

**Orange Creek Basin
Status and Trends
In Water Quality and Phytoplankton
Through 2003**

By

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EXECUTIVE SUMMARY

The Orange Creek Basin is located in the lower Ocklawaha River basin in Alachua, Marion, and Putnam counties in north-central Florida. This watershed covers 385,090 acres, with 52,277 acres of open water (13.5% of the basin). The water bodies of regional significance in the Orange Creek Basin are Newnans, Lochloosa and Orange lakes, which together make up 75% of the open water.

In 2003 the Orange Creek Basin (OCB) was designated by the Governing Board of the St. Johns River Water Management District (SJRWMD) as a priority basin for protection and/or restoration of surface water bodies under Florida's Surface Water Improvement and Management (SWIM) Act of 1987.

This report presents recent status and period-of-record trends in water quality and phytoplankton communities for Lochloosa, Newnans, and Orange lakes through 2003. It was produced by OCB program staff of the SJRWMD for use by various audiences, from the general public and elected officials to scientists. It uses data collected by SJRWMD and other agencies. Water quality data collection began in 1975 for Lochloosa Lake, 1965 for Newnans Lake, and 1985 for Orange Lake.

The trophic state classification of each lake was defined according to quantitative criteria. Newnans Lake is hypereutrophic according to all criteria. Lochloosa and Orange lakes are hypereutrophic based on total nitrogen, chlorophyll-a, and Secchi depth, but are only eutrophic based on total phosphorus.

Water quality status was assessed for each lake using the Florida Trophic State Index (TSI) for data collected from 1999 through 2003. Water quality status for all three lakes during this period was poor, indicated by TSI greater than 60.

Median total phosphorus was 0.072 mg/l in Lochloosa Lake, 0.244 mg/l in Newnans Lake, and 0.078 mg/l in Orange Lake. Median total nitrogen concentrations were 3.70 mg/l, 5.64 mg/l, and 2.03 mg/l for Lochloosa Lake, Newnans Lake, and Orange Lake respectively. Median chlorophyll-a concentration in Lochloosa Lake (148 ug/l) and Newnans Lake (182 ug/l) were high, while median chlorophyll-a for Orange Lake was much lower than the other two lakes (48 ug/l).

Water quality trends were examined by statistically analyzing changes in the Trophic State Index (TSI) over the period-of-record. Increasing trends in the TSI indicated deteriorating water quality in all three lakes over the period of record.

Water quality trends were also examined by statistically analyzing changes in concentration of eight water-quality constituents over the period-of-record. In all three lakes, most water quality constituents showed significant trends towards degraded water quality, except dissolved oxygen in all three lakes and turbidity in Newnans Lake showed no significant trends over the period-of-record.

Annual rate of change over the period of record was greatest in Newnans Lake for total suspended solids, total nitrogen, total phosphorus, and total organic carbon. Rate of change was greatest in Lochloosa for chlorophyll-a and turbidity. Rate of change in Orange Lake was intermediate between the other two lakes for all constituents.

The dominant phytoplankton division in all three lakes for the phytoplankton period of record was cyanobacteria (blue-green algae). Cyanobacteria comprised about 92% of total phytoplankton biovolume for Newnans and Lochloosa lakes, and 87% in Orange Lake. The three dominant species in each lake were cyanobacteria. *Cylindrospermopsis raciborskii* was the dominant species in all three lakes, with the highest biovolume and percentage in Newnans Lake.

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INTRODUCTION

The Orange Creek Basin is located in the lower Ocklawaha River basin in Alachua, Marion, and Putnam counties in north-central Florida (Figure 1). This watershed covers 385,090 acres, with 52,277 acres of open water (13.5% of the basin). The water bodies of regional significance in the Orange Creek Basin are Newnans Lake (6,669 acres), Orange Lake (13,343 acres), and Lochloosa Lake (8,895 acres), which make up 75% of the open water.

In 2003 the Orange Creek Basin (OCB) was designated by the Governing Board of the St. Johns River Water Management District (SJRWMD) as a priority basin for protection and/or restoration of surface water bodies under Florida's Surface Water Improvement and Management (SWIM) Act of 1987.

PURPOSE

This report presents status and trends in water quality and phytoplankton communities for Newnans, Orange and Lochloosa lakes through 2003. It uses data collected by SJRWMD and other agencies, some starting as early as 1965. It was produced by OCB program staff of the SJRWMD for use by various audiences, from the general public to elected officials and other scientists.

METHODS

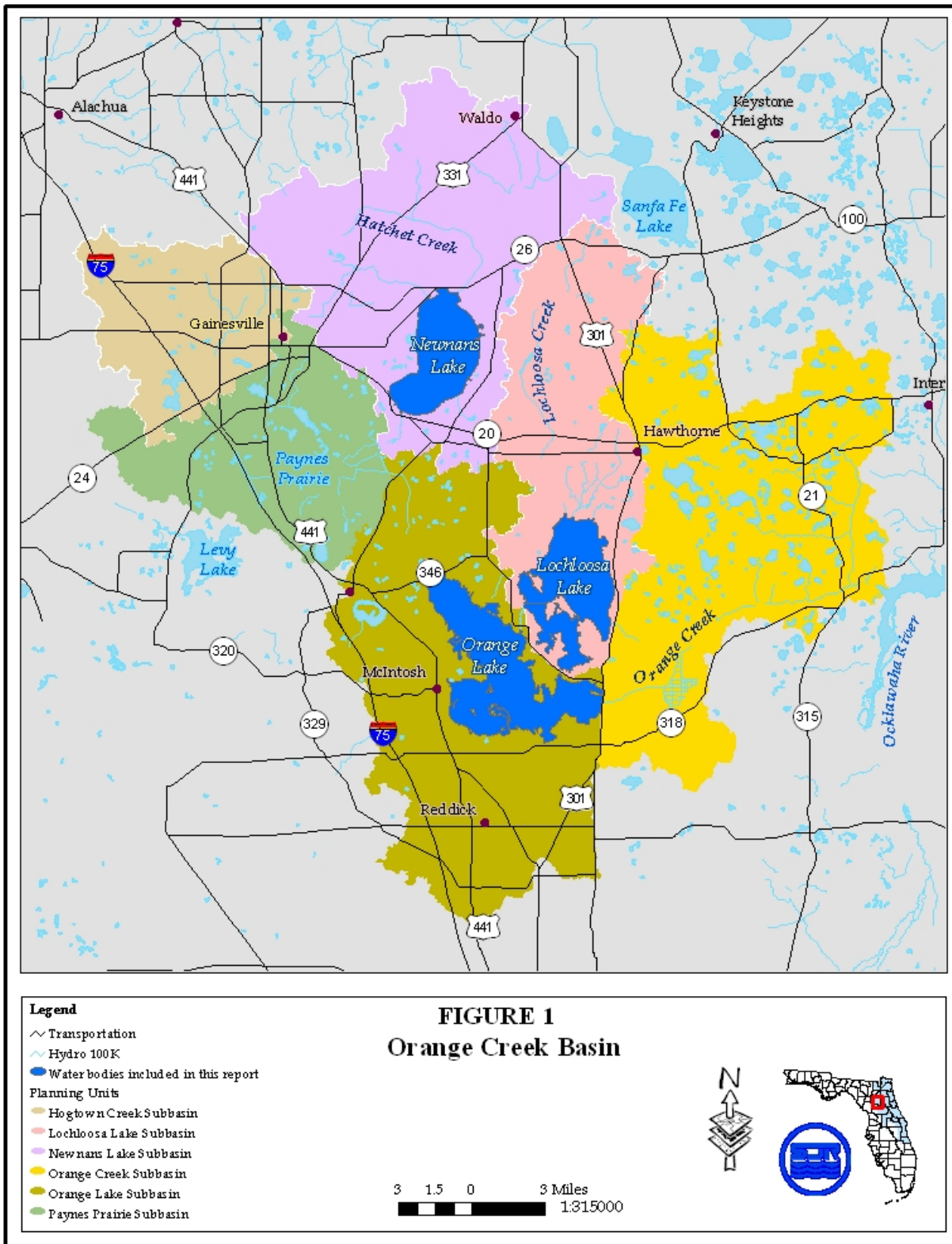
Data Used

Water Quality

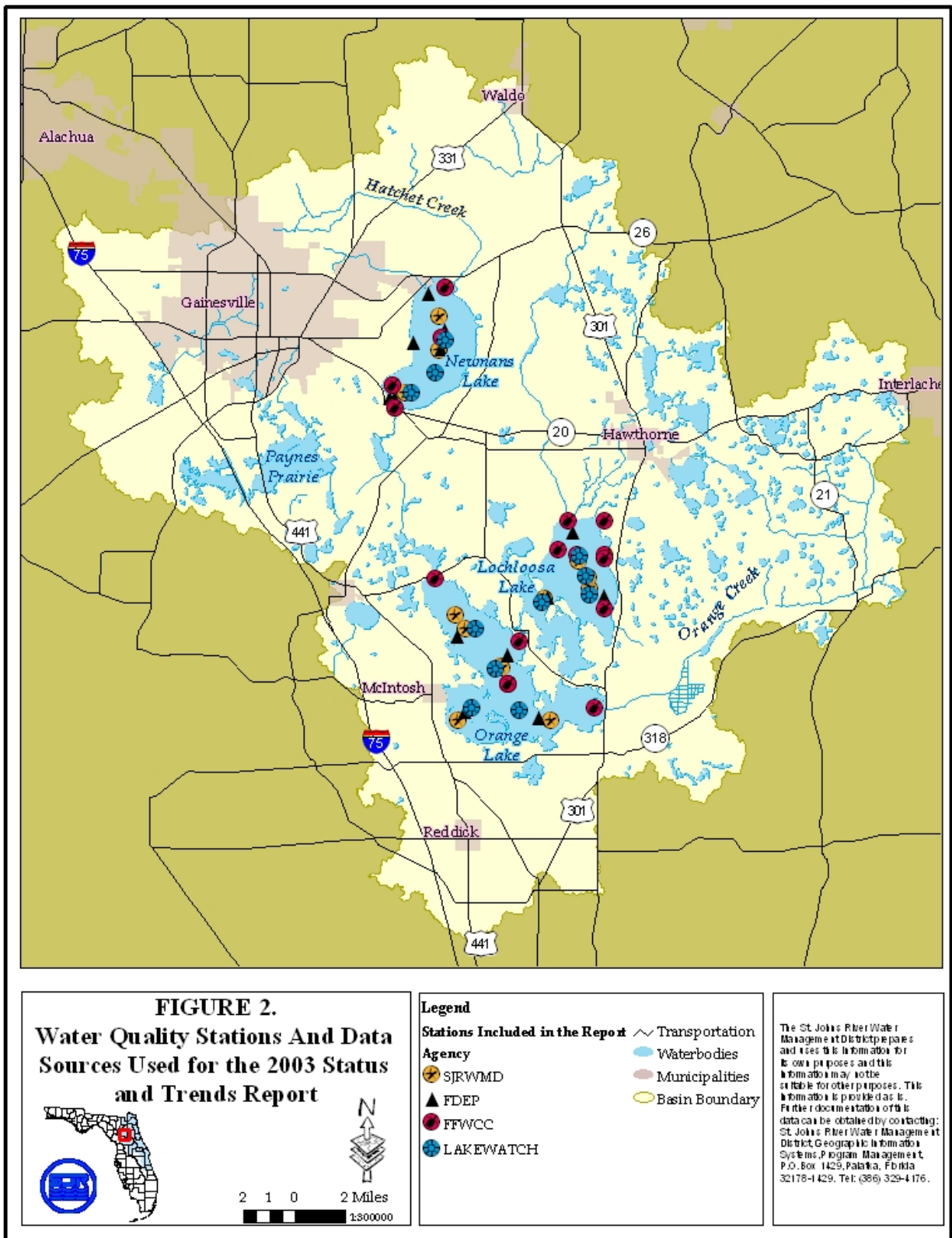
Water quality data used for this report was collected by the St. Johns River Water Management District (SJRWMD), the LakeWatch program of the University of Florida (LW), Florida Department of Environment Protection (FDEP), and Florida Fish and Wildlife Conservation Commission (FFWCC). SJRWMD began monitoring water quality in the OCB in 1994. Data prior to 1994 was collected by the other three agencies. The dates of the earliest water quality data collections are shown in Table 1. Locations of stations sampled by the four agencies are shown in Figure 2.

Table 1. Period of record water quality data available for the OCB lakes.

Lake	Earliest Water Quality Data	Length of period of record through 2003
Newnans	1965	38 years
Lochloosa	1975	28 years
Orange	1985	18 years



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SJRWMD has a quality assurance/quality control protocol to ensure accurate and reproducible water quality data. To assure that the highest quality data were used in this analysis, data coded J, M, O, and Y were eliminated (see Appendix A for code explanations). Data coded “ #, and ^” were also omitted if those data were outside the historic range of values. Values at the detection limit were left unchanged for this analysis.

To obtain a CD of water quality data used for this report, contact Jian Di at jdi@sjrwmd.com or (386) 329-4453.

Phytoplankton

SJRWMD began collecting phytoplankton data in 1992 for Newnans Lake and in 1995 for Orange and Lochloosa lakes. Phytoplankton samples were collected with a Van Dorn sampler from three depths (0.25m, 0.5m, and 1.0 m) and were combined to produce one vertically integrated sample per station. Samples were analyzed by three different laboratories for different periods of time:

Prior to August 2001	PhycoTech Inc.
Aug. 2001 through Sept. 2002	BSA Inc.
Since October, 2002	Dr. Rex Lowe - Bowling Green State University

This report used phytoplankton biovolume data provided by PhycoTech and Bowling Green State University. Total biovolume data provided by BSA for the 14 months from August 2001 through September 2002 differed by a magnitude from the other two labs, and was determined by various means to be unreliable. BSA data was therefore not used in analyses for this report.

To obtain a CD of phytoplankton data used for this report, contact Jian Di at jdi@sjrwmd.com or (386) 329-4453.

Statistical Analysis

Water Quality

Statistical Analysis System (SAS) version 8 (SAS 1999) was used for analyzing and summarizing water quality data. All samples collected (including duplicate measurements) at all stations in a lake during a given month were averaged to generate a single monthly value used in statistical analyses.

Water Quality Status

Trophic State Classification

Lake trophic state was determined for each lake by comparison of median values of total phosphorus, total nitrogen, chlorophyll-a, and/or Secchi depth from 1999 – 2003 to criteria developed by Forsberg and Ryding in 1980 (Table 2).

Table 2. Criteria to define lake trophic state.

	Total Phosphorus (mg/l)	Total Nitrogen (mg/l)	Chlorophyll-a (ug/l)	Secchi Depth (m)
Oligotrophic	<0.015	<0.4	<3	>3.96
Mesotrophic	0.015-0.025	0.4-0.6	3-7	2.44-3.96
Eutrophic	0.025-0.1	0.6-1.5	7-40	0.91-2.44
Hypereutrophic	>0.1	>1.5	>40	<0.91

Trophic State Index Status

Water quality status was assessed for each lake using the median annual averages of Florida Trophic State Index (TSI) (Huber et al. 1982) minus Secchi depth (Hand et al. 1988) for the five-year period from 1999-2003. Smith (1982) proposed that lakes with a TN/TP ratio of less than 10 be considered nitrogen-limited, lakes with a ratio greater than 30 be considered phosphorus-limited, and lakes with intermediate TN/TP ratios ($10 \leq \text{TN/TP} \leq 30$) be considered to have a balanced nutrient status.

The lake's TN/TP ratio in a given year determined which TSI equation was used. When the annual TN/TP ratio was less than 10, the overall annual TSI was based on the average of Chlorophyll-a trophic state index (TSI_chl) and Total Nitrogen trophic state index (TSI_tn). The equations are:

$$\begin{aligned} \text{TSI_chl} &= 16.8 + 14.4 * \ln(\text{Chlor-a}) \text{ (uncorrected chlorophyll-a, in mg/l), and} \\ \text{TSI_tn} &= 10 * (5.96 + 2.15 * \ln * (\text{TN})) \text{ (TN as mg/l N).} \end{aligned}$$

When the annual TN/TP ratio was greater than 30, the overall annual TSI was based on the average of TSI_chl and Total Phosphorus trophic state index (TSI_tp). The equation is:

$$\text{TSI_tp} = 10 * (2.36 * \ln * (\text{TP} * 1000) - 2.38) \text{ (TP as ug/l P).}$$

When the annual TN/TP ratio was between 10 and 30, the average of TSI_tn and TSI_tp was calculated first, and the overall annual TSI was the average of that result and TSI_chl. The equations are:

$$\begin{aligned} \text{TSI_tp} &= 10 * (1.86 * \ln * (\text{TP} * 1000) - 1.84) \text{ (TP as ug/l P).} \\ \text{TSI_tn} &= 10 * (5.6 + 1.98 * \ln * (\text{TN})) \text{ (TN as mg/l N).} \end{aligned}$$

Water quality status in each lake was classified as good, fair, or poor using the following TSI threshold criteria developed for lakes by FDEP (Friedemann and Hand 1989):

Good	Fair	Poor
< 60	60 to 70	> 70

Water Quality Constituent Status

Water quality status was also examined by comparing median concentration of total phosphorus, total nitrogen, and chlorophyll-a in each lake from 1999-2003 to medians for other lakes in the Central Valley region as reported by Griffith et al. (1997).

Water Quality Trends

Normality test was conducted for each constituent in each lake to determine when to use parametric vs. non-parametric statistical tests. The PROC UNIVARIATE procedure in SAS automatically reports results from four normality tests: Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling. In most cases the four tests give the same conclusion about data normality. the Shapiro-Wilk normality test was used in this report because it is very powerful in detecting small departures from normality (SAS 1999). Unlike some other normality tests, the Shapiro-Wilk test does not require specifying the mean and variance.

Water quality trends were examined by analyzing period of record changes in Trophic State Index (TSI). TSI was calculated as described above for analysis of water quality status. TSI trends were analyzed using PROC REG procedure in SAS to perform simple linear regression analysis between year and annual TSI value. A trend was detected when the slope of this regression was statistically significant at $P < 0.05$. This linear regression approach is chosen over the non-parametric ranking regression analysis is because of the TSI data sets for all three lakes are normally distributed and parametric regression analysis can provide prediction model that can be easily used and interpreted.

Water quality trends were also examined by analyzing changes in concentration of eight key water-quality constituents: total phosphorus, total nitrogen, total organic carbon, chlorophyll-a, total suspended solids, Secchi depth, dissolved oxygen, and turbidity.

The water quality data for these constituents are not normally distributed, exception for DO in all three lakes and turbidity in Newnans Lake. Non-parametric methods were applied to all constituents. The Mann-Kendall test was used to detect significant temporal trends for a given constituent. The Sen's Slope tests was used to determine annual rate of change.

Because seasonal changes in water quality constituents can obscure long-term trends, seasonality was evaluated by comparing the average values for wet months (June through September) and dry months (October through May). Seasonal averages were compared statistically using a Wilcoxon signed rank test. Where there was statistical evidence of seasonal differences for a constituent, the Seasonal Mann-Kendall Test, which removes seasonal cycles, was used to determine if the long-term trend was significant despite seasonal differences.

Phytoplankton

Dominant divisions were determined for each lake for the period of record for each lake minus the 14 months from August 2001 through September 2002 when the data was not reliable. Annual average biovolume by division was charted for each lake. Since the total biovolume is a volumetric concentration unit ($\mu\text{m}^3/\text{ml}$) and the data is reported in biovolume by species, the concentration at division level was calculated by adding all of the biovolume values for each species within each division.

The three dominant species in each lake were identified for the period of record as described above. The dominant species were determined based on their average biovolume and from all the samples collected during the period of record. The species with the highest average biovolume was defined as the dominant species.

RESULTS

Water Quality Status and Trend

Appendix B contains detailed data for eight water quality constituents in each lake. This includes period of record, descriptive and summary statistics, results of test for normality, and charts illustrating monthly concentration and frequency distribution for the period of record.

Status

Trophic State Classification

Median values for total phosphorus, total nitrogen, chlorophyll-a, and Secchi depth from 1999 – 2003 are shown in Table 3. These indicate that Newnans Lake is hypereutrophic. Lochloosa and Orange lakes are hypereutrophic based on total nitrogen, chlorophyll-a, and Secchi depth, but are only eutrophic based on total phosphorus.

Trophic State Index Status

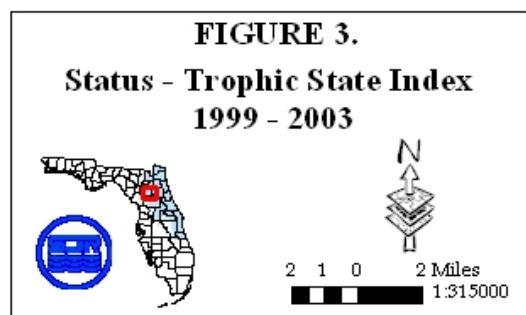
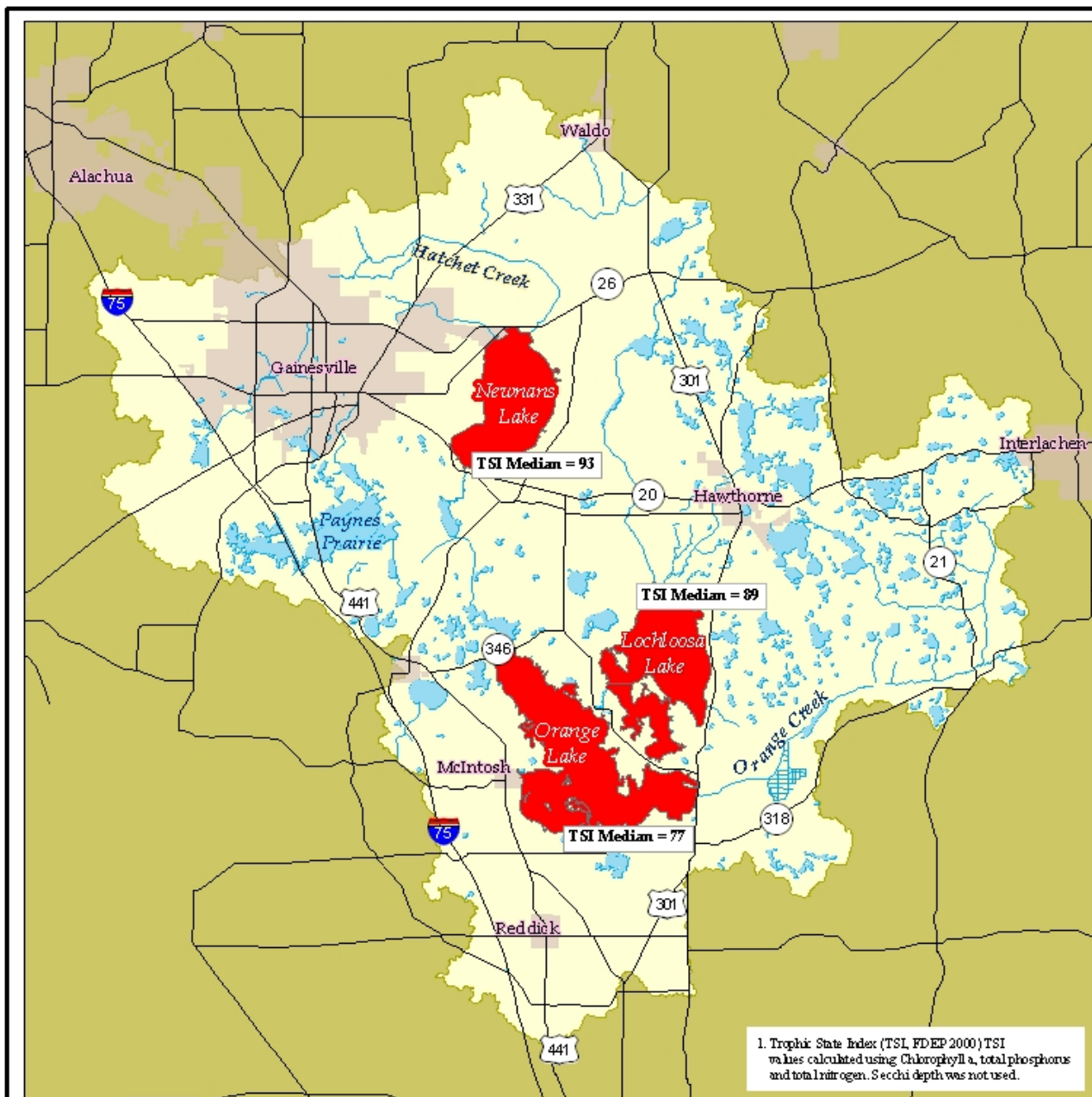
Median annual Florida Trophic State Index (TSI) from 1999 through 2003 was 85, 93, and 77 for Lochloosa, Newnans, and Orange lakes respectively. Water quality status for all three lakes during this period was poor, indicated by TSI greater than 60 (Figure 3).

Water Quality Constituent Status

Table 3 provides statistics describing the status of eight key water quality constituents in each lake from 1999-2003. Table 4 compares medians of total phosphorus, total nitrogen, and chlorophyll-a for the three lakes with medians for other lakes in the Central Valleys region (Griffith 1997). Newnans and Orange lakes had higher TP and chlorophyll-a concentration than 75% of the Central Valley region lakes. Newnans and Lochloosa lakes had higher TN concentration than 75% of the Central Valley region lakes.

Table 3. Status of key water quality constituents (1999 - 2003)

Name	Unit	Median	Minimum	Maximum	Lower 95% C.I.	Upper 95% C.I.	Frequency	Beginning Date	Ending Date
Lochloosa Lake									
Secchi Depth	meter	0.30	0.16	1.11	0.32	0.46	44	1/25/1999	12/11/2003
Dissolved Oxygen	mg/l	8.0	5.2	13.4	7.6	8.8	32	1/19/1999	12/11/2003
Total Suspended Solids	mg/l	20	5	130	17	34	32	1/19/1999	12/11/2003
Total Phosphorus	mg/l	0.072	0.029	0.141	0.064	0.082	43	1/25/1999	12/11/2003
Total Organic Carbon	mg/l	32	14	57	30	37	32	1/19/1999	12/11/2003
Total Nitrogen	mg/l	3.70	1.24	6.46	2.96	3.95	44	1/19/1999	12/3/2003
Chlorophyll-a	ug/l	148	1	317	109	166	43	1/25/1999	12/11/2003
Turbidity	NTU	18	2	50	16	24	36	1/19/1999	12/11/2003
Newnans Lake									
Secchi Depth	meter	0.21	0.07	0.50	0.21	0.26	57	1/25/1999	12/3/2003
Dissolved Oxygen	mg/l	9.9	4.1	13.9	8.8	10.1	54	1/12/1999	11/5/2003
Total Suspended Solids	mg/l	43	5	147	38	52	55	1/12/1999	12/3/2003
Total Phosphorus	mg/l	0.244	0.097	0.899	0.242	0.332	57	1/25/1999	12/3/2003
Total Organic Carbon	mg/l	44	28	113	42	50	58	1/12/1999	12/3/2003
Total Nitrogen	mg/l	5.64	2.28	12.74	4.99	6.45	57	1/12/1999	12/3/2003
Chlorophyll-a	ug/l	182	36	862	185	268	57	1/25/1999	12/3/2003
Turbidity	NTU	27	4	156	28	42	58	1/12/1999	12/3/2003
Orange Lake									
Secchi Depth	meter	0.52	0.14	1.00	0.44	0.58	33	1/25/1999	12/3/2003
Dissolved Oxygen	mg/l	8.8	0.2	13.1	6.2	9.8	16	1/19/1999	11/5/2003
Total Suspended Solids	mg/l	19	5	111	16	46	18	1/19/1999	12/3/2003
Total Phosphorus	mg/l	0.078	0.039	0.467	0.069	0.127	33	1/25/1999	12/3/2003
Total Organic Carbon	mg/l	27	13	48	22	31	17	1/19/1999	12/3/2003
Total Nitrogen	mg/l	2.03	1.22	6.24	2.13	3.15	33	1/19/1999	12/3/2003
Chlorophyll-a	ug/l	48	22	292	57	115	32	1/25/1999	12/3/2003
Turbidity	NTU	9	3	61	8	22	21	1/19/1999	12/3/2003



Legend

- Transportation
 - Waterbodies
 - Municipalities
 - Basin Boundary
- Trophic State Index**
- Poor: TSI > 70
 - Fair: 60 < TSI < 70
 - Good: TSI < 60

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Table 4. Comparison of three water quality constituent medians in the three OCB lakes compared to other Central Valley region lakes.

Water Quality Constituent	Unit	Median			
		Central Valley Region Lakes*	Newnans Lake	Lochloosa Lake	Orange Lake
TN	mg/l	1.40	5.64	3.70	2.03
TP	mg/l	0.04	0.24	0.07	0.07
Chlorophyll-a	ug/l	22	182	148	48

Trends

Trophic State Index (TSI) Trends

TSI could not be calculated prior to 1969 for Newnans Lake and prior to 1986 for Lochloosa Lake due to lack of either chlorophyll-a or nutrient data. Water quality in all three lakes degraded over the period of record (Figure 4), evidenced by statistically significant increasing trends in annual median TSI (Figures 5, 6, 7).

Water Quality Constituent Trends

Table 5 provides statistics describing trends, seasonality, and rate of change (Sen Slope) in eight water quality constituents in each lake for the period of record through 2003. In all three lakes, most water quality constituents showed significant trends towards degraded water quality (probability greater than 0.05) over the period of record through 2003.

Dissolved oxygen (DO) did not show a degrading trend in any lake, likely because DO concentration in the water column is a function of water temperature. The solubility of oxygen in pure water at equilibrium with air at standard pressure saturated with water vapor is 8.9 mg/l at temperature of 21 °C and it is 7.7 mg/l at temperature of 30 °C (Wetzel 2001). The average water temperature of the three lakes was 20 °C and 29 °C for the dry/cool season and wet/hot season respectively. Average DO concentration for the three lakes was significantly higher in the dry/cool season (average 9.00 mg/l) than that was in the wet/hot season (average 7.45 mg/l).

Turbidity in Newnans Lake also did not show a degrading trend, and was much higher in Newnans than in Orange or Lochloosa. Long-term average turbidity in Newnans Lake was 30 NTU, while in Lochloosa and Orange lakes it was 13 NUT and 7 NTU respectively (Appendix B).

Rate of Change of Water Quality Constituents

Annual rate of change over the period of record (Table 5, Sen Slope) was greatest in Newnans Lake for total suspended solids, total nitrogen, total phosphorus, and total organic carbon. Rate of change was greatest in Lochloosa for chlorophyll-a and turbidity.

Rate of change was greatest in Orange for Secchi depth (decreasing water clarity) and was intermediate between the other two lakes for all constituents.

Table 5. Trends in eight water quality constituents for the period of record through 2003.

Name	Period of Record	Trend	Seasonality	Z Score	Probability	Sen Slope (unit/year)	Unit
Lochloosa Lake							
Dissolved Oxygen	1986 - 2003	insignificant	Yes	-0.58	0.5645	-0.016	mg/l
Chlorophyll-a	1986 - 2003	increasing	No	6.33	0.0000	7.707	ug/l
Total Suspended Solids	1978 - 2003	increasing	No	5.14	0.0000	0.852	mg/l
Total Nitrogen	1978 - 2003	increasing	No	6.37	0.0000	0.106	mg/l
Total Phosphorus	1977 - 2003	increasing	No	1.81	0.0700	0.001	mg/l
Total Organic Carbon	1977 - 2003	increasing	No	5.66	0.0000	1.036	mg/l
Secchi Depth	1975 - 2003	decreasing	No	-7.11	0.0000	-0.031	meter
Turbidity	1986 - 2003	increasing	No	2.82	0.0048	0.419	NTU
Newnans Lake							
Dissolved Oxygen	1988 - 2003	insignificant	Yes	-0.12	0.9067	-0.008	mg/l
Chlorophyll-a	1965 - 2003	increasing	Yes	8.64	0.0000	4.865	ug/l
Total Suspended Solids	1978 - 2003	increasing	No	3.18	0.0015	1.336	mg/l
Total Nitrogen	1967 - 2003	increasing	Yes	8.55	0.0000	0.201	mg/l
Total Phosphorus	1967 - 2003	increasing	No	9.10	0.0000	0.008	mg/l
Total Organic Carbon	1977 - 2003	increasing	No	5.60	0.0000	1.403	mg/l
Secchi Depth	1967 - 2003	decreasing	Yes	-7.21	0.0000	-0.012	meter
Turbidity	1988 - 2003	insignificant	Yes	-0.40	0.6874	-0.142	NTU
Orange Lake							
Dissolved Oxygen	1985 - 2003	insignificant	Yes	-1.51	0.1318	-0.044	mg/l
Chlorophyll-a	1985 - 2003	increasing	Yes	6.77	0.0000	2.595	ug/l
Total Suspended Solids	1985 - 2003	increasing	No	3.90	0.0001	0.422	mg/l
Total Nitrogen	1985 - 2003	increasing	Yes	6.92	0.0000	0.057	mg/l
Total Phosphorus	1985 - 2003	increasing	No	4.51	0.0000	0.002	mg/l
Total Organic Carbon	1988 - 2003	increasing	No	4.89	0.0000	0.516	mg/l
Secchi Depth	1988 - 2003	decreasing	No	-8.55	0.0000	-0.109	meter
Turbidity	1985 - 2003	increasing	No	2.97	0.0030	0.192	NTU

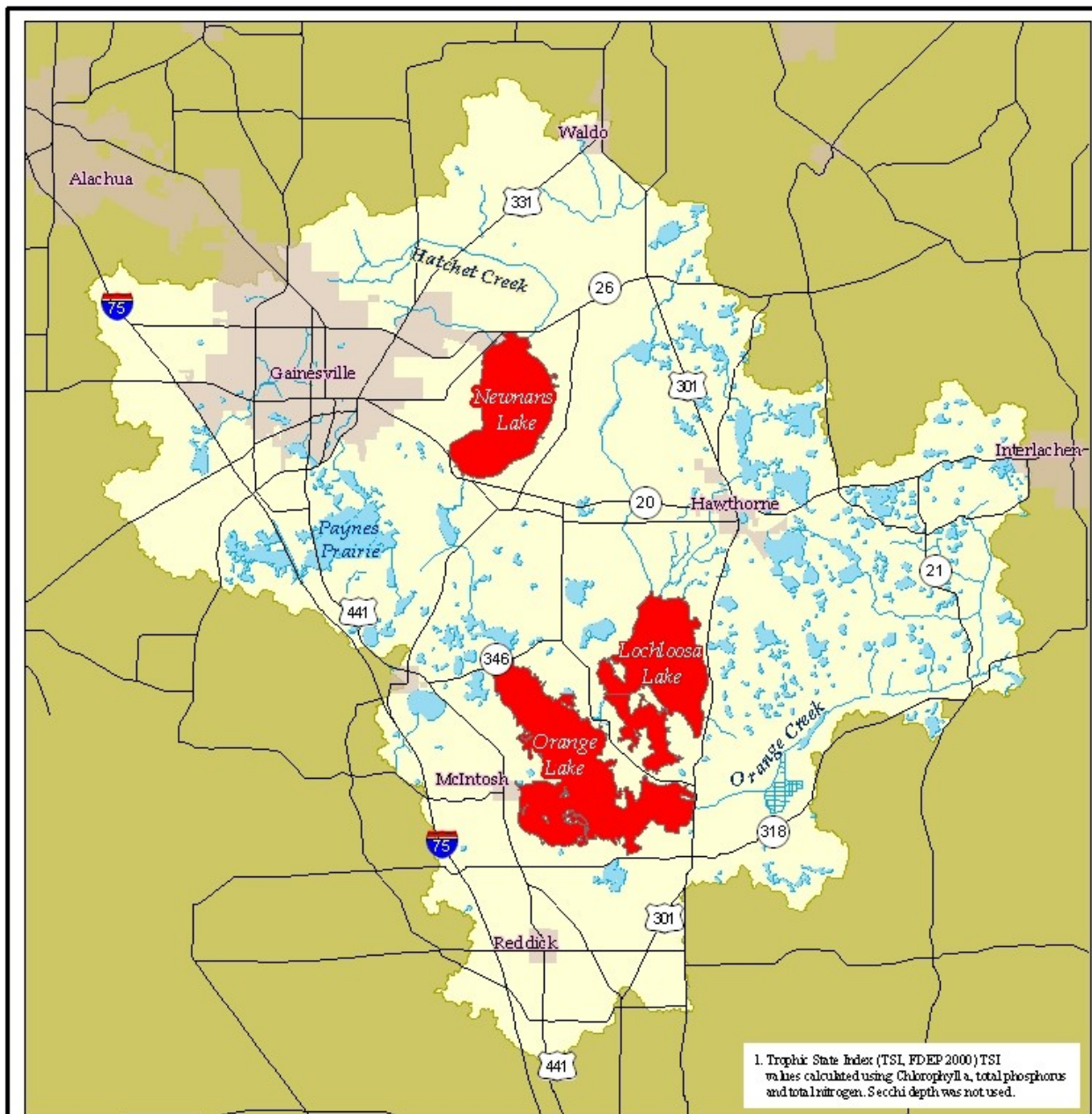


FIGURE 4.
Status - Trophic State Index
Through 2003

Legend

- Transportation
 - Waterbodies
 - Municipalities
 - Basin Boundary
- Trophic State Index**
- Poor: TSI > 70
 - Fair: 60 < TSI < 70
 - Good: TSI < 60

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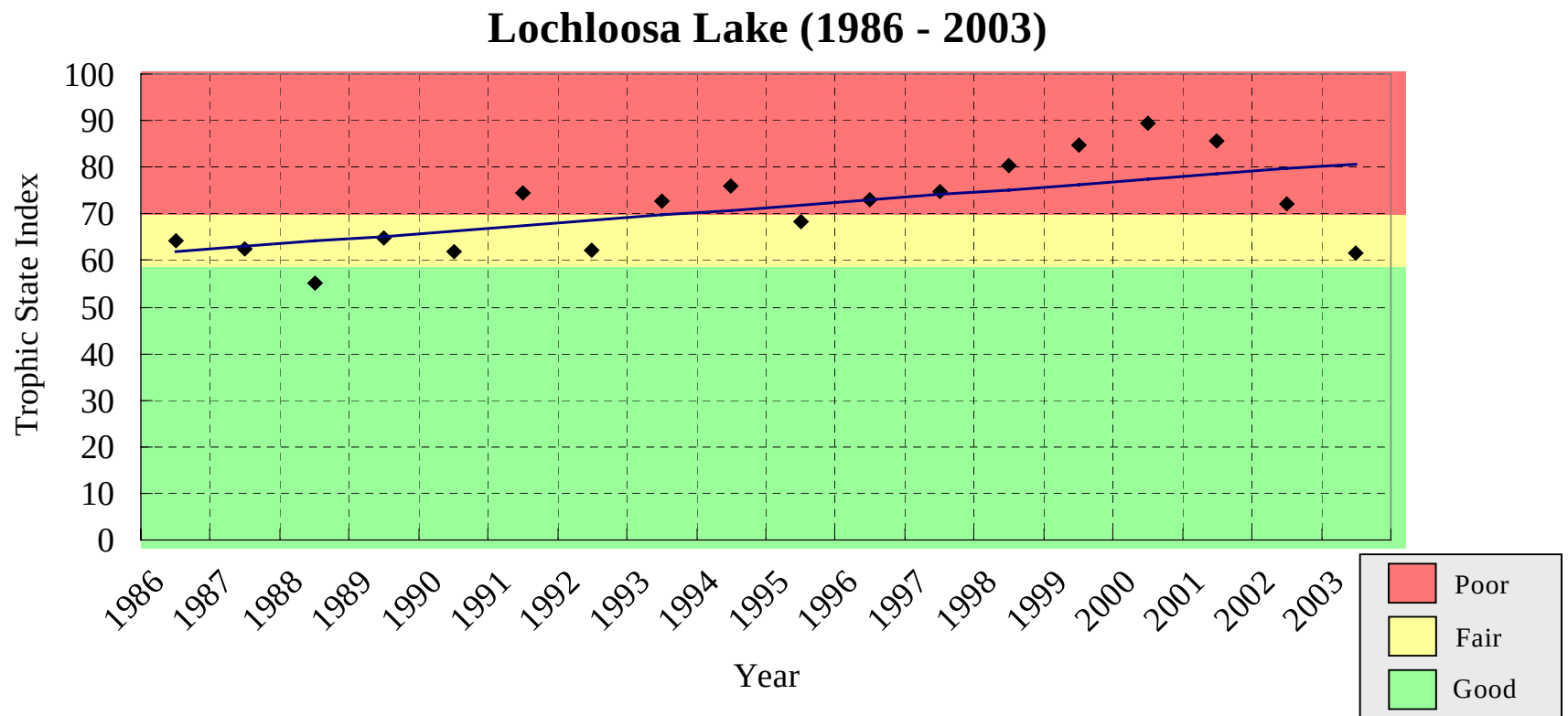


Figure 5. Annual average trophic state index for Lochloosa Lake from 1986-2003.

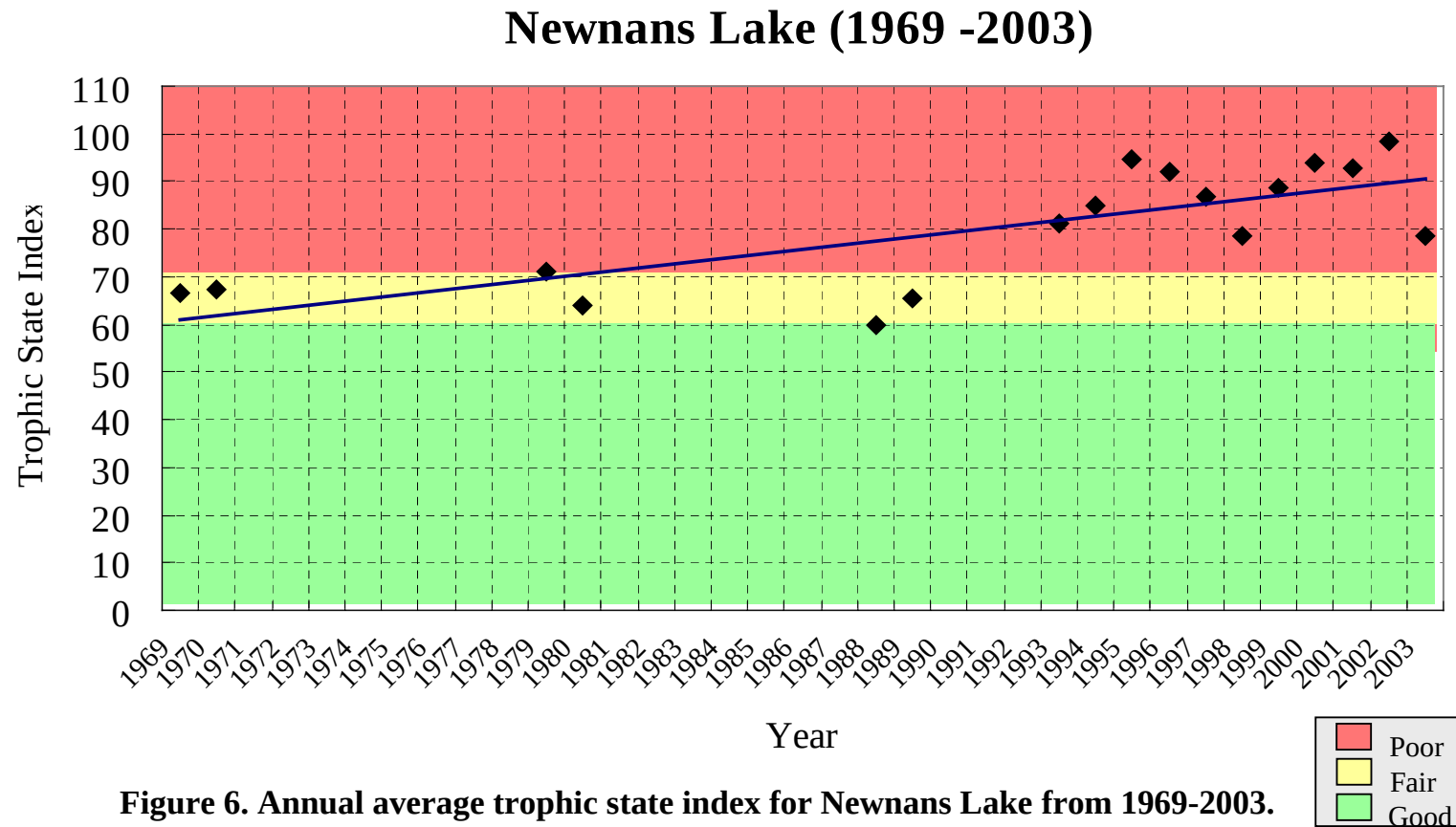


Figure 6. Annual average trophic state index for Newnans Lake from 1969-2003.

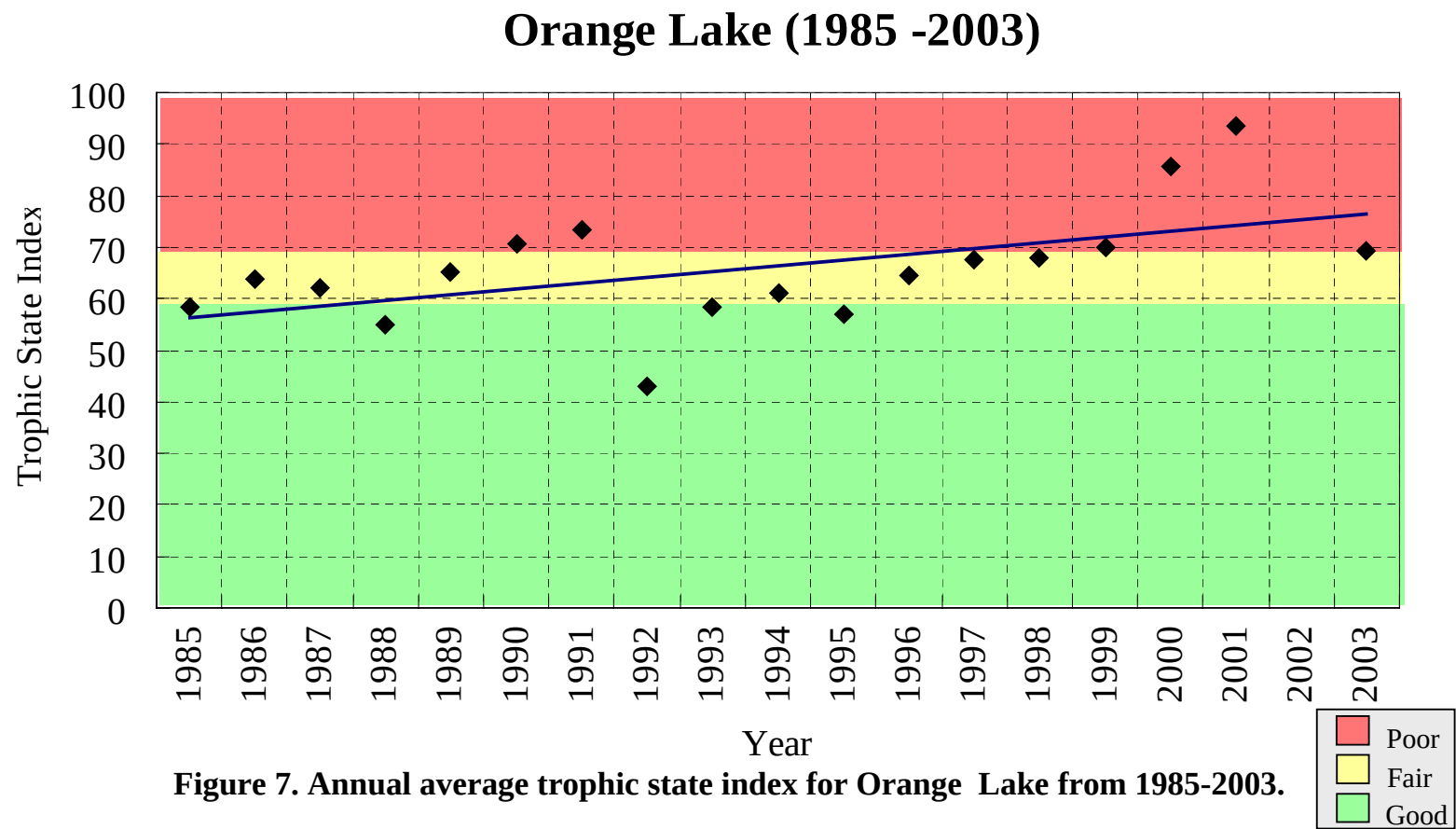


Figure 7. Annual average trophic state index for Orange Lake from 1985-2003.

Phytoplankton Community Structure

Dominant Phytoplankton Division

Eight of the nine phytoplankton divisions defined by Wetzel (2001) were found in these three lakes, including 176 genera and about 360 species and varieties of phytoplankton. Cyanophyta (blue-green algae or cyanobacteria) was the dominant phytoplankton division in all three lakes, composing about 92%, 92%, and 87% of the total biovolume for Newnans, Lochloosa and Orange lakes respectively. Chlorophyta (green algae) was the second most abundant phytoplankton division in these lakes, composing about 6%, 3%, and 5% of the total biovolume for Newnans, Lochloosa and Orange lakes respectively. The third most abundant phytoplankton division was Bacillariophyceae (diatoms), composing about 1%, 3%, and 4% of the total biovolume for Newnans, Lochloosa and Orange lakes respectively.

Average annual phytoplankton biovolume (Figures 8, 9, 10) ranged from about 6,900,000 to 122,000,000 $\mu\text{m}^3/\text{ml}$ in Newnans Lake, from about 4,800,000 to 122,000,000 $\mu\text{m}^3/\text{ml}$ in Lochloosa Lake, and from about 6,300,000 to 123,000,000 $\mu\text{m}^3/\text{ml}$ in Orange Lake. Although average annual biovolume ranges were similar among the three lakes, biovolume in Newnans Lake was about twice as high as in Orange and Lochloosa in most years.

Dominant Phytoplankton Species

Table 6 shows the three dominant species of phytoplankton in each lake, all blue-green algae. *Cylindrospermopsis raciborskii* was the most dominant species in all three lakes, with the highest average biovolume and percentage during the period of record in Newnans Lake.

Table 6. Dominant phytoplankton species in each lake based on average biovolume and percentage biovolume measured for the period of record through 2003. No reliable data was available from August 2001 through September 2002.

LAKE	DIVISION	DOMINANT SPECIES	AVERAGE BIOVOLUME ($\mu\text{m}^3/\text{ml}$)	PERCENTAGE OF OVERALL BIOVOLUME
Lochloosa	Cyanophyta	<i>Cylindrospermopsis raciborskii</i>	21,916,766	59%
	Cyanophyta	<i>Oscillatoria limnetica</i>	7,545,163	20%
	Cyanophyta	<i>Lyngbya contorta</i>	833,625	2%
Newnans	Cyanophyta	<i>Cylindrospermopsis raciborskii</i>	52,801,528	70%
	Cyanophyta	<i>Oscillatoria limnetica</i>	6,059,401	8%
	Cyanophyta	<i>Lyngbya contorta</i>	2,139,848	3%
Orange	Cyanophyta	<i>Cylindrospermopsis raciborskii</i>	12,596,330	46%
	Cyanophyta	<i>Microcystis flos-aquae</i>	1,867,586	7%
	Cyanophyta	<i>Oscillatoria limnetica</i>	1,793,278	7%

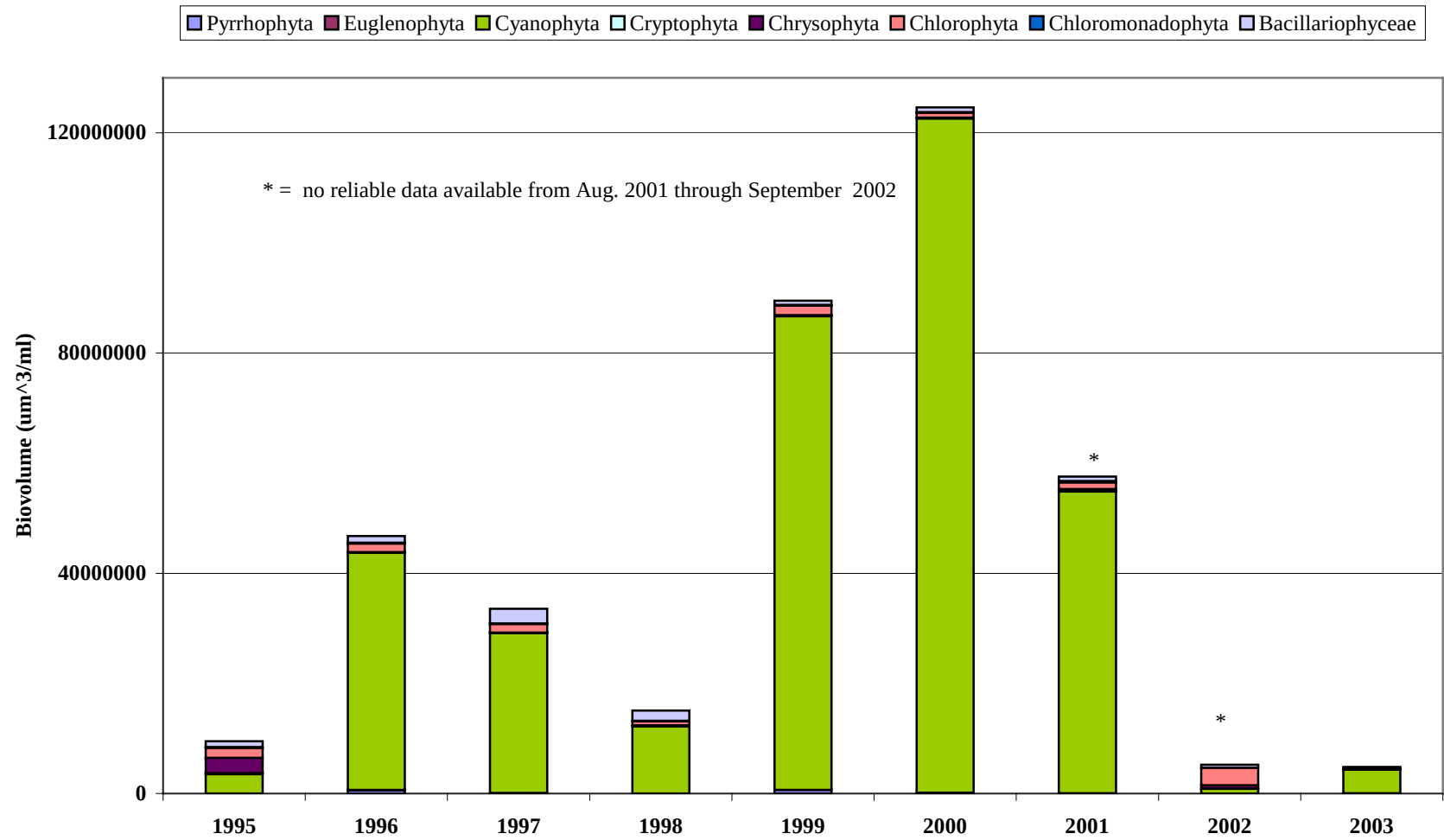


Figure 8. Annual average phytoplankton biovolume in Lochloosa Lake

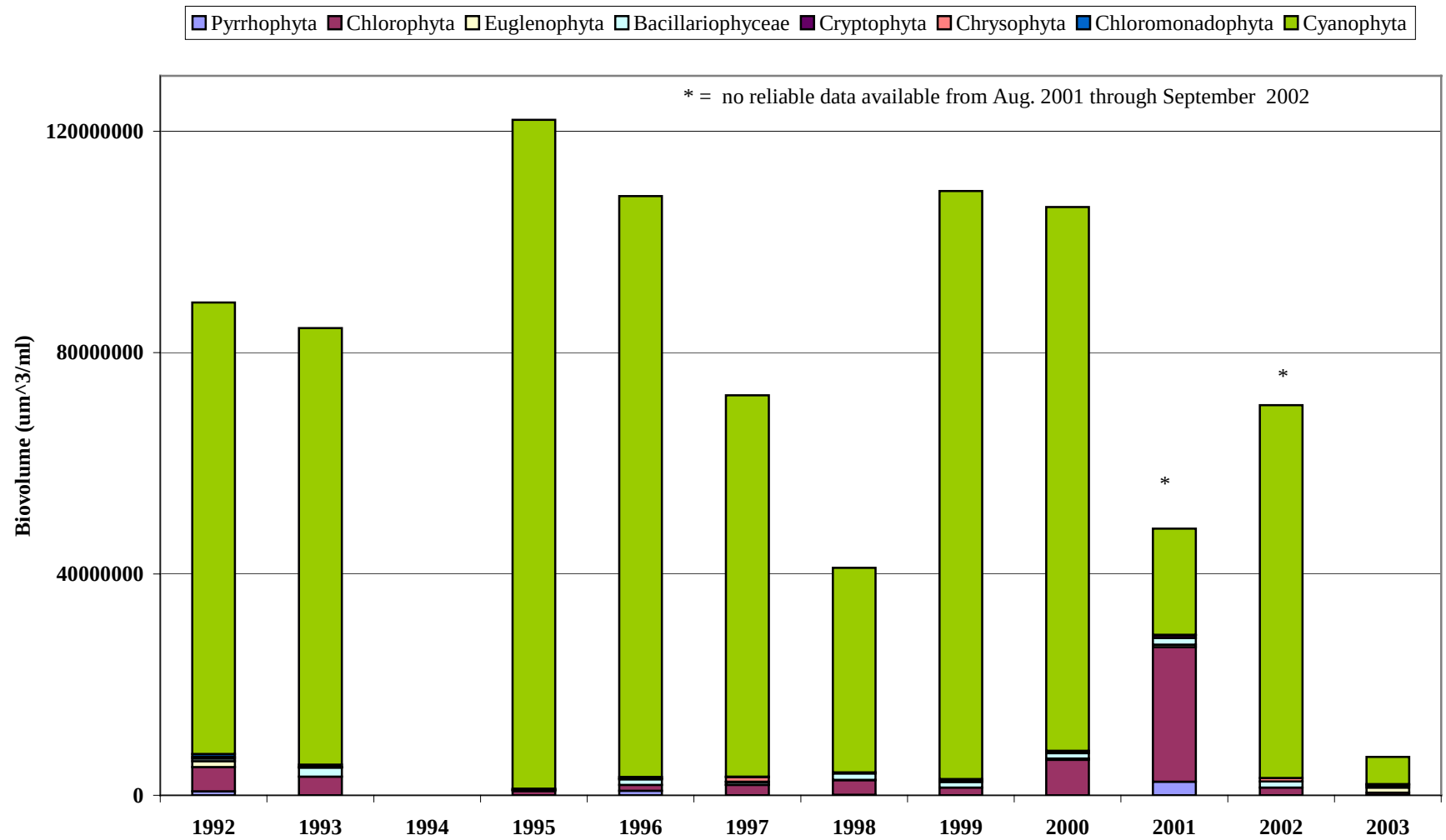


Figure 9. Annual average phytoplankton biovolume in Newnans Lake

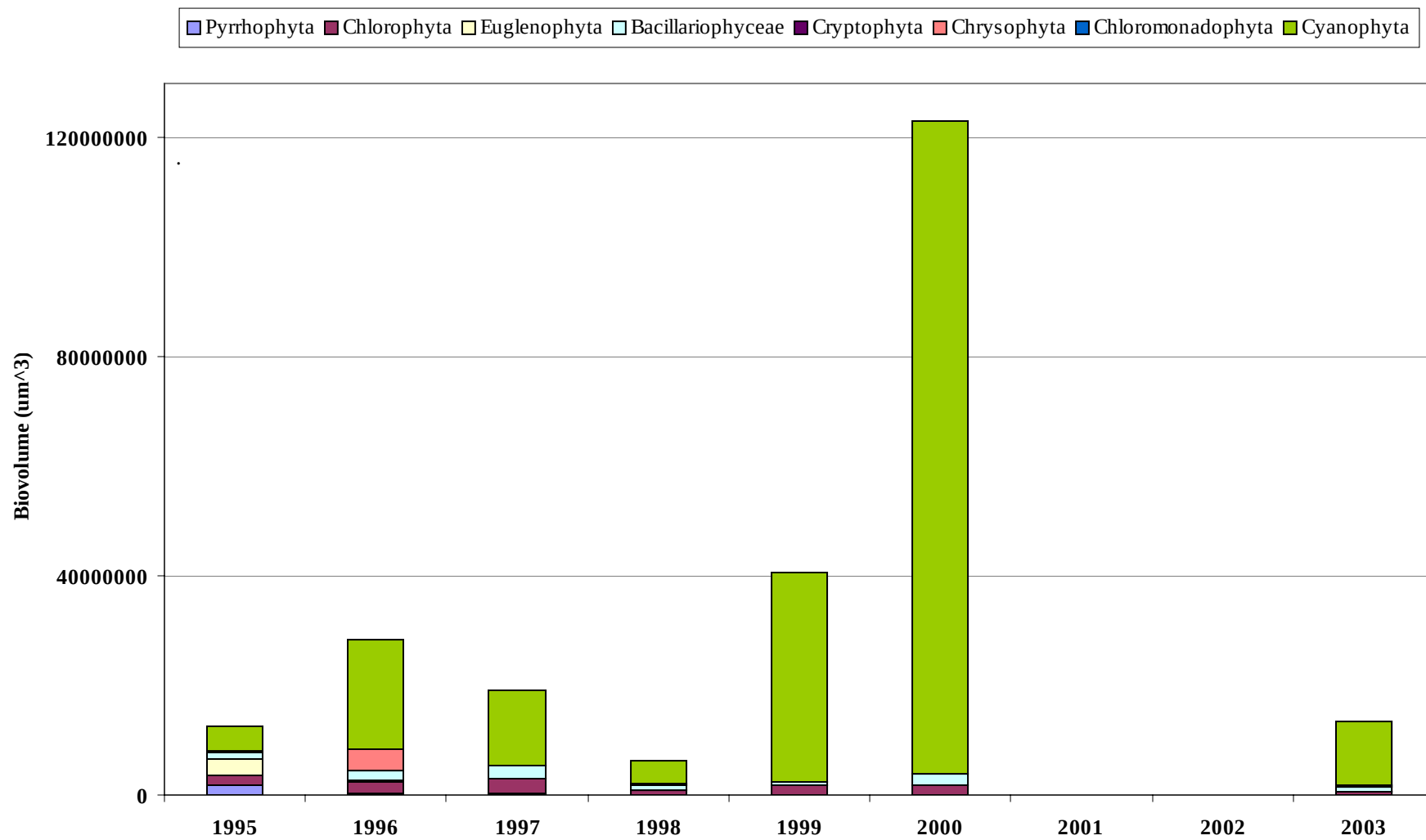


Figure 10. Annual average phytoplankton biovolume in Orange Lake

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APPENDIX A: Quality assurance and quality control codes

QACID	QACNM
\$	STORET - Calculated value
^	Value flagged by range checking program and/or data manager, see comments
0	
1	Over 20% CV - Trophic (ES Remark code)
2	Dissolved greater than total
3	Constituents greater than total
4	Out of range
5	QA Problem, see QA samples and blanks
6	Preservation error
7	Split sample
A	Value reported is the mean of two or more determinations.
B	Results based upon colony counts outside the acceptable range.
C	Calculated value
D	Data unreliable (STORET-field measurement)
E	Extra samples taken at composite stations
F	When reporting species, F determines the female sex.
G	Maximum of two or more determinations
H	Value based on field kit determination - results may not be accurate.
I	Value reported is between the laboratory method detection limit and the practical quantitation limit
J	Estimated value; value not accurate.
K	Actual value is known to be less than value given.
L	Actual value is known to be greater than value given.
M	Presence of material verified but not quantified - the actual value is less than the given value.
N	Presumptive evidence of presence of material
O	Sample amount was insufficient or sample was lost.
P	Evidence of presence of material, presence of analyte was not confirmed by analysis.
Q	Sample held beyond the accepted holding time (# indicates days held beyond holding time limit)
R	Analysis not requested
S	Lab test (old meaning lost or insufficient sample)
T	Value reported is less than the laboratory method detection limit.
U	Indicates material was analyzed for but not detected. Case of species, indicates undetermined sex.
V	Indicates that the analyte was detected in both the sample and the associated method blank.
W	Value observed is less than lowest value reportable under "T" code.
X	Value is quasi-vertically integrated sample
Y	The laboratory analysis was from an unpreserved or improperly preserved sample, value not accurate.
Z	Too many colonies were present, the numeric value represents the filtration volume.
#	Data not accurate; determined by DM/PM. See the narrative explanation for detailed information.
>	Blank values exceed 2 x the MDL

APPENDIX B:

**Descriptive and summary statistics, statistical analyses, and charts
for eight water quality constituents in each lake**

Lochloosa Lake Chlorophyll a (1986- 2003)

Descriptive Statistics

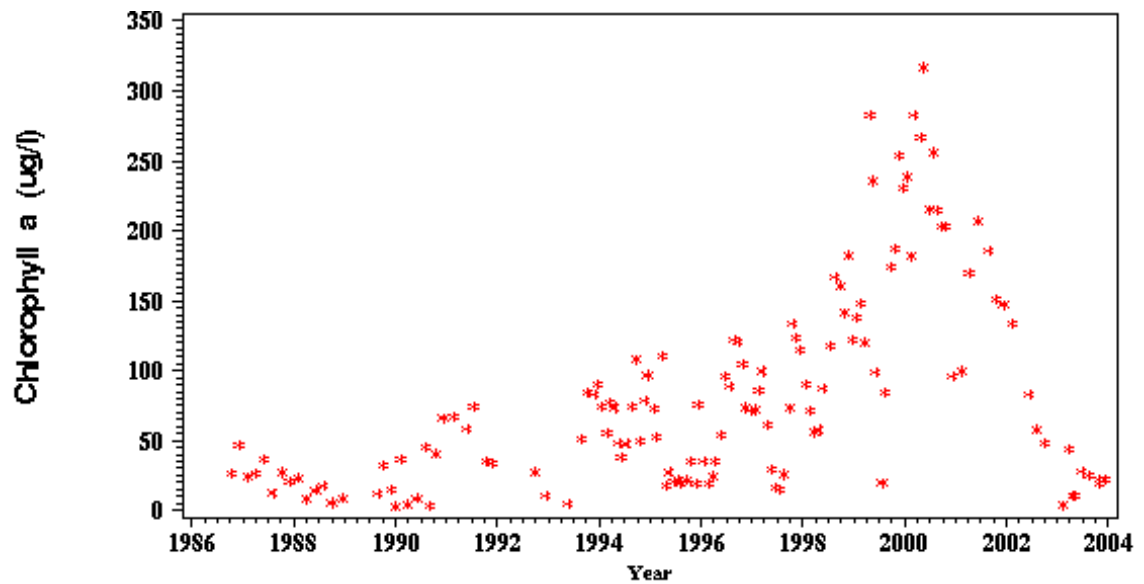
Moments			
N	139	Sum Weights	139
Mean	82.0301824	Sum Observations	11402.1954
Std Deviation	72.0913266	Variance	5197.15937
Skewness	1.21122948	Kurtosis	0.82909483
Uncorrected SS	1652532.16	Corrected SS	717207.992
Coeff Variation	87.8839038	Std Error Mean	6.11470651

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1986	2	37.043	37.043	-88.120	162.207
1987	6	25.740	24.869	16.573	33.165
1988	6	11.729	13.226	6.140	20.312
1989	3	14.815	19.862	-8.617	48.341
1990	8	22.866	26.149	5.840	46.459
1991	5	58.159	53.919	31.521	76.317
1992	2	19.126	19.126	-88.912	127.163
1993	5	83.475	63.073	18.541	107.605
1994	12	74.182	68.622	55.135	82.109
1995	12	24.843	41.441	22.181	60.701
1996	12	72.720	70.831	47.589	94.073
1997	12	72.926	71.151	44.283	98.019
1998	11	117.925	114.205	84.088	144.322
1999	12	161.226	164.632	115.236	214.028
2000	11	215.573	225.102	185.726	264.479
2001	6	160.761	160.400	121.428	199.373
2002	5	58.072	64.706	3.694	125.718
2003	9	22.447	21.012	11.967	30.057

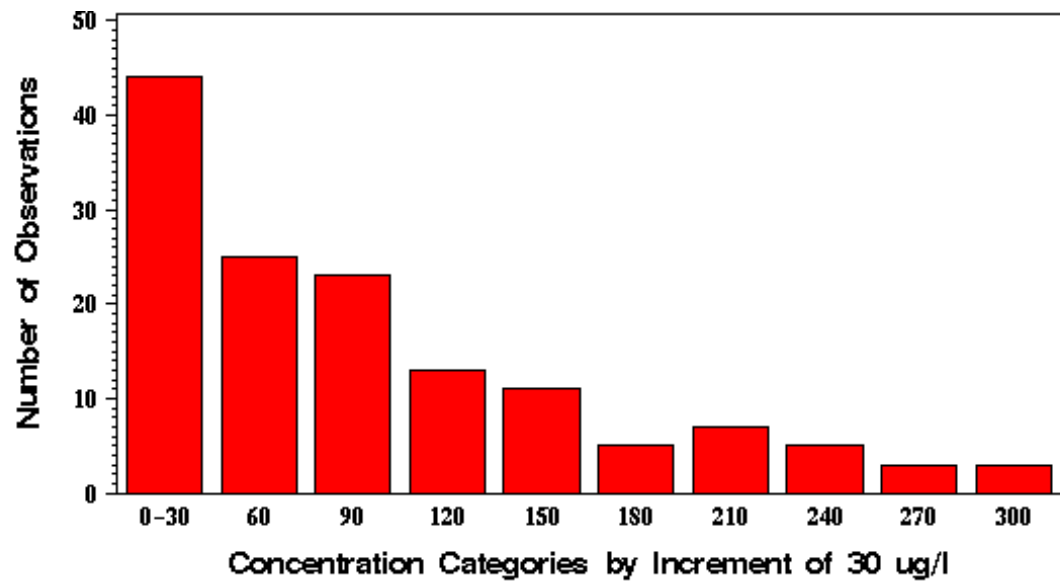
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.871807	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.132473	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.915979	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.595117	Pr > A-Sq	<0.0050

Monthly Chlorophyll a Concentration



Chlorophyll Frequency Distribution



Lochloosa Lake DO (1986- 2003)

Descriptive Statistics

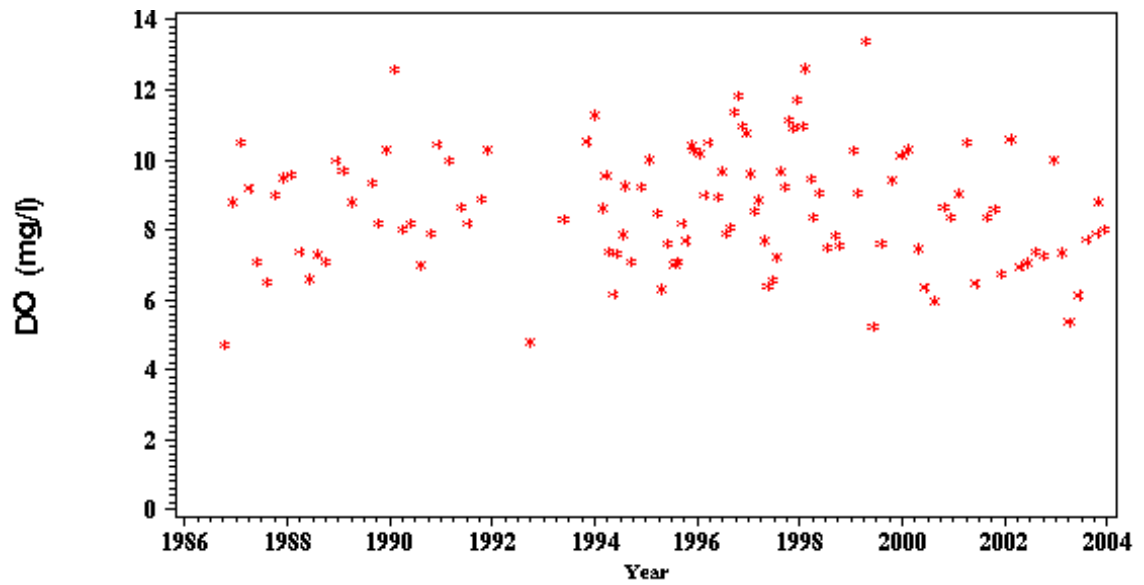
Moments			
N	116	Sum Weights	116
Mean	8.64948727	Sum Observations	1003.34052
Std Deviation	1.7038711	Variance	2.90317674
Skewness	0.17618524	Kurtosis	-0.134178
Uncorrected SS	9012.24641	Corrected SS	333.865325
Coeff Variation	19.6990995	Std Error Mean	0.15820046

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1986	2	6.750	6.750	-19.298	32.798
1987	6	9.100	8.633	7.035	10.231
1988	6	7.350	8.000	6.503	9.497
1989	5	9.332	9.266	8.262	10.270
1990	6	8.100	9.027	6.828	11.225
1991	5	8.900	9.210	8.092	10.328
1992	1	4.800	4.800	.	.
1993	2	9.420	9.420	-4.811	23.651
1994	10	8.252	8.378	7.299	9.456
1995	10	7.953	8.317	7.267	9.366
1996	11	10.192	9.936	9.047	10.826
1997	12	9.043	8.969	7.844	10.095
1998	8	8.719	9.177	7.656	10.699
1999	7	9.430	9.306	6.981	11.631
2000	6	7.910	7.852	6.170	9.533
2001	6	8.485	8.288	6.714	9.861
2002	6	7.324	8.212	6.493	9.932
2003	7	7.715	7.331	6.237	8.425

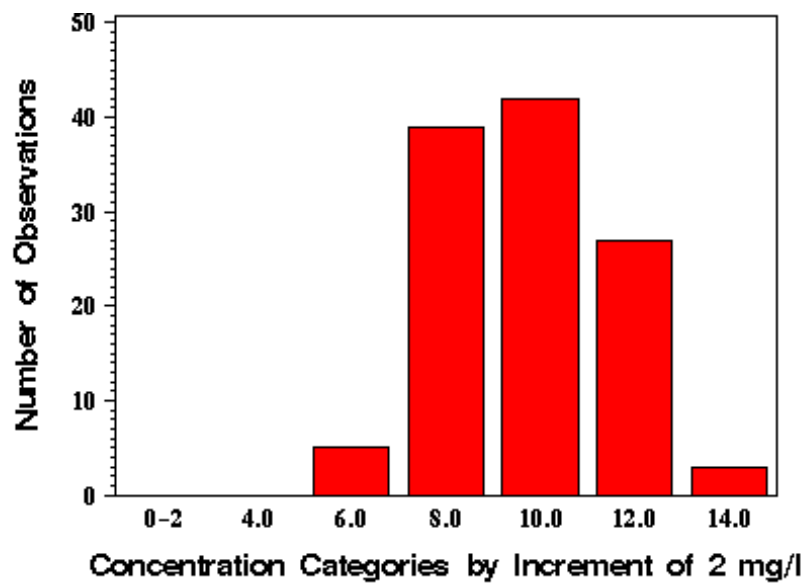
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.992884	Pr < W	0.8189
Kolmogorov-Smirnov	D	0.048114	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.041289	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq	0.259774	Pr > A-Sq	>0.2500

Monthly DO Concentration



DO Frequency Distribution



Lochloosa Lake Secchi (1975- 2003)

Descriptive Statistics

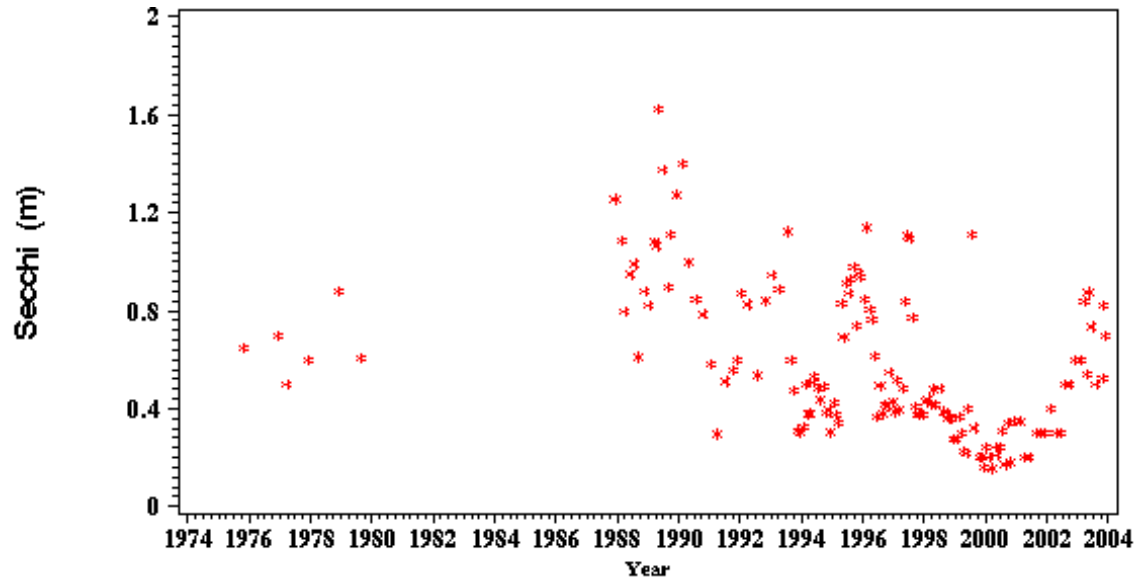
Moments			
N	143	Sum Weights	143
Mean	0.58656458	Sum Observations	83.8787343
Std Deviation	0.30550957	Variance	0.0933361
Skewness	0.84642627	Kurtosis	0.15851356
Uncorrected SS	62.4540199	Corrected SS	13.2537257
Coeff Variation	52.0845584	Std Error Mean	0.02554799

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1975	1	0.650	0.650	.	.
1976	1	0.700	0.700	.	.
1977	2	0.550	0.550	-0.085	1.185
1978	1	0.880	0.880	.	.
1979	1	0.610	0.610	.	.
1987	1	1.258	1.258	.	.
1988	6	0.916	0.887	0.712	1.061
1989	8	1.098	1.157	0.939	1.375
1990	4	0.925	1.009	0.571	1.448
1991	5	0.559	0.510	0.357	0.664
1992	4	0.835	0.771	0.521	1.020
1993	7	0.602	0.664	0.363	0.966
1994	12	0.418	0.428	0.380	0.476
1995	12	0.852	0.749	0.598	0.901
1996	12	0.523	0.603	0.450	0.756
1997	12	0.445	0.596	0.416	0.775
1998	11	0.417	0.404	0.363	0.444
1999	12	0.276	0.344	0.166	0.523
2000	11	0.241	0.241	0.196	0.286
2001	6	0.300	0.275	0.211	0.338
2002	6	0.450	0.433	0.306	0.560
2003	9	0.700	0.683	0.571	0.795

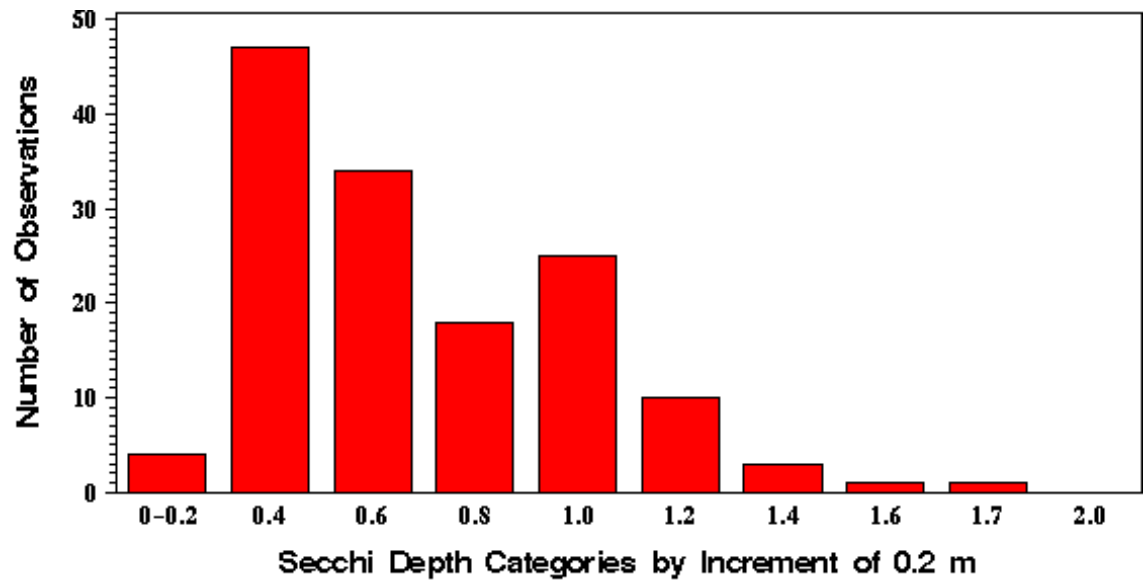
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.926639	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.136494	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.643717	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	3.49887	Pr > A-Sq	<0.0050

Monthly Secchi Depth



Secchi Frequency Distribution



Lochloosa Lake Turbidity (1986- 2003)

Descriptive Statistics

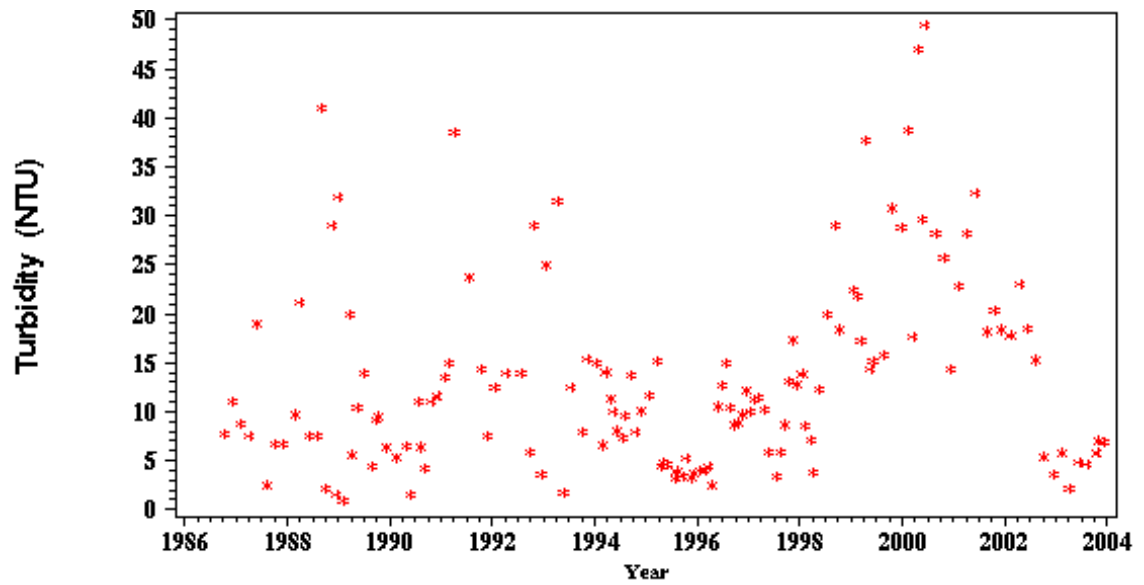
Moments			
N	141	Sum Weights	141
Mean	13.2356068	Sum Observations	1866.22055
Std Deviation	9.8181576	Variance	96.3962186
Skewness	1.39507713	Kurtosis	1.8716287
Uncorrected SS	38196.032	Corrected SS	13495.4706
Coeff Variation	74.1798829	Std Error Mean	0.82683803

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1986	2	9.400	9.400	-10.930	29.730
1987	6	7.100	8.533	2.713	14.354
1988	8	8.638	14.974	3.176	26.773
1989	10	9.375	11.263	4.817	17.708
1990	8	6.475	7.213	4.164	10.261
1991	6	14.700	18.775	7.258	30.292
1992	6	13.250	13.175	3.834	22.516
1993	6	13.950	15.683	4.171	27.196
1994	11	10.067	10.358	8.432	12.284
1995	11	4.500	5.775	3.144	8.405
1996	12	9.300	8.591	6.054	11.127
1997	11	10.167	10.008	7.361	12.656
1998	8	13.066	14.124	7.313	20.936
1999	9	21.800	22.683	16.417	28.949
2000	8	28.950	31.390	20.665	42.114
2001	6	21.600	23.400	17.359	29.441
2002	6	16.550	13.950	5.783	22.117
2003	7	5.800	5.329	3.793	6.864

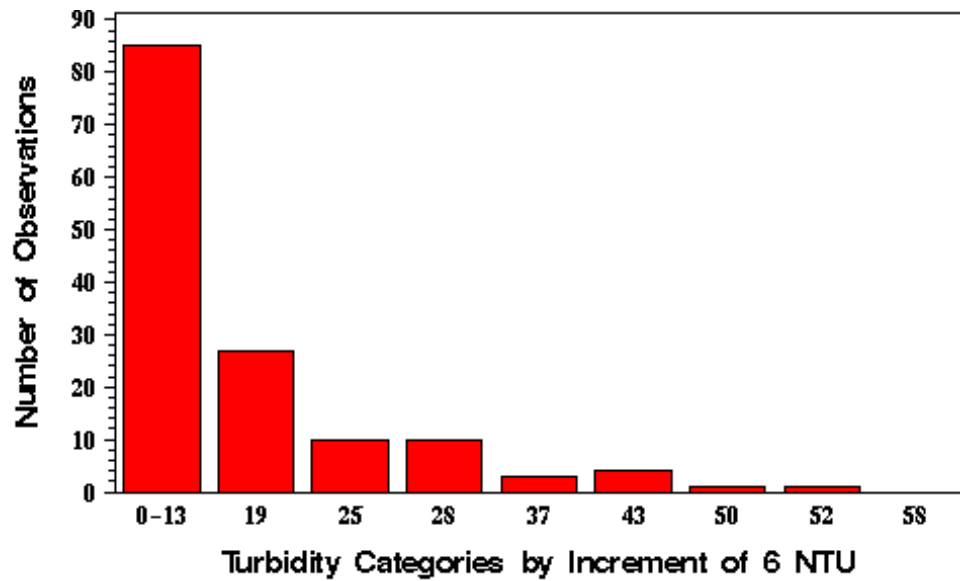
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.874774	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.143258	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.851086	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.091741	Pr > A-Sq	<0.0050

Monthly Turbidity



Turbidity Frequency Distribution



Lochloosa Lake Total Nitrogen (1978- 2003)

Descriptive Statistics

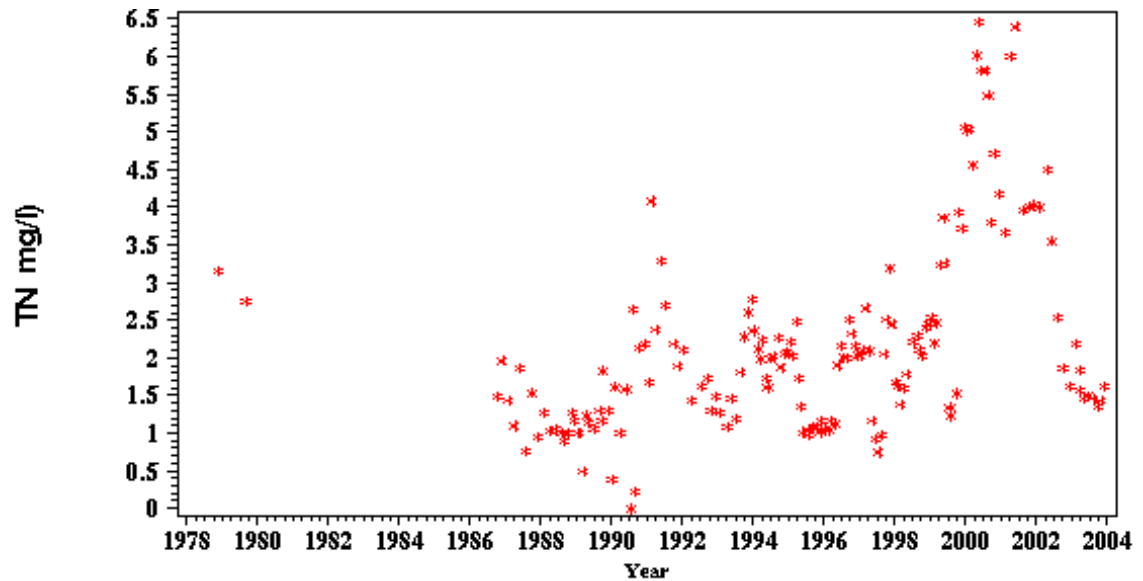
Moments			
N	161	Sum Weights	161
Mean	2.18170242	Sum Observations	351.25409
Std Deviation	1.28868093	Variance	1.66069853
Skewness	1.44669748	Kurtosis	1.87844611
Uncorrected SS	1032.04366	Corrected SS	265.711764
Coeff Variation	59.0676763	Std Error Mean	0.10156228

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1978	1	3.160	3.160	.	.
1979	1	2.760	2.760	.	.
1986	2	1.731	1.731	-1.249	4.710
1987	6	1.269	1.276	0.848	1.704
1988	8	1.046	1.093	0.976	1.209
1989	10	1.148	1.154	0.917	1.390
1990	9	1.585	1.313	0.580	2.046
1991	7	2.387	2.603	1.824	3.382
1992	6	1.561	1.621	1.324	1.917
1993	8	1.637	1.816	1.258	2.373
1994	12	2.042	2.031	1.894	2.167
1995	12	1.131	1.435	1.093	1.777
1996	12	2.004	1.794	1.454	2.133
1997	12	2.074	1.912	1.416	2.408
1998	11	2.023	1.962	1.715	2.209
1999	12	2.898	2.871	2.116	3.625
2000	11	5.033	5.175	4.622	5.729
2001	6	4.022	4.683	3.433	5.932
2002	6	3.047	3.014	1.773	4.255
2003	9	1.503	1.607	1.406	1.808

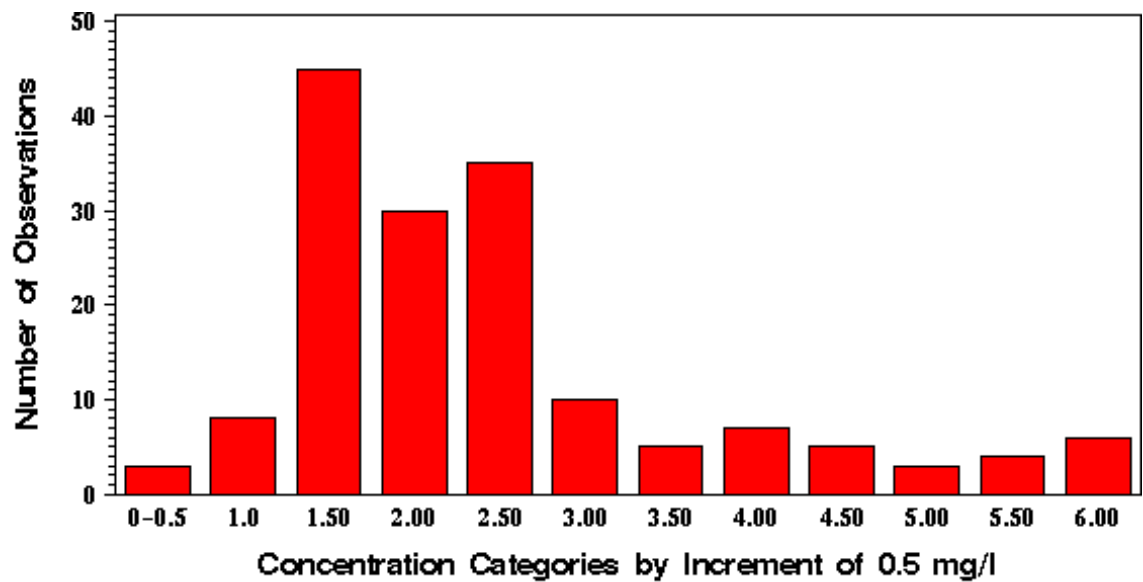
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.860151	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.165962	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.297783	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	7.425401	Pr > A-Sq	<0.0050

Monthly TN Concentration



TN Frequency Distribution



Lochloosa Lake TOC (1977- 2003)

Descriptive Statistics

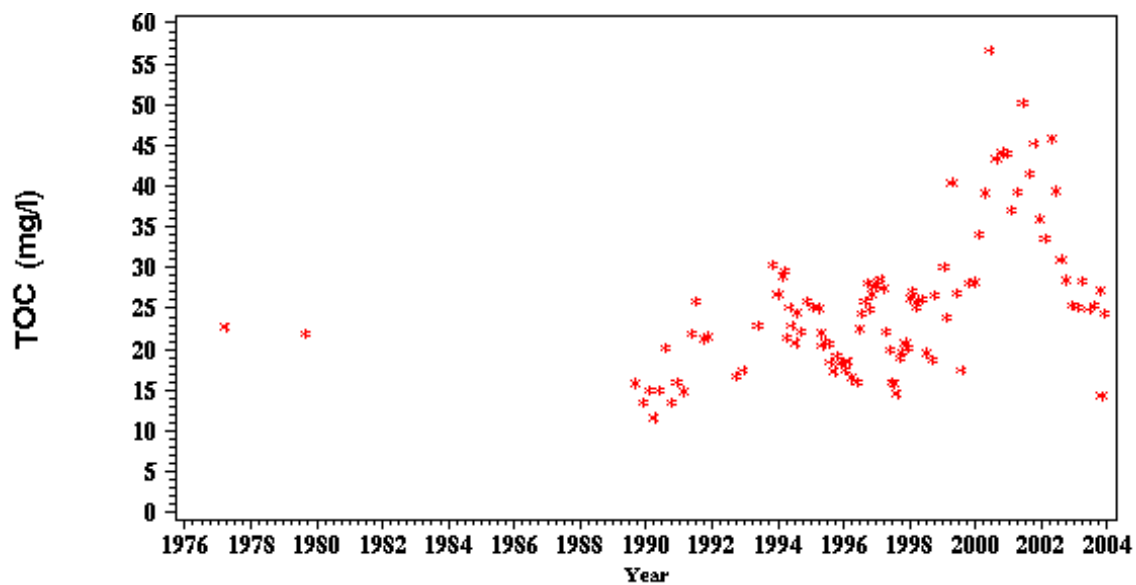
Moments			
N	103	Sum Weights	103
Mean	25.3707443	Sum Observations	2613.18667
Std Deviation	8.68569932	Variance	75.4413727
Skewness	1.20985007	Kurtosis	1.54671903
Uncorrected SS	73993.5108	Corrected SS	7695.02001
Coeff Variation	34.2350985	Std Error Mean	0.85582738

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1977	1	22.800	22.800	.	.
1979	1	22.000	22.000	.	.
1989	2	14.730	14.730	0.372	29.088
1990	6	14.985	15.237	12.236	18.238
1991	5	21.600	21.120	16.216	26.024
1992	2	17.125	17.125	12.360	21.890
1993	2	26.700	26.700	-20.313	73.713
1994	10	24.900	24.871	22.683	27.059
1995	11	20.500	20.558	18.781	22.336
1996	11	24.500	22.675	19.548	25.802
1997	12	20.116	21.080	18.008	24.153
1998	8	26.109	24.489	21.713	27.265
1999	7	28.180	27.944	21.544	34.344
2000	6	43.710	43.586	35.713	51.459
2001	6	40.440	41.618	35.957	47.279
2002	6	32.373	34.017	26.130	41.903
2003	7	25.170	24.310	20.047	28.573

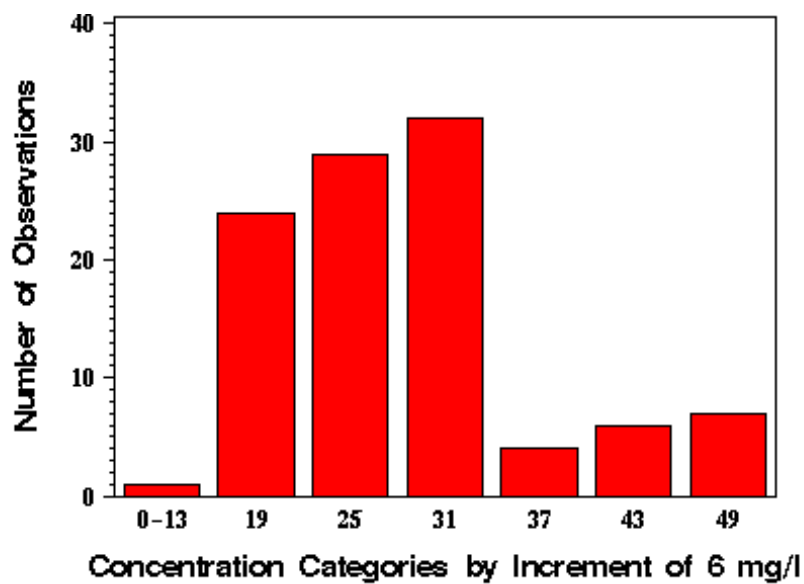
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.906816	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.147932	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.457811	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	2.838114	Pr > A-Sq	<0.0050

Monthly TOC Concentration



TOC Frequency Distribution



Lochloosa Lake Total Phosphorus (1977- 2003)

Descriptive Statistics

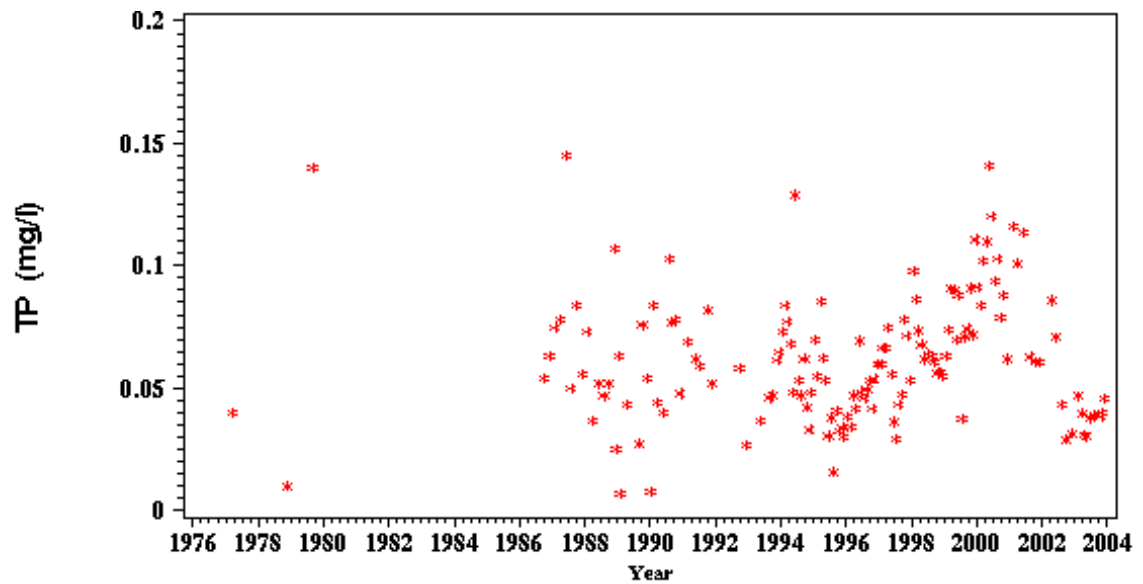
Moments			
N	146	Sum Weights	146
Mean	0.06209962	Sum Observations	9.06654418
Std Deviation	0.02624585	Variance	0.00068884
Skewness	0.75116195	Kurtosis	0.81249391
Uncorrected SS	0.66291143	Corrected SS	0.09988251
Coeff Variation	42.2641158	Std Error Mean	0.00217212

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1977	1	0.040	0.040	.	.
1978	1	0.010	0.010	.	.
1979	1	0.140	0.140	.	.
1986	2	0.058	0.058	0.001	0.116
1987	6	0.076	0.081	0.046	0.117
1988	7	0.052	0.056	0.031	0.081
1989	6	0.049	0.045	0.019	0.071
1990	8	0.063	0.060	0.035	0.086
1991	5	0.062	0.065	0.051	0.079
1992	2	0.043	0.043	-0.157	0.243
1993	5	0.047	0.051	0.037	0.066
1994	12	0.058	0.064	0.048	0.080
1995	12	0.039	0.046	0.033	0.058
1996	12	0.048	0.049	0.042	0.055
1997	12	0.058	0.057	0.047	0.067
1998	11	0.063	0.068	0.059	0.077
1999	12	0.074	0.078	0.066	0.089
2000	11	0.094	0.098	0.083	0.112
2001	6	0.082	0.086	0.057	0.115
2002	5	0.044	0.052	0.021	0.083
2003	9	0.039	0.039	0.035	0.043

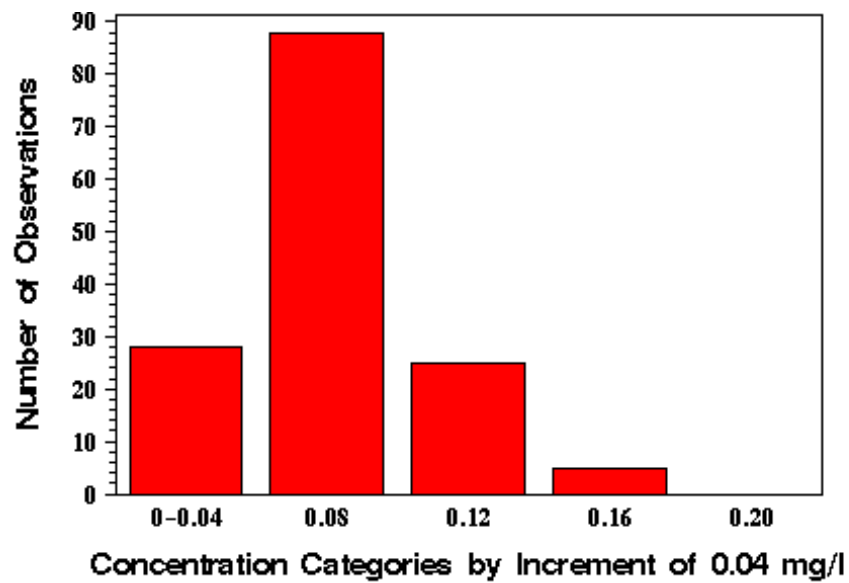
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.96331	Pr < W	0.0006
Kolmogorov-Smirnov	D	0.083361	Pr > D	0.0143
Cramer-von Mises	W-Sq	0.208977	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.363503	Pr > A-Sq	<0.0050

Monthly TP Concentration



TP Frequency Distribution



Lochloosa Lake TSS (1978- 2003)

Descriptive Statistics

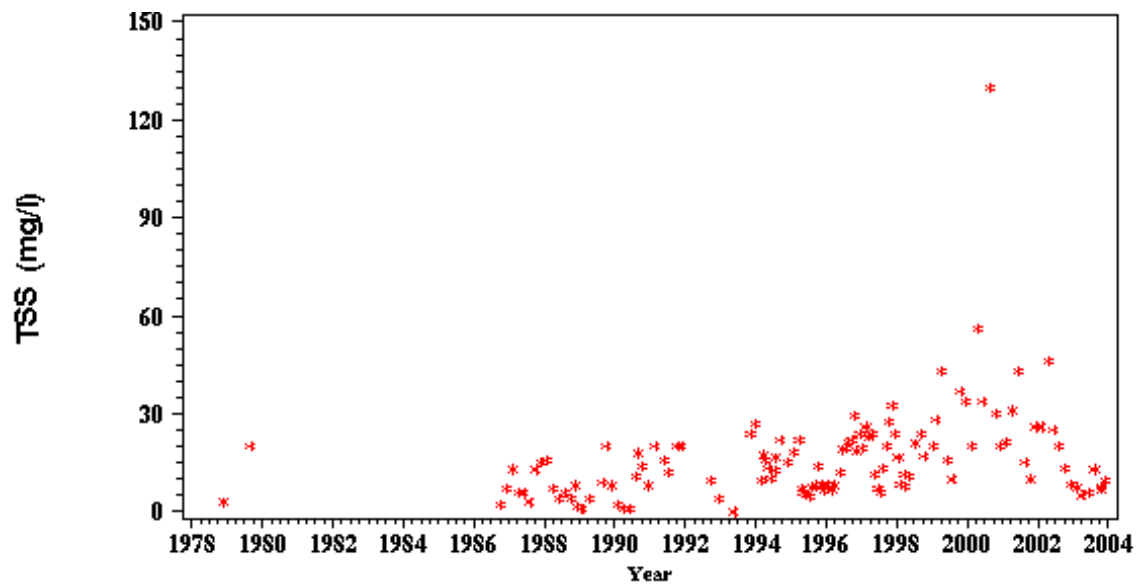
Moments			
N	123	Sum Weights	123
Mean	16.1376694	Sum Observations	1984.93333
Std Deviation	14.5995458	Variance	213.146738
Skewness	4.24732305	Kurtosis	29.8865909
Uncorrected SS	58036.0999	Corrected SS	26003.9021
Coeff Variation	90.468738	Std Error Mean	1.31639671

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1978	1	3.000	3.000	.	.
1979	1	20.000	20.000	.	.
1986	2	4.500	4.500	-27.266	36.266
1987	6	9.500	9.333	4.164	14.503
1988	7	6.000	6.643	2.332	10.954
1989	6	6.083	7.176	-0.295	14.647
1990	7	8.000	7.857	1.552	14.162
1991	5	20.000	17.600	13.158	22.042
1992	2	6.750	6.750	-28.192	41.692
1993	2	12.000	12.000	-140.474	164.474
1994	10	15.375	15.963	12.177	19.748
1995	11	7.500	9.797	5.898	13.696
1996	11	19.167	17.207	12.266	22.148
1997	12	21.667	19.543	14.216	24.871
1998	8	14.083	14.599	9.582	19.616
1999	7	28.000	26.857	15.753	37.961
2000	6	32.000	48.333	4.119	92.548
2001	6	23.750	24.417	12.033	36.800
2002	6	22.500	23.108	9.332	36.885
2003	7	7.500	7.964	5.515	10.413

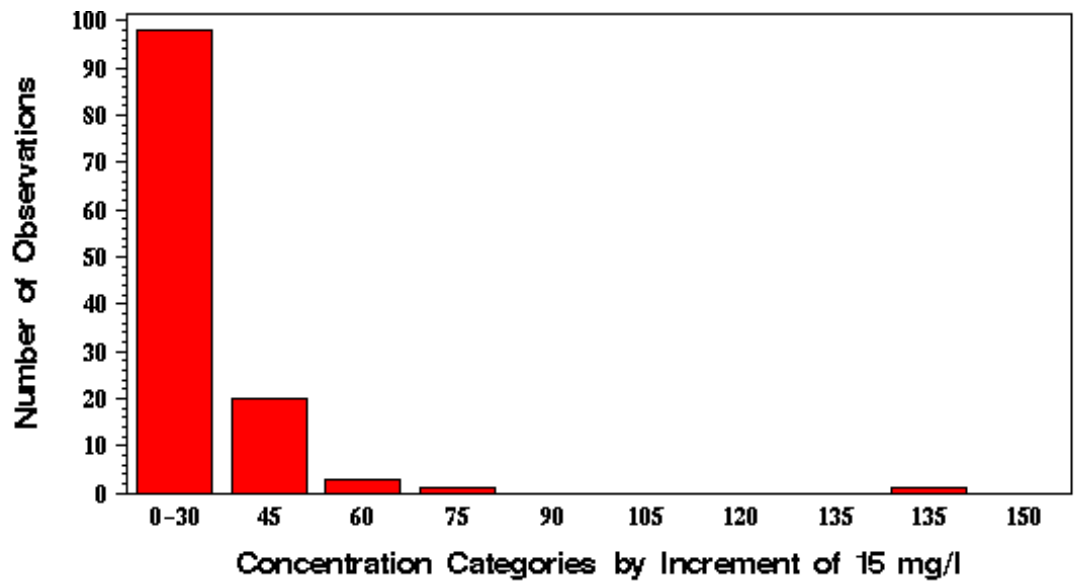
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.688016	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.141771	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.864113	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.625715	Pr > A-Sq	<0.0050

Monthly TSS a Concentration



TSS Frequency Distribution



Newnans Lake Chlorophyll a (1965- 2003)

Descriptive Statistics

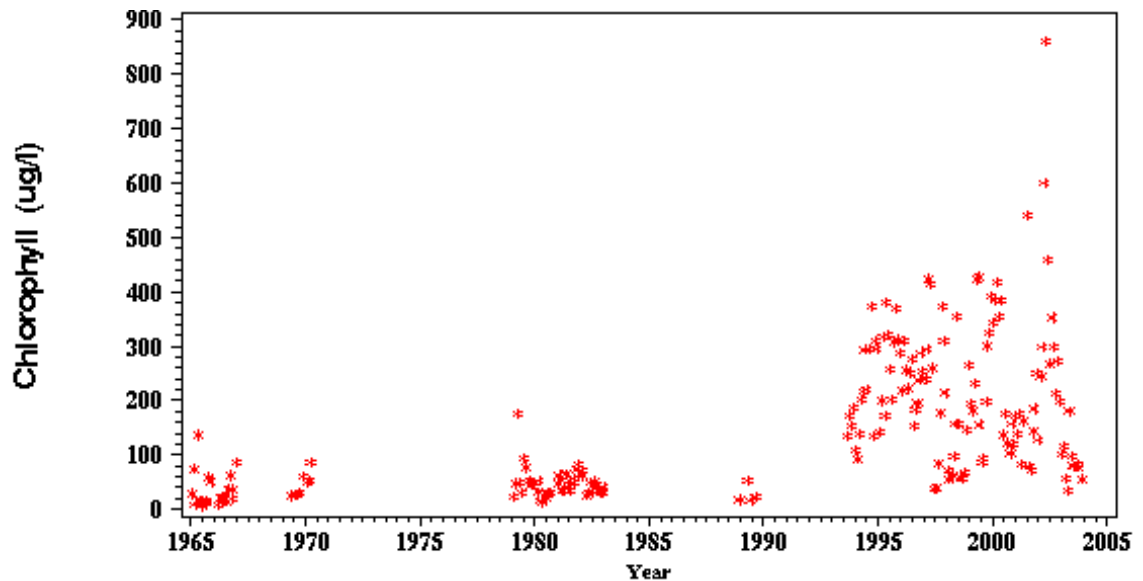
Moments			
N	197	Sum Weights	197
Mean	153.192202	Sum Observations	30178.8637
Std Deviation	134.85706	Variance	18186.4267
Skewness	1.45632721	Kurtosis	3.35282172
Uncorrected SS	8187706.23	Corrected SS	3564539.64
Coeff Variation	88.0312828	Std Error Mean	9.60816772

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1965	11	18.000	39.465	12.782	66.147
1966	10	22.020	33.307	15.729	50.886
1969	5	29.050	35.154	16.046	54.262
1970	3	54.500	63.447	12.750	114.143
1979	11	50.400	63.945	35.677	92.214
1980	8	29.250	28.897	18.550	39.244
1981	12	52.000	53.667	43.526	63.808
1982	11	37.000	43.455	33.456	53.454
1983	1	41.000	41.000	.	.
1988	1	18.564	18.564	.	.
1989	3	23.496	31.209	-19.765	82.182
1993	4	164.000	163.333	127.524	199.143
1994	12	218.800	224.230	166.564	281.895
1995	12	297.839	272.992	223.544	322.440
1996	12	245.151	238.033	209.018	267.049
1997	12	250.271	239.999	154.231	325.768
1998	12	85.801	130.201	69.680	190.722
1999	12	216.164	251.749	175.018	328.480
2000	11	176.610	246.068	159.561	332.574
2001	11	163.826	182.994	95.278	270.709
2002	12	286.165	350.195	220.768	479.623
2003	11	81.333	88.546	62.661	114.432

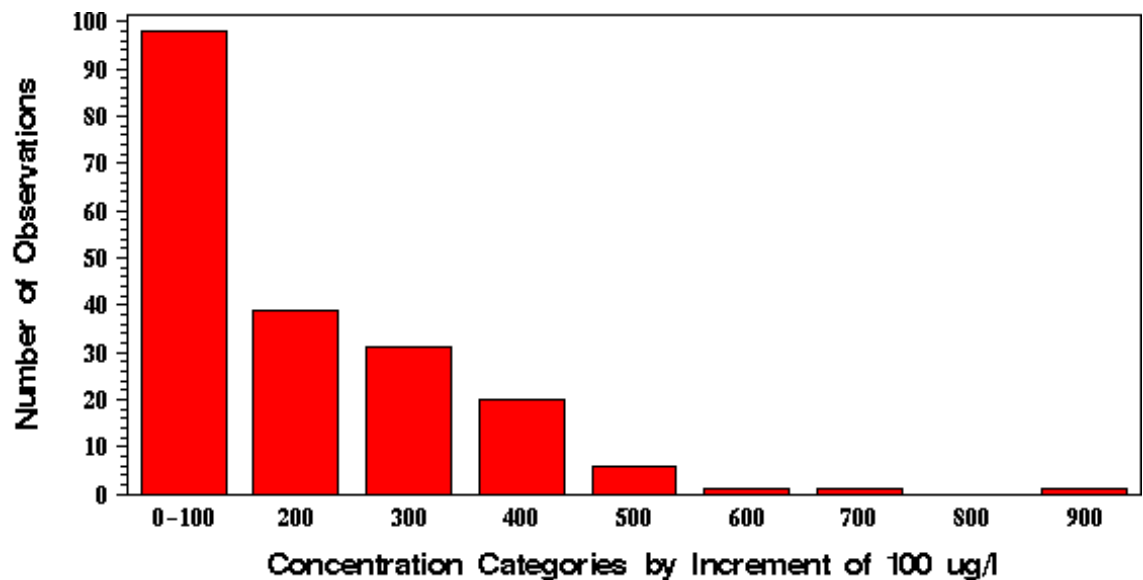
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.860644	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.158076	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.231255	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	7.283951	Pr > A-Sq	<0.0050

Monthly Chlorophyll a Concentration



Chlorophyll Frequency Distribution



Newnans Lake DO (1988- 2003)

Descriptive Statistics

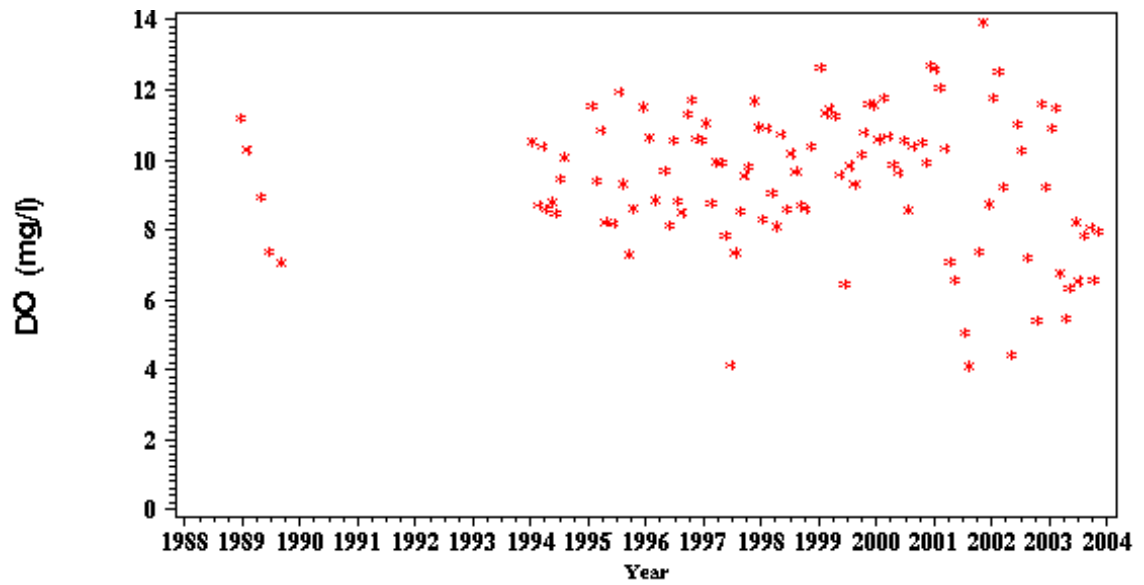
Moments			
N	111	Sum Weights	111
Mean	9.43628754	Sum Observations	1047.42792
Std Deviation	1.95939839	Variance	3.83924205
Skewness	-0.5536541	Kurtosis	0.18033702
Uncorrected SS	10306.1476	Corrected SS	422.316625
Coeff Variation	20.7645049	Std Error Mean	0.18597786

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1988	1	11.200	11.200	.	.
1989	4	8.158	8.422	6.037	10.808
1994	8	9.128	9.383	8.677	10.089
1995	10	9.373	9.699	8.514	10.883
1996	11	10.550	9.952	9.142	10.761
1997	12	9.693	9.131	7.834	10.429
1998	11	9.057	9.394	8.700	10.087
1999	12	11.014	10.503	9.483	11.523
2000	11	10.498	10.478	9.748	11.208
2001	10	8.057	8.787	6.403	11.170
2002	10	9.745	9.275	7.292	11.257
2003	11	7.850	7.837	6.572	9.102

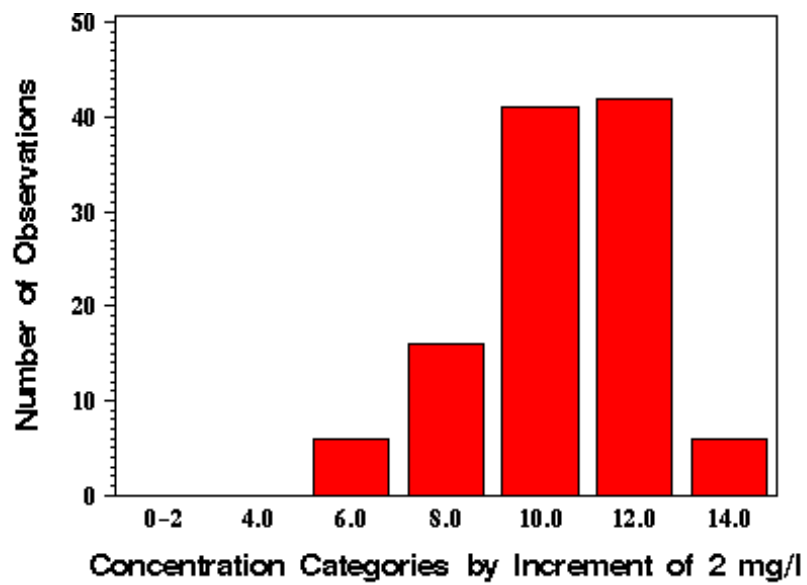
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.973964	Pr < W	0.0286
Kolmogorov-Smirnov	D	0.069866	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.117484	Pr > W-Sq	0.0682
Anderson-Darling	A-Sq	0.790888	Pr > A-Sq	0.0408

Monthly DO Concentration



DO Frequency Distribution



Newnans Lake Turbidity (1988 - 2003)

Descriptive Statistics

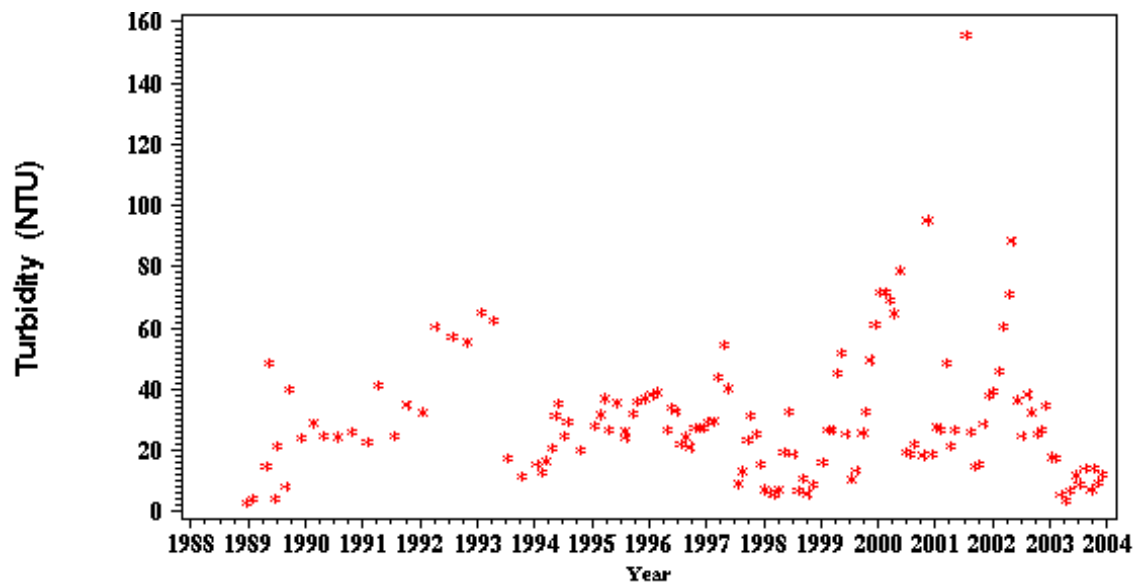
Moments			
N	135	Sum Weights	135
Mean	30.15693	Sum Observations	4071.18556
Std Deviation	21.3338573	Variance	455.133466
Skewness	2.20026702	Kurtosis	8.73236169
Uncorrected SS	183762.343	Corrected SS	60987.8845
Coeff Variation	70.7428019	Std Error Mean	1.83612609

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1988	1	2.900	2.900	.	.
1989	8	18.250	20.781	7.080	34.483
1990	4	25.500	26.125	22.918	29.332
1991	4	30.000	31.125	17.308	44.942
1992	4	56.375	51.438	31.080	71.795
1993	4	40.000	39.188	-6.127	84.502
1994	9	20.667	22.913	16.951	28.875
1995	10	31.875	31.483	27.986	34.981
1996	11	27.333	29.209	25.130	33.288
1997	11	29.333	28.763	19.567	37.958
1998	11	7.233	11.832	6.124	17.539
1999	12	26.783	32.171	21.823	42.518
2000	11	64.850	49.992	29.796	70.189
2001	11	26.750	39.154	12.347	65.960
2002	12	37.425	43.788	31.207	56.368
2003	12	10.750	10.795	7.875	13.716

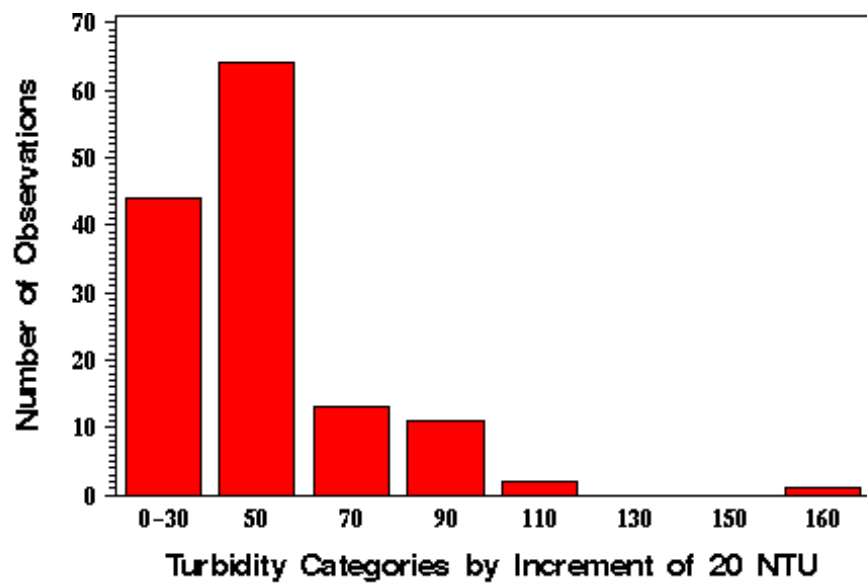
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.835738	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.147925	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.796507	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	4.503913	Pr > A-Sq	<0.0050

Monthly Turbidity



Turbidity Frequency Distribution



Newnans Lake Secchi (1967- 2003)

Descriptive Statistics

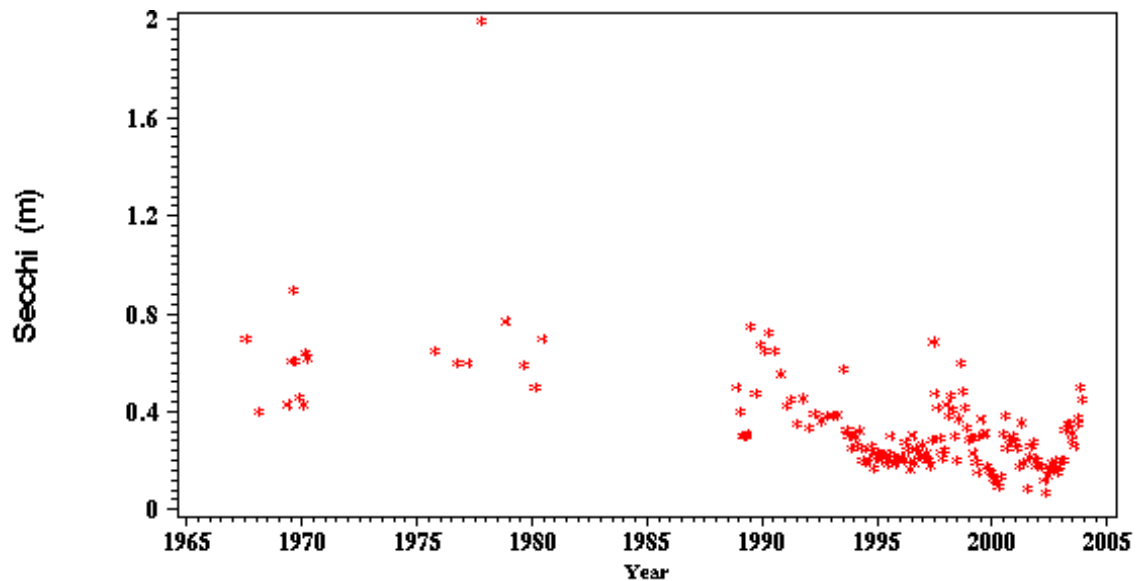
Moments			
N	162	Sum Weights	162
Mean	0.33509468	Sum Observations	54.2853376
Std Deviation	0.20867746	Variance	0.04354628
Skewness	3.63476338	Kurtosis	24.3781782
Uncorrected SS	25.2016791	Corrected SS	7.01095145
Coeff Variation	62.2741794	Std Error Mean	0.01639525

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1967	1	0.700	0.700	.	.
1968	1	0.400	0.400	.	.
1969	5	0.610	0.602	0.371	0.833
1970	3	0.620	0.563	0.275	0.851
1975	1	0.650	0.650	.	.
1976	1	0.600	0.600	.	.
1977	2	1.300	1.300	-7.594	10.194
1978	1	0.770	0.770	.	.
1979	1	0.590	0.590	.	.
1980	2	0.600	0.600	-0.671	1.871
1988	1	0.500	0.500	.	.
1989	7	0.400	0.459	0.287	0.631
1990	4	0.650	0.645	0.534	0.756
1991	4	0.439	0.421	0.343	0.498
1992	4	0.374	0.369	0.325	0.413
1993	7	0.328	0.363	0.266	0.460
1994	12	0.229	0.235	0.206	0.264
1995	12	0.217	0.221	0.202	0.240
1996	12	0.224	0.229	0.204	0.255
1997	12	0.239	0.307	0.212	0.401
1998	12	0.396	0.391	0.325	0.457
1999	12	0.261	0.246	0.198	0.294
2000	10	0.194	0.213	0.139	0.288
2001	11	0.215	0.226	0.178	0.273
2002	12	0.175	0.162	0.138	0.186
2003	12	0.338	0.331	0.275	0.387

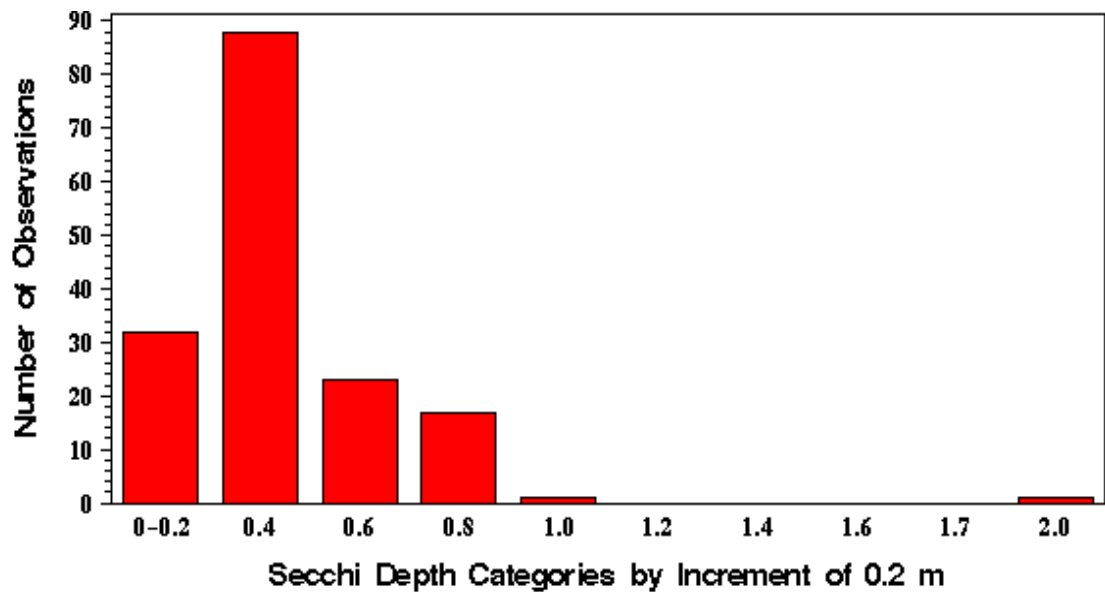
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.732225	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.155641	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.348076	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	7.620717	Pr > A-Sq	<0.0050

Monthly Secchi Depth



Secchi Frequency Distribution



Newnans Lake Total Nitrogen (1967- 2003)

Descriptive Statistics

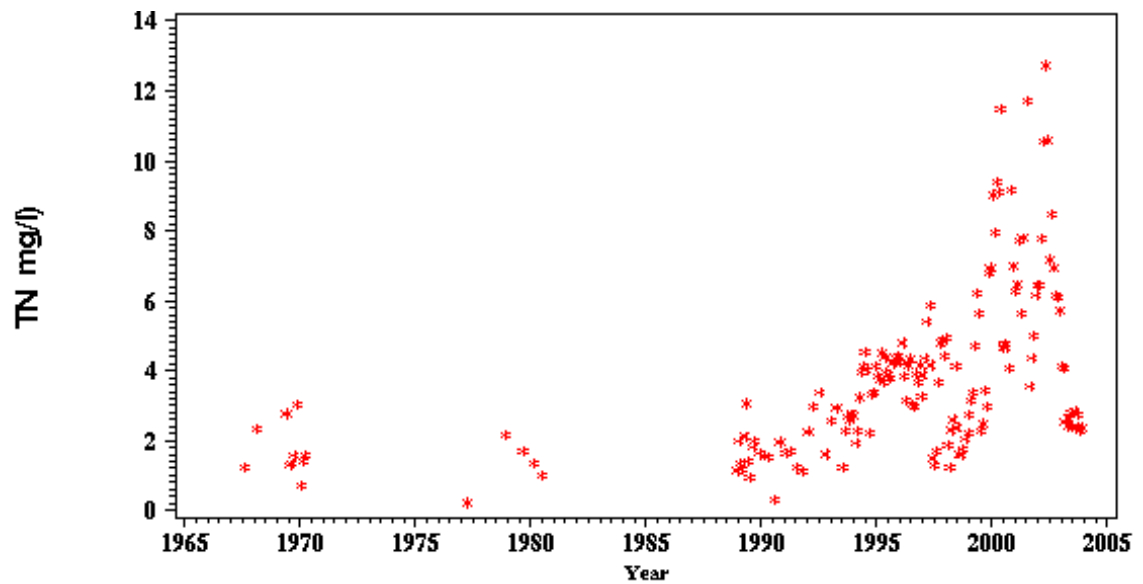
Moments			
N	162	Sum Weights	162
Mean	3.8054774	Sum Observations	616.487338
Std Deviation	2.38926792	Variance	5.70860118
Skewness	1.35849416	Kurtosis	1.97721446
Uncorrected SS	3265.11342	Corrected SS	919.08479
Coeff Variation	62.784972	Std Error Mean	0.18771862

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1967	1	1.230	1.230	.	.
1968	1	2.340	2.340	.	.
1969	5	1.590	2.016	0.988	3.044
1970	3	1.400	1.243	0.135	2.352
1977	1	0.230	0.230	.	.
1978	1	2.170	2.170	.	.
1979	1	1.698	1.698	.	.
1980	2	1.169	1.169	-1.011	3.348
1988	1	1.151	1.151	.	.
1989	10	1.733	1.756	1.326	2.187
1990	4	1.548	1.344	0.206	2.482
1991	4	1.460	1.440	0.970	1.910
1992	4	2.625	2.560	1.325	3.795
1993	7	2.597	2.439	1.910	2.969
1994	12	3.369	3.331	2.783	3.878
1995	12	4.095	4.097	3.906	4.288
1996	12	3.882	3.803	3.431	4.176
1997	12	4.272	3.833	2.856	4.810
1998	12	2.133	2.400	1.711	3.088
1999	12	3.413	4.233	3.131	5.335
2000	11	7.955	7.401	5.717	9.086
2001	10	6.234	6.479	4.844	8.113
2002	12	7.066	7.935	6.518	9.352
2003	12	2.599	2.810	2.407	3.213

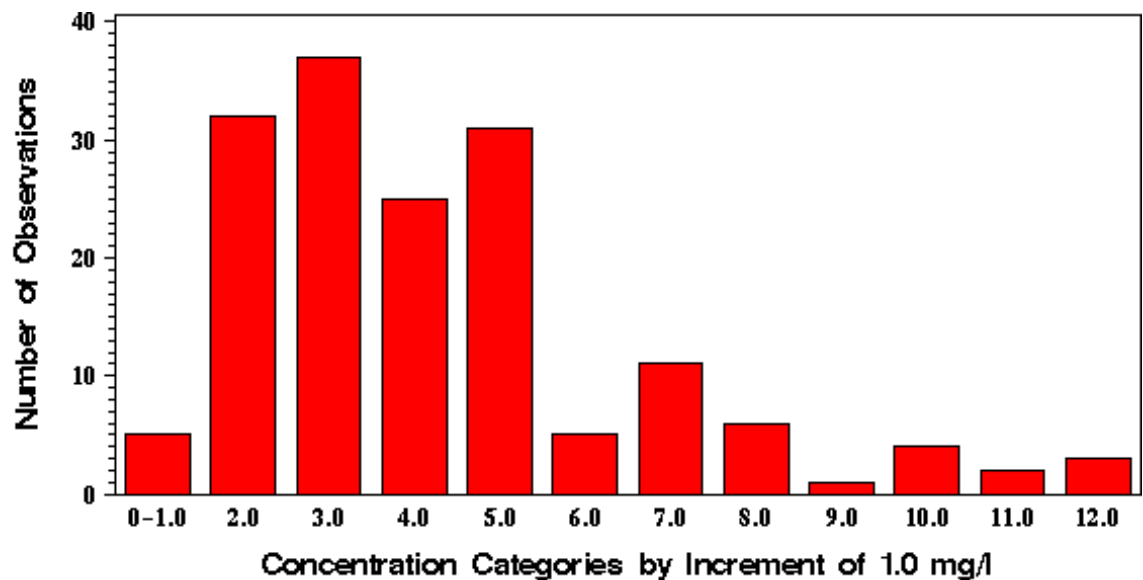
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.890709	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.128778	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.762686	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	4.745264	Pr > A-Sq	<0.0050

Monthly TN Concentration



TN Frequency Distribution



Newnans Lake TOC (1977- 2003)

Descriptive Statistics

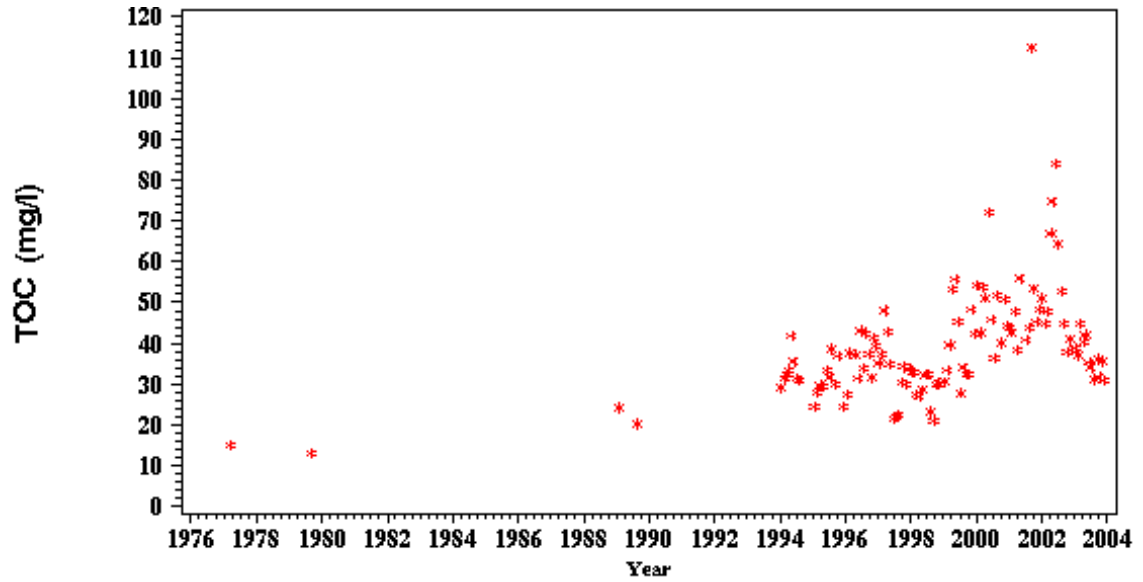
Moments			
N	114	Sum Weights	114
Mean	38.9953947	Sum Observations	4445.475
Std Deviation	13.5019013	Variance	182.30134
Skewness	2.03866879	Kurtosis	8.03577131
Uncorrected SS	193953.104	Corrected SS	20600.0514
Coeff Variation	34.6243484	Std Error Mean	1.26456892

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1977	1	15.000	15.000	.	.
1979	1	13.000	13.000	.	.
1989	2	22.333	22.333	-2.667	47.332
1994	8	32.075	33.345	30.087	36.602
1995	10	29.863	30.729	27.366	34.093
1996	11	37.525	36.702	33.356	40.047
1997	12	34.126	32.840	27.690	37.990
1998	11	30.095	28.974	26.292	31.656
1999	12	36.939	39.678	33.754	45.601
2000	11	50.785	49.436	43.033	55.838
2001	11	45.323	52.155	38.241	66.069
2002	12	49.550	54.131	44.552	63.711
2003	12	35.965	36.588	33.799	39.376

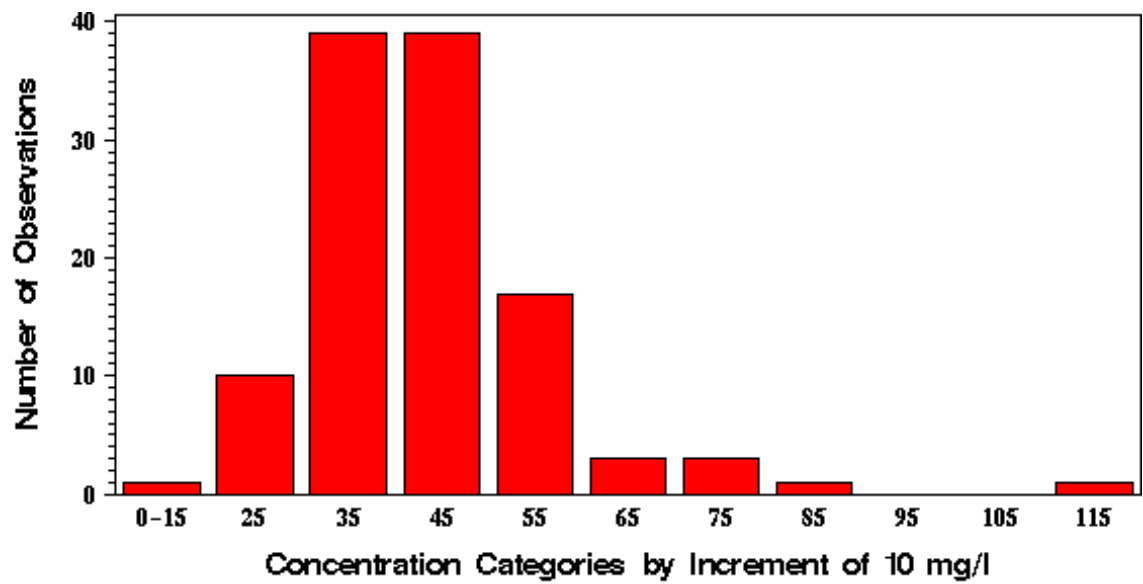
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.859269	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.111659	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.512074	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	3.129833	Pr > A-Sq	<0.0050

Monthly TOC Concentration



TOC Frequency Distribution



Newnans Lake Total Phosphorus (1967- 2003)

Descriptive Statistics

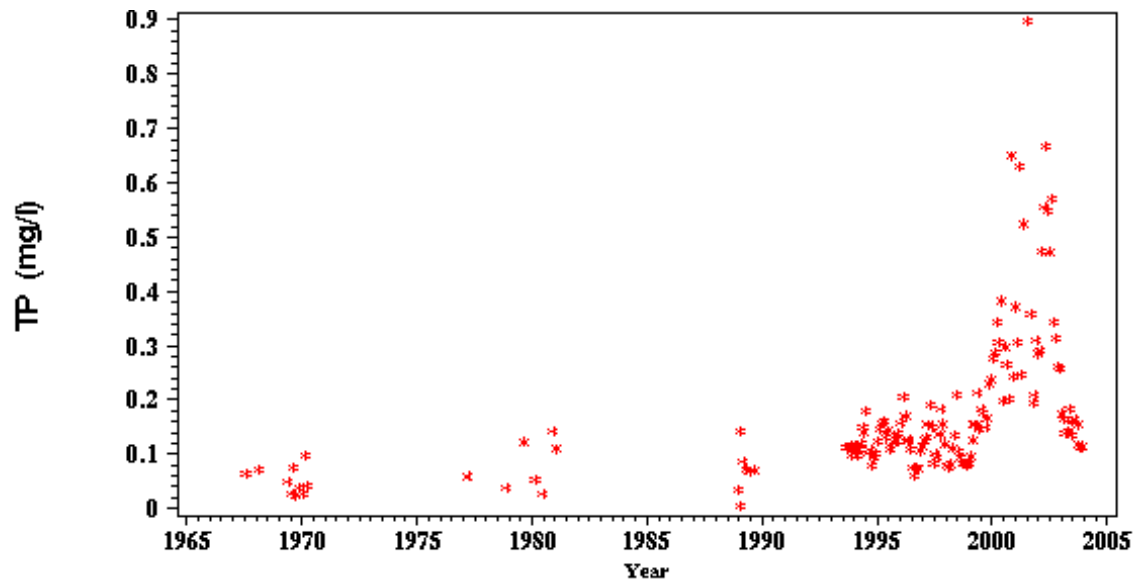
Moments			
N	145	Sum Weights	145
Mean	0.17718254	Sum Observations	25.6914686
Std Deviation	0.14198251	Variance	0.02015903
Skewness	2.30964696	Kurtosis	6.40872204
Uncorrected SS	7.45498034	Corrected SS	2.90290062
Coeff Variation	80.1334627	Std Error Mean	0.01179101

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1967	1	0.065	0.065	.	.
1968	1	0.072	0.072	.	.
1969	5	0.039	0.044	0.019	0.068
1970	3	0.042	0.056	-0.035	0.147
1977	1	0.060	0.060	.	.
1978	1	0.040	0.040	.	.
1979	1	0.123	0.123	.	.
1980	3	0.054	0.075	-0.077	0.227
1981	1	0.111	0.111	.	.
1988	1	0.036	0.036	.	.
1989	6	0.072	0.075	0.029	0.121
1993	4	0.114	0.111	0.097	0.124
1994	12	0.109	0.117	0.100	0.135
1995	12	0.132	0.135	0.125	0.145
1996	12	0.113	0.118	0.090	0.146
1997	12	0.134	0.136	0.115	0.157
1998	12	0.084	0.102	0.078	0.127
1999	12	0.161	0.170	0.144	0.196
2000	11	0.289	0.315	0.231	0.398
2001	10	0.335	0.406	0.248	0.563
2002	12	0.408	0.421	0.329	0.512
2003	12	0.149	0.148	0.133	0.163

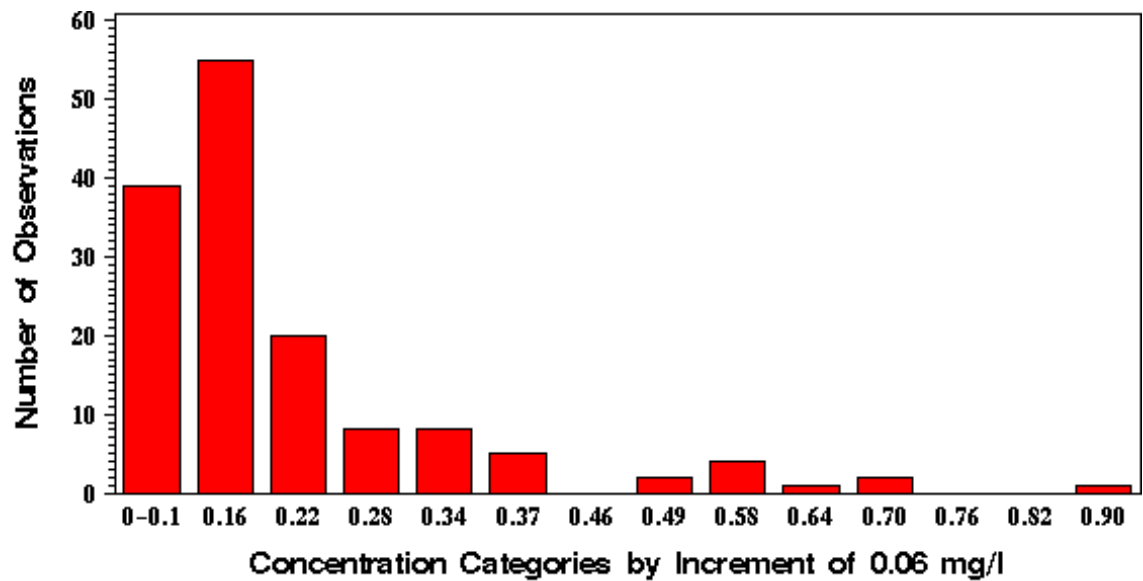
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.759516	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.211345	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.940594	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	10.65408	Pr > A-Sq	<0.0050

Monthly TP Concentration



TP Frequency Distribution



Newnans Lake TSS (1978- 2003)

Descriptive Statistics

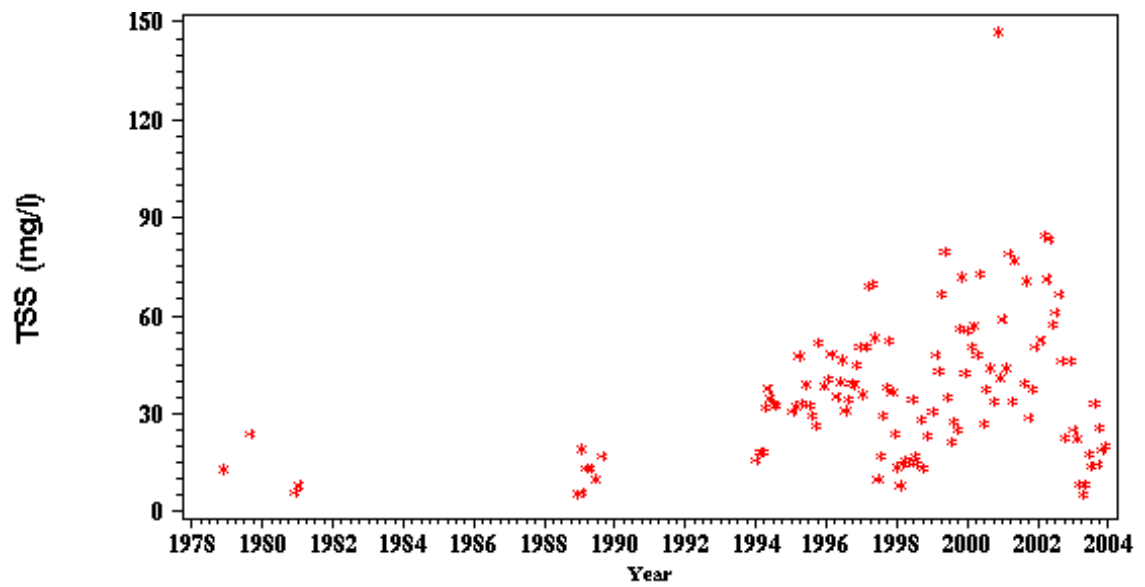
Moments			
N	118	Sum Weights	118
Mean	36.788936	Sum Observations	4341.09444
Std Deviation	21.9493563	Variance	481.774244
Skewness	1.38237919	Kurtosis	4.30021985
Uncorrected SS	216071.832	Corrected SS	56367.5865
Coeff Variation	59.6629279	Std Error Mean	2.02060203

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1978	1	13.000	13.000	.	.
1979	1	24.000	24.000	.	.
1980	1	6.000	6.000	.	.
1981	1	8.000	8.000	.	.
1988	1	5.500	5.500	.	.
1989	6	13.306	13.135	8.155	18.115
1994	8	32.375	27.854	20.535	35.173
1995	10	32.875	36.167	30.292	42.041
1996	11	39.750	40.909	36.785	45.033
1997	12	37.333	40.542	28.403	52.680
1998	11	15.333	17.998	12.915	23.081
1999	12	42.750	45.625	33.345	57.905
2000	11	48.000	55.856	33.867	77.845
2001	10	47.333	51.967	38.762	65.171
2002	10	59.250	59.212	45.771	72.652
2003	12	18.125	17.758	12.534	22.983

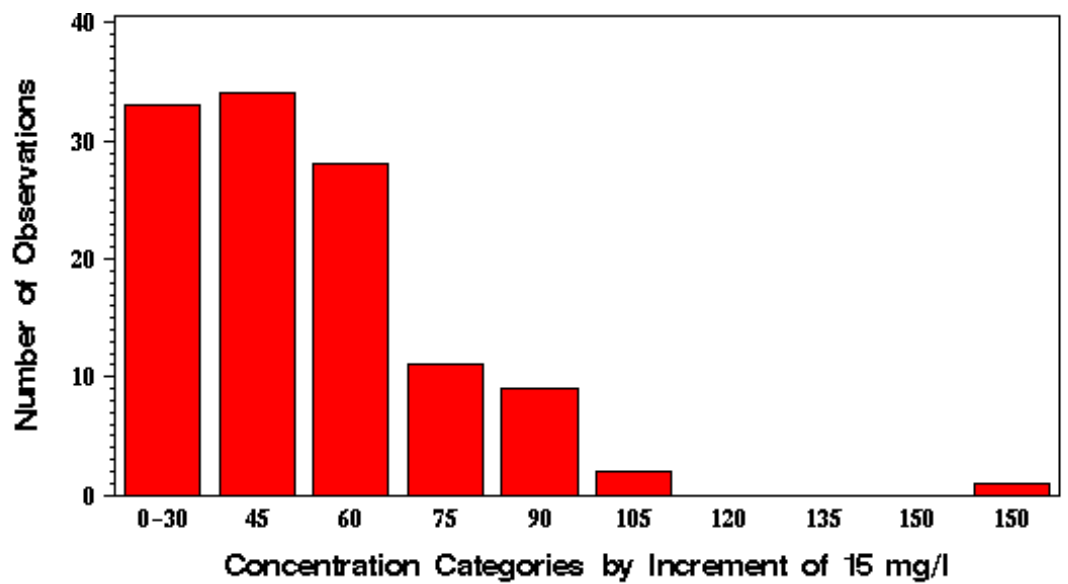
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.913443	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.090412	Pr > D	0.0188
Cramer-von Mises	W-Sq	0.210128	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	1.45524	Pr > A-Sq	<0.0050

Monthly TSS a Concentration



TSS Frequency Distribution



Orange Lake Chlorophyll a (1985- 2003)

Descriptive Statistics

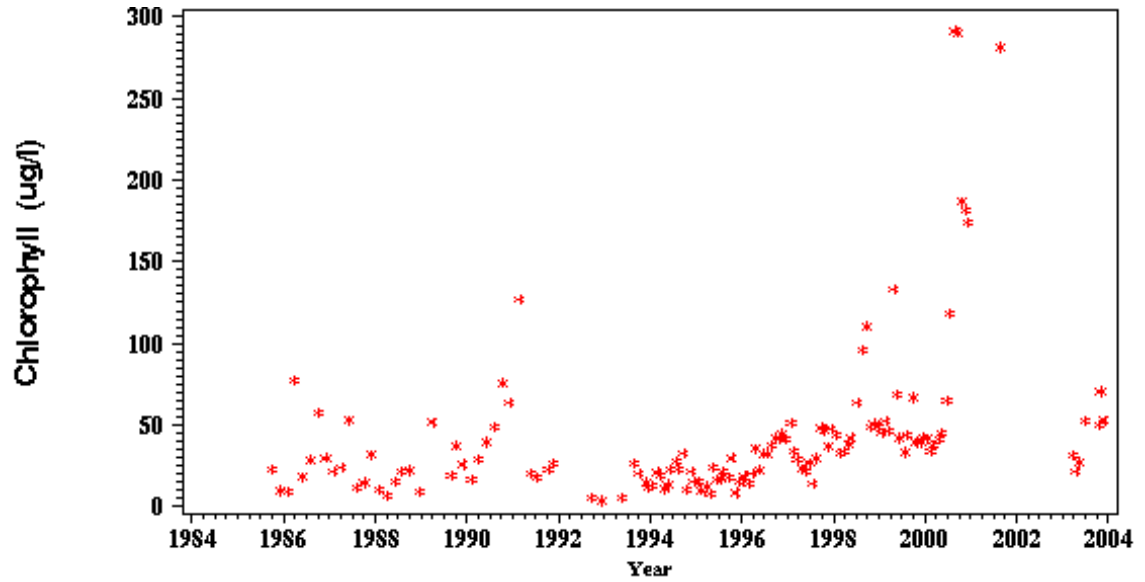
Moments			
N	133	Sum Weights	133
Mean	43.6496995	Sum Observations	5805.41003
Std Deviation	48.9618781	Variance	2397.26551
Skewness	3.44737396	Kurtosis	13.4909397
Uncorrected SS	569843.45	Corrected SS	316439.047
Coeff Variation	112.170023	Std Error Mean	4.24553326

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	16.450	16.450	-67.974	100.874
1986	6	29.234	36.932	10.104	63.760
1987	6	22.817	26.216	10.459	41.973
1988	6	13.069	14.380	7.590	21.170
1989	4	31.643	33.501	10.469	56.533
1990	6	44.348	45.755	22.883	68.627
1991	5	23.298	43.167	-15.249	101.583
1992	2	4.711	4.711	-7.687	17.109
1993	5	14.890	15.859	5.968	25.750
1994	12	20.130	19.471	15.076	23.865
1995	12	15.999	16.498	12.422	20.575
1996	12	34.071	32.024	25.313	38.734
1997	12	31.939	34.299	26.628	41.969
1998	11	49.000	55.640	38.602	72.679
1999	12	44.858	54.651	37.514	71.788
2000	12	91.653	125.794	63.916	187.671
2001	1	281.667	281.667	.	.
2003	7	49.805	43.960	27.846	60.074

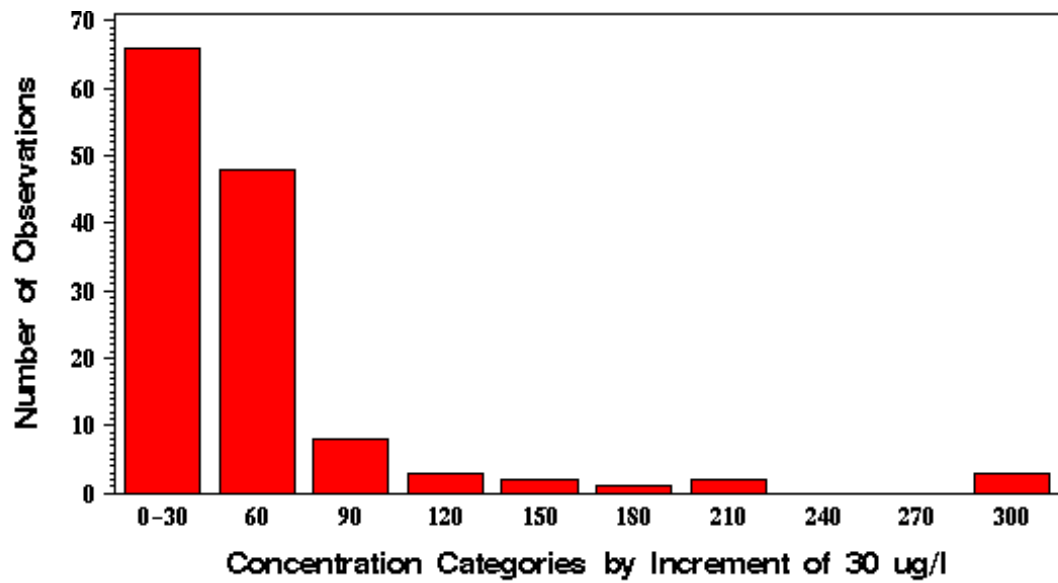
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.594924	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.272557	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.871427	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	15.70595	Pr > A-Sq	<0.0050

Monthly Chlorophyll a Concentration



Chlorophyll Frequency Distribution



Orange Lake DO (1985- 2003)

Descriptive Statistics

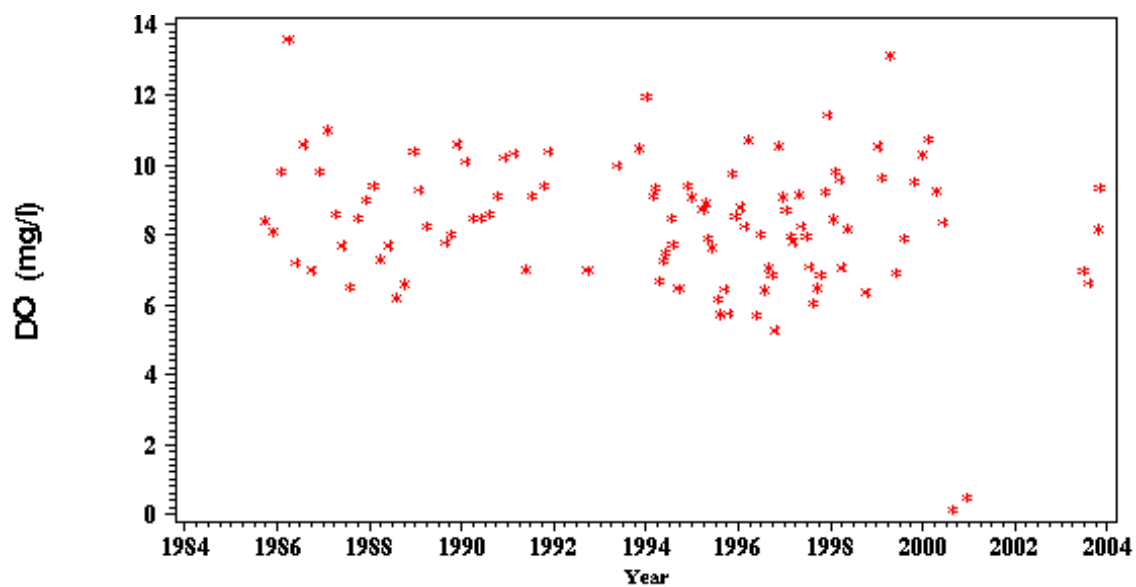
Moments			
N	105	Sum Weights	105
Mean	8.34232765	Sum Observations	875.944403
Std Deviation	1.95402677	Variance	3.81822061
Skewness	-0.950087	Kurtosis	4.35228126
Uncorrected SS	7704.51015	Corrected SS	397.094943
Coeff Variation	23.4230403	Std Error Mean	0.19069349

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	8.250	8.250	6.344	10.156
1986	6	9.800	9.667	7.114	12.219
1987	6	8.550	8.550	6.984	10.116
1988	6	7.500	7.933	6.211	9.656
1989	5	8.250	8.790	7.344	10.237
1990	6	8.850	9.170	8.331	10.009
1991	5	9.400	9.250	7.542	10.958
1992	1	7.000	7.000	.	.
1993	2	10.240	10.240	7.191	13.289
1994	10	8.106	8.392	7.221	9.564
1995	11	7.900	7.701	6.729	8.672
1996	11	8.034	7.888	6.665	9.110
1997	12	7.953	8.079	7.152	9.005
1998	6	8.311	8.241	6.816	9.665
1999	7	9.630	9.704	7.856	11.553
2000	5	8.350	5.802	-0.498	12.102
2003	4	7.563	7.781	5.817	9.745

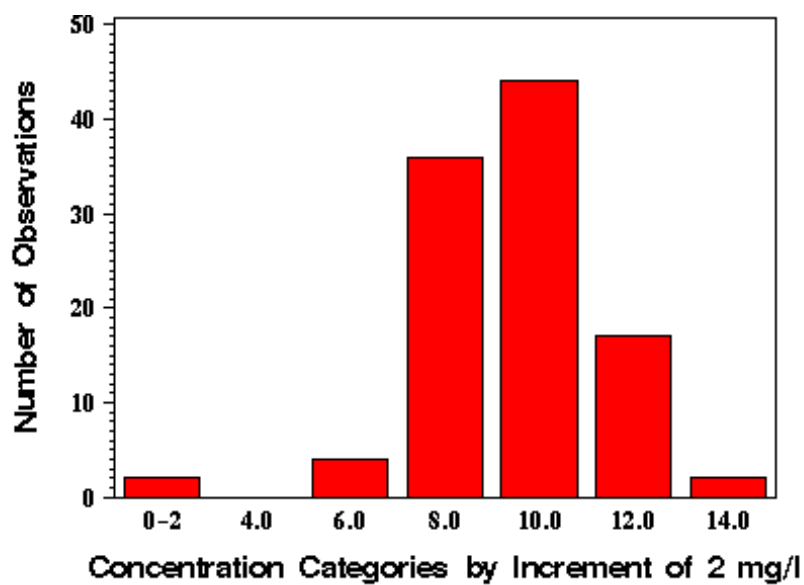
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.925338	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.069462	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.104201	Pr > W-Sq	0.0984
Anderson-Darling	A-Sq	1.042568	Pr > A-Sq	0.0094

Monthly DO Concentration



DO Frequency Distribution



Orange Lake Total Nitrogen (1985- 2003)

Descriptive Statistics

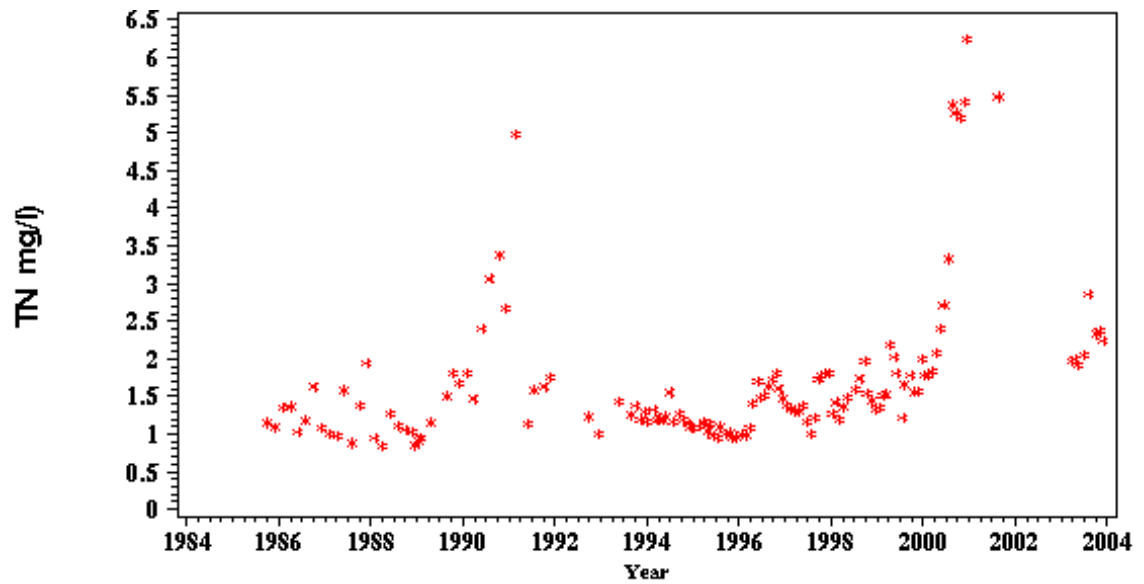
Moments			
N	137	Sum Weights	137
Mean	1.70212028	Sum Observations	233.190479
Std Deviation	0.99707291	Variance	0.99415439
Skewness	2.82537856	Kurtosis	8.32080862
Uncorrected SS	532.12324	Corrected SS	135.204997
Coeff Variation	58.5782874	Std Error Mean	0.08518569

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	1.127	1.127	0.764	1.489
1986	6	1.275	1.281	1.047	1.514
1987	6	1.194	1.298	0.864	1.732
1988	7	1.026	1.021	0.881	1.162
1989	6	1.333	1.338	0.931	1.744
1990	6	2.539	2.468	1.701	3.236
1991	5	1.637	2.225	0.288	4.161
1992	2	1.117	1.117	-0.379	2.613
1993	5	1.308	1.313	1.194	1.433
1994	12	1.200	1.232	1.155	1.309
1995	12	1.035	1.048	1.000	1.096
1996	12	1.499	1.458	1.277	1.638
1997	12	1.368	1.442	1.264	1.619
1998	11	1.453	1.490	1.341	1.639
1999	12	1.618	1.689	1.506	1.871
2000	12	3.026	3.623	2.521	4.724
2001	1	5.483	5.483	.	.
2003	8	2.147	2.224	1.964	2.483

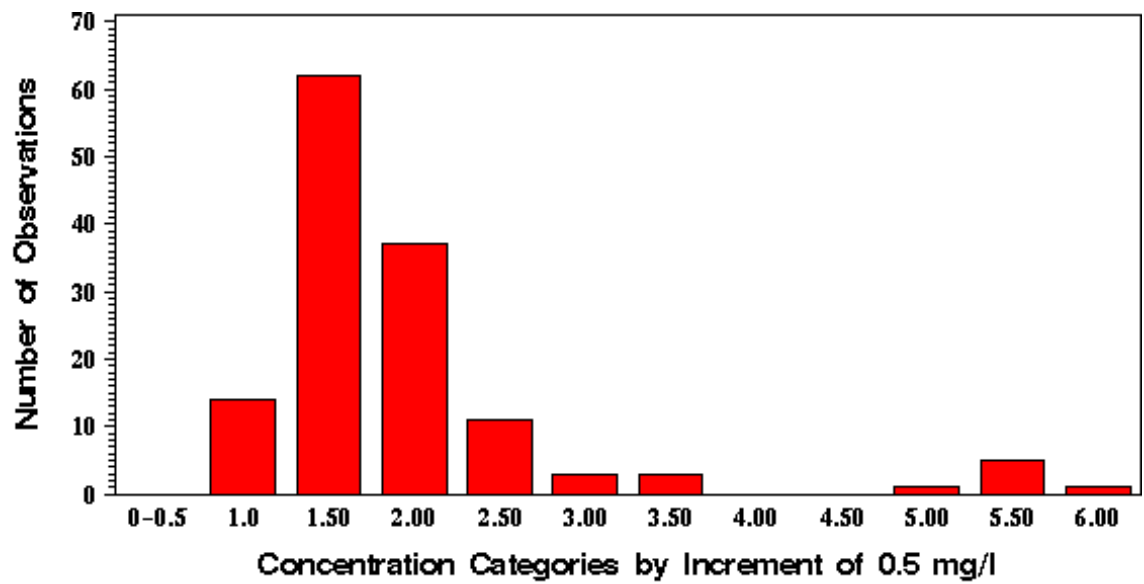
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.647462	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.240339	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.52759	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	14.55758	Pr > A-Sq	<0.0050

Monthly TN Concentration



TN Frequency Distribution



Orange Lake Secchi (1985- 2003)

Descriptive Statistics

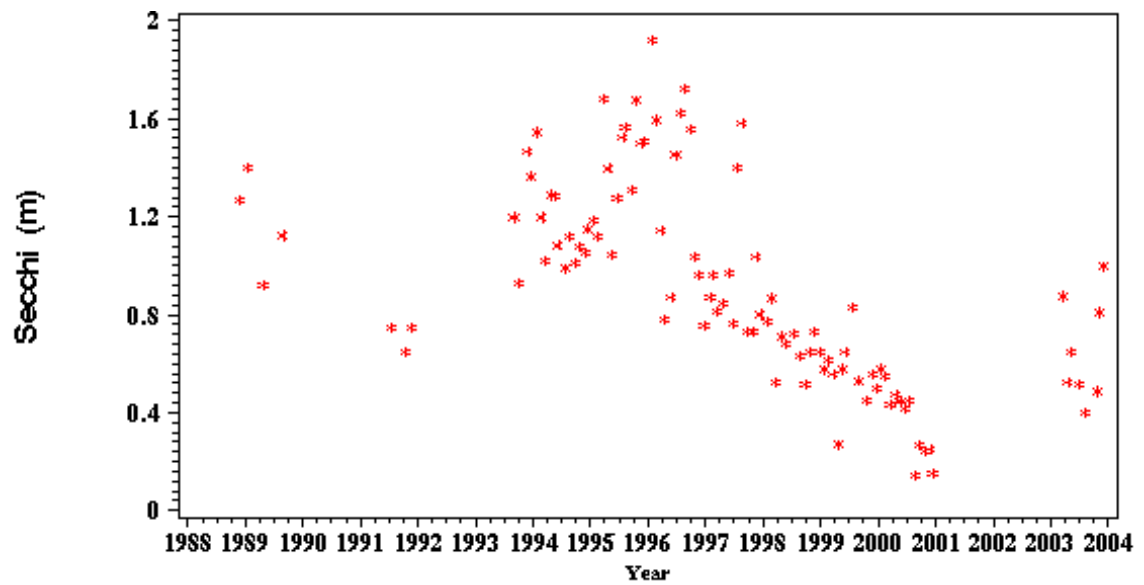
Moments			
N	101	Sum Weights	101
Mean	0.9180827	Sum Observations	92.7263524
Std Deviation	0.40883801	Variance	0.16714852
Skewness	0.32400188	Kurtosis	-0.6810967
Uncorrected SS	101.845312	Corrected SS	16.714852
Coeff Variation	44.5317196	Std Error Mean	0.0406809

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1988	1	1.273	1.273	.	.
1989	3	1.125	1.150	0.558	1.742
1991	3	0.750	0.717	0.573	0.860
1993	4	1.282	1.241	0.864	1.617
1994	12	1.104	1.154	1.053	1.255
1995	12	1.449	1.401	1.266	1.535
1996	12	1.301	1.288	1.030	1.545
1997	12	0.859	0.960	0.789	1.132
1998	11	0.680	0.678	0.610	0.747
1999	12	0.556	0.556	0.465	0.647
2000	12	0.427	0.368	0.273	0.463
2001	1	.	.	.	.
2003	8	0.588	0.658	0.479	0.837

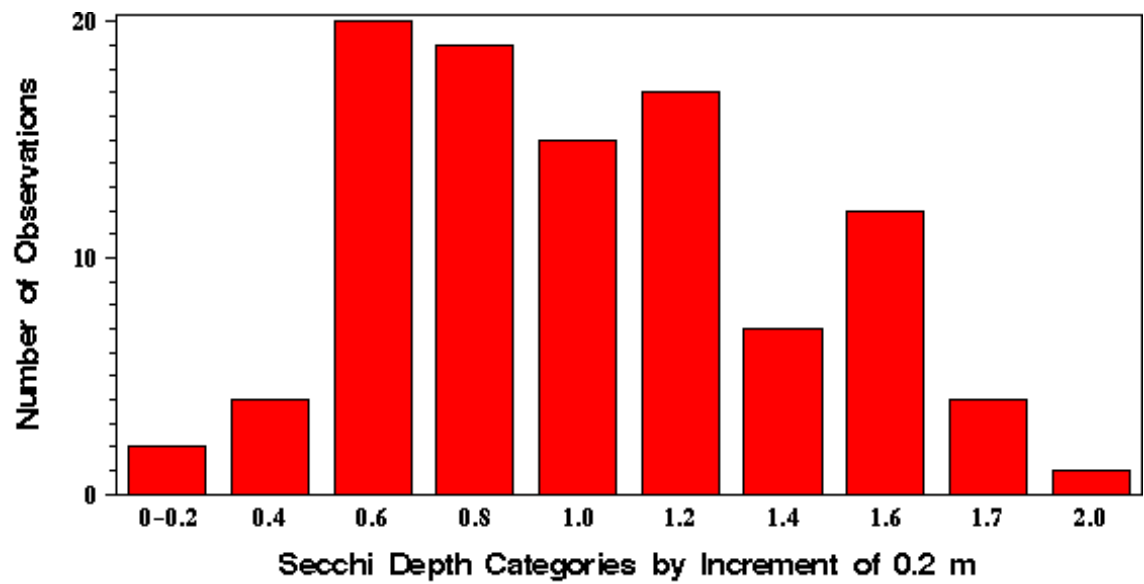
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.973733	Pr < W	0.0412
Kolmogorov-Smirnov	D	0.075626	Pr > D	>0.1500
Cramer-von Mises	W-Sq	0.134785	Pr > W-Sq	0.0393
Anderson-Darling	A-Sq	0.849341	Pr > A-Sq	0.0285

Monthly Secchi Depth



Secchi Frequency Distribution



Orange Lake TOC (1985- 2003)

Descriptive Statistics

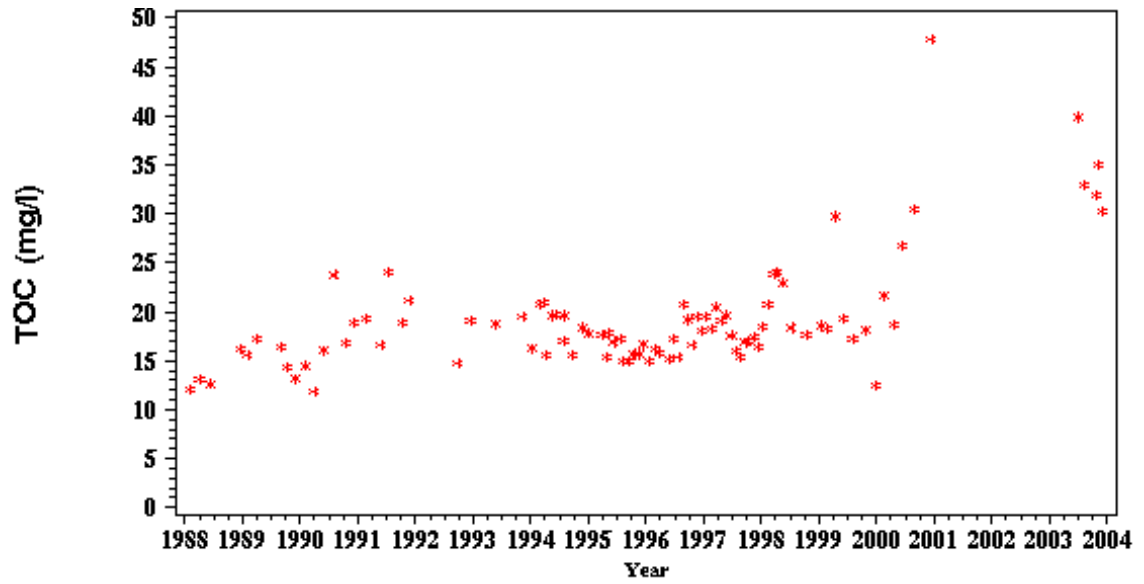
Moments			
N	92	Sum Weights	92
Mean	19.235157	Sum Observations	1769.63445
Std Deviation	5.79663111	Variance	33.6009322
Skewness	2.44857718	Kurtosis	7.70795937
Uncorrected SS	37096.8814	Corrected SS	3057.68483
Coeff Variation	30.1356058	Std Error Mean	0.60434057

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1988	4	12.880	13.510	10.601	16.419
1989	5	15.660	15.386	13.380	17.392
1990	6	16.450	16.992	12.704	21.280
1991	5	19.400	20.040	16.563	23.517
1992	2	16.975	16.975	-10.661	44.611
1993	2	19.200	19.200	14.118	24.282
1994	10	19.020	18.367	16.868	19.865
1995	11	16.725	16.465	15.707	17.222
1996	11	16.650	17.208	15.885	18.531
1997	12	17.510	17.827	16.804	18.850
1998	7	20.757	20.919	18.371	23.467
1999	7	18.290	19.156	14.353	23.958
2000	5	26.780	29.112	14.948	43.276
2003	5	32.920	34.018	29.403	38.632

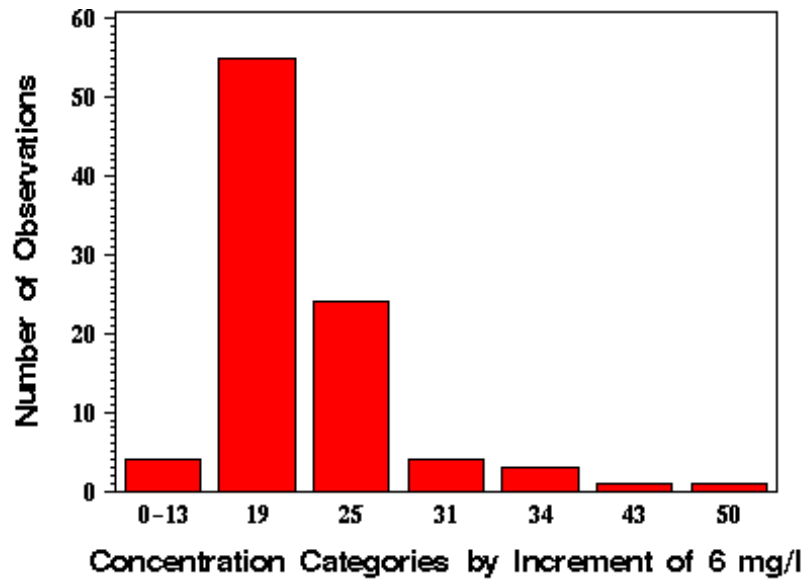
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.757865	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.239781	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.224104	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	6.654033	Pr > A-Sq	<0.0050

Monthly TOC Concentration



TOC Frequency Distribution



Orange Lake Total Phosphorus (1985- 2003)

Descriptive Statistics

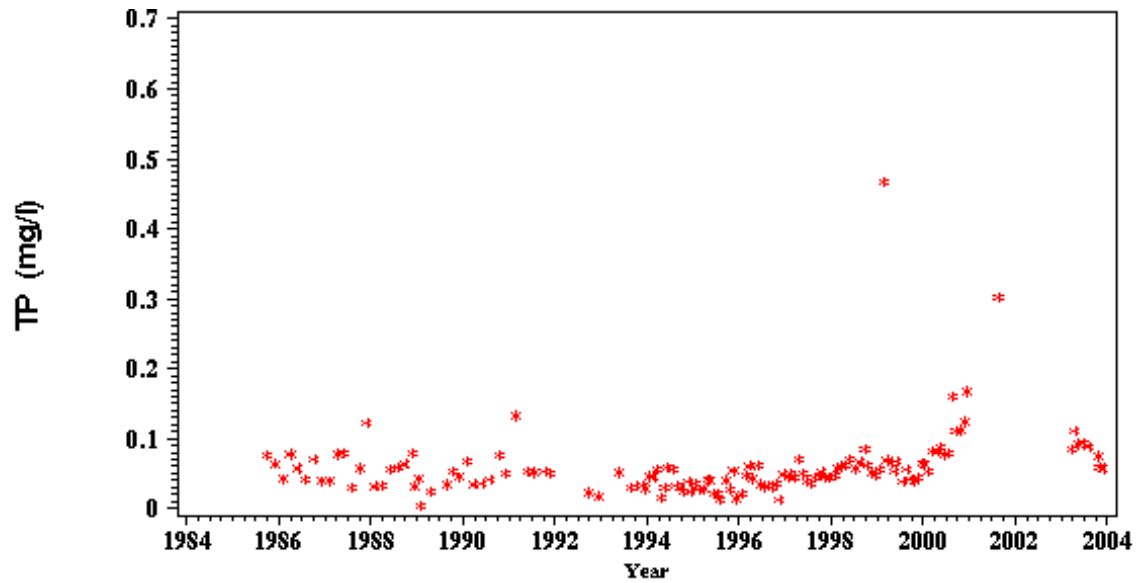
Moments			
N	137	Sum Weights	137
Mean	0.05899514	Sum Observations	8.08233371
Std Deviation	0.04912748	Variance	0.00241351
Skewness	5.35072576	Kurtosis	38.7859339
Uncorrected SS	0.80505562	Corrected SS	0.32823724
Coeff Variation	83.2737766	Std Error Mean	0.00419724

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	0.071	0.071	-0.012	0.153
1986	6	0.051	0.055	0.038	0.072
1987	6	0.068	0.068	0.033	0.103
1988	7	0.056	0.051	0.034	0.068
1989	6	0.039	0.034	0.016	0.053
1990	6	0.046	0.051	0.033	0.069
1991	5	0.054	0.069	0.024	0.113
1992	2	0.020	0.020	-0.015	0.055
1993	5	0.032	0.035	0.024	0.047
1994	12	0.036	0.039	0.030	0.048
1995	12	0.028	0.031	0.023	0.039
1996	12	0.036	0.039	0.030	0.048
1997	12	0.045	0.047	0.042	0.053
1998	11	0.061	0.061	0.054	0.068
1999	12	0.056	0.089	0.013	0.165
2000	12	0.085	0.100	0.077	0.123
2001	1	0.303	0.303	.	.
2003	8	0.087	0.083	0.068	0.098

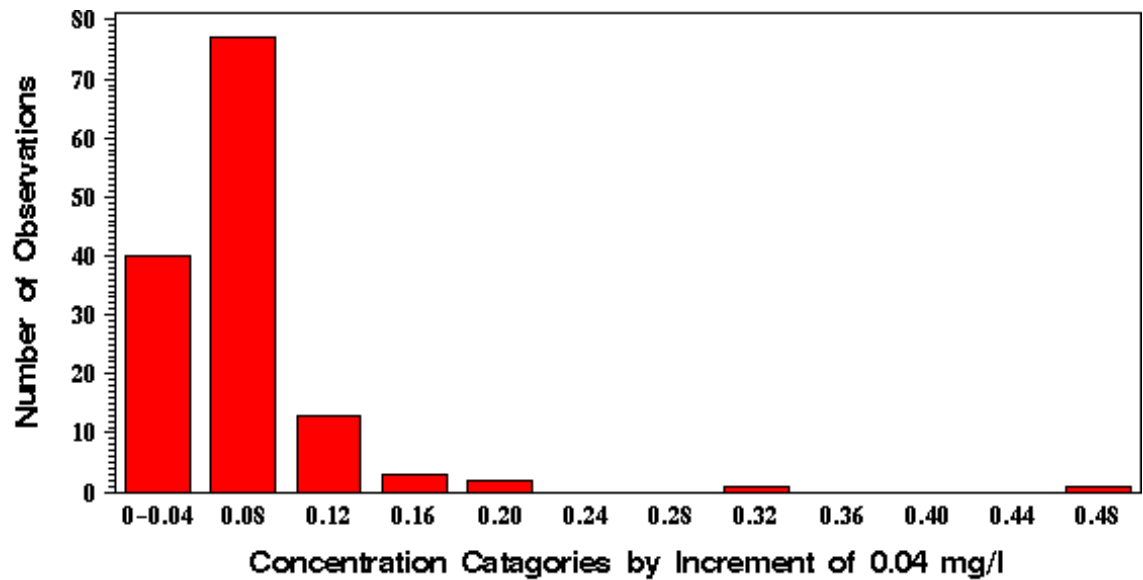
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.555463	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.204098	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.271565	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	12.80819	Pr > A-Sq	<0.0050

Monthly TP Concentration



TP Frequency Distribution



Orange Lake TSS (1985- 2003)

Descriptive Statistics

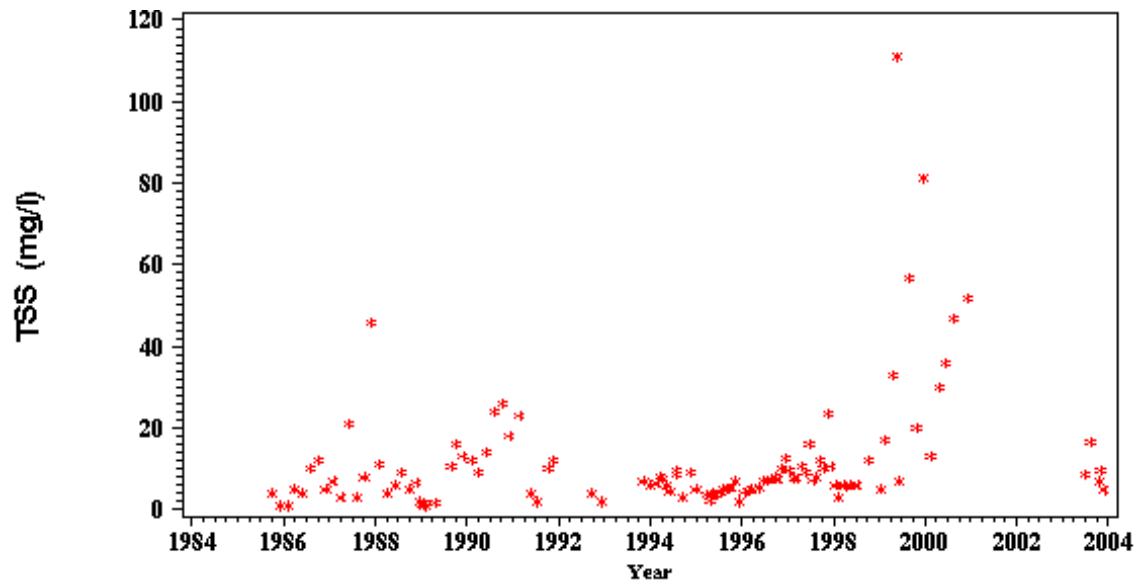
Moments			
N	111	Sum Weights	111
Mean	11.8365991	Sum Observations	1313.8625
Std Deviation	15.5122999	Variance	240.631447
Skewness	3.88218411	Kurtosis	18.6666888
Uncorrected SS	42021.1229	Corrected SS	26469.4592
Coeff Variation	131.05369	Std Error Mean	1.47236234

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	2.500	2.500	-16.559	21.559
1986	6	5.000	6.167	1.895	10.438
1987	6	7.500	14.667	-2.877	32.210
1988	7	6.000	6.250	3.447	9.053
1989	6	6.208	7.319	0.301	14.338
1990	6	16.000	17.167	10.067	24.266
1991	5	10.000	10.200	-0.054	20.454
1992	2	3.000	3.000	-9.706	15.706
1993	2	3.000	3.000	-47.825	53.825
1994	10	7.000	6.918	5.393	8.442
1995	11	4.100	4.307	3.320	5.295
1996	11	7.267	7.273	5.561	8.986
1997	12	9.896	11.058	8.102	14.014
1998	7	6.000	6.400	3.898	8.902
1999	8	26.500	41.414	9.299	73.528
2000	5	36.000	35.600	16.554	54.646
2003	5	8.700	9.367	3.918	14.815

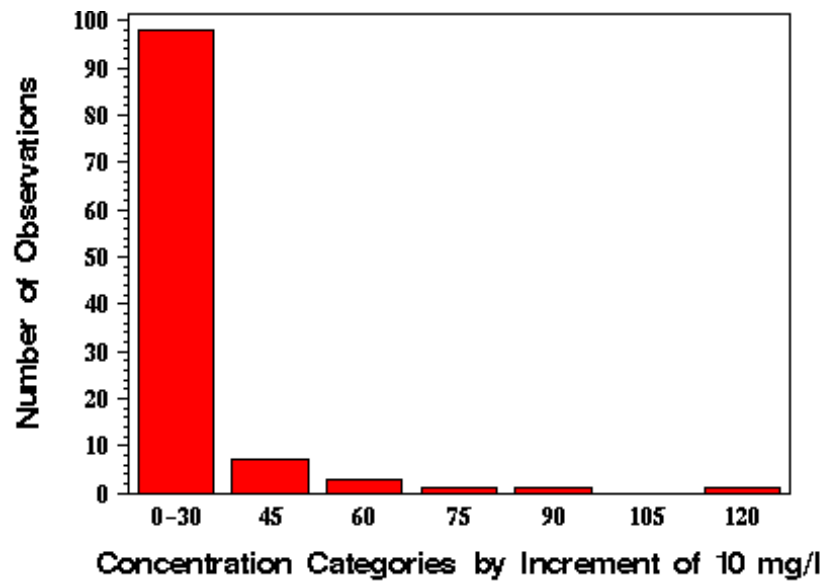
Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.568307	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.280919	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.80669	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	14.56768	Pr > A-Sq	<0.0050

Monthly TSS a Concentration



TSS Frequency Distribution



Orange Lake Turbidity (1985- 2003)

Descriptive Statistics

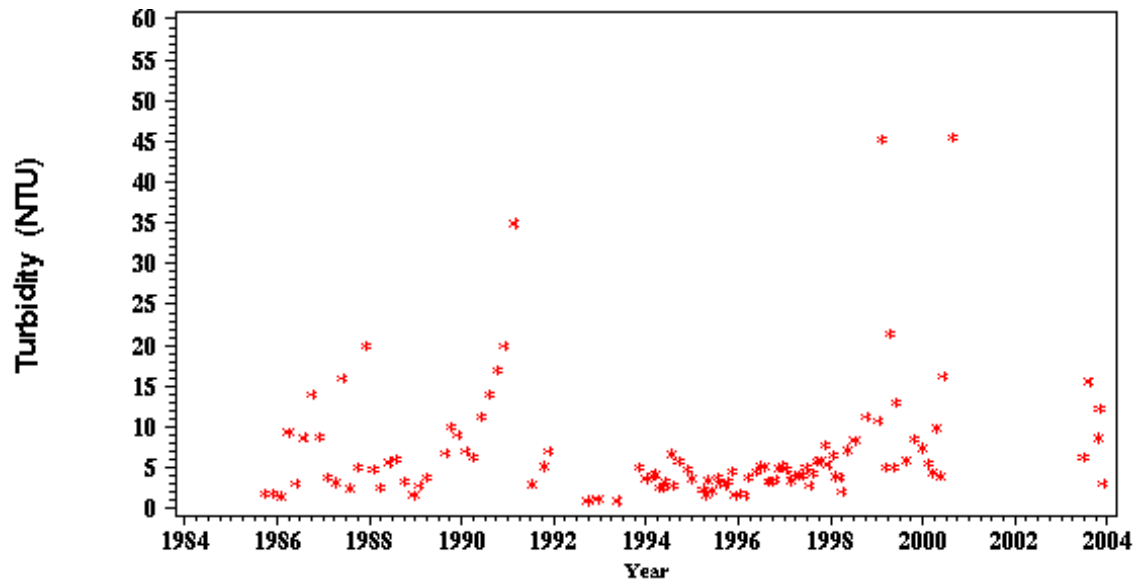
Moments			
N	111	Sum Weights	111
Mean	7.41609921	Sum Observations	823.187012
Std Deviation	8.87723894	Variance	78.8053712
Skewness	3.78781025	Kurtosis	16.8395781
Uncorrected SS	14773.4274	Corrected SS	8668.59083
Coeff Variation	119.702268	Std Error Mean	0.84259023

Year	Number of Months	Annual Median	Annual Average	Lower 95% Confidence interval	Upper 95% Confidence interval
1985	2	1.900	1.900	.	.
1986	6	8.750	7.583	2.790	12.377
1987	6	4.450	8.433	0.497	16.370
1988	6	4.100	4.050	2.200	5.900
1989	5	6.900	6.520	2.638	10.402
1990	6	12.600	12.600	6.894	18.306
1991	4	6.100	12.550	-11.407	36.507
1992	2	1.100	1.100	-0.171	2.371
1993	2	3.000	3.000	-22.412	28.412
1994	10	3.875	4.067	3.085	5.048
1995	11	3.140	2.980	2.370	3.590
1996	11	3.900	3.901	3.010	4.793
1997	12	4.619	4.816	3.982	5.651
1998	7	6.604	6.211	3.315	9.107
1999	9	8.590	13.607	3.644	23.569
2000	7	9.900	20.881	-0.199	41.961
2003	5	8.675	9.225	3.165	15.285

Normality Test

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.565958	Pr < W	<0.0001
Kolmogorov-Smirnov	D	0.249741	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.636288	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	14.11331	Pr > A-Sq	<0.0050

Monthly Turbidity



Turbidity Frequency Distribution

