Smith Mountain Lake Association Water Quality Volunteer Monitoring Program

1990 and 1991 Report

Carolyn L. Thomas and David M. Johnson
Ferrum College
Ferrum, Virginia 24088

December 1991

CONTENTS

FIGURES

TABLES

Smith Mountain Lake Association

Rt 2, Box 13B

Moneta, VA 24121

703/297-4146

1991 OFFICERS

President - Robert C. Hawlk

Vice President - Donald W. Lindgren

Secretary/Treasurer - Patricia S. Dalton

Past President - Charles M. Hoover

1991 DIRECTORS

John Y. Barr

Walter A. Berg

Susan B. Bidwell

James E. Comer

Napier L. Dills

John U. Harkness

James E. Knap

John D. Marchant

Warren B. Melroy

Michael Thacker

Joseph K. Wagoner

SMITH MOUNTAIN LAKE VOLUNTEER MONITORS

1990-1991

Advanced Monitors

Howard & Katherine Chilton, Union Hall

Yvonne & Walter Hughes, Union Hall

Richard Chamberlain, Moneta

Warren B. Melroy, Moneta

Ken Dugan, Moneta

Ed & Loretta Osika, Lynchburg

Bob Wheaton, Huddleston

Jim Murphy, Huddleston

Daphne Jamison, Wirtz

Andy & Ellie Anderson, Moneta

Janet & Richard Hill, Huddleston

Judy Gring, Ferrum

Leonard Pick, Roanoke

Gene McCullough, Huddleston

Mickie & Bob Hawlk, Union Hall

Ray & Tina Rex, Wirtz

Betty & Stanley Reeder, Moneta

Walt & Brenda Berg, Huddleston

Ted Borgsrud, Hardy

Raymond Strachan, Huddleston

Basic Monitors

Robert & Ilma Mowery, Moneta

Roger Mueller, Moneta

Glenn Randa, Moneta

Warren & Jean Beall, Huddleston

Henry Strubbe, Hardy

Becky Rowe, Wirtz

Julia & Clayton Anderson, Moneta

Tom Holt, Moneta

Charles Zimmerman, Moneta

Beth Hoover, Moneta

John & Shirley Barr, Hardy

Colleen & Dave Owens, Huddleston

Bert & Marian Thurman, Wirtz

Mary Ann & Joseph Spahr, Moneta

Maxwell Gyett, Moneta

Brewster Freeman, Moneta

Gary & Sally Garst, Roanoke

1. INTRODUCTION

The Smith Mountain Lake Water Quality Volunteer Monitoring Program (SMLWQVMP) is a program designed to monitor the water quality of Smith Mountain Lake, located in southwestern Virginia. The program is jointly coordinated by scientists from Ferrum College in Ferrum, Virginia and members of the Smith Mountain Lake Association (SMLA), a lake residents' citizen association. This document reports on the 1990 and 1991 monitoring efforts of the SMLWQVMP, which are the fourth and fifth years of this ongoing program. The detailed data, data analysis, and conclusions for the first three years (1987, 1988 and 1989) can be found in the Final Report to the Virginia Environmental Endowment (VEE) by Johnson and Thomas (March, 1990). The VEE provided primary funding for the project during the first three years.

In May of each year, a training session was organized and taught by the Ferrum College scientists and the SMLA Volunteer Monitoring Coordinator with assistance from the student technician. In 1990, the student technician was Missy Talley and the training session was held at the Bethlehem United Methodist Church in Moneta, Virginia. In 1991, the student technician was Rick Sloan and the training session was held at the Smith Mountain Lake Visitor Center at Hales Ford Bridge. Both sessions were well attended with attendees including experienced monitors and new volunteers. The number of monitors participating was very consistent, with some experienced monitors leaving the program but new monitors joining the program each year. The program consisted of a review of the previous year's findings and the planned schedule for the upcoming year. Returning monitors confirmed their sample site locations on the map of Smith Mountain Lake provided by the program directors, received new supplies (sample bottles and filters), and had their monitoring equipment checked. The program co-directors worked with the new volunteer monitors to assign sample site locations, explain the sampling procedures, and issue sampling equipment and supplies.

Sample collection began the first week of June each year and the first sample bottles and sample filters were picked up in the second week of June. The sample bottles and sample filters were picked up and new supplies issued each Tuesday. In 1990, samples were collected for thirteen weeks until the first week in September. In 1991, the decision was made to collect samples for twelve weeks because Ferrum College begins fall semester the first week in September and sample pick-up and analysis are difficult to complete.

Newsletters were written and published by the program co-directors each summer, reporting on activities of the program and data analytical reports. Announcements were included in the newsletters in addition to advice or tips on more efficient sample collection. Two newsletters were written in 1990 and one in 1991.

At the end of each monitoring season, a meeting and social event is held. At these combination picnic/business meetings, the co-directors of the program from Ferrum College gave reports on the results of the sample collection and analyses, and the SMLA program coordinator and president made presentations about the success of this year's program and the next year's plans for the SMLWQVMP.

The results of the data analyses, and conclusions and comparisons with the previous three years' data, will be discussed in the following sections.

2. METHODS

Detailed methods of sample collection, sample analyses, and quality control/quality assurance procedures can be found in the VEE Report (Johnson and Thomas, 1990).

The parameters measured included: turbidity, measured with a Secchi disc; total phosphorus, measured spectrophotometrically after persulfate digestion; and chlorophyll-*a*, determined using the acetone extraction method with fluorimetric detection.

Quality control and quality assurance procedures evaluated both sample collection and storage by the volunteer monitors, and the laboratory procedures used to determine total phosphorus and chlorophyll-*a*.

3. RESULTS

3.1 1990 Results

The three water quality parameters that are studied on Smith Mountain Lake are water turbidity, total phosphorus, and chlorophyll-*a*. In 1990, the average seasonal value for each water quality parameter was: (1) Secchi depth = 2.41 m; (2) total phosphorus concentration = 25.2 ppb; and (3) chlorophyll-*a* = 4.53 ppb. The average values are also displayed in Table 1.

Table 1. Comparison of water quality data from Smith Mountain Lake from 1987 to 1991 with data from other southeastern lakes and reservoirs.

Parameter	**Average - Smith**		**Mountain**	**Lake**		Average of
	1987	1988	1989	1990	1991	80 S.E. Lakes*
Total Phosphorus (ppb)	19.7	20.9	27.8	25.2	25.9	33.0
Chlorophyll-*a* (ppb)	3.8	2.6	3.7	4.5	3.0	8.1
Secchi Disk Depth (m)	2.4	2.7	2.2	2.4	2.6	1.7

(*Reckhow, 1988)

In 1990, the weekly mean of all stations followed a fluctuating pattern similar to the previous three years, as illustrated in Figure 1. The Secchi depth exhibited the highest mean value in Week 5, indicating that the lake water was the clearest at most stations during the first week of July. The lowest mean value occurred during Week 1 indicating that the water was the most turbid during the first week of June. The grand mean of Secchi depth values, including all 826 values for all stations and all 13 weeks, was 2.41 $\pm$ 0.11 m. The total phosphorus concentration exhibited the lowest mean value in Week 13 and highest mean value in Week 1. The chlorophyll-*a* concentration exhibited the lowest mean value in Week 5 and the highest mean value during Weeks 12 and 13.

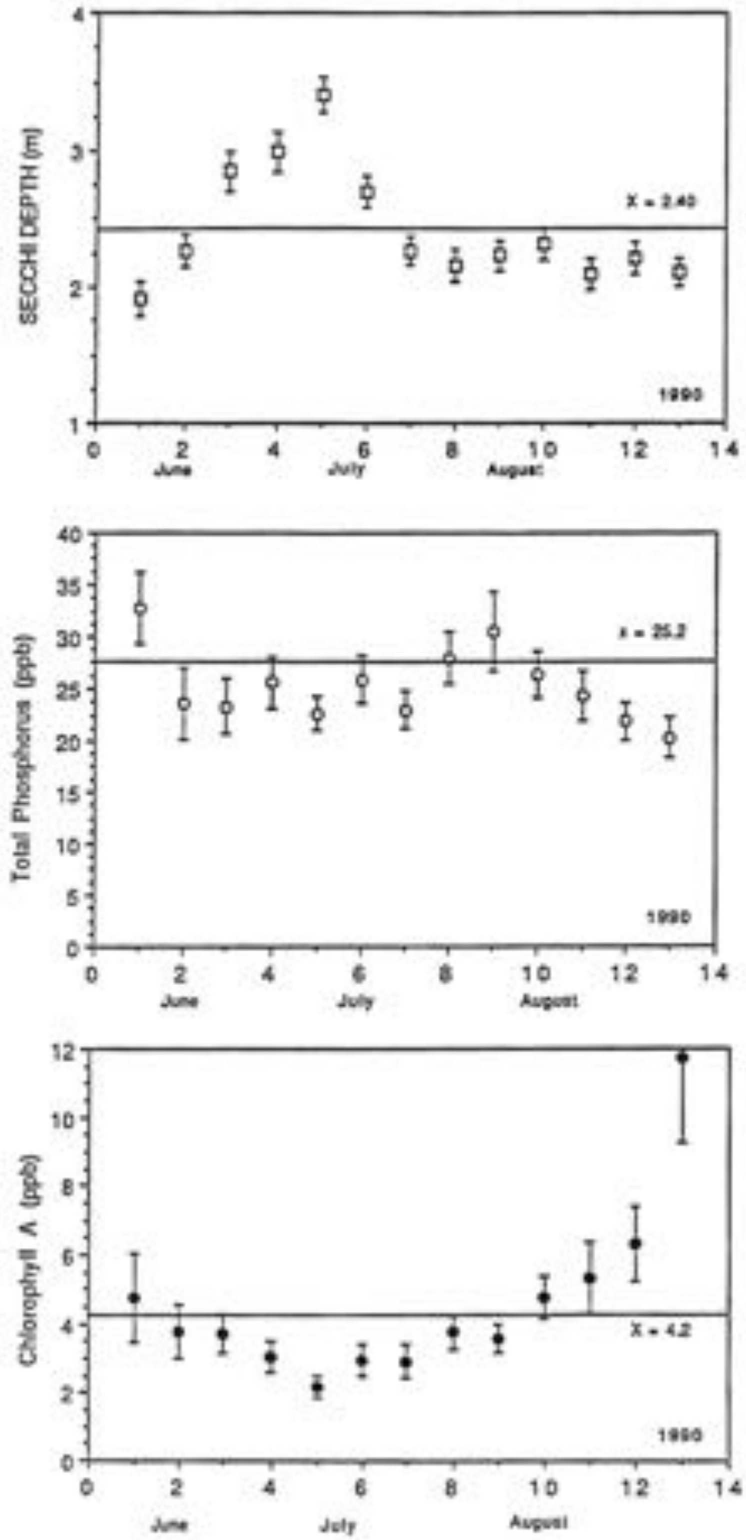

Figure 1. 1990 Smith Mountain Lake data averaged by sampling period.

When these three water quality parameters are evaluated based on the means for each station and correlated with miles to the dam, trends are exhibited which would be considered typical of a reservoir. As can be seen in Figure 2, the upper reaches of the tributaries are more riverine, while the lower reaches (closer to Smith Mountain Lake Dam) exhibit more lacustrine (lake-like) water quality. The Secchi depth increased as miles to the dam decreased, indicating higher water clarity closer to the dam in the larger expanse of water. The lowest water clarity (SD = 1.0 m) was measured at a station approximately 18 miles from the dam, and the highest water clarity (SD = 4.6 m) was measured at a station approximately 5 miles from the dam. The increase in Secchi mean depth was significantly correlated with decreasing miles to the dam. The total phosphorus concentration (TP) decreased closer to Smith Mountain Lake Dam, indicating less nutrient-enrichment in the larger expanse of water. The highest total phosphorus concentrations (TP = 59 ppb and 42 ppb) were measured at stations approximately 17 and 15 miles from the Smith Mountain Lake Dam and the lowest total phosphorus concentrations (TP = 11 ppb) were measured at stations approximately 1 and 2 miles from the dam. The decrease in total phosphorus concentration was significantly correlated with decreasing miles to the dam. The chlorophyll-*a* concentration (CHA) also decreased toward the dam, indicating less algal growth in the larger expanse of water. The highest chlorophyll-*a* concentrations (CHA = 11 ppb) were measured at a station approximately 17 miles from the dam, and the lowest chlorophyll-*a* concentrations (CHA = 0.2 ppb) were measured at stations approximately a mile from the dam. The decrease in the chlorophyll-*a* concentrations was significantly correlated with decreasing miles to the dam.

The average values of the three water quality parameters, when compared to other southern lakes and reservoirs, indicate excellent water quality in Smith Mountain Lake as a whole.

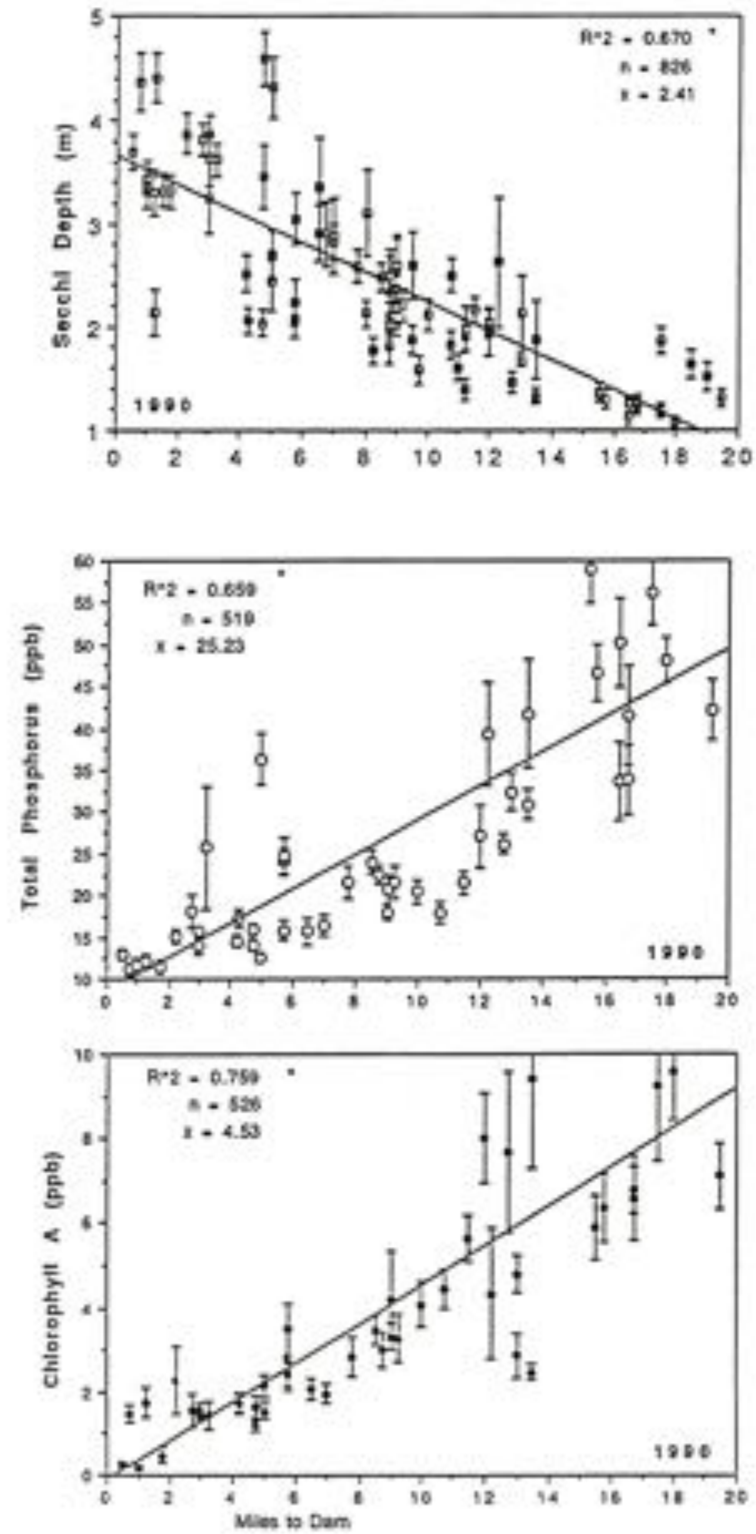

Figure 2. 1990 sample site average versus miles to the SML Dam.

3.2 1991 Results

In 1991, the average seasonal value for each water quality parameter was: (1) Secchi depth = 2.55 m (787 measurements); (2) total phosphorus concentration = 25.9 ppb (485 analyses); and (3) chlorophyll-*a* = 2.97 ppb (480 analyses).

In 1991, the weekly average parameter values are illustrated in Figure 3. The Secchi depth (SD) exhibited the highest (SD = 2.7 m) mean value in Week 3 and the lowest mean value (SD = 2.3 m) during Week 9. The total phosphorus (TP) concentration exhibited the lowest mean value (TP = 21.9 ppb) in Week 10 and the highest mean value (TP = 34.8 ppb) in Week 3. The chlorophyll-*a* (CHA) concentration exhibited the lowest mean value (CHA = 1.9 ppb) during Week 12, and the highest mean value (CHA = 5.1 ppb) during Week 3.

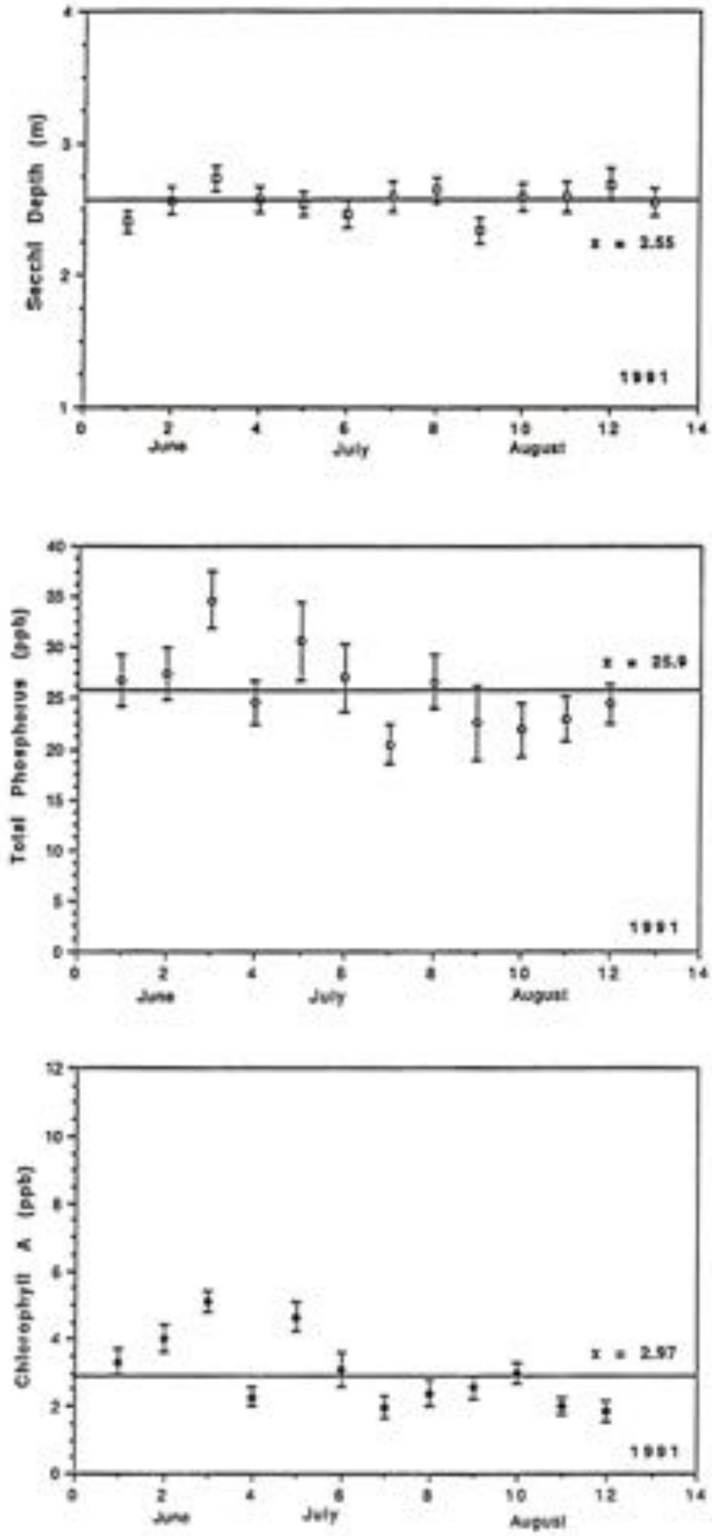

Figure 3. 1991 Smith Mountain Lake data averaged by sampling period.

When these three water quality parameters are evaluated based on the means for each station and correlated with miles to Smith Mountain Lake Dam, the same trends observed in 1990 are exhibited. Water quality improves as measurements are made closer to the dam, as illustrated in Figure 4. The Secchi depth increased as miles to the dam decreased, indicating better water clarity closer to the dam in the larger expanse of water. The lowest water clarity (SD = 1.3 m) was measured at a station approximately 18 miles from the dam, and the highest water clarity (SD = 4.2 m) was measured at a station approximately 3 miles from the dam. The increase in Secchi mean depth was significantly correlated with decreasing miles to the dam. The total phosphorus concentration (TP) decreased closer to Smith Mountain Lake Dam, indicating less nutrient-enriched water. The highest total phosphorus concentrations (TP = 66 ppb) were measured at a station approximately 17 miles from the Smith Mountain Lake Dam, and the lowest total phosphorus concentrations (TP = 12 ppb) were measured at a station approximately 1 mile from the dam. The decrease in total phosphorus concentration was significantly correlated with decreasing miles to the dam. The chlorophyll-*a* concentration (CHA) also decreased toward the dam, indicating less algal growth in the larger expanse of water. The highest chlorophyll-*a* concentrations (CHA = 5 ppb) were measured at stations approximately 13 and 12 miles from the dam, and the lowest chlorophyll-*a* concentrations (CHA = 1 ppb) were measured at a station approximately 2 miles from the dam. The decrease in the chlorophyll-*a* concentrations was significantly correlated with the decreasing miles to the dam.

The grand mean of the three parameters for the entire summer, and for all stations combined are listed in Table 1. The values were very similar to those from 1990, again indicating excellent water quality in Smith Mountain Lake as a whole.

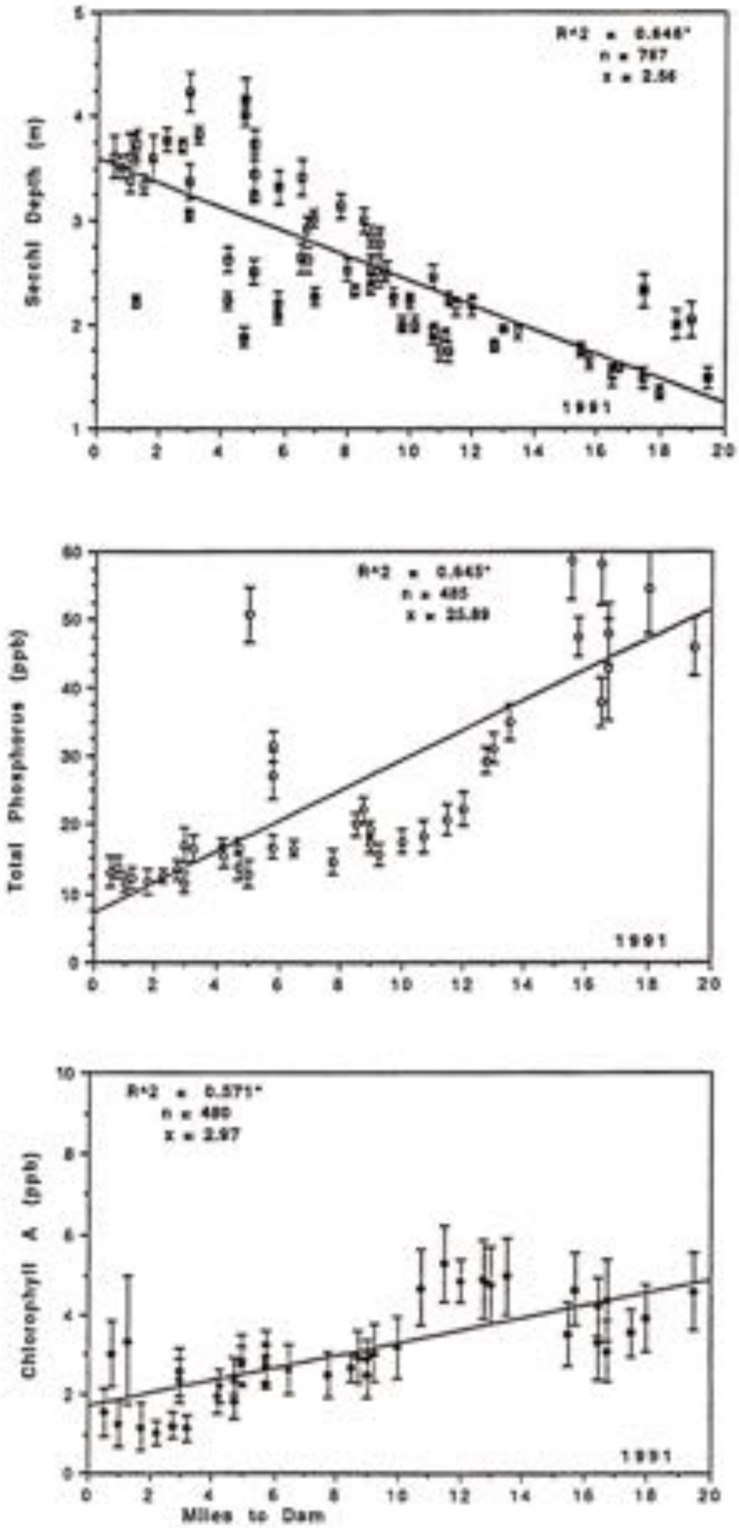

Figure 4. 1991 sample site average versus miles to the SML Dam.

3.3 Yearly Comparison of Parameters

If the entire five years' worth of data for all three water quality parameters is examined, a trend toward decreasing water quality is evident (Figure 5). Fluctuations occur from year to year, but the general trend in the means for Secchi depth is decreasing, indicating less water clarity, and the trends in the means for total phosphorus and chlorophyll are increasing, indicating greater nutrient enrichment and greater algal populations. These trends are expected even in a pristine lake unaffected by human activities, but the rate of change is usually increased by humankind's activities. Five years of data is not sufficient to be confident about the rate of change of these trends on Smith Mountain Lake. As more data is collected in the years to come, assessments will be made with more confidence.

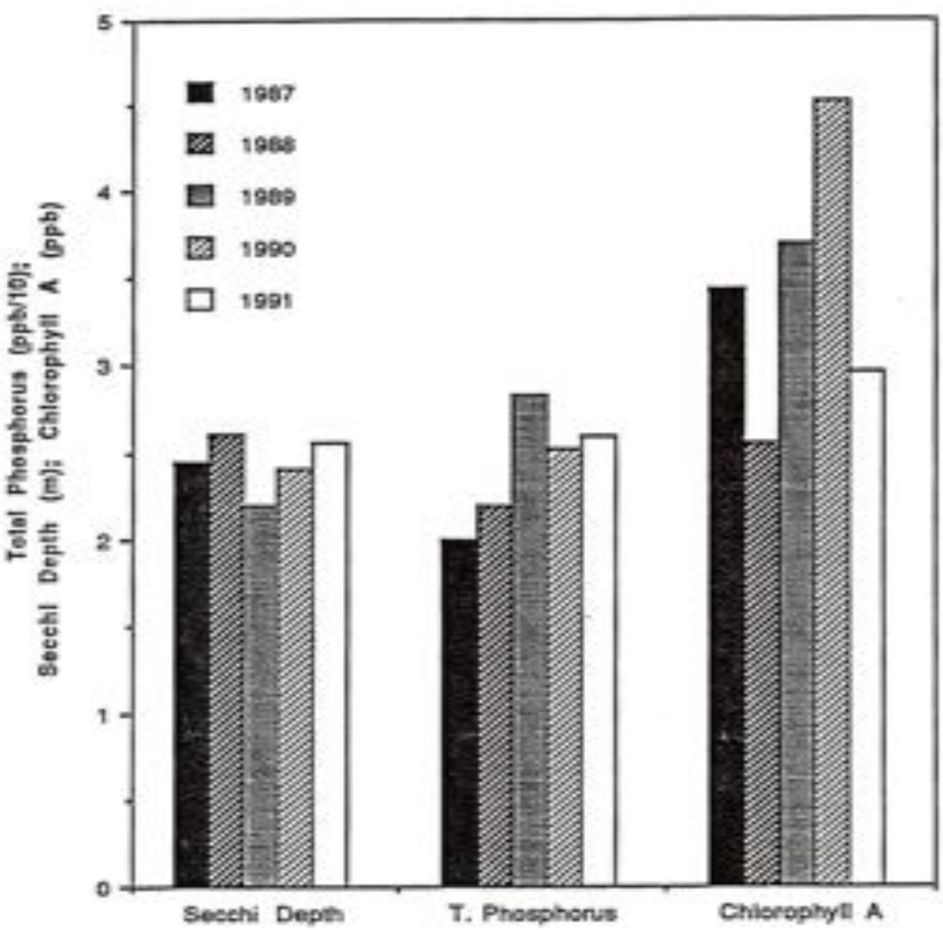

Figure 5. A comparison of annual average values for each water quality parameter.

4. QUALITY ASSURANCE AND CONTROL

The results of the quality assurance program for 1990 and 1991 indicate that the SMLWQVMP continues to produce reliable information on the trophic status of Smith Mountain Lake. The detailed description and results of the full quality assurance program, examining the validity of sample collection, preservation, and analytical techniques, are presented in the 1990 VEE report. It is not necessary to duplicate the entire quality assurance scheme every year, but we continue to examine certain aspects of the program, especially those aspects involving new personnel. In both 1990 and 1991, the quality assurance program included duplicate analyses to check the precision of analytical procedures and the use of field blanks and surrogate samples of known concentration to check the precision and accuracy of the entire (sample collection, preservation, and analysis) analytical scheme for total phosphorus and chlorophyll-*a*. In the past two years we have not included Secchi disk measurement in the QA/QC program because earlier efforts have convinced us that this measurement is reliable (after proper training) because of its simplicity. In short, we need to be concerned that variation in concentrations of phosphorus and chlorophyll-*a* reflect real variation in the lake and are not artifacts of sampling and analytical methods, but are convinced that variation in Secchi depth readings reflect real changes in water clarity.

4.1 QA/QC for Total Phosphorus

The primary test of reliability for total phosphorus data is the use of field blanks and surrogate samples, distributed randomly among volunteer monitors during the summer. The field blanks (distilled water) and surrogate samples (20 ppb standards) are placed in used sample bottles that have been treated in the same manner as all other sample bottles. They are carried into the field by the monitors, handled and stored in the same manner as the other samples, and analyzed along with all the samples collected in a given week. The results are shown in Table 2. The average values are within 2 ppb of target values and precision is generally good. Examination of the individual values indicates that most of the deviation is produced by a relatively few "outliers". This is typical of measurements made at the parts per billion level, even under the most exacting of conditions. Gain or loss of 0.1μg (one tenth of one millionth of a gram) will change the concentration in a 10mL sample by 10ppb.

Table 2. Values for TP field blanks and surrogate samples, 1990-91.

1990-week	Field blanks (ppb)	20ppb Surrogates (ppb)
2	1.4	21.2
		21.7
3	1.8	14.1
	0.6	
	1.8	
4	1.2	22
	0	18.6
	0	21.1
5	0	21.1
	1.2	14.8
6	7.7	20.4
		21.2
7	0.3	19.7
		18.9
8	4.9	27.8
	0.3	19.7
9	1.3	
	1.7	
	1.7	
10	0.3	20
11	5.9	16.5
	2.5	
12	0.3	15.6
	0.3	
13	4.1	25.3
avg	**1.8**	**19.8**
stdev	**2.1**	**3.5**

1991-week	Field blanks(ppb)	20 ppb Surrogates (ppb)
2		23.1
5	0.4	15.6
	1.3	15.6
	1.3	19.1
8	0.0	15.9
	2.9	9.5
		28.3
10	-2.9	21.6
	0.0	22.5
	-2.0	15.3
avg	**0.1**	**18.7**
stdev	**3.8**	**10.3**

Table 3 gives data from instrument calibration for 1991 and indicates the extreme reliability of the analytical procedure itself. Displayed in the last column of the table, R^2 is the correlation coefficient and is a measure of how well the calibration curve fits the absorbance readings of the standards. A correlation coefficient of exactly one is the highest value possible and indicates a perfect fit. The weekly values are all very close to 1.0 and indicate the method works very well. The measured phosphate concentrations reliably reflect what is in the sample container and errors stem primarily from the collection, handling, storage and transfer of the water samples. As a further check on the laboratory procedures, the samples collected during week 2 were analyzed twice. The replicate analysis was performed the day after the original and all steps were repeated, from the pouring out of samples from bottle to test tube and sample digestion to instrument recalibration. The absolute difference in the mean values was less than 1.5 ppb and there was no statistical difference between the values. The complete results of the replication study are included in Table A.5 of the Appendix (see 9102 and 9102r).

Table 3. Slope, intercept, and correlation coefficient (R^2) from 1991 phosphate calibration curves.

Week	Slope	Intercept	R^2
1	0.0166	0.0019	0.992
2	0.0135	0.0021	0.996
2(rep)	0.0180	0.0022	0.997
3	0.0180	0.0016	0.921
4	0.0069	0.0023	0.999
5	0.0050	0.0023	1.000
6	0.0003	0.0023	0.999
7	0.0150	0.0021	0.994
8	0.0066	0.0021	0.994
9	0.0067	0.0021	0.985
10	0.0104	0.0023	0.998
11	0.0124	0.0023	0.999
mean	**0.0108**	**0.0021**	**0.990**
std dev	**0.0057**	**0.0002**	**0.022**

4.2 QA/QC for Chlorophyll-a

Reliability of the chlorophyll-*a* data was tested in two ways. First, a single water sample from Adams Lake, on the Ferrum College Campus, was collected and 20 100 mL portions were passed through 20 filters and analyzed. This gives 20 filters with approximately the same amount of chlorophyll-*a*. Although the water sample was shaken each time before removing a portion to be filtered, the amount of algae on each filter will vary by some unknown amount. This means that the variability among the replicate analyses arises both from real differences and as an artifact of the analytical procedures, and we have no way of knowing their relative contributions. The results, shown in Table 4, indicate a standard deviation of 5 ppb and good reproducibility for the determination of chlorophyll-*a*, an inherently imprecise measurement (the difficulties associated with the determination of chlorophyll are discussed in the 1990 VEE Report). In the second quality control procedure for chlorophyll-*a*, samples were collected from the docks of two volunteer monitors (Pick and Chilton) and five filters were prepared from portions of each sample. Each filter was then cut in two. One half was returned to the field for normal handling and storage while the other half was frozen in a lab at Ferrum College. The results of this procedure are also shown in Table 4 (the first filter of sample 1 was ruined before analysis). Results again indicate reasonable reproducibility and indicate that sample handling and preservation do not significantly alter the sample.

Table 4. Quality control data for 1991 chlorophyll-*a* analysis.

replicate	Chlor-*a* (ppb)	field 1(ppb)	frozen 1 (ppb)	field 2 (ppb)	frozen 2 (ppb)
1	28	no sample	no sample	2	3
2	24	13	13	3	2
3	23	16	11	2	4
4	31	13	14	3	3
5	30	7	12	3	3
6	32				
7	20				
8	24				
9	21				
10	23				
11	17				
12	20				
13	18				
14	21				
15	21				
16	19				
17	25				
18	22				
19	34				
20	29				
mean	**24**	**12**	**13**	**3**	**3**
std dev	**5**	**4**	**1**	**1**	**1**

5. SAMPLING EFFICIENCY

The monitoring program depends on volunteers for sample collection and one measure of success for the program is the consistency with which these volunteers attend to their stations. Table 5 below presents the collection efficiency for 1991.

Table 5. 1991 volunteer sample collection efficiency.

Parameter	number possible	number taken	sampling efficiency (%)
Secchi disk measurements	864	739	86
total phosphorous samples	504	485	96
chlorophyll-*a* samples	504	480	95
overall	1872	1704	91

The figures show that the volunteer monitors are very conscientious about sample collection. That advanced monitors collected over 95% of the samples possible in spite of bad weather, travels away from home, and illness is remarkable. Their sampling efficiency is as good or better than that of professionals in agencies responsible for environmental sampling. This degree of commitment undoubtedly carries over to the care with which samples are collected and is evidence of their dedication.

6. CONCLUSIONS

1990 and 1991 were good years for the SMLWQVMP. The generous financial support of the Virginia Environmental Endowment had come to an end and the future of the program was uncertain. The past two sampling seasons have proven that, after adequate development, a volunteer monitoring program can be continued on a fraction of the original budget and continue to produce high quality data. We quickly point out that this could not have happened without the efforts and dedication of the SMLA and the many volunteer monitors. Citizens who, along with both local and state officials, helped obtain funding from the State of Virginia during the past two years also played a critical role. Although long-term funding has not yet been secured, it appears that we are moving toward a permanent program. The past two seasons have been successful with regard to the following aspects of the program:

- Recruitment and number of volunteer monitors,
- Number of sampling stations and completeness of lake coverage,
- Competence of the student technician and volunteers,
- Quality assurance program for field and laboratory operations,
- Attendance at the training programs and year-end picnics,
- Obtaining state funding, and
- Continued publicity and requests for information.

Tasks and challenges that remain include:

- Extending coverage further up the Roanoke and Blackwater channels and Gills Creek,
- Assuring long term funding,
- Working more closely with other agencies and projects (The Blue Ridge Soil and Water Conservation District, especially the Blackwater Demonstration Project, and the State Water Control Board both generate data that can be useful to supplement and compare to the data produced from the SMLA monitoring project), and
- Data interpretation, trend analysis, and water quality modeling based on data from the monitoring program and supplemented with data from other sources.

APPENDIX

TableA1. SML 1990 Secchi depth data.

ST/WK	9001	9002	9003	9004	9005	9006	9007	9008	9009	9010	9011	9012	9013
ST1	1.75	2.50	3.00		3.50	2.50	2.50	2.00	2.50	2.50	2.50	2.50	2.00
ST2	2.00	2.00	3.50		3.50	3.00	2.00	2.00	2.50	2.50	3.00	2.50	2.50
ST3	2.00	2.00	3.00		3.00	2.50	2.50	1.50	2.00	2.50	2.50	2.50	2.50
ST4	1.50	2.50	2.50	2.50	3.00	2.00	2.00	2.00	1.50	2.00	1.50	1.50	
ST5	2.00	2.50	2.50	3.00	2.50	2.50	2.00	2.00	2.00	2.00	1.50	1.50	
ST6	2.00	2.50	2.50	3.00	4.00	2.50	2.50	2.50	2.50	2.00	2.00	2.00	
ST7	1.50	2.25	3.00	4.25	4.50	2.75		2.25	2.00	2.00	1.50	1.75	1.50
ST8	1.50	2.00	2.75	3.50	2.75	2.50		2.00	2.00	1.50	1.50	1.50	1.50
ST9	1.50	2.00	2.75	3.15	4.00	2.75		2.00	2.00	1.75	1.75	1.75	1.50
ST10A	1.50	2.50	3.00	4.00	3.75	2.50	2.00		2.00				1.75
ST11A	1.75	2.25	2.50	4.00	3.50	2.50	2.25		2.00				1.75
ST12A	2.00	2.00	2.75	3.50	3.00	2.25	2.00		2.00				1.50
ST10		1.75	2.25	2.00	2.50	2.75	2.50	2.00	2.00	1.75	1.50	1.50	1.75
ST11		1.75	2.00	2.00	2.25	2.50	2.25	2.00	2.00	2.25	1.75	1.75	1.75
ST12		1.75	2.25	2.25	2.25	2.50	2.25	2.00	1.75	2.00	1.75	1.50	1.50
ST16	1.50	1.75	2.00	2.00	1.75	1.50	1.75	1.75	1.50	1.50		1.50	1.50
ST17	1.25	1.50	1.25	1.75	1.50	1.50	1.50	1.50	1.25	1.00		1.00	1.00
ST18	1.50	1.75	1.50	2.25	1.50	1.50	1.50	1.50	1.50	1.00		1.00	1.00
ST19		2.25	3.50	4.25	4.00	3.50	4.00	4.00	4.00	4.00	3.25	3.75	3.00
ST20		2.50	3.75	4.50	4.00	4.00	4.50	4.00	4.00	3.50	3.50	4.00	3.50
ST21		2.50	4.00	5.00	4.25	4.50	4.50	3.75	3.75	3.75	3.00	4.00	3.50
ST25	1.75	2.75	4.25	4.25		3.75							
ST26	1.75	2.75	3.50	3.50		3.00							
ST27	1.75	2.50	3.15	4.00		3.00							
ST28		2.75	2.75	4.25	4.50	4.00		3.25	3.00	3.00	2.75	2.75	
ST29		2.75	2.75	4.00	4.50	4.00		3.25	3.00	3.50	3.00	2.75	
ST30		3.00	2.50	4.00	3.75	3.50		3.00	3.50	4.00	3.00	3.00	
ST31	1.50	1.50											
ST32	1.50	1.50											
ST33	1.50	1.50											
ST34		1.50	2.50	2.75	3.50		1.50	1.50	2.00			2.00	2.00
ST35		1.25	2.25	2.50	3.25		1.25	1.25	2.00			2.00	2.00
ST36		1.25	2.00	2.00	3.50		1.50	1.50	1.75			2.00	2.00
ST37		1.75	2.75	3.00	3.50	2.00							
ST38		2.00	2.50	3.50	3.00	2.00							
ST39		1.75	2.75	4.00	4.00	3.00							
ST40	1.50	2.00	2.75	2.50	4.00	2.50	2.00	2.00	2.75	2.50	3.25	2.50	2.50
ST41	1.25	1.75	2.75	2.75	2.00	2.50	1.50	1.50	1.75	2.00	2.25	2.50	2.00
ST42	1.50	1.50	2.50	2.75	2.75	1.75	1.50	1.75	2.00	2.50	2.00	2.00	2.25
ST43					5.00	4.50	3.50	3.50	3.00	3.00		2.50	2.70
ST44					5.25	4.00	3.50	3.00	2.25	3.00		2.50	2.50
ST45					3.50	4.00	2.50	2.50	2.50	2.50		2.00	2.00
ST46	1.75	2.00	2.25	2.00	2.50	2.50	2.00	1.25	1.25	1.25	1.50	1.50	1.25
ST47	1.00	1.50	1.75	1.75	2.50	3.25	2.50	1.00	1.75	1.50	1.50	1.75	1.75
ST48	1.75	1.00	1.25	1.25	2.50	2.50	2.00	1.00	1.25	1.50	1.50	1.50	1.50

Table A.1. SML 1990 Secchi depths (continued).

ST/WK	9001	9002	9003	9004	9005	9006	9007	9008	9009	9010	9011	9012	9013
ST49	1.75	2.00	3.00	3.50	4.00	2.25	2.00	2.00	2.25	2.25	2.50	2.50	2.50
ST50	1.50	2.00	2.50	3.25	3.25	1.75	1.50	1.75	2.25	2.00	2.00	2.50	2.50
ST51	1.50	2.00	2.25	2.50	3.50	1.50	1.50	1.50	2.25	2.00	2.00	2.50	2.50
ST55			1.00	1.50		1.50	1.50	1.25	1.00	1.50	1.25	1.00	1.25
ST56			1.25	1.50		1.50	1.50	1.00	1.00	1.25	1.25	1.00	1.00
ST57			1.00	1.75		1.25	1.50	1.25		1.25	1.25	1.00	1.00
ST64	2.75	3.50	4.50	5.00	5.00	4.00	3.50	3.50	3.00	4.25	3.50	3.75	4.00
ST65	3.00	4.50	6.00	5.50	5.50	4.50	4.00	3.75	4.25	4.00	4.00	4.50	3.75
ST66	3.00	4.50	6.00	6.00	5.75	4.50	3.50	3.75	3.50	4.25	3.50	4.25	4.25
ST67				2.00	3.25								
ST68				1.75	2.50								
ST69				1.50	2.25								
ST70		1.50		1.25			1.25	1.50	1.00	1.25	1.00	1.00	1.00
ST71		1.00		1.50			1.25	1.00	1.00	1.00	1.00	1.00	1.00
ST72		1.50		1.50			1.50	1.00	1.00	1.50	1.50	1.00	1.25
ST73	1.75	2.00	2.00	2.25	1.50	2.50	2.75	2.25	1.00	1.50	1.50	1.75	1.50
ST74	1.50	1.75	2.00	2.00	1.50	2.25	2.50	2.00	1.00	1.00	1.00	1.50	1.25
ST75	1.25	1.25	2.00	2.00	1.50	2.25	2.50	1.50	1.00	1.00	1.00	1.25	1.25
ST79	2.50	3.50	4.50	4.50	4.50	4.00	3.00	3.75	3.00	4.00	3.50	3.75	3.50
ST80	2.50	3.50	3.50	4.50	4.50	3.00	3.00	3.75	2.75	3.50	3.50	3.50	3.25
ST81	2.30	3.00	3.50	4.00	4.50	3.50	2.50	3.00	3.50	3.50	3.00	3.75	3.00
ST82	2.00	2.00	3.00	3.00			2.50	1.25	1.75	2.00	2.00	2.50	2.00
ST83	2.00	3.00	4.75	4.00			3.50	1.75	2.00	3.00	2.50	3.00	2.50
ST84	2.50	3.50	4.25	4.50			3.00	1.75	2.00	3.00	3.00	3.00	3.00
ST85	1.25	1.00	1.25	1.00		1.25	1.50	1.25		2.00	1.25	1.50	1.75
ST86	1.00	1.00	1.00	1.00		1.25	1.50	1.25		2.00	1.25	1.50	1.50
ST87	0.75	1.00	1.00	0.75		1.00	1.50	1.00		1.50	1.00	1.50	1.50
ST88	5.00	5.00	6.00	6.00	4.50	4.00	3.00	4.00	4.00	3.50		3.50	3.25
ST89	5.00	5.50	6.00	6.00	5.00	4.50	3.50	4.00	4.00	3.75		3.75	4.00
ST90	5.00	5.00	5.00	4.00	3.50	3.50	2.50	3.25	3.00	3.00		2.75	3.00
ST91	1.25	2.00	1.75	2.50	3.00	1.50	1.25	1.50	2.00	2.00		2.00	2.25
ST92	1.00	2.00	2.00	2.00	3.00	1.50	1.50	1.50	2.00	2.00		1.75	2.25
ST93	1.50	2.25	2.50	2.50	3.00	2.25	1.75	1.50	2.00	2.00		2.00	2.25
ST94				1.75		1.50	1.50			1.50	1.00	1.50	1.00
ST95				2.25		1.75	1.50			1.75	1.25	1.50	1.25
ST96				2.50		2.00	1.75			2.00	1.50	1.50	1.50
ST97		2.50	3.50		4.00	3.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50

Table A.2. SML 1990 phosphorus data.

ST/WK	9001	9002	9003	9004	9005	9006	9007	9008	9009	9010	9011	9012	9013
ST1	28.1	15.3	17.9		23.7	26.6	25.3	32.9	27.1	29.6	22.0	20.6	18.5
ST2	30.7	11.5	14.9		17.7	19.0	20.2	27.8	20.3	23.7	16.6	19.0	36.7
ST3	26.9	13.6	16.6		16.9	20.3	16.8	17.6	18.2	19.1	18.2	13.9	17.2
ST4	66.9	18.7	25.5	25.8	22.0	22.9	24.4	21.9	31.3	27.3	13.6	23.6	
ST5	31.8	14.9	22.1	21.1	22.0	20.0	20.2	24.8	22.9	26.0	11.9	20.6	
ST6	31.0	14.0	18.7	19.0	17.3	17.4	15.1	19.3	17.0	19.1	11.4	16.4	
ST7	29.4	13.2	47.9	29.6	41.0	53.4		39.2	49.5	27.3	30.0	33.3	42.6
ST8	26.0	10.2	16.2	23.7	38.9	23.3		32.0	20.3	29.6	18.6	21.1	35.9
ST9	26.0	13.6	28.9	23.7	30.4	25.0		28.6	22.9	28.3	15.6	19.8	26.1
ST16	55.6	21.7	30.8	39.3	33.4	27.1	31.6	33.3	28.4	32.9	29.6	31.6	24.0
ST17	43.4	20.4	38.9	38.9	26.2	26.3	29.1	35.8	27.1	34.7	26.6	29.1	24.0
ST18	33.2	22.1	20.3	28.3	31.3	24.6	23.6	29.1	22.9	31.5	24.1	27.0	21.5
ST19		108.9	14.5	16.2	24.9	22.8	16.1	18.9	18.5	19.9	16.8	15.2	16.0
ST20		36.2	10.2	13.7	20.7	21.5	16.6	16.8	14.7	14.8	21.4	15.2	15.6
ST21		19.7	11.5	14.1	17.3	21.1	12.8	13.0	13.4	13.1	19.1	12.7	13.9
ST40	18.0	13.2	12.8	16.0	18.2	12.8	18.5	13.8	10.6	17.7	12.7	13.5	10.9
ST41	20.9	12.8	12.0	15.6	18.2	15.7	20.2	17.2	13.1	19.6	13.1	16.0	12.2
ST42	27.3	19.6	12.4	18.6	20.3	14.9	17.6	21.0	14.4	15.9	13.1	16.0	12.6
ST43					13.9	16.5	12.3	12.3	17.2	11.9		14.3	13.5
ST44					13.9	14.8	15.7	17.2	17.2	16.1		16.5	15.6
ST45					15.2	12.2	11.1	13.4	11.7	9.8		13.5	14.3
ST49	31.0	21.3	22.1	18.2	19.4	17.8	24.9	29.5	23.3	22.3	19.8	23.6	18.9
ST50	31.0	19.6	15.4	16.0	20.3	17.0	41.4	23.6	20.8	20.0	20.3	19.4	16.0
ST51	31.4	19.2	17.9	13.5	22.0	13.6	18.9	22.7	26.7	21.8	20.3	21.1	16.0
ST55			30.5	47.5		72.7	36.5	45.1	49.8	47.1	59.0	26.2	0.2
ST56			32.2	33.6		48.6	32.6	43.4	38.8	44.3	39.7	22.9	0.1
ST57			31.8	30.2		55.4	29.3	36.2	37.1	51.2	41.1	22.4	0.1
ST64	10.2	10.2	7.3	15.2	13.9	14.0	15.1	15.5	14.8	18.6	20.7	15.6	15.5
ST65	7.7	12.8	6.1	14.3	13.5	9.0	12.6	13.0	15.3	12.7	13.5	13.5	15.1
ST66	8.1	12.4	5.2	11.8	12.2	9.0	10.5	12.6	14.4	12.2	11.0	14.3	13.0
ST67					37.2	19.8		62.5	43.2	33.9			
ST68					23.2	18.6		64.2	161.7	46.1			
ST69					26.6	22.0		57.4	47.8	54.6			
ST70		76.8	71.2	53.7		47.5	46.0	69.2	57.6	49.8	60.0	35.1	43.9
ST71		54.8	57.2	57.8		58.0	42.2	52.7	49.5	29.6	34.7	39.4	34.2
ST72		59.9	60.6	28.7		36.5	30.4	60.0	41.9	41.6	33.8	36.8	32.0
ST79	18.8	15.3	13.2	9.3	11.4	11.1	12.6	13.0	11.5	13.6	12.7	12.6	14.3
ST80	18.8	9.0	13.7	9.7	7.2	10.2	11.7	10.4	14.8	11.8	9.7	13.9	11.3
ST81	18.0	6.9	15.8	9.3	10.1	10.2	9.6	11.7	14.0	11.8	9.7	ns	10.5
ST82	34.1	18.3		28.1	20.3	14.8	18.3	19.4	24.0	20.9	16.9	13.1	
ST83	29.4	16.6		10.3	17.3	8.8	15.3	13.9	17.6	17.3	15.6	10.6	
ST84	22.6	10.7		10.7	13.9	16.9	17.4	18.9	19.7	16.3	16.9	10.6	
ST85	81.9	33.9		61.9	56.7	52.1	62.3		59.1	69.8	42.0	75.7	52.8
ST86	67.5	34.8		53.4	40.2	40.7	35.6		65.4	50.8	51.2	36.4	36.7
ST87	77.6	34.4		45.8	40.6	50	34.3		79.8	51.2	73.2	33.4	31.6
ST97		9.4	20.9		17.3	14.3	21	24.4	17.8	16.3	13.1	11	14.7

Table A.3. SML 1990 chlorophyll data.

ST/WK	9001	9002	9003	9004	9005	9006	9007	9008	9009	9010	9011	9012	9013
ST1	4.6	2.1	4.2		2.6	1.9		5.8	3.9	4.2	2.5	3.1	3.3
ST2	2.7	1.8	2.1		2.2	1.5		7.6	2.8	3.3	2.1	2.3	2.5
ST3	4.0	2.8	2.3		2.1	1.6		4.5	4.7	4.5	4.3	2.4	4.6
ST4	3.6		5.3	8.9	5.8	8.1	4.0	7.8	7.7	9.0	18.6	9.3	
ST5	1.9		6.9	5.0	6.0	6.3	3.3	5.3	4.0	6.7	9.2	7.5	
ST6	1.3		4.4	4.5	3.3	4.1	2.5	4.6	4.9	7.6	7.1	4.6	
ST7	2.0	2.1	3.8	2.6	1.1	0.7		1.9	1.9	3.3			4.5
ST8	4.0	1.9	4.2	2.4	1.7	1.3		1.5	2.6	2.4			6.4
ST9	4.0	6.2	3.5	1.8	2.2			1.3	1.9	7.2			6.9
ST16	6.8	4.0	4.7	0.9	4.7	3.9	5.8	6.1	5.7	7.1	4.2	3.7	13.2
ST17	7.8	2.6	7.8	0.8	6.2	9.4	4.2	7.7	8.2	19.9	8.2	30.0	29.7
ST18	5.6	3.4	4.8	1.3	6.0	7.4	4.9	4.3	7.5	11.5	6.5	29.0	34.1
ST19		4.4	0.6	1.7	2.9	0.9	0.5	1.0	0.6	1.0	1.6	0.5	
ST20				1.4	5.3	1.0	0.9	0.7	1.2	0.9	2.2	0.4	
ST21				1.4	2.7	0.9	1.0	0.5	1.0	9.8	2.6	0.6	
ST40	2.7	1.7	1.7	0.7	1.9	0.9	1.5	1.9	1.5	1.9	0.8	3.5	4.1
ST41	3.4	3.0	1.5	0.8	0.7	1.0	1.1	1.9	0.8	2.1	0.7	2.9	4.0
ST42	3.6	2.9	2.3	1.0	1.0	1.2	0.6	1.3	1.2	1.8	0.8	3.0	
ST43					0.5	1.7	0.9	1.6	1.3	1.2		1.3	4.1
ST44					0.7	2.0	1.3	2.0	1.6	2.2		1.1	5.8
ST45					0.9	1.9	1.1	1.2	1.5	2.6		1.6	6.6
ST49	2.6	3.3	2.0		1.7				1.2	5.0		5.3	11.0
ST50	2.0	4.7	2.0		0.6				2.5	3.7		7.4	12.1
ST51	2.7	4.1	2.3		2.2				3.5	6.0		7.8	8.0
ST55			4.7	6.5		5.1	8.3	10.0	4.6	6.9	6.3	8.6	41.4
ST56			5.5	4.1		5.9	5.2	8.6	6.3	4.2	14.7	4.7	23.8
ST57			4.1	10.1		5.9	5.7	8.9	9.0	21.0	22.0	10.3	24.9
ST64	1.1		0.8	0.8	1.4	0.9		2.2		2.2		2.1	5.4
ST65	0.7		1.4	0.3	0.9	0.8		2.5		3.6		3.9	6.2
ST66	1.9		0.9	0.8	0.8	1.0		1.2		2.7		2.5	6.6
ST67						1.7			9.7	1.6			
ST68						1.4			4.5	2.7			
ST69						1.9			3.0	2.5			
ST70		22.9	10.5	3.8		13.1	6.2	5.8	3.9	4.7		12.4	36.3
ST71		10.0	14.3	7.0		6.1	9.6	5.9	6.4	9.3		17.6	29.7
ST72		5.0	8.6	4.9		3.7	6.5		8.5	7.3		12.4	30.8
ST79	0.1	0.1	0.2	0.0	0.0	0.0	0.1		1.0	0.4	0.5	0.4	2.0
ST80	0.2	0.0	0.2	0.1	0.0	0.1	0.1		0.0	0.2	0.5	0.7	0.9
ST81	0.4	0.0	0.2	2.3	0.0	0.1	0.3		0.4	1.3	0.3	0.0	0.4
ST82	3.7	1.4		3.9	1.5	2.1	2.2	2.3	5.1	3.1	4.1	16.6	
ST83	3.7	0.8		2.1	1.4	2.1	1.2	1.4	2.2	2.5	1.7	3.8	
ST84	4.1	1.1		2.3	1.1	1.7	1.0	1.6	2.4	4.2	2.1	5.0	
ST85	10.1	4.4		5.9		3.0				3.0	8.6	6.2	5.6
ST86	12.0	5.2		6.2		3.4				3.6	6.9	7.1	4.0
ST87	39.2	5.5		4.2		6.6				3.7	8.3	9.1	7.3
ST97		1.9	2.0		2.0	0.0	1.7	3.0	2.3	3.1	1.6	2.1	1.2

Table A.4. SML 1991 Secchi depths.

ST/WK	9101	9102	9103	9104	9105	9106	9107	9108	9109	9110	9111	9112	9113
ST 1	3.00	2.50	2.50	3.00	3.00	3.50	3.50	3.50		2.50		3.00	3.00
ST 2	2.50	2.50	3.00	3.00	3.50	3.50	3.50	3.50		3.00		3.50	3.00
ST 3	2.00	2.00	2.50	3.00	3.00	2.50	3.50	3.50		3.00		3.00	2.50
ST 4	1.50	2.00	2.75	2.50	2.50	2.00	2.00	2.50	2.00	2.00	2.00	2.00	2.50
ST 5	1.50	2.00	2.75	2.50	2.50	2.00	2.00	2.50	2.00	2.00	2.50	2.00	2.00
ST.6	1.50	2.50	3.00	2.50	2.50	2.50	2.00	2.50	2.50	2.50	3.00	2.50	2.50
ST.7	2.00	2.00	2.25	2.50	2.50	3.00	2.75	2.00		2.75	3.00	2.75	
ST.8	1.75	2.00	2.00	1.75	2.00	2.25	2.25	1.75		2.25	2.50	2.50	
ST.9	1.50	1.75	2.00	2.00	2.25	2.50	2.50	2.00		2.50	2.75	2.50	
ST.10	2.00	2.00	3.00	2.00	2.00	2.50		2.50	2.50	3.00	2.50	2.50	3.00
ST.11	2.50	2.50	3.00	2.00	2.00	2.00		2.50	2.00	3.00	3.00	3.00	3.00
ST.12	2.00	2.50	2.50	2.50	2.00	2.50		2.00	2.00	3.00	3.00	3.00	3.00
ST.13	1.50		2.25	2.25	2.00	2.00	1.75	1.75	1.75	2.00	2.25	2.00	2.50
ST.14	1.75		2.25	2.00	2.00	2.00	1.50	1.75	1.75	1.75	2.25	2.00	2.25
ST.15	1.50		2.25	2.00	1.75	1.75	1.75	1.75	1.75	2.00	2.00	2.25	2.00
ST.16	2.00	1.75	2.00	2.00	2.00		2.00	2.00	2.00	2.00	1.75	2.00	
ST.17	2.50	2.00	2.00	2.00	2.00		2.00	2.00	1.50	1.75	2.00	1.50	
ST.18	2.00	1.75	2.00	2.00	2.00		1.50	2.00	1.50	1.75	1.50	1.75	
ST.19		3.50		4.00	4.00	4.00	3.75	4.00	3.25	3.75	4.00	4.00	
ST.20		3.50		3.75	3.75	3.75	3.50	3.50	3.50	4.00	4.00	4.00	
ST.21		3.75		4.25	3.75	3.50	4.00	3.50	3.00	4.00	4.00	4.00	
ST 25	1.50	2.50	2.75	2.50	2.25	2.25	2.50	2.50	2.50	2.75	3.25	3.50	3.50
ST 26	2.00	2.00	2.50	2.50	2.00	2.50	3.00	2.50	2.75	2.75	3.25	3.25	3.00
ST 27	1.75	2.00	2.50	2.50	2.00	2.00	2.50	2.00	2.00	2.50	2.50	2.75	2.50
ST 28	3.25	4.00	4.00		3.50	3.00	3.75	4.00		3.25		3.50	4.50
ST 29	3.00	3.25	4.00		4.00	2.75	3.50	3.25		3.25		3.75	3.25
ST 30	3.25	3.25	3.00		3.25	3.00	3.50	3.25		3.25		4.00	3.75
ST 34	2.25	2.00	2.00		2.25	2.00	2.25	2.50		2.25	2.50		
ST 35	2.50	2.25	2.25		2.50	2.00	2.00	2.25		2.00	2.50		
ST 36	2.50	2.25	2.50		2.25	2.00	2.00	2.25		2.25	2.00		
ST 40	2.00		2.50	2.00	2.00		2.50	2.00	2.00	2.25	2.25	2.75	
ST 41	1.75		2.25	1.75	2.25		2.25	1.75	1.50	1.75	2.00	1.50	
ST 42	3.50		2.75	2.50	2.75		2.75	2.25	2.00	2.50	2.75	2.50	
ST 43	2.50	4.00	4.00	4.00	4.25	4.25	4.50	4.00	3.75	5.25	5.00	4.50	
ST 44	2.75	4.25	4.00	4.25	4.25	4.25	5.00	3.50	4.00	5.00	4.75	4.75	
ST 45	2.75	3.50	4.00	3.50	3.50	3.75	3.75	3.25	3.50	4.50	4.25	4.50	
ST 46	2.50	2.25	2.00	2.00	2.25	2.25		2.50	2.50	2.25	2.50	2.50	
ST 47	2.75	2.25	2.00	2.25	2.25	2.50		2.50	2.50	2.25	2.25	2.25	
ST 48	2.50	2.25	1.75	1.75	2.25	1.75		2.25	2.00	2.00	1.75	1.75	

Table A.4. SML 1991 Secchi depths (continued).

ST/WK	9001	9002	9003	9004	9005	9006	9007	9008	9009	9010	9011	9012	9013
ST 49	2.50		2.50	2.50	3.00	3.00	3.00	3.00		3.50	2.50	3.00	
ST 50	2.75		2.00	2.00	2.50	2.50	2.50	2.75		3.00	2.50	2.50	
ST 51	2.75		2.00	2.00	2.00	2.25	2.00	2.25		2.25	2.25	2.50	
ST 55	1.50	1.50		1.75	1.75	1.50	1.50	1.75	1.75	1.50	1.50	1.50	1.50
ST 56	1.50	1.50		1.75	1.70	1.50	1.50	1.50	1.75	1.50	1.50	1.50	1.50
ST 57	1.50	1.25		1.75	1.75	1.25	1.25	1.75	1.75	1.50	1.50	1.50	1.50
ST 58	2.75	2.25	2.25	3.00	3.00	2.75	3.00	3.75	3.25	3.25	3.00	2.75	3.00
ST 59	3.00	2.75	2.75	3.25	3.25	3.25	3.00	3.50	3.00	2.75	3.50	2.75	2.50
ST 60	3.00	2.75	3.00	3.25	3.00	3.50	3.25	3.25	3.50	3.50	3.50	3.25	3.25
ST 64	2.50	3.50	3.50	3.50	3.00	2.50	3.50	3.50		3.50	4.00	4.50	3.00
ST 65	3.00	3.50	3.50	4.00	3.50	3.25	4.50	4.00		4.00	4.00	4.50	3.00
ST 66	3.00	3.50	4.00	3.50	3.50	3.25	3.50	3.50		4.50	3.50	3.00	3.50
ST 70		1.50		1.50	1.50	1.00	1.50	2.00	2.00	1.25	1.50	1.00	1.50
ST 71		1.50		1.50	1.50	1.00	1.50	1.50	1.50	1.25	1.50	1.00	1.00
ST 72		1.50		1.50	2.00	1.50	1.50	2.00	1.50	1.25	1.50	1.00	1.00
ST 73	2.75	2.75		2.75	2.75		2.00	2.00		1.75	1.75	1.75	3.00
ST 74	2.50	2.50		2.50	2.50		1.75	1.75		1.50	1.50	1.50	2.00
ST 75	2.75	2.50		2.50	2.50		1.75	1.50		1.50	1.50	1.50	2.50
ST 79	4.00	4.00	4.00	3.00	3.50			3.50	2.50	3.00	3.75	5.00	3.50
ST 80	3.50	4.00	4.50	4.00	3.00			3.50	2.50	3.50	3.25	5.00	3.00
ST 81	3.50	4.50	4.00	4.00	3.00			3.00	2.00	3.50	4.00	4.50	3.50
ST 82	3.00	2.50	2.50	2.50		2.50	3.00	3.50	3.00	3.00		2.50	2.50
ST 83	3.00	2.50	3.50	3.00		3.50	4.00	4.50	4.00	3.00		3.50	3.00
ST 84	3.00	2.50	3.00	3.50		3.50	4.00	4.50	3.00	3.00		3.50	3.00
ST 85				1.75	1.50	1.50	1.50	1.75	2.00	2.00	1.75	1.75	2.00
ST 86				1.50	1.25	1.25	1.50	2.00	2.00	1.75	1.75	1.50	2.00
ST 87				1.50	1.00	1.00	1.25	2.00	2.00	1.50	1.50	1.50	1.75

Table A.5. SML 1991 phosphorus data.

ST/WK	9101	9102	9102r	9103	9104	9105	9106	9107	9108	9109	9110	9111	9112
ST 1	26.0	28.4	30.1	29.4	18.1	20.0	19.5	13.9	15.0	14.7	17.3	14.5	24.3
ST 2	19.2	20.2	21.0	23.9	16.3	19.1	12.4	17.8	13.0	6.7	10.9	2.3	14.8
ST 3	23.9	17.3	21.9	25.8	19.4	16.4	12.4	13.9	15.0	9.7	13.6	19.5	19.5
ST 4	42.3	21.6	25.5	28.2	16.3	20.4	21.2	16.3	17.8	21.7	13.6	25.5	
ST 5	32.3	21.2	22.8	29.4	14.6	24.4	18.6	13.9	20.7	22.7	8.2	21.4	
ST 6	36.5	19.2	21.9	20.9	16.3	25.3	17.2	7.7	15.9	12.7	11.8	16.8	
ST 7	30.2	39.9	40.6	63.8	65.7	68.0	41.7	38.9	40.7	69.7	50.0	56.4	45.2
ST 8	29.2	20.2	31.0	61.3	23.4	28.0	21.7	31.3	14.0	21.7	30.0	24.5	21.9
ST 9	17.6	28.8	28.3	45.4	36.6	37.8	37.2	28.4	35.9	28.7	30.9	24.1	26.2
ST 16	27.1	35.6	41.0	35.6	42.8	31.6	36.8	28.4	37.8	32.7	17.3	21.8	26.2
ST 17	55.5	36.5	41.0	38.0	28.7	28.0	29.2	29.3	25.4	35.7	30.9	35.5	47.1
ST 18	38.6	39.4	39.2	40.5	29.6	26.2	25.7	19.7	28.3	26.7	21.8	25.5	30.0
ST 19	17.6	22.6	17.3	24.5	16.3	19.6	15.9	10.1	28.3	8.7	12.7	7.3	13.8
ST 20	12.3	17.3	17.3	25.2	12.8	16.4	10.6	12.0	15.9	10.7	11.4	6.4	11.0
ST 21	18.6	12.5	11.9	18.4	12.8	11.1	7.9	13.0	14.0	9.7	7.3	10.0	15.7
ST 40	20.7	15.4	19.2	25.8	15.5	16.4	15.0	17.8	19.2	12.7	9.1	15.5	18.6
ST 41	12.3	26.9	31.0	20.9	18.1	19.1	16.8	13.0	14.0	15.7	12.7	14.5	17.6
ST 42	18.6	15.4	16.4	27.0	13.7	14.7	11.5	8.7	22.6	11.7	12.7	12.7	16.7
ST 43	28.1	19.2	17.3	18.4	15.9	16.4	15.0	5.3	15.0	4.7	7.3	10.5	11.0
ST 44	36.5	19.2	21.0	27.0	19.9	15.6	14.1	7.2	18.8	8.7	12.7	10.9	13.8
ST 45	21.8	15.4	19.2	19.6	19.0	9.3	17.7	8.2	15.9	2.7	3.2	7.3	14.8
ST 49	32.3	32.2	36.5	24.5	26.0	15.6	21.2	13.9	17.8	11.7	25.0	25.5	19.5
ST 50	21.8	17.8	21.0	21.5	15.5	13.3	13.2	10.6	4.5	12.7	20.0	18.2	19.5
ST 51	19.7	22.1	21.0	22.1	27.8	19.1	14.1	11.1	7.3	11.7	18.2	19.5	17.6
ST 55	79.7	39.4	41.6	64.4	25.6	62.7	46.1	48.6	42.1	50.7	34.5	45.5	36.7
ST 56	49.2	28.8	29.2	55.8	30.4	51.1	113.7	32.2	30.2	32.7	28.2	33.6	26.2
ST 57	58.6	27.9	27.4	59.5	26.9	49.3	35.5	35.1	41.6	35.7	29.1	26.4	28.1
ST 64	20.7	12.5	10.9	16.0	14.6	12.0	10.1	7.2		4.7	8.2	10.9	10.0
ST 65	14.9	11.5	14.6	17.8	20.7	14.7	7.9	5.3		7.7	7.3	11.8	14.8
ST 66	20.7	21.2	18.3	16.0	18.1	12.0	8.8	12.5		7.7	7.3	13.6	14.8
ST 70		61.5	64.8	87.7	50.7	114.2	42.6	49.5	43.5	123.7	51.8	52.3	46.2
ST 71		95.7	93.2	64.4	25.2	77.8	47.0	43.3	67.3	38.7	44.5	44.1	51.0
ST 72		53.8	58.4	55.2	50.7	76.4	32.4	33.2	40.7	30.7	37.3	52.7	42.4
ST 79	0.0	18.3	18.3	20.9	15.5	16.4		18.8	17.8	3.7	6.4	11.4	15.7
ST 80	3.8	12.0	14.6	18.4	9.7	13.3		8.7	16.9	5.7	10.0	12.7	15.7
ST 81	15.4	3.8	17.3	23.3	10.2	10.7		15.9	14.0	2.7	6.4	10.9	15.7
ST 82	23.9	23.1	20.5	24.5	16.3	14.7	23.9	16.8		13.7	15.5	20.9	20.5
ST 83	22.3	20.2	18.3	22.1	16.3	14.7	15.9	16.8		9.7	13.2	16.4	13.8
ST 84	17.6	16.3	17.8	23.3	19.9	16.4	17.7	14.9		2.7	15.5	19.1	21.4
ST 85		53.4	51.1	75.5	34.8	38.7	73.7		44.5	86.7	74.5	58.0	48.1
ST 86		40.4	39.2	41.7	42.3	62.7	54.1	43.8	53.0	41.7	62.7	41.8	38.6
ST 87		51.9	48.4	56.4	66.6	99.6	61.2	47.6	76.9	28.7	60.9	39.1	51.0

Table A.6. SML 1991 chlorophyll data.

ST/WK	9101	9102	9103	9104	9105	9106	9107	9108	9109	9110	9111	9112
ST 1	3.7	3.0	4.7	2.5	4.2	2.9	2.9	1.9	2.4	2.0	1.3	0.6
ST 2	2.0	2.5	5.2	2.0	6.7		1.0	1.5	2.4	1.2	2.0	1.0
ST 3	1.3	2.9	6.9	2.1	6.1	1.4	0.9	1.9	2.2	1.5	1.5	1.2
ST 4	7.4	6.3	1.1*	3.6	1.7*	4.6	6.6	3.5	2.1*	4.2	2.5	
ST 5	9.4	1.1	7.5	3.2	1.4*	4.9	9.2	2.0	1.5*	5.5	4.6	
ST 6	5.3	1.2	8.0	4.0	.9*	9.6	2.0	1.8	7.1	6.3	1.5	
ST 7	4.1	3.4	4.3	1.6	6.1	2.0	1.1	1.1	3.5	1.5	1.2	3.0
ST 8	2.8	5.0	2.5	2.3	6.8	3.8	1.0	0.7	2.3	3.1	0.7	1.9
ST 9	5.4	3.8	4.4	0.9	5.6	2.3	0.8	1.0	2.6	1.9	2.6	0.8
ST 16	2.0	8.3	5.5	2.0	11.0	2.3	2.0	2.3	9.1	4.9	3.7	3.8
ST 17	1.2	9.0	8.0	2.5	1.1*	2.8	2.6	1.7	2.8*	8.0	4.9	8.9
ST 18	1.4	9.9	8.5	2.5	10.2	3.1	3.5	0.7	5.4	6.0	4.5	3.0
ST 19	1.2	1.4	4.1	0.3	2.6	0.6	0.1	0.7	0.6	-1.0	0.4	0.7
ST 20	1.3	1.9	3.8	0.5	2.7	0.6	0.2	1.3	0.6	1.0	0.3	0.4
ST 21	1.1	2.4	3.6	0.4	1.8	0.3	0.3	0.8	0.4	0.5	0.3	0.2
ST 40	1.3	2.3	4.8	0.3	3.5	0.8	2.7	0.6	3.1	3.0	0.4	0.5
ST 41	0.5	1.9	3.4	0.4	4.8	1.3	1.5	1.1	4.4	2.4	0.1	0.3
ST 42	2.0	1.4	5.9	0.8	3.7	0.9	2.7	1.1	1.5	2.5	2.2	1.8
ST 43	2.8	4.5	3.8	1.2	5.3		1.3	1.2	1.8	2.1	2.0	0.9
ST 44	3.8	5.2	5.4	1.0	4.8		1.2	0.7	2.5	1.0	2.0	0.6
ST 45	5.0	5.0	7.3	1.5	3.7		1.1	1.4	1.6	0.8	2.4	1.5
ST 49	2.6	5.9	6.0	1.7	7.1	1.3	0.7	1.4	1.1	2.3	3.8	1.4
ST 50	6.1	6.7	6.6	1.7	5.9	1.6	0.4	1.1	1.6	1.9	2.2	0.7
ST 51	4.3	6.2	9.1	3.0	5.6	2.2	1.0	1.0	1.4	1.3	2.1	1.0
ST 55	5.6	1.5*	2.2*	3.1	8.0	2.5	1.0	6.1	1.6	0.9	0.5	1.5
ST 56	8.7	8.8	2.1*	3.0	7.7	1.8	1.2	7.9	1.0	1.4	2.0	7.3/
ST 57	2.5	8.6	2.3*	2.6	9.2	3.7	2.1	1.2*	1.3	1.1	1.6	0.3
ST 64	2.7	5.0	4.3	1.2	2.7	0.4	0.9			0.5	4.1	1.7
ST 65	1.1	2.3	4.1	0.6	0.6	18.0	0.5		0.5	3.5	4.9	0.7
ST 66	1.8	3.6	4.5	2.6	1.1		0.5		1.0	6.5	7.7	0.8
ST 70		4.9	1.5*	7.3	1.7	4.7	1.2	4.4	4.2	2.0	1.7	3.3
ST 71		9.7	4.2*	4.6	3.3	4.6	1.9	6.0	2.9	4.1	0.5	1.5
ST 72		4.5*	3.3*	4.5	0.9	8.0	6.1	5.7	9.8	1.8	1.4	2.9
ST 79		0.4	1.9	0.6	0.7	0.7	0.2	4.6	1.4	5.8	0.5	0.3
ST 80		0.2	0.9	0.5	0.9	1.1	0.1	1.2	1.5	6.5	0.3	0.5
ST 81		0.5	0.5	0.2	1.6	0.8	0.2	1.5	0.3	6.8	0.3	0.2
ST 82	3.4	0.5	5.5	2.6	4.0	1.3	0.9		3.2	4.0	3.7	2.8
ST 83	2.4	6.0	5.7	1.2	4.2	2.2	0.3		0.5	2.1	2.8	1.4
ST 84	2.9	1.7	6.5	1.0	3.9	1.2	0.6		1.6	5.6	2.5	5.0
ST 85		2.2	1.8*	2.6	1.1*	4.9	5.3	9.0	2.3	2.0	0.4	3.0
ST 86		2.2	5.4	8.3	9.2	4.7	6.2	1.1*	1.9	2.7	0.2	5.5
ST 87		3.2	4.5*	6.9	1.3*	4.6	7.2	.9*	4.6	2.0	0.3	4.9