AQUATIC ECOSYSTEM SCIENCES, LLC

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# Email Memorandum

| | | | |
|---|---|---|---|
| To: | Dave Stone/Ken Kauffman – OHD<br>Mike Mader/Jason – TMLBP | From: | Jake Kann |
| email: | tlbp@presys.com,Dave.Stone@state.or.us,<br>Kenneth.Kauffman@state.or.us | Pages: | 10 |
| Phone: | | Date: | 10-10-05 |
| Re: | *Tenmile Sampling* | CC: | |

To all,

September 28th toxic algal cell count results for Tenmile Lakes are as follows:

| STATION | DATE | *Microcystis* (cells/ml) | *Total Anabaena* (cells/ml) |
|---|---|---|---|
| S3 | 9-06-05 | 0 | 0 |
| S8 | 9-06-05 | 31 | 11 |
| N11 | 9-06-05 | 0 | 14 |
| N16 | 9-06-05 | 36 | 669 |

*Microcystis aeruginosa* (MSAE) was low lake-wide on September 28th, with a maximum of 36 cells per ml detected at North Lake station N16, and 31 cells per ml at South Lake station S8. No MSAE was detected at remaining stations. Total *Anabaena* cells/ml remained low at all stations, with station N16 stable at 669 cells per ml, and station N11 decreasing from 1131 cells per ml to 14 cells per ml. None of the stations exceeded the WHO Alert Level 2 drinking water guideline of 2000 cells $ml^{-1}$ (see below figure). At the Alert Level 2 guideline of 2000 cells/ml Oregon Human Services (OHS) issues public alerts for drinking water lakes. Levels are well below the 40,000 cells/ml and 100,000 cells/ml level when OHS recommends issuing recreational advisories for *Microcystis and Anabaena,* respectively. As always, those who utilize lake water for domestic purposes should take precautions to ensure water treatment systems are functioning properly and that Oregon Health Division recommendations for purification are being followed.

South lake stations were dominated primarily by the cyanobacterium *Aphanizomenon* and secondarily by various diatoms*;* North Lake Stations N11 and N16 were dominated by *Aphanizomenon* (92.5 and 76.3% respectively), with *Anabaena* comprising 18.7% of the biovolume at N16. Various Chrysophytes, Cryptophytes, and Diatoms comprised the remainder of the biovolume.

Due to the patchy nature of blue-green algal blooms it is possible for higher *Microcystis aeruginosa* and *Anabaena flos-aquae* densities (and therefore higher microcystin toxin and anatoxin concentrations to be

present in areas not sampled in this survey, particularly along shorelines or during calm conditions of little to no wind. Given the lakes' demonstrated history of toxic blooms, and the fact that all areas of the lake cannot be tested at all times, those utilizing the lake for drinking water should always follow Oregon Health Division recommendations for purification (attached). In addition, recreational users should always avoid contact with water whenever noticeable surface concentrations of algae are evident or when the lake has an obvious green to blue-green appearance. Moreover, because pets or other domestic animals are the most likely to ingest contaminated water, these animals should not be allowed access to the lakeshore whenever either noticeable surface concentrations of algae or an obvious green to blue-green appearance is evident.

Please call if you have any questions.

Sincerely,

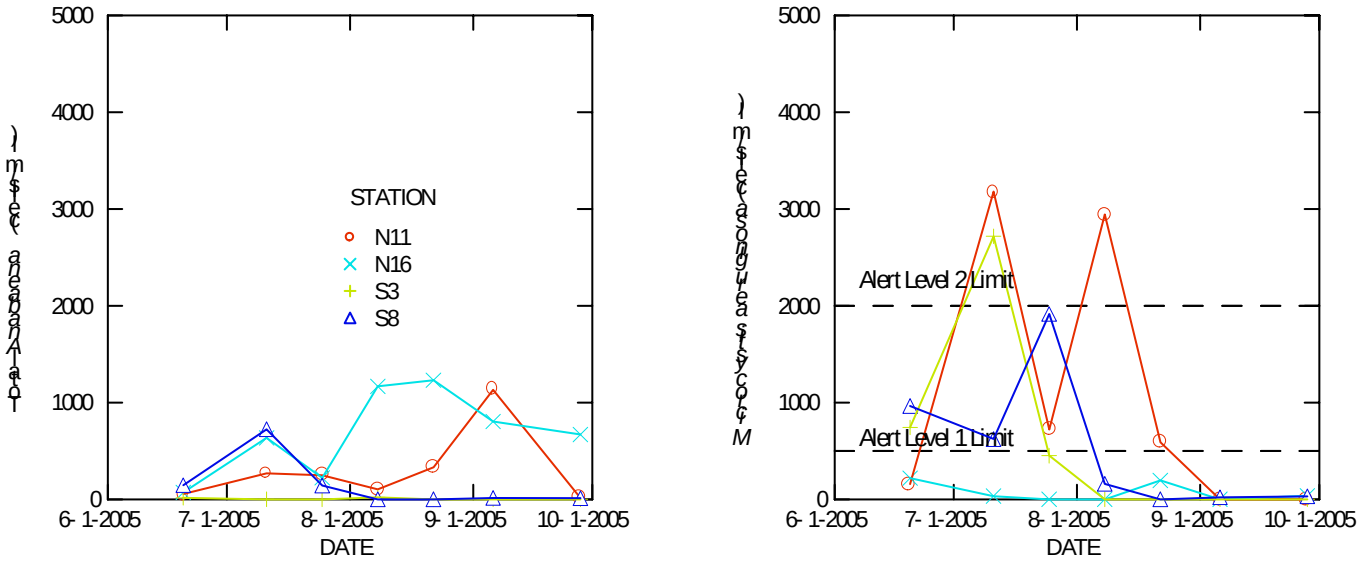
Jacob Kann Ph.D.

Aquatic Ecologist

**References for Alert Levels**

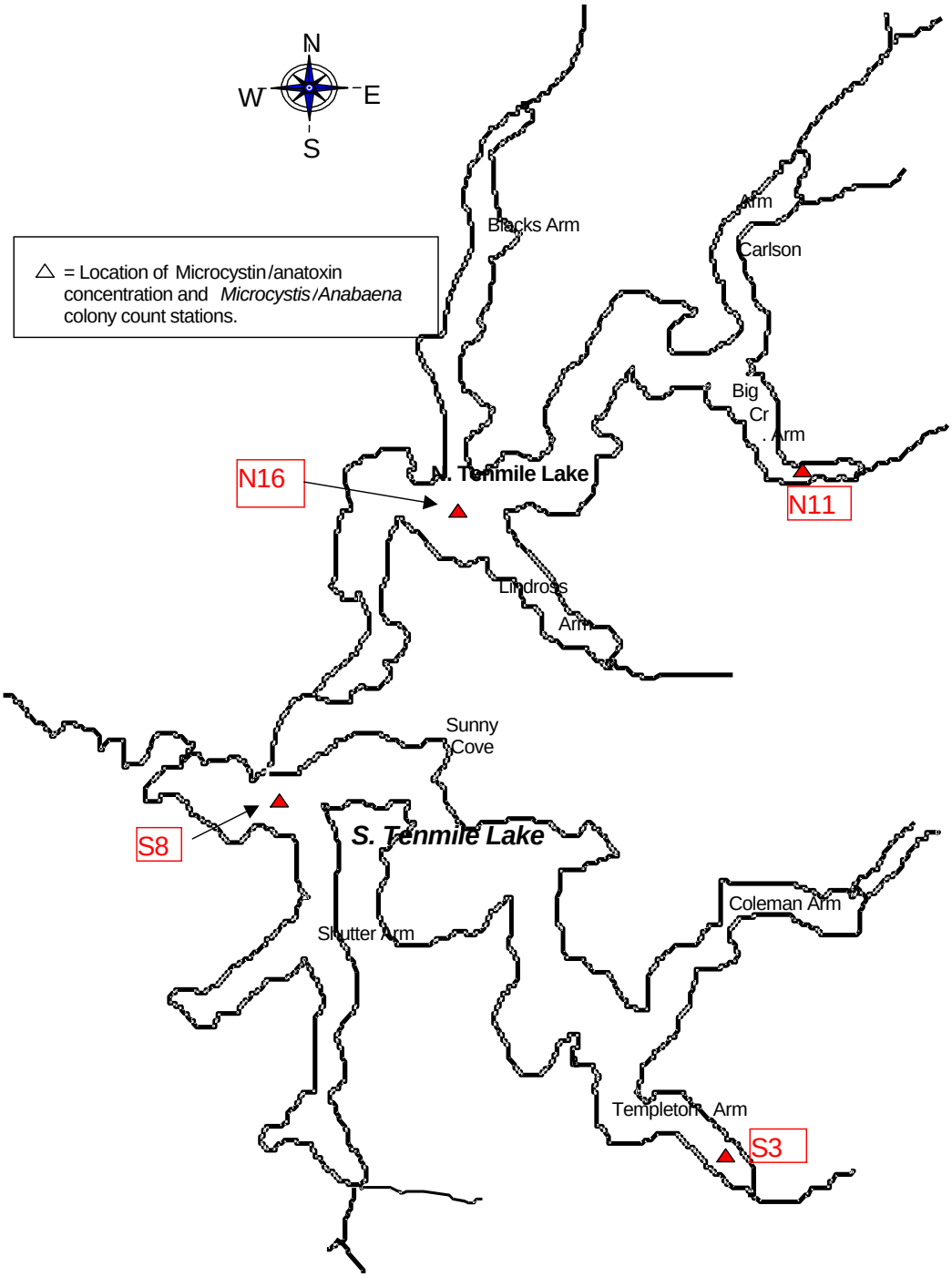

Yoo, S.R., W.W. Carmichael, R.C. Hoehn, and S.E. Hrudy. 1995. Cyanobacterial (blue-green algal) toxins: a resource guide. AWWA Research Foundation and American Water Works Association. Denver, CO. 229 p. (ISBN 0-89867-824-2)

Falconer et al. 1999. Safe levels and safe practices. Pages 155-177 *in*: I. Chorus and J. Bartram, editors. *Toxic Cyanobacteria in water: a guide to their public health consequences*. World Health Organization Report. E & FN Spon, London and New York.


Algal cell count trends for Tenmile Lakes, 2005.

Year 2005 Tenmile Lakes Sample Site Locations



## Phytoplankton Sample Analysis

| | |
|---|---|
| **Sample:** | Tenmile Lake |
| **Sample Station:** | S3 |
| **Sample Depth:** | |
| **Sample Date:** | 28-Sep-05 |

| | |
|---|---|
| **Total Density (#/mL):** | 215 |
| **Total Biovolume (um$^3$/mL):** | 269,990 |
| **Trophic State Index:** | 40.4 |

| | Species | Density #/mL | Density Percent | Biovolume um$^3$/mL | Biovolume Percent |
|---|---|---|---|---|---|
| 1 | Aphanizomenon flos-aquae | 184 | 85.9 | 185,966 | 68.9 |
| 2 | Melosira varians | 12 | 5.5 | 46,254 | 17.1 |
| 3 | Nitzschia palea | 5 | 2.5 | 949 | 0.4 |
| 4 | Melosira granulata | 3 | 1.2 | 8,697 | 3.2 |
| 5 | Melosira ambigua | 3 | 1.2 | 3,105 | 1.1 |
| 6 | Fragilaria crotonensis | 3 | 1.2 | 24,353 | 9.0 |
| 7 | Nitzschia acicularis | 1 | 0.6 | 369 | 0.1 |
| 8 | Navicula cryptocephala | 1 | 0.6 | 244 | 0.1 |
| 9 | Chromulina sp. | 1 | 0.6 | 26 | 0.0 |
| 10 | Rhodomonas minuta | 1 | 0.6 | 26 | 0.0 |

| | |
|---|---|
| Aphanizomenon flos-aquae cells/mL = | 2,952 |
| Aphanizomenon flos-aquae heterocysts/mL = | 29 |

**Aquatic Analysts** **Sample ID:** HN72

## Phytoplankton Sample Analysis

| | |
|---|---|
| **Sample:** | Tenmile Lake |
| **Sample Station:** | S8 |
| **Sample Depth:** | |
| **Sample Date:** | 28-Sep-05 |

| | |
|---|---|
| **Total Density (#/mL):** | 121 |
| **Total Biovolume (um$^3$/mL):** | 182,045 |
| **Trophic State Index:** | 37.6 |

| | Species | Density #/mL | Density Percent | Biovolume um$^3$/mL | Biovolume Percent |
|---|---|---|---|---|---|
| 1 | Aphanizomenon flos-aquae | 51 | 41.9 | 63,759 | 35.0 |
| 2 | Melosira granulata angustissima | 45 | 37.6 | 67,022 | 36.8 |
| 3 | Melosira ambigua | 7 | 6.0 | 34,063 | 18.7 |
| 4 | Cryptomonas erosa | 3 | 2.6 | 1,611 | 0.9 |
| 5 | Melosira granulata | 3 | 2.6 | 10,735 | 5.9 |
| 6 | Mallomonas sp. | 2 | 1.7 | 785 | 0.4 |
| 7 | Ochromonas sp. | 2 | 1.7 | 176 | 0.1 |
| 8 | Fragilaria crotonensis | 1 | 0.9 | 867 | 0.5 |
| 9 | Anabaena flos-aquae | 1 | 0.9 | 69 | 0.0 |
| 10 | Melosira varians | 1 | 0.9 | 1,343 | 0.7 |
| 11 | Rhodomonas minuta | 1 | 0.9 | 21 | 0.0 |
| 12 | Ulothrix sp. | 1 | 0.9 | 1,322 | 0.7 |
| 13 | Microcystis aeruginosa | 1 | 0.9 | 248 | 0.1 |
| 14 | Ankistrodesmus falcatus | 1 | 0.9 | 26 | 0.0 |

| | |
|---|---|
| Aphanizomenon flos-aquae cells/mL = | 1,012 |
| Aphanizomenon flos-aquae heterocysts/mL = | 8 |
| Anabaena flos-aquae cells/mL = | 10 |
| Anabaena flos-aquae heterocysts/mL = | 1 |
| Microcystis aeruginosa cells/mL = | 31 |

**Aquatic Analysts** **Sample ID:** HN73

## Phytoplankton Sample Analysis

| | |
|---|---|
| **Sample:** | Tenmile Lake |
| **Sample Station:** | N11 |
| **Sample Depth:** | |
| **Sample Date:** | 28-Sep-05 |

| | |
|---|---|
| **Total Density (#/mL):** | 199 |
| **Total Biovolume (um$^3$/mL):** | 244,464 |
| **Trophic State Index:** | 39.7 |

| | Species | Density #/mL | Density Percent | Biovolume um$^3$/mL | Biovolume Percent |
|---|---|---|---|---|---|
| 1 | Aphanizomenon flos-aquae | 171 | 85.7 | 226,013 | 92.5 |
| 2 | Dinobryon bavaricum | 11 | 5.7 | 5,740 | 2.3 |
| 3 | Dinobryon sertularia | 7 | 3.6 | 2,711 | 1.1 |
| 4 | Cryptomonas erosa | 1 | 0.7 | 740 | 0.3 |
| 5 | Rhodomonas minuta | 1 | 0.7 | 28 | 0.0 |
| 6 | Trachelomonas volvocina | 1 | 0.7 | 2,684 | 1.1 |
| 7 | Cosmarium sp. | 1 | 0.7 | 299 | 0.1 |
| 8 | Trachelomonas hispida | 1 | 0.7 | 2,990 | 1.2 |
| 9 | Anabaena planctonica | 1 | 0.7 | 2,605 | 1.1 |
| 10 | Cocconeis placentula | 1 | 0.7 | 655 | 0.3 |

| | |
|---|---|
| Aphanizomenon flos-aquae cells/mL = | 3,587 |
| Aphanizomenon flos-aquae heterocysts/mL = | 68 |
| Anabaena planctonica cells/mL = | 14 |

**Aquatic Analysts** **Sample ID:** HN74

## Phytoplankton Sample Analysis

**Sample:** Tenmile Lake
**Sample Station:** N16
**Sample Depth:**
**Sample Date:** 28-Sep-05

**Total Density (#/mL):** 350
**Total Biovolume ($um^3$/mL):** 649,945
**Trophic State Index:** 46.7

| | Species | Density #/mL | Density Percent | Biovolume $um^3$/mL | Biovolume Percent |
|---|---|---|---|---|---|
| 1 | Aphanizomenon flos-aquae | 328 | 93.8 | 495,985 | 76.3 |
| 2 | Anabaena planctonica | 13 | 3.6 | 121,700 | 18.7 |
| 3 | Melosira ambigua | 4 | 1.0 | 13,725 | 2.1 |
| 4 | Mallomonas sp. | 2 | 0.5 | 681 | 0.1 |
| 5 | Ceratium hirundinella | 2 | 0.5 | 17,567 | 2.7 |
| 6 | Microcystis aeruginosa | 2 | 0.5 | 287 | 0.0 |

Aphanizomenon flos-aquae cells/mL = 7,873
Aphanizomenon flos-aquae heterocysts/mL = 102

Anabaena planctonica cells/mL = 665
Anabaena planctonica heterocysts/mL = 4

Microcystis aeruginosa cells/mL = 36

**Aquatic Analysts** **Sample ID:** HN75

**Oregon Health Division**
**Drinking water treatment guidance**
**August 31, 2001**

**Contact Person: Ken Kauffman**
**503-731-4015**
**kenneth.w.kauffman@state.or.us**

1. Treatment systems should consist of sand filtration followed by chlorination, followed by activated charcoal filtration. It is essential that sand filtration be done before disinfection to remove as many algal cells as possible without killing or rupturing them.

2. Chlorination systems should be capable of maintaining at least 1 ppm of chlorine residual for at least 20 minutes contact time before the water enters the activated charcoal system.

3. The final step in the process should be effective activated charcoal treatment to remove toxin remaining after the sand filtration and disinfection processes.

4. All treatment equipment used should meet NSF standard 53, and should be adequately sized to treat the maximum amount of water that you use. Treatment equipment needs regular monitoring and servicing to assure that it functions properly.

5. Ideally all water entering your home should be treated as recommended. It is possible to treat only water used in the kitchen, but this increases chances that animals or pets would inadvertently drink untreated water.