

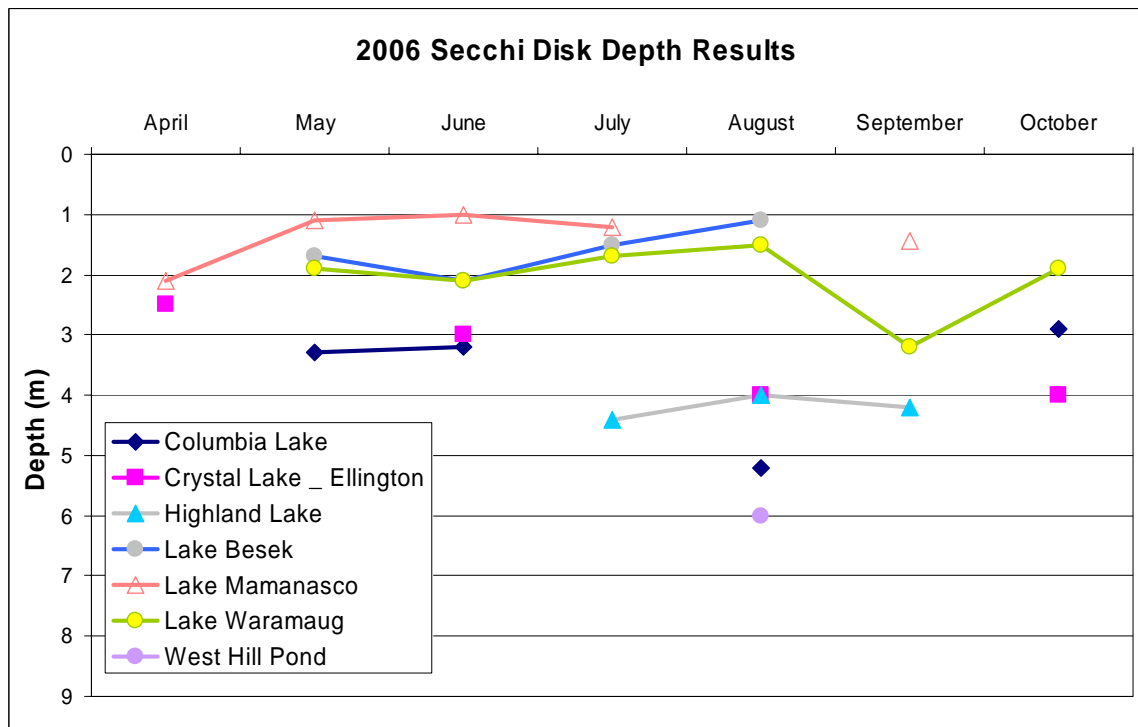
Volunteer Secchi Disk Monitoring Program  
2006 Report  
Connecticut Federation of Lakes

There was a significant drop off in the number of lakes participating in the Volunteer Monitoring Program this past year. Eleven lakes reported Secchi disk depth data in the previous two years. In 2006, seven lakes reported data. Obviously we had hoped to increase the number of lakes reporting data instead of experiencing a reduction of participants. I would like to hear some suggestions on how the program can be improved and attract more willing participants. The CFL and I would like to thank all of those volunteers who provided data. Keep up the good work.

**2006 Data**

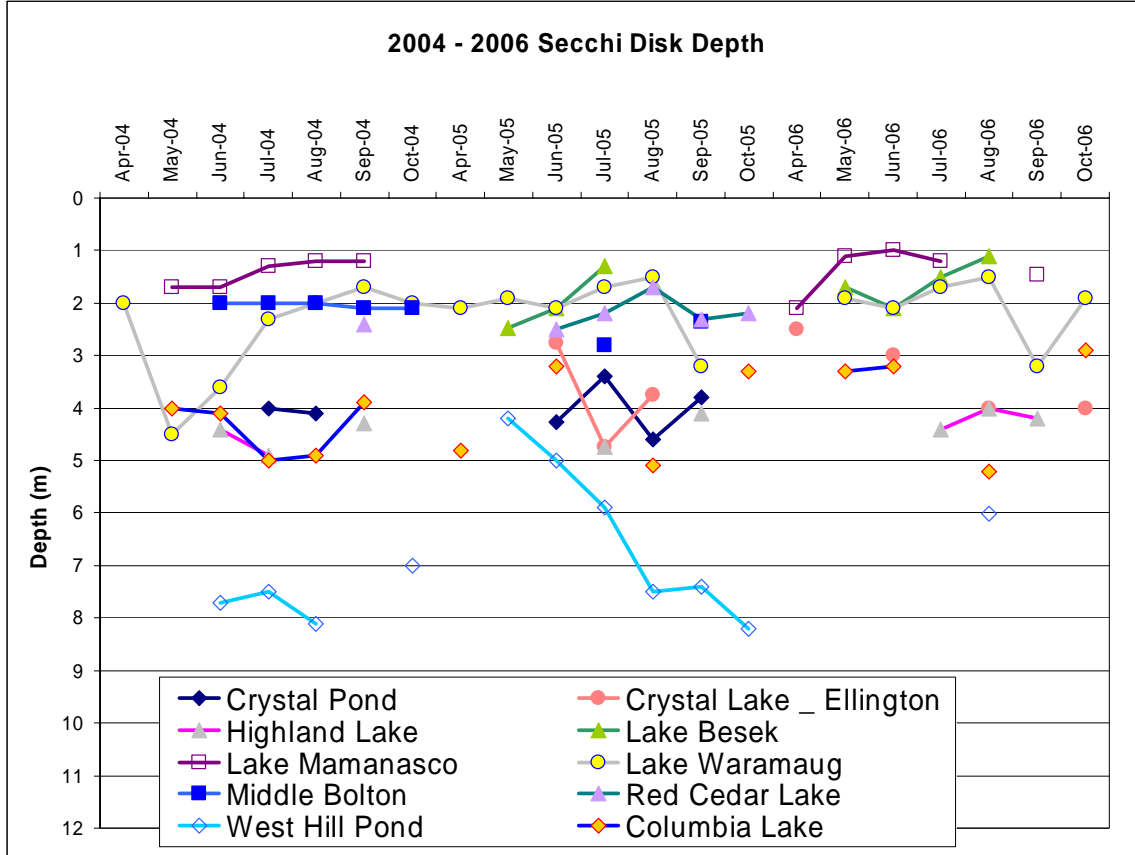
The Secchi disk depths for the lakes reporting in 2006 ranged between 1 – 6.0 meters. West Hill Pond reported the greatest Secchi depth at 6.0 meters in August and Lake Mamanasco reported the least Secchi disk depth at 1 meter in June.

	April	May	June	July	August	September	October
Columbia Lake		3.3	3.2		5.2		2.9
Crystal Lake _ Ellington	2.5		3		4		4
Highland Lake				4.4	4	4.2	
Lake Besek		1.7	2.1	1.5	1.1		
Lake Mamanasco	2.1	1.1	1	1.2		1.45	
Lake Waramaug		1.9	2.1	1.7	1.5	3.2	1.9
West Hill Pond					6		



## 2004 – 2006 Data

Examining the data for all the lakes that have participated in the monitoring program over the past three years reveals that most Secchi disk depths were fairly consistent, only varying between 1 - 2 meters. However, the Secchi disk depths for West Hill Pond had a 4 meter variation (4 – 8 meter Secchi disk depth) between 2004 - 2006. West Hill Pond reported the greatest Secchi disk depths of all the lakes during the survey period.



## TSI Comparison

The Trophic State Index (TSI) was created by Dr. Carlson in the late 1970's as a way to classify lakes based on algal productivity. Lakes are classified as having low productivity (oligotrophic, TSI < 40), moderate productivity (mesotrophic, TSI 40 - 50), or high productivity (eutrophic, TSI > 50). The index was designed to use chlorophyll a concentrations to predict lake trophic status as chlorophyll a measurements provide the best estimates of algal biomass. The following equation is used to calculate the chlorophyll a TSI:  $TSI(Chl\ a) = 30.6 + (9.81 * LN(chl\ a))$  (Managing Lakes and Reservoirs, Third Edition, NALMS, 2001). LN refers to the natural logarithm of chlorophyll a and most calculators have this function. While chlorophyll a concentrations provide the best estimate of algae biomass, it is a costly and time consuming analysis, and most lake associations do not have the budget or manpower to collect chlorophyll a

data. Dr. Carlson also developed a TSI for other variables that are routinely measured. These include Secchi Disk =  $60 - (14.41 * \text{LN}(\text{Secchi}))$ , phosphorus =  $4.15 + (14.42 * \text{LN}(\text{P}))$ , nitrogen =  $4.45 + (14.43 * \text{LN}(\text{N}))$  (Managing Lakes and Reservoirs, Third Edition, NALMS, 2001). Gertrud Nurnberg created a TSI for the anoxic factor,  $\text{TSI}(\text{AF}) = 10 + \text{AF}$  (Managing Lakes and Reservoirs, Third Edition, NALMS, 2001). If a lake association has measured several of these parameters, the calculated TSIs can be compared to get an overall picture of lake productivity. For example, if the calculated TSI (Secchi) is over 50, TSI (TP) is over 50, and a TSI (AF) is over 40 for a lake, one can say with some certainty that the lake is eutrophic.

I wanted to compare the various lakes that have participated in this monitoring program over the past three years. I used the reported Secchi disk depths to calculate a TSI for each lake for each year that they reported data. The problem with using Secchi disk data to estimate lake productivity is that Secchi disk depths can be affected by factors other than algae, such as suspended solids / sediment or organics that affect light penetration (tannins). Therefore, such an approach is not appropriate for all lakes. Another issue is that I am only using one TSI to estimate productivity. A better picture of trophic status is attained when several TSIs can be calculated and compared.

I first averaged the Secchi disk data for each lake for each year to arrive at an annual Secchi disk average. I used this annual average to calculate the TSI for each lake.

#### Annual Average Secchi Disk Depth

	2004	2005	2006
Bashan Lake		5.4	
Columbia Lake	4.4	4.1	3.7
Crystal Lake _ Ellington		3.8	3.4
Crystal Pond	4.1	4.0	
Highland Lake	4.5	4.4	4.2
Lake Besek		2.0	1.6
Lake Housatonic		2.6	
Lake Mamanasco	1.4		1.4
Lake Waramaug	3.5	2.1	2.1
Lake Williams	2.4		
Lower Bolton	2.3		
Middle Bolton	2.0	2.6	
Moosup Pond		3.8	
Pachaug Pond	2.6		
Red Cedar Lake	2.4	2.2	
West Hill Pond	7.6	6.4	6

#### Trophic Status Classification

TSI < 40	Oligotrophic
TSI 40 - 50	Mesotrophic
TSI > 50	Eutrophic

### TSI - Secchi Disk Depths

	2004	2005	2006
Bashan Lake		35.6	
Columbia Lake	38.7	39.7	41.3
Crystal Lake _ Ellington		41.0	42.5
Crystal Pond	39.8	40.0	
Highland Lake	38.2	38.6	39.3
Lake Besek		50.3	53.2
Lake Housatonic		46.5	
Lake Mamasasco	54.9		55.5
Lake Waramaug	41.8	49.4	49.7
Lake Williams	47.7		
Lower Bolton	48.0		
Middle Bolton	49.7	46.4	
Moosup Pond		40.8	
Pachaug Pond	46.2		
Red Cedar Lake	47.4	48.8	
West Hill Pond	30.8	33.3	34.2

### Trophic Status based on Secchi Disk Depth

	Trophic Status
Bashan Lake	oligotrophic
Columbia Lake	oligotrophic - mesotrophic
Crystal Lake _ Ellington	mesotrophic
Crystal Pond	oligotrophic
Highland Lake	oligotrophic
Lake Besek	eutrophic
Lake Housatonic	mesotrophic
Lake Mamasasco	eutrophic
Lake Waramaug	mesotrophic
Lake Williams	mesotrophic
Lower Bolton	mesotrophic
Middle Bolton	mesotrophic
Moosup Pond	mesotrophic
Pachaug Pond	mesotrophic
Red Cedar Lake	mesotrophic
West Hill Pond	oligotrophic

Based on the TSI (Secchi), there were four lakes that would be considered oligotrophic, one lake between oligotrophy and mesotrophy, nine lakes of moderate productivity, and two lakes of eutrophic status. Again, lakes that are affected by turbidity or highly colored water would have a false sense of trophic status if only Secchi disk data was considered.

I hope that everyone has started taking measurements for the 2007 season. Please encourage other lake associations to participate in this program. I am interested in any comments or suggestions that you might have to improve this monitoring program. Thank you again for all of your efforts, and have a safe 2007.

Sincerely,

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