22-Dec-02 | 22.0 | 7 | 27.4 | 7 | | | | | | | |
| 29-Dec-02 | 76.0 | 7 | 31.3 | 6 | | | | | | | |
| 5-Jan-03 | 3.0 | 7 | 30.1 | 7 | | | | | | | |
| 12-Jan-03 | 32.0 | 7 | 29.3 | 7 | | | | | | | |
| 19-Jan-03 | 54.0 | 7 | 34.6 | 7 | | | | | | | |
| 26-Jan-03 | 94.0 | 7 | 52.0 | 7 | | | | | | | |
| 2-Feb-03 | 3.0 | 7 | 41.3 | 7 | | | | | | | |
| 9-Feb-03 | 4.0 | 7 | 30.9 | 7 | | | | | | | |
| 16-Feb-03 | 39.0 | 7 | 30.9 | 7 | | | | | | | |
| 23-Feb-03 | 4.0 | 7 | 31.6 | 7 | | | | | | | |
| 2-Mar-03 | 38.0 | 7 | 30.4 | 7 | | | | | | | |
| 9-Mar-03 | 57.0 | 7 | 40.9 | 7 | | | | | | | |
| 16-Mar-03 | 45.0 | 7 | 39.6 | 7 | | | | | | | |
| 23-Mar-03 | 11.0 | 7 | 38.4 | 7 | | | | | | | |
| 30-Mar-03 | 22.0 | 7 | 30.7 | 6 | | | | | | | |
| 6-Apr-03 | 36.0 | 7 | 31.3 | 7 | | | | | | | |
| 13-Apr-03 | 22.0 | 7 | 35.3 | 7 | | | | | | | |
| 20-Apr-03 | 36.0 | 7 | 34.0 | 7 | | | | | | | |
| 27-Apr-03 | 0.0 | 7 | 31.3 | 7 | | | | | | | |
| 4-May-03 | 18.0 | 7 | 28.4 | 7 | | | | | | | |
| 11-May-03 | 9.0 | 7 | 26.7 | 7 | | | | | | | |
| 18-May-03 | 3.0 | 7 | 24.7 | 7 | | | | | | | |
| 25-May-03 | 1.0 | 7 | 23.0 | 7 | | | | | | | |
| 1-Jun-03 | 0.0 | 7 | 20.3 | 7 | 2-Jun-03 | 16:00 | 1.7 | 21.0 | | | |
| 8-Jun-03 | 4.0 | 7 | 18.7 | 7 | | | | | | | |
| 15-Jun-03 | 0.0 | 7 | 18.0 | 7 | | | | | | | |
| 22-Jun-03 | 6.0 | 7 | 17.6 | 7 | | | | | | | |
| 29-Jun-03 | 2.0 | 7 | 16.3 | 7 | | | | | | | |
| 6-Jul-03 | 0.0 | 7 | 14.6 | 7 | | | | | | | |
| 13-Jul-03 | 1.0 | 7 | 12.6 | 7 | 13-Jul-03 | 14:00 | 2.0 | 22.0 | | | |
| 20-Jul-03 | 0.0 | 7 | 9.7 | 7 | | | | | | | |
| 27-Jul-03 | 0.0 | 7 | 6.7 | 7 | | | | | | | |
| 3-Aug-03 | 1.0 | 7 | 4.3 | 7 | 1-Aug-03 | 15:00 | 2.1 | 24.5 | | | |
| 10-Aug-03 | 7.0 | 7 | 3.6 | 7 | | | | | | | |
| 17-Aug-03 | 0.0 | 7 | 1.6 | 7 | | | | | | | |
| 24-Aug-03 | 0.0 | 7 | -0.3 | 7 | | | | | | | |
| 31-Aug-03 | 0.0 | 7 | -2.7 | 7 | | | | | | | |
| 7-Sep-03 | 28.0 | 7 | -2.4 | 7 | | | | | | | |
| 14-Sep-03 | 12.0 | 7 | -0.7 | 7 | | | | | | | |
| 21-Sep-03 | 0.0 | 7 | -0.6 | 7 | | | | | | | |
| 28-Sep-03 | 0.0 | 3 | -1.0 | 3 | | | | | | | |
| Min | 0.0 | | -2.7 | | | Min | 1.7 | 21.0 | | | |
| Max | 94.0 | | 52.0 | | | Max | 2.1 | 24.5 | | | |
| Total | 936.0 | | | | | | | | | | |

Trout

2003 Level II Data

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|---------------|------------------|-------------------|---------------------|------------------|------------------|--------------------|------------|-----------------------|--------------|-----------|---------------------------|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | 12.5 | 1.6 | 8.6 | 23.0 | 1160 | | 50 | 53.2 | 51.7 | 49.4 | |
| 5-May | 14.0 | 1.7 | 3.4 | 22.5 | 1080 | | 48 | 52.3 | 42.7 | 49.1 | |
| 19-May | 15.0 | 1.8 | 4.1 | 28.7 | 1090 | | 38 | 51.5 | 44.5 | 52.6 | |
| 2-Jun | 21.0 | 1.7 | 4.5 | 37.4 | 1090 | | 29 | 52.3 | 45.4 | 56.4 | |
| 16-Jun | 21.0 | 1.9 | 4.0 | 29.5 | 983 | | 33 | 50.7 | 44.2 | 53.0 | |
| 30-Jun | 21.0 | 1.9 | 14.2 | 18.8 | 875 | | 47 | 50.7 | 56.6 | 46.5 | |
| 14-Jul | 22.0 | 2.0 | 7.0 | 18.3 | 828 | | 45 | 50.0 | 49.6 | 46.1 | |
| 28-Jul | 24.5 | 2.1 | 4.0 | 16.7 | 786 | | 47 | 49.3 | 44.2 | 44.8 | |
| 11-Aug | 21.0 | 2.2 | 9.7 | 25.7 | 769 | | 30 | 48.6 | 52.8 | 51.0 | |
| 25-Aug | 21.0 | 2.3 | 5.5 | 15.4 | 686 | | 45 | 48.0 | 47.3 | 43.6 | |
| 8-Sep | 19.0 | 2.2 | 7.6 | 19.9 | 766 | | 38 | 48.6 | 50.5 | 47.3 | |
| 21-Sep | 16.5 | 2.1 | 7.4 | 20.0 | 669 | | 33 | 49.3 | 50.2 | 47.4 | |
| 6-Oct | 15.5 | 2.1 | 9.1 | 55.5 | 735 | 3 | 13 | 49.3 | 52.2 | 62.1 | |
| 20-Oct | 12.5 | 1.7 | 32.7 | 33.3 | 1180 | | 35 | 52.3 | 64.8 | 54.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.3 | 2.0 | 8.7 | 26.1 | 906.9 | 3 | 38 | 50.5 | 49.8 | 50.3 | TSI Average = 50.2 |
| Median | 20.0 | 2.0 | 7.2 | 22.8 | 851.5 | 3 | 38 | 50.4 | 49.9 | 49.2 | |
| Min | 12.5 | 1.6 | 3.4 | 15.4 | 669.0 | 3 | 13 | 48.0 | 42.7 | 43.6 | |
| Max | 24.5 | 2.3 | 32.7 | 55.5 | 1180.0 | 3 | 50 | 53.2 | 64.8 | 62.1 | |
| Count | 14 | 14 | 14 | 14 | 14 | 1 | 14 | 14 | 14 | 14 | |

Twelve

Lake Overview

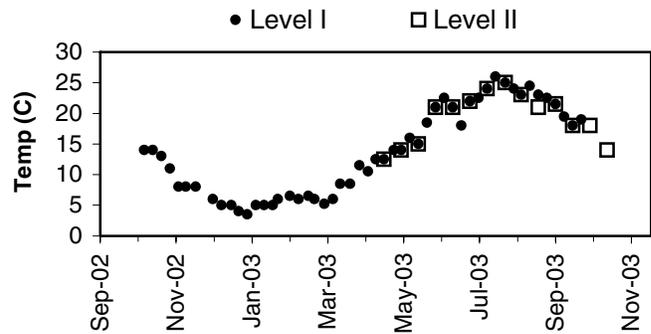
Volunteer monitoring began at Lake Twelve in the early 1980s and has continued through 2003, missing only 1997 and 1999. The data collected indicate this lake is generally moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 10% of the drainage area, direct precipitation is important in addition to watershed inputs. There is a large Class 2 wetland along its eastern shoreline (King County, 1990) that may contribute water to the lake occasionally. Land use analysis of 2002 aerial photographs showed slightly more than 21% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Lake Twelve has a public access boat launch, and an infestation of Eurasian milfoil was treated in the 1990s, but has since reappeared. Residents should keep an eye on this, as well as watch for other noxious weeds such as Brazilian elodea.

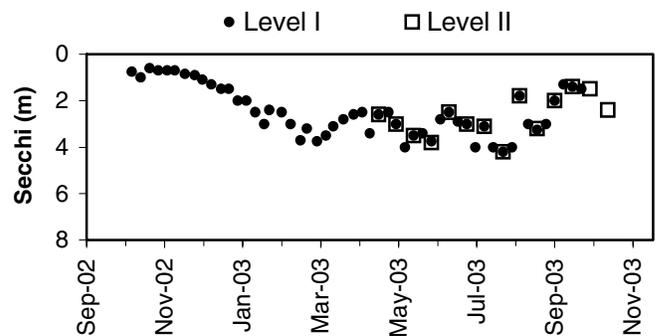
Physical Parameters

Secchi transparency ranged from 0.6 to 4.2m through the year, with the lowest transparencies in autumn 2002. Water temperatures ranged from 3.5 to 26.0 degrees Celsius. Excellent precipitation and water level records indicated a moderate winter high–summer low pattern, similar to other regional lakes.

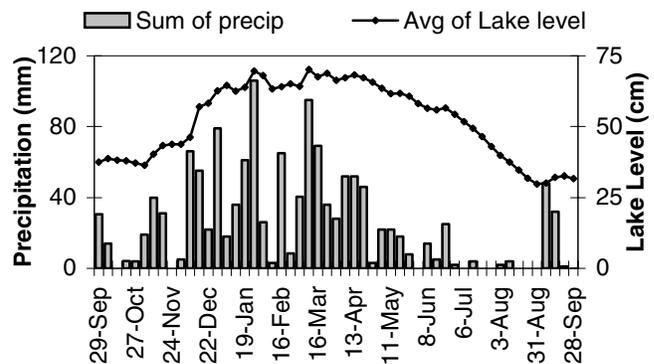
Lake Temperature



Secchi Depth

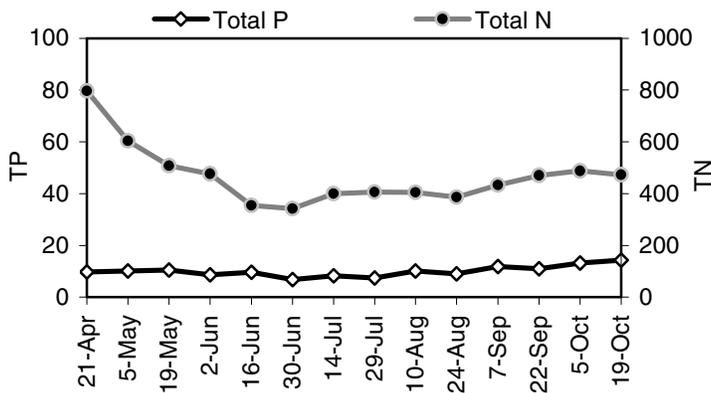


Lake Level and Precipitation

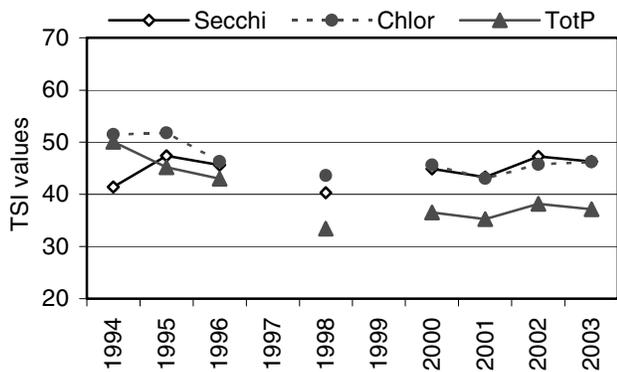


Twelve

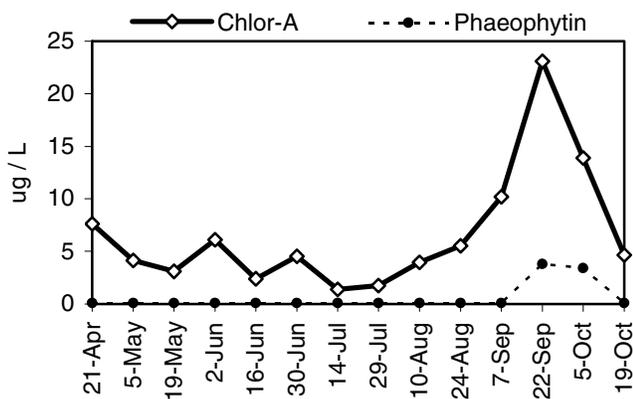
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-------------------------|----------------|
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Cryptomonas</i> spp. | cryptophyte |
| <i>Peridinium</i> sp. | dinoflagellate |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased from an initial high value through mid-June and then rose slightly through the remaining dates. Total phosphorus was stable throughout the sample period. The N:P ratio ranged from 33 to 82. In 2003, the average TSI-chlor and TSI-Secchi were close together in the middle range for mesotrophy, while TSI-TP was significantly smaller.

Chlorophyll and Algae

Chlorophyll content varied in the moderate range through most of the sample season, but climbed to a distinctly higher peak in late September. The autumn peak was caused by the chrysophyte *Dinobryon*. Other commonly occurring algae through the season included the cryptophyte *Cryptomonas* and the dinoflagellate *Peridinium*. Bluegreens were extremely rare in the samples.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 30.5 | 5 | 37.4 | 5 | | | | | | | |
| 6-Oct-02 | 14.0 | 7 | 38.6 | 7 | 7-Oct-02 | 10:15 | 0.8 | 14.0 | C3 | C3 | 0 |
| 13-Oct-02 | 0.0 | 7 | 38.1 | 7 | 14-Oct-02 | 15:20 | 1.0 | 14.0 | C3 | C3 | 0 |
| 20-Oct-02 | 4.1 | 7 | 37.9 | 7 | 21-Oct-02 | 15:07 | 0.6 | 13.0 | C3 | C3 | 0 |
| 27-Oct-02 | 4.0 | 7 | 37.1 | 7 | 28-Oct-02 | 15:15 | 0.7 | 11.0 | C3 | C3 | 0 |
| 3-Nov-02 | 19.0 | 7 | 36.4 | 7 | 4-Nov-02 | 15:07 | 0.7 | 8.0 | C3 | C3 | 0 |
| 10-Nov-02 | 40.0 | 5 | 40.3 | 5 | 10-Nov-02 | 12:26 | 0.7 | 8.0 | C3 | C3 | 0 |
| 17-Nov-02 | 31.1 | 7 | 43.3 | 7 | 18-Nov-02 | 15:12 | 0.9 | 8.0 | C3 | C3 | 0 |
| 24-Nov-02 | 0.0 | 7 | 43.7 | 7 | 26-Nov-02 | 16:35 | 0.9 | | C3 | C3 | 0 |
| 1-Dec-02 | 5.0 | 7 | 43.8 | 7 | 2-Dec-02 | 15:15 | 1.1 | 6.0 | NA | NA | 0 |
| 8-Dec-02 | 66.0 | 7 | 46.2 | 7 | 9-Dec-02 | 12:00 | 1.3 | 5.0 | NA | NA | 0 |
| 15-Dec-02 | 55.0 | 7 | 57.0 | 7 | 17-Dec-02 | 14:45 | 1.5 | 5.0 | NA | NA | 0 |
| 22-Dec-02 | 22.0 | 7 | 58.3 | 7 | 23-Dec-02 | 15:30 | 1.5 | 4.0 | NA | NA | 0 |
| 29-Dec-02 | 79.0 | 7 | 62.6 | 7 | 30-Dec-02 | 15:15 | 2.0 | 3.5 | NA | NA | 0 |
| 5-Jan-03 | 18.0 | 7 | 64.6 | 7 | 6-Jan-03 | 15:30 | 2.0 | 5.0 | NA | NA | 0 |
| 12-Jan-03 | 36.0 | 6 | 62.5 | 6 | 13-Jan-03 | 8:45 | 2.5 | 5.0 | NA | NA | 0 |
| 19-Jan-03 | 61.0 | 7 | 63.9 | 7 | 20-Jan-03 | 14:00 | 3.0 | 5.0 | NA | NA | 0 |
| 26-Jan-03 | 106.0 | 7 | 69.6 | 7 | 24-Jan-03 | 15:00 | 2.4 | 6.0 | NA | NA | 0 |
| 2-Feb-03 | 26.0 | 7 | 68.0 | 7 | 3-Feb-03 | 13:30 | 2.5 | 6.5 | NA | NA | 0 |
| 9-Feb-03 | 3.0 | 7 | 63.4 | 7 | 10-Feb-03 | 15:15 | 3.0 | 6.0 | NA | NA | 4 |
| 16-Feb-03 | 65.0 | 6 | 64.1 | 6 | 18-Feb-03 | 14:50 | 3.7 | 6.5 | NA | NA | 4 |
| 23-Feb-03 | 8.5 | 6 | 65.1 | 6 | 23-Feb-03 | 15:50 | 3.2 | 6.0 | NA | NA | 0 |
| 2-Mar-03 | 40.5 | 6 | 64.2 | 6 | 3-Mar-03 | 17:45 | 3.8 | 5.2 | NA | NA | 6 |
| 9-Mar-03 | 95.0 | 7 | 70.1 | 7 | 10-Mar-03 | 16:30 | 3.5 | 6.0 | NA | NA | 0 |
| 16-Mar-03 | 69.0 | 6 | 67.6 | 6 | 16-Mar-03 | 13:55 | 3.1 | 8.5 | NA | NA | 0 |
| 23-Mar-03 | 36.0 | 7 | 68.9 | 7 | 24-Mar-03 | 15:40 | 2.8 | 8.5 | NA | NA | 4 |
| 30-Mar-03 | 28.1 | 7 | 66.4 | 7 | 1-Apr-03 | 15:30 | 2.6 | 11.5 | NA | NA | 3 |
| 6-Apr-03 | 52.0 | 7 | 67.2 | 7 | 8-Apr-03 | 14:45 | 2.5 | 10.5 | | | |
| 13-Apr-03 | 52.0 | 7 | 68.3 | 7 | 14-Apr-03 | 15:15 | 3.4 | 12.5 | | P1 | |
| 20-Apr-03 | 46.0 | 7 | 67.2 | 7 | 21-Apr-03 | 15:30 | 2.6 | 12.5 | | P1 | |
| 27-Apr-03 | 3.1 | 7 | 65.7 | 7 | 29-Apr-03 | 15:15 | 2.5 | 14.0 | | P1 | |
| 4-May-03 | 22.0 | 7 | 63.5 | 7 | 5-May-03 | 15:45 | 3.0 | 14.0 | P1 | P2 | |
| 11-May-03 | 22.0 | 7 | 61.6 | 7 | 12-May-03 | 16:35 | 4.0 | 16.0 | NA | NA | |
| 18-May-03 | 18.0 | 7 | 61.8 | 7 | 19-May-03 | 16:15 | 3.5 | 15.0 | NA | NA | |
| 25-May-03 | 8.0 | 7 | 60.7 | 7 | 26-May-03 | 15:00 | 3.4 | 18.5 | | P2 | |
| 1-Jun-03 | 0.0 | 7 | 58.1 | 7 | 2-Jun-03 | 15:30 | 3.8 | 21.0 | P1 | P2 | |
| 8-Jun-03 | 14.0 | 7 | 56.4 | 7 | 9-Jun-03 | 14:40 | 2.8 | 22.5 | P3 | P3 | |
| 15-Jun-03 | 5.0 | 7 | 55.9 | 7 | 16-Jun-03 | 14:40 | 2.5 | 21.0 | P1 | P1 | |
| 22-Jun-03 | 25.0 | 7 | 56.6 | 7 | 23-Jun-06 | 16:00 | 2.9 | 18.0 | NA | NA | |
| 29-Jun-03 | 2.0 | 7 | 54.3 | 7 | 30-Jun-06 | 14:50 | 3.0 | 22.0 | NA | NA | |
| 6-Jul-03 | 0.0 | 7 | 51.7 | 7 | 7-Jul-03 | 14:05 | 4.0 | 22.5 | NA | NA | |
| 13-Jul-03 | 4.0 | 7 | 49.4 | 7 | 14-Jul-03 | 16:10 | 3.1 | 24.0 | NA | P1 | |
| 20-Jul-03 | 0.0 | 7 | 46.4 | 7 | 21-Jul-03 | 16:30 | 4.0 | 26.0 | P1 | P3 | |
| 27-Jul-03 | 0.0 | 7 | 42.9 | 7 | 29-Jul-03 | 8:30 | 4.2 | 25.0 | NA | NA | |
| 3-Aug-03 | 2.0 | 7 | 39.8 | 7 | 5-Aug-03 | 16:00 | 4.0 | 24.0 | NA | NA | |
| 10-Aug-03 | 4.0 | 5 | 37.5 | 5 | 11-Aug-03 | 14:50 | 1.8 | 23.0 | NA | NA | |
| 17-Aug-03 | 0.0 | 7 | 34.6 | 7 | 18-Aug-03 | 16:35 | 3.0 | 24.5 | NA | NA | |
| 24-Aug-03 | 0.0 | 7 | 31.9 | 7 | 25-Aug-03 | 9:40 | 3.3 | 23.0 | NA | NA | |
| 31-Aug-03 | 0.0 | 7 | 29.8 | 7 | 1-Sep-03 | 15:30 | 3.0 | 22.5 | P3 | P3 | |
| 7-Sep-03 | 48.1 | 7 | 30.1 | 7 | 8-Sep-03 | 17:20 | 2.0 | 21.5 | P1 | P3 | |
| 14-Sep-03 | 32.0 | 7 | 32.1 | 7 | 15-Sep-03 | 15:40 | 1.3 | 19.5 | P3 | P3 | |
| 21-Sep-03 | 1.0 | 7 | 32.6 | 7 | 22-Sep-03 | 15:35 | 1.4 | 18.0 | P3 | P3 | |
| 28-Sep-03 | 0.0 | 3 | 31.7 | 3 | 29-Sep-03 | 16:30 | 1.5 | 19.0 | P3 | P3 | |
| Min | 0.0 | | 29.8 | | Min | | 1.1 | 3.5 | | | 0 |
| Max | 106.0 | | 70.1 | | Max | | 4.2 | 26.0 | | | 6 |
| Total | 1321.8 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes | |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|---|--|
| | | | | | | | | Secc | chl-a | TP | | |
| 21-Apr | 12.5 | 2.6 | 7.6 | 9.7 | 797 | 1 | 82 | 46.2 | 50.5 | 36.9 | Particles are either very tiny or there are none. | |
| 5-May | 14.0 | 3.0 | 4.1 | 10.1 | 603 | 1 | 60 | 44.1 | 44.5 | 37.5 | | |
| 19-May | 15.0 | 3.5 | 3.1 | 10.5 | 507 | 1 | 48 | 41.9 | 41.6 | 38.1 | | |
| 2-Jun | 21.0 | 3.8 | 6.1 | 8.6 | 477 | 2 | 55 | 40.7 | 48.3 | 35.2 | | |
| 16-Jun | 21.0 | 2.5 | 2.4 | 9.6 | 355 | 1 | 37 | 46.8 | 39.2 | 36.8 | | |
| 30-Jun | 22.0 | 3.0 | 4.5 | 6.8 | 342 | 0 | 50 | 44.1 | 45.3 | 31.8 | | |
| 14-Jul | 24.0 | 3.1 | 1.4 | 8.3 | 400 | 1 | 48 | 43.7 | 33.9 | 34.7 | | |
| 29-Jul | 25.0 | 4.2 | 1.8 | 7.4 | 407 | 1 | 55 | 39.3 | 36.1 | 33.0 | | |
| 11-Aug | 23.0 | 1.8 | 4.0 | 10.1 | 405 | 1 | 40 | 51.5 | 44.0 | 37.5 | | No algae visible. |
| 25-Aug | 21.0 | 3.2 | 5.5 | 9.0 | 387 | 0 | 43 | 43.2 | 47.3 | 35.8 | | |
| 8-Sep | 21.5 | 2.0 | 10.2 | 11.8 | 434 | 3 | 37 | 50.0 | 53.4 | 39.8 | | |
| 22-Sep | 18.0 | 1.4 | 23.1 | 10.9 | 471 | 3 | 43 | 55.1 | 61.4 | 38.6 | | Algae bloom over entire lake. |
| 6-Oct | 18.0 | 1.5 | 13.9 | 13.2 | 488 | 3 | 37 | 54.1 | 56.4 | 41.4 | | |
| 20-Oct | 14.0 | 2.4 | 4.7 | 14.3 | 473 | 3 | 33 | 47.4 | 45.6 | 42.5 | | The water is clearer, but algae still present. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | | |
| | | | | | | | | Secc | chl-a | TP | | |
| Mean | 19.3 | 2.7 | 6.6 | 10.0 | 467.6 | 1.5 | 48 | 46.3 | 46.2 | 37.1 | TSI Average = 43.2 | |
| Median | 21.0 | 2.8 | 4.6 | 9.9 | 452.5 | 1 | 46 | 45.2 | 45.5 | 37.2 | | |
| Min | 12.5 | 1.4 | 1.4 | 6.8 | 342.0 | 0 | 33 | 39.3 | 33.9 | 31.8 | | |
| Max | 25.0 | 4.2 | 23.1 | 14.3 | 797.0 | 3 | 82 | 55.1 | 61.4 | 42.5 | | |
| Count | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | | |

Union

Lake Overview

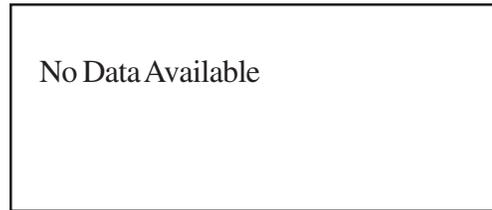
Volunteer monitoring began at Lake Union in water year 2003. Only Level I data were collected at this city lake (Seattle). Current land use is mixed urban residential and commercial.

Lake Union has many access points and is a popular recreational city lake. Lake users and residents should watch for patches of Eurasian milfoil, Bazilian elodea and other noxious aquatic weeds.

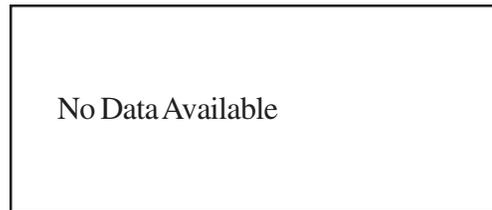
Physical Parameters

Records were kept from October through January, which showed that water levels did not vary with precipitation. This is understandable since the water levels of Lake Washington, Lake Union and the ship canal are all controlled by the dam at the Chittenden locks in Salmon Bay.

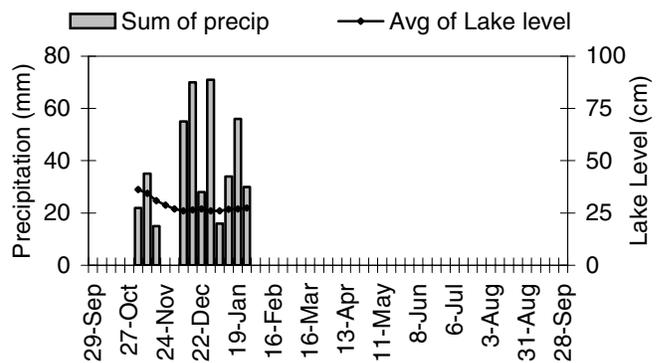
Lake Temperature



Secchi Depth



Lake Level and Precipitation



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Union

2003 Level I Data

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | | | | | | | | | | | |
| 13-Oct-02 | | | | | | | | | | | |
| 20-Oct-02 | | | | | | | | | | | |
| 27-Oct-02 | | | | | | | | | | | |
| 3-Nov-02 | 22.0 | 3 | 36.3 | 3 | | | | | | | |
| 10-Nov-02 | 35.0 | 7 | 34.4 | 7 | 10-Nov-02 | 13:10 | 3.3 | 12.0 | NA | NA | 0 |
| 17-Nov-02 | 15.0 | 7 | 31.0 | 7 | 17-Nov-02 | 8:40 | 4.0 | 12.0 | NA | NA | 0 |
| 24-Nov-02 | 0.0 | 7 | 28.9 | 7 | 24-Nov-02 | 13:20 | 4.5 | 12.0 | NA | NA | 0 |
| 1-Dec-02 | 0.0 | 7 | 27.0 | 7 | | | | | | | |
| 8-Dec-02 | 55.0 | 7 | 26.0 | 7 | | | | | | | |
| 15-Dec-02 | 70.0 | 7 | 26.6 | 7 | 15-Dec-02 | 12:30 | 3.3 | 11.0 | NA | NA | 0 |
| 22-Dec-02 | 28.0 | 7 | 27.0 | 7 | 22-Dec-02 | 11:00 | 3.3 | 8.0 | NA | NA | 0 |
| 29-Dec-02 | 71.0 | 7 | 26.0 | 7 | 29-Dec-02 | 8:20 | 4.5 | 7.0 | NA | NA | 0 |
| 5-Jan-03 | 16.0 | 7 | 26.0 | 7 | 5-Jan-03 | 16:00 | 4.5 | 8.0 | NA | P1 | 0 |
| 12-Jan-03 | 34.0 | 6 | 26.9 | 7 | 12-Jan-03 | 16:30 | 4.5 | 7.0 | NA | P1 | 0 |
| 19-Jan-03 | 56.0 | 7 | 27.0 | 7 | 19-Jan-03 | 11:45 | 5.3 | 7.0 | NA | P1 | 5 |
| 26-Jan-03 | 30.0 | 5 | 27.4 | 5 | 28-Jan-03 | 17:20 | 4.5 | 9.0 | NA | P1 | 0 |
| 2-Feb-03 | | | | | | | | | | | |
| 9-Feb-03 | | | | | | | | | | | |
| 16-Feb-03 | | | | | | | | | | | |
| 23-Feb-03 | | | | | | | | | | | |
| 2-Mar-03 | | | | | | | | | | | |
| 9-Mar-03 | | | | | | | | | | | |
| 16-Mar-03 | | | | | | | | | | | |
| 23-Mar-03 | | | | | | | | | | | |
| 30-Mar-03 | | | | | | | | | | | |
| 6-Apr-03 | | | | | | | | | | | |
| 13-Apr-03 | | | | | | | | | | | |
| 20-Apr-03 | | | | | | | | | | | |
| 27-Apr-03 | | | | | | | | | | | |
| 4-May-03 | | | | | | | | | | | |
| 11-May-03 | | | | | | | | | | | |
| 18-May-03 | | | | | | | | | | | |
| 25-May-03 | | | | | | | | | | | |
| 1-Jun-03 | | | | | | | | | | | |
| 8-Jun-03 | | | | | | | | | | | |
| 15-Jun-03 | | | | | | | | | | | |
| 22-Jun-03 | | | | | | | | | | | |
| 29-Jun-03 | | | | | | | | | | | |
| 6-Jul-03 | | | | | | | | | | | |
| 13-Jul-03 | | | | | | | | | | | |
| 20-Jul-03 | | | | | | | | | | | |
| 27-Jul-03 | | | | | | | | | | | |
| 3-Aug-03 | | | | | | | | | | | |
| 10-Aug-03 | | | | | | | | | | | |
| 17-Aug-03 | | | | | | | | | | | |
| 24-Aug-03 | | | | | | | | | | | |
| 31-Aug-03 | | | | | | | | | | | |
| 7-Sep-03 | | | | | | | | | | | |
| 14-Sep-03 | | | | | | | | | | | |
| 21-Sep-03 | | | | | | | | | | | |
| 28-Sep-03 | | | | | | | | | | | |
| Min | 0.0 | | 26.0 | | | | Min | 3.3 | 7.0 | | 0 |
| Max | 71.0 | | 36.3 | | | | Max | 5.3 | 11.0 | | 5 |
| Total | 432.0 | | | | | | | | | | |

No Level II Data
Available For This Lake

Walsh

Lake Overview

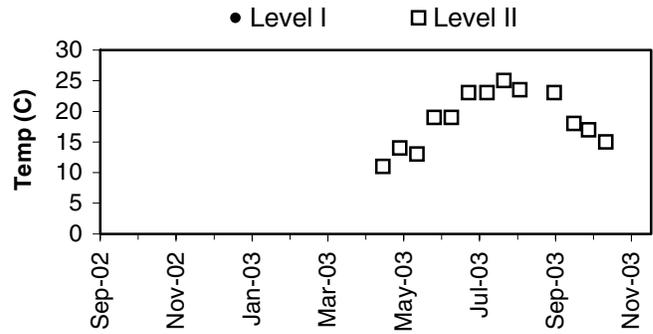
Volunteer monitoring began at Walsh Lake in 2002 and continued through 2003. The data suggest that this lake, located inside the restricted Cedar River watershed, is relatively low in primary productivity (oligotrophic - mesotrophic) with very good water quality. Since the lake surface makes up 6% of the drainage area, direct precipitation is not as important as watershed inputs. Extensive wetlands surround much of the shoreline. Current land use in the watershed is very restricted, protected as the domestic water source for the city of Seattle and suburban areas, so development is negligible.

Walsh Lake has no access available to the public and no private ownership of land nearby. Noxious aquatic weeds have not been reported.

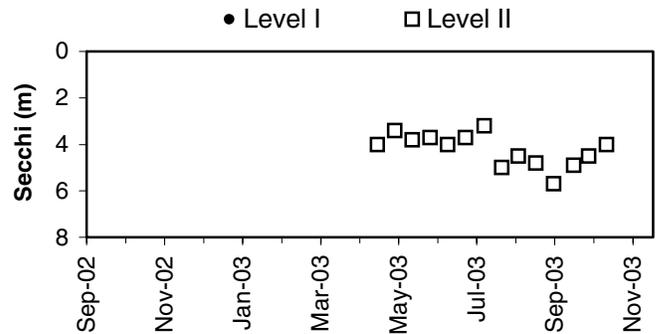
Physical Parameters

Secchi transparency ranged between 3.2 and 5.7m from April through October. Level II surface water temperatures reached 25.0 degrees Celsius. No water level or local precipitation records were kept.

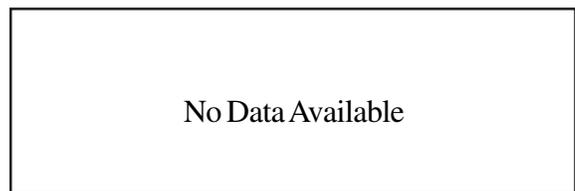
Lake Temperature



Secchi Depth

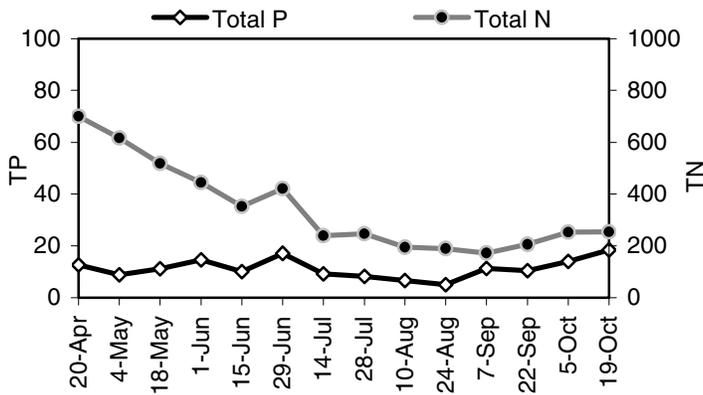


Lake Level and Precipitation

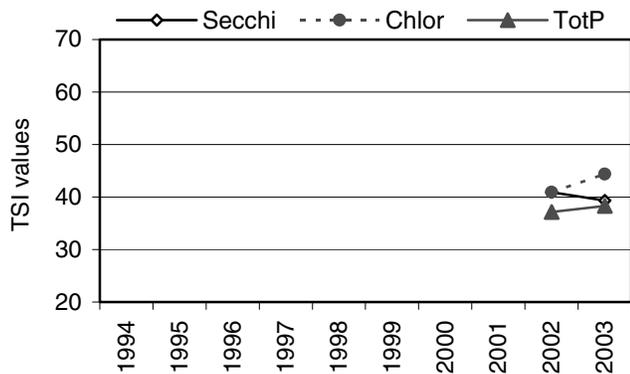


Walsh

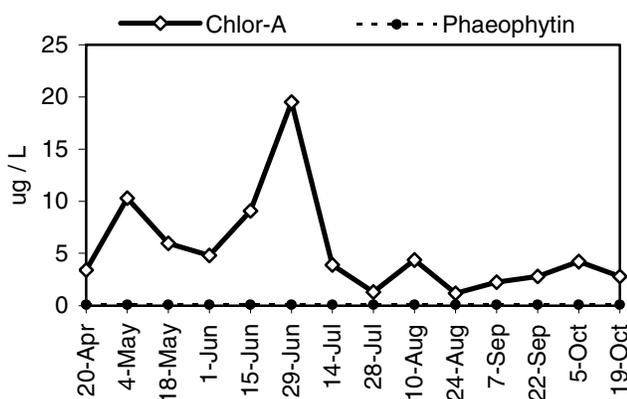
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



Common algae

Group

| | |
|-----------------------|--------------------|
| unidentified species | chrysophyte |
| <i>Peridinium</i> sp. | dinoflagellate |
| <i>Cyclotella</i> sp. | diatom-chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased slowly through spring until mid-July, after which it remained fairly stable. Total phosphorus varied only slightly through the sampling period. The N:P ratio ranged from 14 to 69, with the lower values in the second half of the season. In 2003, the average TSI values ranged across the threshold between oligotrophy and mesotrophy, similar to 2002.

Chlorophyll and Algae

Chlorophyll content reached a minor peak in early May and a major peak in late June, then maintained relatively low levels through the rest of the sample period. Both spring peaks were dominated by an unidentified chrysophyte species. Other commonly occurring species included the dinoflagellate *Peridinium*, the diatom-chrysophytes *Cyclotella* and *Asterionella*, and the chlorophyte *Botryococcus*. Bluegreens were extremely rare until fall, when both *Aphanizomenon* and *Anabaena* become common.

No Level I Data
Available For This Lake

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|--------------|---------------|-----------------|--------------|--------------|----------------|-----|----------------|-------|------|---|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 11.0 | 4.0 | 3.4 | 12.7 | 701 | 1 | 55 | 40.0 | 42.7 | 40.8 | |
| 4-May | 14.0 | 3.4 | 10.3 | 8.9 | 617 | 1 | 69 | 42.3 | 53.4 | 35.7 | |
| 18-May | 13.0 | 3.8 | 6.0 | 11.2 | 518 | 1 | 46 | 40.7 | 48.1 | 39.0 | Lots of pollen observed. Can't see algae well. |
| 1-Jun | 19.0 | 3.7 | 4.8 | 14.7 | 445 | 3 | 30 | 41.1 | 46.0 | 42.9 | Cannot tell if particles are algae or pollen. |
| 15-Jun | 19.0 | 4.0 | 9.1 | 10.1 | 352 | 3 | 35 | 40.0 | 52.2 | 37.5 | Numerous diatoms. |
| 29-Jun | 23.0 | 3.7 | 19.5 | 17.1 | 421 | 3 | 25 | 41.1 | 59.7 | 45.1 | Same algae bloom continues all this month. |
| 14-Jul | 23.0 | 3.2 | 3.9 | 9.2 | 239 | 3 | 26 | 43.2 | 43.9 | 36.2 | |
| 28-Jul | 25.0 | 5.0 | 1.3 | 8.3 | 246 | 1 | 30 | 36.8 | 33.1 | 34.7 | Algae bloom is over. |
| 10-Aug | 23.5 | 4.5 | 4.4 | 6.7 | 194 | 1 | 29 | 38.3 | 45.1 | 31.6 | Clearer lake conditions this week. |
| 24-Aug | | 4.8 | 1.2 | 5.0 | 190 | | 38 | 37.4 | 32.4 | 27.4 | |
| 7-Sep | 23.0 | 5.7 | 2.3 | 11.3 | 173 | 2 | 15 | 34.9 | 38.6 | 39.1 | Approximately 30 particles are visible. |
| 23-Sep | 18.0 | 4.9 | 2.8 | 10.5 | 206 | 3 | 20 | 37.1 | 40.7 | 38.1 | |
| 5-Oct | 17.0 | 4.5 | 4.2 | 14.0 | 252 | 2 | 18 | 38.3 | 44.7 | 42.2 | |
| 19-Oct | 15.0 | 4.0 | 2.8 | 18.5 | 254 | 2 | 14 | 40.0 | 40.7 | 46.2 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 18.7 | 4.2 | 5.4 | 11.3 | 343.4 | 2.0 | 32 | 39.4 | 44.4 | 38.3 | TSI Average = 40.7 |
| Median | 19.0 | 4.0 | 4.1 | 10.9 | 253.0 | 2 | 29 | 40.0 | 44.3 | 38.5 | |
| Min | 11.0 | 3.2 | 1.2 | 5.0 | 173.0 | 1 | 14 | 34.9 | 32.4 | 27.4 | |
| Max | 25.0 | 5.7 | 19.5 | 18.5 | 701.0 | 3 | 69 | 43.2 | 59.7 | 46.2 | |
| Count | 13 | 14 | 14 | 14 | 14 | 13 | 14 | 14 | 14 | 14 | |

Welcome

Lake Overview

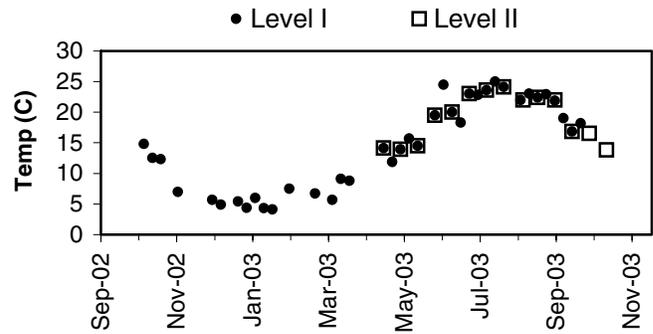
Volunteer monitoring began at Welcome Lake in 1996 and has continued through 2003. The data indicate this lake is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up only 3% of the drainage area, direct precipitation is less important than watershed inputs. There are designated wetlands in the watershed (King County 1990). Land use analysis of 2002 aerial photographs showed almost 52% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Welcome Lake has no public access boat launch, but residents should watch for Eurasian milfoil, Brazilian elodea, as well as other noxious weeds.

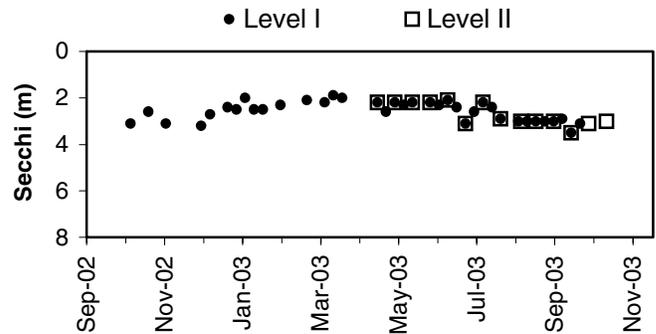
Physical Parameters

Secchi transparency ranged from 1.9 to 3.5m through the year. Water temperatures ranged from 4.1 to 25.0 degrees Celsius. Water level and precipitation records had some gaps through the water year, but suggested the lake followed the regional pattern of winter-high – summer-low stands.

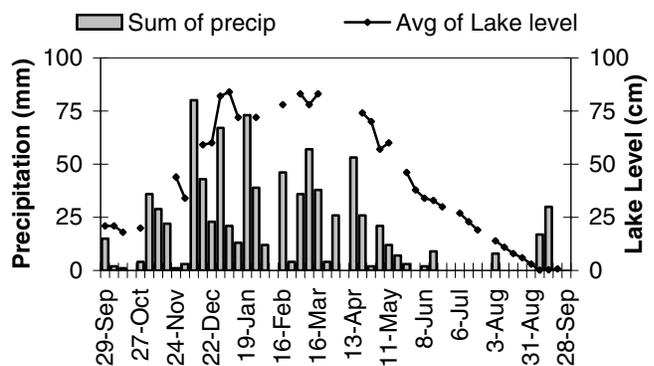
Lake Temperature



Secchi Depth

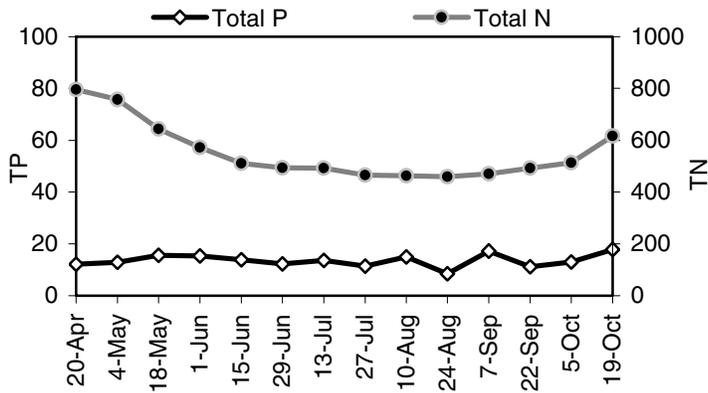


Lake Level and Precipitation

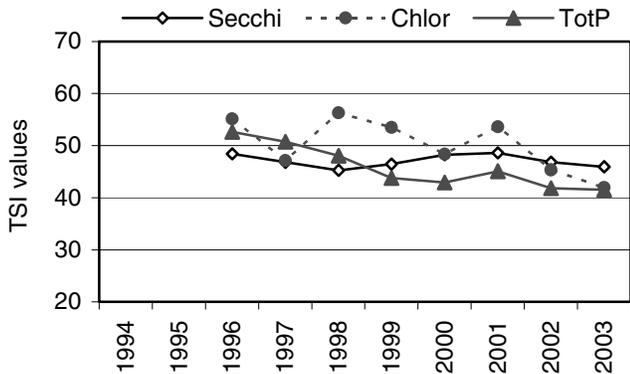


Welcome

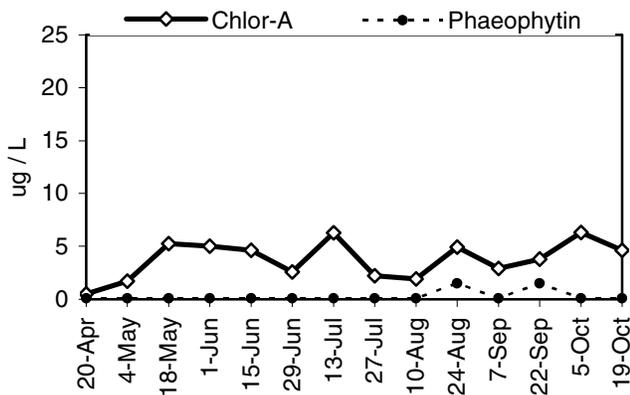
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-------------------------|-------------|
| unidentified species | chrysophyte |
| <i>Dinobryon</i> spp. | chrysophyte |
| <i>Cryptomonas</i> spp. | cryptophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen declined from an initial high value through mid-June and remained stable through the rest of the season, with a small increase on the last sample date. Total phosphorus remained fairly steady throughout the period. The N:P ratio ranged from 27 to 65. In 2003 the average TSI values were in the low to mid range for mesotrophy, similar to 2002.

Chlorophyll and Algae

Chlorophyll concentrations varied around a moderate level through the season, but never made any distinct peaks. Phytoplankton were dominated by chrysophytes and cryptophytes, with very few bluegreens occurring in the plankton.

Daily Data Summary

Weekly Data Summary

| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae (Shore) | Algae (at site) | Goose Count |
|--------------|---------------------|-----------|------------------------|-----------|-------------|-------------|------------|-----------|---------------|-----------------|-------------|
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | 15.0 | 1 | 21.0 | 1 | 6-Oct-02 | | 3.1 | 14.8 | | | |
| 13-Oct-02 | 2.0 | 1 | 21.0 | 1 | 13-Oct-02 | | | 12.5 | | | |
| 20-Oct-02 | 1.0 | 1 | 18.0 | 1 | 20-Oct-02 | | 2.6 | 12.3 | | | |
| 27-Oct-02 | 0.0 | 1 | | | | | | | | | |
| 3-Nov-02 | 4.0 | 1 | 20.0 | 1 | 3-Nov-02 | | 3.1 | 7.0 | | | |
| 10-Nov-02 | 36.0 | 1 | | | | | | | | | |
| 17-Nov-02 | 29.0 | 1 | | | | | | | | | |
| 24-Nov-02 | 22.0 | 1 | | | | | | | | | |
| 1-Dec-02 | 1.0 | 1 | 44.0 | 1 | 1-Dec-02 | | 3.2 | 5.7 | | | |
| 8-Dec-02 | 3.0 | 1 | 34.0 | 1 | 8-Dec-02 | | 2.7 | 4.9 | | | |
| 15-Dec-02 | 80.0 | 1 | | | | | | | | | |
| 22-Dec-02 | 43.0 | 1 | 59.0 | 1 | 22-Dec-02 | | 2.4 | 5.4 | | | |
| 29-Dec-02 | 23.0 | 1 | 60.0 | 1 | 29-Dec-02 | | 2.5 | 4.4 | | | |
| 5-Jan-03 | 67.0 | 1 | 82.0 | 1 | 5-Jan-03 | | 2.0 | 6.0 | | | |
| 12-Jan-03 | 21.0 | 1 | 84.0 | 1 | 12-Jan-03 | | 2.5 | 4.3 | | | |
| 19-Jan-03 | 13.0 | 1 | 72.0 | 1 | 19-Jan-03 | | 2.5 | 4.1 | | | |
| 26-Jan-03 | 73.0 | 1 | | | | | | | | | |
| 2-Feb-03 | 39.0 | 1 | 72.0 | 1 | 2-Feb-03 | | 2.3 | 7.5 | | | |
| 9-Feb-03 | 12.0 | 1 | | | | | | | | | |
| 16-Feb-03 | 0.1 | 1 | | | | | | | | | |
| 23-Feb-03 | 46.0 | 1 | 78.0 | 1 | 23-Feb-03 | | 2.1 | 6.7 | | | |
| 2-Mar-03 | 4.0 | 1 | | | | | | | | | |
| 9-Mar-03 | 36.0 | 1 | 83.0 | 1 | 9-Mar-03 | | 2.2 | 5.7 | | | |
| 16-Mar-03 | 57.0 | 1 | 78.0 | 1 | 16-Mar-03 | | 1.9 | 9.1 | | | |
| 23-Mar-03 | 38.0 | 1 | 83.0 | 1 | 23-Mar-03 | | 2.0 | 8.8 | | | |
| 30-Mar-03 | 4.0 | 1 | | | | | | | | | |
| 6-Apr-03 | 26.0 | 1 | | | | | | | | | |
| 13-Apr-03 | | | | | | | | | | | |
| 20-Apr-03 | 53.0 | 1 | | | 20-Apr-03 | | 2.2 | 14.1 | | | |
| 27-Apr-03 | 26.0 | 1 | 74.0 | 1 | 27-Apr-03 | | 2.6 | 11.9 | | | |
| 4-May-03 | 2.0 | 1 | 70.0 | 1 | 4-May-03 | | 2.2 | 13.9 | | | |
| 11-May-03 | 21.0 | 1 | 57.0 | 1 | 11-May-03 | | 2.3 | 15.7 | | | |
| 18-May-03 | 12.0 | 1 | 60.0 | 1 | 18-May-03 | | 2.2 | 14.5 | | | |
| 25-May-03 | 7.0 | 1 | | | | | | | | | |
| 1-Jun-03 | 3.0 | 1 | 46.0 | 1 | 1-Jun-03 | | 2.2 | 19.5 | | | |
| 8-Jun-03 | 0.0 | 1 | 38.0 | 1 | 8-Jun-03 | | 2.3 | 24.5 | | | |
| 15-Jun-03 | 2.0 | 1 | 34.0 | 1 | 15-Jun-03 | | 2.1 | 20.0 | | | |
| 22-Jun-03 | 9.0 | 1 | 33.0 | 1 | 22-Jun-03 | | 2.4 | 18.3 | | | |
| 29-Jun-03 | 0.0 | 1 | 30.0 | 1 | 29-Jun-03 | | 3.1 | 23.0 | | | |
| 6-Jul-03 | | 1 | | | 6-Jul-03 | | 2.6 | 22.8 | | | |
| 13-Jul-03 | 0.0 | 1 | 27.0 | 1 | 13-Jul-03 | | 2.2 | 23.6 | | | |
| 20-Jul-03 | 0.0 | 1 | 23.0 | 1 | 20-Jul-03 | | 2.4 | 25.0 | | | |
| 27-Jul-03 | 0.0 | 1 | 19.0 | 1 | 27-Jul-03 | | 2.9 | 24.1 | | | |
| 3-Aug-03 | | | | | | | | | | | |
| 10-Aug-03 | 8.0 | 1 | 14.0 | 1 | 10-Aug-03 | | 3.0 | 22.0 | | | |
| 17-Aug-03 | 0.0 | 1 | 11.0 | 1 | 17-Aug-03 | | 3.0 | 23.0 | | | |
| 24-Aug-03 | 0.0 | 1 | 8.0 | 1 | 24-Aug-03 | | 3.0 | 22.4 | | | |
| 31-Aug-03 | 0.0 | 1 | 6.0 | 1 | 31-Aug-03 | | 3.0 | 22.9 | | | |
| 7-Sep-03 | 0.0 | 1 | 3.0 | 1 | 7-Sep-03 | | 3.0 | 21.9 | | | |
| 14-Sep-03 | 17.0 | 1 | 0.2 | 1 | 14-Sep-03 | | 2.9 | 19.0 | | | |
| 21-Sep-03 | 30.0 | 1 | 0.3 | 1 | 21-Sep-03 | | 3.5 | 16.8 | | | |
| 28-Sep-03 | 0.0 | 1 | 0.8 | 1 | 28-Sep-03 | | 3.1 | 18.2 | | | |
| Min | 0.0 | | 0.2 | | | Min | 1.9 | 4.1 | | | |
| Max | 80.0 | | 84.0 | | | Max | 3.5 | 25.0 | | | |
| Total | 885.1 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 20-Apr | 14.1 | 2.2 | 0.6 | 12.2 | 795 | | 65 | 48.6 | | 40.2 | Chlor-a value was <MDL. Reported as .6µgl. |
| 4-May | 13.9 | 2.2 | 1.7 | 12.9 | 757 | 0 | 59 | 48.6 | 35.9 | 41.0 | 10-12 water fleas in 2L, but no algae. |
| 18-May | 14.5 | 2.2 | 5.3 | 15.7 | 644 | 1 | 41 | 48.6 | 46.9 | 43.9 | |
| 1-Jun | 19.5 | 2.2 | 5.0 | 15.4 | 573 | 1 | 37 | 48.6 | 46.4 | 43.6 | |
| 15-Jun | 20.0 | 2.1 | 4.6 | 13.9 | 511 | 3 | 37 | 49.3 | 45.6 | 42.1 | Water has briny look from dense clear .1mm spheres. |
| 29-Jun | 23.0 | 3.1 | 2.6 | 12.3 | 494 | 2 | 40 | 43.7 | 39.9 | 40.4 | Clear ~.1mm spheres. |
| 13-Jul | 23.6 | 2.2 | 6.3 | 13.7 | 493 | 2 | 36 | 48.6 | 48.6 | 41.9 | Briny look - clear ~.1mm spheres & water fleas. |
| 27-Jul | 24.1 | 2.9 | 2.2 | 11.4 | 465 | 2 | 41 | 44.6 | 38.5 | 39.3 | |
| 12-Aug | 22.0 | 3.0 | 1.9 | 15.0 | 463 | 2 | 31 | 44.1 | 37.0 | 43.2 | |
| 24-Aug | 22.4 | 3.0 | 4.9 | 8.5 | 459 | 2 | 54 | 44.1 | 46.2 | 35.0 | |
| 7-Sep | 22.0 | 3.0 | 2.9 | 17.3 | 470 | 2 | 27 | 44.1 | 41.1 | 45.3 | |
| 21-Sep | 16.8 | 3.5 | 3.8 | 11.2 | 492 | 2 | 44 | 41.9 | 43.7 | 39.0 | Clear ~.1mm spheres and water fleas. |
| 5-Oct | 16.5 | 3.1 | 6.3 | 13.0 | 514 | 1 | 40 | 43.7 | 48.6 | 41.2 | |
| 19-Oct | 13.8 | 3.0 | 4.6 | 17.8 | 617 | 2 | 35 | 44.1 | 45.6 | 45.7 | |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 19.0 | 2.7 | 3.8 | 13.6 | 553.4 | 1.7 | 42 | 45.9 | 43.4 | 41.6 | TSI Average = 43.6 |
| Median | 19.8 | 3.0 | 4.2 | 13.4 | 502.5 | 2 | 40 | 44.4 | 45.6 | 41.5 | |
| Min | 13.8 | 2.1 | 0.6 | 8.5 | 459.0 | 0 | 27 | 41.9 | 35.9 | 35.0 | |
| Max | 24.1 | 3.5 | 6.3 | 17.8 | 795.0 | 3 | 65 | 49.3 | 48.6 | 45.7 | |
| Count | 14 | 14 | 14 | 14 | 14 | 13 | 14 | 14 | 13 | 14 | |

Wilderness

Lake Overview

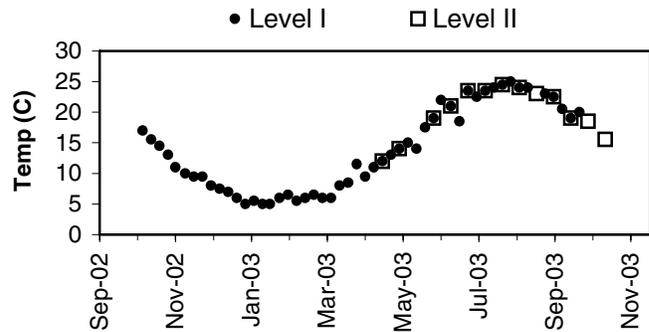
Volunteer monitoring began at Lake Wilderness in the early 1980s and has continued through 2003. The data indicate this city lake (Maple Valley) is moderate in primary productivity (mesotrophic) with good water quality. Since the lake surface makes up 20% of the drainage area, direct precipitation is very important, in addition to surface and ground water inputs. There is one Class 1 wetland, as classified by the King County Wetlands Inventory 1990, adjacent to the southwestern edge of the lake. Current land use is mixed residential and open space, with a large park along the western shoreline.

Lake Wilderness has a public access boat launch. There is a history of Eurasian milfoil infestation with control efforts by the lake community and the city of Maple Valley. Residents should watch for new patches of Eurasian milfoil, as well as other noxious weeds.

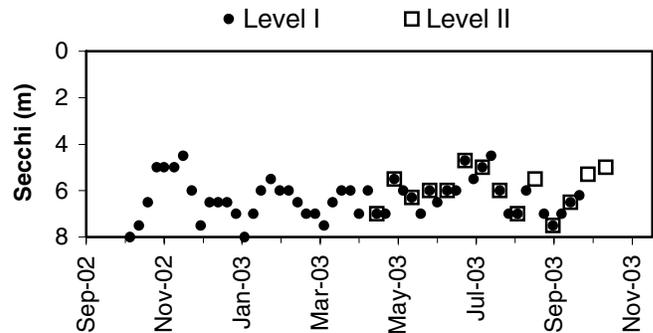
Physical Parameters

Secchi transparency was quite variable, ranging from 3.0 to 8.0m through the year. Annual water temperatures ranged from 4.5 to 24.0 degrees Celsius. Precipitation and water level records were fairly complete, indicating the winter-high stand to autumn-low stand pattern typical of area lakes.

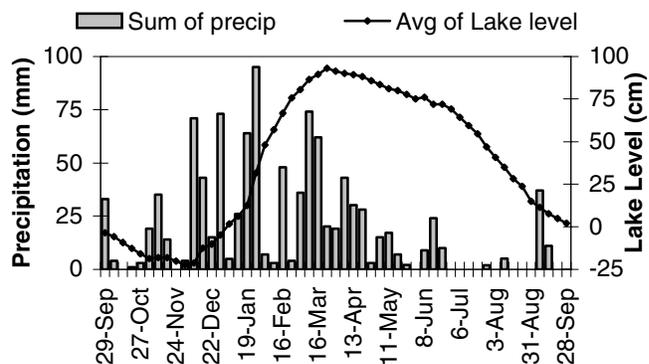
Lake Temperature



Secchi Depth

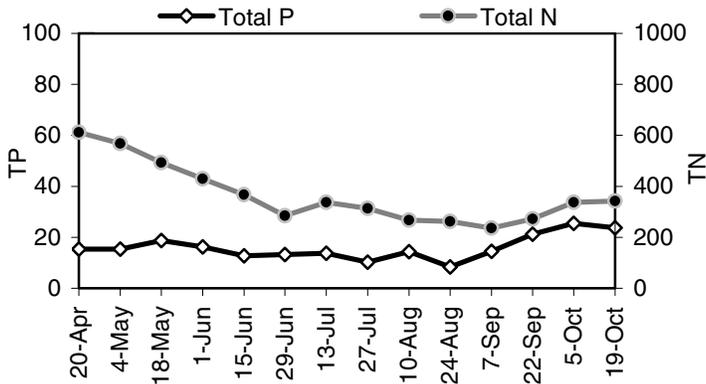


Lake Level and Precipitation

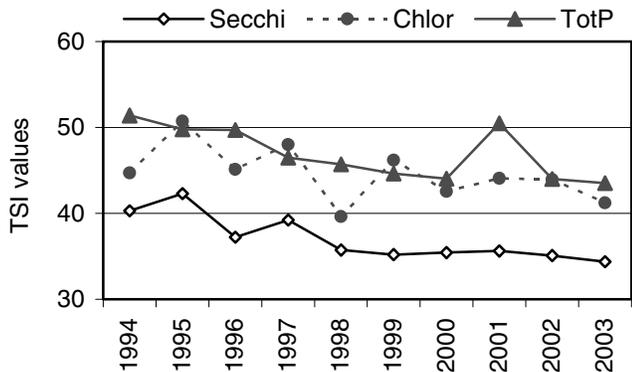


Wilderness

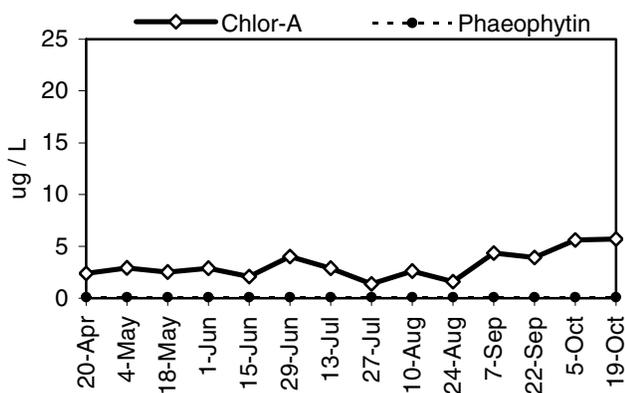
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|---------------------------------|-------------|
| <i>Aphanizomenon flos-aquae</i> | bluegreen |
| <i>Cryptomonas</i> spp. | cryptophyte |
| unidentified species | chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen decreased from April through the end of June, after which it remained in stable proportion to phosphorus through the remainder of the sampling period. The N:P ratio ranged from 13 to 56, with the lower values in the latter part of the season.

In 2002 the average TSI-Secchi indicated oligotrophy, unlike the other two indicators which were in the mid mesotrophic range. TSI-Secchi has consistently produced lower trophic estimates through the years of sampling at Lake Wilderness.

Chlorophyll and Algae

The phytoplankton community made two distinct peaks during the sample season and was increasing at the end of October. The first peak was made by the bluegreen *Gloeotrichia*, accompanied by a variety of chlorophytes including the chlorophyte *Botryococcus*. The second peak was dominated by an unidentified chrysophyte species, while the bluegreen *Aphanizomenon* increased in October. Chlorophyll content reflected the summer peaks, but did not track the magnitude of the June peak very closely. Phaeophytin (degraded chlorophyll) remained low through the sampling season.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | 33.0 | 5 | -3.6 | 5 | | | | | | | |
| 6-Oct-02 | 4.0 | 7 | -5.9 | 7 | 6-Oct-02 | 14:30 | 8.0 | 17.0 | NA | NA | 0 |
| 13-Oct-02 | 0.1 | 7 | -9.3 | 7 | 13-Oct-02 | 13:30 | 7.5 | 15.5 | NA | NA | 0 |
| 20-Oct-02 | 1.0 | 7 | -12.7 | 7 | 20-Oct-02 | 11:00 | 6.5 | 14.5 | P2 | P2 | 0 |
| 27-Oct-02 | 3.1 | 7 | -15.9 | 7 | 27-Oct-02 | 12:45 | 5.0 | 13.0 | P2 | P2 | 0 |
| 3-Nov-02 | 19.0 | 7 | -18.6 | 7 | 2-Nov-02 | 16:48 | 5.0 | 11.0 | P1 | P2 | 0 |
| 10-Nov-02 | 35.1 | 7 | -18.1 | 7 | 10-Nov-02 | 10:45 | 5.0 | 10.0 | NA | P3 | 0 |
| 17-Nov-02 | 14.0 | 7 | -18.0 | 7 | 17-Nov-02 | 10:02 | 4.5 | 9.5 | NA | P3 | 1 |
| 24-Nov-02 | 0.0 | 7 | -20.1 | 7 | 24-Nov-02 | 13:30 | 6.0 | 9.5 | P3 | P2 | 1 |
| 1-Dec-02 | 4.0 | 7 | -22.3 | 7 | 1-Dec-02 | 13:45 | 7.5 | 8.0 | P2 | P2 | 1 |
| 8-Dec-02 | 71.0 | 7 | -21.3 | 7 | 8-Dec-02 | 12:30 | 6.5 | 7.5 | P3 | P2 | 1 |
| 15-Dec-02 | 43.1 | 7 | -12.4 | 7 | 15-Dec-02 | 14:35 | 6.5 | 7.0 | P2 | P2 | 1 |
| 22-Dec-02 | 15.1 | 7 | -10.3 | 7 | 22-Dec-02 | 11:00 | 6.5 | 6.0 | P2 | P2 | 0 |
| 29-Dec-02 | 73.0 | 7 | -5.0 | 7 | 29-Dec-02 | 10:30 | 7.0 | 5.0 | P2 | P2 | 0 |
| 5-Jan-03 | 5.0 | 7 | 1.6 | 7 | 5-Jan-03 | 11:20 | 8.0 | 5.5 | P1 | P1 | 1 |
| 12-Jan-03 | 26.0 | 7 | 6.1 | 7 | 12-Jan-03 | 13:30 | 7.0 | 5.0 | P1 | P1 | 1 |
| 19-Jan-03 | 64.0 | 7 | 12.6 | 7 | 18-Jan-03 | 16:00 | 6.0 | 5.0 | P1 | P1 | 0 |
| 26-Jan-03 | 95.0 | 7 | 31.6 | 7 | 26-Jan-03 | 9:40 | 5.5 | 6.0 | P1 | P1 | 0 |
| 2-Feb-03 | 7.0 | 7 | 48.1 | 7 | 2-Feb-03 | 15:00 | 6.0 | 6.5 | P2 | P2 | 0 |
| 9-Feb-03 | 3.0 | 7 | 57.0 | 7 | 9-Feb-03 | 10:30 | 6.0 | 5.5 | P2 | P2 | 0 |
| 16-Feb-03 | 48.0 | 7 | 66.7 | 7 | 16-Feb-03 | 13:00 | 6.5 | 6.0 | P2 | P2 | 1 |
| 23-Feb-03 | 4.0 | 7 | 75.7 | 7 | 23-Feb-03 | 13:40 | 7.0 | 6.5 | P2 | P2 | 12 |
| 2-Mar-03 | 36.0 | 7 | 80.6 | 7 | 2-Mar-03 | 10:45 | 7.0 | 6.0 | P2 | P2 | 0 |
| 9-Mar-03 | 74.0 | 7 | 86.6 | 7 | 9-Mar-03 | 13:15 | 7.5 | 6.0 | P1 | P1 | 12 |
| 16-Mar-03 | 62.0 | 7 | 89.4 | 7 | 16-Mar-03 | 11:30 | 6.5 | 8.0 | P1 | P1 | 12 |
| 23-Mar-03 | 20.1 | 7 | 93.0 | 7 | 23-Mar-03 | 11:30 | 6.0 | 8.5 | P2 | P2 | 33 |
| 30-Mar-03 | 19.1 | 7 | 91.3 | 7 | 30-Mar-03 | 13:45 | 6.0 | 11.5 | P1 | P1 | 7 |
| 6-Apr-03 | 43.0 | 7 | 90.0 | 7 | 6-Apr-03 | 10:15 | 7.0 | 9.5 | P1 | P1 | 1 |
| 13-Apr-03 | 30.1 | 7 | 89.3 | 7 | 13-Apr-03 | 11:45 | 6.0 | 11.0 | P2 | P2 | 8 |
| 20-Apr-03 | 28.0 | 7 | 88.3 | 7 | 20-Apr-03 | 9:40 | 7.0 | 12.0 | P2 | P2 | 11 |
| 27-Apr-03 | 3.0 | 7 | 85.7 | 7 | 27-Apr-03 | 12:20 | 7.0 | 13.0 | P2 | P2 | 5 |
| 4-May-03 | 15.0 | 7 | 83.4 | 7 | 4-May-03 | 15:45 | 5.5 | 14.0 | P2 | P2 | 0 |
| 11-May-03 | 17.1 | 7 | 81.0 | 7 | 11-May-03 | 13:40 | 6.0 | 15.0 | P3 | P2 | 2 |
| 18-May-03 | 7.1 | 7 | 79.9 | 7 | 18-May-03 | 13:05 | 6.3 | 14.0 | P3 | P2 | 0 |
| 25-May-03 | 2.1 | 7 | 77.7 | 7 | 25-May-03 | 15:45 | 7.0 | 17.5 | P2 | P2 | 7 |
| 1-Jun-03 | 0.0 | 7 | 75.0 | 7 | 1-Jun-03 | 15:00 | 6.0 | 19.0 | P3 | P2 | |
| 8-Jun-03 | 9.1 | 7 | 76.0 | 7 | 7-Jun-03 | 10:35 | 6.5 | 22.0 | P3 | P2 | 37 |
| 15-Jun-03 | 24.1 | 7 | 71.9 | 7 | 15-Jun-03 | 10:00 | 6.0 | 21.0 | P2 | P2 | 10 |
| 22-Jun-03 | 10.0 | 7 | 71.9 | 7 | 22-Jun-03 | 14:30 | 6.0 | 18.5 | P2 | P2 | 0 |
| 29-Jun-03 | 0.1 | 7 | 69.0 | 7 | 29-Jun-03 | 17:40 | 4.7 | 23.5 | P2 | P2 | 0 |
| 6-Jul-03 | 0.0 | 7 | 64.4 | 7 | 6-Jul-03 | 13:30 | 5.5 | 22.5 | P3 | P3 | 36 |
| 13-Jul-03 | 0.1 | 7 | 59.4 | 7 | 13-Jul-03 | 13:30 | 5.0 | 23.5 | P2 | P2 | 6 |
| 20-Jul-03 | 0.0 | 7 | 54.6 | 7 | 20-Jul-03 | 13:00 | 4.5 | 24.0 | P2 | P2 | 12 |
| 27-Jul-03 | 2.0 | 7 | 47.0 | 7 | 27-Jul-03 | 11:05 | 6.0 | 24.5 | P2 | P2 | 25 |
| 3-Aug-03 | 0.0 | 7 | 40.9 | 7 | 3-Aug-03 | 11:00 | 7.0 | 25.0 | P1 | P1 | |
| 10-Aug-03 | 5.1 | 7 | 35.0 | 7 | 10-Aug-03 | 15:30 | 7.0 | 24.0 | P1 | P1 | 65 |
| 17-Aug-03 | 0.0 | 7 | 28.1 | 7 | 17-Aug-03 | 19:00 | 6.0 | 24.0 | P1 | P1 | 1 |
| 24-Aug-03 | 0.0 | 7 | 23.7 | 7 | | | | | | | 30 |
| 31-Aug-03 | 0.0 | 7 | 15.0 | 7 | 31-Aug-03 | 13:32 | 7.0 | 23.0 | P1 | P1 | 1 |
| 7-Sep-03 | 37.0 | 7 | 11.4 | 7 | 7-Sep-03 | 16:30 | 7.5 | 22.5 | P1 | P1 | 37 |
| 14-Sep-03 | 11.1 | 7 | 7.6 | 7 | 14-Sep-03 | 13:15 | 7.0 | 20.5 | P1 | P1 | 20 |
| 21-Sep-03 | 0.0 | 7 | 4.7 | 7 | 21-Sep-03 | 14:03 | 6.5 | 19.0 | P1 | P1 | 34 |
| 28-Sep-03 | 0.0 | 3 | 2.0 | 3 | 28-Sep-03 | 15:04 | 6.2 | 20.0 | P2 | P3 | 10 |
| Min | 0.0 | | -22.3 | | Min | | 4.5 | 5.0 | | | 0 |
| Max | 95.0 | | 93.0 | | Max | | 8.0 | 25.0 | | | 65 |
| Total | 1022.0 | | | | | | | | | | |

Yellow

Lake Overview

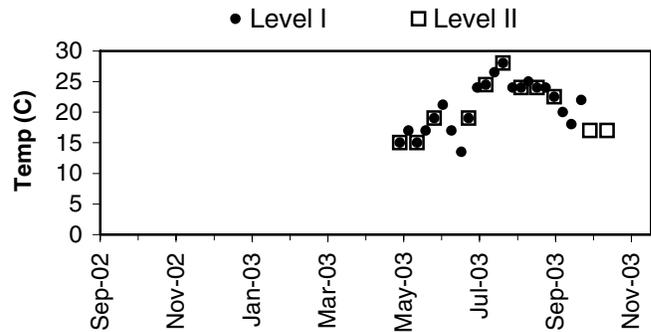
Volunteer monitoring began at Yellow Lake in 2003. The data indicate the lake is moderately high in primary productivity (mesotrophic - eutrophic) with good to fair water quality. Since the lake surface makes up only 4% of the drainage area, direct precipitation is not as important as watershed inputs. The lake is part of a large Class 1 wetland (King County, 1990). Land use analysis of 2002 aerial photographs showed 68% of the surrounding watershed has been developed for uses other than agriculture or forestry.

Yellow Lake has public access, but no boat launch. Lake users should watch for early infestations of Eurasian milfoil, Brazilian elodea and other noxious aquatic weeds.

Physical Parameters

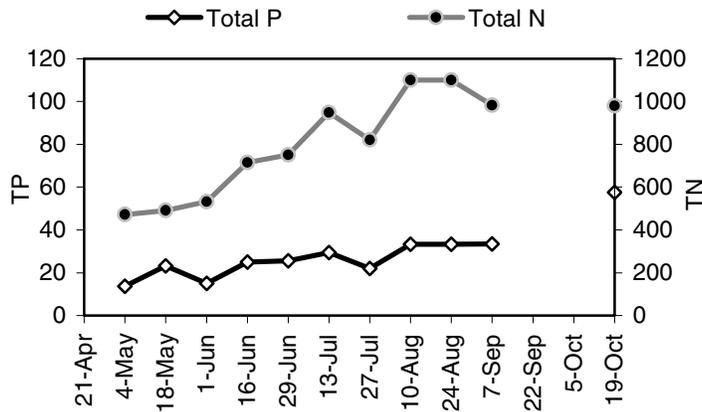
Secchi transparency ranged from 1.0 to 2.8m from April through October. Surface water temperatures through the same period ranged from 13.5 to 28.0 degrees Celsius. There were no records of precipitation and water level over the year.

Lake Temperature

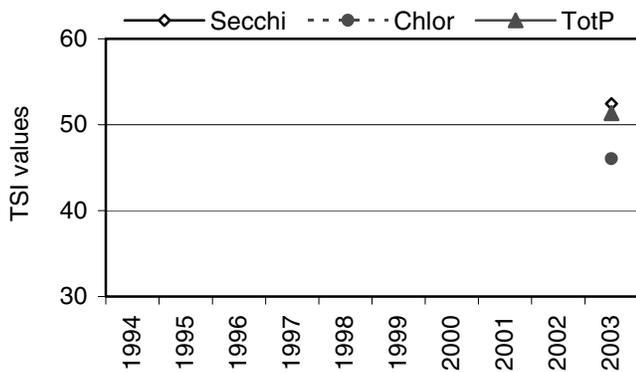


Yellow

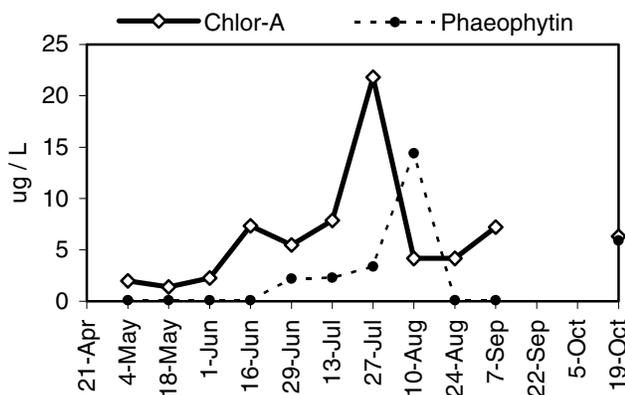
Nutrient Analysis



TSI Ratings



Chlorophyll a Concentrations (ug/L)



| Common algae | Group |
|-----------------------------|-------------|
| <i>Micrasterias radiata</i> | chlorophyte |
| unidentified species | chrysophyte |
| <i>Dinobryon</i> spp. | chrysophyte |

Nutrient Analysis and TSI Ratings

Total nitrogen increased from April through August, after which it remained in relatively stable. Total phosphorus also rose over the sample period, but at a much slower rate. The N:P ratio ranged from 17 to 37, with the lower values in the beginning of the season. In 2003, the average TSI-chlorophyll was in the mid-mesotrophic range, lower than the other two indicators which were above the threshold for eutrophy.

Chlorophyll and Algae

Chlorophyll rose to a distinct maximum in late July. Phaeophytin was also higher in summer, suggesting that some amount of sediment containing degraded chlorophyll was included in the samples. The data gap in autumn may have missed a fall phytoplankton bloom. Dominant algae included the chlorophyte desmids *Micrasterias radiata*, which is indicative of a small water body, as well as an unidentified chrysophyte species and several species of the chrysophyte *Dinobryon*. Bluegreens were very scarce and never identified as more than a trace.

| Daily Data Summary | | | | | Weekly Data Summary | | | | | | |
|--------------------|---------------------|-----------|------------------------|-----------|---------------------|-------------|------------|-----------|----------------|------------------|--------------|
| Week of | Sum of precip. (mm) | # of days | Avg of lake level (cm) | # of days | Sample date | Sample time | Secchi (m) | Temp (°C) | Algae* (Shore) | Algae* (at site) | Goose Count* |
| 29-Sep-02 | | | | | | | | | | | |
| 6-Oct-02 | | | | | | | | | | | |
| 13-Oct-02 | | | | | | | | | | | |
| 20-Oct-02 | | | | | | | | | | | |
| 27-Oct-02 | | | | | | | | | | | |
| 3-Nov-02 | | | | | | | | | | | |
| 10-Nov-02 | | | | | | | | | | | |
| 17-Nov-02 | | | | | | | | | | | |
| 24-Nov-02 | | | | | | | | | | | |
| 1-Dec-02 | | | | | | | | | | | |
| 8-Dec-02 | | | | | | | | | | | |
| 15-Dec-02 | | | | | | | | | | | |
| 22-Dec-02 | | | | | | | | | | | |
| 29-Dec-02 | | | | | | | | | | | |
| 5-Jan-03 | | | | | | | | | | | |
| 12-Jan-03 | | | | | | | | | | | |
| 19-Jan-03 | | | | | | | | | | | |
| 26-Jan-03 | | | | | | | | | | | |
| 2-Feb-03 | | | | | | | | | | | |
| 9-Feb-03 | | | | | | | | | | | |
| 16-Feb-03 | | | | | | | | | | | |
| 23-Feb-03 | | | | | | | | | | | |
| 2-Mar-03 | | | | | | | | | | | |
| 9-Mar-03 | | | | | | | | | | | |
| 16-Mar-03 | | | | | | | | | | | |
| 23-Mar-03 | | | | | | | | | | | |
| 30-Mar-03 | | | | | | | | | | | |
| 6-Apr-03 | | | | | | | | | | | |
| 13-Apr-03 | | | | | | | | | | | |
| 20-Apr-03 | | | | | | | | | | | |
| 27-Apr-03 | | | | | | | | | | | |
| 4-May-03 | | | | | 4-May-03 | 18:15 | 2.7 | 15.0 | P2 | P2 | 1 |
| 11-May-03 | | | | | 11-May-03 | 18:40 | 2.6 | 17.0 | P2 | P2 | 1 |
| 18-May-03 | | | | | 18-May-03 | 19:30 | 2.8 | 15.0 | P2 | P2 | 1 |
| 25-May-03 | | | | | 25-May-03 | 20:00 | 2.5 | 17.0 | P2 | P2 | 1 |
| 1-Jun-03 | | | | | 1-Jun-03 | 18:13 | 2.5 | 19.0 | P1 | P1 | 0 |
| 8-Jun-03 | | | | | 8-Jun-03 | 19:30 | 2.3 | 21.2 | P1 | P1 | 0 |
| 15-Jun-03 | | | | | 15-Jun-03 | 20:00 | 1.5 | 17.0 | P2 | P1 | 0 |
| 22-Jun-03 | | | | | 23-Jun-03 | 19:30 | 1.4 | 13.5 | P1 | P1 | 0 |
| 29-Jun-03 | | | | | 29-Jun-03 | 10:40 | 1.9 | 19.0 | P1 | P1 | 0 |
| 6-Jul-03 | | | | | 6-Jul-03 | 18:30 | 1.8 | 24.0 | P1 | P1 | 0 |
| 13-Jul-03 | | | | | 13-Jul-03 | 19:30 | 1.6 | 24.5 | P1 | P1 | 0 |
| 20-Jul-03 | | | | | 20-Jul-03 | 19:30 | 1.5 | 26.5 | P1 | P1 | 0 |
| 27-Jul-03 | | | | | 27-Jul-03 | 19:40 | 1.0 | 28.0 | P1 | P2 | 0 |
| 3-Aug-03 | | | | | 4-Aug-03 | 10:40 | 1.2 | 24.0 | | P1 | 0 |
| 10-Aug-03 | | | | | 11-Aug-03 | 10:30 | 1.0 | 24.0 | | P2 | 0 |
| 17-Aug-03 | | | | | 17-Aug-03 | 19:35 | 1.6 | 25.0 | | P2 | 0 |
| 24-Aug-03 | | | | | 24-Aug-03 | 18:00 | 2.0 | 24.0 | | P3 | 0 |
| 31-Aug-03 | | | | | 31-Aug-03 | 19:45 | 1.1 | 24.0 | P3 | P1 | 0 |
| 7-Sep-03 | | | | | 7-Sep-03 | 19:00 | | 22.5 | | | |
| 14-Sep-03 | | | | | 14-Sep-03 | 18:15 | 1.5 | 20.0 | | P2 | |
| 21-Sep-03 | | | | | 21-Sep-03 | 18:45 | 1.7 | 18.0 | | P2 | |
| 28-Sep-03 | | | | | 29-Sep-03 | 14:00 | 2.0 | 22.0 | | P2 | 3 |
| Min | 0.0 | | 0.0 | | | Min | 1.0 | 13.5 | | | 0 |
| Max | 0.0 | | 0.0 | | | Max | 2.8 | 28.0 | | | 3 |
| Total | 0.0 | | | | | | | | | | |

| Date (2003) | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | Notes |
|----------------|----------------------|-----------------------|-------------------------|----------------------|----------------------|------------------------|------------|-----------------------|--------------|-----------|--|
| | | | | | | | | Secc | chl-a | TP | |
| 21-Apr | | | | | | | | | | | No sample. |
| 4-May | 15.0 | 2.7 | 2.0 | 13.7 | 472 | 2 | 34 | 45.7 | 37.3 | 41.9 | |
| 18-May | 15.0 | 2.8 | 1.4 | 23.3 | 491 | 2 | 21 | 45.1 | 33.9 | 49.6 | |
| 1-Jun | 19.0 | 2.5 | 2.3 | 15.1 | 532 | 1 | 35 | 46.8 | 38.6 | 43.3 | |
| 16-Jun | | | | | | | | | | | Lots of stringy algae on marker rope. No sample. |
| 29-Jun | 19.0 | 1.9 | 7.3 | 25.0 | 715 | 1 | 29 | 50.7 | 50.1 | 50.6 | |
| 13-Jul | 24.5 | 1.6 | 5.5 | 25.6 | 751 | 1 | 29 | 53.2 | 47.2 | 50.9 | Slimy algae in clumps on surface. |
| 27-Jul | 28.0 | 1.0 | 7.9 | 29.5 | 949 | 2 | 32 | 60.0 | 50.8 | 53.0 | |
| 11-Aug | 24.0 | 1.0 | 21.8 | 22.0 | 820 | 2 | 37 | 60.0 | 60.8 | 48.7 | |
| 24-Aug | 24.0 | 2.0 | 4.2 | 33.4 | 1100 | 2 | 33 | 50.0 | 44.6 | 54.8 | |
| 7-Sep | 22.5 | 1.1 | 7.2 | 33.5 | 983 | 1 | 29 | 58.6 | 49.9 | 54.8 | |
| 22-Sep | | | | | | | | | | | No sample. |
| 6-Oct | 17.0 | 1.7 | | | | 2 | | 52.3 | | | No water sample. |
| 20-Oct | 17.0 | 1.5 | 6.3 | 57.4 | 980 | 2 | 17 | 54.1 | 48.6 | 62.6 | The water sample was taken at surface. |
| | Temp (°C) | Secchi (m) | Chl-a (µg/l) | TP (µg/l) | TN (µg/l) | Algae Obsv. | N:P | Calculated TSI | | | |
| | | | | | | | | Secc | chl-a | TP | |
| Mean | 20.5 | 1.8 | 6.6 | 27.9 | 779.3 | 1.6 | 30 | 52.4 | 46.2 | 51.0 | TSI Average = 49.9 |
| Median | 19.0 | 1.7 | 5.9 | 25.3 | 785.5 | 2 | 31 | 52.3 | 47.9 | 50.8 | |
| Min | 15.0 | 1.0 | 1.4 | 13.7 | 472.0 | 1 | 17 | 45.1 | 33.9 | 41.9 | |
| Max | 28.0 | 2.8 | 21.8 | 57.4 | 1100.0 | 2 | 37 | 60.0 | 60.8 | 62.6 | |
| Count | 11 | 11 | 10 | 10 | 10 | 11 | 10 | 11 | 10 | 10 | |