AQUATIC ECOSYSTEM SCIENCES, LLC

Jacob Kann, Ph.D.
Aquatic Ecologist

295 East Main St., Suite 7
Ashland, OR 97520
Voice: 541-482-1575
Fax: 541-552-1024
Email: jacobkann@aol.com

Email Memorandum

To:	Dave Stone/Ken Kauffman – OHD Mike Mader/Jason – TMLBP	From:	Jake Kann
email:	tlbp@presys.com,Dave.Stone@state.or.us, Kenneth.Kauffman@state.or.us	Pages:	10
Phone:		Date:	10-20-05
Re:	*Tenmile Sampling*	CC:	

To all,

October 10th 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	0	133
N11	9-06-05	36	110
N16	9-06-05	12	97

Microcystis aeruginosa (MSAE) was low or non-detectable lake-wide on October 10th, with a maximum of 36 cells per ml detected at North Lake station N11. Total *Anabaena* cells/ml remained low at all stations, with station N16 decreasing to 97 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* (92.6 and 88.3% respectively). 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.

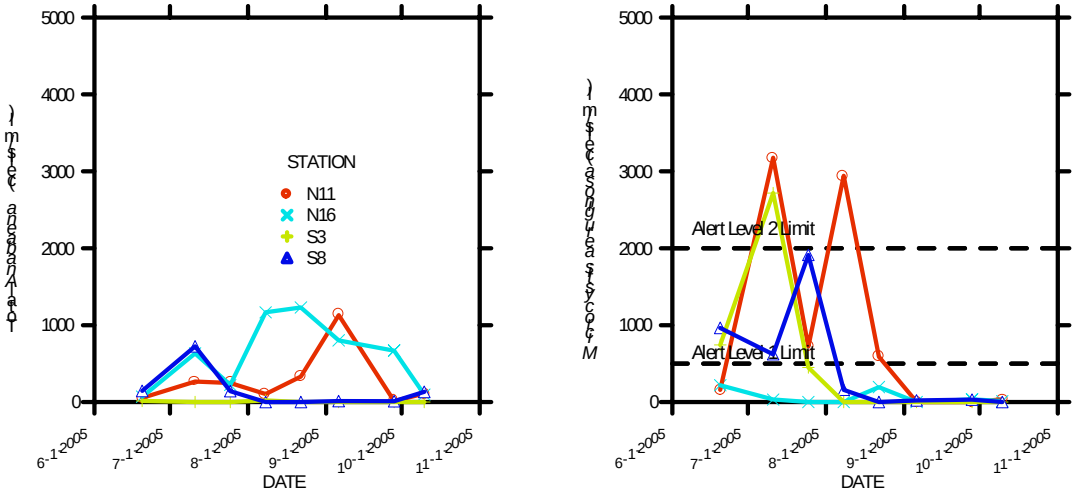
Aquatic Ecologist

References for Alert Levels

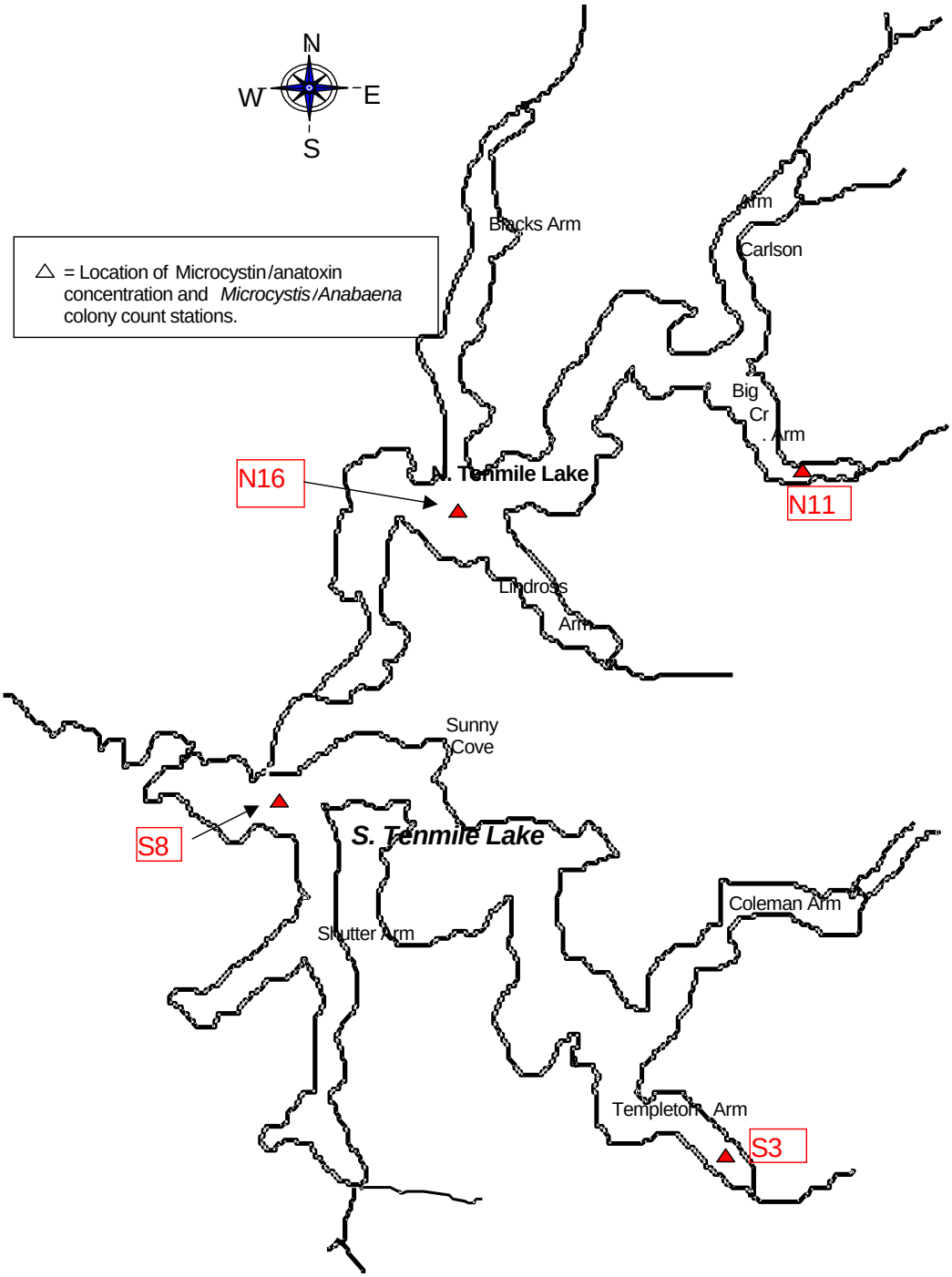
Yoo, S.R., W.W. Carmichael, R.C. Hoehn, and S.E. Hrudy. 1995. Cyanobacterial (blue-green algal) toxins: a resource guide. AWWA Research Foundation and American Water Works Association. Denver, CO. 229 p. (ISBN 0-89867-824-2)

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:	10-Oct-05
Total Density (#/mL):	1,358
Total Biovolume (um^3/mL):	2,532,933
Trophic State Index:	56.5

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Aphanizomenon flos-aquae	849	62.5	1,283,599	50.7
2	Melosira granulata	244	18.0	724,890	28.6
3	Melosira granulata angustissima	138	10.2	155,197	6.1
4	Melosira ambigua	106	7.8	368,769	14.6
5	Rhodomonas minuta	11	0.8	212	0.0
6	Ankistrodesmus falcatus	11	0.8	265	0.0

Aphanizomenon flos-aquae cells/mL =	20,375
Aphanizomenon flos-aquae heterocysts/mL =	255

Aquatic Analysts **Sample ID:** HN76

Phytoplankton Sample Analysis

Sample: Tenmile Lake
Sample Station: S8
Sample Depth:
Sample Date: 10-Oct-05

Total Density (#/mL): 319
Total Biovolume (um^3/mL): 499,218
Trophic State Index: 44.8

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Aphanizomenon flos-aquae	162	50.8	204,531	41.0
2	Melosira granulata angustissima	101	31.7	126,401	25.3
3	Melosira ambigua	21	6.7	67,711	13.6
4	Melosira granulata	11	3.3	38,053	7.6
5	Cryptomonas erosa	8	2.5	4,151	0.8
6	Anabaena flos-aquae	5	1.7	8,915	1.8
7	Fragilaria crotonensis	5	1.7	49,177	9.9
8	Ochromonas sp.	3	0.8	226	0.0
9	Rhodomonas minuta	3	0.8	53	0.0

Aphanizomenon flos-aquae cells/mL = 3,247
Aphanizomenon flos-aquae heterocysts/mL = 72

Anabaena flos-aquae cells/mL = 133

Aquatic Analysts

Sample ID: HN77

Phytoplankton Sample Analysis

Sample: Tenmile Lake
Sample Station: N11
Sample Depth:
Sample Date: 10-Oct-05

Total Density (#/mL): 249
Total Biovolume (um^3/mL): 404,739
Trophic State Index: 43.3

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Aphanizomenon flos-aquae	229	91.8	374,894	92.6
2	Anabaena planctonica	4	1.4	19,840	4.9
3	Microcystis aeruginosa	2	1.0	289	0.1
4	Dinobryon sertularia	2	1.0	1,290	0.3
5	Desmidium sp.	2	1.0	4,638	1.1
6	Nitzschia frustulum	2	1.0	289	0.1
7	Cryptomonas erosa	1	0.5	626	0.2
8	Synedra radians	1	0.5	434	0.1
9	Unidentified flagellate	1	0.5	24	0.0
10	Navicula cryptocephala veneta	1	0.5	114	0.0
11	Ankistrodesmus falcatus	1	0.5	30	0.0
12	Trachelomonas volvocina	1	0.5	2,271	0.6

Aphanizomenon flos-aquae cells/mL = 5,951
Aphanizomenon flos-aquae heterocysts/mL = 102

Microcystis aeruginosa cells/mL = 36

Anabaena planctonica cells/mL = 108
Anabaena planctonica heterocysts/mL = 2

Aquatic Analysts

Sample ID: HN78

Phytoplankton Sample Analysis

Sample:	Tenmile Lake
Sample Station:	N16
Sample Depth:	
Sample Date:	10-Oct-05

Total Density (#/mL):	183
Total Biovolume (um^3/mL):	239,480
Trophic State Index:	39.6

	Species	Density #/mL	Density Percent	Biovolume um^3/mL	Biovolume Percent
1	Aphanizomenon flos-aquae	153	83.3	211,552	88.3
2	Ochromonas sp.	9	5.1	798	0.3
3	Cryptomonas erosa	5	2.6	2,442	1.0
4	Anabaena planctonica	4	1.9	17,404	7.3
5	Fragilaria crotonensis	4	1.9	2,959	1.2
6	Mallomonas sp.	4	1.9	1,338	0.6
7	Chlamydomonas sp.	1	0.6	382	0.2
8	Trachelomonas sp.	1	0.6	2,348	1.0
9	Dinobryon sertularia	1	0.6	140	0.1
10	Microcystis aeruginosa	1	0.6	94	0.0
11	Rhodomonas minuta	1	0.6	23	0.0

Aphanizomenon flos-aquae cells/mL =	3,358
Aphanizomenon flos-aquae heterocysts/mL =	38
Anabaena planctonica cells/mL =	95
Anabaena planctonica heterocysts/mL =	2
Microcystis aeruginosa cells/mL =	12

Aquatic Analysts **Sample ID:** HN79

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.