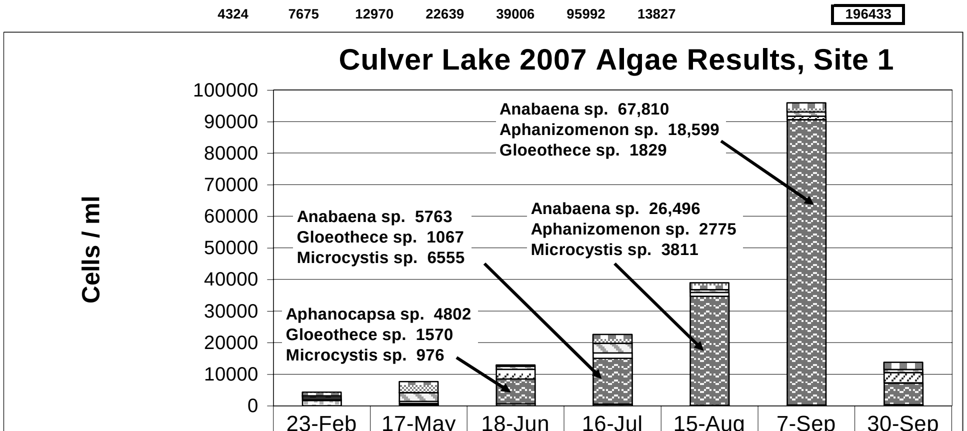
Culver Lake 2007

Anabaena sp. is a bluegreen alga (Cyanobacteria) that is able to use nitrogen from the atmosphere (nitrogen fixation). It is not dependant on dissolved inorganic nitrogen compounds (e.g. nitrate) as are most other types of algae. Nitrogen fixation requires a significant expenditure of energy by organisms, it is an "expensive" process for them to perform. Every June *Anabaena sp.* germinates from resting cysts on the lake bottom and tries to gain a competitive advantage over other algae. It essentially "tests the waters" to see if conditions are right for it to out-compete other algae for available light, phosphorus, and other needed resources. If conditions are right (adequate phosphorus, light, etc.; little nitrate for its competition), it "blooms". If not it remains at low cell densities and returns to the bottom as over-wintering cysts to try again next year.

In 2007, *Anabaena sp*. bloomed at Culver Lake. It appeared in June, doubled in July, doubled again in August and September, and died off abruptly between September 7 and 30. When *Anabaena sp.* and *Aphanizomenon sp.* die the cells become very buoyant, float, and cause an algae scum on the surface of the lake (which becomes very concentrated in down-wind locations along the shore). That was readily apparent at Culver Lake in 2007. Increased *Anabaena* blooms were anticipated at some lakes due to abberant weather patterns during the winter of 2006-07 (see appended advisory).

Culver Lake 2007 Site 1 Algae Results

	23-Feb	17-May	18-Jun	16-Jul	15-Aug	7-Sep	30-Sep	Total
BACILLARIOPHYCEAE	1676	297	610	477	103	244	291	**3697**
DINOPHYCEAE	46	61	6	94	66	0	59	**332**
CYANOPHYCEAE	285	396	7897	14452	34484	90311	6830	**154656**
EUGLENOPHYCEAE	30	30	6	30	30	61	91	**280**
CHLOROPHYCEAE	503	640	3049	1700	1243	1107	3262	**11506**
CRYPTOPHYCEAE	564	2714	991	3049	915	1342	1037	**10611**
CHRYSOPHYCEAE	107	30	0	30	30	0	0	**198**
NANNOPLANKTON	1113	3506	412	2805	2134	2927	2256	**15154**
	4324	**7675**	**12970**	**22639**	**39006**	**95992**	**13827**	**196433**



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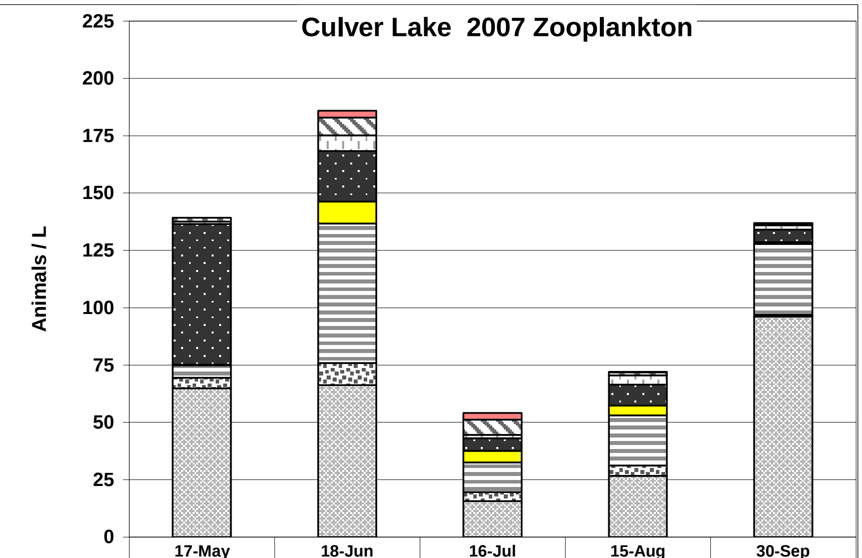
	17-May	18-Jun	16-Jul	15-Aug	30-Sep
ROTIFERS	64.8	66.3	15.7	26.7	96.2
COPEOPOD NAUPLII	4.7	9.6	3.9	4.4	0.7
SMALL CLADOCERA	5.4	60.8	13.0	21.9	30.9
LARGE CLADOCERA	0.2	9.6	5.0	4.2	0.7
SMALL CYCLOPOIDS	61.4	22.1	5.4	9.2	5.5
LARGE CYCLOPOIDS	1.0	6.8	1.6	4.1	1.8
SMALL CALANOIDS	1.7	7.7	6.6	1.3	0.7
LARGE CALANOIDS	0.0	2.9	2.9	0.2	0.2
TOTAL	139.3	185.9	54.1	72.0	136.9



	17-May	18-Jun	16-Jul	15-Aug	30-Sep
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SMALL CALANOIDS	1.7	7.7	6.6	1.3	0.7
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SMALL CYCLOPOIDS	61.4	22.1	5.4	9.2	5.5
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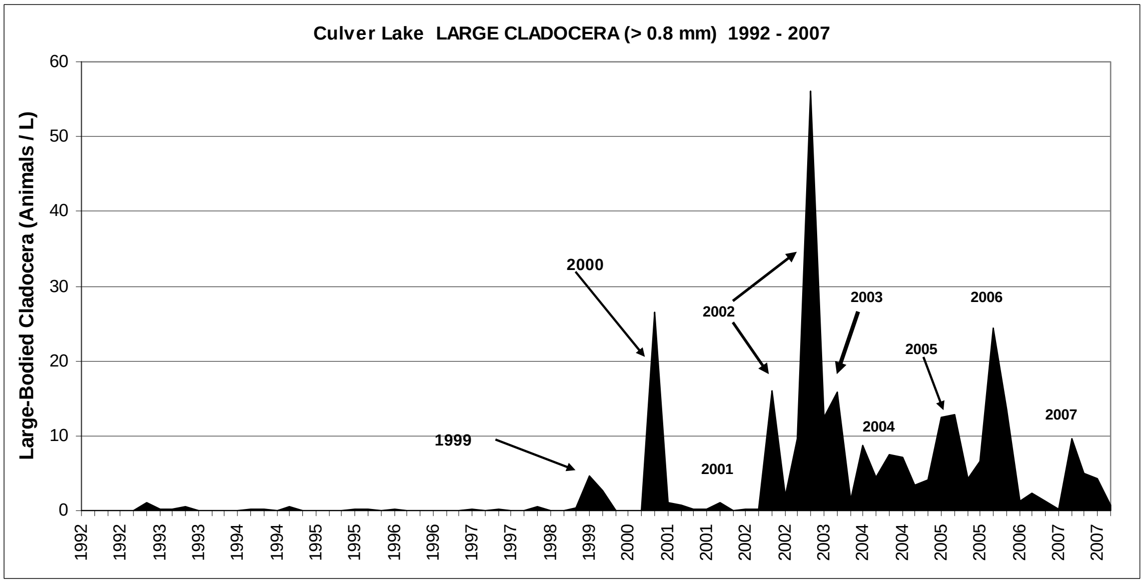
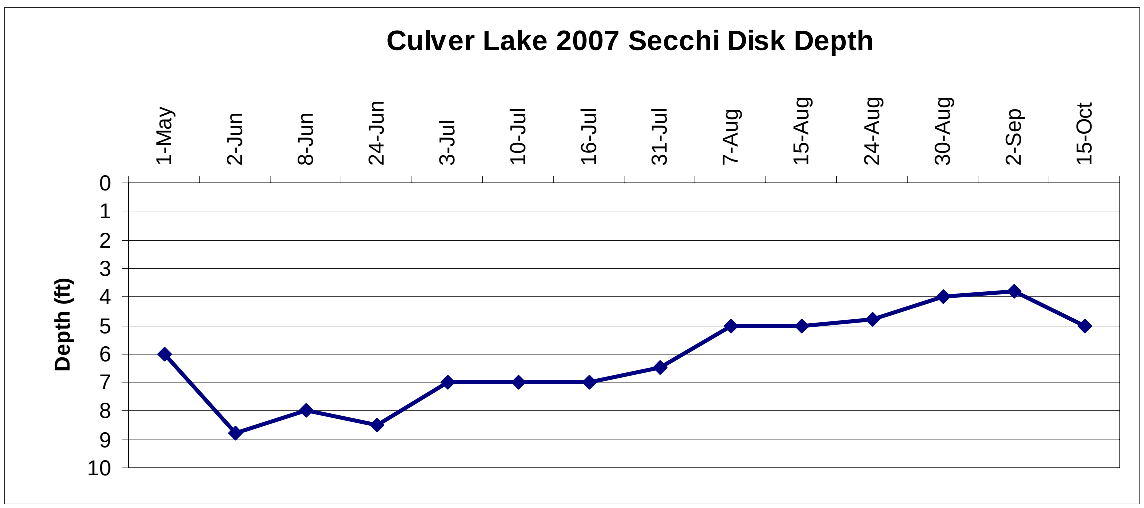
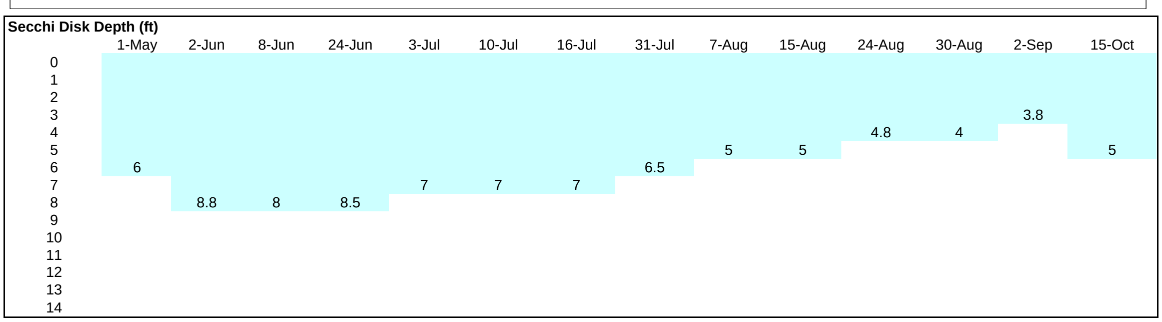
ROTIFERS	64.8	66.3	15.7	26.7	96.2

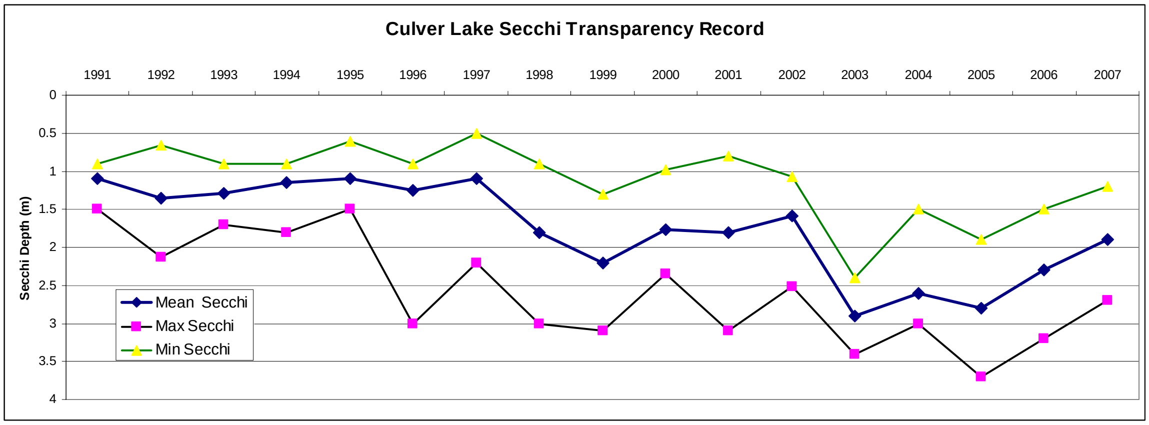
A decline in the abundance of large-bodied herbivorous zooplankton (that most effectively graze on algae) was of concern during 2007 due to the abundance of Cyanobacteria (not a good food source for zooplankton) and habitat conditions related to a bloom. Fortunately, significant numbers of large-bodied Cladocera were observed during summer samplings. It will be important to keep track of this population through future years.







Secchi disk transparency reached approximately 9 ft during the "clear-water phase" of the lake in early June. Then as *Anabaena sp* and *Aphanizomenon sp* increased, Secchi disk transparency decreased.



Since 1991, Mean, Maximum, and Minimum Secchi transparency has exhibited an increasing (improving) trend. There appears to be a 3-4 year "cyclic tendency" within the long-term observations. Secchi transparency improved significantly between 1997-1999, decreased some between 1999-2001, improved abruptly between 2002-2003, decreased again between 2005-2007. This could be due to climatic variability (especially winter conditions), related to the 4-year life span of land-locked alewife (one main age class?), or other environmental/biological factor. If the "pattern" holds true, we might expect an abrupt increase in transparency in 2008.

Temperature (° C)	1-May	2-Jun	8-Jun	24-Jun	3-Jul	10-Jul	16-Jul	31-Jul	7-Aug	15-Aug	24-Aug	30-Aug	2-Sep	15-Oct
0	11.4	23.7	23.0	21.0	21.6	27.5	26.9	26.7	26.2	24.1	20.9	26.9	22.1	16.7
1	11.3	23.7	21.5	21.0	21.6	26.0	25.4	25.9	26.2	24.1	20.9	24.5	22.0	16.8
2	11.3	23.7	21.0	21.0	21.6	25.3	24.8	24.7	26.0	24.1	20.5	23.5	21.9	16.9
3	11.3	21.8	20.7	20.9	21.7	24.8	24.6	24.0	26.0	24.1	20.4	21.8	21.9	16.9
4	11.2	18.8	20.6	20.9	21.7	23.3	24.1	22.7	24.9	23.7	20.3	21.3	21.8	16.9
5	11.1	16.0	18.4	20.9	21.6	21.3	22.8	20.8	20.6	21.6	20.0	19.6	19.8	16.9
6	11.0	13.7	13.3	15.6	17.0	17.9	16.9	18.9	17.8	17.4	18.2	18.3	17.7	16.9
7	10.2	11.7	11.4	12.5	13.3	13.9	14.5	15.3	15.2	15.6	16.0	16.2	15.7	16.9
8	9.2	10.8	10.8	11.7	12.4	12.7	13.8	14.6	14.7	14.8	15.3	15.4	15.1	16.9
9	8.1	9.7	10.3	11.1	11.6	12.3	12.9	13.7	14.0	13.6	14.6	14.9	14.5	16.9
10	7.5	9.4	9.4	10.4	10.3	10.3	11.2	12.6	13.2	12.7	12.8	12.9	13.7	16.2
11	6.9	8.7	8.6	9.3	9.7	9.5	9.5	11.5	11.6	11.9	12.2	12.2	12.7	14.7
12	6.6	8.2	7.9	8.8	9.1	8.9	8.8	10.3	10.9	11.3	11.6	11.6	12.2	13.3
13	6.4	7.7	7.4	8.3	8.6	8.3	8.2	9.4	9.6	10.0	10.3	10.8	10.8	12.5
14	6.3	7.3	7.0	7.6	7.9	8.0	8.1	8.5	8.7	8.7	9.4	9.7	9.3	11.5

RTRM	1-May	2-Jun	8-Jun	24-Jun	3-Jul	10-Jul	16-Jul	31-Jul	7-Aug	15-Aug	24-Aug	30-Aug	2-Sep	15-Oct
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	1	0	42	0	0	51	49	27	0	0	0	78	3	-2
2	0	0	14	0	0	23	19	38	7	0	10	30	3	-2
3	0	55	8	3	-3	16	6	22	0	0	3	49	0	0
4	1	77	3	0	0	46	16	38	35	12	3	14	3	0
5	1	62	55	0	3	57	39	53	124	60	8	44	53	0
6	1	42	101	122	113	85	149	48	68	104	44	31	50	0
7	9	30	28	53	69	79	47	77	54	37	48	46	42	0
8	10	12	8	11	14	19	12	13	9	15	14	16	12	0
9	9	12	6	8	11	6	15	16	13	21	13	10	11	0
10	4	3	10	8	16	26	24	17	13	14	30	34	14	15
11	4	7	7	12	7	9	19	16	24	12	9	10	16	29
12	1	4	6	5	6	6	7	15	9	8	8	8	7	24
13	1	4	3	4	4	5	5	10	15	16	16	10	19	12
14	0	3	3	5	6	2	1	8	9	13	10	12	16	14
SumRTRM	**45**	**311**	**292**	**232**	**246**	**429**	**407**	**397**	**379**	**312**	**214**	**393**	**248**	**90**

Thermal stratification was similar to prior years. The "warm/dry Summer" did result in a relatively strong thermocline, but stratification was not "unusual". Late August storm events (in North Jersey; not in South Jersey) did perturb stratification (note the changes in RTRM) and may have introduced a "pulse" of nutrients. Those storm episodes contributed to an intensification of the *Anabaena/Aphanizomenon* bloom.

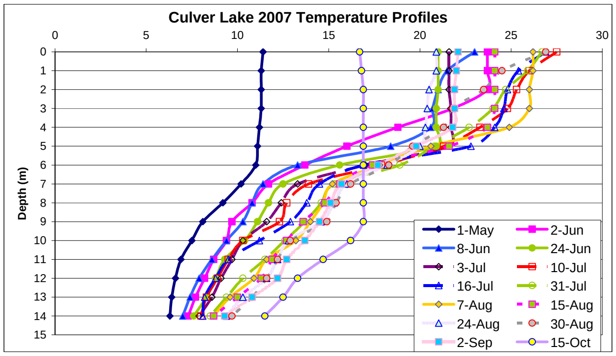
Dissolved Oxygen (mg / L)

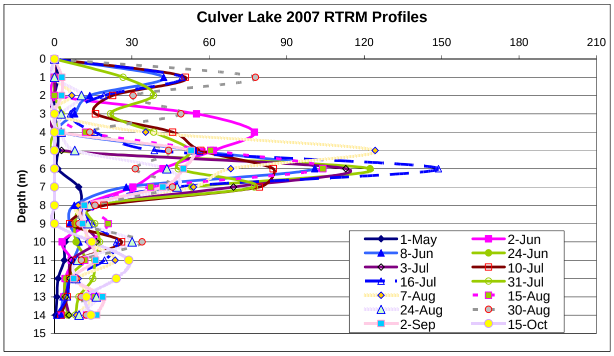
	1-May	2-Jun	8-Jun	24-Jun	3-Jul	10-Jul	16-Jul	31-Jul	7-Aug	15-Aug	24-Aug	30-Aug	2-Sep	15-Oct
0	11.0	9.3	9.4	8.9	8.2	10.3	9.2	9.6	9.5	8.7	9.6	12.5	9.8	6.2
1	11.1	9.3	9.5	8.9	8.2	10.7	9.6	9.9	9.5	8.7	9.5	13.4	9.8	6.1
2	11.0	9.3	9.3	8.9	8.3	10.7	9.5	9.9	9.3	8.7	8.8	12.8	9.7	6.2
3	11.0	9.9	9.2	8.8	8.3	10.1	9.4	9.7	9.2	8.7	8.6	8.9	9.6	6.2
4	11.0	9.9	9.2	8.8	8.2	8.7	7.9	7.3	6.9	6.6	8.4	7.0	9.4	6.2
5	11.1	8.6	7.9	8.8	8.2	6.4	4.7	3.1	1.1	0.2	7.0	3.9	3.0	6.1
6	11.0	6.7	5.9	2.9	2.3	2.0	0.6	1.4	0.1	0.0	0.5	1.3	0.6	6.1
7	11.0	6.8	5.8	3.9	2.3	2.4	1.2	1.0	0.8	0.2	0.3	0.8	0.1	6.1
8	10.9	6.8	5.9	3.7	2.5	2.2	1.6	0.9	0.6	0.5	0.4	0.1	0.1	6.1
9	10.9	6.9	6.0	3.8	2.5	2.2	1.6	0.4	0.4	0.4	0.3	0.2	0.0	6.1
10	10.8	7.0	5.9	3.2	2.9	2.9	1.3	0.5	0.7	0.0	0.2	0.0	0.0	3.3
11	10.7	7.0	5.7	3.8	2.8	2.3	1.6	0.9	1.1	0.2	0.0	0.0	0.0	0.1
12	10.8	7.2	7.0	3.2	2.4	1.8	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.1
13	10.1	8.0	6.1	2.9	1.9	0.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1
14	9.3	7.7	2.7	1.4	0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1

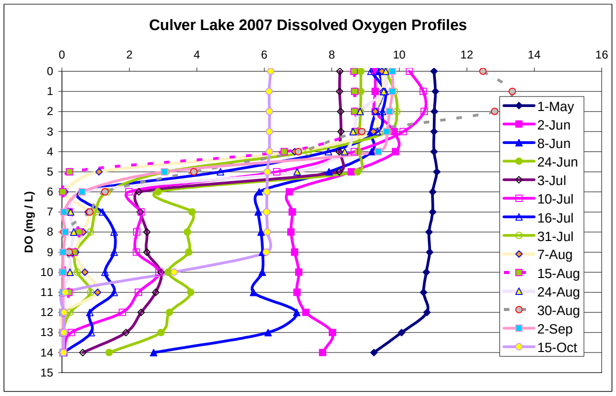
% DO Saturation

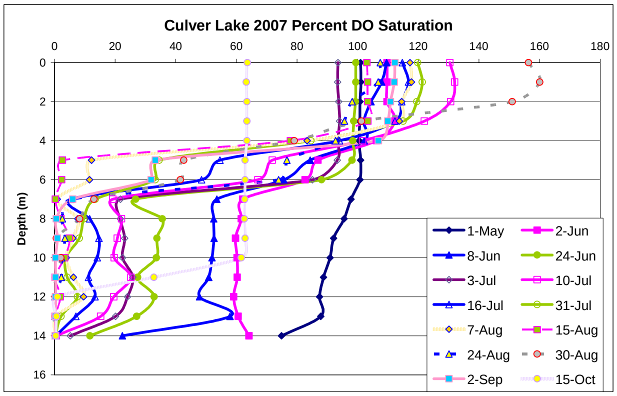
	1-May	2-Jun	8-Jun	24-Jun	3-Jul	10-Jul	16-Jul	31-Jul	7-Aug	15-Aug	24-Aug	30-Aug	2-Sep	15-Oct
0	101	110	110	99	94	130	115	120	117	103	107	156	112	64
1	101	110	108	99	93	132	117	121	118	103	107	160	112	63
2	101	110	104	99	94	131	115	120	115	103	98	151	111	63
3	101	112	102	99	94	122	112	115	114	103	96	101	110	63
4	100	106	102	98	93	102	94	85	83	78	93	79	107	63
5	101	87	84	98	93	72	55	35	12	3	77	43	33	63
6	101	83	76	88	85	67	49	33	12	2	74	42	32	63
7	98	62	54	27	22	19	5	13	1	0	5	13	6	63
8	96	62	53	36	22	22	12	10	8	2	3	8	1	63
9	92	60	53	34	23	21	15	8	6	5	3	1	1	63
10	91	60	52	34	22	20	14	4	4	3	2	2	0	62
11	89	60	51	27	26	25	11	4	6	0	2	0	0	33
12	87	59	48	33	24	20	13	8	10	2	0	0	0	1
13	88	61	58	27	20	15	7	2	1	0	0	0	0	1
14	75	64	22	12	5	1	0	0	0	0	0	0	0	0

Dissolved oxygen was slowly consumed in the 6-11m layer which remained aerobic into August. Saturation significantly above 100% was observed in July and August. Purturbation of stratification by storm episodes in August can also be seen in the % DO saturation data (see August 24, 2007).



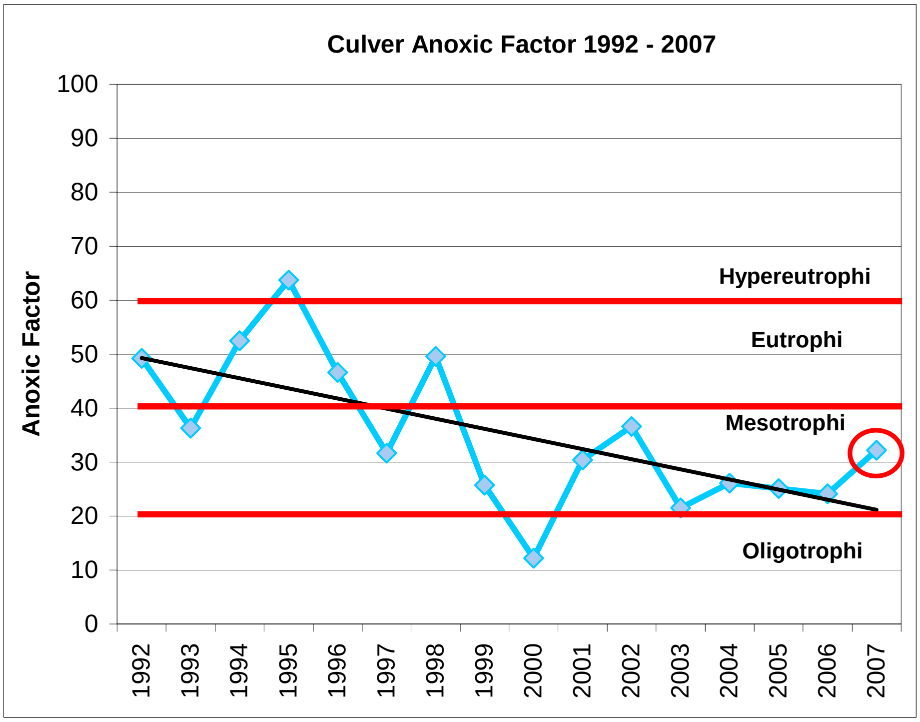






Depth profiles were similar to previous years. One of the compressors was out of service for repairs for several weeks. However, that does not appear to have been a major reason for the abundance of *Anabaena* and *Aphanizomenon*.

Year	AF
1992	**49.2**
1993	**36.3**
1994	**52.5**
1995	**63.7**
1996	**46.6**
1997	**31.7**
1998	**49.6**
1999	**25.7**
2000	**12.2**
2001	**30.4**
2002	**36.6**
2003	**21.5**
2004	**26.1**
2005	**25.1**
2006	**24.1**
2007	**32.2**



"Anoxic Factor" is a computation that indicates how much loss of dissolved oxygen occurs in a lake and for how long. It is often used as an indicator of the "Trophic State" of a lake. The anoxic factor has declined (improved) at Culver Lake since 1991. Anoxic factor was somewhat higher in 2007 than during 2005-06, which is probably a result of compressor outage. However, the anoxic factor remained significantly below most years since 1991.

Total Phosphorus as P (ug/L)							
Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
1	14	17	15	16	25	27	21
3	18	22	14	12	27	22	
5	16	18	15	15	9	18	
7	13	12	9	10	12	16	
9	11	13	7	14	29	17	37
12	16	9	9	48	145	207	
14	33	22	478	231	615	520	

Ammonia as N (ug/L)							
Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
1	20	27	<10	17	21	107	184
3	20	54	<10	13	54	113	
5	20	39	12	12	29	136	
7	13	28	<10	<10	57	183	
9	25	46	<10	35	120	187	306
12	185	78	20	125	315	530	
14	250	290	360	515	760	1030	

Nitrate as N (ug/L)							
Depth (m)				15-Aug	7-Sep	30-Sep	22-Oct
1					<20	<20	<20
3					<20	<20	
5					<20	<20	
7					<20	<20	
9					<20	<20	<20
12					<20	<20	
14				<20	<20	<20	

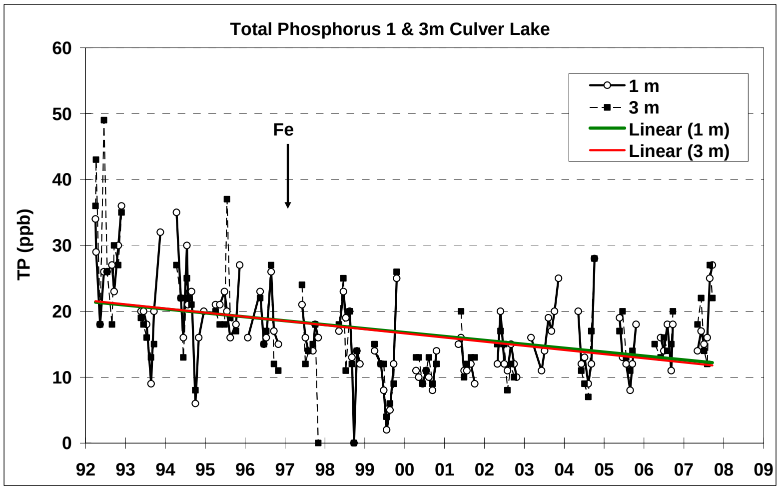
Turbidity NTU							
Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
1	1.5	2.2	2.3	5.6	11	2.5	3.6
3	1.2	2	2.3	4.3	7.3	2.6	
5	1.3	1.8	2.2	4.6	1.5	1.5	
7	1	1.6	1.7	2.3	2.6	2.6	
9	0.9	1.7	1.7	2.1	3.9	3.2	6
12	2.9	2	1.3	2.9	5.4	8.1	
14	3.2	4.2	43	2.2	12	12	

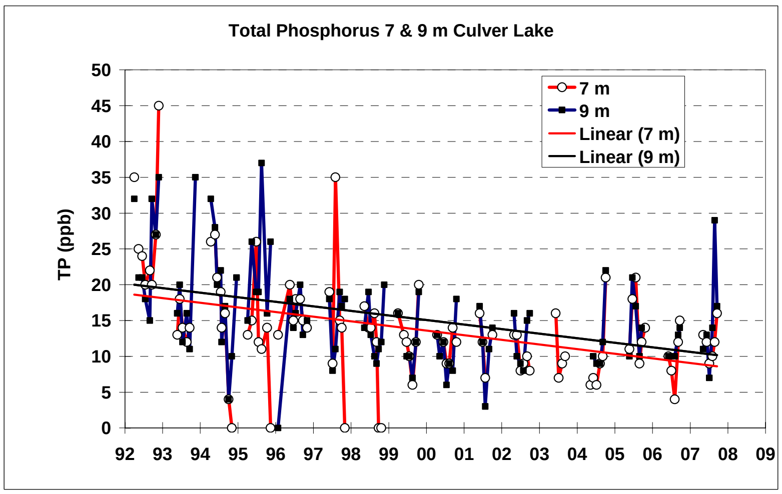
Total P remained relatively low in surface waters until late August/ early September. The increase in surface water Total P in September was probably due to 1) August storm episodes (loading and perturbation of stratification), and 2) uptake by algae in deeper strata which then ascended to the surface. A third possible source is disturbance of sediments (e.g. harvesting, power boats on unusually low water levels). A likely source was “flushing of watershed wetland areas” which had been very stagnant during most of the summer.

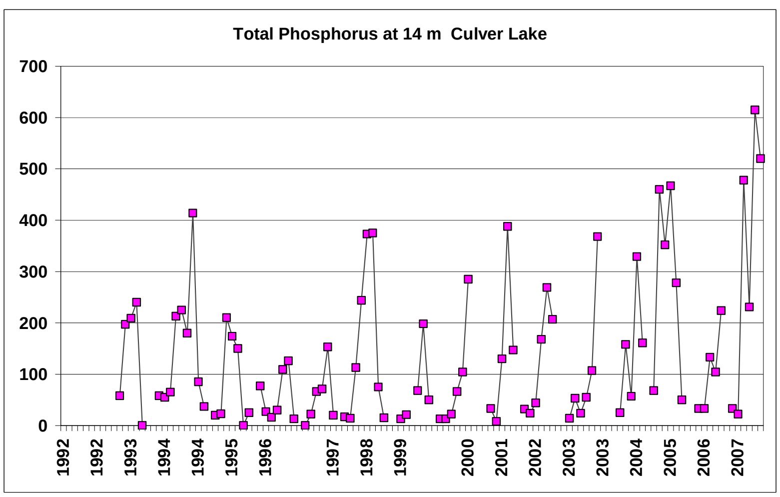
Ammonia-N remained very low in waters to 10m deep until September. Nitrogen availability to algae (nitrate and ammonia) was very low during 2007, which would tend to stimulate organisms capable of using atmospheric N.

Total Iron (mg/L)							
Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
7		0.036	0.045	0.07	0.07	0.11	
9	0.06	0.028	0.04	0.11	0.05	0.08	0.13
12	0.1	0.035	0.07	0.28	0.86	1.5	
14	0.15	0.06	2.9	1.2	4.5	3.9	

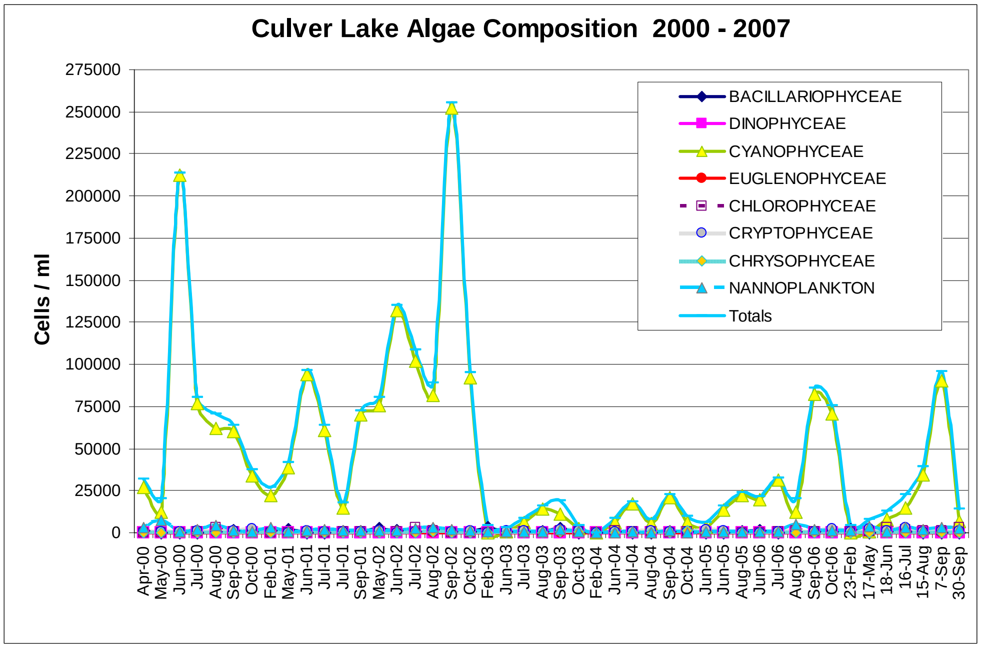
Hypolimnetic iron reached 4-4.5 mg/L, which should help to precipitate phosphorus through late Fall and Winter.

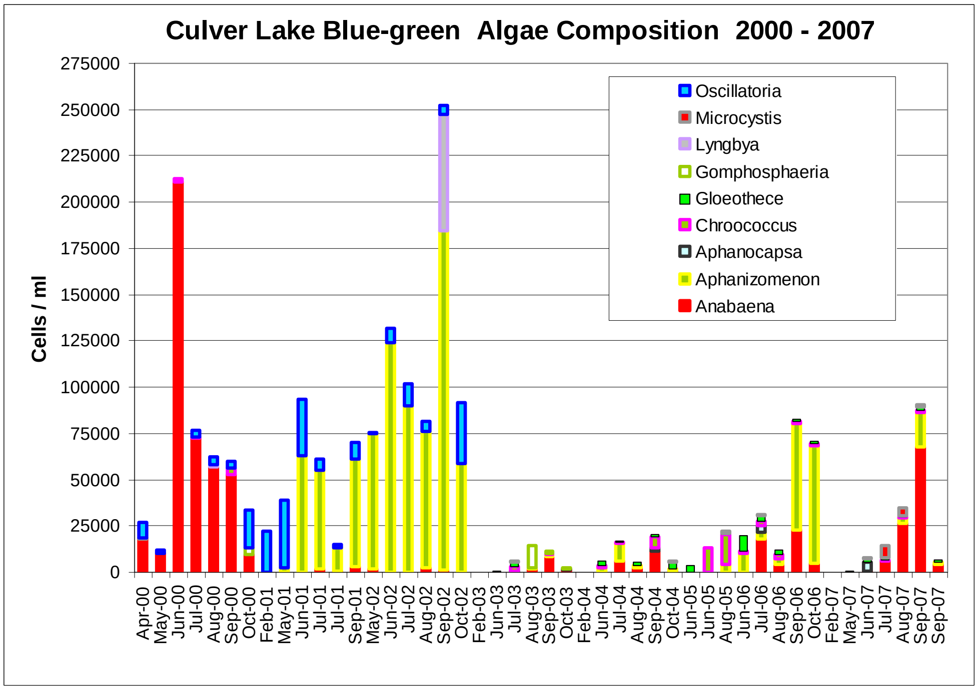






Although lower than most early years (1992-1999), Total phosphorus was slightly higher during 2007 than recent years. Continued reduction in TP availability consistently below 20 ppb in surface water should be a management goal. It is not desirable to reduce nitrate loading, especially reductions in nitrate load without a comparable (relative to algae requirements) reduction in TP loading.





The abundance of algae was not as high as during the 1990's. The nuisance water quality conditions appear to be more related to "what kind of algae" than "how much algae". *Anabaena* and *Aphanizomenon* become very buoyant and form a "canopy" which helps them compete with other, more desirable algae, for light. These algae also cause floating algae scum when a bloom dies off.

Suggestions

- Encourage the use of **Zero Phosphorus Fertilizer** (Nitrate as N Source for lawns, etc.) Lawns need nitrogen, not phosphorus.

Normanoch Association could institute a "voluntary ban on the use of Phosphorus-containing fertilizer", through newsletters, etc. Normanoch Association could also consider bulk purchase by the pallet- and discount re-sale to lake community members- using cost as an incentive. I've identified two zero-P fertilizers below – Scotts and Greenview – with several advantages/disadvantages.

- Add Monitoring of major inflows during storm episodes, especially:
  - Causeway Culvert (can this be controlled?)
  - Inflow to Stear Tract

- Possible Alternative: Use the aeration system (with some adjustments) to enhance Spring circulation, sustain inorganic nitrogen availability, and favor diatoms and green algae over N-fixing bluegreen algae. Such an approach would require further evaluation and planning.

2007

Ammonia as N (ug/L)

Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
1	20	27	<10	17	21	107	184
3	20	54	<10	13	54	113	
5	20	39	12	12	29	136	
7	13	28	<10	<10	57	183	
9	25	46	<10	35	120	187	306
12	185	78	20	125	315	530	
14	250	290	360	515	760	1030	

Total Phosphorus as P (ug/L)

Depth (m)	17-May	20-Jun	16-Jul	15-Aug	7-Sep	30-Sep	22-Oct
1	14	17	15	16	25	27	21
3	18	22	14	12	27	22	
5	16	18	15	15	9	18	
7	13	12	9	10	12	16	
9	11	13	7	14	29	17	37
12	16	9	9	48	145	207	
14	33	22	478	231	615	520	

DO

	5/1/2007	6/2/2007	6/8/2007	6/24/2007
0	11.0	9.3	9.4	8.9
1	11.1	9.3	9.5	8.9
2	11.0	9.3	9.3	8.9
3	11.0	9.9	9.2	8.8
4	11.0	9.9	9.2	8.8
5	11.1	8.6	7.9	8.8
6	11.0	6.7	5.9	2.9
7	11.0	6.8	5.8	3.9
8	10.9	6.8	5.9	3.7
9	10.9	6.9	6.0	3.8
10	10.8	7.0	5.9	3.2
11	10.7	7.0	5.7	3.8
12	10.8	7.2	7.0	3.2
13	10.1	8.0	6.1	2.9
14	9.3	7.7	2.7	1.4

Temp

	5/1/2007	6/2/2007	6/8/2007	6/24/2007
0	11.4	23.7	23.0	21.0
1	11.3	23.7	21.5	21.0
2	11.3	23.7	21.0	21.0
3	11.3	21.8	20.7	20.9
4	11.2	18.8	20.6	20.9
5	11.1	16.0	18.4	20.9
6	11.0	13.7	13.3	15.6
7	10.2	11.7	11.4	12.5
8	9.2	10.8	10.8	11.7
9	8.1	9.7	10.3	11.1
10	7.5	9.4	9.4	10.4
11	6.9	8.7	8.6	9.3
12	6.6	8.2	7.9	8.8
13	6.4	7.7	7.4	8.3
14	6.3	7.3	7.0	7.6

Possible Alternative Operation Approach

Perhaps use the aeration system during late Spring to extend the duration of complete circulation to sustain inorganic nitrogen availability and favor diatoms and green algae (discourage bluegreen algae). This may be feasible while the whole water column remains aerobic and exhibits relatively low TP. Further evaluation would be needed to develop specifics of an approach, evaluate effects on heat gain, distribution, and stratification development, cool water habitat, etc.

- Aeration System Maintenance and/or Upgrade Tasks to consider:
  - New air distribution manifold controls.
  - Work on in-lake aerators, anchor attachments, diffuser systems, etc.
  - Additional in-lake apparatus, increased capacity – increased compressed air capacity, focus on cool water habitat and sustaining nitrogen availability.

Lake and Reservoir Management
Client Advisory

(From: www.ecosystemconsulting.com January 2007)

Winter Climate Advisory
How does Winter influence Summer in Lakes and Reservoirs?

We have experienced some "aberrant" weather patterns the past several years….and "unusual weather" seems to be becoming the "norm". During the Fall, Winter, Spring and early Summer of 2001-2002 drought conditions were experienced in the Northeastern US. By contrast, 2003 conditions were wet, with higher than average rainfall-runoff. Few "heat waves" were experienced during the Summer of 2004, with some of the warmest temperatures experienced in April and May. However, summer stratification in the lake extended through September and into October; a prolonged stratification period. In 2005, stratification developed later than usual, with very weak stratification at the end of May. Stratification developed abruptly, and was very strong during June to September. Stratification persisted even longer than it did during 2004, with summer-like weather well into October. Weather patterns during the summer of 2006 were similar to 2005. However, heat waves were more intense and of longer duration (especially July-August). 2006 was the warmest year on record! Recently Fall-Winter weather patterns have also been aberrant. (We have experienced very little winter weather – *there are implications for lake conditions*).

"Aberrant weather patterns seem to be becoming the norm. Average temperature and average annual rainfall are the becoming "averages of extremes". When it rains…it pours. When it's hot…it's hot."

"How much algae grows" tends to be controlled by phosphorus availability in most lakes. "What kind of algae grows" tends to be controlled by other factors such as the availability of silica, nitrate, and stratification intensity. Silica and nitrate were exhausted early in the summer of 2006 in many productive lakes, creating conditions that favored nitrogen-fixing bluegreen algae over diatoms and green algae. That exhaustion of the "other nutrients" needed by non-nuisance diatoms and green algae occurred very early, resulting in more intense dominance by N-fixing bluegreen algae (e.g. *Anabaena*) in many lakes and reservoirs. Weather patterns during December-April set the stage for the abundance of phytoplankton the following growing season and, more importantly, what kind of algae is dominant. Winters that are unusually mild, with short, weak ice-cover, result in greater carry-over of phosphorus from the previous Fall, and early exhaustion of available nitrate-N and silica. The growing season and stratification starts early. The "stage is set" for greater abundance of nuisance nitrogen-fixing bluegreen algae the following summer (especially if the stratification season extends into October). Whether this is long-term "climate change" is debatable. However, it is becoming clear that there is an influence over summer conditions in Lakes and Water Supply Reservoirs and we need to anticipate management needs to avoid water quality and supply treatment problems.

Robert W. Kortmann

Robert W. Kortmann, Ph.D.

TWO Zero-Phosphorus Fertilizers:

Scotts® Champion® **13-0-44 Potassium Nitrate** Plus This may be difficult to find locally in North Jersey, it is more common in agricultural uses, crops, etc. It is also a material used by terrorists to construct bombs (e.g. Oklahoma City) and is closely monitored since. It has the advantage of having water soluble nitrate as the nitrogen source (some would probably consider that a disadvantage).

Greenview 27-0-12 is more readily available at retailers such as Lowe's or Home Depot (they would certainly stock it if a demand developed, as in other areas where lake communities instituted P-fertilizer restrictions). The nitrogen source is more "slow-release", not water-soluble nitrate (whether considered an advantage or disadvantage depends on one's perspective).

View Spring Fertilizer Zero Phosphate 27-0-12 Share with a Friend Ask us a Question

application of Greenview Spring Fertilizer Zero Phosphate 27-0-12 provides the recommended amount of nitrogen for the entire spring and summer season. It contains no phosphates to comply with local areas that restrict phosphate use. More Info

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View Spring Fertilizer Zero Phosphate 27-0-12 Unlike competitive brands, one application of Greenview Spring Fertilizer Zero Phosphate 27-0-12 provides the right amount of nitrogen for the entire spring and summer season!!

- 75% slow release nitrogen fertilizes up to 16 weeks.
- Slow release nitrogen provides your lawn with controlled, steady nutrition over a longer period of time, resulting in thicker, healthier grass.
- No excess growth, less mowing!
- Provides a full root system for a healthier, greener lawn.
- Zero Phosphate to comply with local areas that restrict phosphate use.

ne to apply: The best time to apply is in spring or early fall. The grass should be dry when applied and the product should be watered in to achieve maximum results. Application can be made using all makes and models of spreaders (drop or broadcast). Check the product label link for settings for the most common spreaders.

le in 5,000 square feet (18 lbs.) lawn coverage.