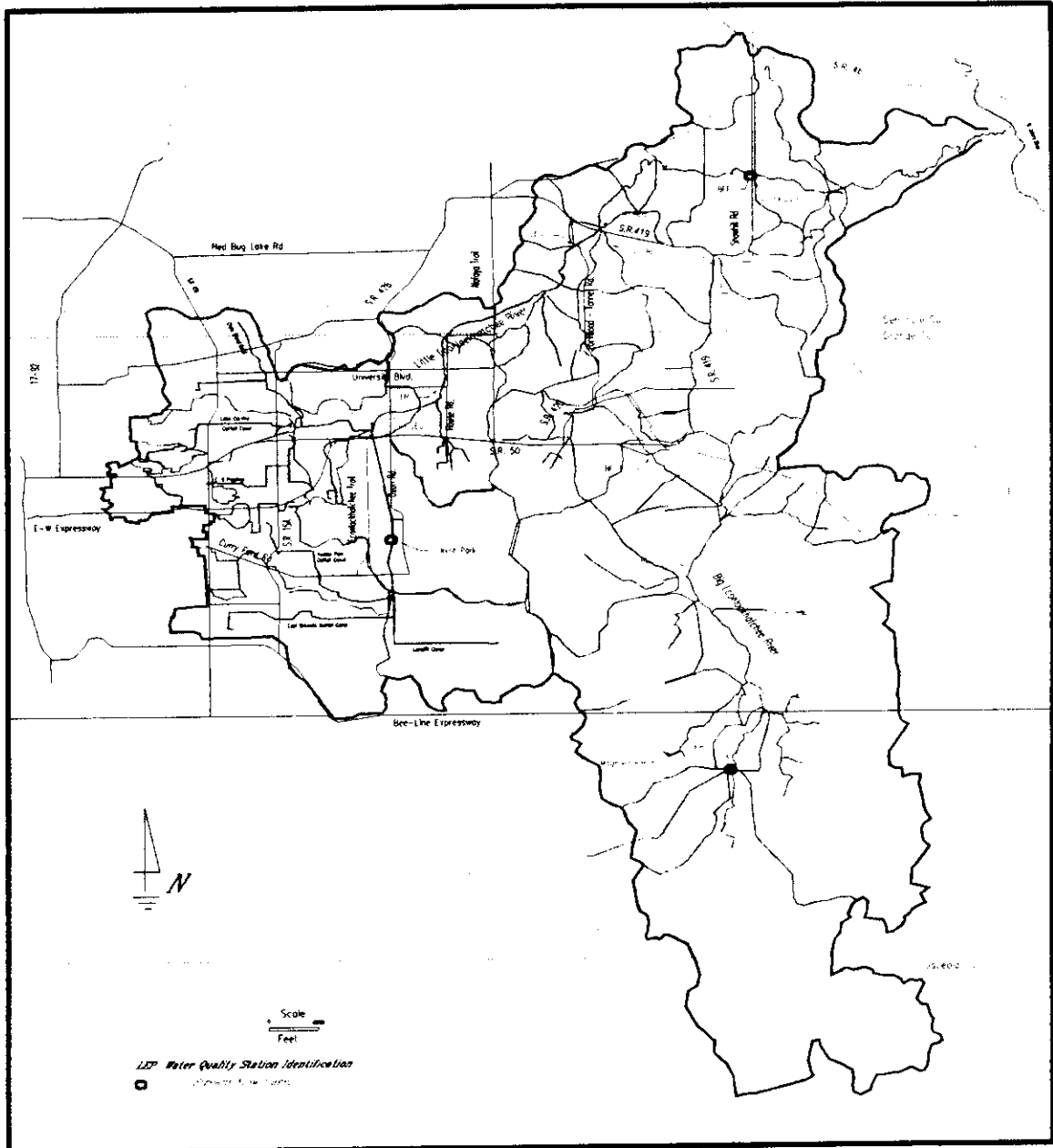


**Summary of Historical Water Quality
in the Econlockhatchee River
(1971-1991)**



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ACKNOWLEDGMENTS AND DEDICATION

The authors wish to thank all those who spent time to collect water samples and conduct laboratory analyses at the Orange County Environmental Protection Department and the State Department of Environmental Regulation over the past 20 years. We **dedicate** this report to them. Also, from these departments, the guidance and direction provided by James Hulbert, Jim Bradner, and John Bateman are very much appreciated. The authors also would like to thank all student assistants who helped prepare this report; Lori Webb-Paris, Chad Luedtke, and Samatha McReynolds.

Marty Wanielista
Ron Eaglin

TABLE OF CONTENTS

Acknowledgements and Dedication	i
Introduction	1
Background Conditions	1
Description of Water Quality Analysis	3
Water Quality Changes as Function of Time	5
Pre vs Post 1983 Statistical Comparisons	58
Graphical Comparison of Time and Location.....	61
Probability Frequency Distributions	70

INTRODUCTION

The reason for this report is to present a summary of historical water quality data for the Little and Big Econlockhatchee Rivers in east Central Florida. The data summaries indicate in general an improvement in water quality beginning in the year 1983 which was the approximate year when regionalization of and improvement in wastewater treatment occurred. However, after the regionalization of the wastewater treatment facilities, there remains some water quality problems in the River, some of which may be related to high flow conditions.

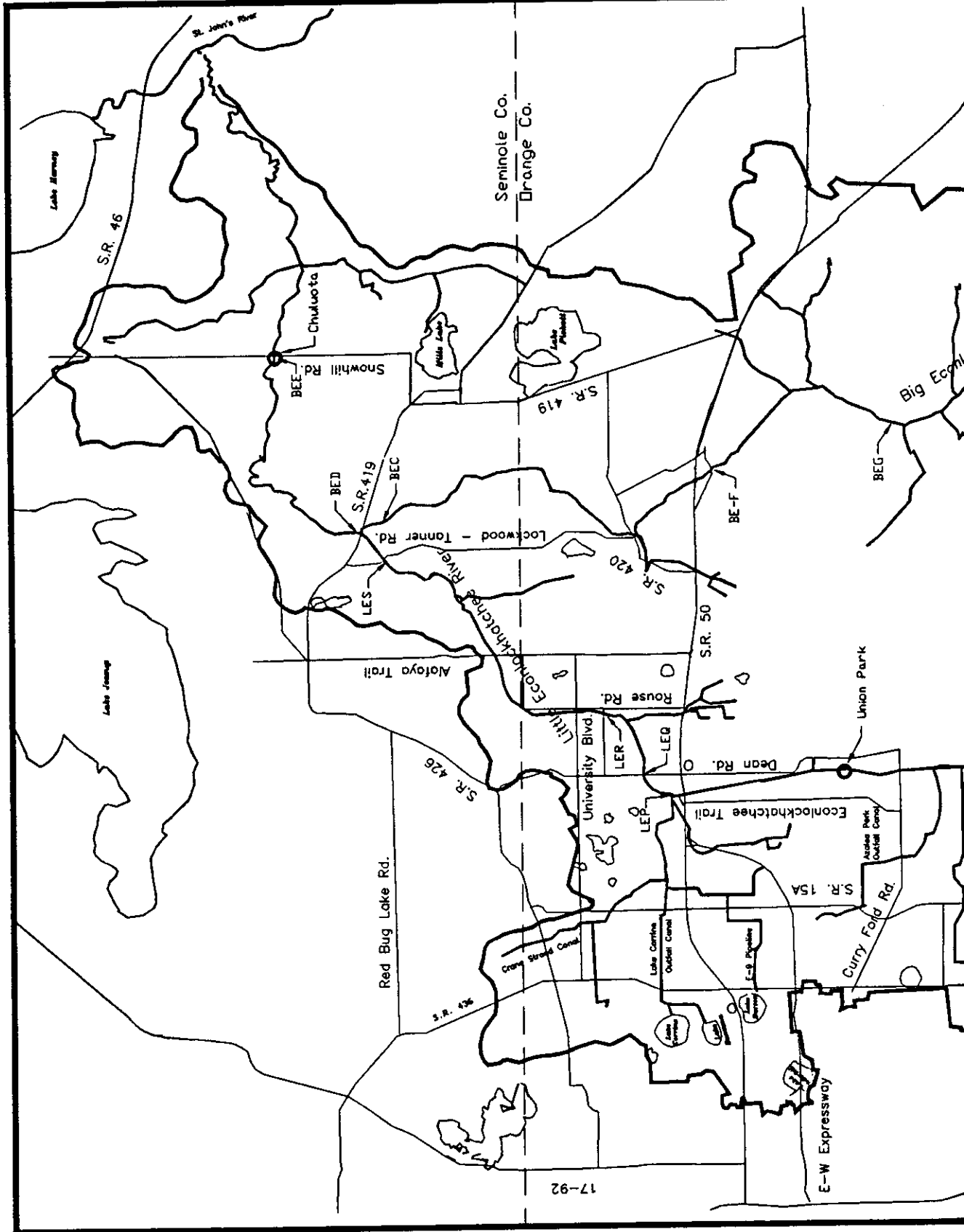
The water quality data were analyzed using statistical and graphical methods. The results are presented in four forms;

- (1) water quality changes as a function of time,
- (2) pre versus post 1983 statistical data comparisons,
- (3) graphical comparisons of sampling time and location, and
- (4) probability frequency distributions for each location for the pre and post 1983 time period.

The frequency distributions and graphical comparisons should serve as a base line for future water quality comparisons, especially in relationship to land use changes and stormwater management practices.

BACKGROUND CONDITIONS

Prior to 1983 the Little Econlockhatchee had a number of domestic wastewater point sources that were substantially combined into a regional treatment system. Before regionalization, these sources presumably contributed to a high level of total nitrogen (TN), total phosphorus (TP), and biochemical oxygen demand (BOD); and lower dissolved oxygen (DO) in the Econlockhatchee River. To date, no water quality comparisons have been completed to document the assumed water quality improvement. There are 6 water quality sampling sites on the Big Econlockhatchee and 4 on the Little Econlockhatchee as shown on the attached watershed map. All of the sampling sites on the River that are downstream of the wastewater plants illustrate water quality improvement after the regionalization and improvement of the wastewater treatment facilities. Four of the sampling sites on the Big Econlockhatchee River should never reflect the effects of improved treatment because the sites are upstream of discharges from the sewage treatment facilities and have experienced relatively little development. These sites are BEH, BEG, BEF, and BEC. These sites are all located upstream of any point sources. Any significant changes in pollution concentrations at these sites may be due to stormwater regulations which started in 1981.



17-92

E-W Expressway

Curry Fold Rd

S.R. 15A

Asheek Park Outfall Canal

L-8 Pipeline

Lake Canine Outfall Canal

Copy Street Canal

S.R. 15

Red Bug Lake Rd.

S.R. 426

Alofaya Trail

ECONOKHATCHEE RING

Lockwood - Tanner Rd

S.R. 419

BE-F

BE-C

BE-D

S.R. 419

BEE

Snowhill Rd

Chuluota

S.R. 46

Lake Harvey

St. John's River

Seminole Co.
Orange Co.

Big Econ

BEG

Union Park

University Blvd

Rouse Rd.

S.R. 50

Dean Rd.

LER

LED

LER

LER

LER

LER

LER

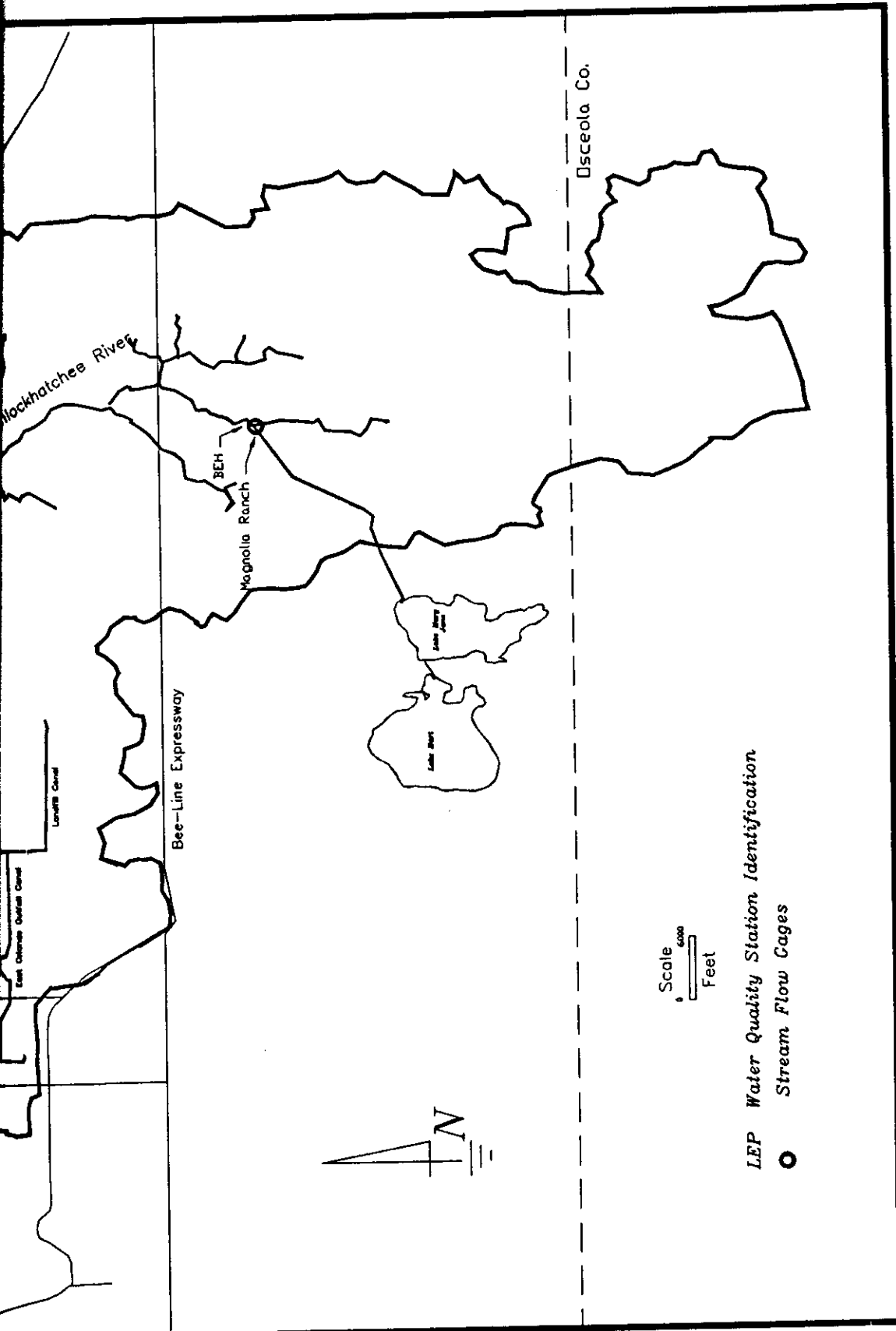


Figure 1. Vicinity Map and Water Quality Stations

DESCRIPTION OF WATER QUALITY ANALYSIS

Data Summary

Water quality data for the Little Econlockhatchee and the Big Econlockhatchee River were obtained from the Orange County Pollution Control Department. The data sites are designated by three and four letter codes. The first letters of any code designates the river basin from which the samples were taken: LE - Little Econlockhatchee River, BE - Big Econlockhatchee River. The following sites were included in the water quality analysis:

BEC - Big Econlockhatchee above Confluence with Little Econlockhatchee River

BED - Big Econlockhatchee at State Road 419

BEE - Big Econlockhatchee at Snow Hill Road

BEF - Big Econlockhatchee at Old Cheney Highway

BEG - Big Econlockhatchee at Power Line at Ranger Drainage District

BEH - Big Econlockhatchee at Wood Bridge at Magnolia Ranch

LEP - Little Econlockhatchee at Econlockhatchee Trail

LEQ - Dean Road at Michaels Dam

LER - Little Econlockhatchee at Buck Road

LES - Little Econlockhatchee above Confluence with Big Econlockhatchee River.

Analysis Summary

The water quality parameters analyzed in detail are Total Nitrogen, Bicochemical Oxygen Demand, Total Phosphorus, and Dissolved Oxygen. A number of metals were also analyzed; these metals are Iron, Copper, Lead, Zinc, and Cadmium. The lack of data on some of the metals means that some of the analyses are incomplete.

The distribution analysis procedure followed these steps:

1. Input of data from copied forms obtained from Orange County Pollution Control - The data were originally input into a Quattro Pro™ spreadsheet, the data were later transferred to a Microsoft Excel™ spreadsheet. The data which were input to the spreadsheet were; Date, Temperature, Dissolved Oxygen Concentration, Biochemical Oxygen Demand, Total Phosphorus Concentration, Total Organic Nitrogen Concentration, Total Kjeldahl Nitrogen Concentration, Total Nitrogen Concentration, Iron Concentration, Copper Concentration, Lead Concentration, Zinc Concentration, Cadmium Concentration, Alakalinity, Caclium Concentration, Chlorides Concentration, Conductivity, Hardness, Potassium Concentration, Magnesium Concentration, Sodium Concentration, and Total Solids Concentration.

2. Transfer of selected data ranges to DISTRIB - From the spreadsheet data ranges of the selected water quality constituents were exported as text files. These text files were then

imported into DISTRIB. The water quality parameters transferred were Dissolved Oxygen, Biochemical Oxygen Demand, Total Phosphorus, and Total Nitrogen. The ranges selected were the entire available range of data and all data since the year 1983.

3. Distribution Analysis - The data were tested to determine which frequency distribution best fit the data. The distribution which were compared were the Normal, 2 Parameter Log Normal, 3-Parameter Log Normal, Gumbel, Pearson, and Log Pearson. From the results of the distribution analysis a distribution was selected which gave the best fit of the data based on the sum of squared errors and a visual inspection of the plotted data. This distribution was then used to give a prediction of the maximum and minimum values for the parameter. The exceedence probabilities calculated were 99%, 98%, 90%, 80%, 50%, 20%, 10%, 2%, and 1%.

4. Plotting of Distribution Analysis Results - The results of the distribution analysis are then plotted as areal isopleths against location and exceedence probability.

Along with the distribution analysis the points were also directly plotted on as parameter vs. date and the averages for 5 year increments were computed and plotted as Location vs. Year vs. Value on a 3 dimensional bar chart.

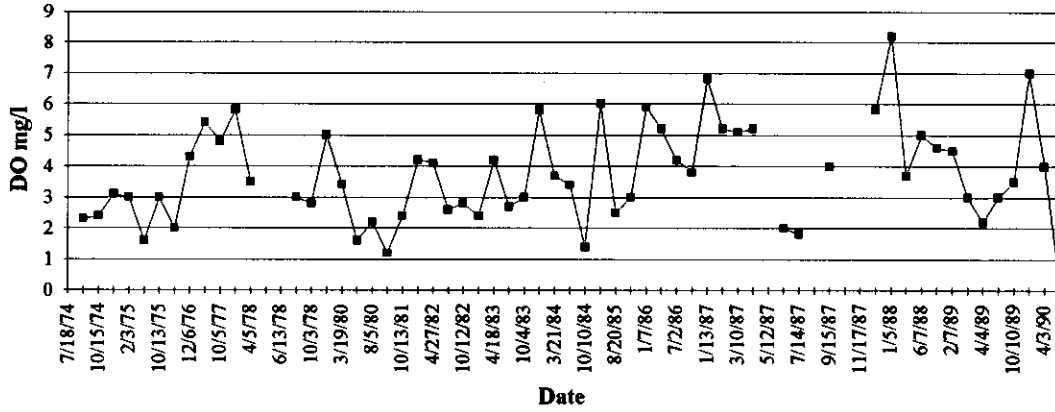
WATER QUALITY CHANGES AS A FUNCTION OF TIME

All reported concentration data for dissolved oxygen, biochemical oxygen demand, total nitrogen, and total phosphorus were plotted as a function of time. Thus, the graphs indicate the existence of a change in the concentration with time. The graphs are arranged in the order of stream flow or the upstream location is presented before the downstream location, with the Little Econlockhatchee before the Big Econlockhatchee. For some sampling dates, no data were reported presumably because of sampling, transport, or laboratory analysis difficulties. The upper reach of the Big Econlockhatchee River frequently does not flow during the spring and early summer months, thus no samples were taken during those time periods. When no data were reported for a sampling time, the previous plotted data point was not connected to the next plotted data point. Thus the graphical representation indicates the recovery of data related to the number of field data collection visits.

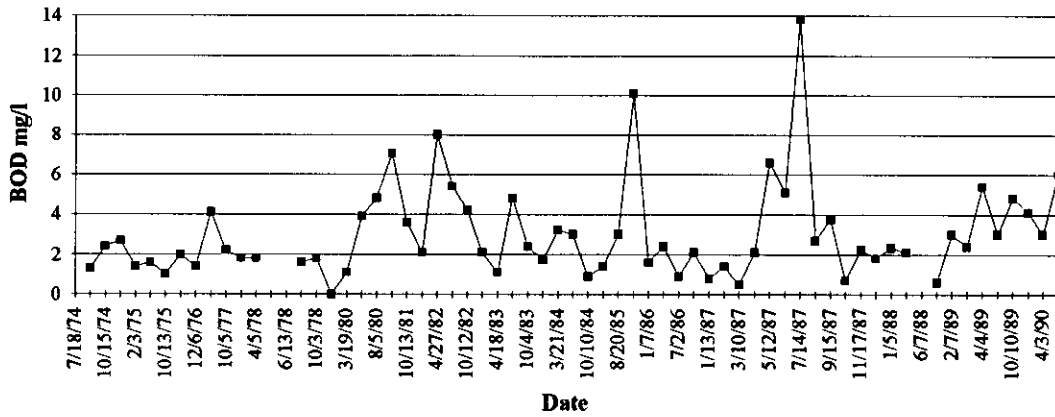
From observation of the concentration versus time graphical presentations, an increase in water quality is observed around 1983, which corresponds to the approximate time for improvement and regionalization of sewage treatment facilities. Dissolved Oxygen increased while BOD₅, TP, and TN all decreased. The improvement is noted for all sites on the Little Econlockhatchee and sites D and E on the Big Econlockhatchee River. The other sites are not affected by discharge from sewage treatment facilities. A decrease in Phosphorus concentration was recorded in about 1975, at which time phosphorus in detergents was significantly reduced. There remains in the database frequent times when the concentrations change and could represent poor water quality conditions. Some of these lower DO levels and higher TP and TN levels are related to high flow conditions and presumably are caused by non-point sources.

Water Quality Time Plots for Site BEH
Big Econlockhatchee at Wood Bridge at Magnolia Ranch

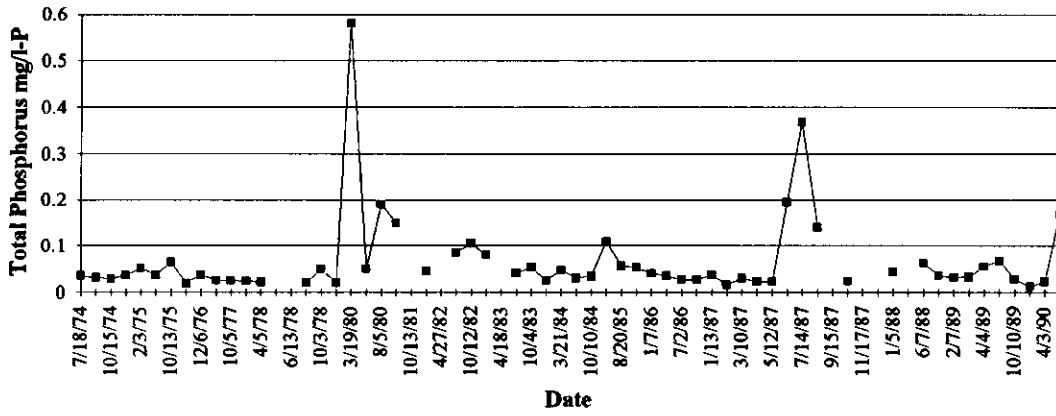
Dissolved Oxygen - BEH
Location - Wood Bridge at Magnolia Ranch



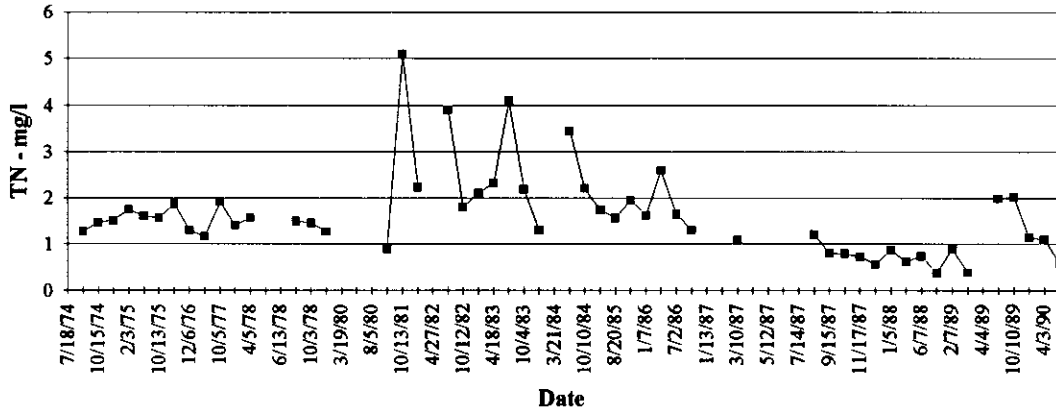
Biochemical Oxygen Demand - BEH
Location - Wood Bridge at Magnolia Ranch



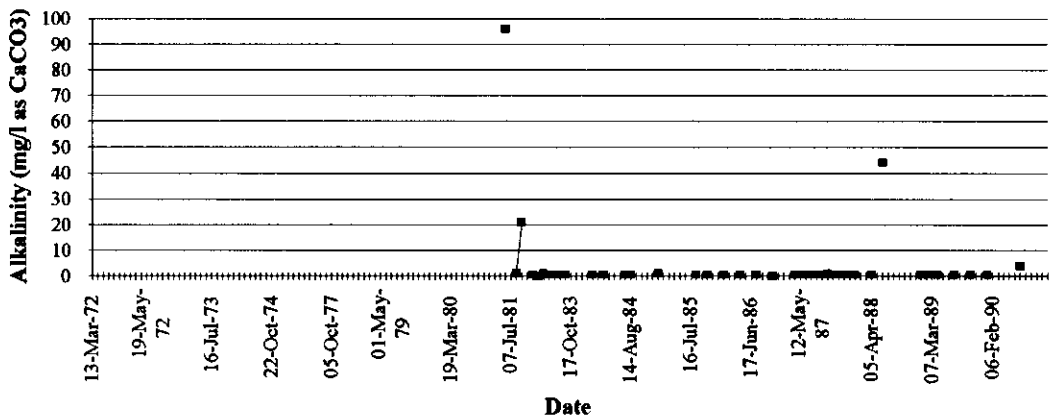
Total Phosphorus - BEH
Location - Wood Bridge at Magnolia Ranch



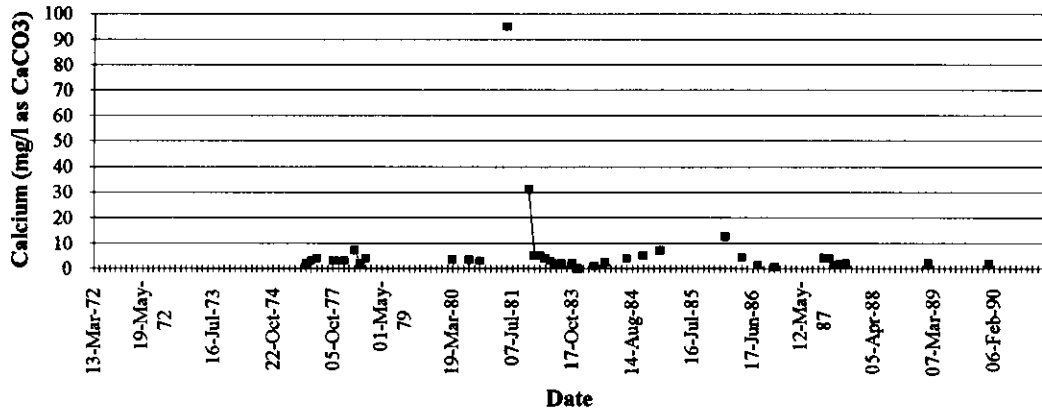
Total Nitrogen - BEH
Location - Wood Bridge at Magnolia Ranch



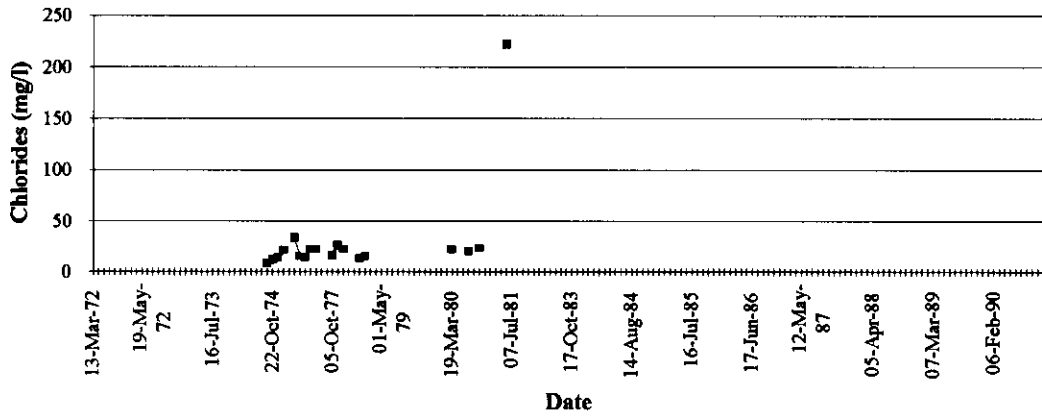
Alkalinity - BEH
Location - Wood Bridge at Magnolia Ranch



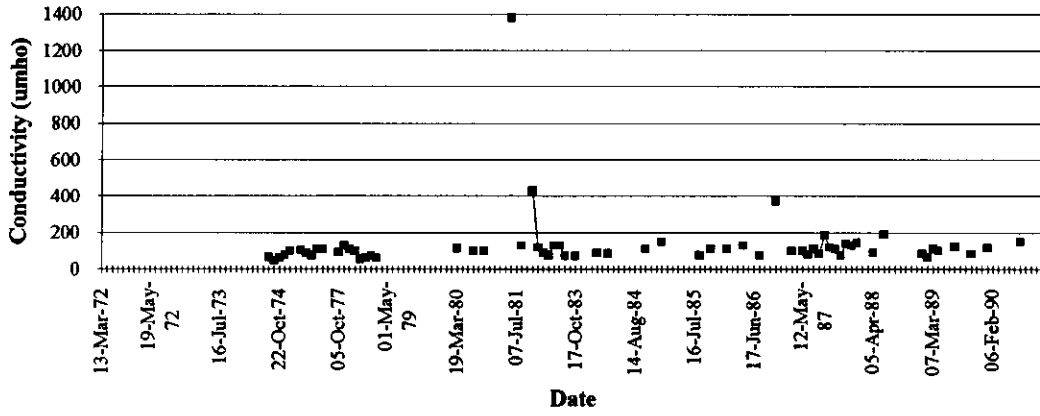
Calcium-BEH
Location - Wood Bridge at Magnolia Ranch



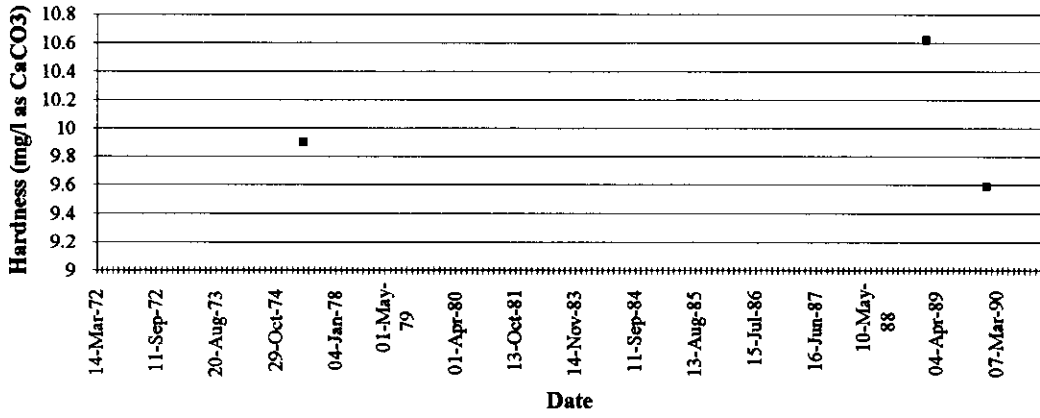
Chlorides - BEH
Location - Wood Bridge at Magnolia Ranch



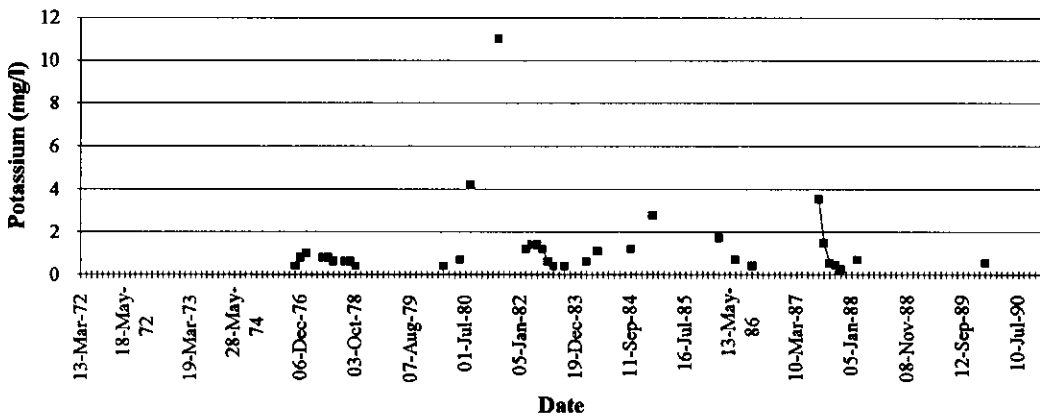
Conductivity - BEH
Location - Wood Bridge at Magnolia Ranch



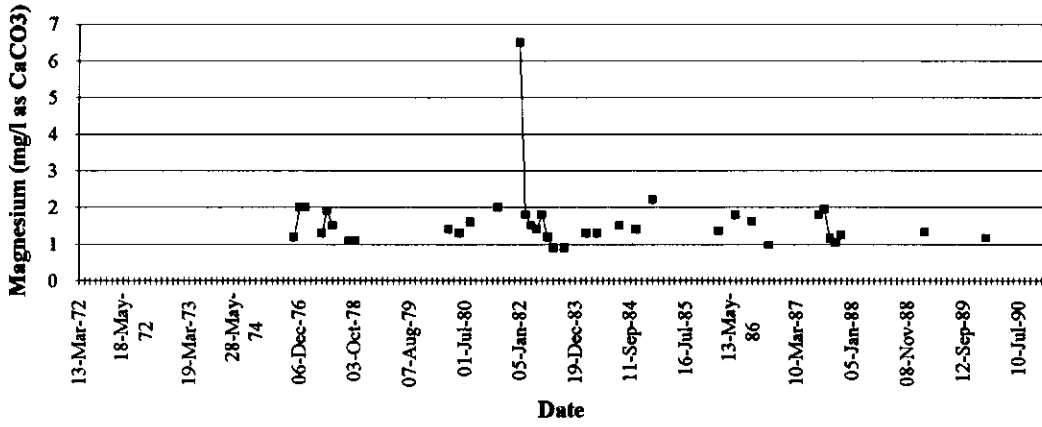
Hardness - BEH
Location - Wood Bridge at Magnolia Ranch



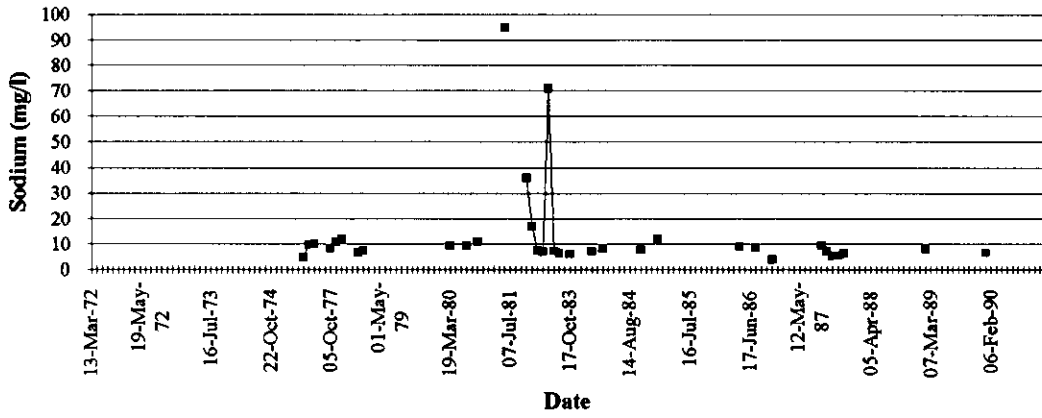
Potassium - BEH
Location - Wood Bridge at Magnolia Ranch



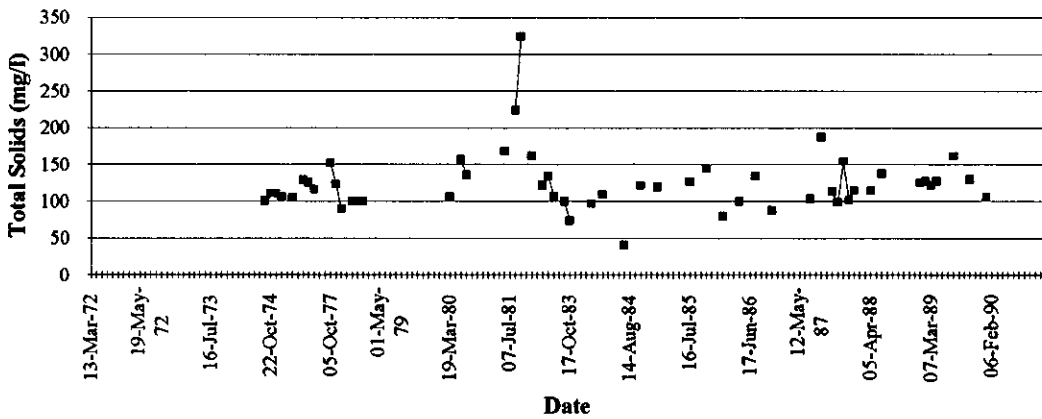
Magnesium - BEH
Location - Wood Bridge at Magnolia Ranch



Sodium - BEH
Location - Wood Bridge at Magnolia Ranch

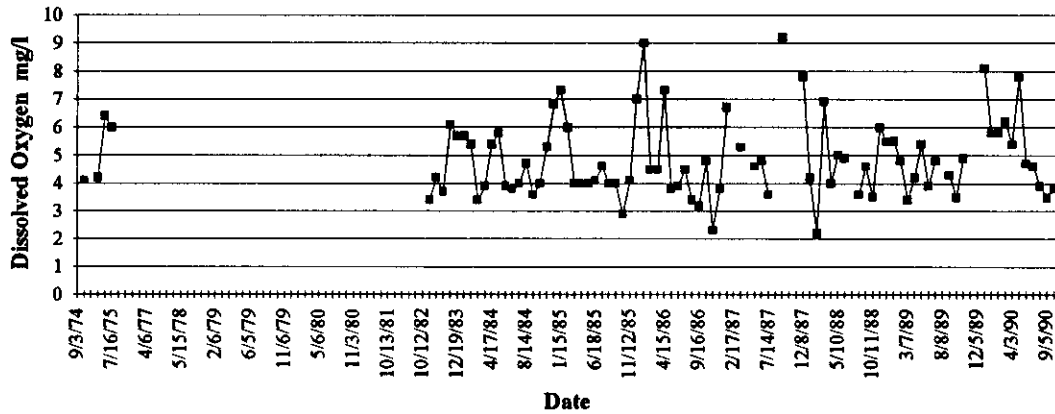


Total Solids - BEH
Location - Wood Bridge at Magnolia Ranch

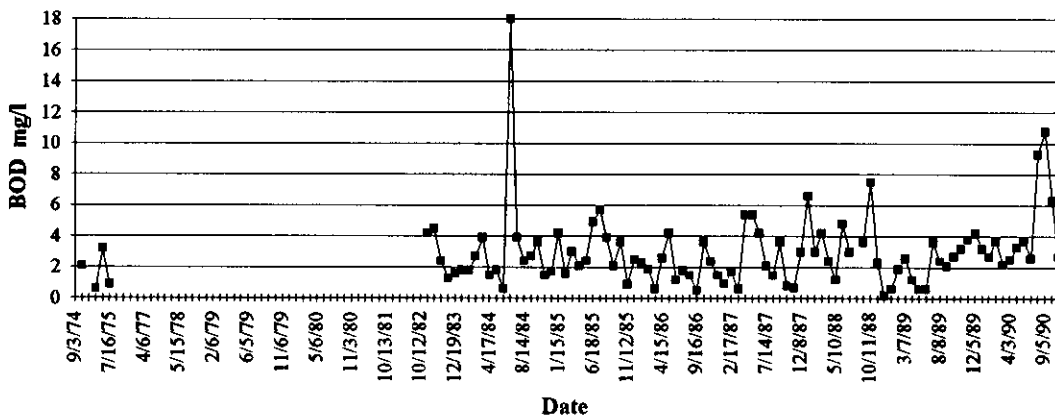


Water Quality Time Plots for Site BEG
Big Econlockhatchee River at Power Line at Ranger Drainage District

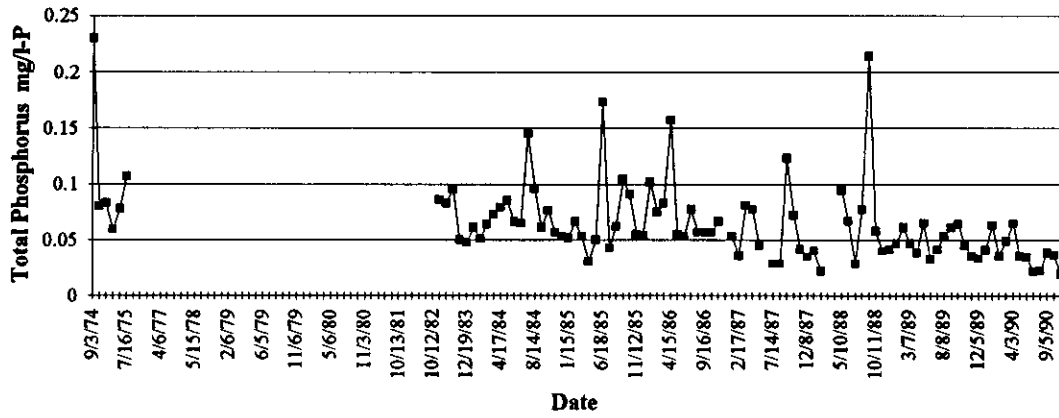
Dissolved Oxygen - BEG
Location - Power Line at Ranger Drainage District



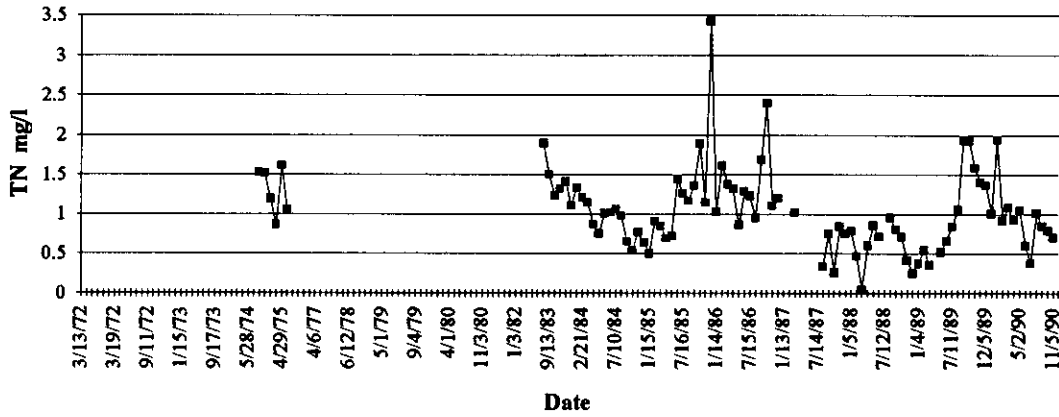
Biochemical Oxygen Demand - BEG
Location - Power Line at Ranger Drainage District



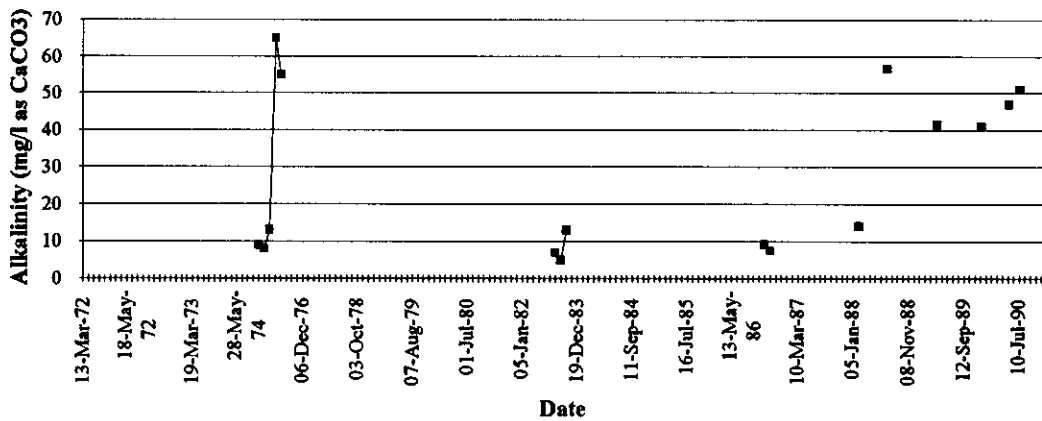
Total Phosphorus - BEG
Location - Power Line at Ranger Drainage District



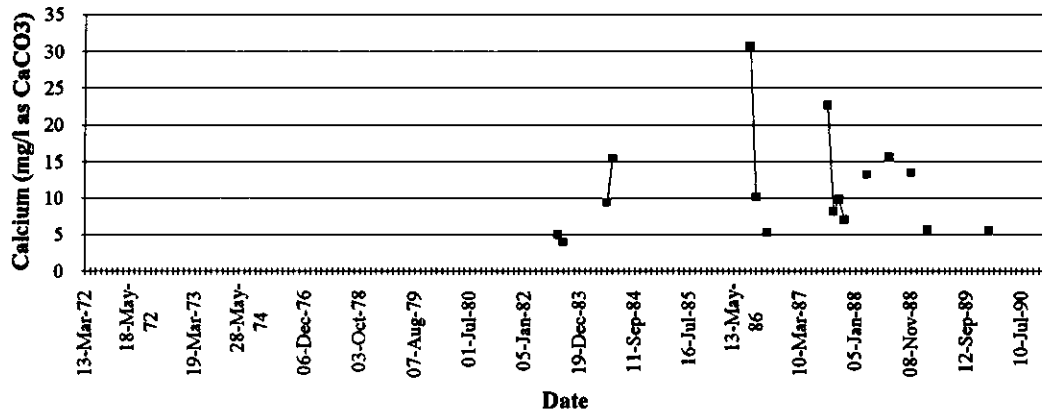
Total Nitrogen - BEG
Location - Power Line at Ranger Drainage District



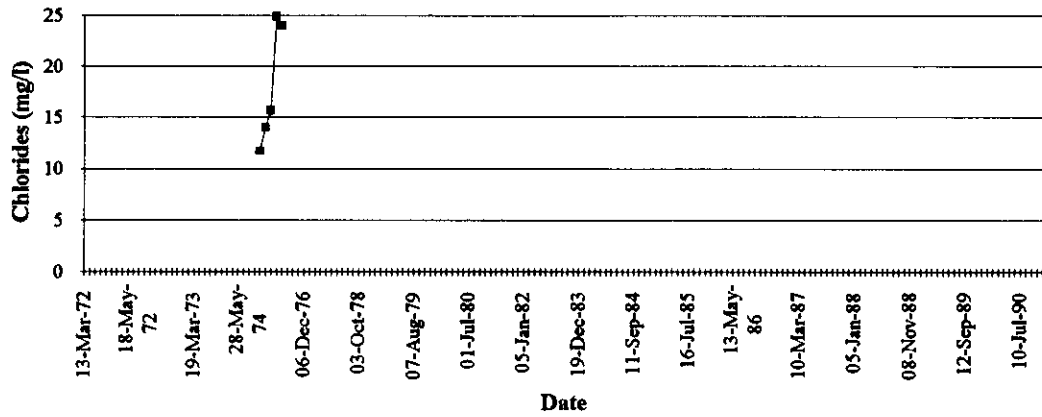
Alkalinity - BEG
Location - Power Line at Ranger Drainage District



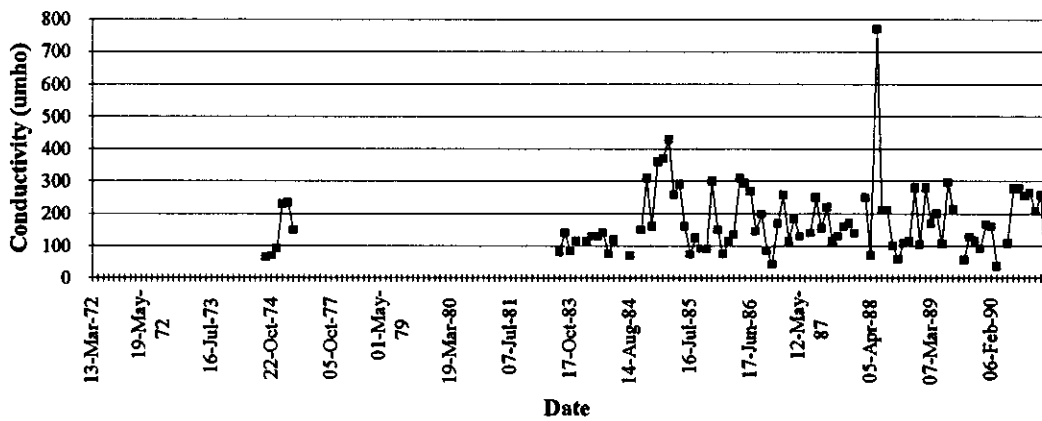
Calcium - BEG
Location - Power Line at Ranger Drainage Station



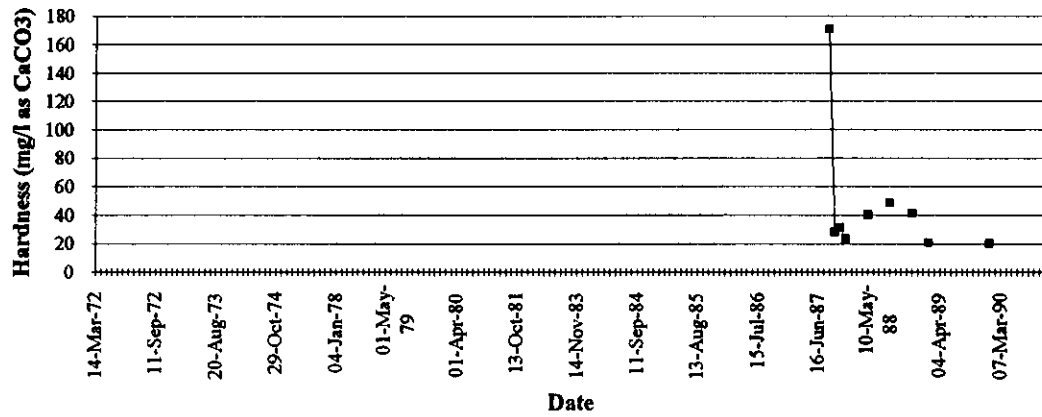
Chlorides - BEG
Location - Power Line at Ranger Drainage District



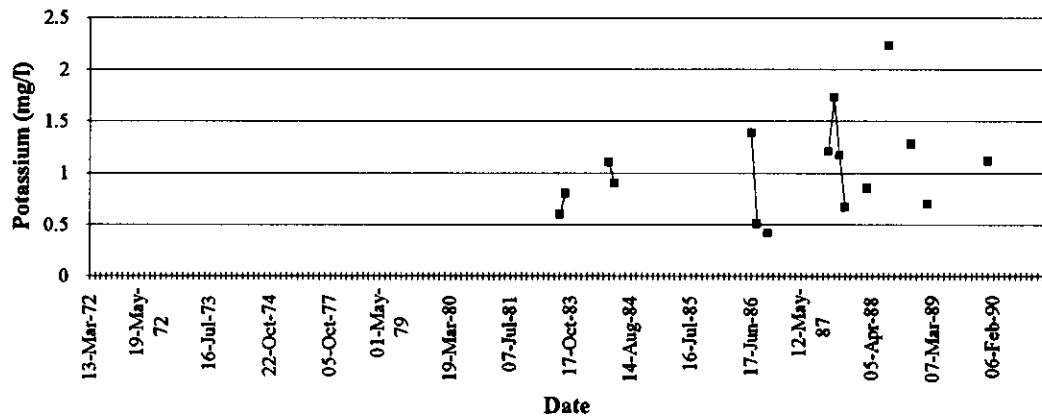
Conductivity - BEG
Location - Power Line at Ranger Drainage District



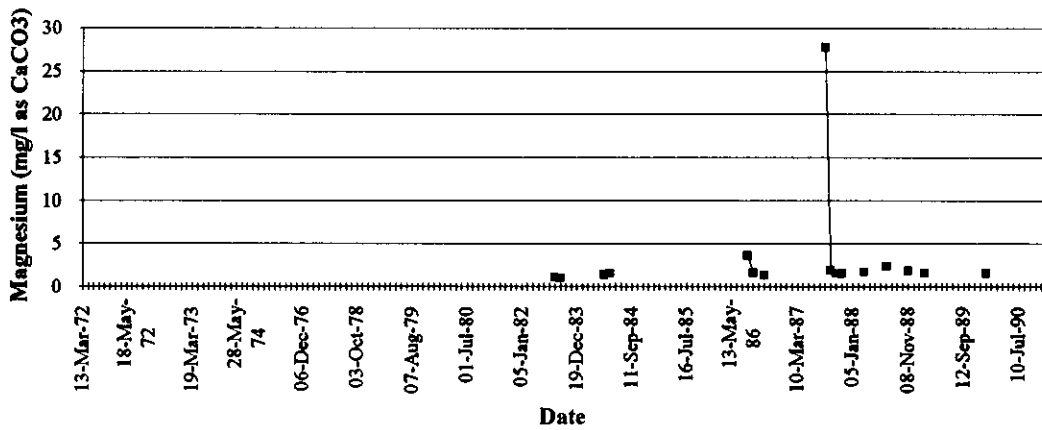
Hardness - BEG
Location - Power Line at Ranger Drainage District



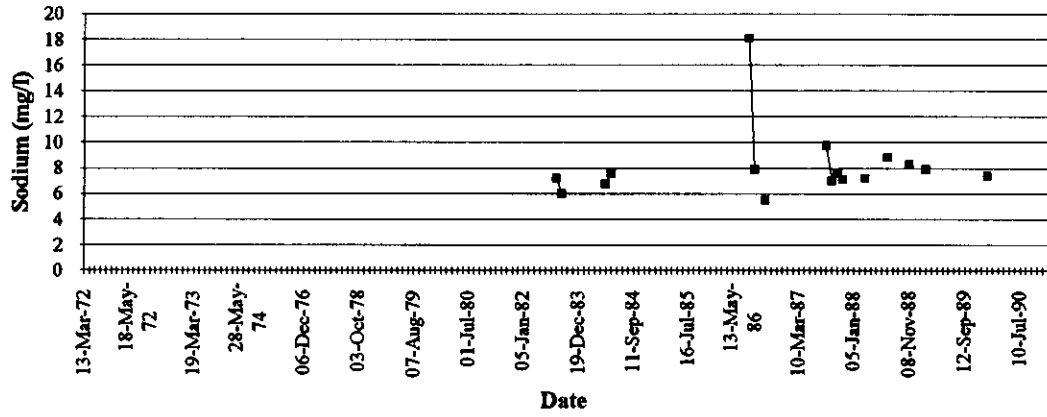
Potassium - BEG
Location - Power Line at Ranger Drainage District



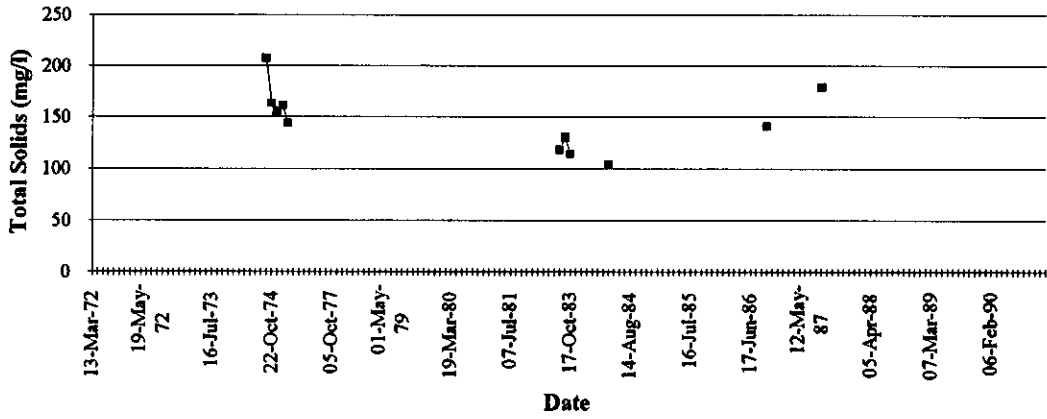
Magnesium - BEG
Location - Power Line at Ranger Drainage District



Sodium - BEG
Location - Power Line at Ranger Drainage District

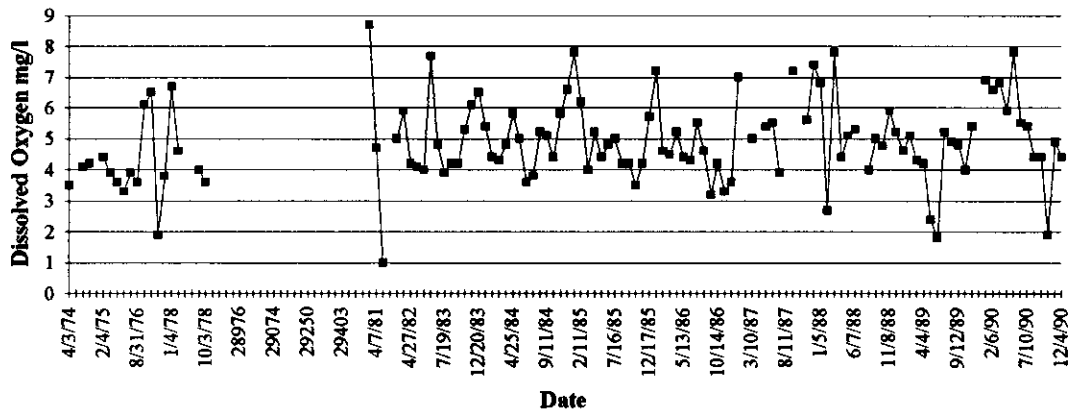


Total Solids - BEG
Location - Power Line at Ranger Drainage District

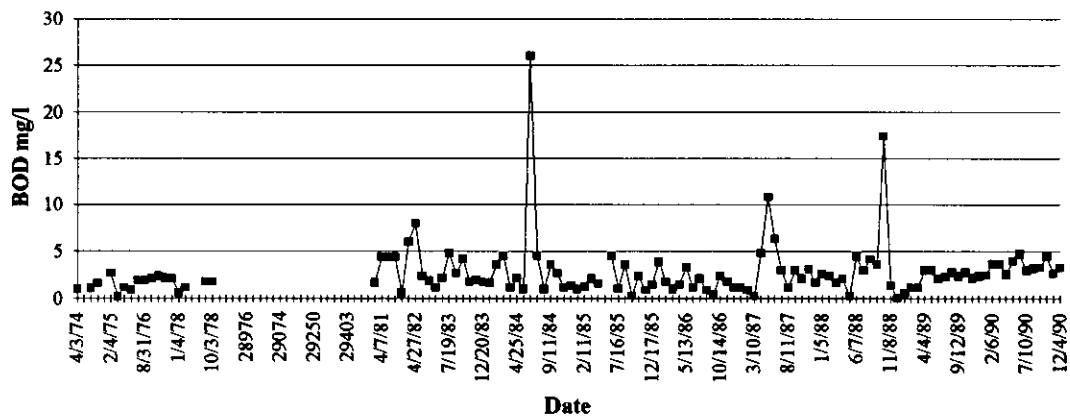


Water Quality Time Plots for Site BEF
Big Econlockhatchee at Old Cheney Highway

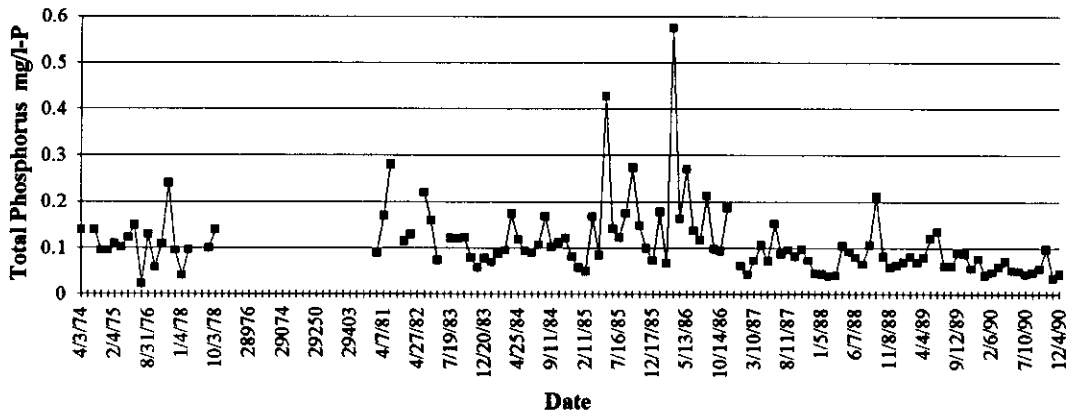
Dissolved Oxygen - BEF
Location - Old Cheney Highway



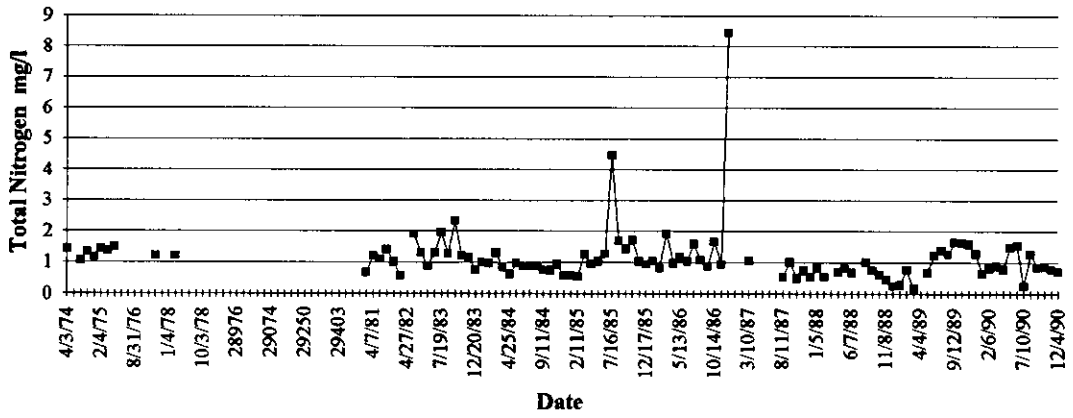
Biochemical Oxygen Demand - BEF
Location - Old Cheney Highway



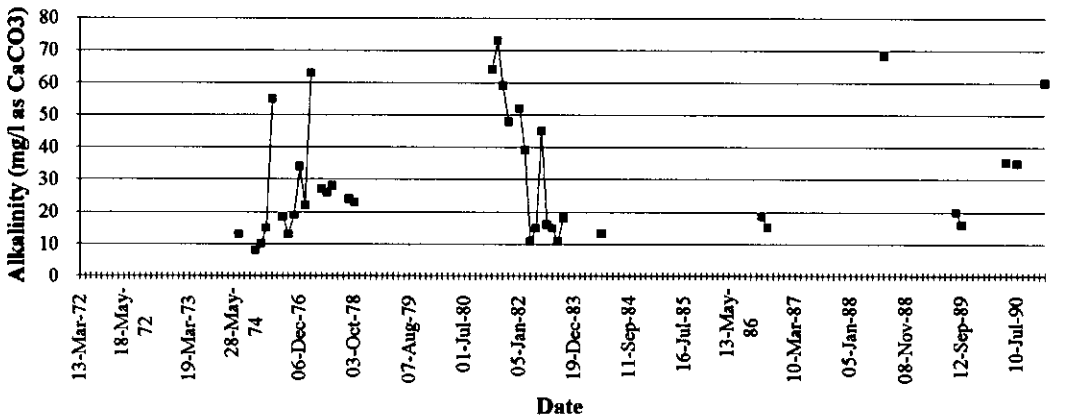
Total Phosphorus - BEF
Location - Old Cheney Highway



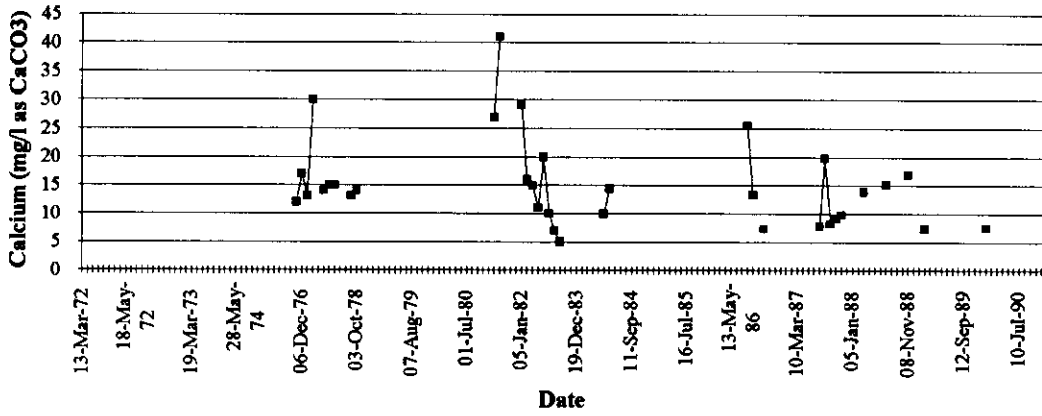
Total Nitrogen - BEF
Location - Old Cheney Highway



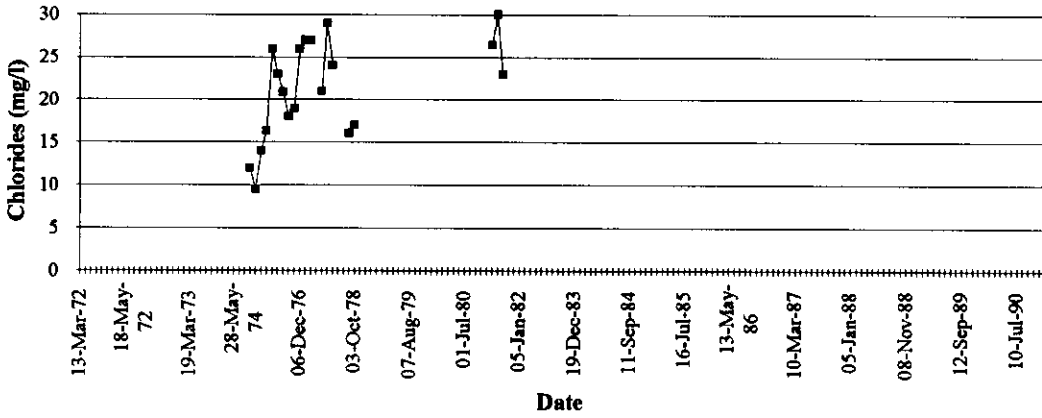
Alkalinity - BEF
Location - Old Cheney Highway



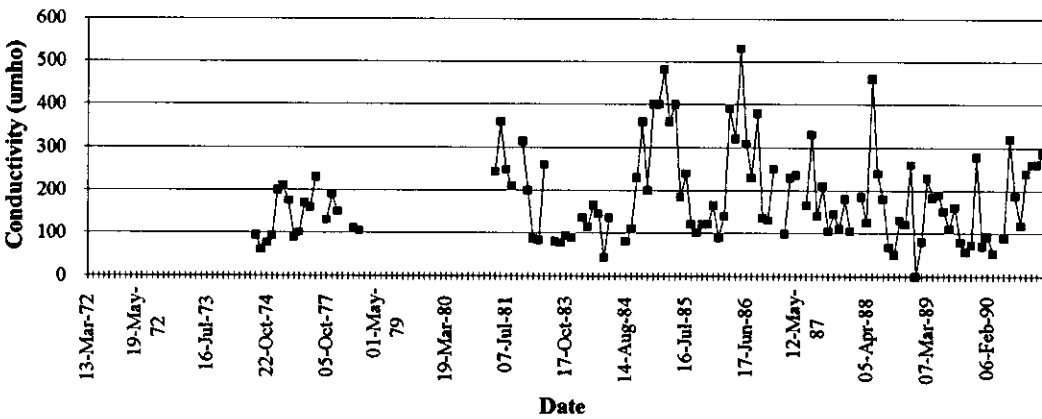
Calcium-BEF
Location - Old Cheney Highway



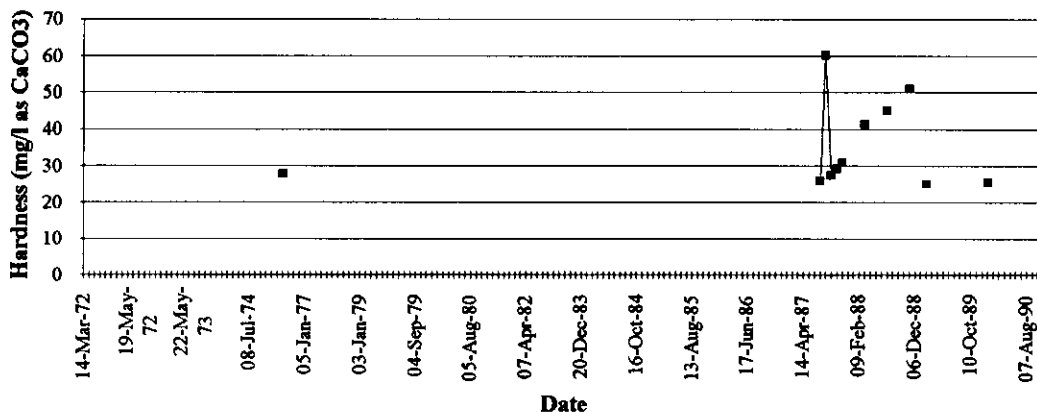
Chlorides - BEF
Location - Old Cheney Highway



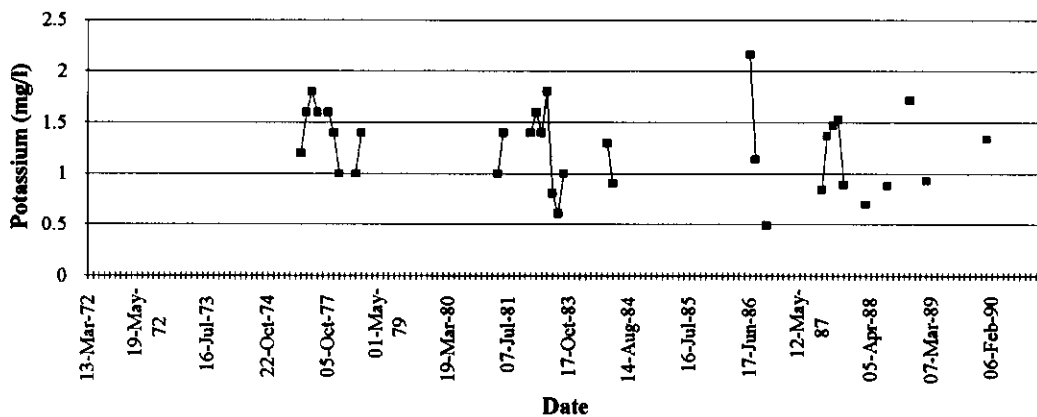
Conductivity - BEF
Location - Old Cheney Highway



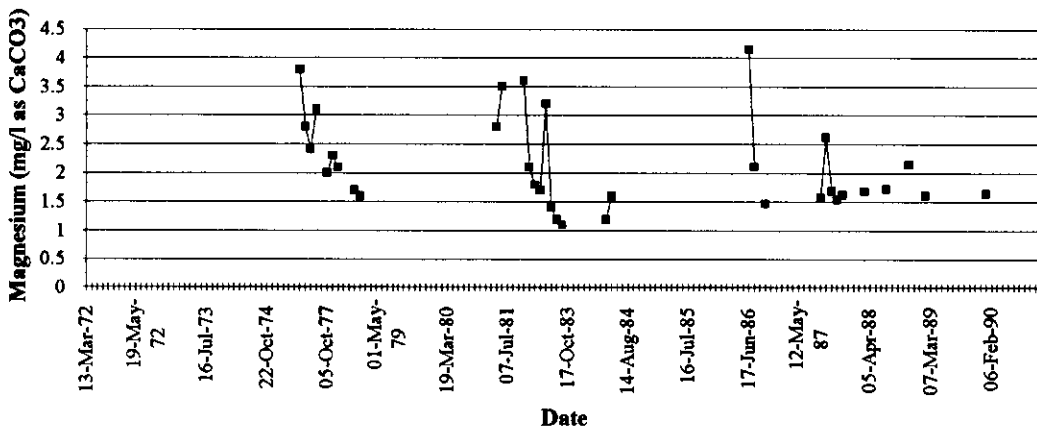
Hardness - BEF
Location - Old Cheney Highway



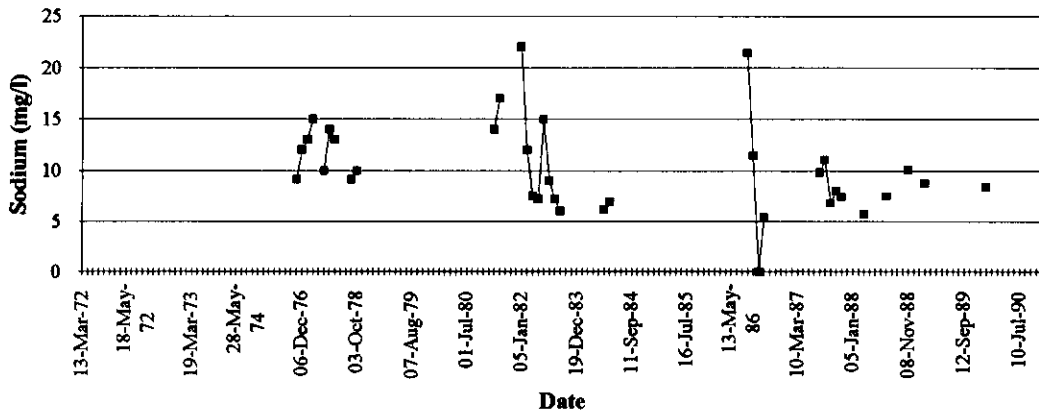
Potassium - BEF
Location - Old Cheney Highway



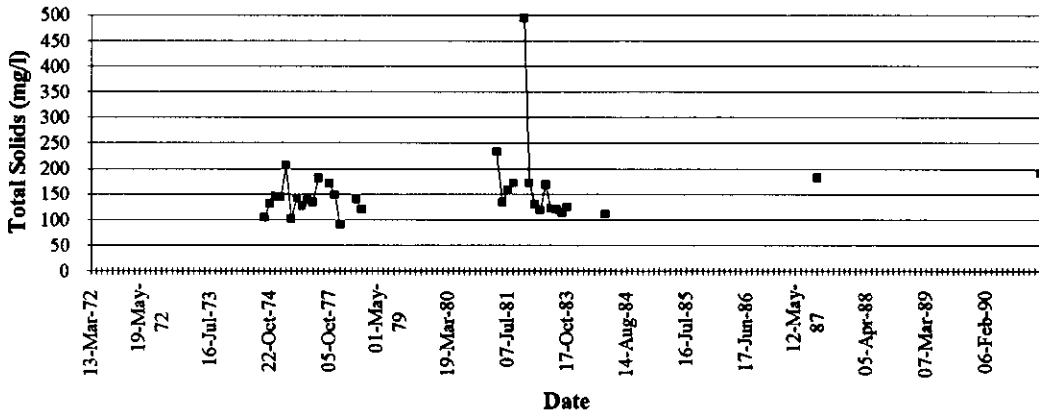
Magnesium - BEF
Location - Old Cheney Highway



Sodium - BEF
Location - Old Cheney Highway



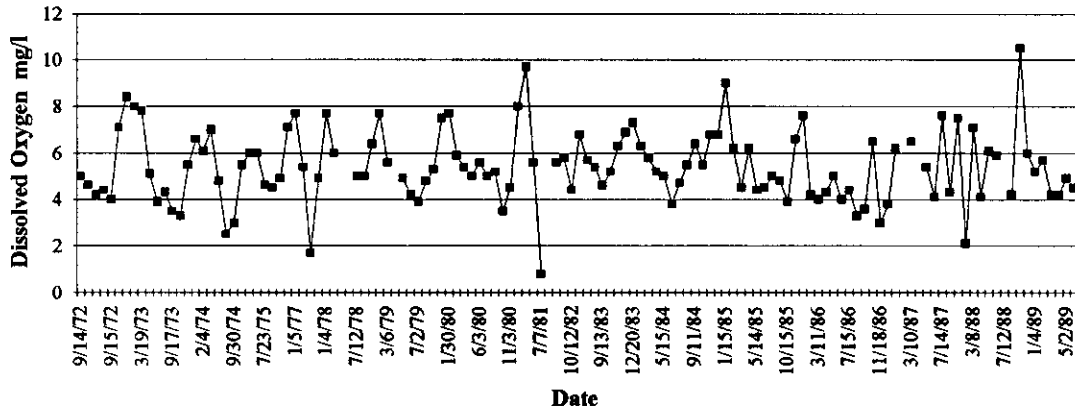
Total Solids - BEF
Location - Old Cheney Highway



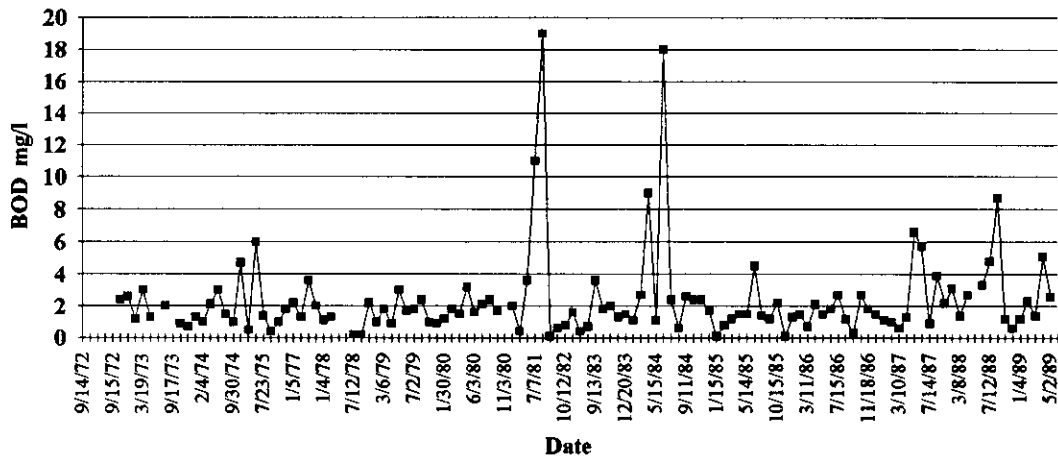
Water Quality Time Plots for Site BEC

Located on the Big Econlockhatchee River above the confluence with the Little Econlockhatchee River

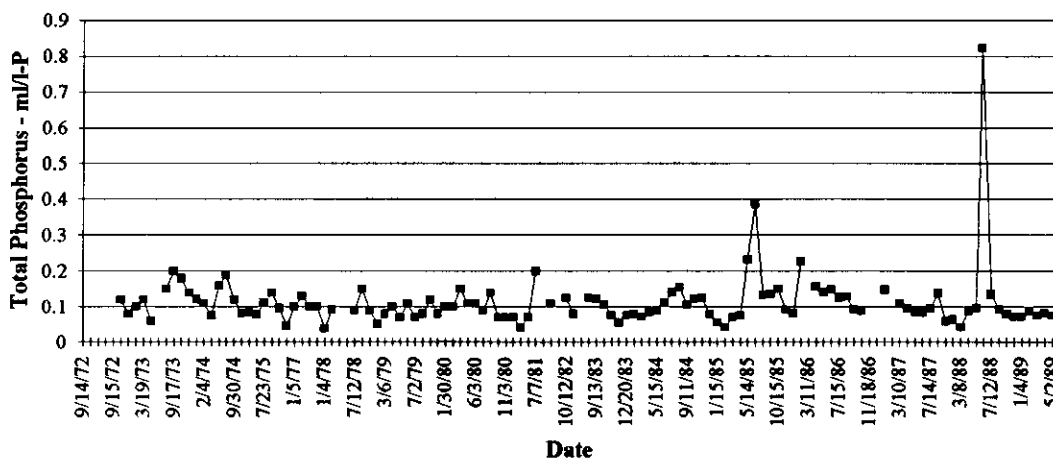
Dissolved Oxygen - BEC
Location - Confluence with Little Econlockhatchee River



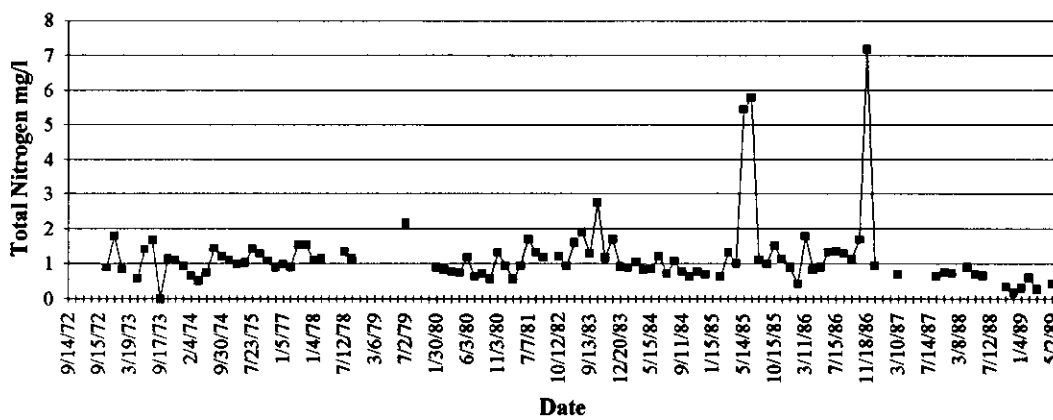
Biochemical Oxygen Demand - BEC
Location - Confluence with Little Econlockhatchee River



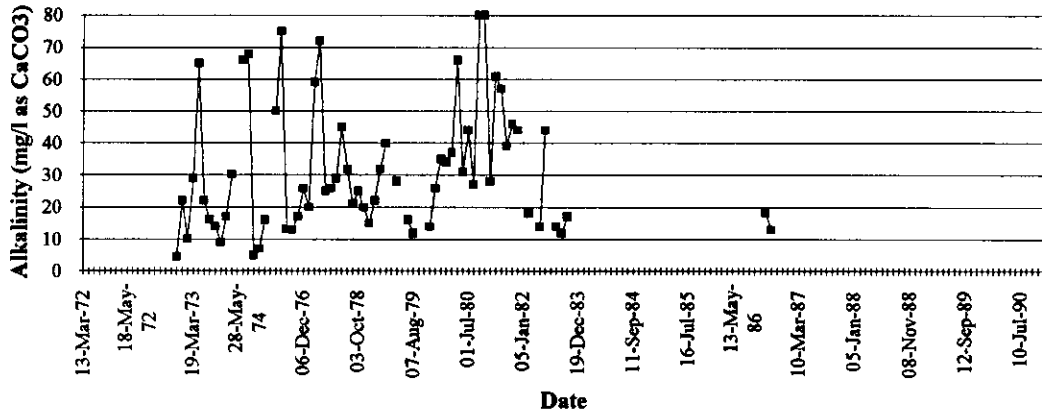
Total Phosphorus - BEC
Location - Confluence with Little Econlockhatchee River



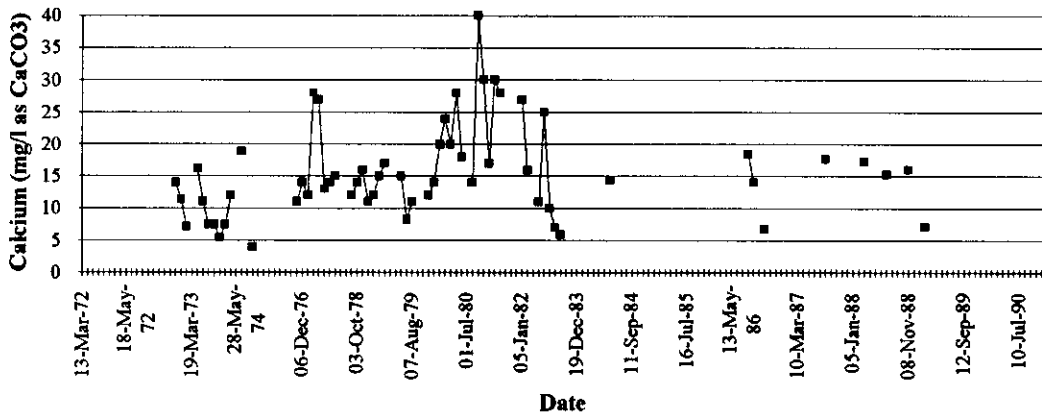
Total Nitrogen - BEC
Location - Confluence with Little Econlockhatchee River



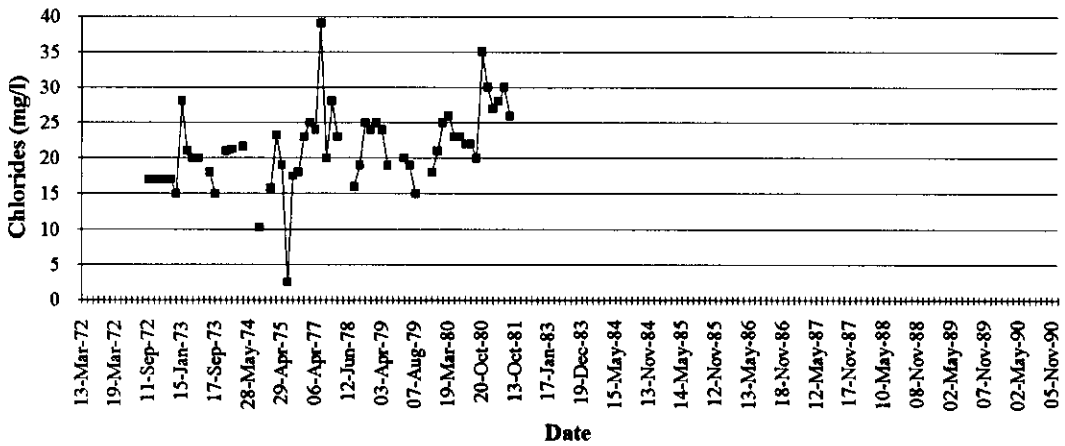
Alkalinity - BEC
Location - Confluence with Little Econlockhatchee River



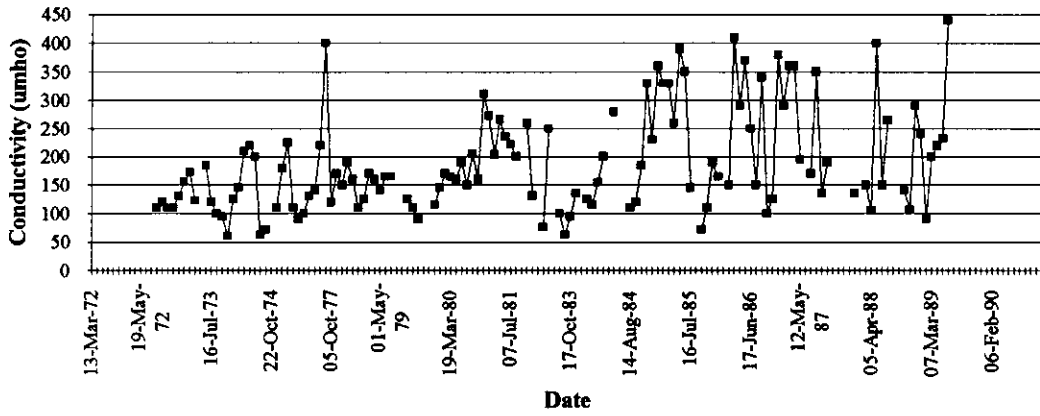
Calcium-BEC
Location - Confluence with Little Econlockhatchee River



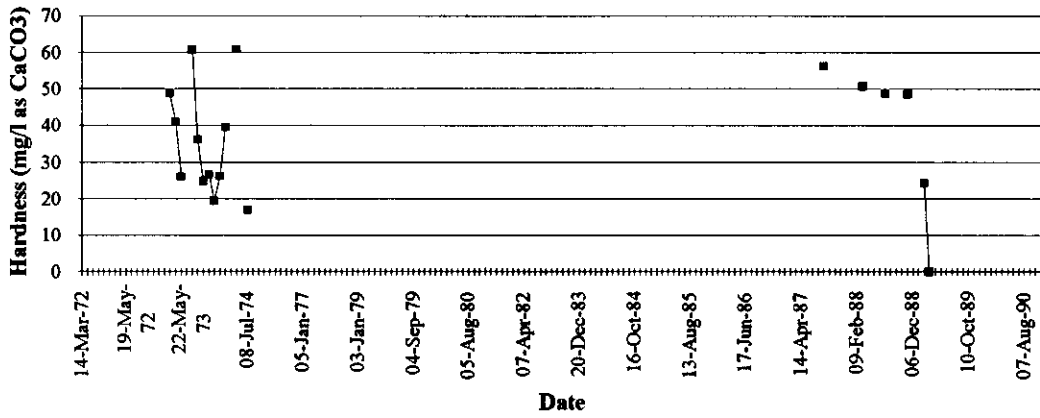
Chlorides - BEC



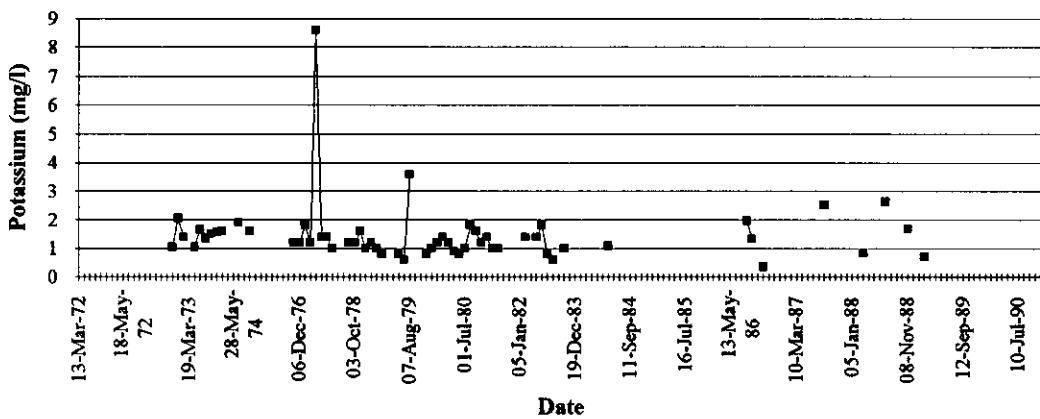
Conductivity - BEC
Location - Confluence with Little Econlockhatchee River



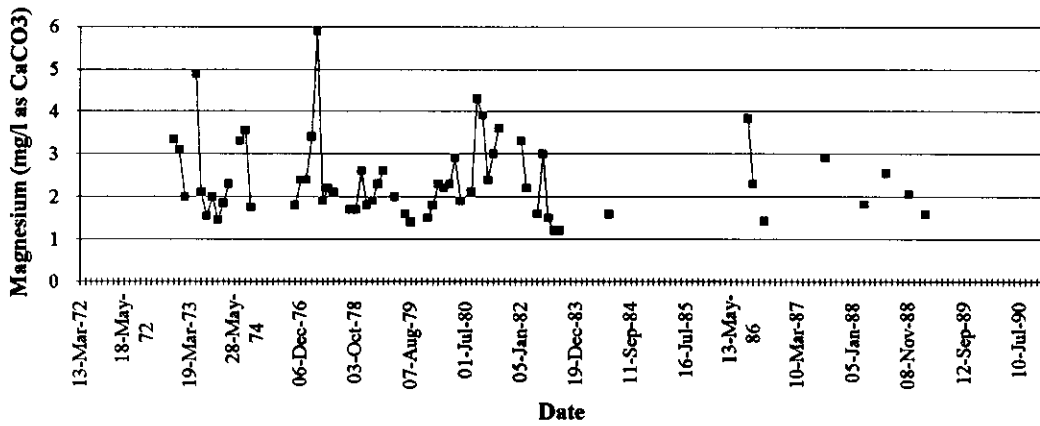
Hardness - BEC
Location - Confluence with Little Econlockhatchee River



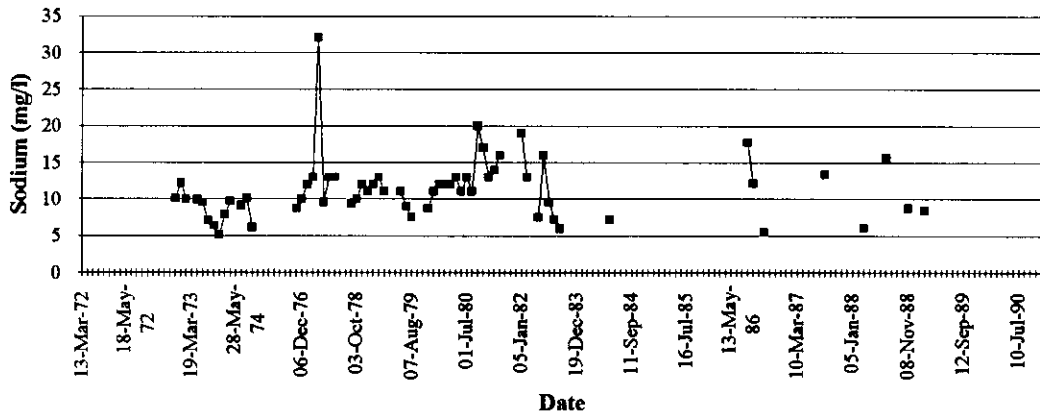
Potassium - BEC
Location - Confluence with Little Econlockhatchee River



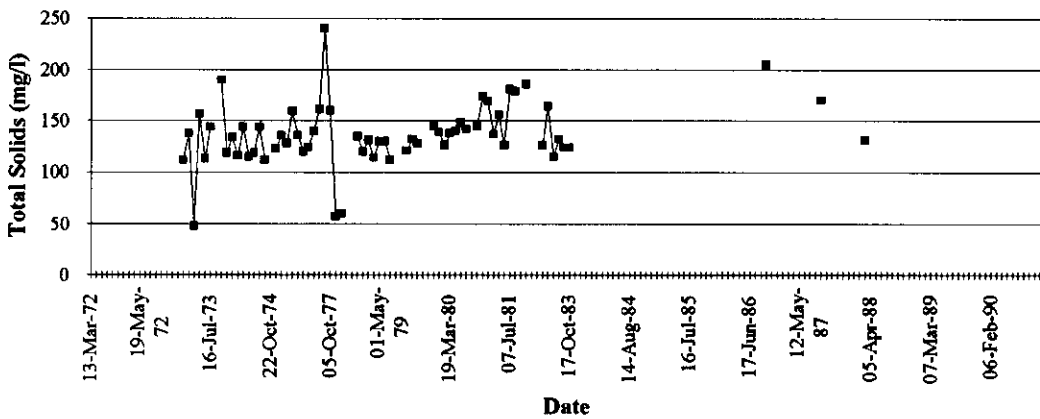
Magnesium - BEC
Location - Confluence with Little Econlockhatchee River



Sodium - BEC
Location - Confluence with Little Econlockhatchee River

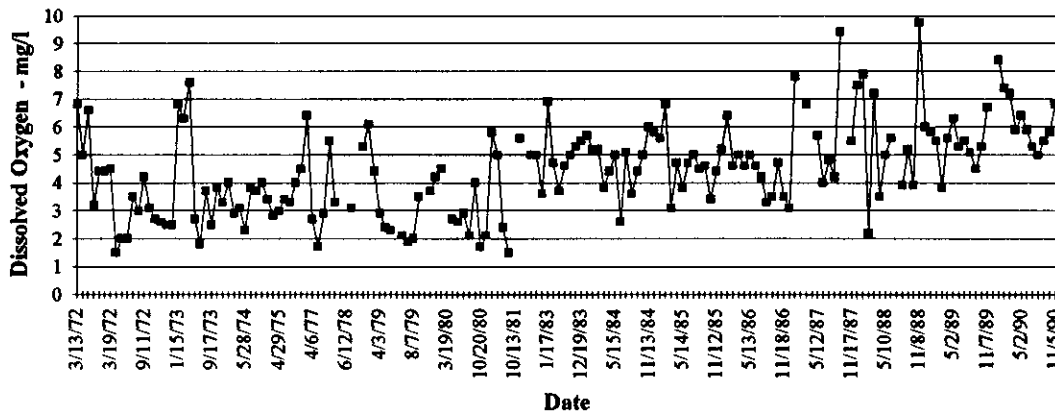


Total Solids - BEC
Location - Confluence with Little Econlockhatchee River

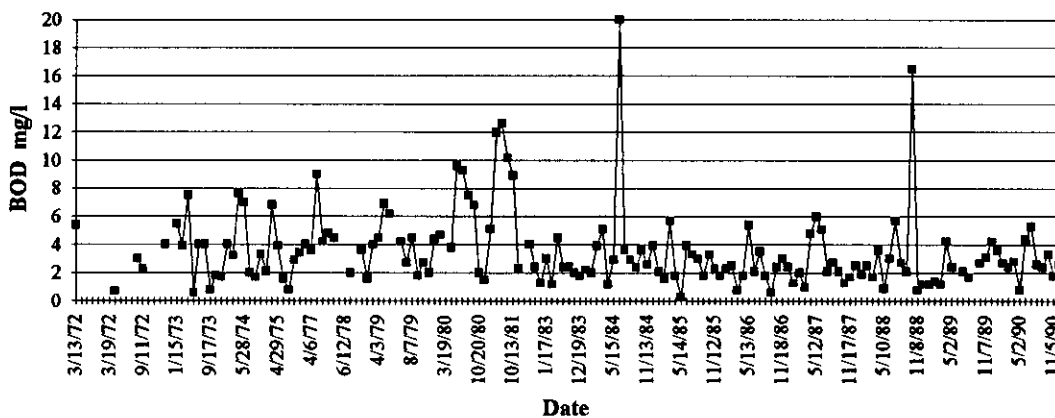


Water Quality Time Plots for Site BED
Big Econlockhatchee River at State Road 419

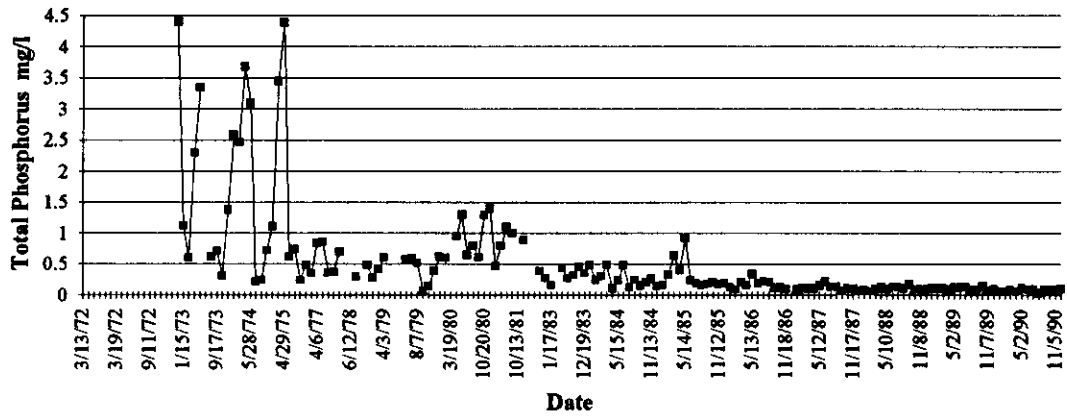
Dissolved Oxygen - BED
Location - State Road 419



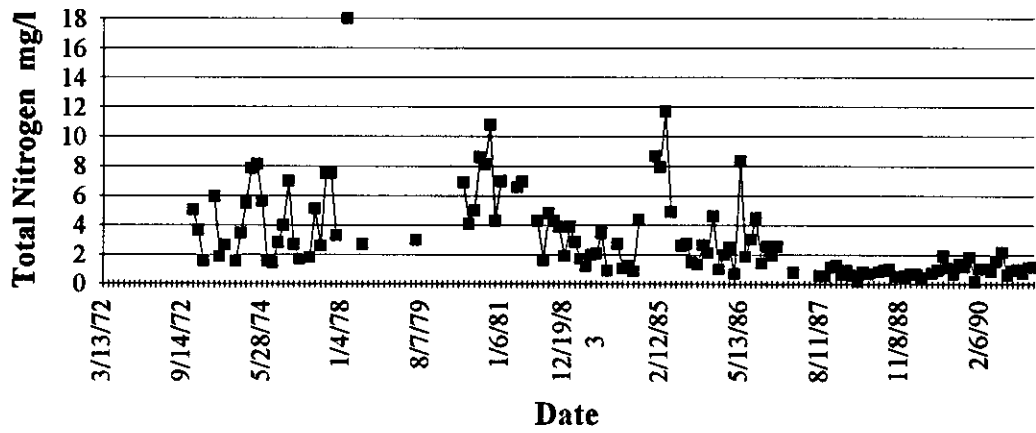
Biochemical Oxygen Demand - BED
Location - State Road 419



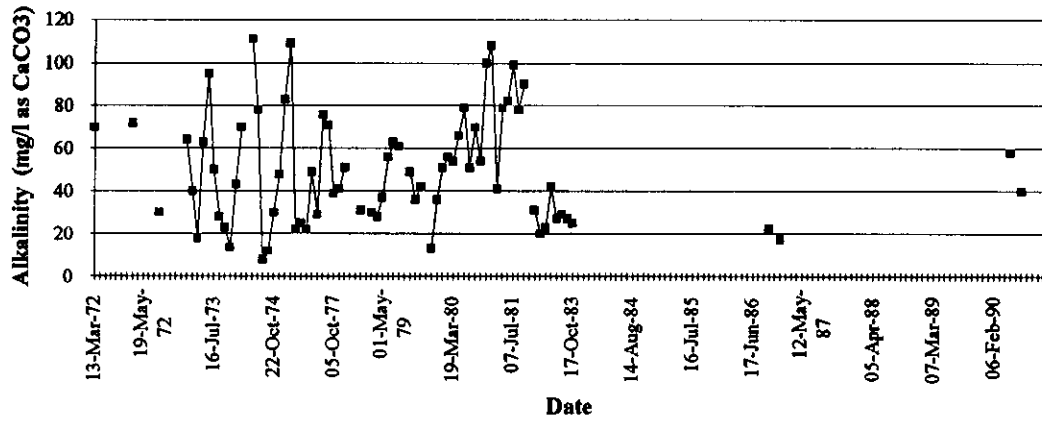
Total Phosphorus - BED
Location - State Road 419



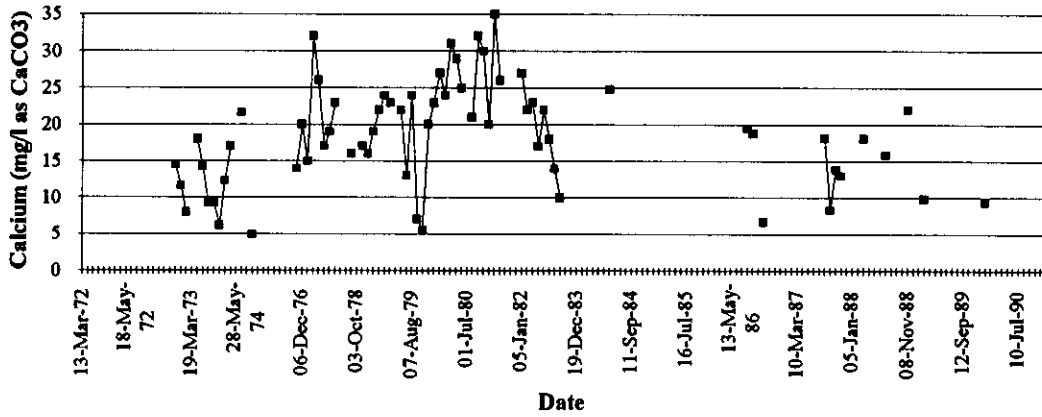
Total Nitrogen - BED
Location - State Road 419



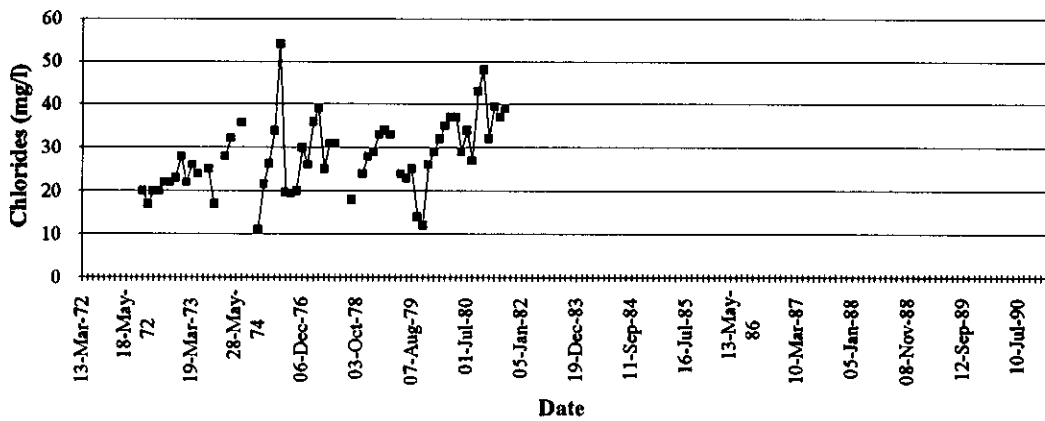
Alkalinity - BED
Location - State Road 419



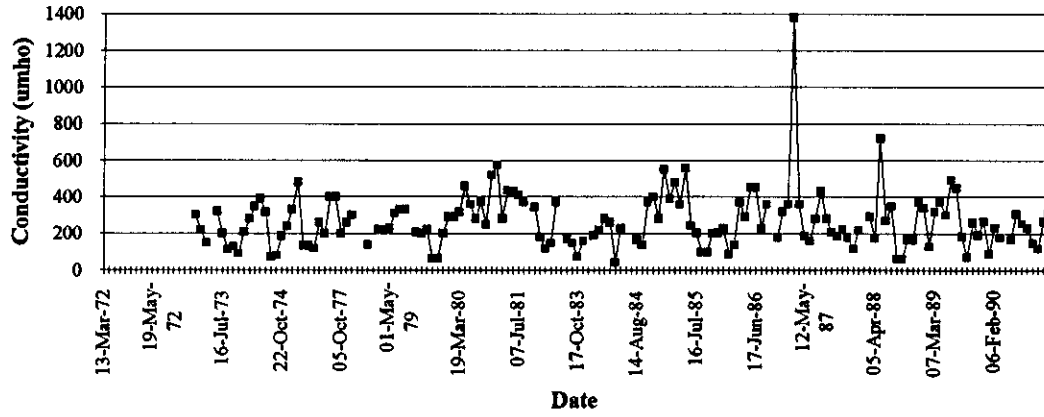
Calcium-BED
Location - State Road 419



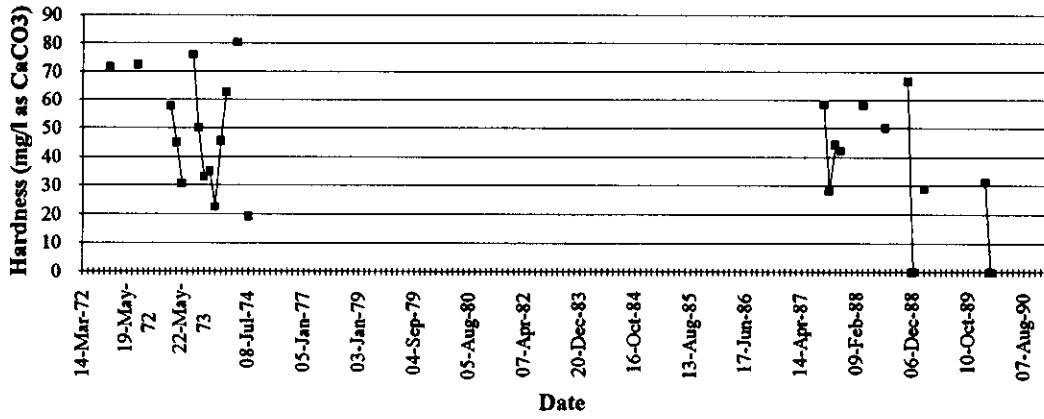
Chlorides - BED
Location - State Road 419



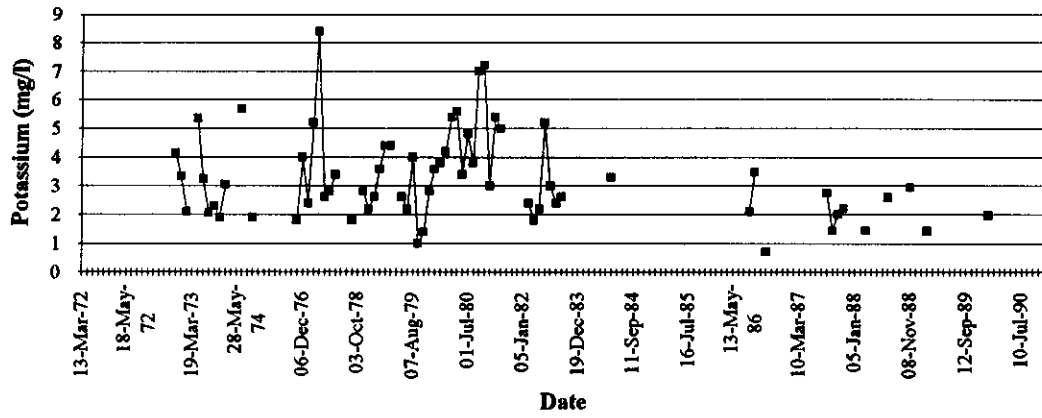
Conductivity - BED
Location - State Road 419



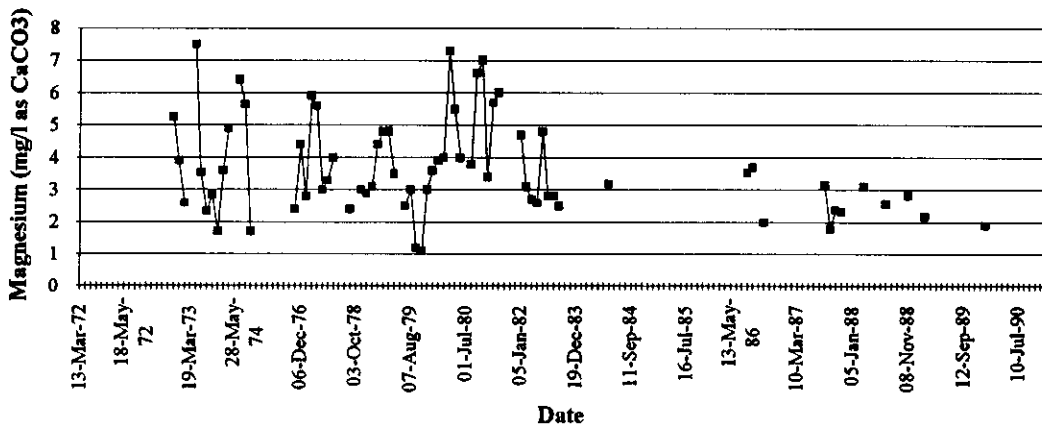
Hardness - BED
Location - State Road 419



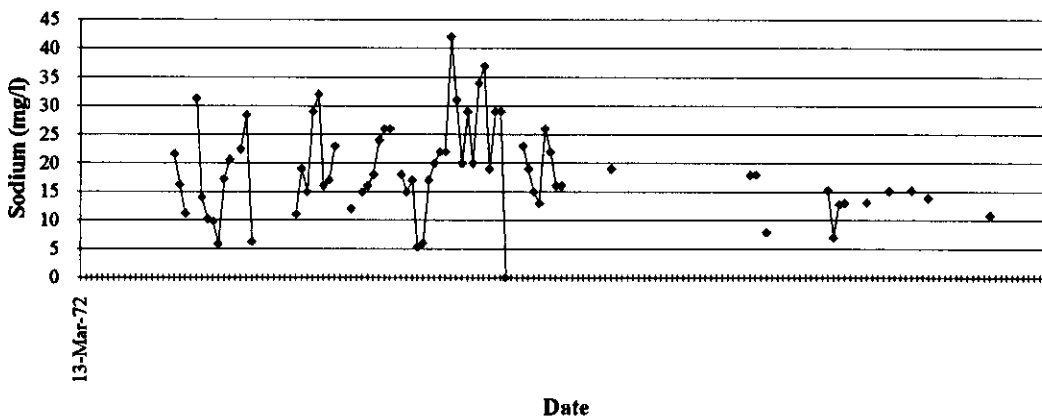
Potassium - BED
Location - State Road 419



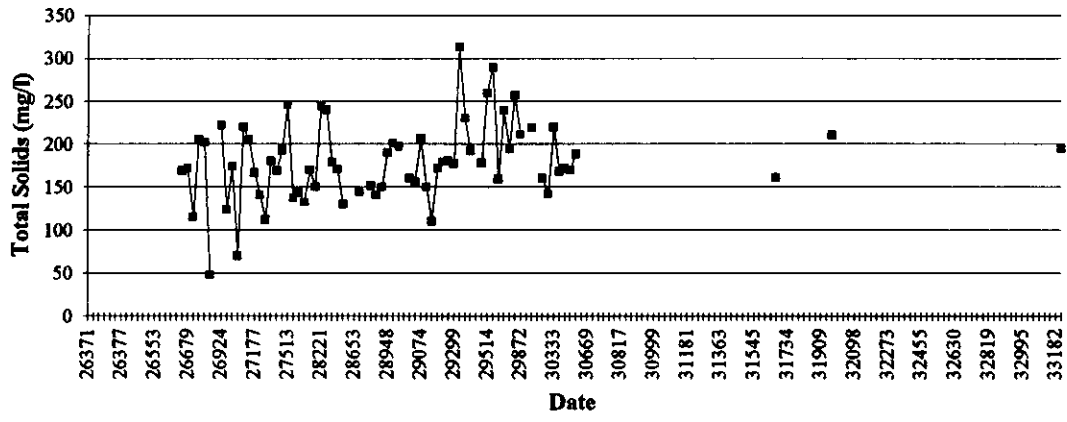
Magnesium - BED
Location - State Road 419



Sodium - BED
Location - State Road 419

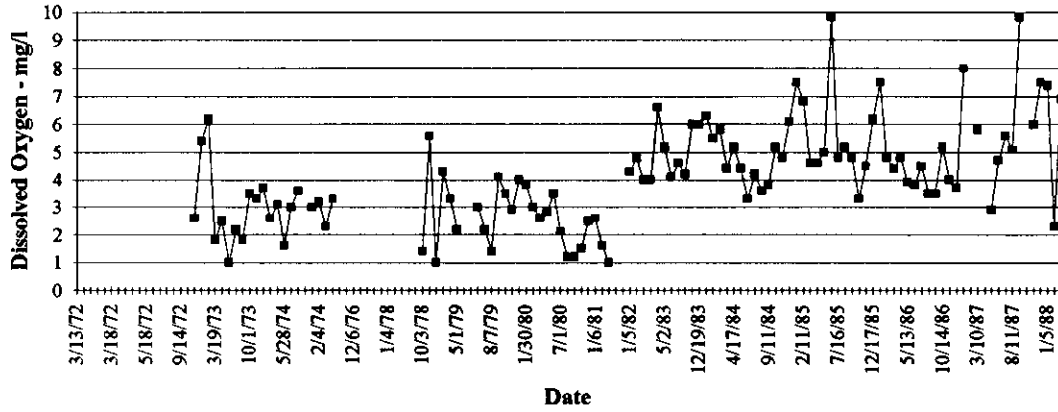


Total Solids - BED
Location - State Road 419

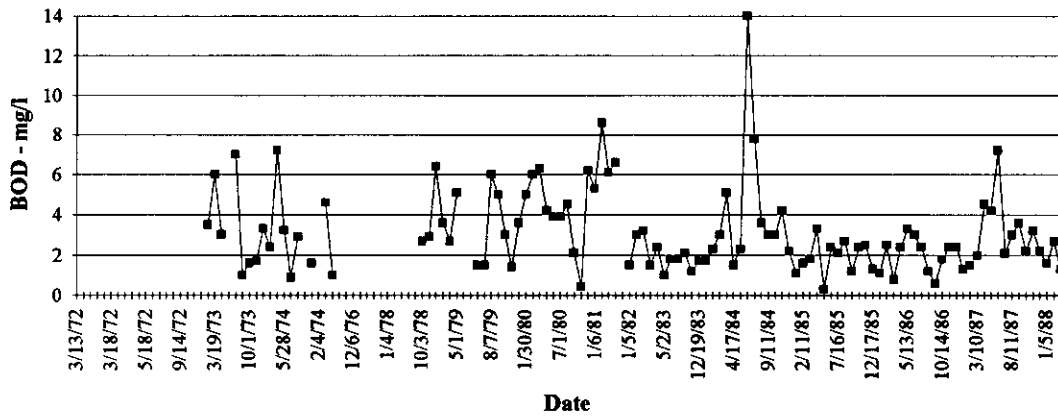


Water Quality Time Plots for Site BEE
Big Econlockhatchee at Snow Hill Road

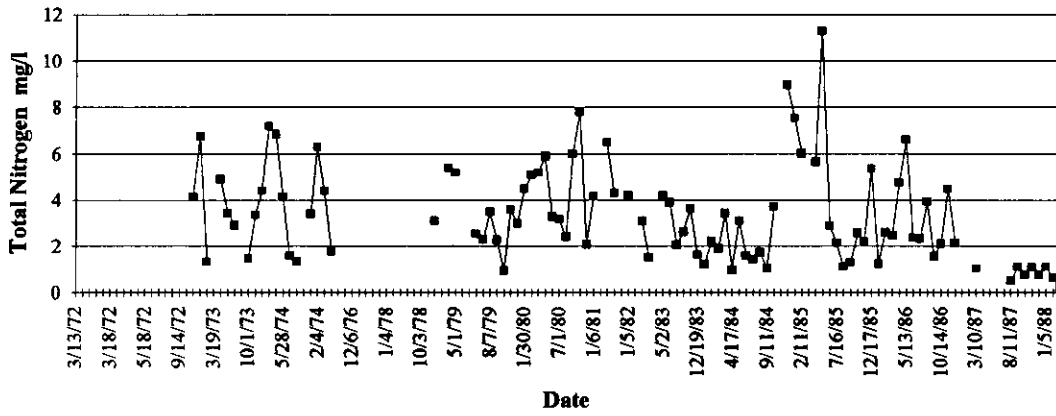
Dissolved Oxygen - BEE
Location - Snow Hill Road



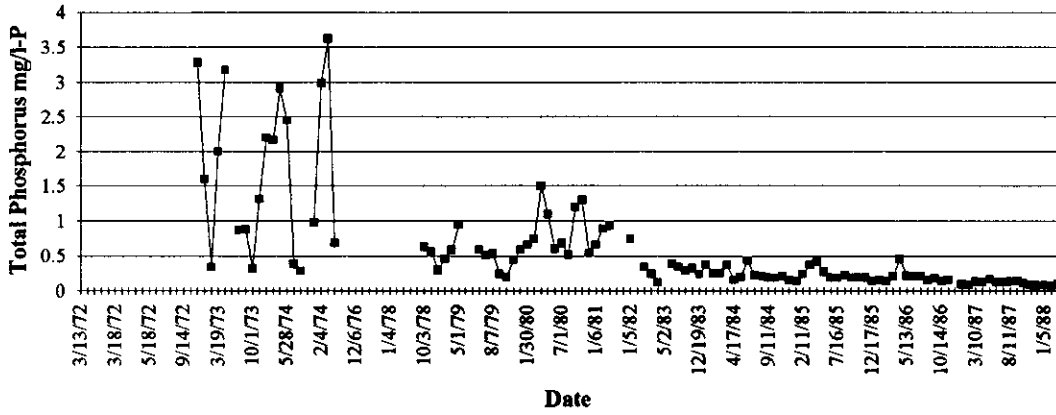
Biochemical Oxygen Demand - BEE
Location - Snow Hill Road



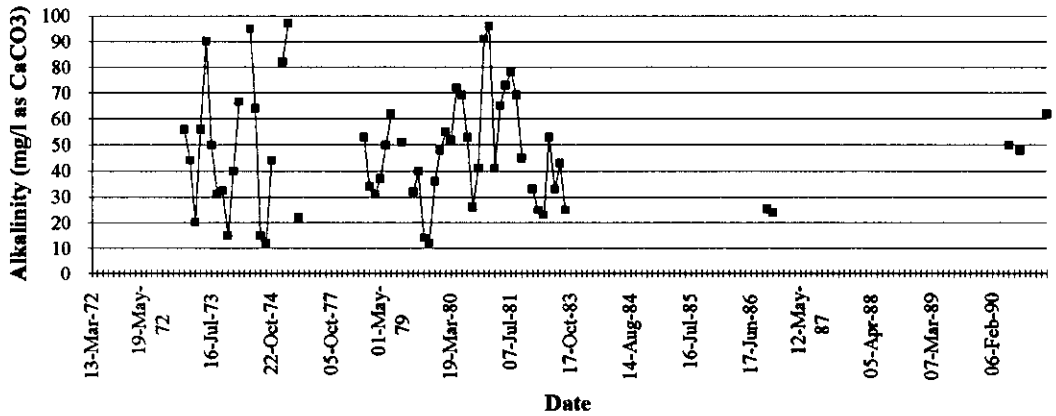
Total Nitrogen - BEE
Location - Snow Hill Road



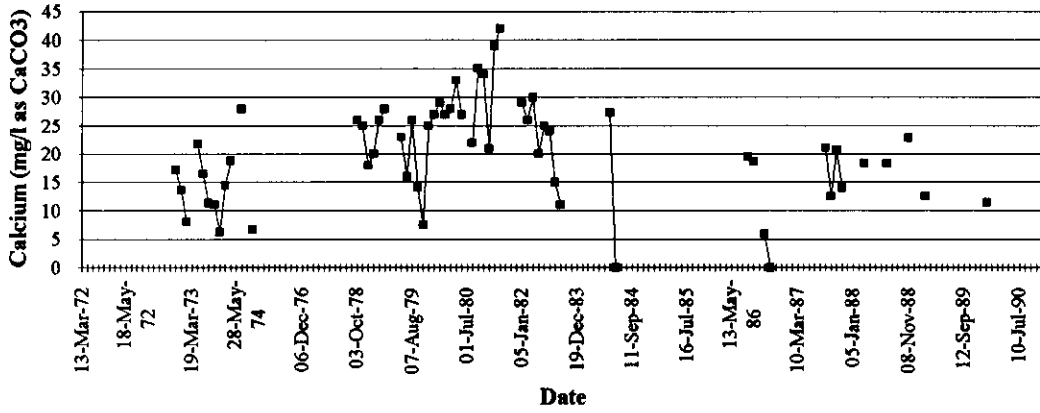
Total Phosphorus - BEE
Location - Snow Hill Road



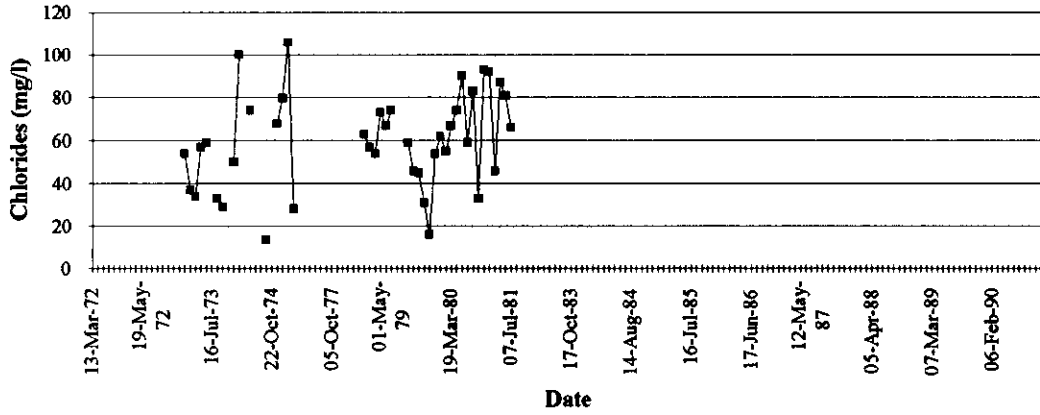
Alkalinity - BEE
Location - Snow Hill Road



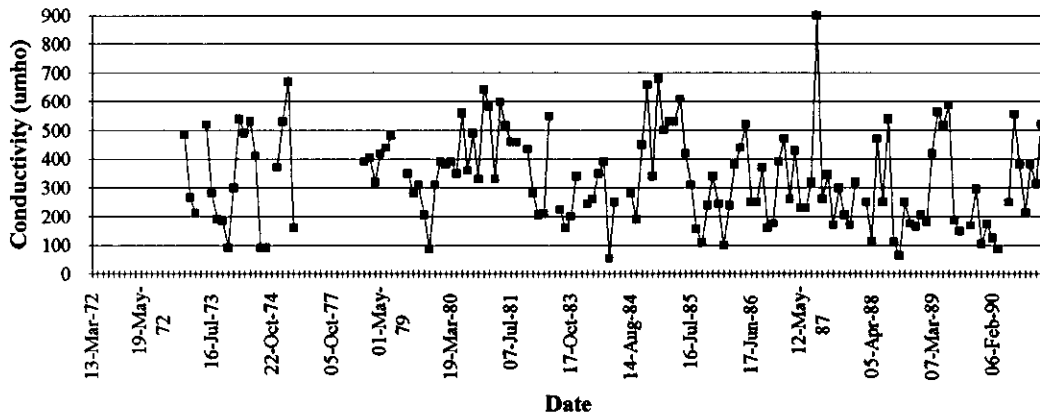
Calcium-BEE
Location - Snow Hill Road



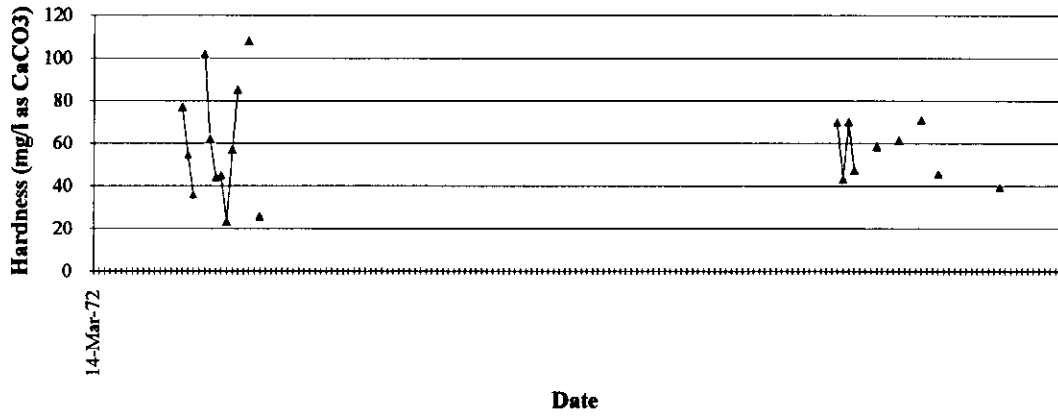
Chlorides - BEE
Location - Snow Hill Road



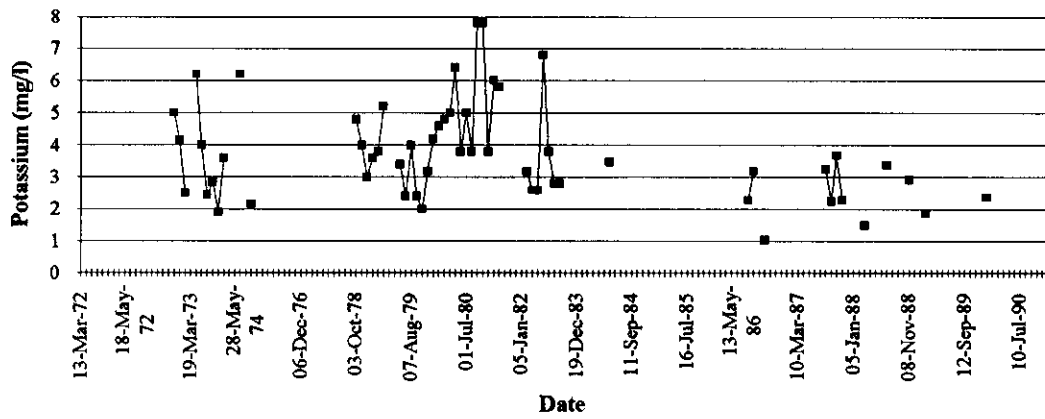
Conductivity - BEE
Location - Snow Hill Road



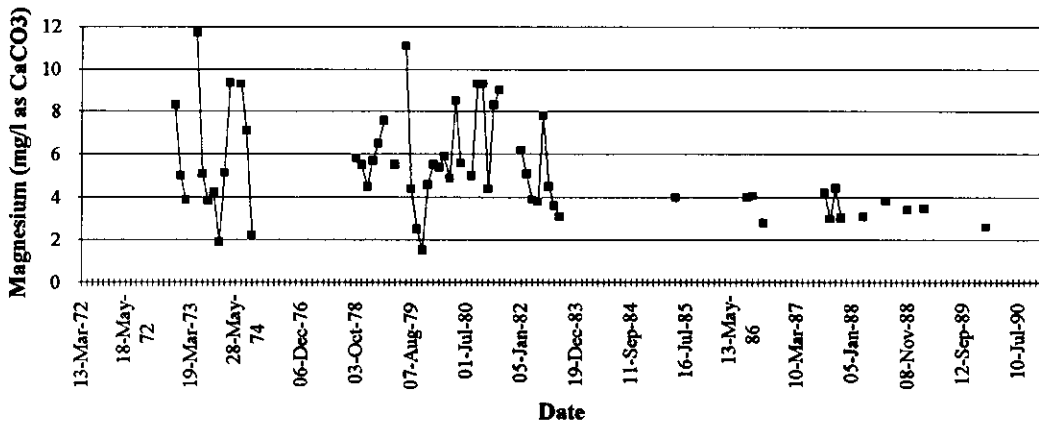
Hardness - BEE
Location - Snow Hill Road



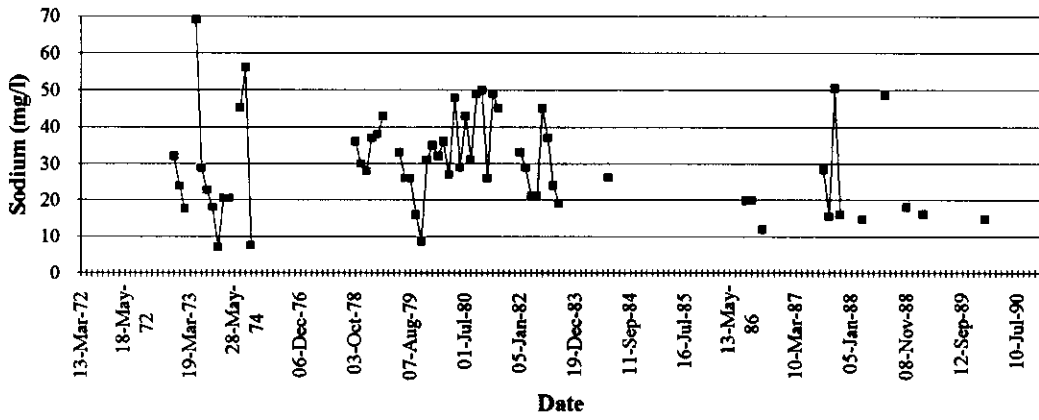
Potassium - BEE
Location - Snow Hill Road



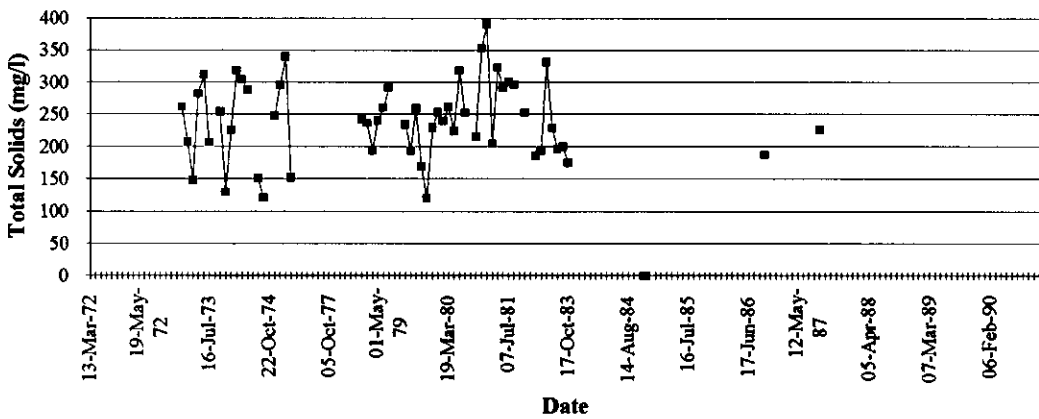
Magnesium - BEE
Location - Snow Hill Road



Sodium - BEE
Location - Snow Hill Road

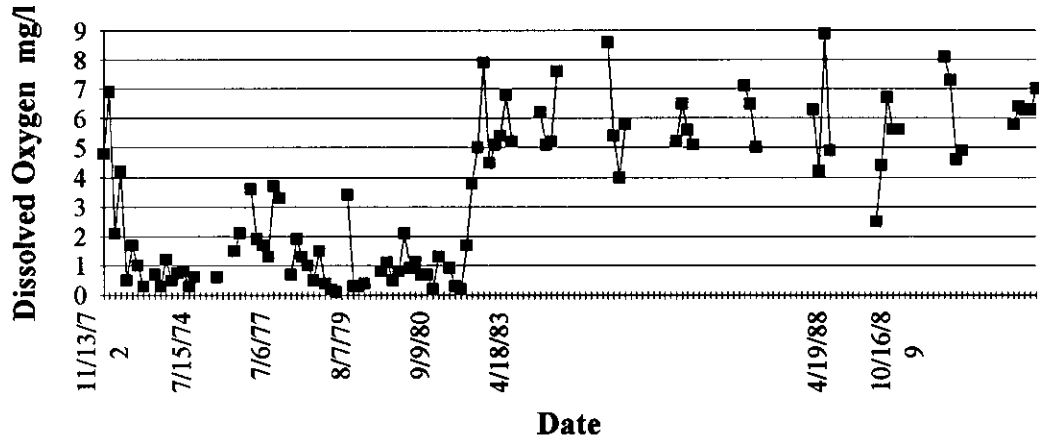


Total Solids - BEE
Location - Snow Hill Road

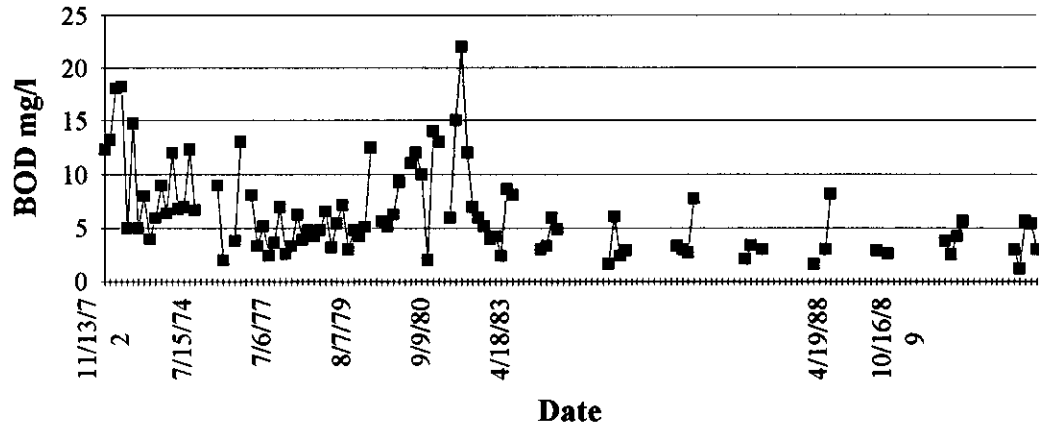


Water Quality Time Plots for Site LEP
Little Econlockhatchee at Econlockhatchee Trail

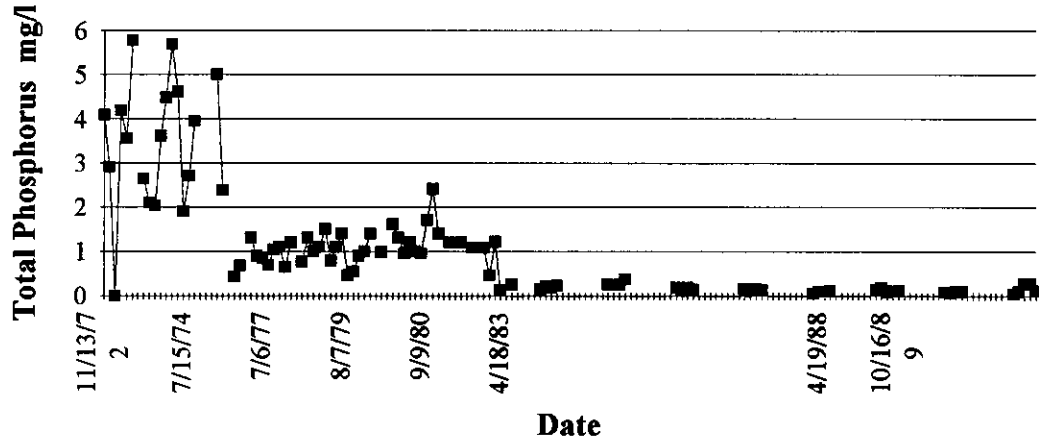
Dissolved Oxygen - LEP
Location - Econlockhatchee Trail



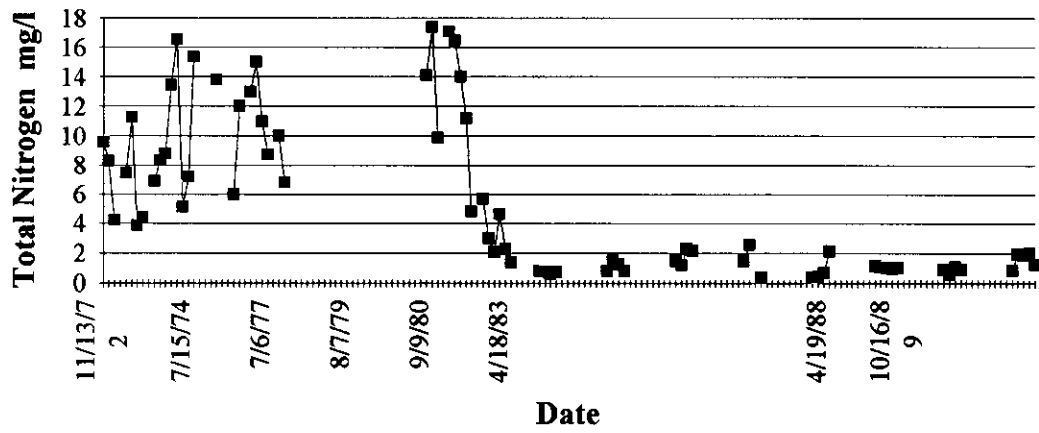
Biochemical Oxygen Demand - LEP
Location - Econlockhatchee Trail



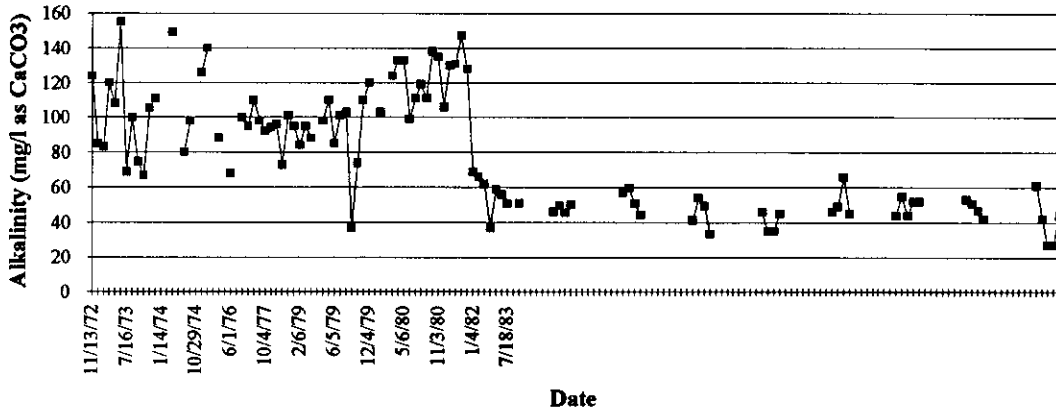
**Total Phosphorus - LEP
Location - Econlockhatchee Trail**



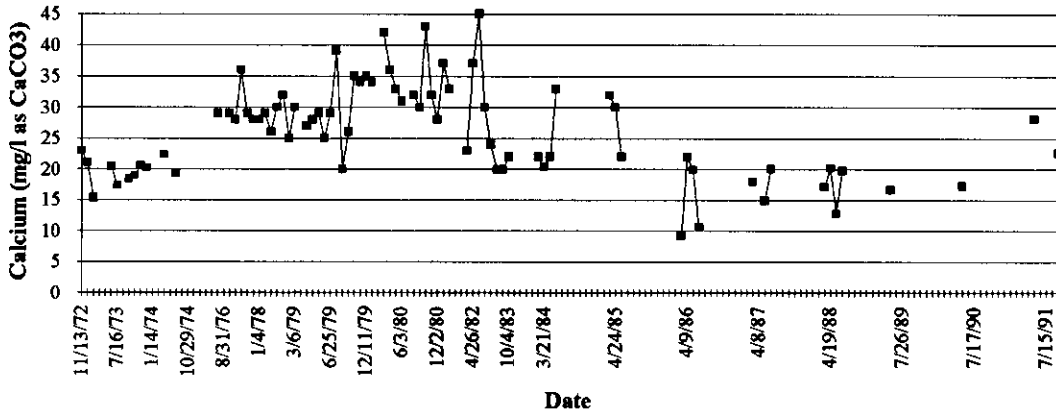
**Total Nitrogen - LEP
Location - Econlockhatchee Trail**



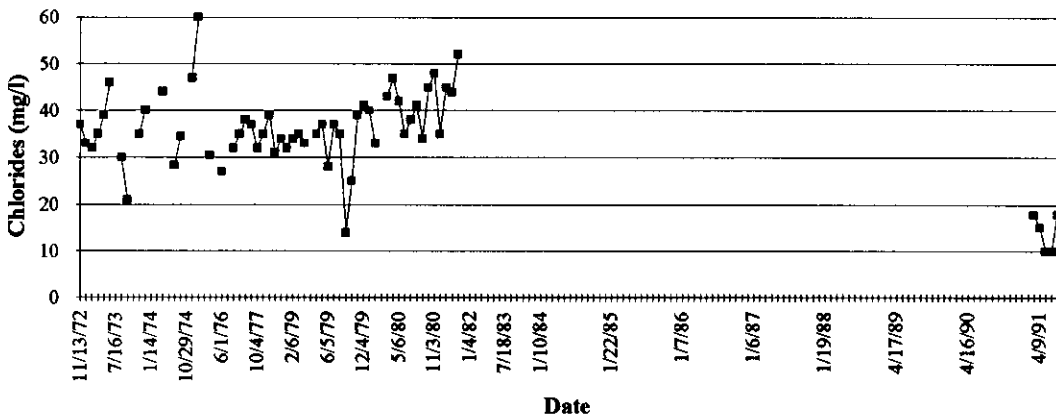
Alkalinity - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



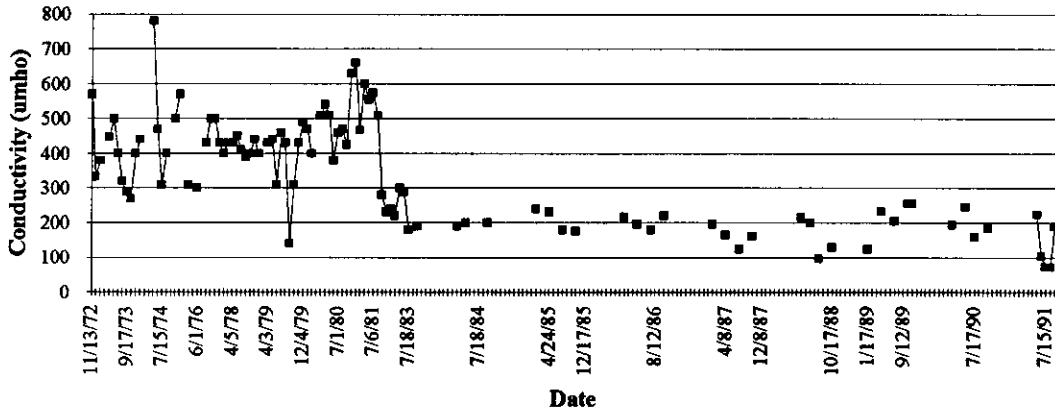
Calcium - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



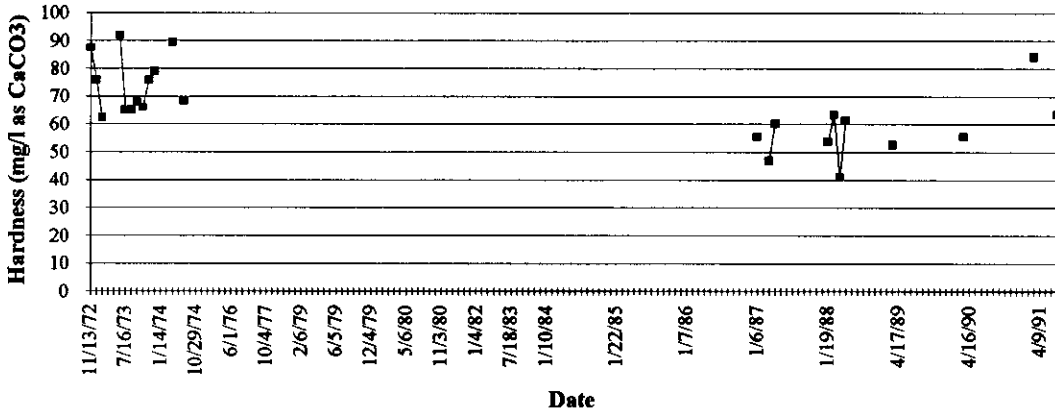
Chlorides - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



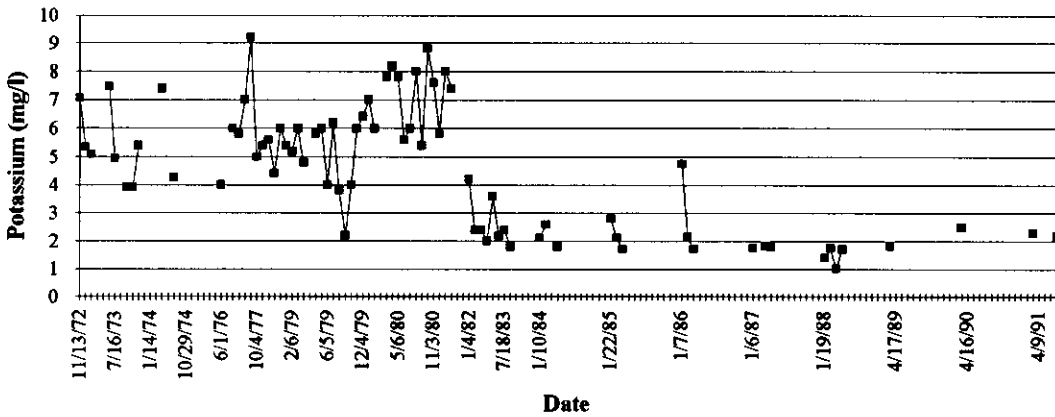
Conductivity - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



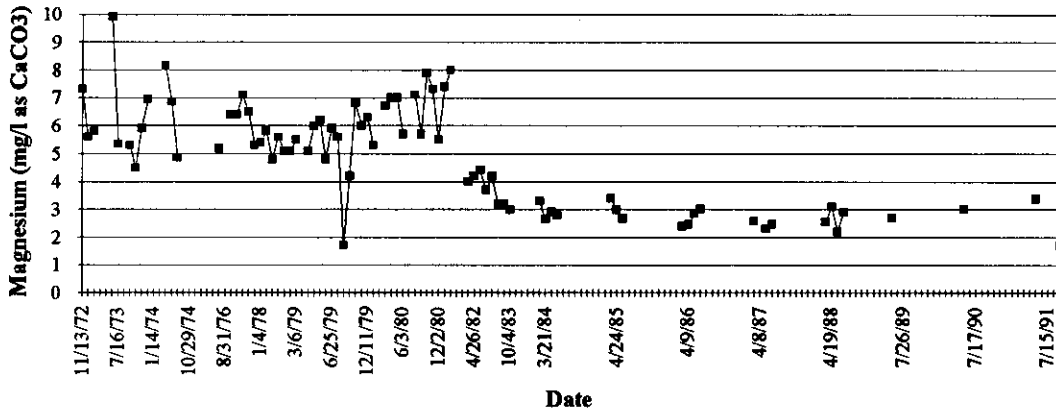
Hardness - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



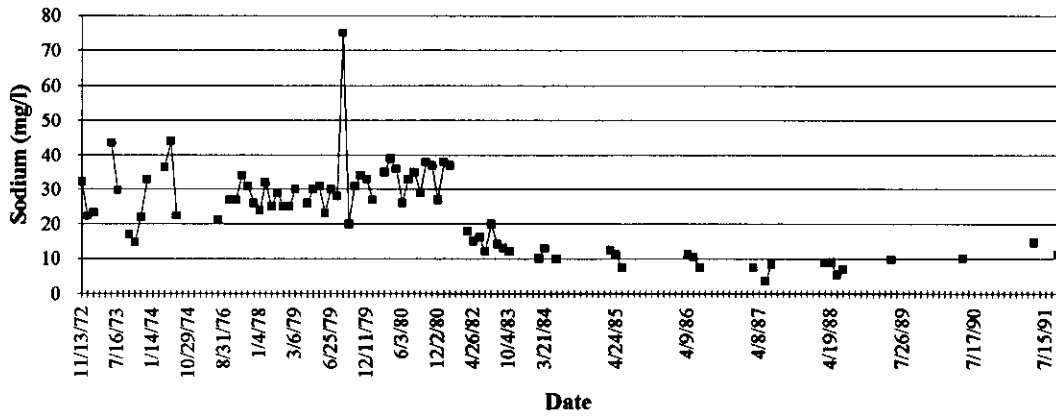
Potassium - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



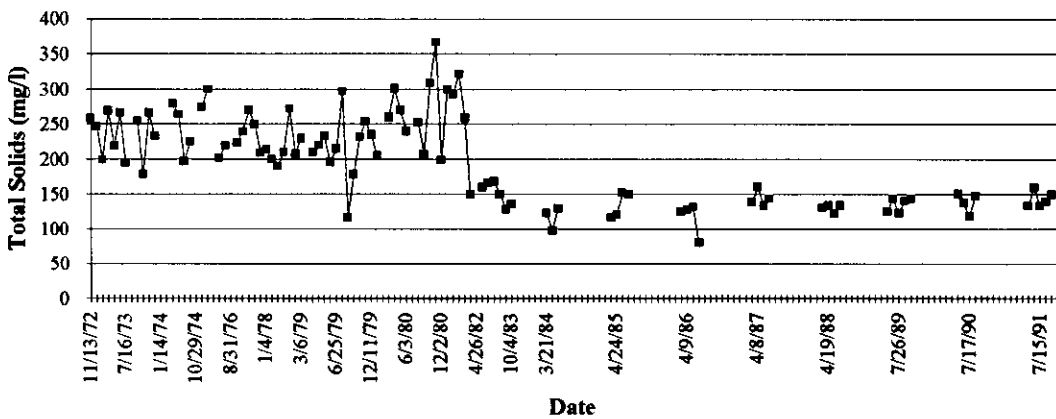
Magnesium - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail



Sodium - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail

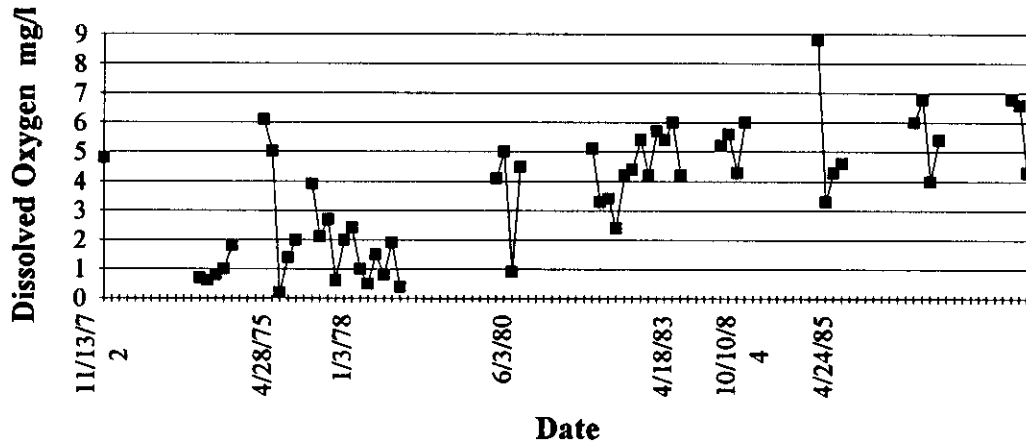


Total Solids - LEP
Location - Little Econlockhatchee at Econlockhatchee Trail

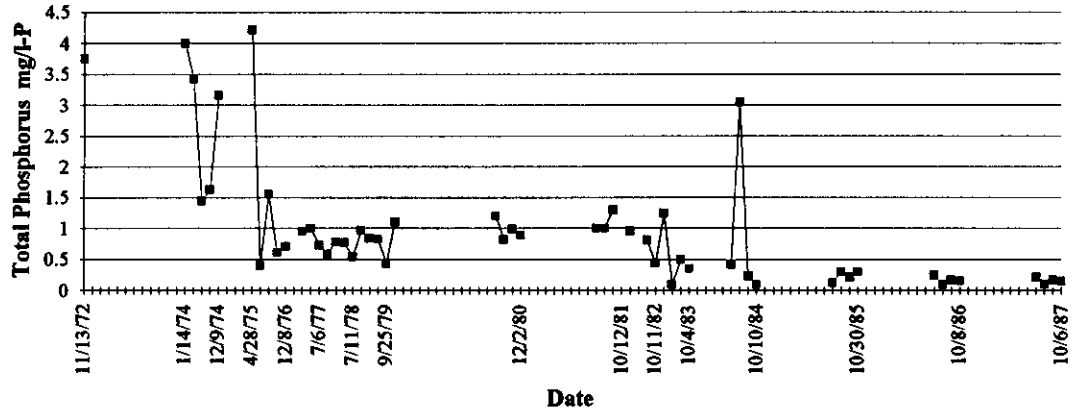


Water Quality Time Plots for Site LEQ
Dean Road at Michaels Dam

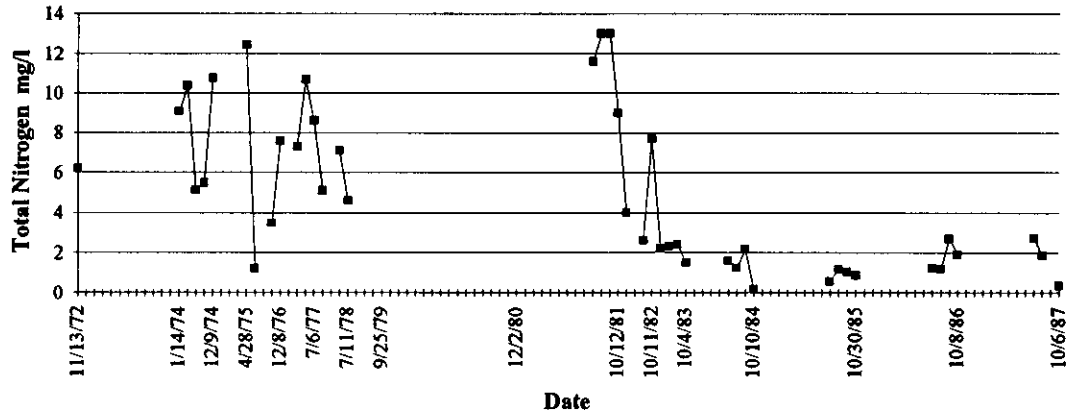
Dissolved Oxygen - LEQ
Location - Dean Road at Michaels Dam



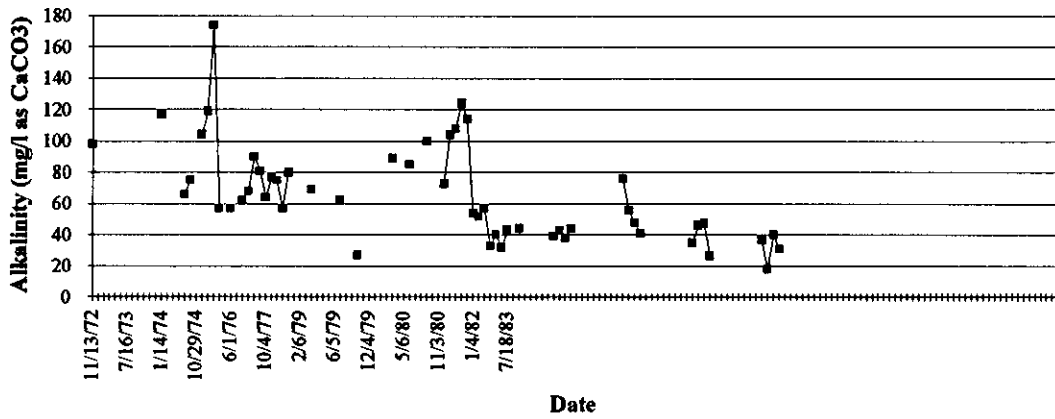
Total Phosphorus - LEQ
Location - Dean Road at Michaels Dam



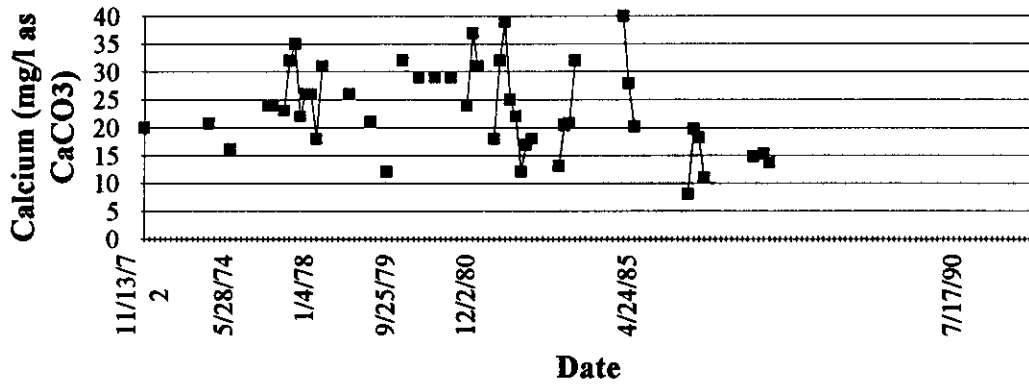
Total Nitrogen - LEQ
Location - Dean Road at Michaels Dam



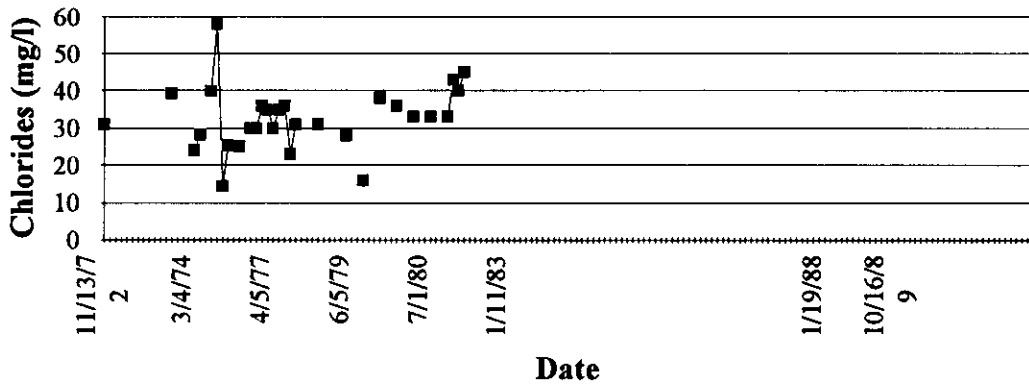
Alkalinity - LEQ
Location - Dean Road at Michaels Dam



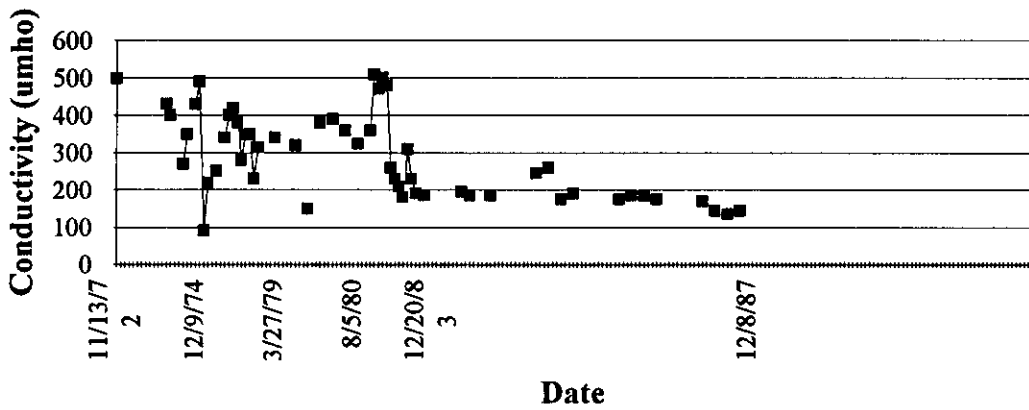
Calcium - LEQ
Location - Dean Road at Michaels Dam



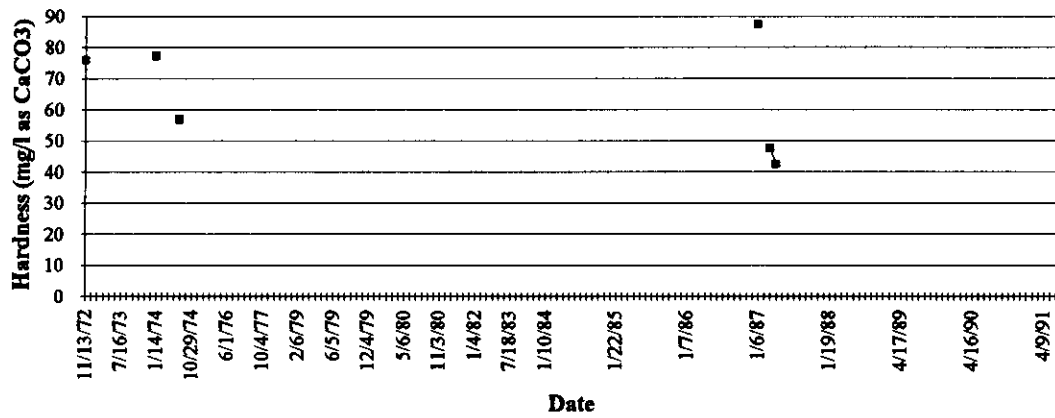
Chlorides - LEQ
Location - Dean Road at Michaels Dam



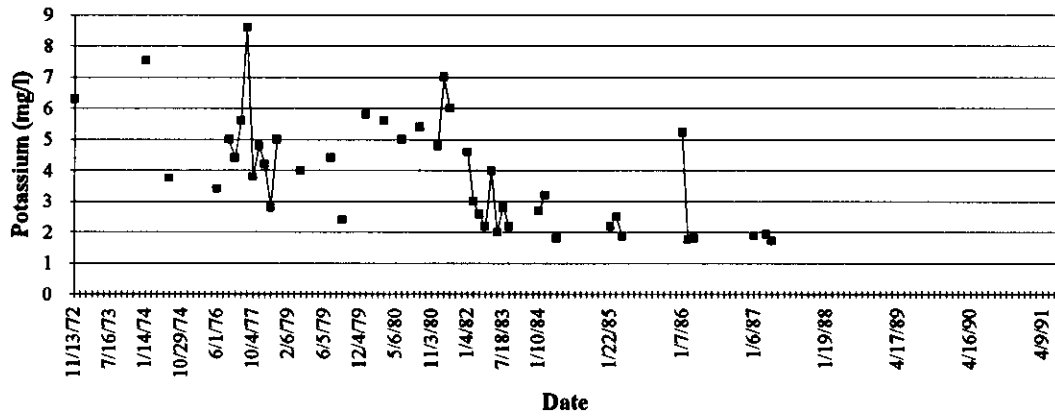
Conductivity - LEQ
Location - Dean Road at Michaels Dam



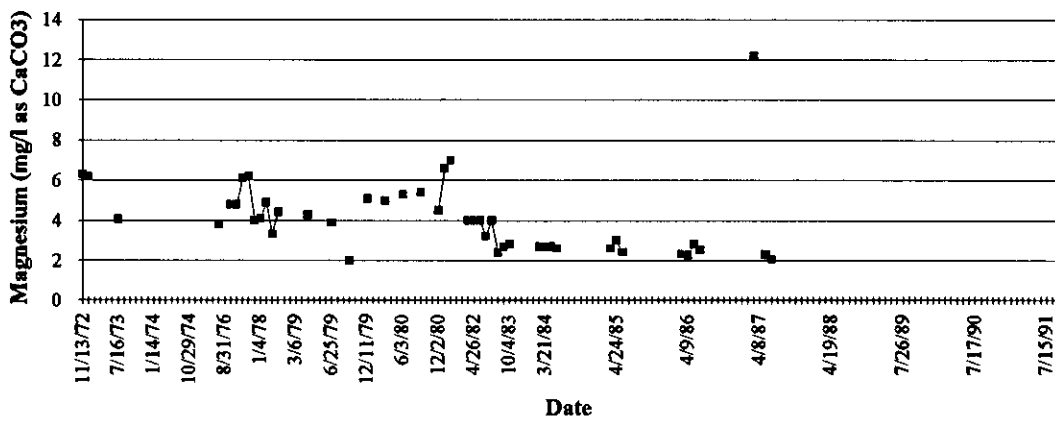
Hardness - LEQ
Location - Dean Road at Michaels Dam



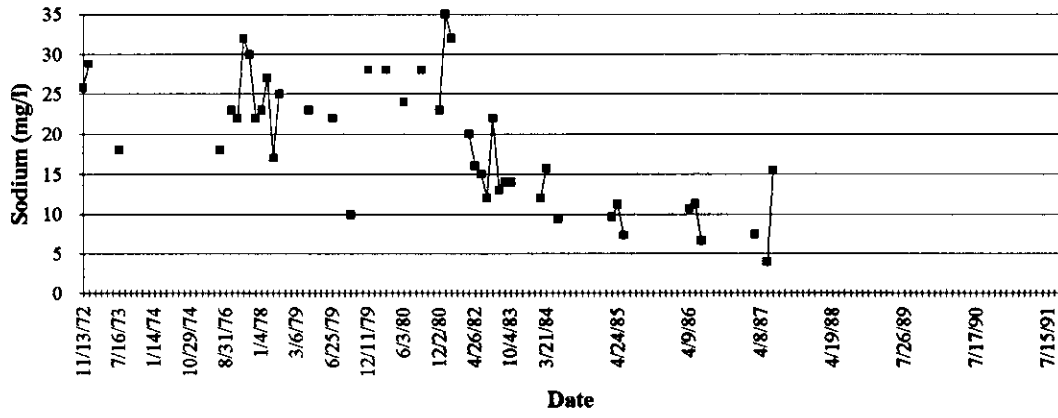
Potassium - LEQ
Location - Dean Road at Michaels Dam



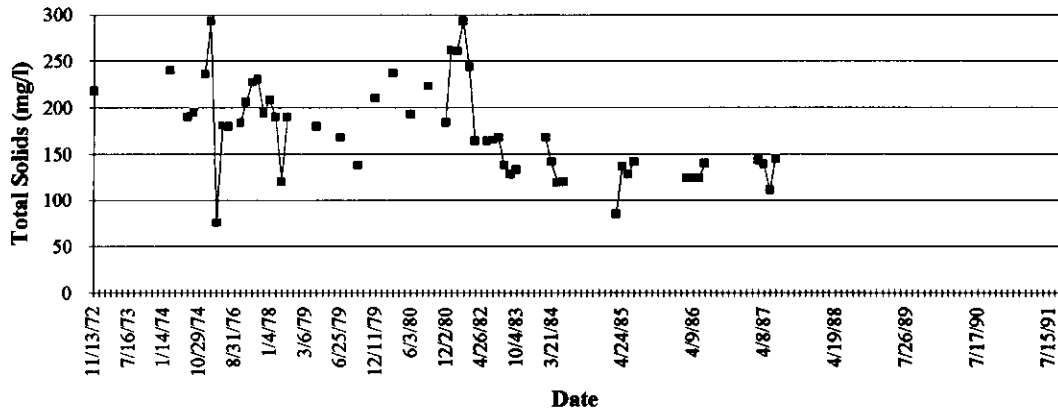
Magnesium - LEQ
Location - Dean Road at Michaels Dam



Sodium - LEQ
Location - Dean Road at Michaels Dam

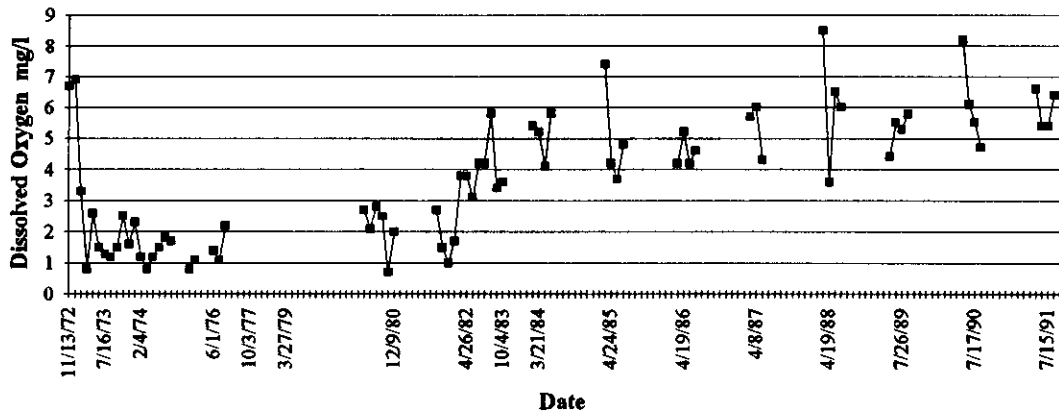


Total Solids - LEQ
Location - Dean Road at Michaels Dam

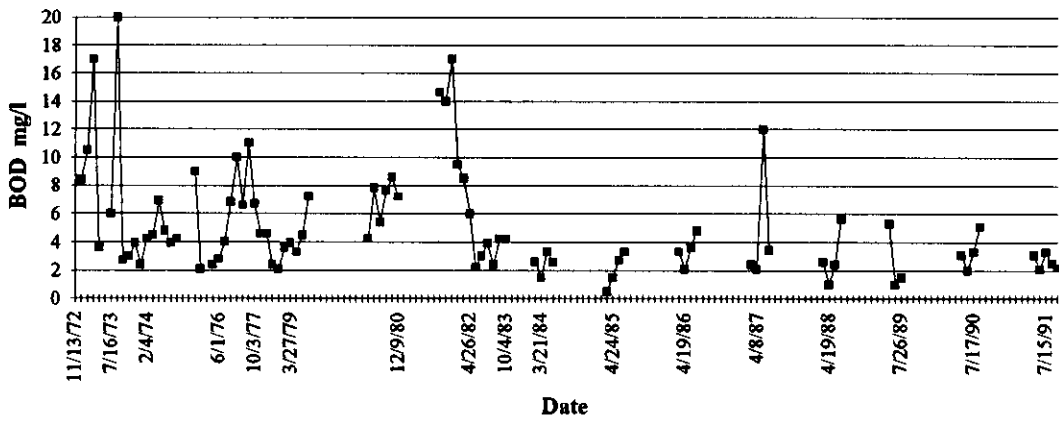


Water Quality Summary Site LER
Little Econlockhatchee at Buck Road

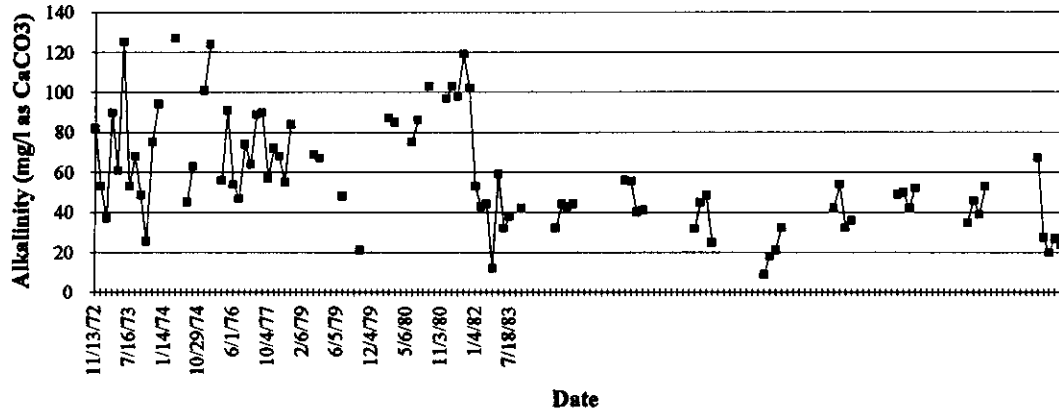
Dissolved Oxygen - LER
Location - Buck Road



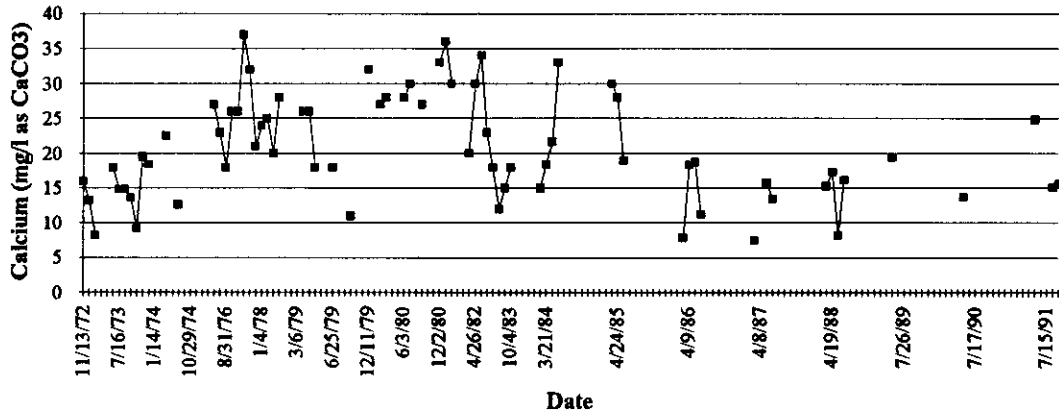
Biochemical Oxygen Demand - LER
Location - Buck Road



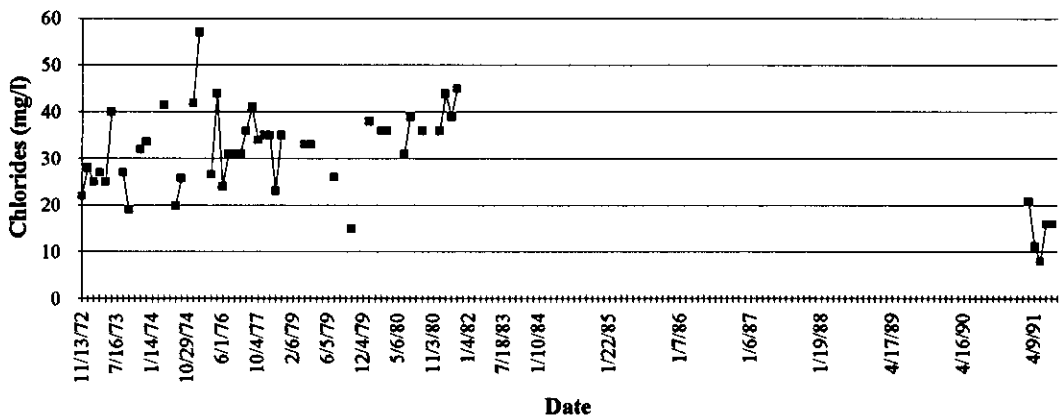
Alkalinity - LER
Location - Little Econlockhatchee at Buck Road



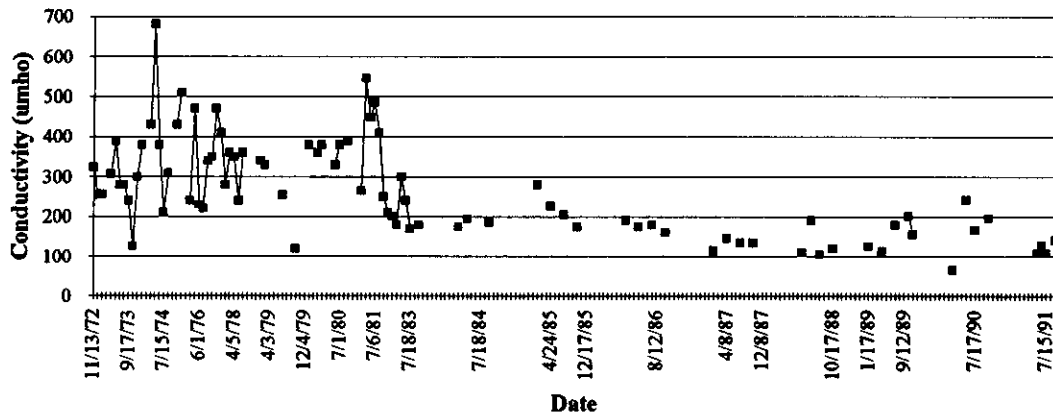
Calcium - LER
Location - Little Econlockhatchee at Buck Road



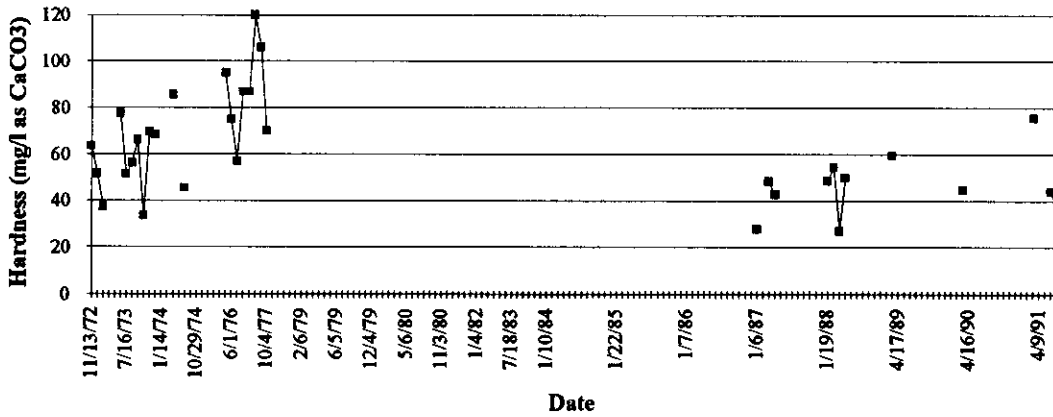
Chlorides - LER
Location - Little Econlockhatchee at Buck Road



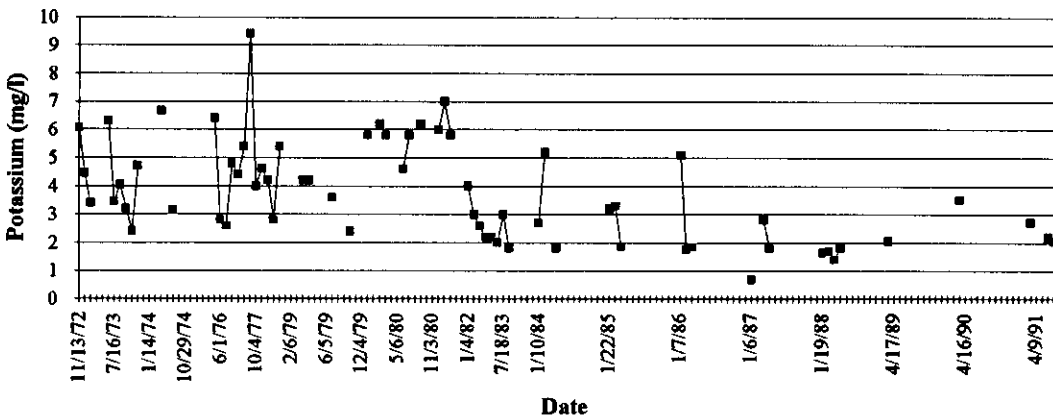
Conductivity - LER
Location - Little Econlockhatchee at Buck Road



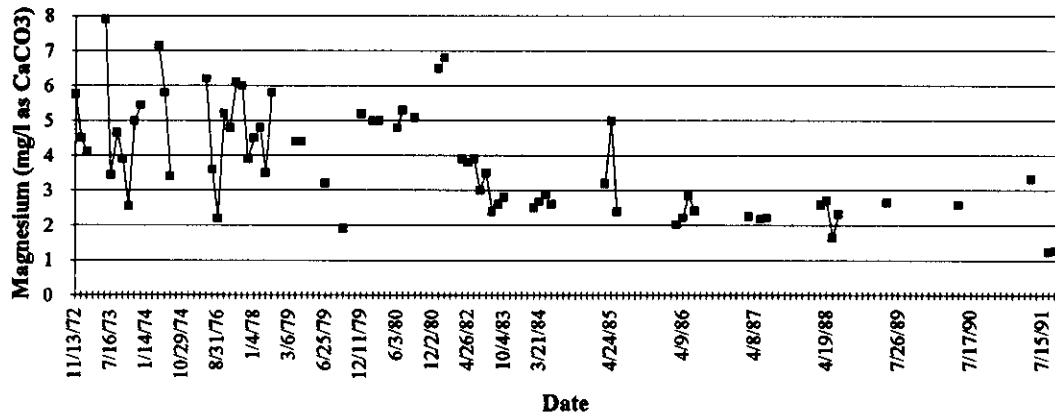
Hardness - LER
Location - Little Econlockhatchee at Buck Road



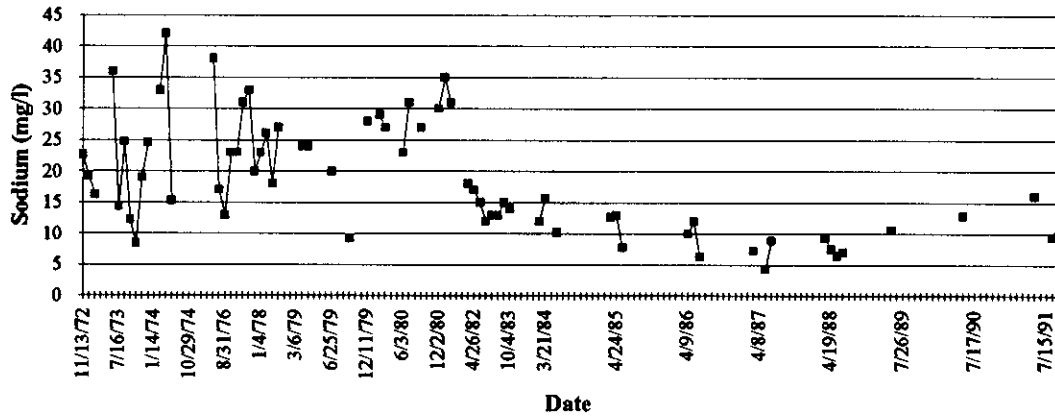
Potassium - LER
Location - Little Econlockhatchee at Buck Road



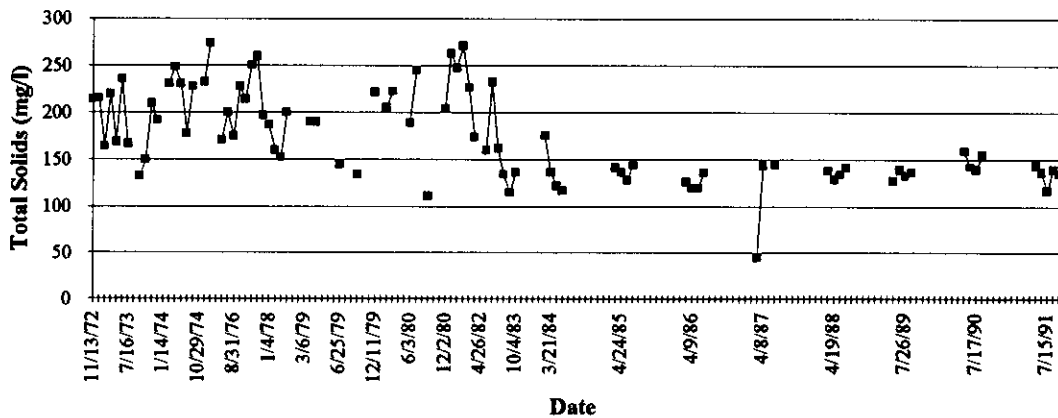
Magnesium - LER
Location - Little Econlockhatchee at Buck Road



Sodium - LER
Location - Little Econlockhatchee at Buck Road

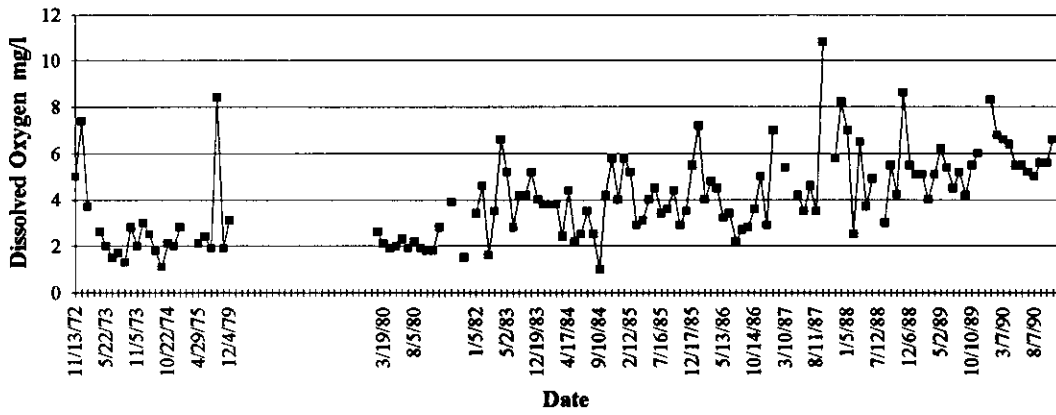


Total Solids - LER
Location - Little Econlockhatchee at Buck Road

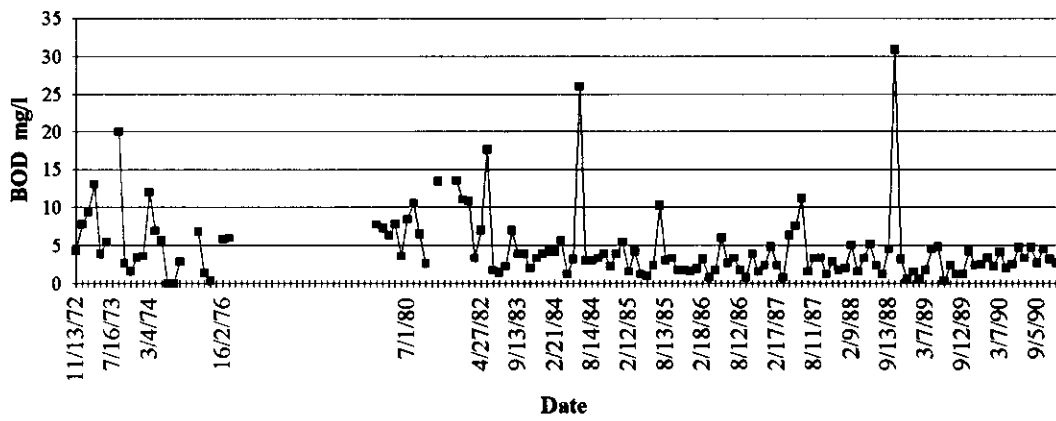


Water Quality Summary Site LES
 Little Econlockhatchee above confluence with Big Econlockhatchee River

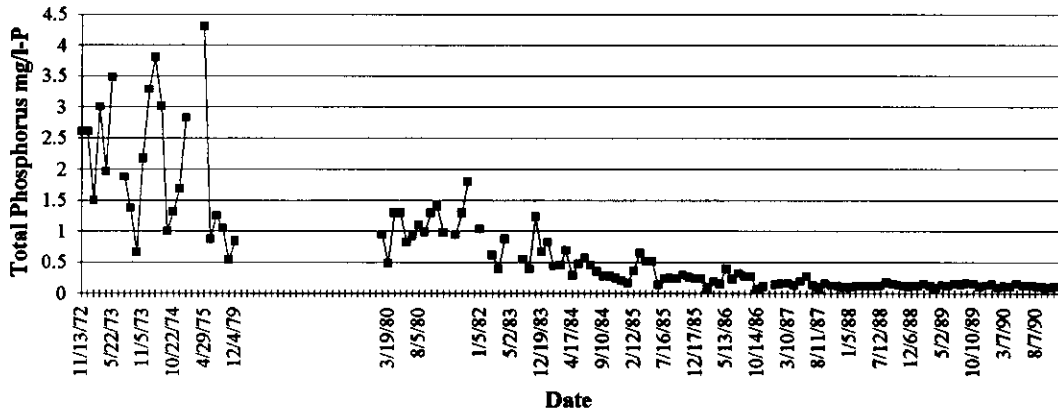
Dissolved Oxygen - LES
 Location - Confluence with Big Econlockhatchee River



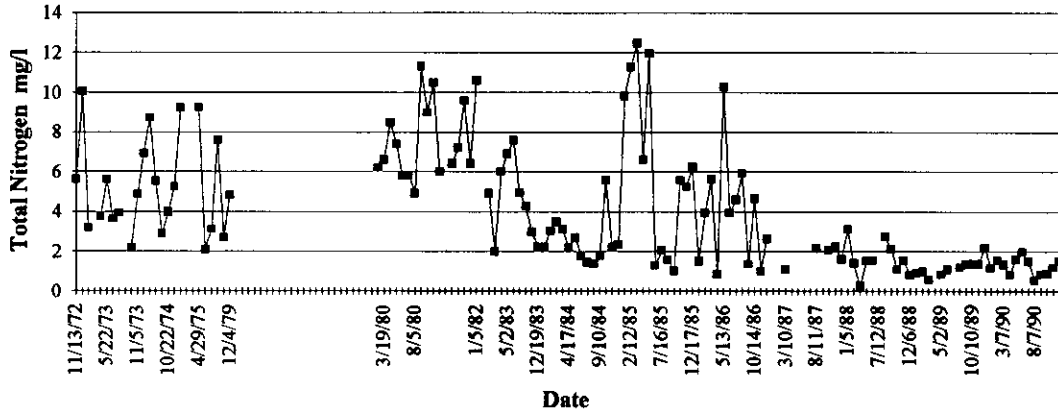
Biochemical Oxygen Demand - LES
 Location - Confluence with Big Econlockhatchee River



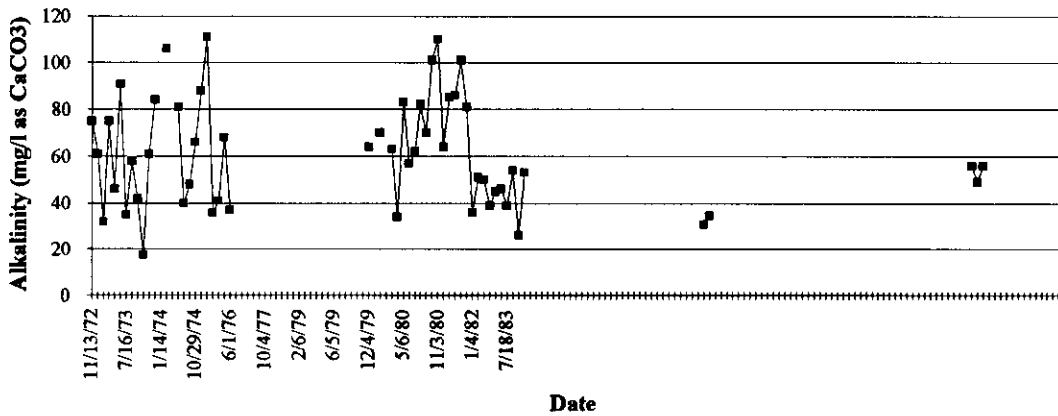
Total Phosphorus - LES
Location - Confluence with Big Econlockhatchee River



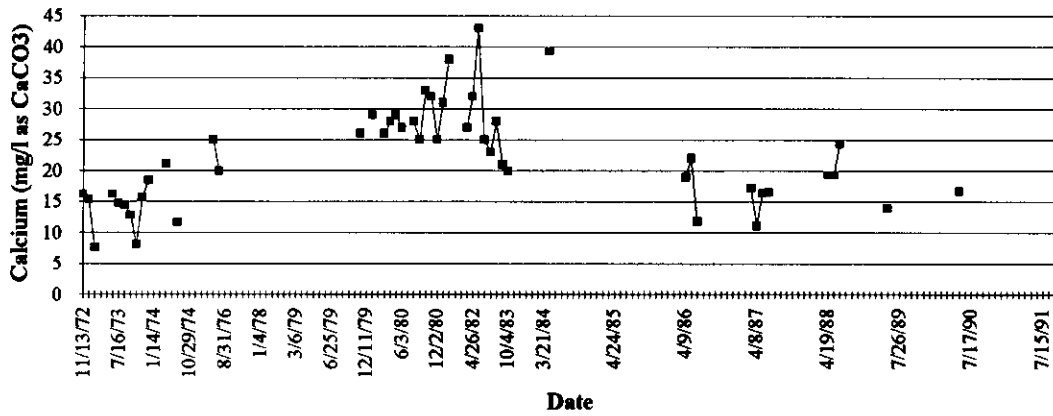
Total Nitrogen - LES
Location - Confluence with Big Econlockhatchee River



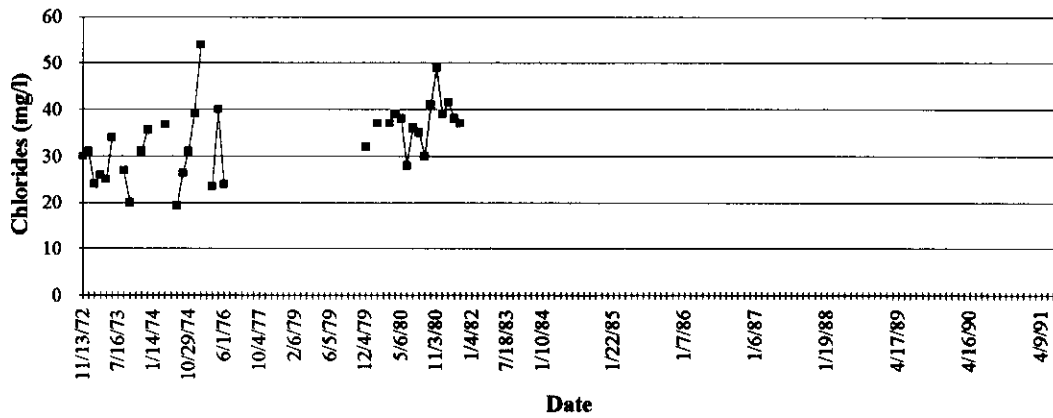
Alkalinity - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



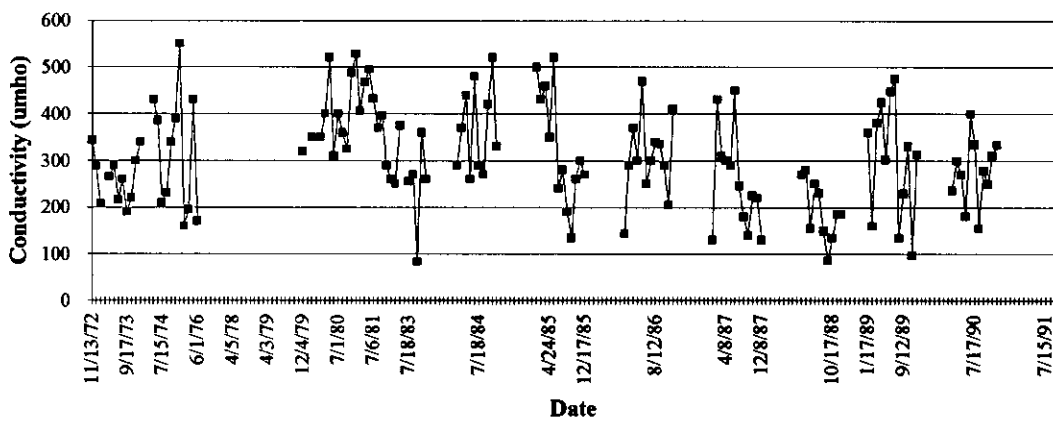
Calcium - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



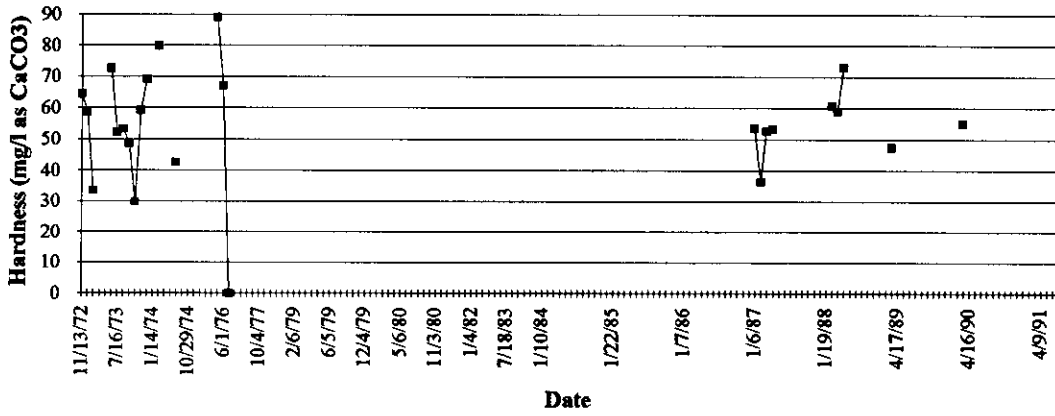
Chlorides - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



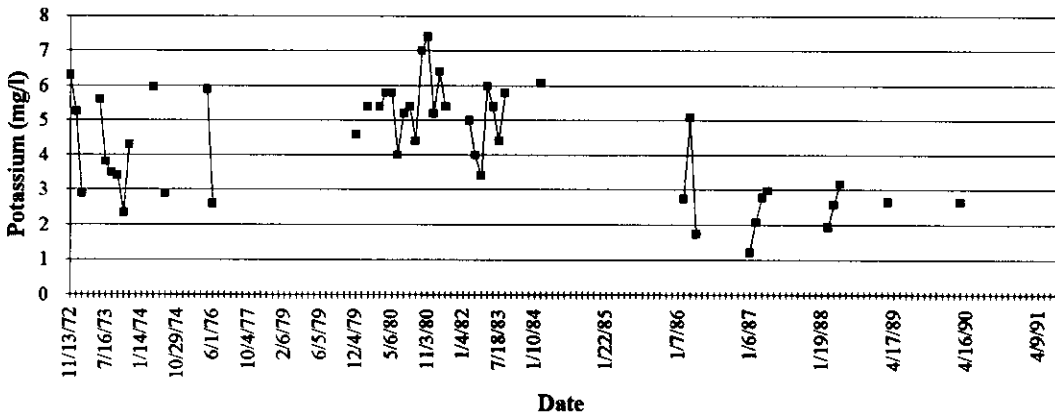
Conductivity - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



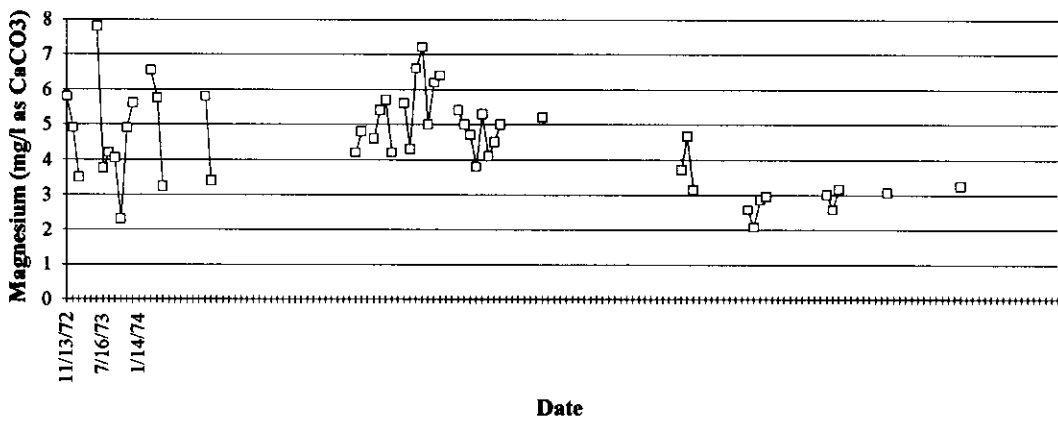
Hardness - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



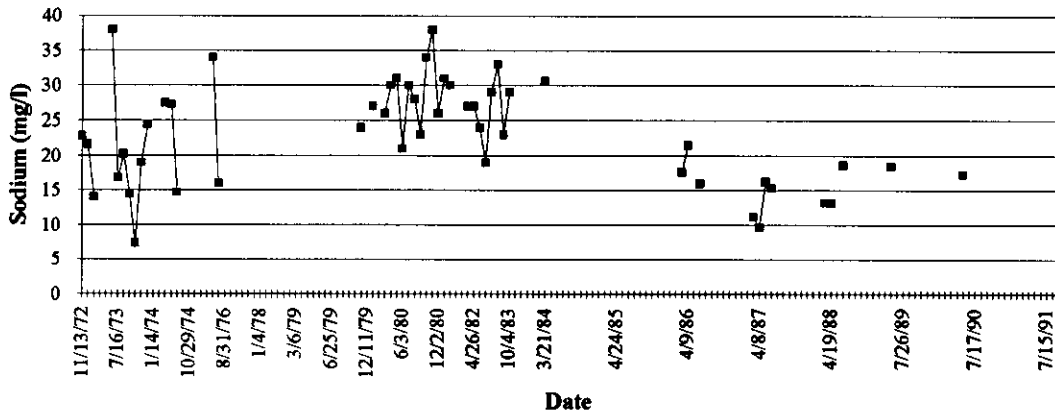
Potassium - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



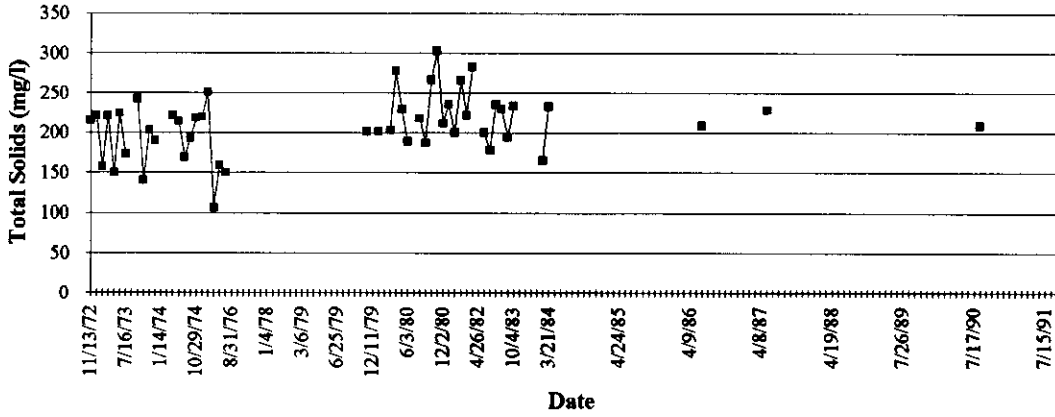
Magnesium - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



Sodium - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



Total Solids - LES
Location - Little Econlockhatchee above Confluence with Big Econlockhatchee River



PRE VERSUS POST STATISTICAL COMPARISONS

Statistical analyses of the data were completed and are summarized in the following Figures. Four water quality parameters; BOD, DO, TN, and TP were used. The first Figure is a summary of the average and standard deviation for the Big Econlockhatchee, pre 1983 and post 1983. The year 1983 was chosen because it was the approximate time significant regionalization of treatment facilities took place. For the four sites on the Little Econlockhatchee River, the same four water quality parameters were compared.

The post 1983 mean and standard deviation statistics show an improvement in the water quality for those locations previously affected by sewage treatment plant discharge.

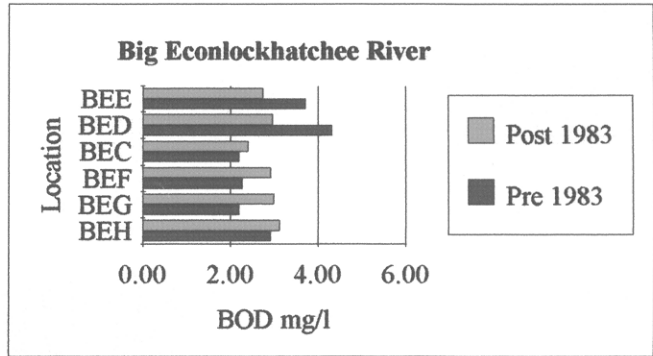
STATISTICS FOR BIG ECONLOCKHATCHEE RIVER

Pre 1983 Statistics for BOD

	BEH	BEG	BEF	BEC	BED	BEE
Average	2.92	2.20	2.28	2.21	4.32	3.72
Standard Dev.	1.92	1.52	1.73	2.85	2.75	2.02
Number points	23	5	28	55	65	47

Post 1983 Statistics for BOD

	BEH	BEG	BEF	BEC	BED	BEE
Average	3.13	3.00	2.92	2.42	2.97	2.75
Standard Dev.	2.64	2.43	3.30	2.68	2.64	2.00
Number points	38	90	90	63	90	91

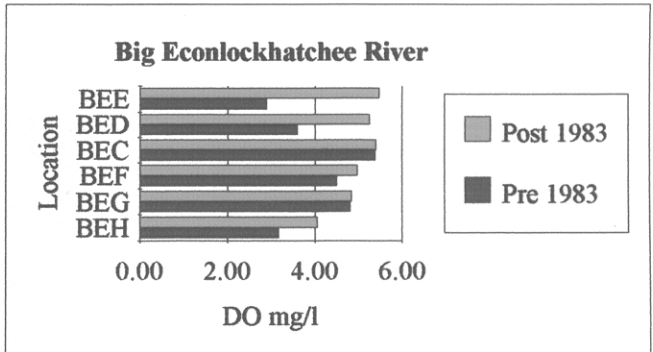


Pre 1983 Statistics for Dissolved Oxygen

	BEH	BEG	BEF	BEC	BED	BEE
Average	3.19	4.82	4.51	5.40	3.61	2.90
Standard Dev.	1.23	1.30	1.61	1.65	1.42	1.22
Number points	24	5	27	61	76	50

Post 1983 Statistics for Dissolved Oxygen

	BEH	BEG	BEF	BEC	BED	BEE
Average	4.06	4.85	4.99	5.40	5.26	5.47
Standard Dev.	1.71	1.41	1.24	1.47	1.40	1.46
Number points	35	82	85	62	87	87

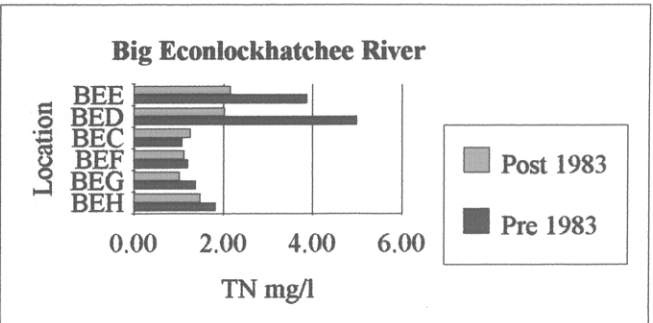


Pre 1983 Statistics for Total Nitrogen

	BEH	BEG	BEF	BEC	BED	BEE
Average	1.83	1.38	1.21	1.08	4.99	3.88
Standard Dev.	0.98	0.36	0.30	0.36	3.23	1.77
Number points	20	7	19	46	40	44

Post 1983 Statistics for Total Nitrogen

	BEH	BEG	BEF	BEC	BED	BEE
Average	1.48	1.02	1.12	1.26	2.04	2.16
Standard Dev.	0.88	0.51	0.99	1.29	2.05	2.01
Number points	31	83	82	54	80	79

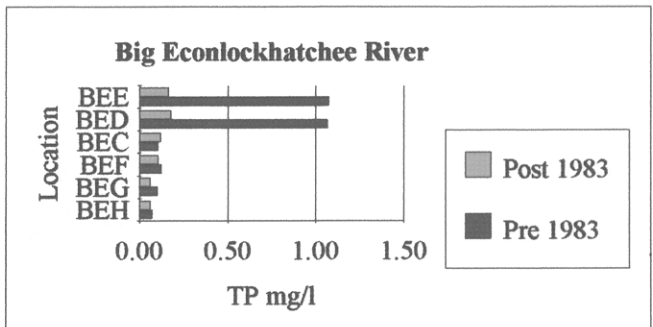


Pre 1983 Statistics for Total Phosphorus

	BEH	BEG	BEF	BEC	BED	BEE
Average	0.08	0.10	0.12	0.10	1.07	1.08
Standard Dev.	0.12	0.06	0.06	0.04	1.07	0.90
Number points	23	7	26	55	56	48

Post 1983 Statistics for Total Phosphorus

	BEH	BEG	BEF	BEC	BED	BEE
Average	0.06	0.06	0.11	0.12	0.18	0.17
Standard Dev.	0.07	0.03	0.08	0.11	0.14	0.09
Number points	34	87	90	60	90	90



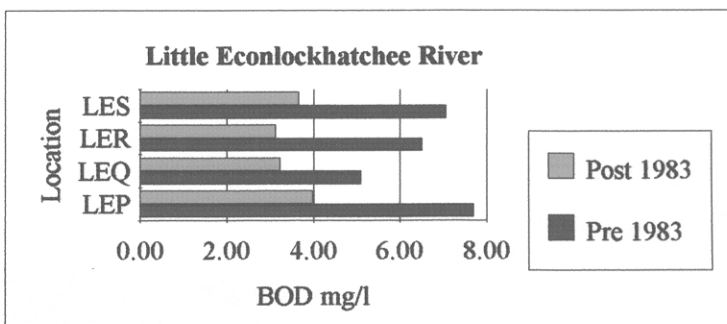
STATISTICS FOR THE LITTLE ECONLOCKHATCHEE RIVER

Pre 1983 statistics for BOD

	LEP	LEQ	LER	LES
Average	7.70	5.10	6.51	7.07
Standard Dev.	4.44	3.03	4.22	4.53
Count	61	34	49	37

Post 1983 statistics for BOD

	LEP	LEQ	LER	LES
Average	3.99	3.24	3.13	3.66
Standard Dev.	2.02	1.47	1.94	4.20
Count	33	19	36	91

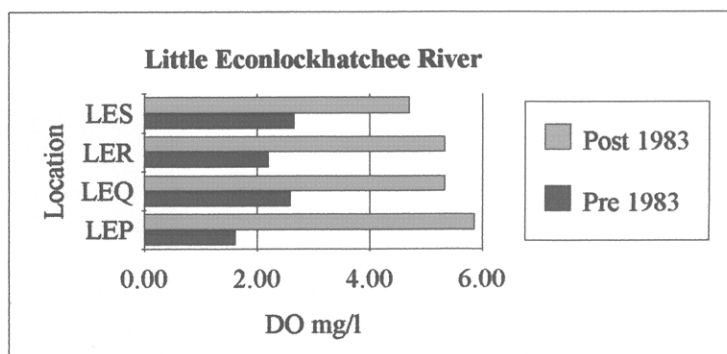


Pre 1983 statistics for Dissolved Oxygen

	LEP	LEQ	LER	LES
Average	1.63	2.60	2.21	2.67
Standard Dev.	1.70	1.76	1.44	1.49
Count	57	35	37	40

Post 1983 statistics for Dissolved Oxygen

	LEP	LEQ	LER	LES
Average	5.87	5.35	5.34	4.72
Standard Dev.	1.30	1.33	1.22	1.64
Count	37	20	36	86

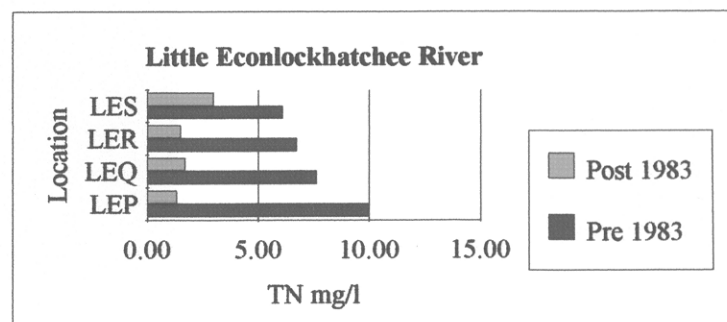


Pre 1983 statistics for Total Nitrogen

	LEP	LEQ	LER	LES
Average	10.02	7.65	6.75	6.10
Standard Dev.	4.26	3.40	2.73	2.57
Count	34	23	41	40

Post 1983 statistics for Total Nitrogen

	LEP	LEQ	LER	LES
Average	1.34	1.72	1.51	2.98
Standard Dev.	0.81	1.05	0.97	2.73
Count	37	20	36	81

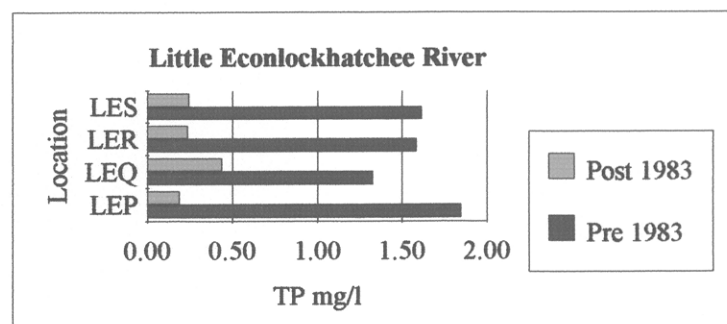


Pre 1983 statistics for Total Phosphorus

	LEP	LEQ	LER	LES
Average	1.85	1.33	1.59	1.62
Standard Dev.	1.40	1.07	1.12	0.99
Count	56	33	47	40

Post 1983 statistics for Total Phosphorus

	LEP	LEQ	LER	LES
Average	0.19	0.44	0.24	0.24
Standard Dev.	0.19	0.66	0.25	0.20
Count	37	21	35	88



GRAPHICAL COMPARISONS OF TIME AND LOCATION

To illustrate water quality improvement with time and location, three dimensional graphs were constructed. The graphs relate concentration to both time and location in the Big and Little Econlockhatchee Rivers. The graphs provide a summary for each river with time and for each sampling location.

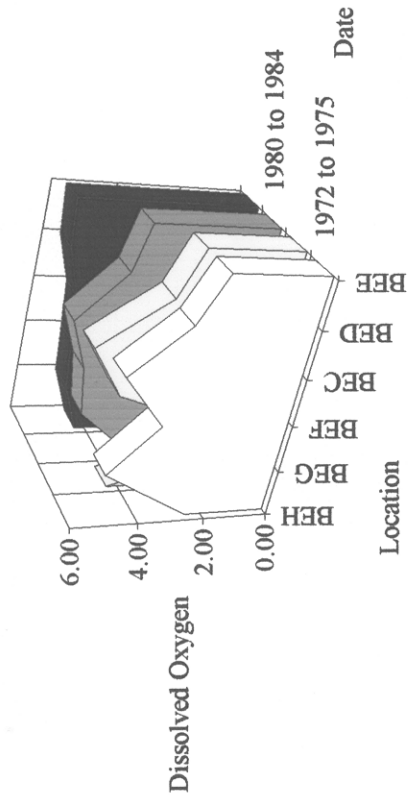
The water quality parameters modeled are dissolved oxygen, biochemical oxygen demand, total phosphorus, and total nitrogen, conductivity, alkalinity, chlorides, total solids, hardness. The data were divided into increments representing time periods of at least 10 data points, except for location BEG that had only a low of five data points previous to 1983. These time intervals are: 1972 to 1975; 1976 to 1979; 1980 to 1984; and 1985 to present. Some of the analyses are incomplete due to lack of data. If there was insufficient data to complete the analysis for a given time period, the time period was combined with another time period.

Conductivity, Alkalinity, Total Solids, and Hardness all showed a gradual increase with downstream distance. There is little difference between time periods.

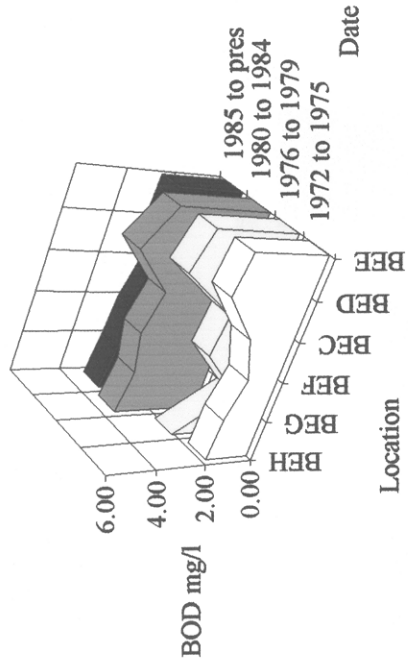
From the following Figure, dissolved oxygen showed an increase in the 1985 to present analysis over the previous years. This increase in water quality is most likely due to improvements made in wastewater treatment around 1983. A corresponding decrease in biochemical oxygen demand, total phosphorus, and total nitrogen also occurs during the same time period as shown in the remaining Figures.

The total solids data showed a consistent increase as downstream distance increases. For site BEG in time period 1976 to 1979 there was no data. The total averages for all total solids data are shown. No alkalinity data existed for site BEH for time period 1972 to 1975. No data existed for site BEH and BEG for 1976 to 1979. The BEH data for all time periods appeared inconsistent. No conductivity data existed for site BEG for time period 1976 to 1979. There was not enough hardness data to form a time variation. All data was averaged to give one plot.

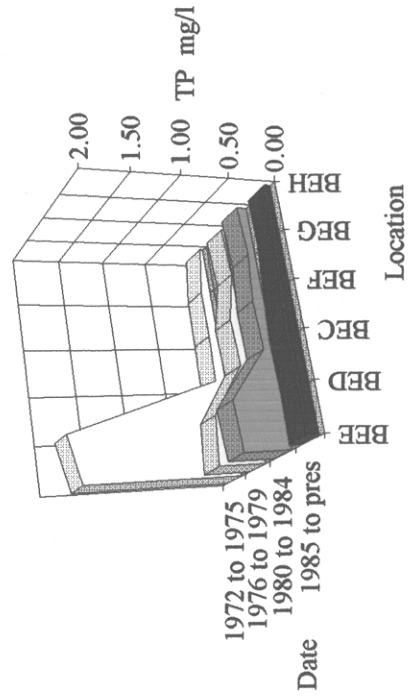
Dissolved Oxygen Variation with Location and Time Period



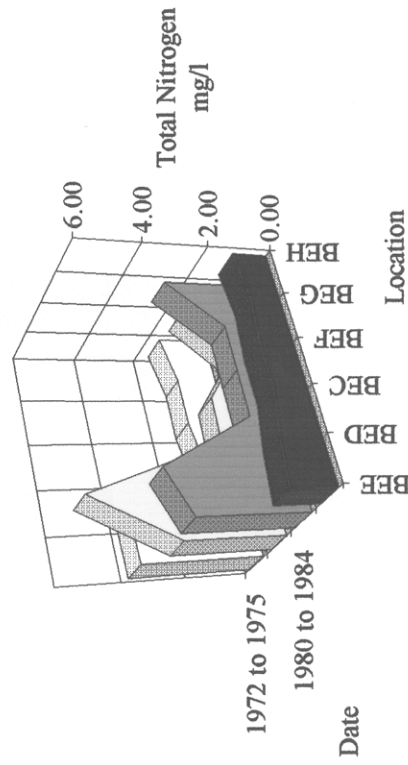
BOD Variation with Location and Time Period



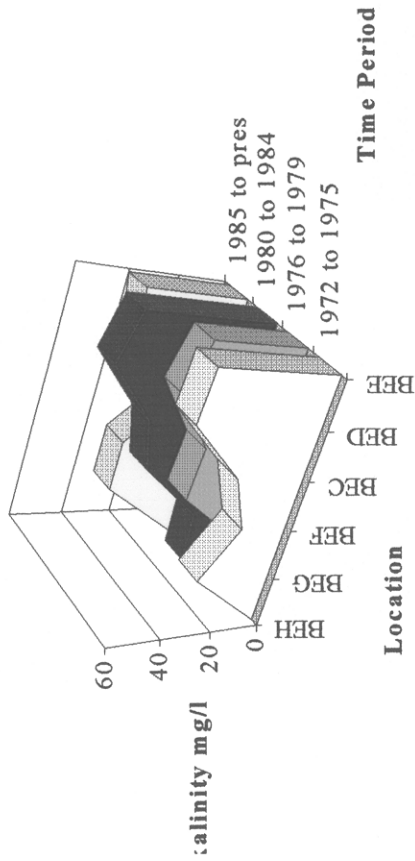
Total Phosphorus Variation with Location and Time Period



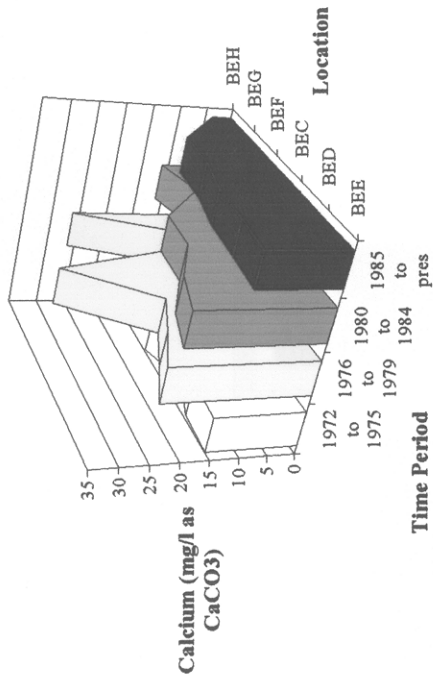
Total Nitrogen Variation with Location and Time Period



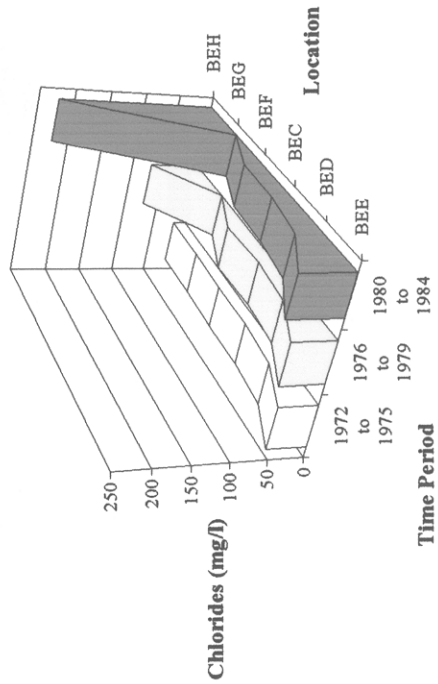
Alkalinity Variation with Location and Time Period



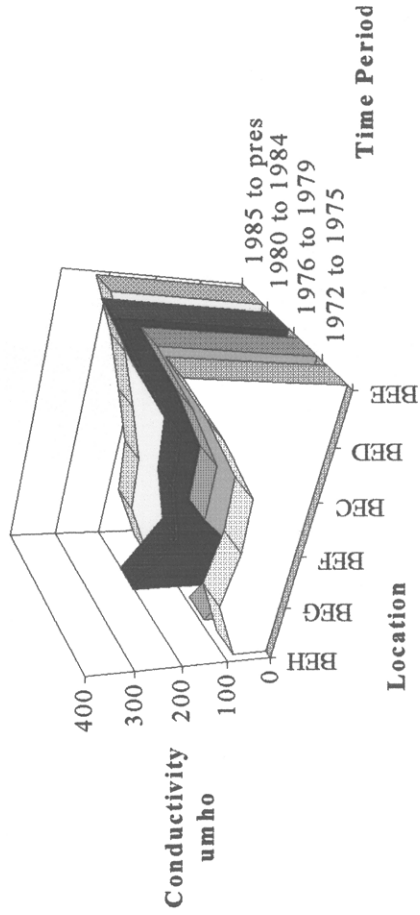
Calcium Variation with Location and Time Period



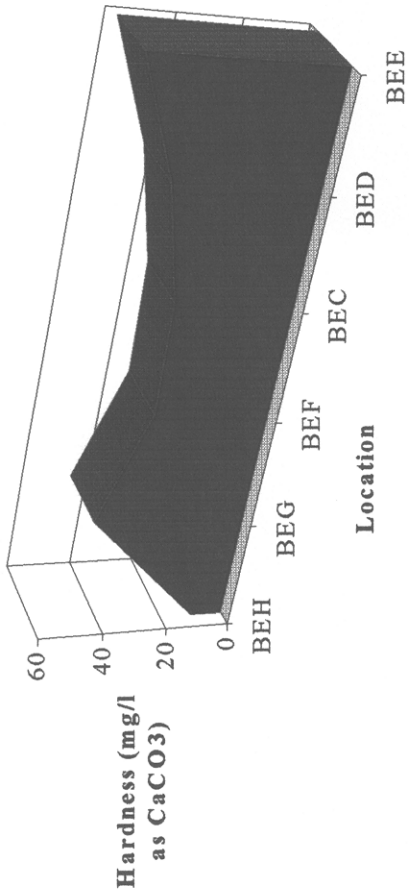
Chlorides Variation with Location and Time Period



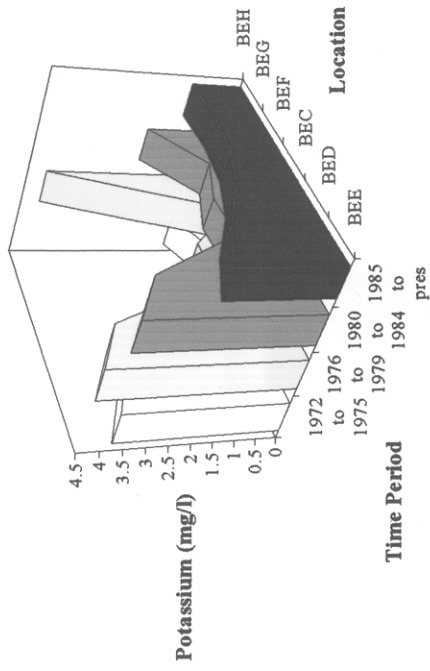
Conductivity Variation with Location and Time Period



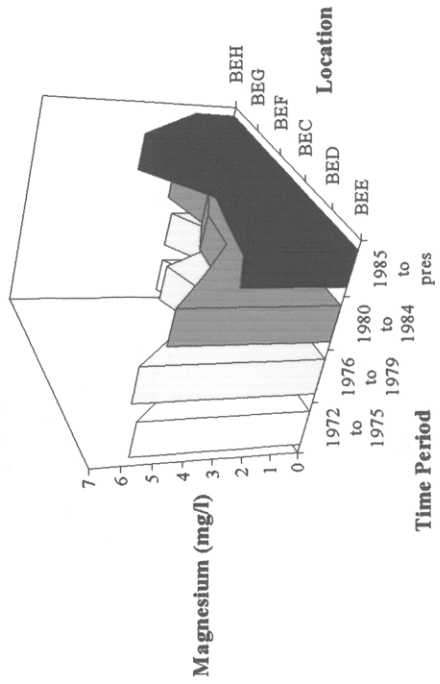
Hardness Variation with Location



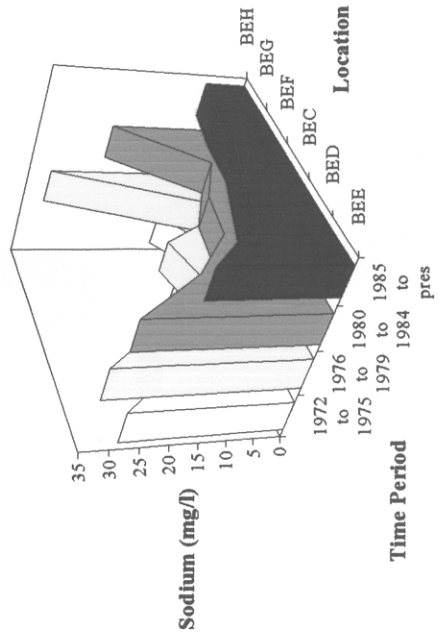
Potassium Variation with Location and Time Period



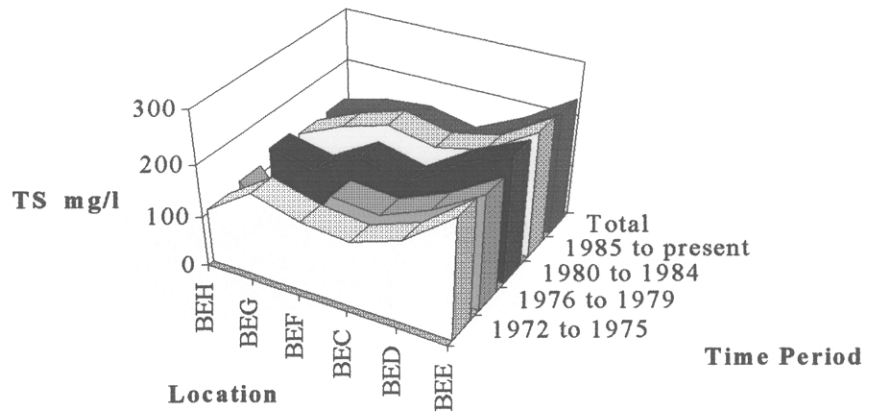
Magnesium Variation with Location and Time Period



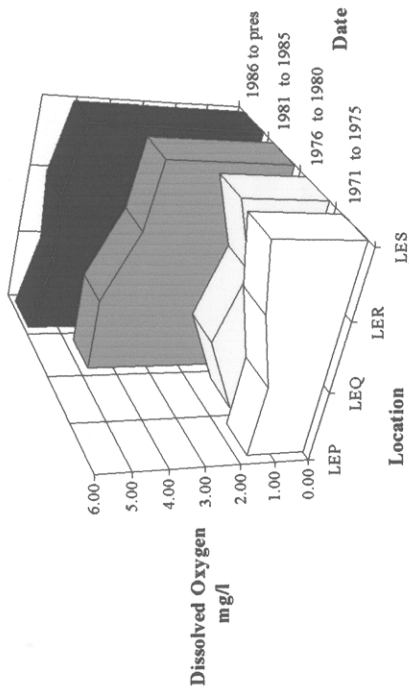
Sodium Variation with Location and Time Period



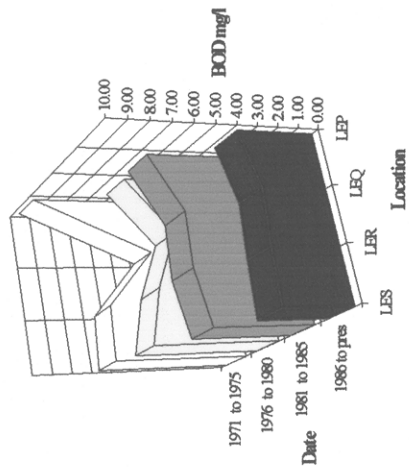
Total Solids with Location and Time Period



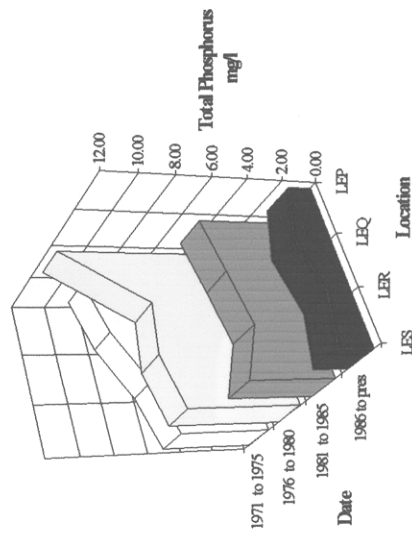
Dissolved Oxygen Variation with Location and Time Period



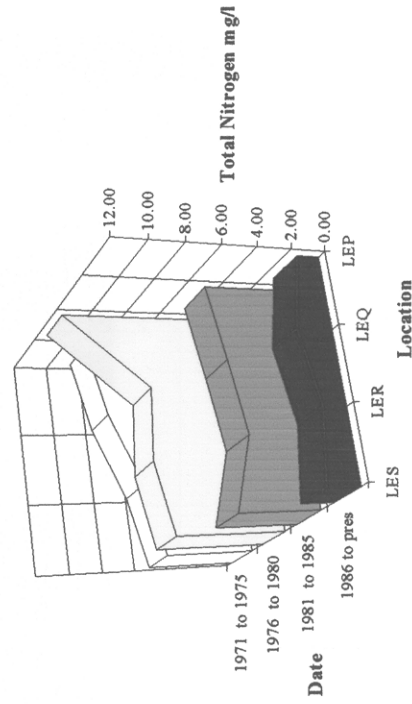
BOD Variation with Location and Time Period



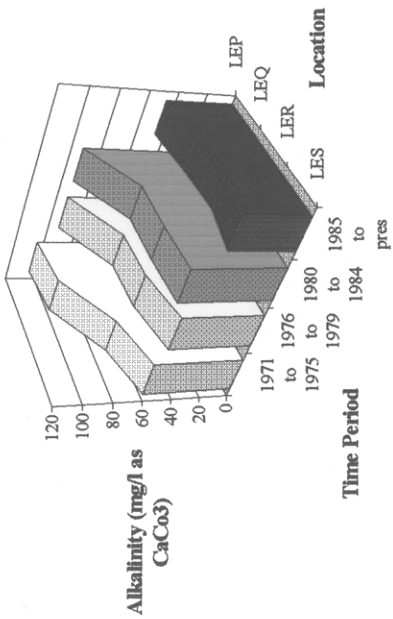
Total Phosphorus Variation with Location and Time Period



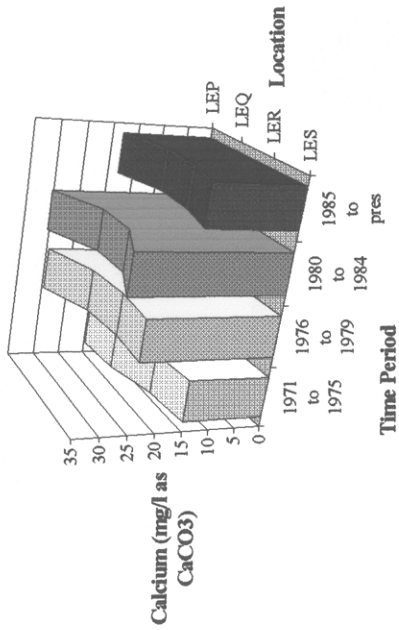
Total Nitrogen Variation with Location and Time Period



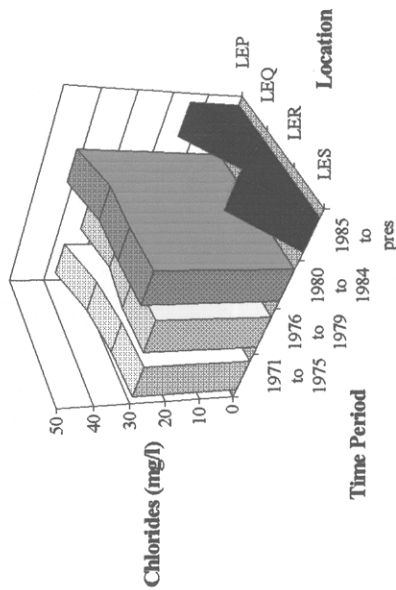
Alkalinity Variation with Location and Time Period



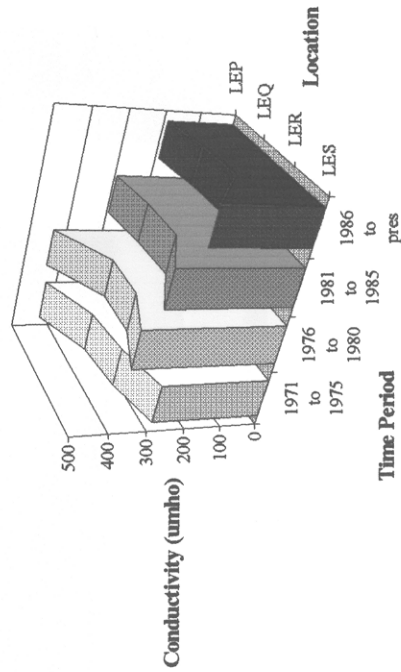
Calcium Variation with Location and Time Period



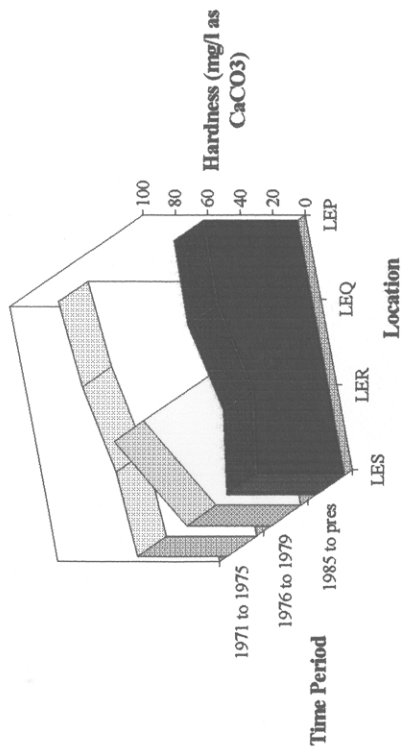
Chlorides Variation with Location and Time Period



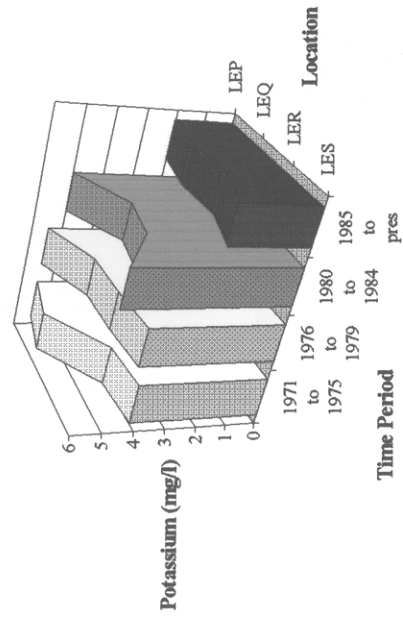
Conductivity Variation with Location and Time Period



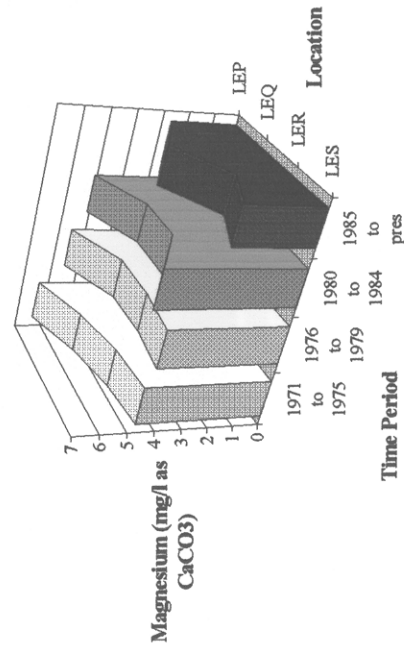
Hardness Variation with Location and Time Period



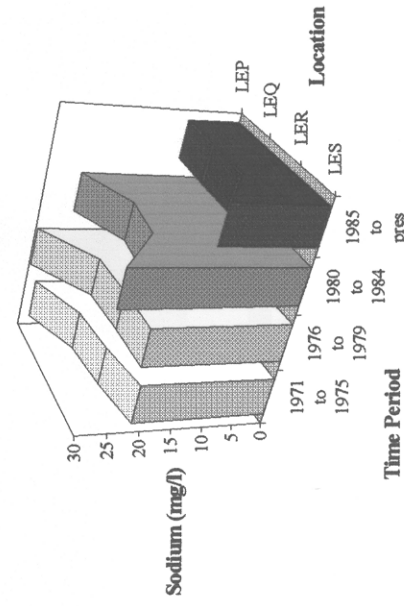
Potassium Variation with Location and Time Period



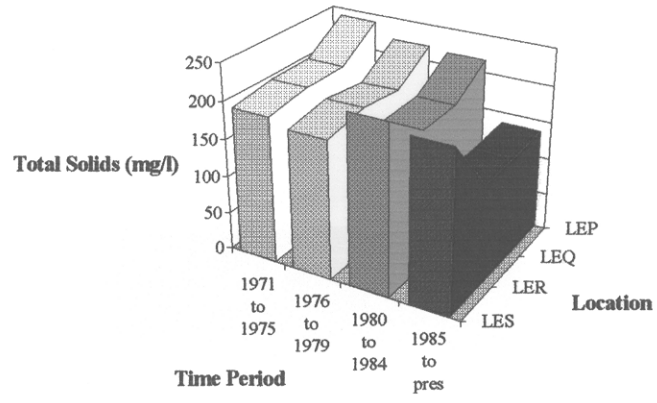
Magnesium Variation with Location and Time Period



Sodium Variation with Location and Time Period



Total Solids Variation with Location and Time Period



PROBABILITY FREQUENCY DISTRIBUTIONS

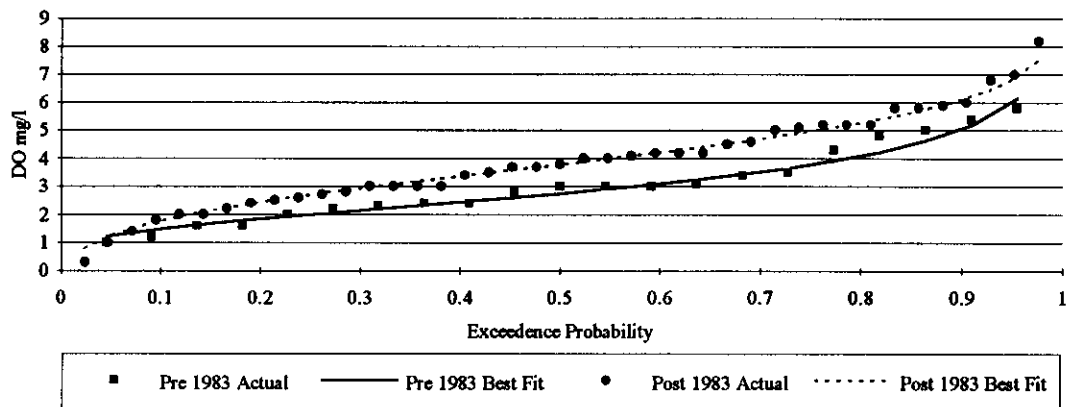
The constituents which are reported in this analysis are dissolved oxygen, biochemical oxygen demand, total nitrogen, total phosphorus, alkalinity, calcium, chlorides, conductivity, hardness, potassium, magnesium, sodium, and total solids. The data was collected by Orange County Pollution Control Department over a 20 year period beginning in 1971. Each of the analyses begins with a summary plot for each water quality constituent. These plots show the average of all data, pre 1983 data, and post 1983 data for each water quality constituent for both the Big and the Little Econlockhatchee River segments.

Each comparison plot contains four sets of data. Two sets are the actual water quality parameter values arranged as an empirical probability distribution and calculated using the Weibull plot position formula. The other sets of data are the best fit random distribution to an empirical one. The random theoretical distributions tested were normal, 2 parameter log normal, Pearson type III, Log Pearson type III, and Gumbel distribution. The best fit was determined on the basis of minimum sum of errors squared. The best fit theoretical distribution was either the 3 parameter log normal or the 2 parameter log normal.

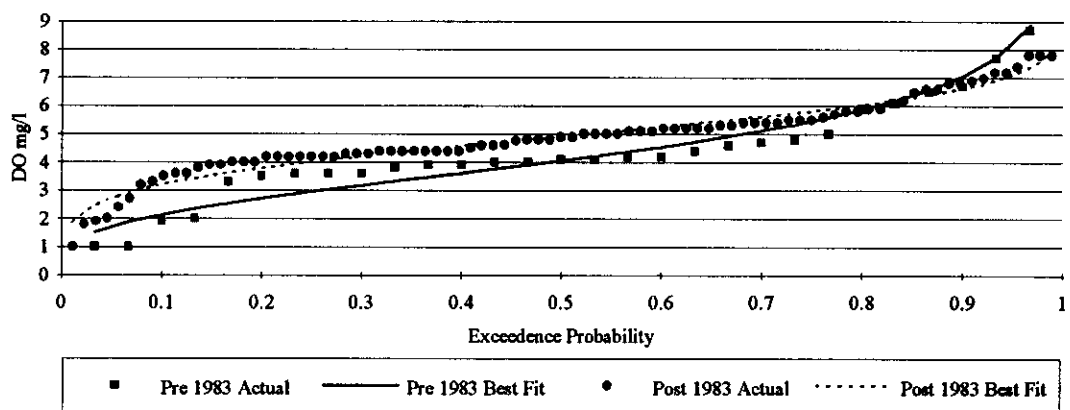
In the future as additional water quality data are collected, empirical probability distributions can be developed and plotted against the ones in this report to indicate changes in water quality. The future data must be independent of one another to calculate the random empirical distribution. The frequency of sampling of no less than once per month appears to produce independent data sets.

Probability Analysis of Dissolved Oxygen

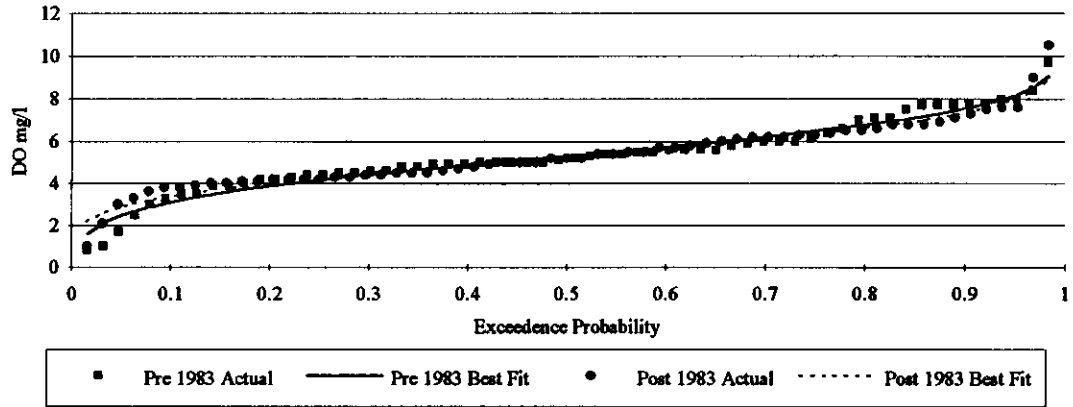
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



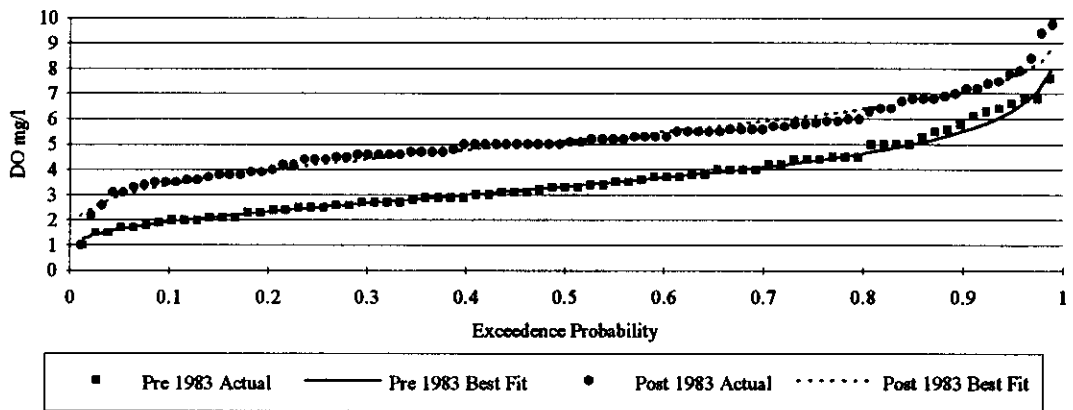
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site BEF on the Big Econlockhatchee River
Before and After Stormwater Regulation



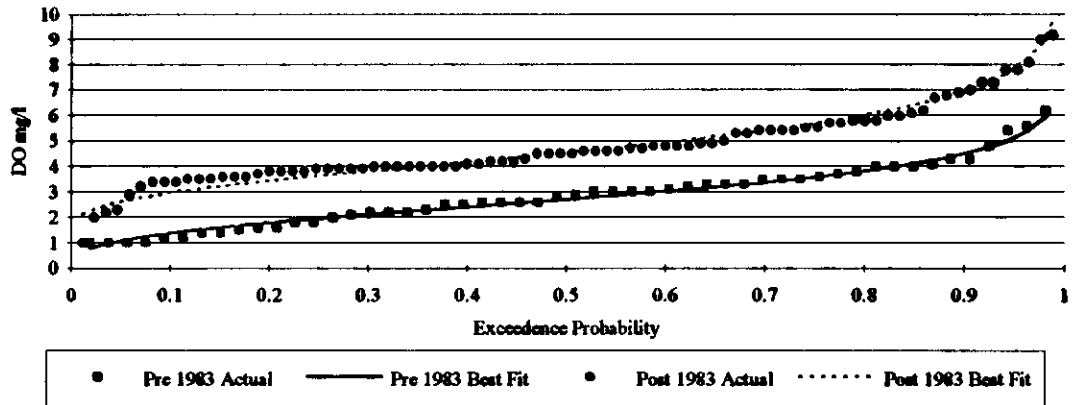
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River
Before and After Stormwater Regulations



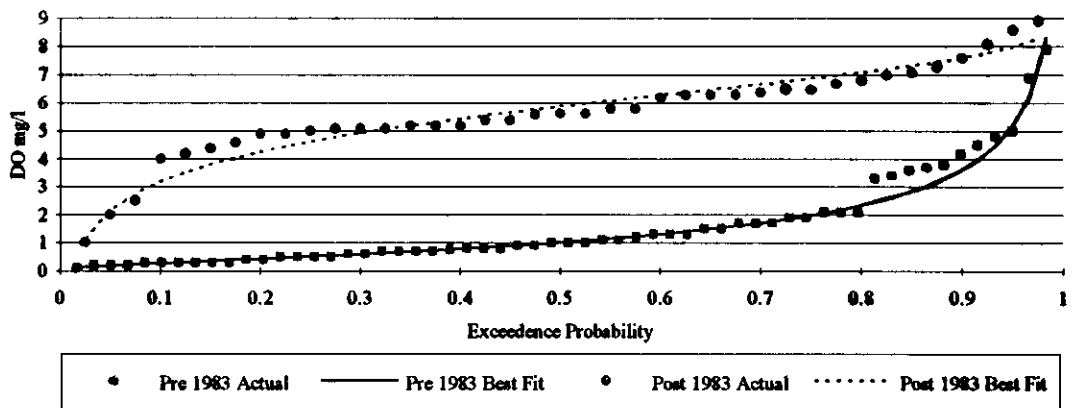
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site BED on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



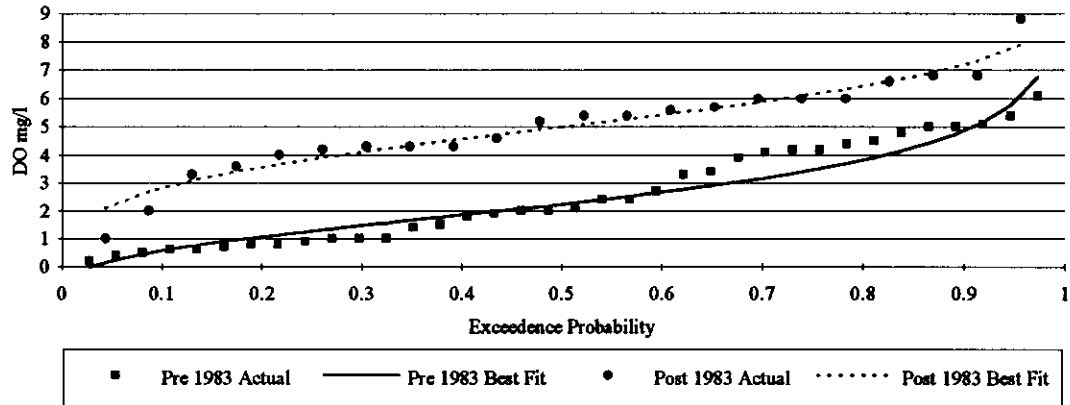
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



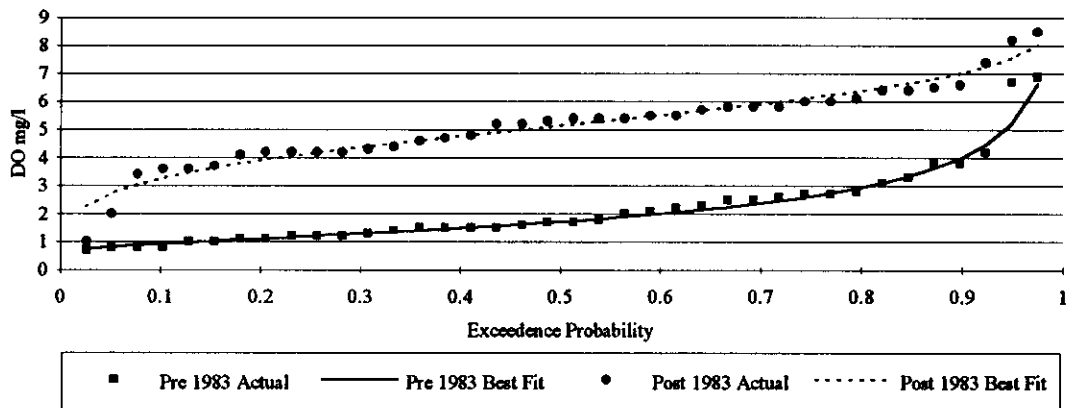
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site LEP on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



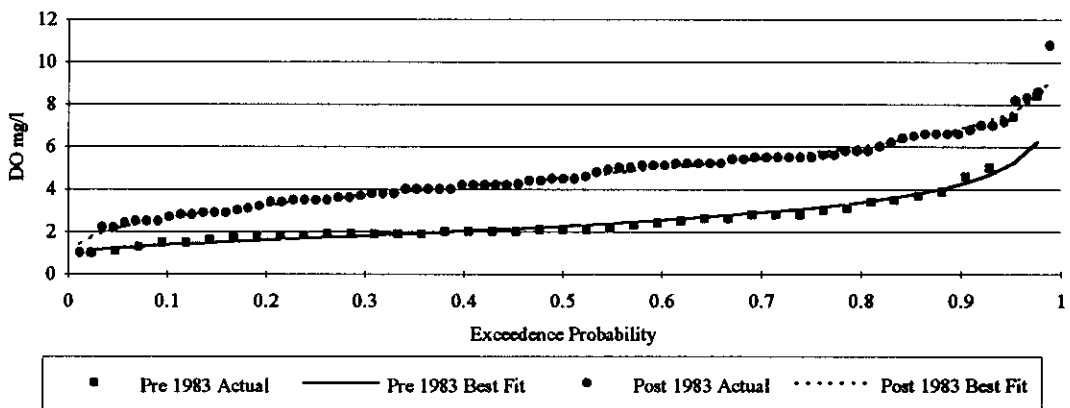
Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site LEQ on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site LER on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

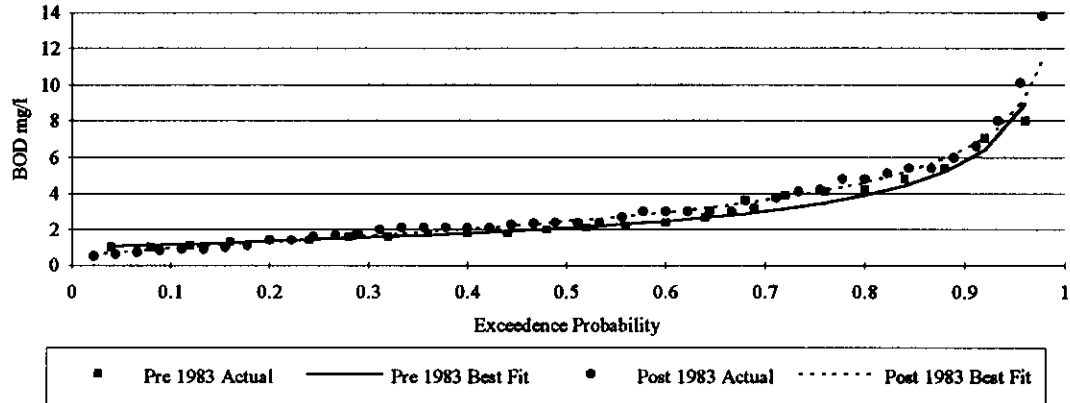


Comparison of Dissolved Oxygen Concentration Distributions
in mg/l for site LES on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

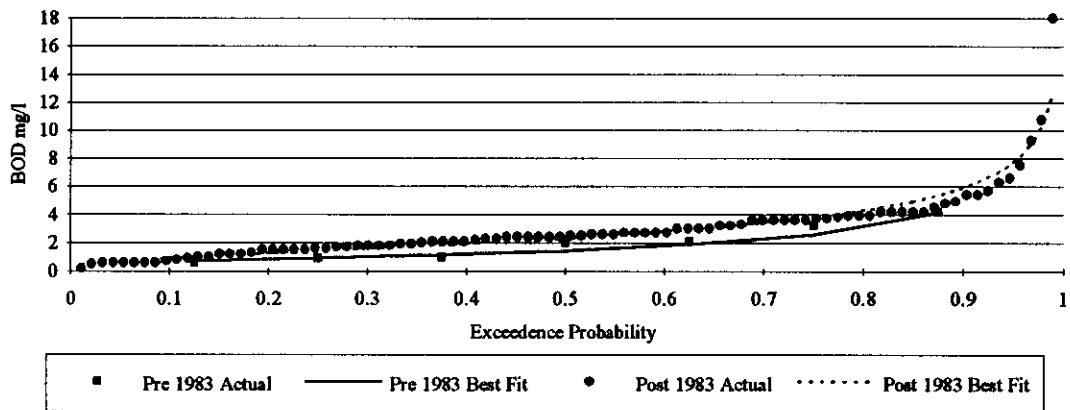


Probability Analysis of Biochemical Oxygen Demand

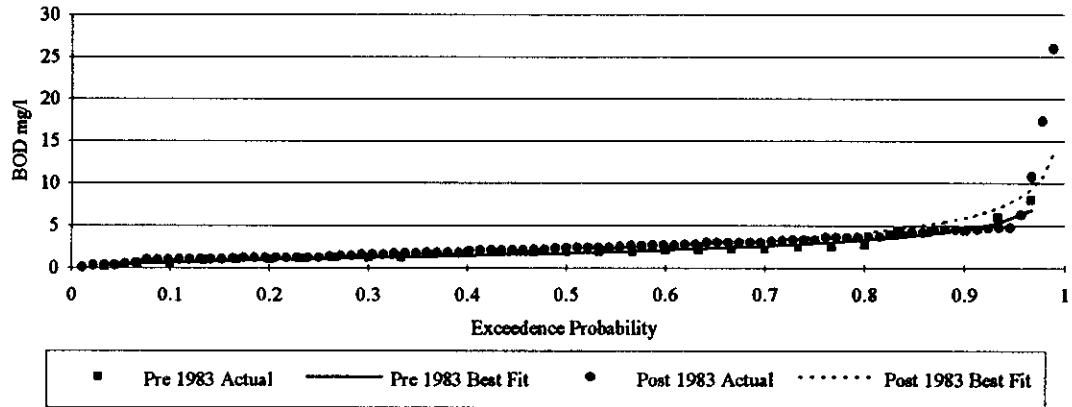
Comparison of BOD Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River
Before and After Stormwater Regulation



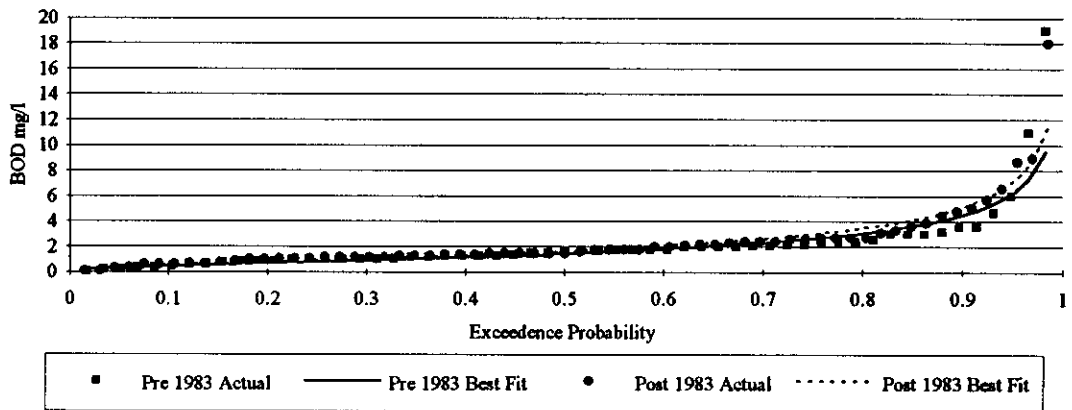
Comparison of BOD Concentration Distributions
in mg/l for site BEG on the Big Econlockhatchee River
Before and After Stormwater Regulation



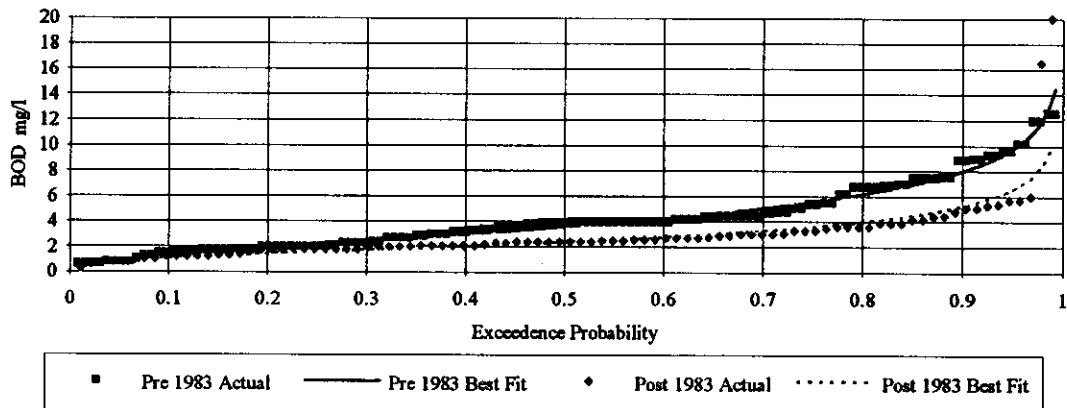
Comparison of BOD Concentration Distributions
in mg/l for site BEF on the Big Econlockhatchee River
Before and After Stormwater Regulations



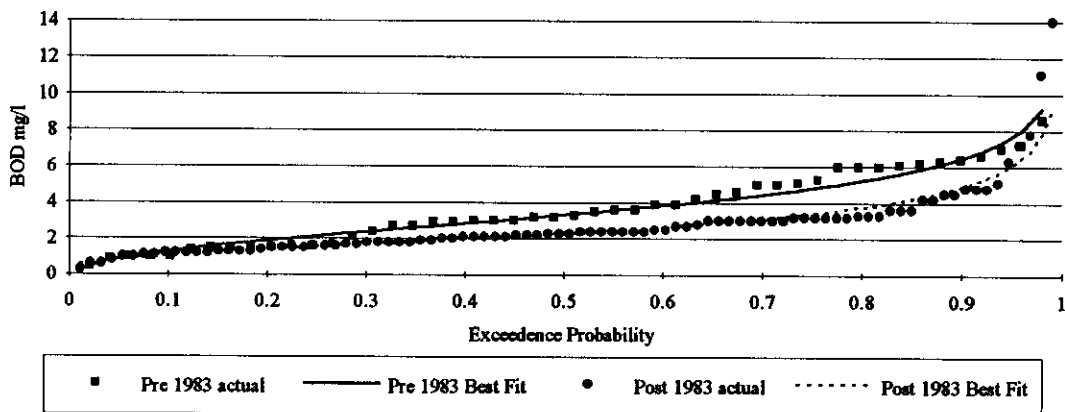
Comparison of BOD Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River
Before and After Stormwater Regulations



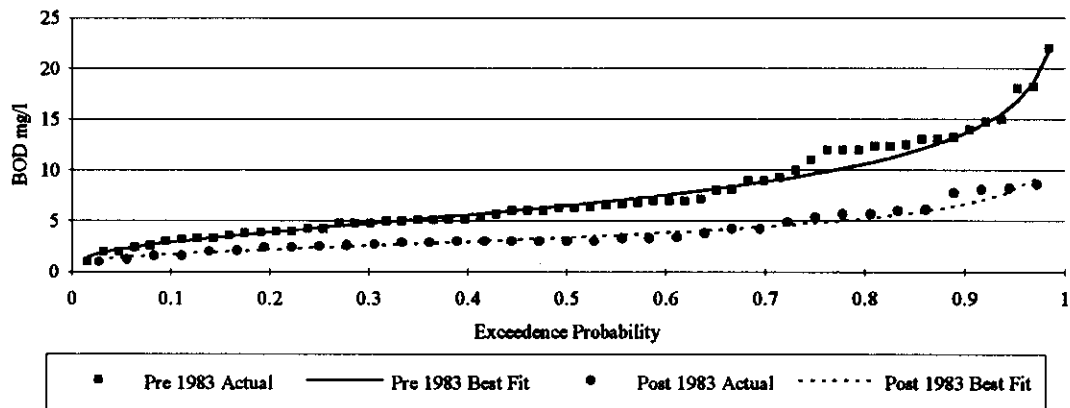
Comparison of BOD Concentration Distributions
in mg/l for site BED on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



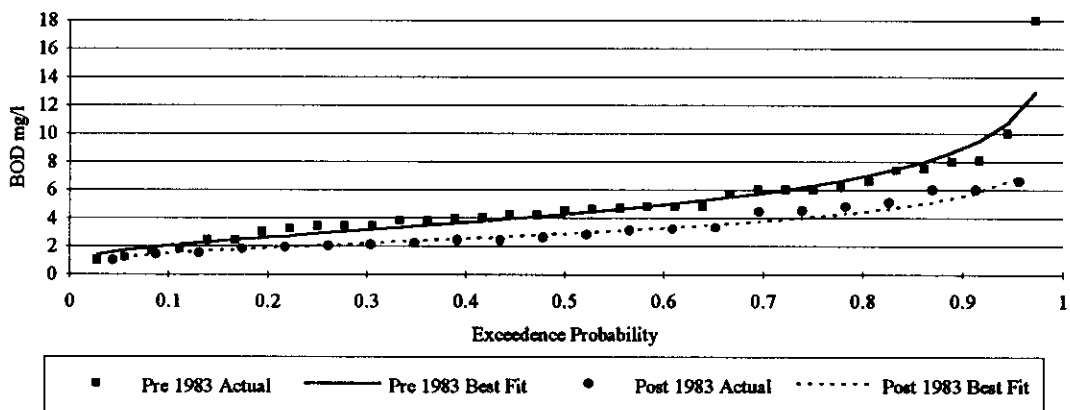
Comaprison of BOD Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



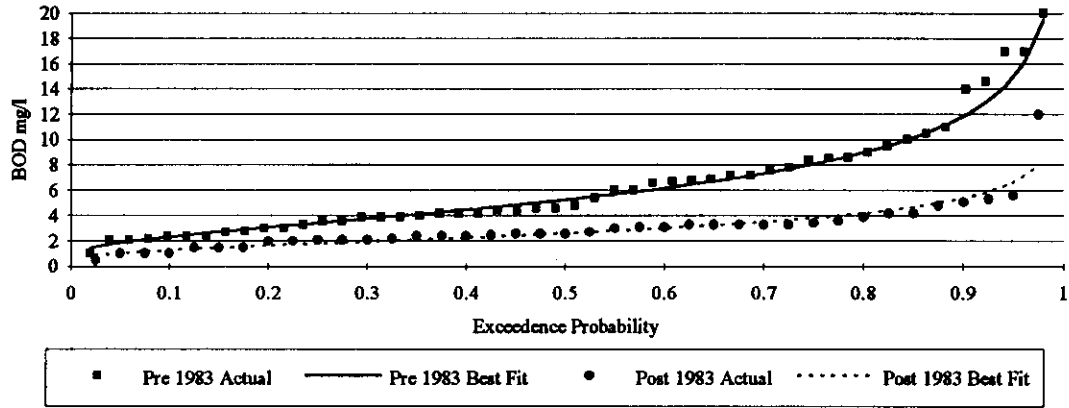
Comparison of BOD Concentration Distributions
in mg/l for site LEP on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



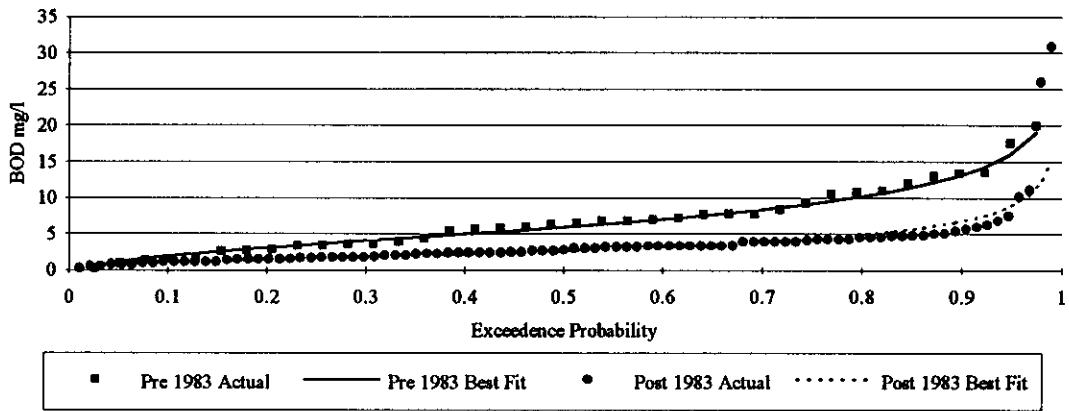
Comparison of BOD Concentration Distributions
in mg/l for site LEQ on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



Comparison of BOD Concentration Distributions
in mg/l for site LER on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

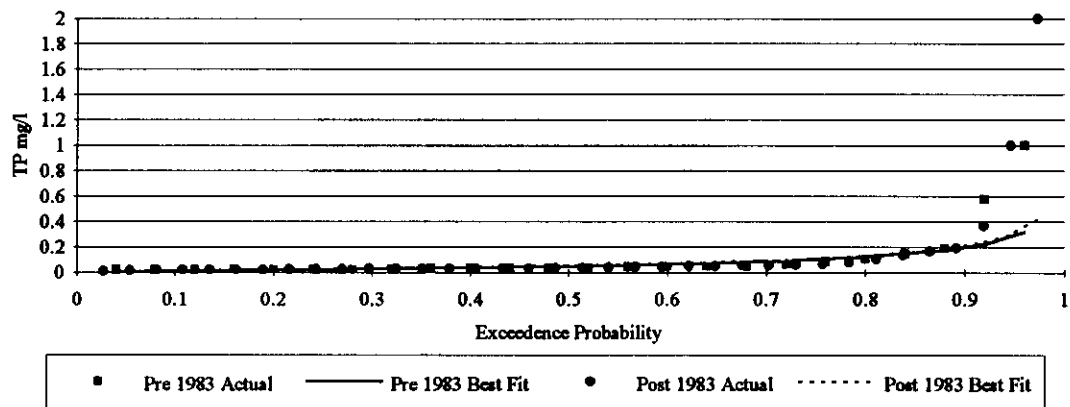


Comparison of BOD Concentration Distributions
in mg/l for site LES on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

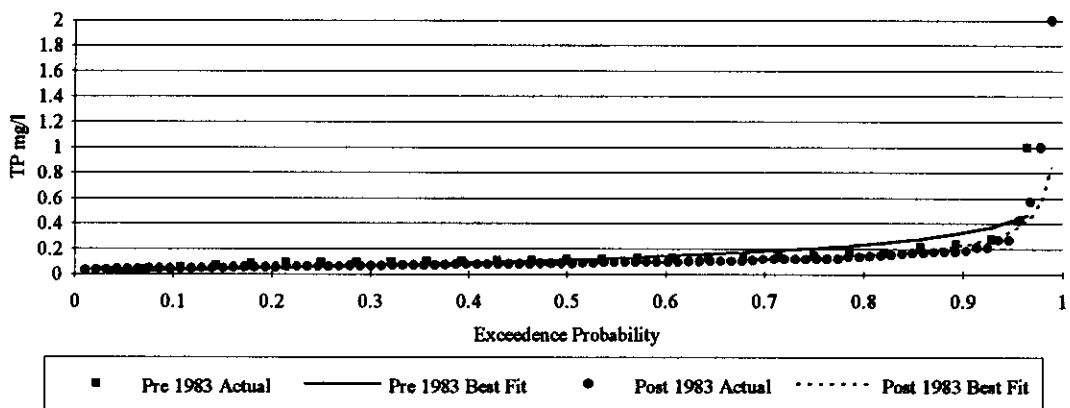


Probability Analysis of Total Phosphorus

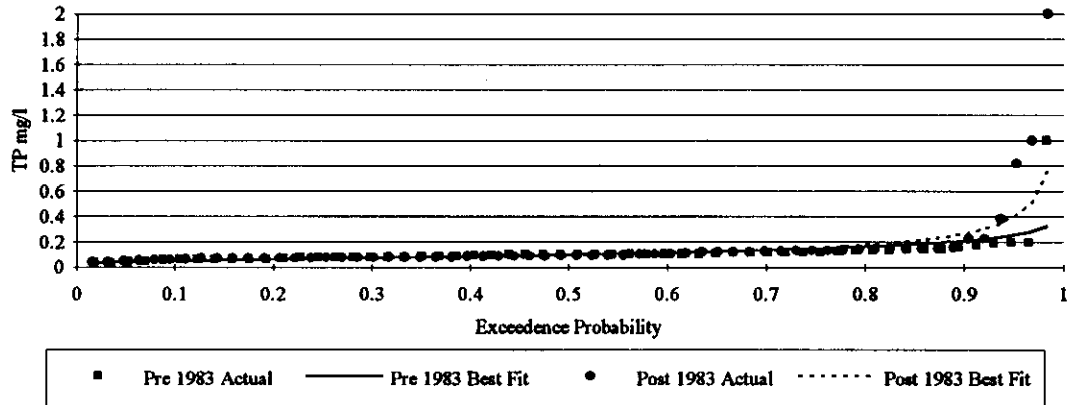
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River
Before and After Stormwater Regulation



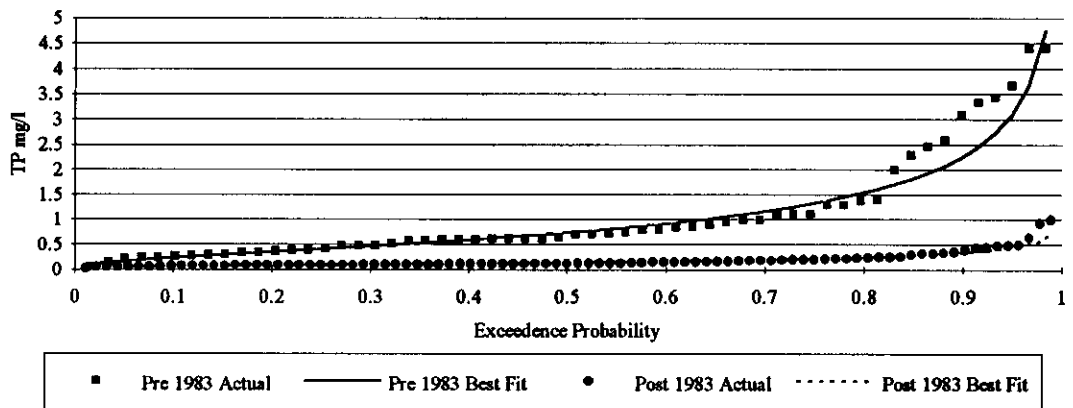
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site BEF on the Big Econlockhatchee River
Before and After Stormwater Regulations



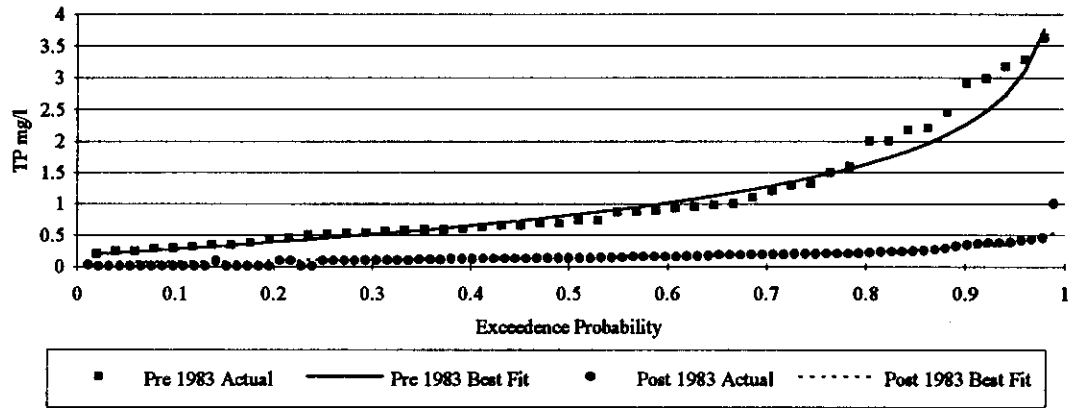
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River
Before and After Stormwater Regulations



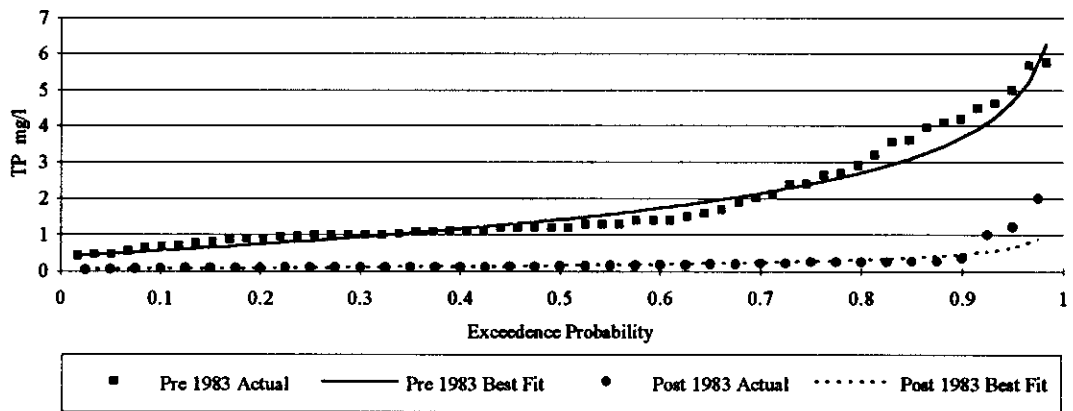
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site BED on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



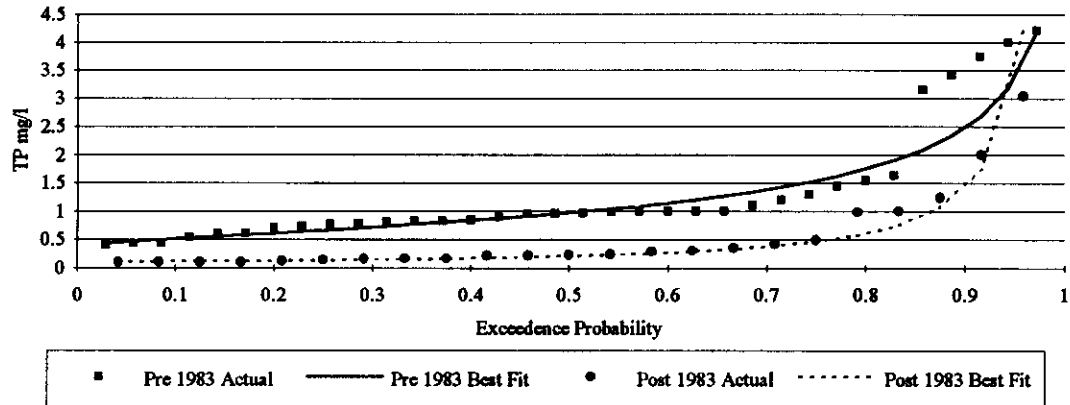
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



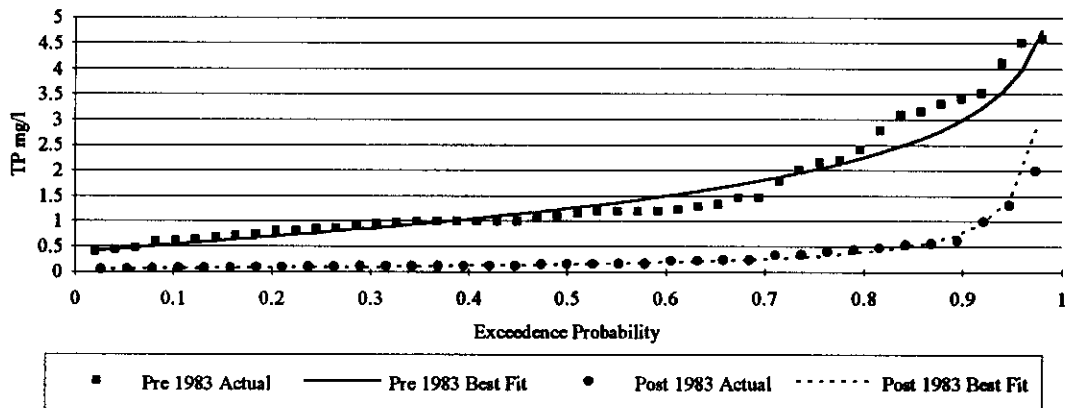
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site LEP on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



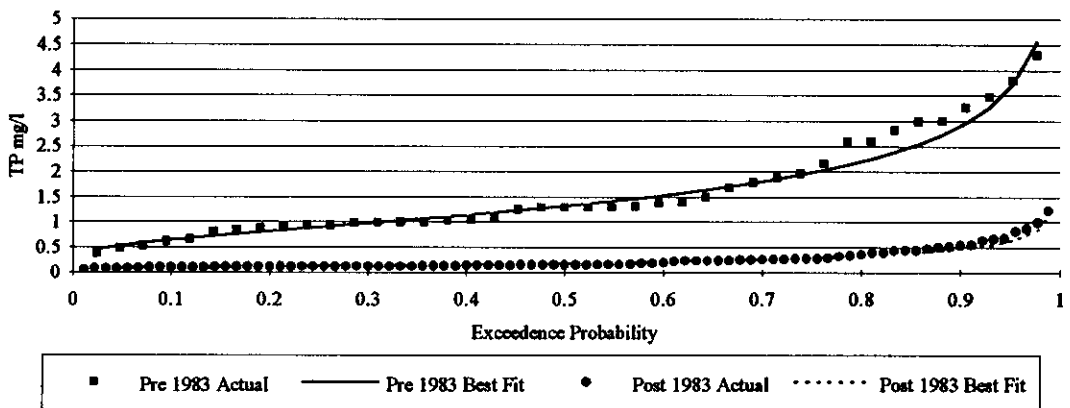
Comparison of Total Phosphorus Concentration Distributions
in mg/l for site LEQ on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



Comparison of Total Phosphorus Concentration Distributions
in mg/l for site LER on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

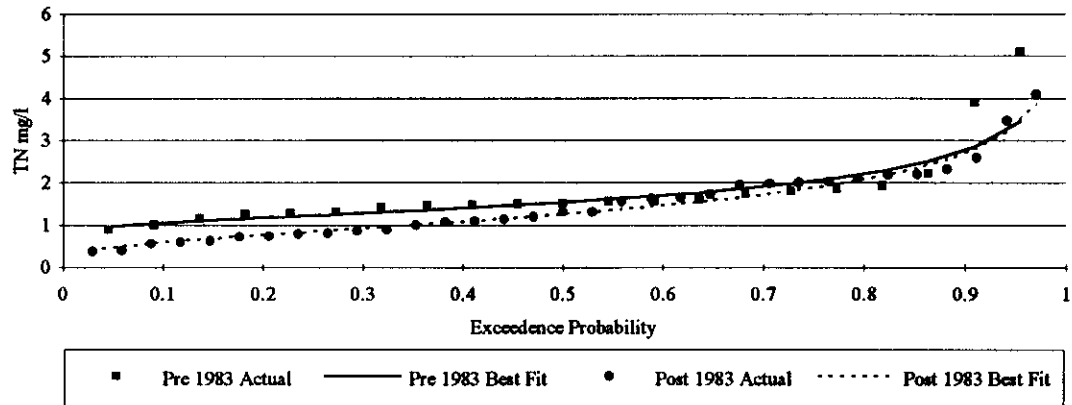


Comparison of Total Phosphorus Concentration Distributions
in mg/l for site LES on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities

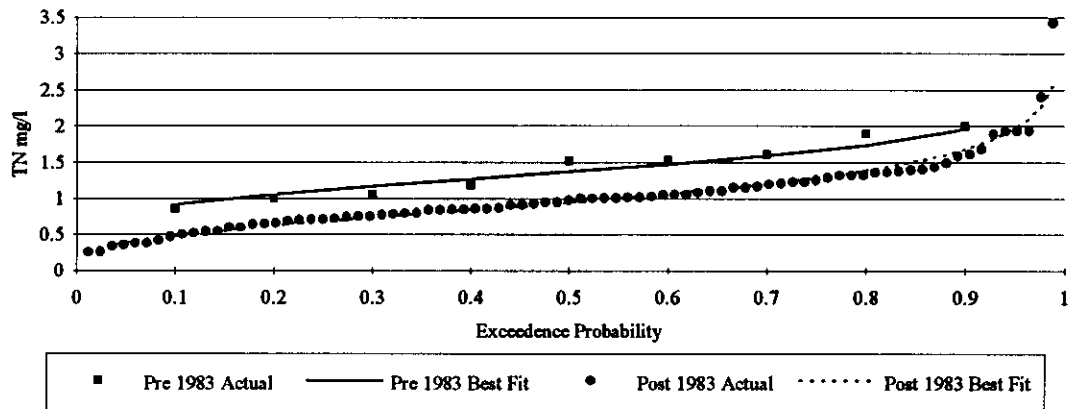


Probability Analysis of Total Nitrogen

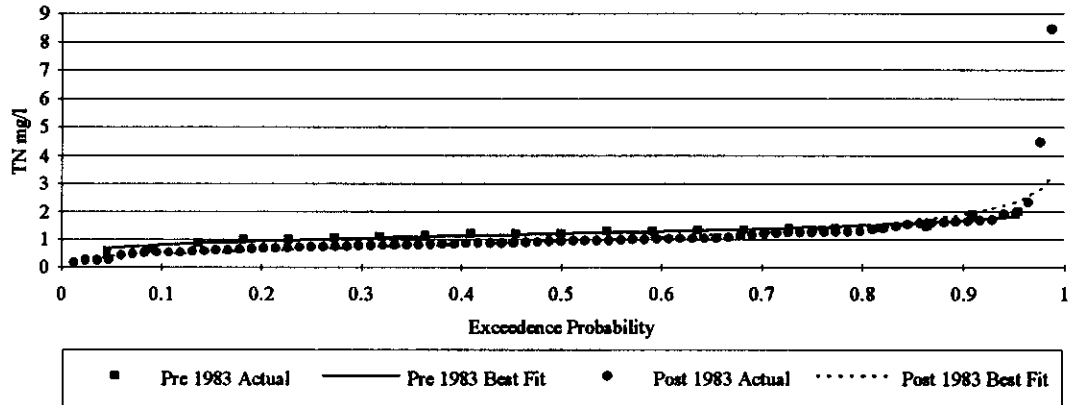
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River
Before and After Stormwater Regulation



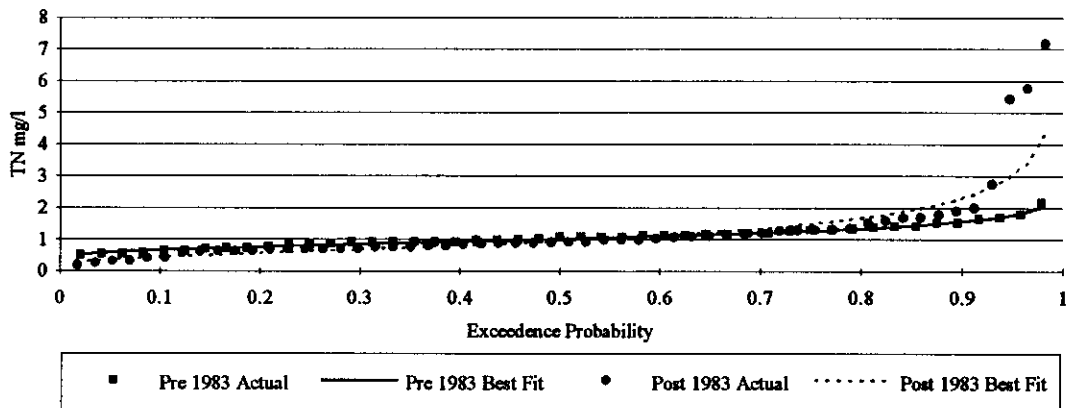
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BEG on the Big Econlockhatchee River
Before and After Stormwater Regulation



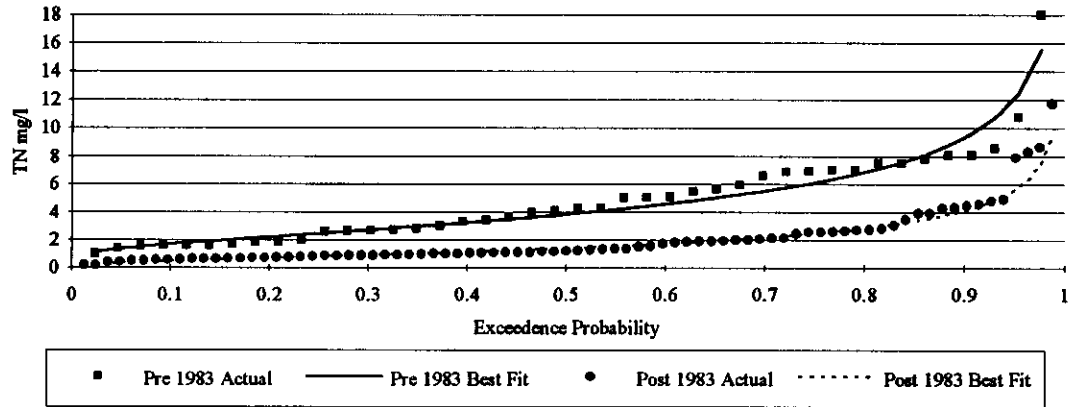
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BEF on the Big Econlockhatchee River
Before and After Stormwater Regulation



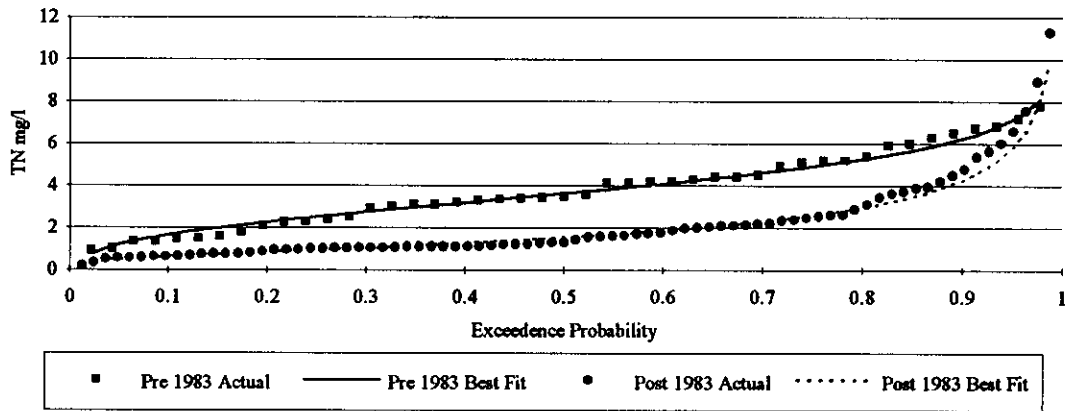
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



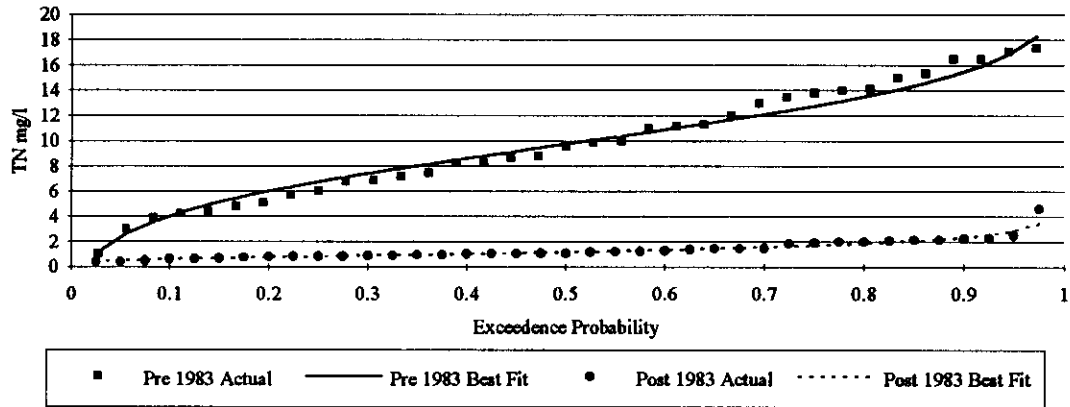
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BED on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



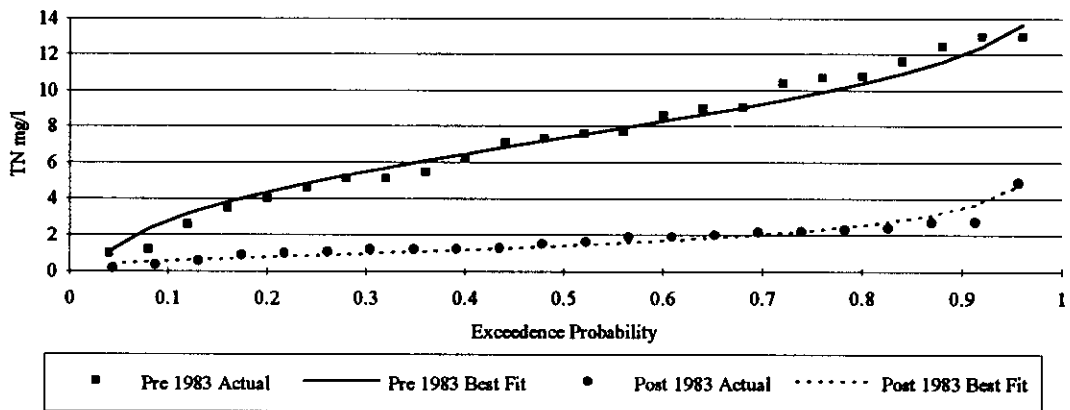
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



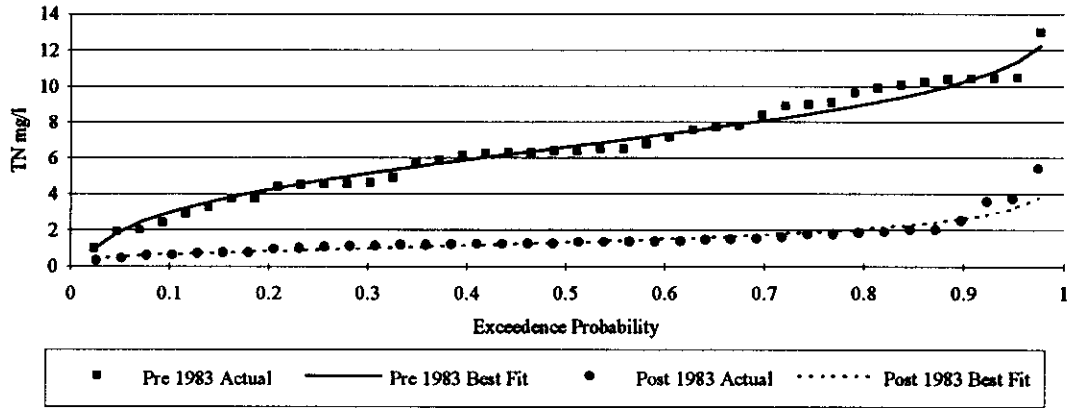
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site LEP on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



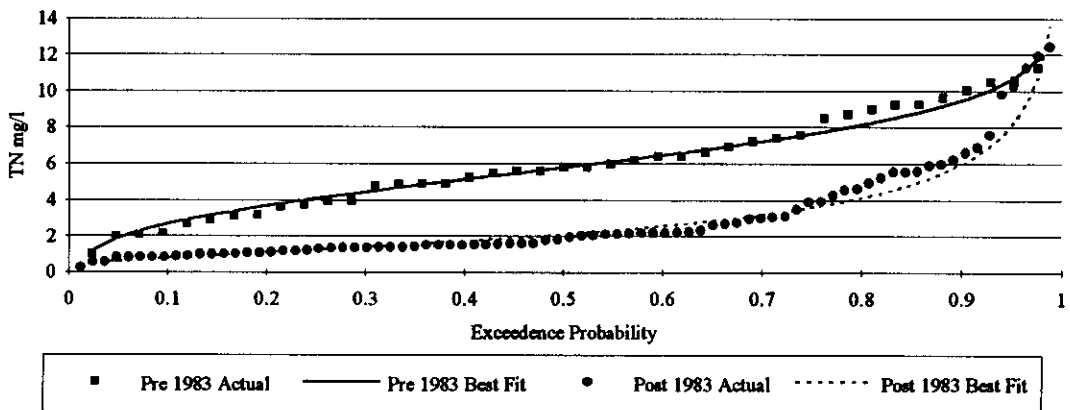
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site LEQ on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



Comparison of Total Nitrogen Concentration Distributions
in mg/l for site LER on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



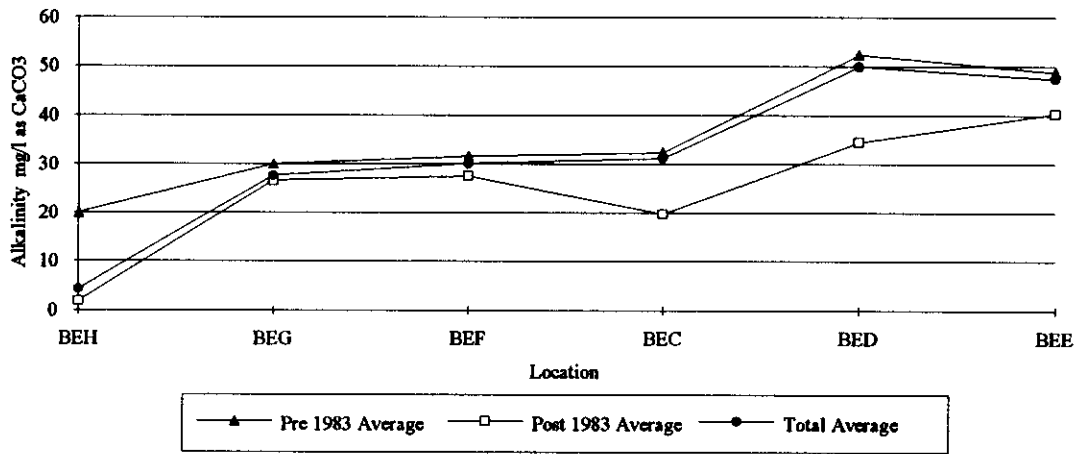
Comparison of Total Nitrogen Concentration Distributions
in mg/l for site LES on the Little Econlockhatchee River
Before and After Regionalization of Sewage Treatment Facilities



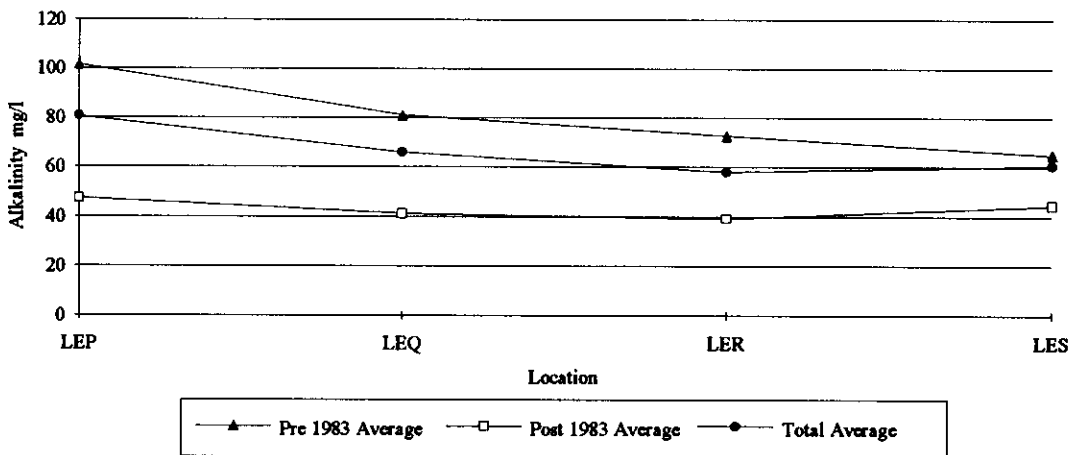
Probability Analysis of Alkalinity

The alkalinity of a water is a measure of its capacity to neutralize acids. Bicarbonates represent the major form of alkalinity, since they are formed by the actions of carbon dioxide upon basic materials in the soil. The major portion of alkalinity in natural waters is typically due to three major classes of materials; hydroxides, carbonates, and bicarbonates.

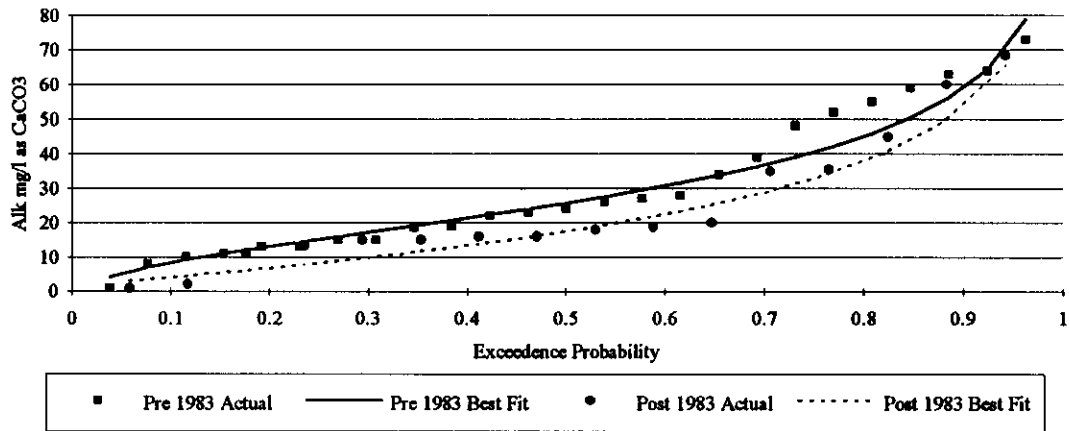
Average Alkalinity Concentration on Big Econlockhatchee River with Location



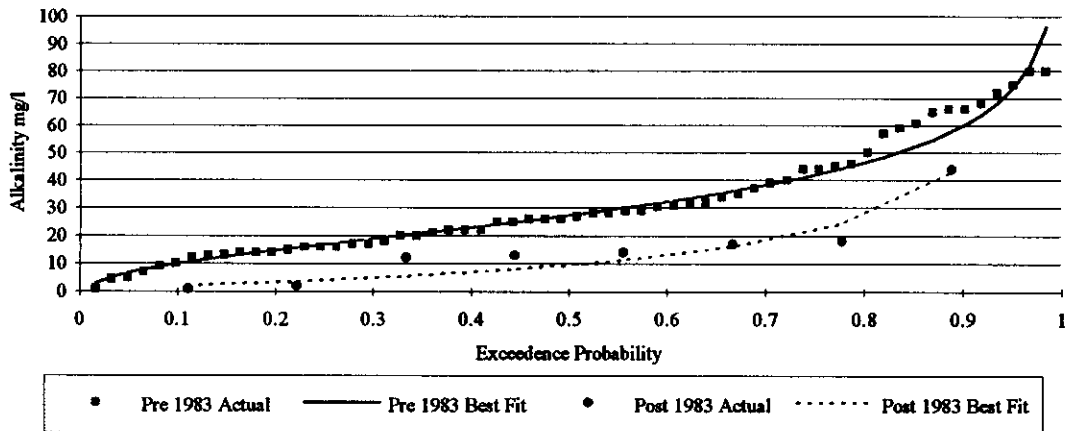
Average Alkalinity Concentration on Little Econlockhatchee River with Location



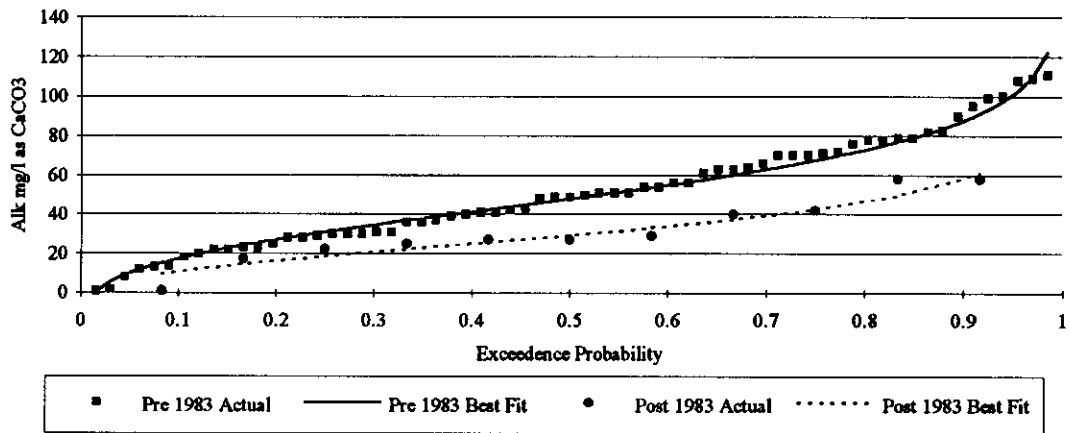
Comparison of Alkalinity Concentration Distributions
for site BEF on the Big Econlockhatchee River



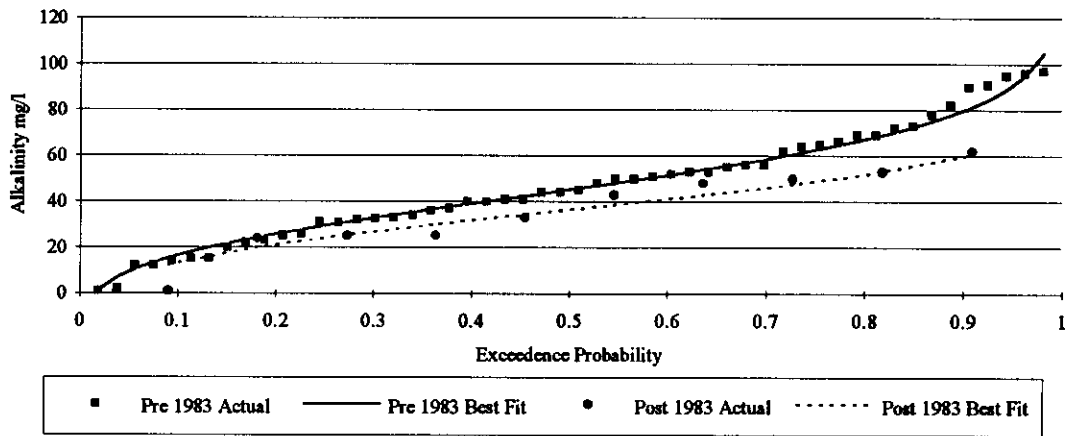
Comparison of Alkalinity Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River



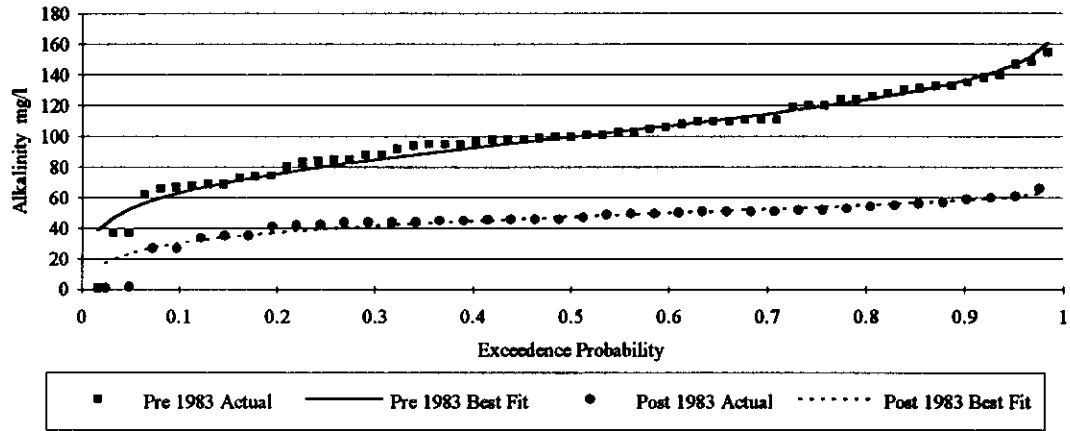
Comparison of Alkalinity Concentration Distributions
for site BED on the Big Econlockhatchee River



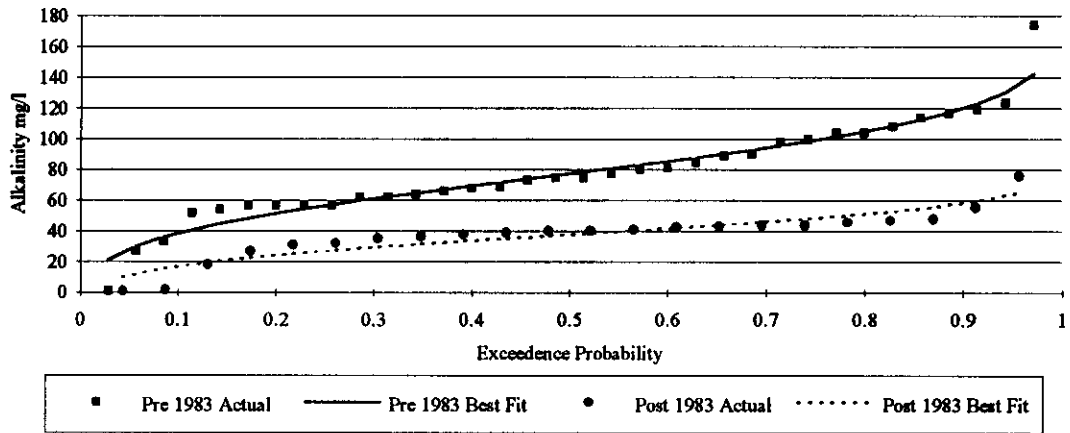
Comparison of Alkalinity Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River



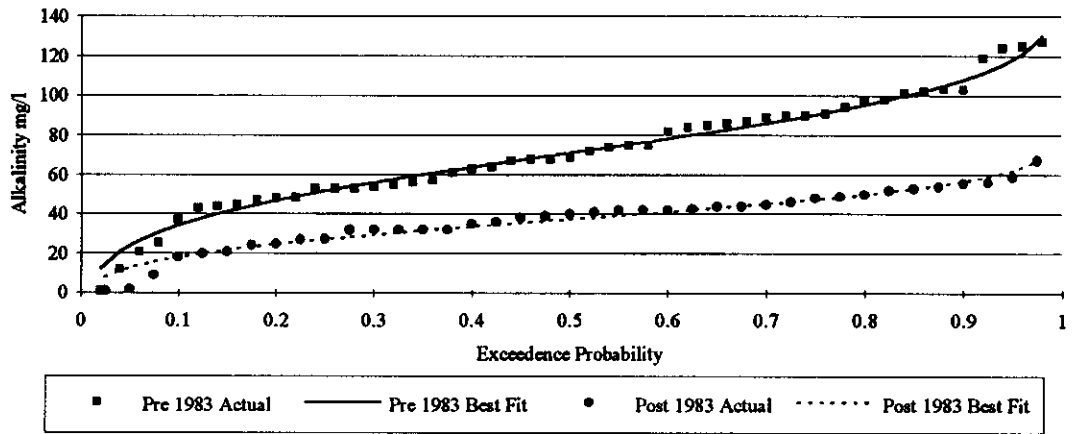
Comparison of Alkalinity Concentration Distributions
for site LEP on the Little Econlockhatchee River



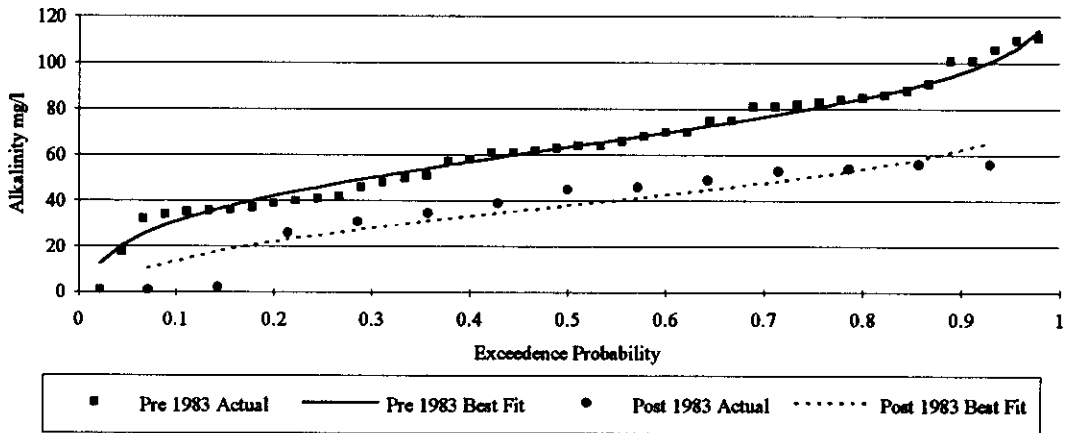
Comparison of Alkalinity Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Alkalinity Concentration Distributions
for site LER on the Little Econlockhatchee River



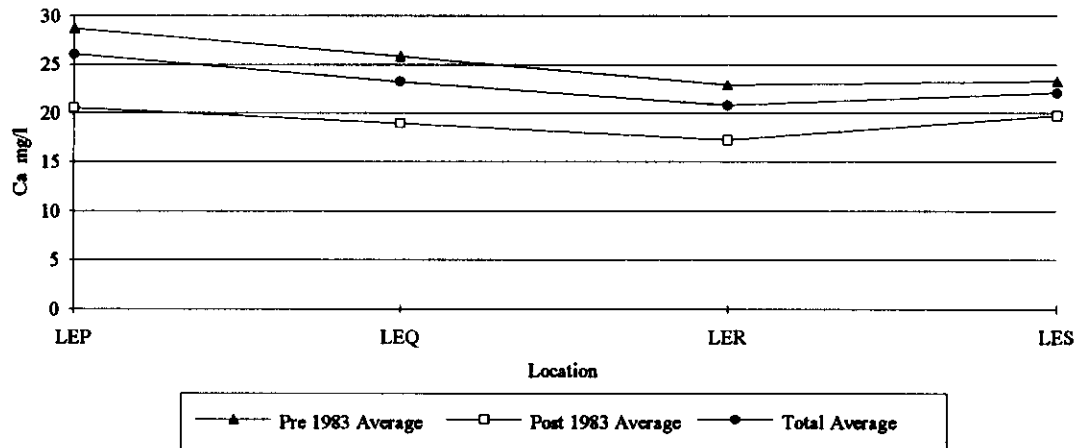
Comparison of Alkalinity Concentration Distributions
for site LES on the Little Econlockhatchee River



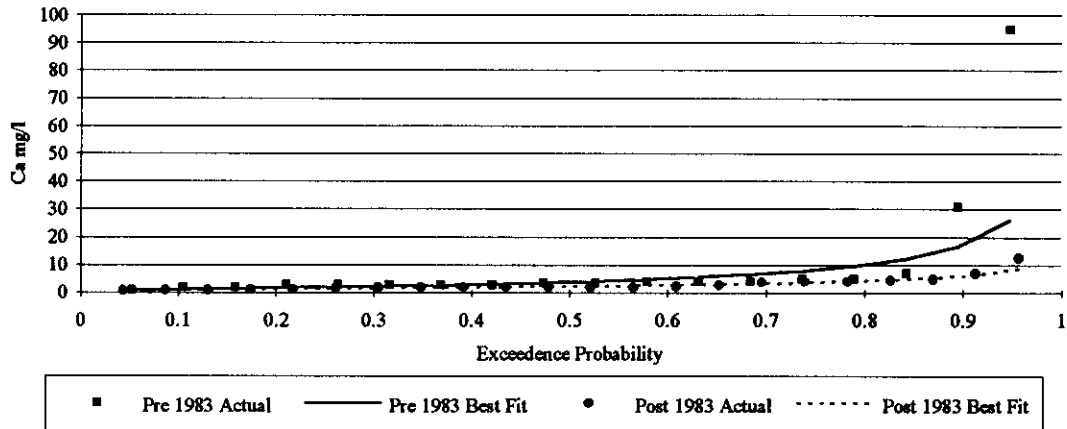
Probability Analysis of Calcium

Calcium is one of the primary hardness constituents on typical streams and water bodies. The calcium concentrations in this analysis are useful for verifying the hardness concentrations.

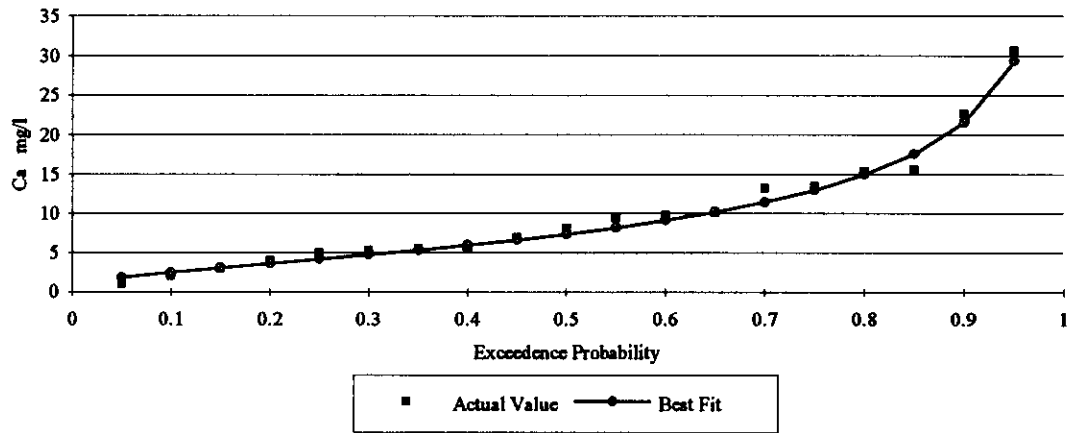
Average Calcium Concentration on Little Econlockhatchee River with Location



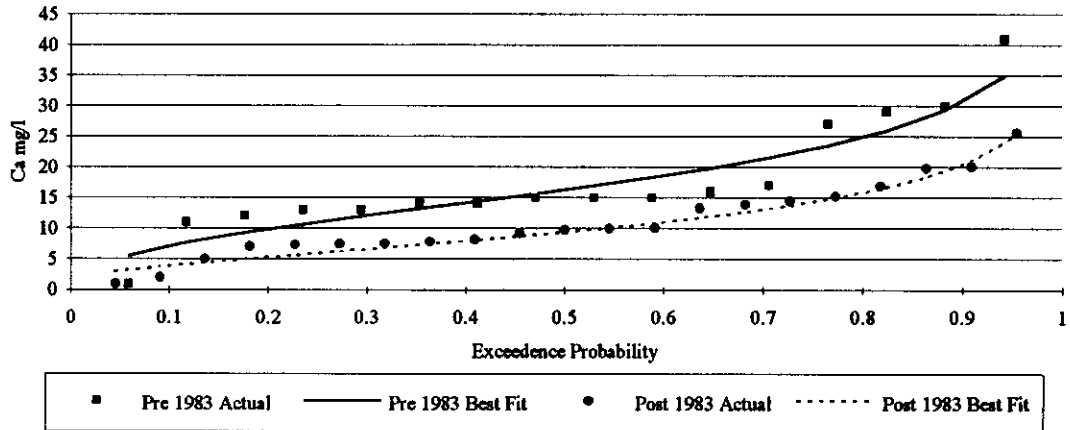
**Comparison of Calcium Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River**



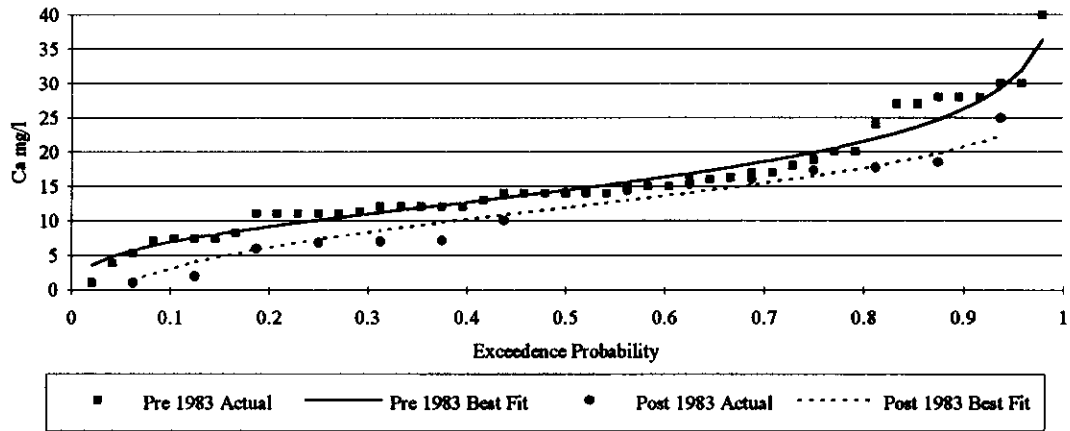
Distribution Analysis of Calcium for site BEG
on the Big Econlockhatchee River



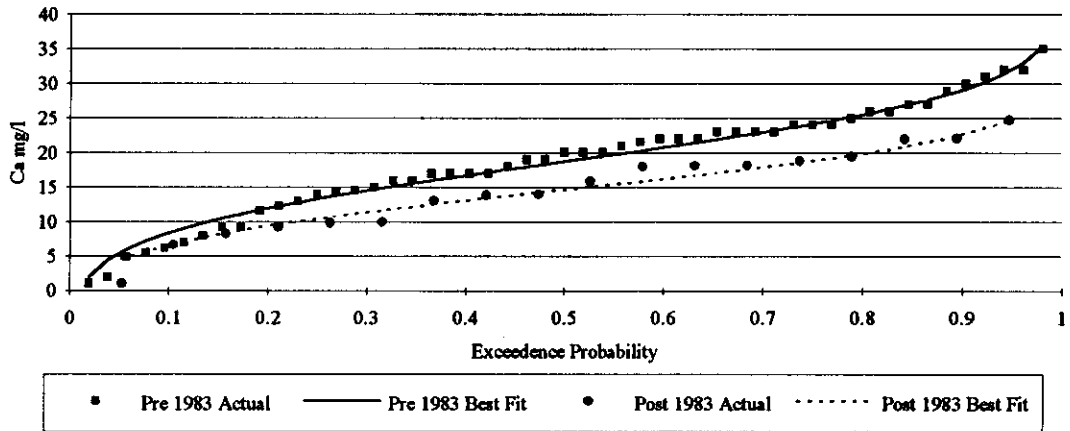
Comparison of Calcium Concentration Distributions
in mg/l for site BEF on the Big Econlockhatchee River



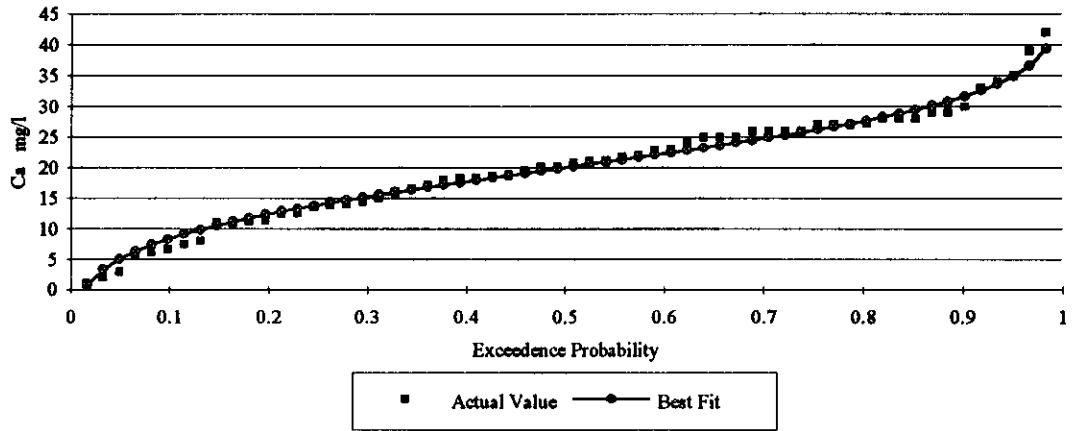
Comparison of Calcium Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River



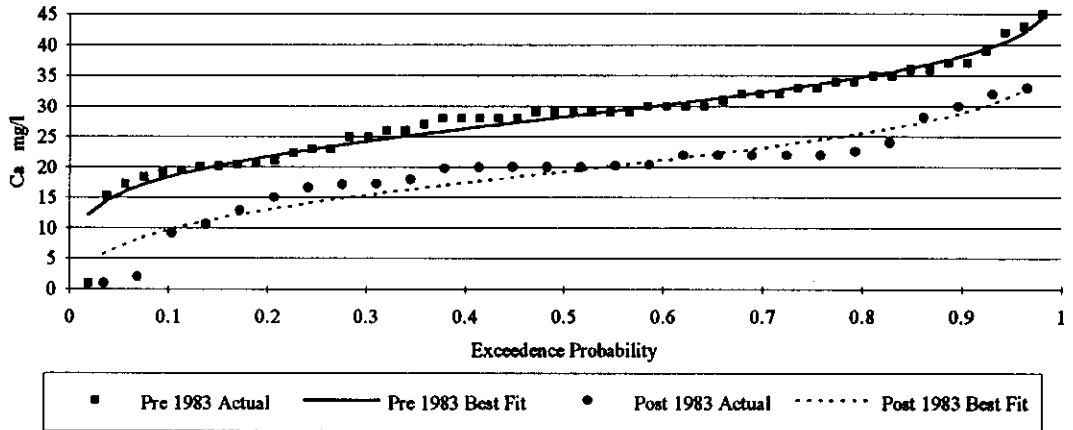
Comparison of Calcium Concentration Distributions
in mg/l for site BED on the Big Econlockhatchee River



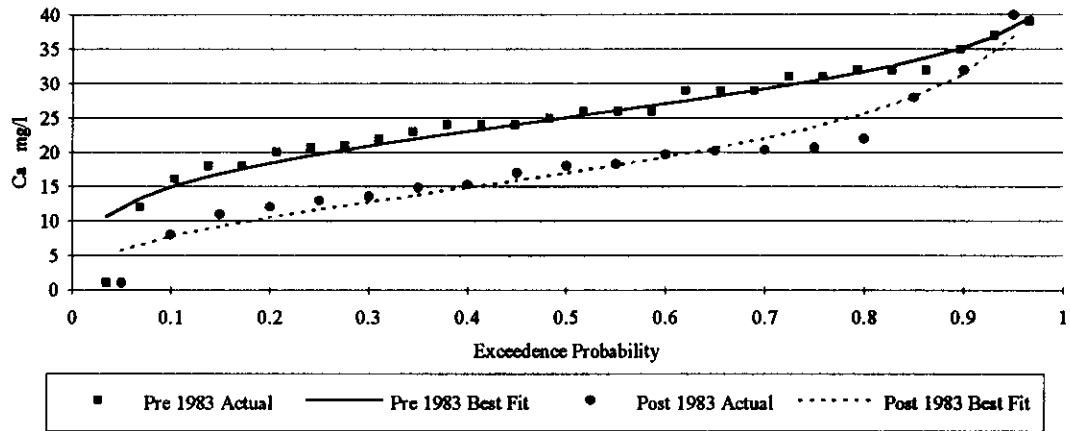
Distribution Analysis of Calcium for site BEE
on the Big Econlockhatchee River



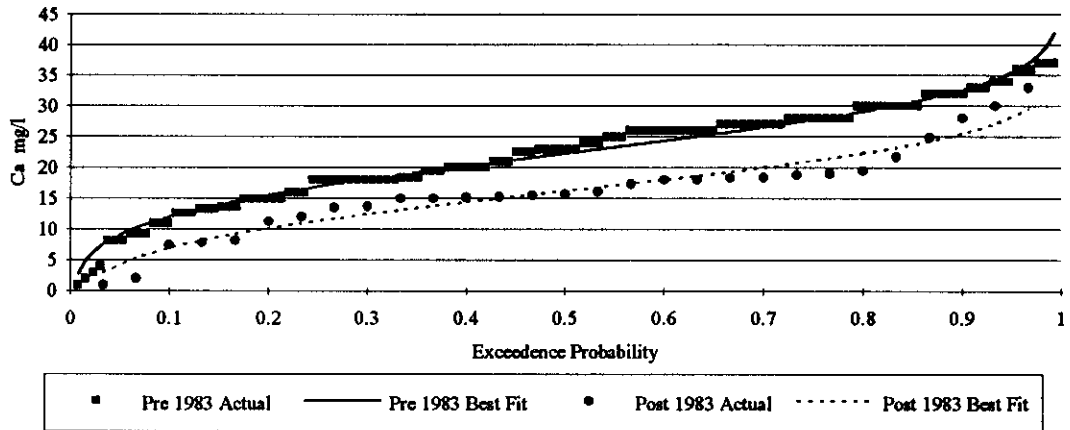
Comparison of Calcium Concentration Distributions
for site LEP on the Little Econlockhatchee River



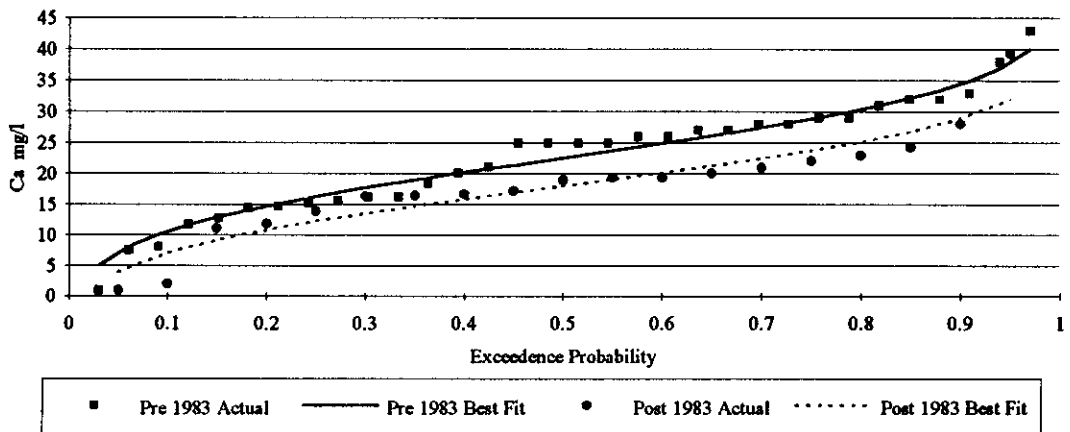
Comparison of Calcium Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Calcium Concentration Distributions
for site LER on the Little Econlockhatchee River



Comparison of Calcium Concentration Distributions
for site LES on the Little Econlockhatchee River

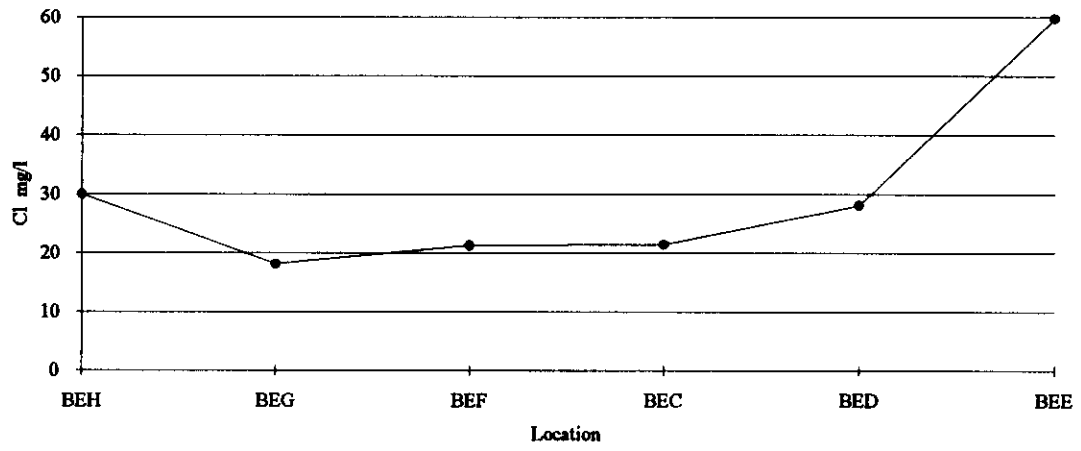


Probability Analysis of Chlorides

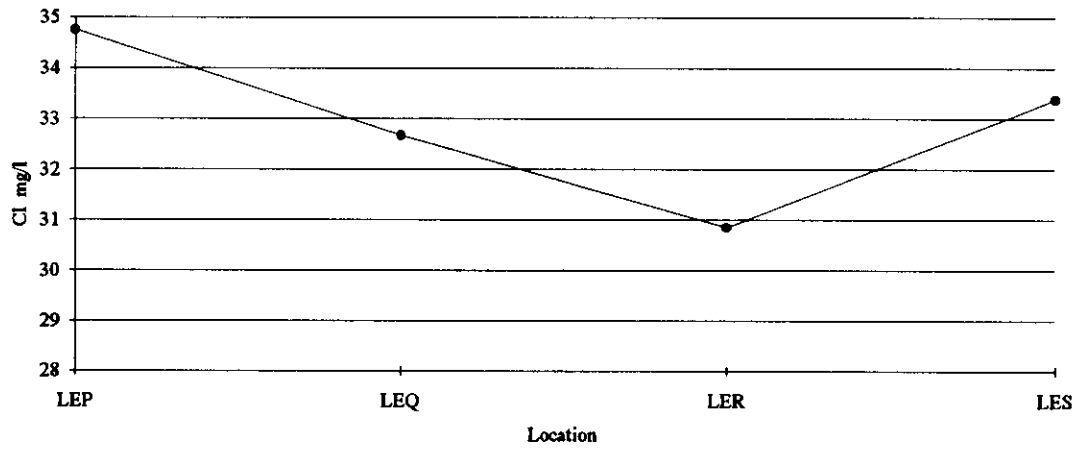
Chlorides occur in all natural waters in various concentrations. The chlorides can be used as a general indicator of mineral content. Water dissolves chlorides in topsoil and deeper formations giving groundwater a higher typical concentration of chlorides than surface runoff. In the Big Econlockhatchee River data there was little difference between the pre and post 1983 data indicating that the regionalization of the sewage treatment facilities had little influence on chloride content in the the river. It is therefore believed that variation in the chloride content was primarily due to groundwater inflow.

It should be noted that chloride content increased dramatically after the confluence with the Little Econlockhatchee River at site BED. It should be noted that the average chloride concentration at site LES (Little Econlockhatchee River above confluence) is between 33 and 34 mg/l. The mixing of this site and site BEC (Big Econlockhatchee River above the confluence) give an expected concentration at site BED. The largest increase in concentration occurred between sites BED and BEE. It would be expected that the greatest influx of groundwater occurred in this reach.

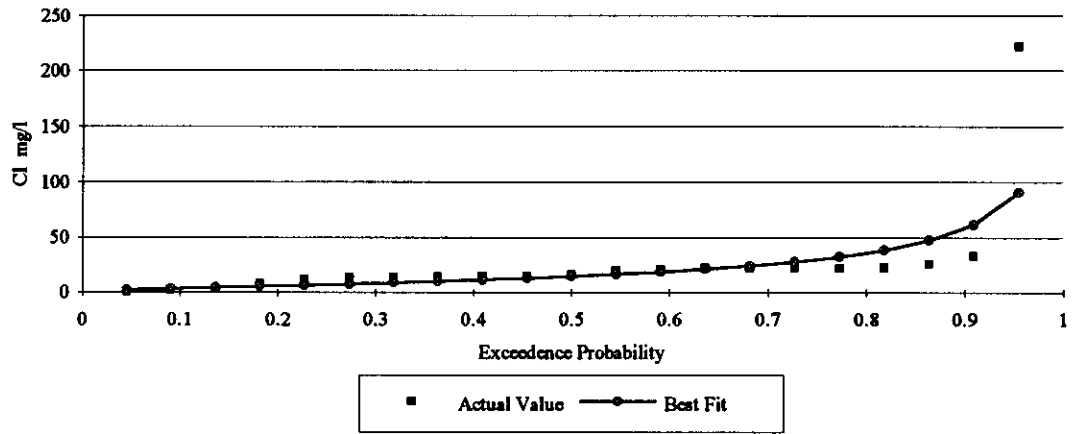
Average Chloride Concentration on the Big Econlockhatchee River with Location



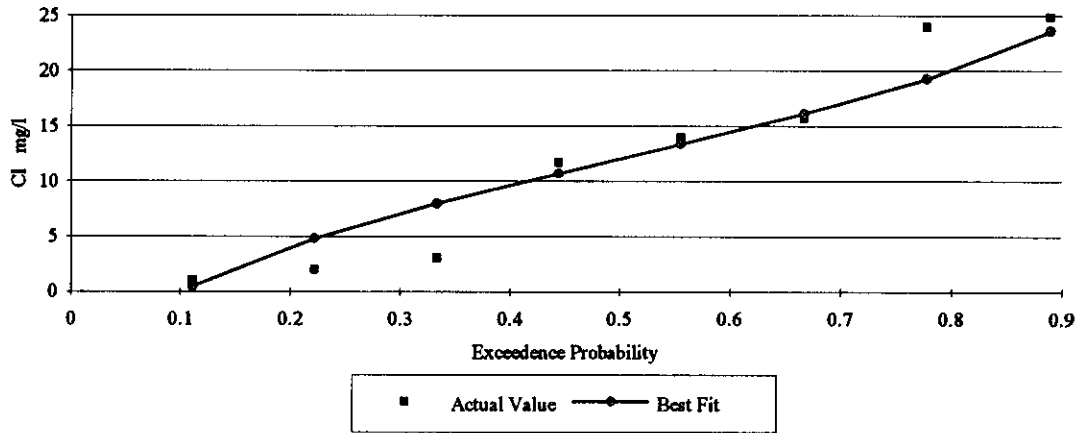
Average Chloride Concentration on Little Econlockhatchee River with Location



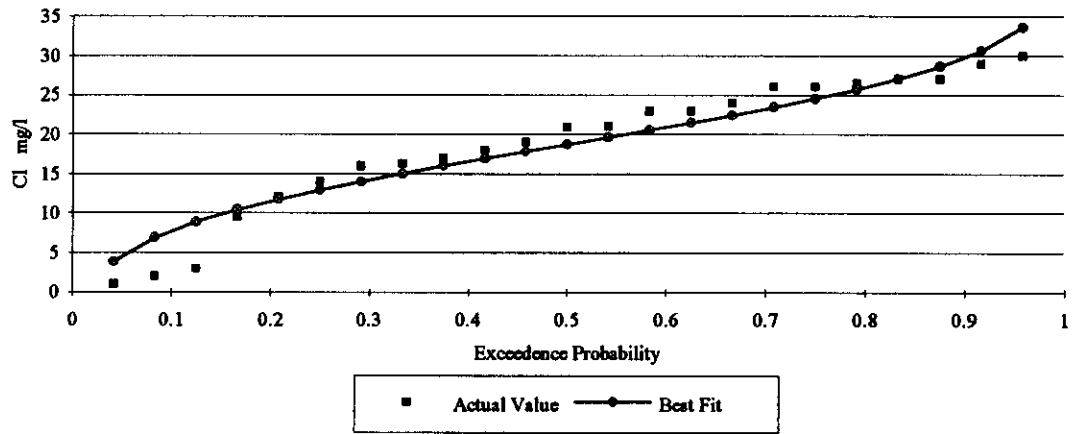
Distribution Analysis of Chlorides for site BEH
on the Big Econlockhatchee River



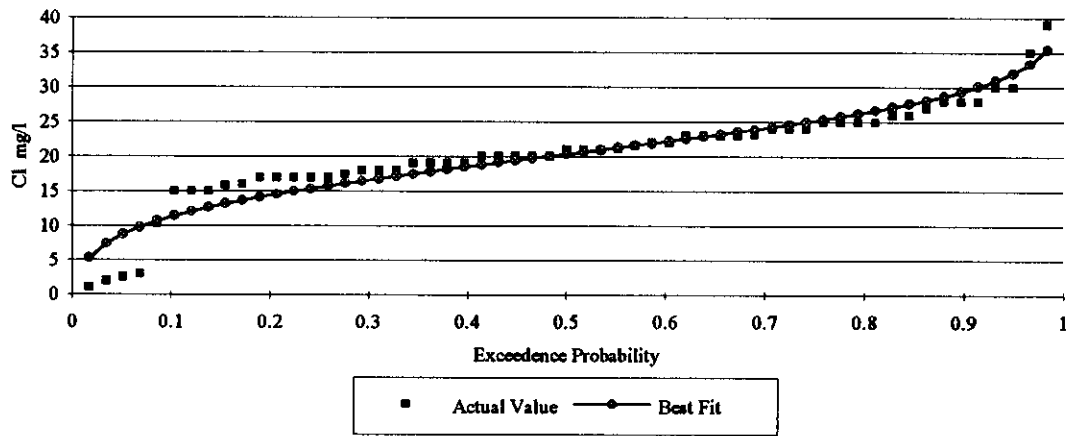
Distribution Analysis of Chlorides for site BEG
on the Big Econlockhatchee River



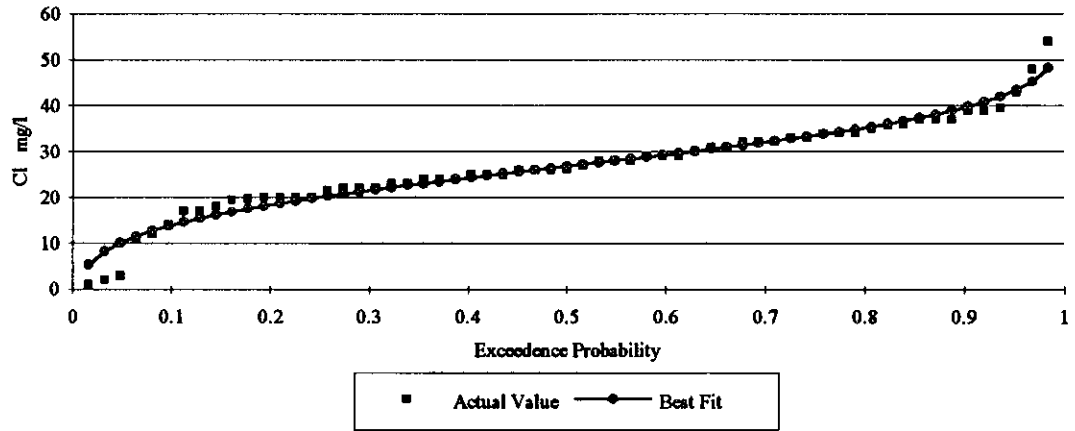
Distribution Analysis of Chlorides for site BEF
on the Big Econlockhatchee River



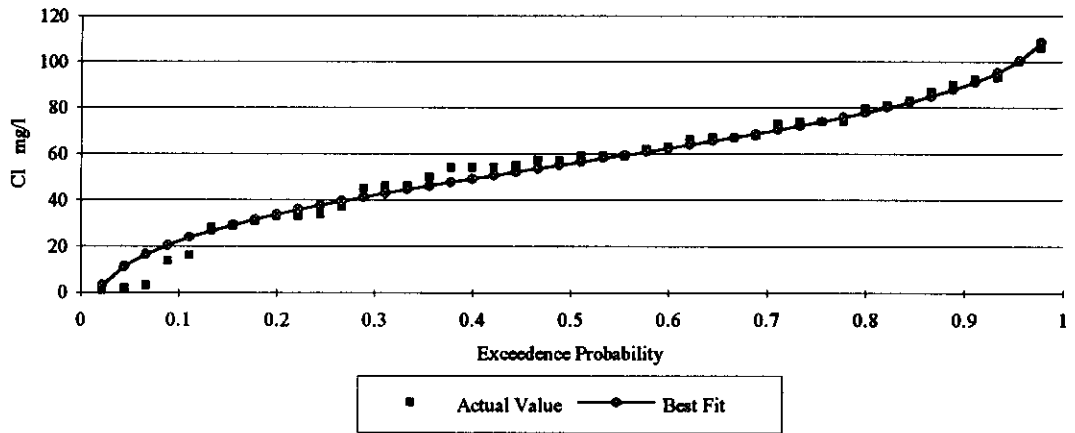
Distribution Analysis of Chlorides for site BEC
on the Big Econlockhatchee River



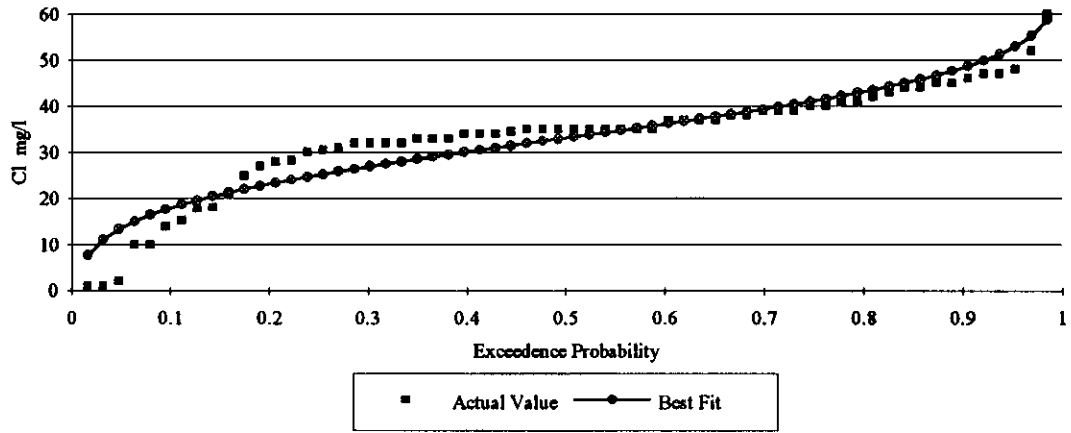
Distribution Analysis of Chlorides for site BED
on the Big Econlockhatchee River



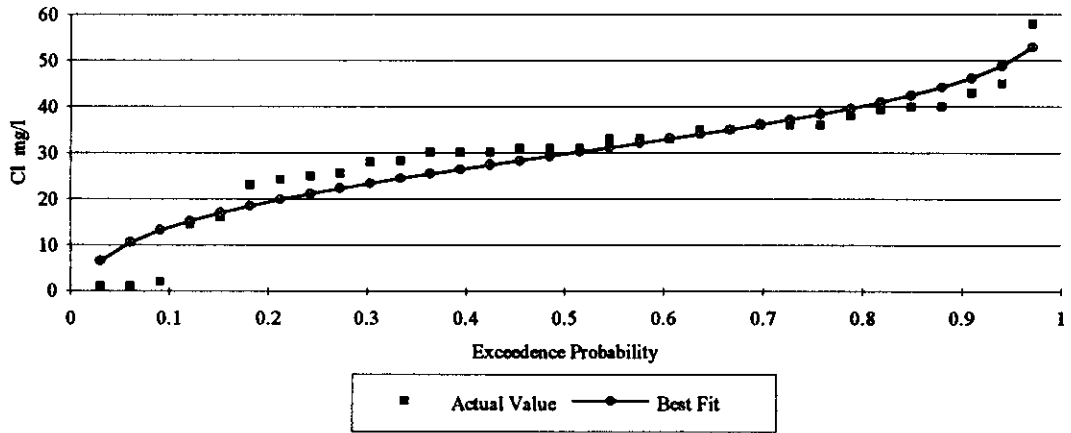
Distribution Analysis of Chlorides for site BEE
on the Big Econlockhatchee River



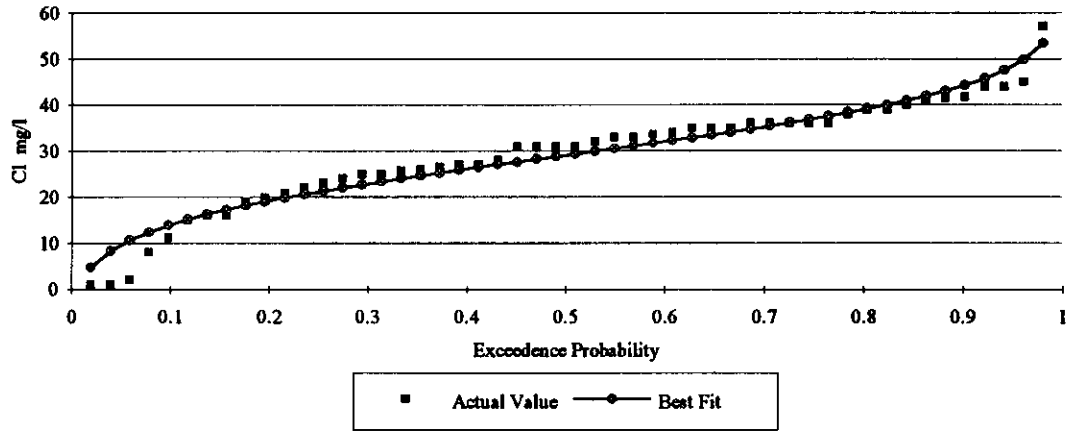
Distribution Analysis of Chlorine for site LEP
on the Little Econlockhatchee River



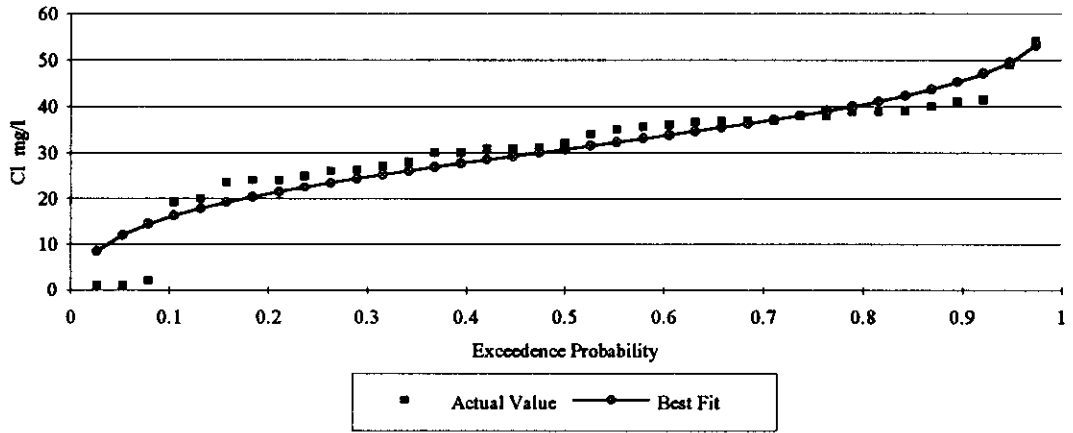
Distribution Analysis of Chlorine for site LEQ
on the Little Econlockhatchee River



Distribution Analysis of Chlorine for site LER
on the Little Econlockhatchee River



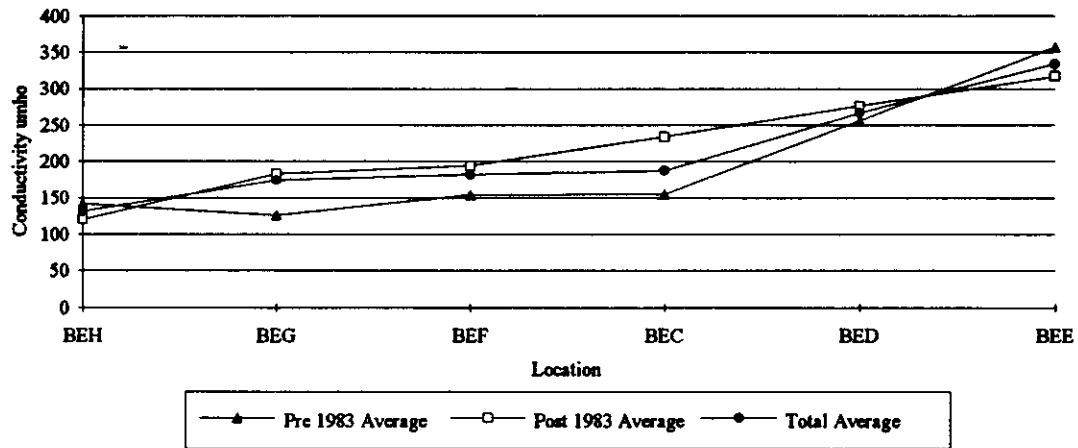
Distribution Analysis of Chlorine for site LES
on the Little Econlockhatchee River



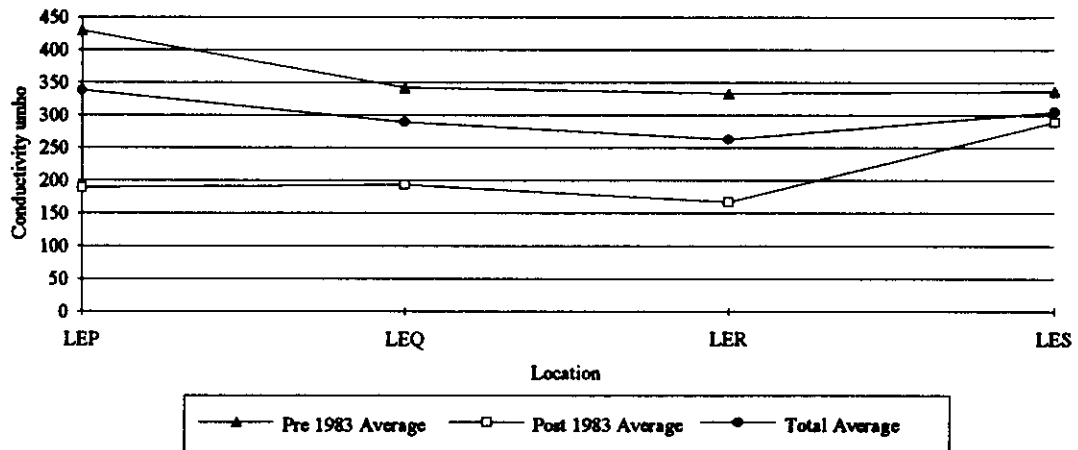
Probability Analysis of Conductivity

Conductivity of a solution is a measure of its ability to carry an electrical current. The conductivity of a solution is attributable to the ions in solution. Conductivity is a conservative substance. It can be used as a general indicator of groundwater input into the stream.

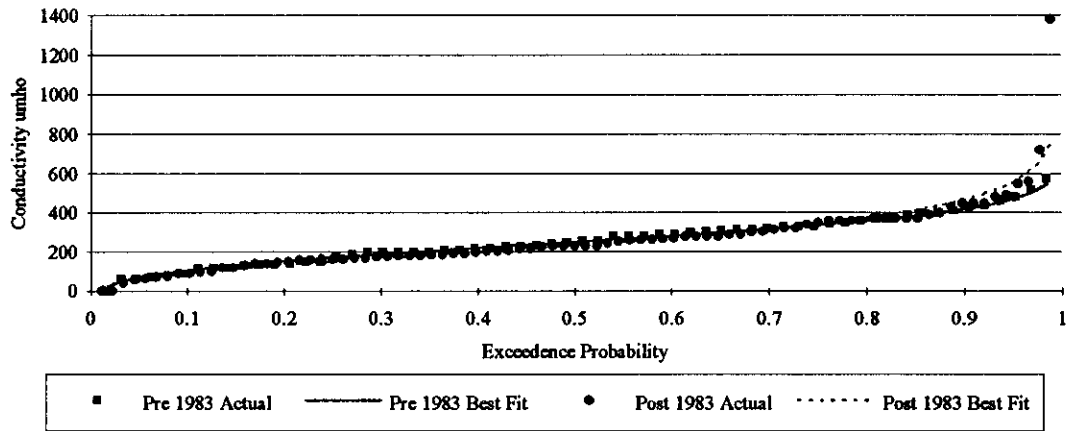
Average Conductivity on Big Econlockhatchee River with Location



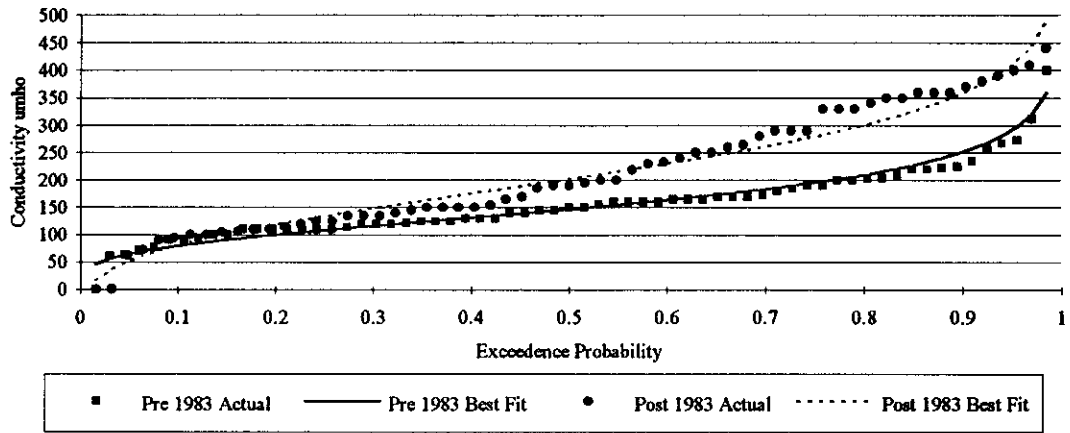
Average Conductivity on Little Econlockhatchee River with Location



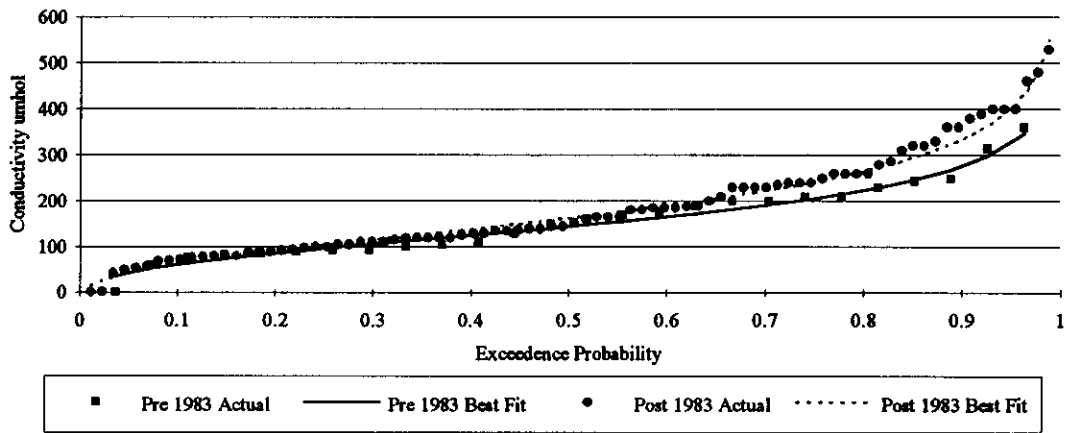
Comparison of Conductivity Distributions
for site BED on the Big Econlockhatchee River



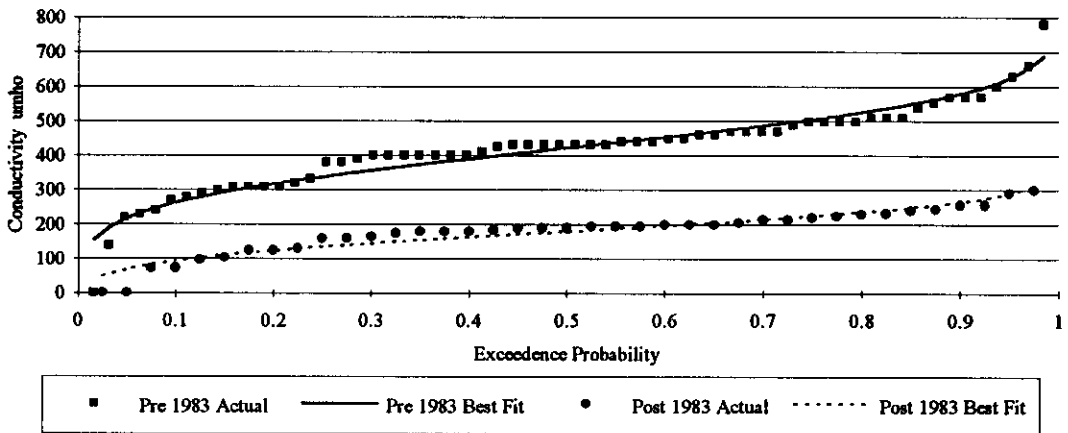
Comparison of Conductivity Distributions
for site BEC on the Big Econlockhatchee River



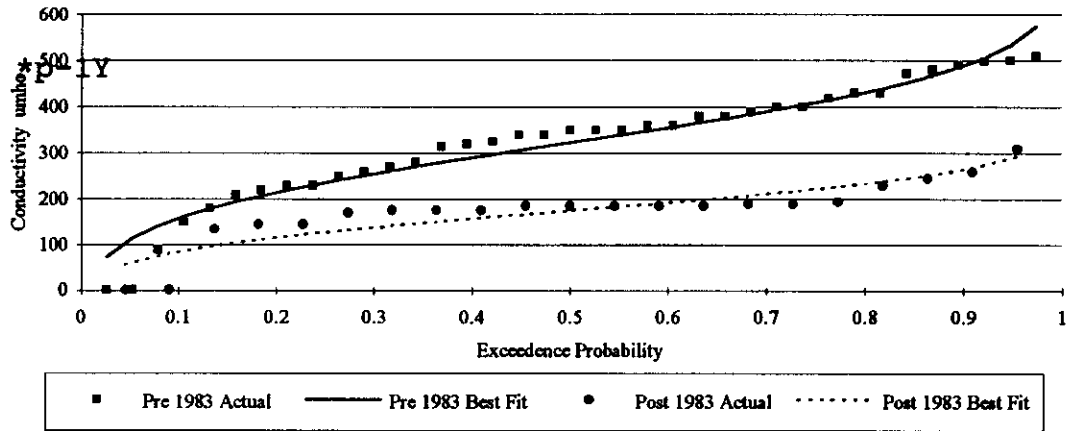
Comparison of Conductivity Distributions
for site BEF on the Big Econlockhatchee River



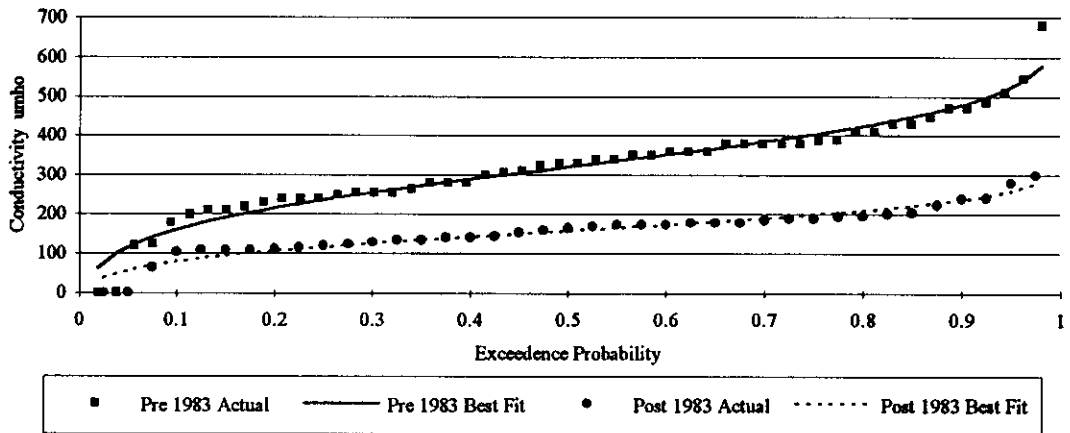
Comparison of Conductivity Concentration Distributions
for site LEP on the Little Econlockhatchee River



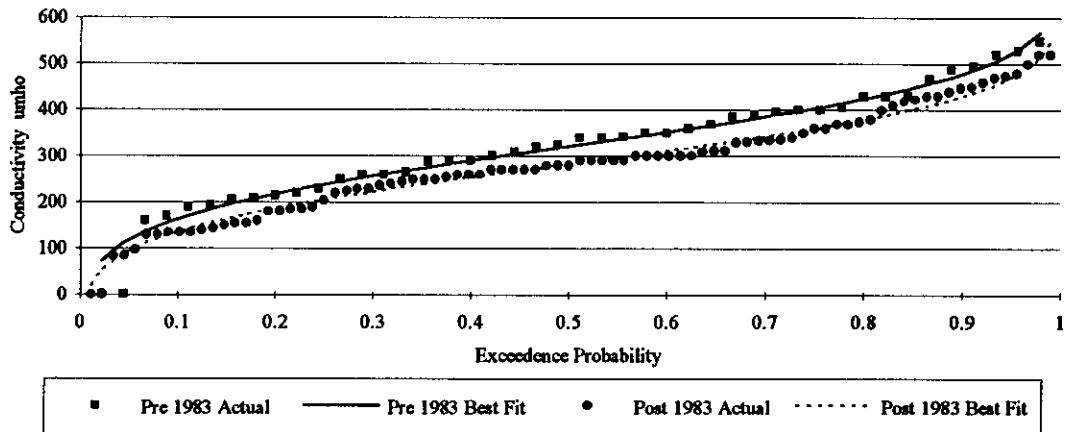
Comparison of Conductivity Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Conductivity Concentration Distributions
for site LER on the Little Econlockhatchee River



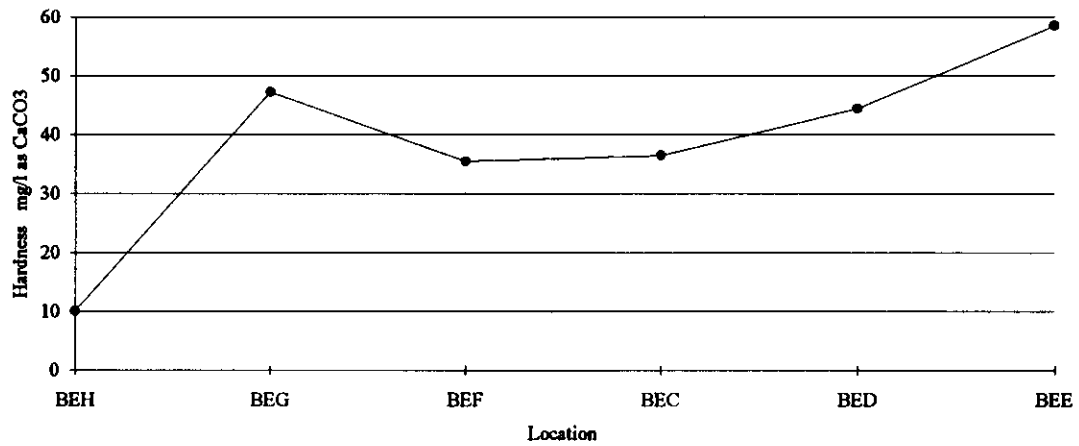
Comparison of Conductivity Concentration Distributions
for site LES on the Little Econlockhatchee River



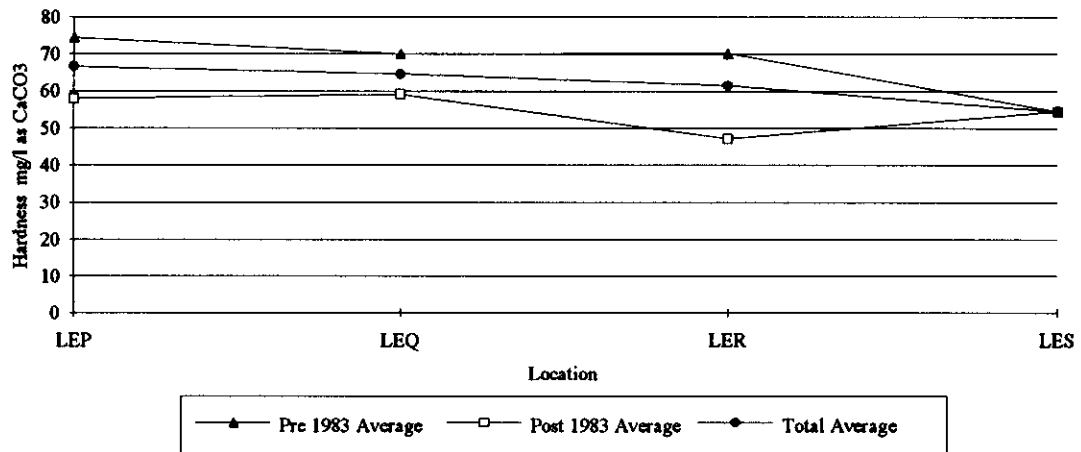
Probability Analysis of Hardness

Hardness in the Econlockhatchee River basin can be attributed mainly to the groundwater influx. Hardness is caused by divalent metallic cations. The principal cations contributing to hardness are Calcium and Magnesium. This hardness is primarily derived from contact with the soil and rock formations.

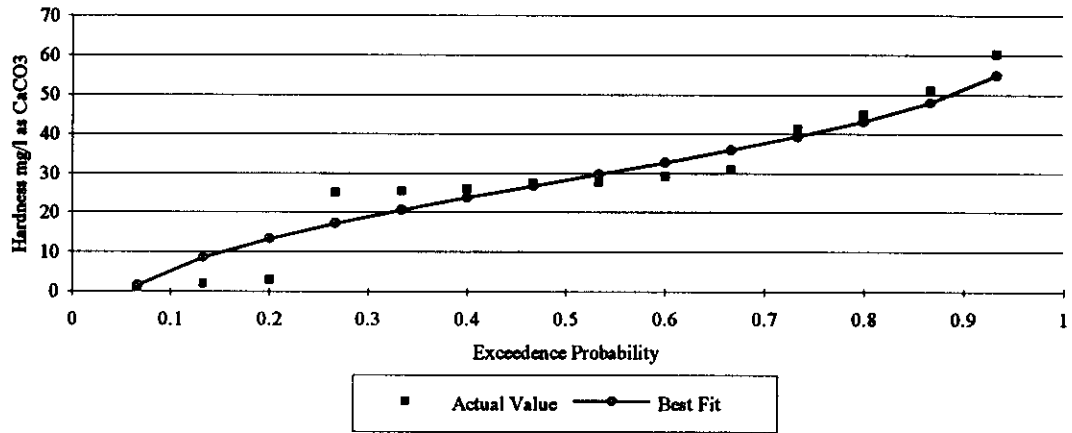
Average Hardness Concentration on Big Econlockhatchee River with Location



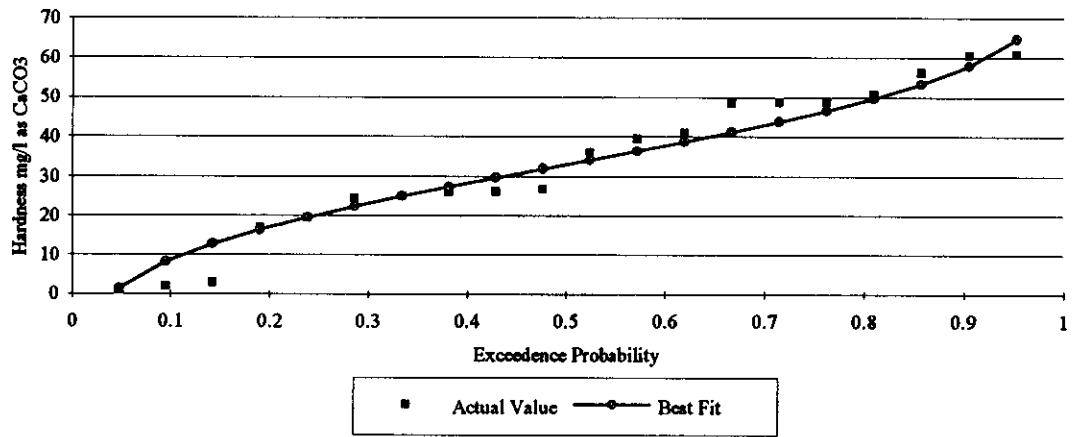
Average Hardness Concentration on Little Econlockhatchee River with Location



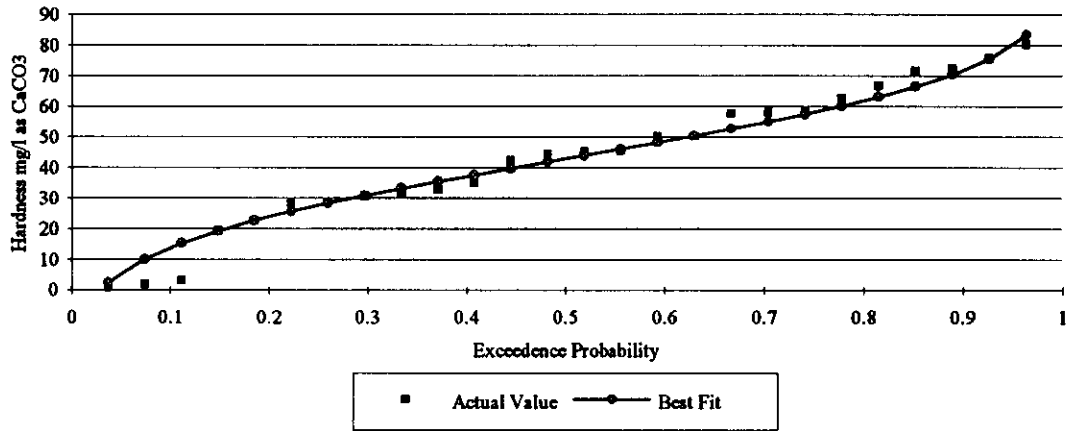
Distribution Analysis of Hardness for site BEF
on the Big Econlockhatchee River



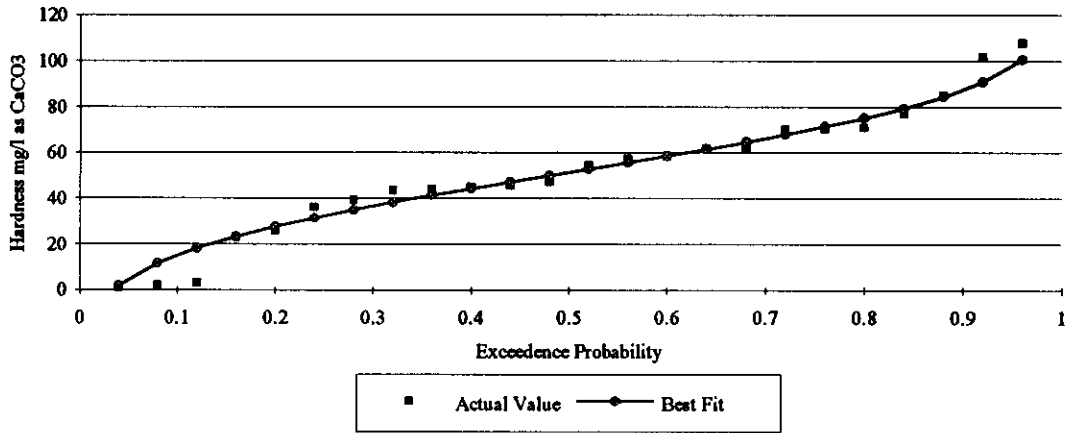
Distribution Analysis of Hardness for site BEC
on the Big Econlockhatchee River



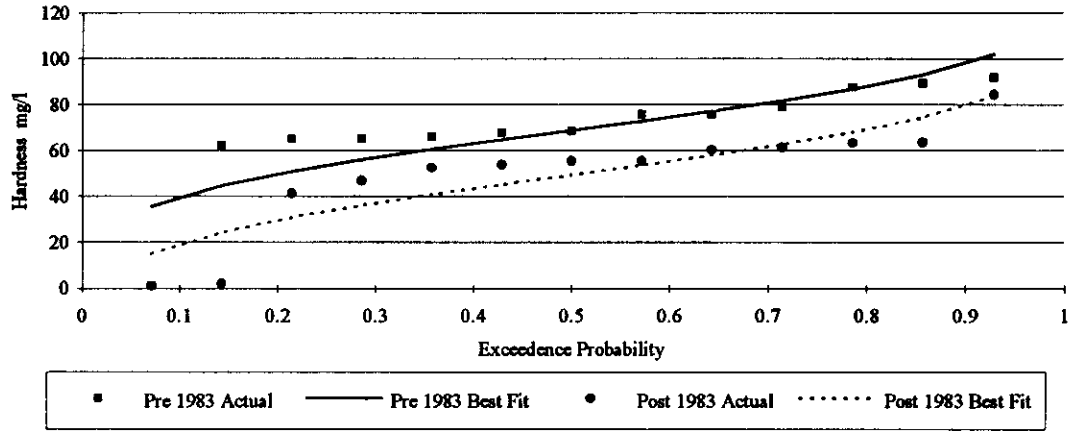
Distribution Analysis of Hardness for site BED
on the Big Econlockhatchee River



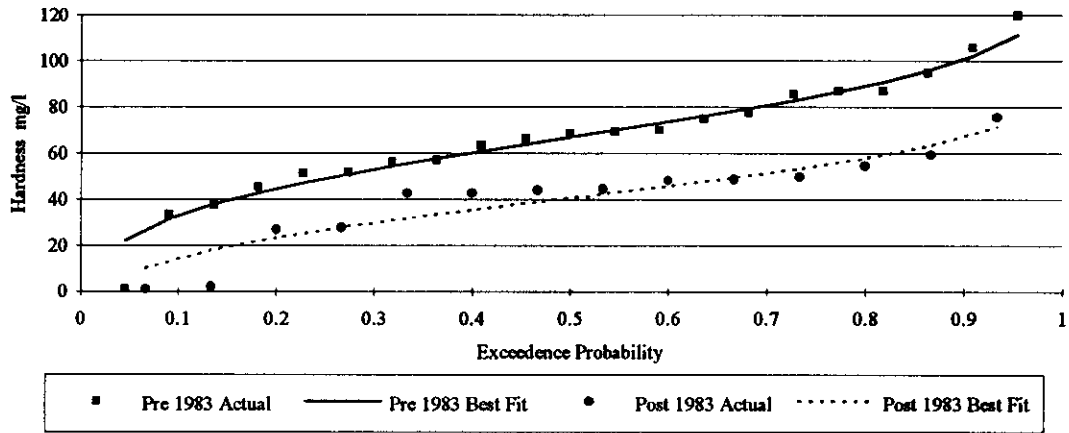
Distribution Analysis of Hardness for site BEE
on the Big Econlockhatchee River



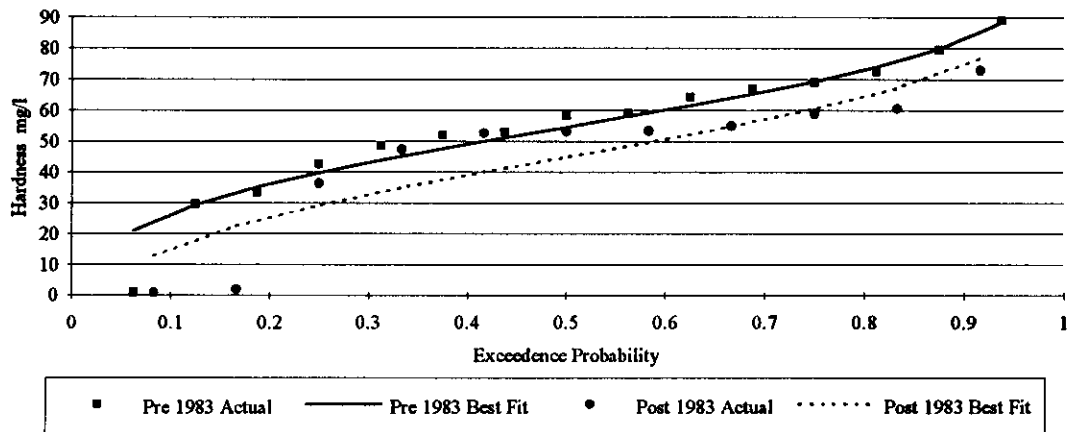
Comparison of Hardness Concentration Distributions
for site LEP on the Little Econlockhatchee River



Comparison of Hardness Concentration Distributions
for site LER on the Little Econlockhatchee River

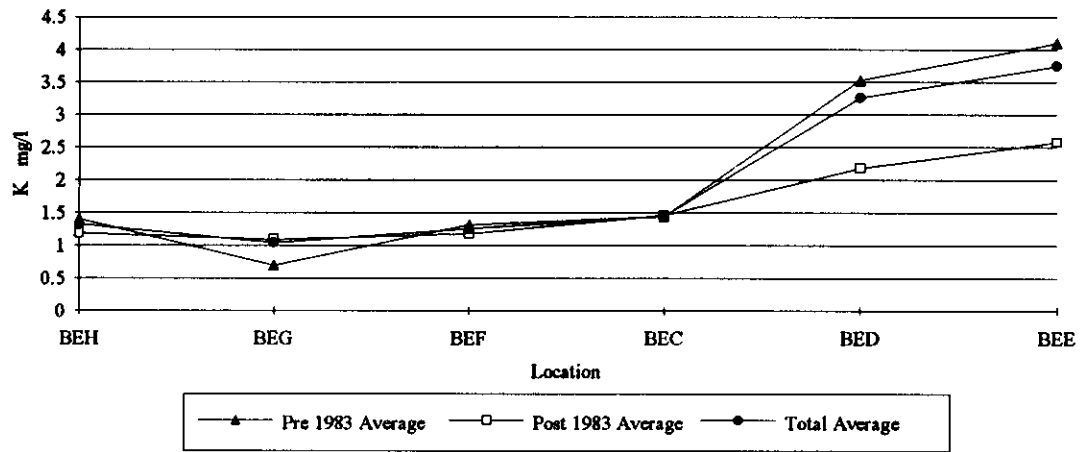


Comparison of Hardness Concentration Distributions
for site LES on the Little Econlockhatchee River

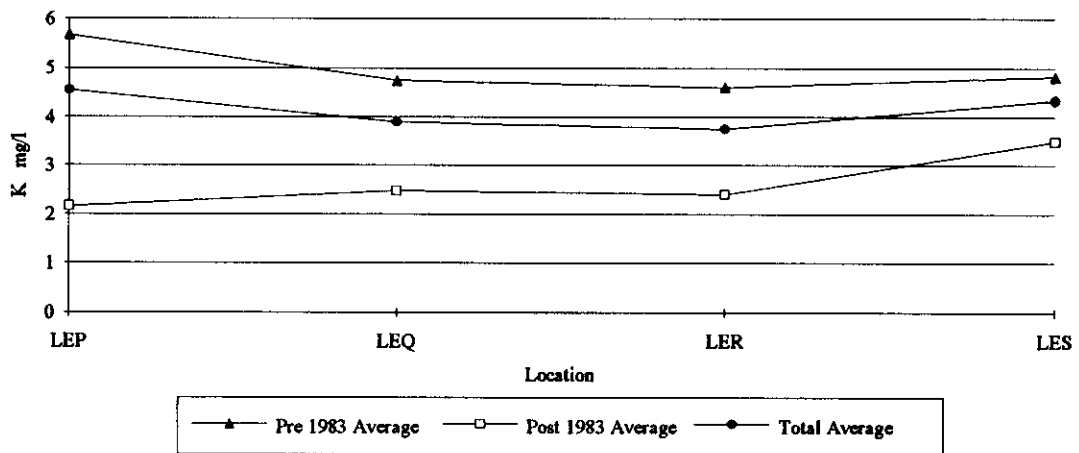


Probability Analysis of Potassium

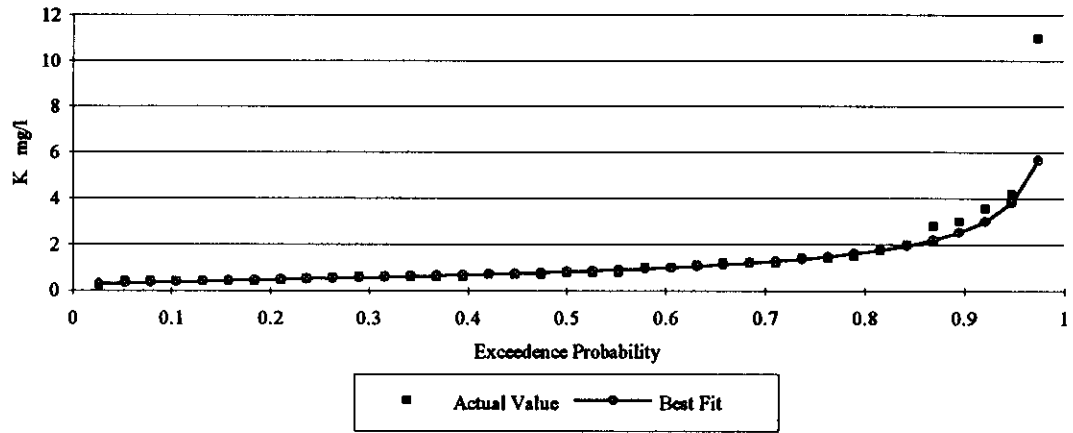
Average Potassium Concentration on Big Econlockhatchee River with Location



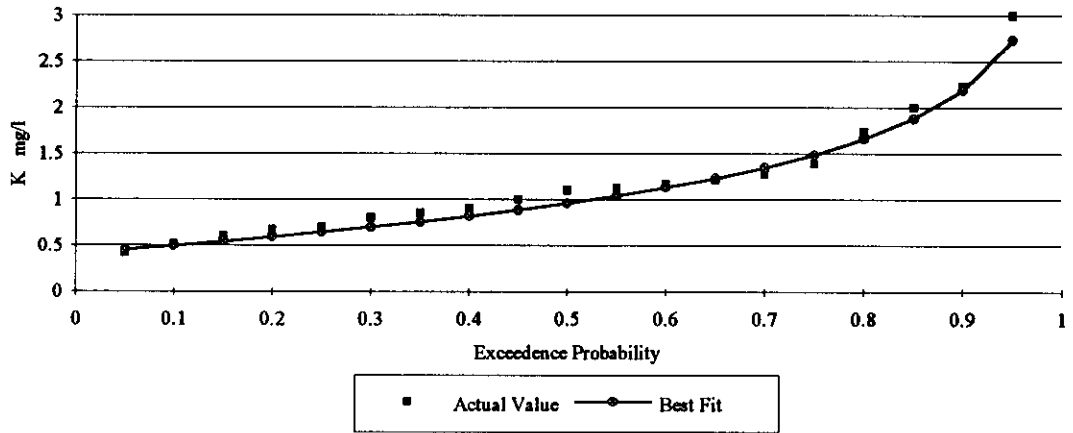
Average Potassium Concentration on Little Econlockhatchee River with Location



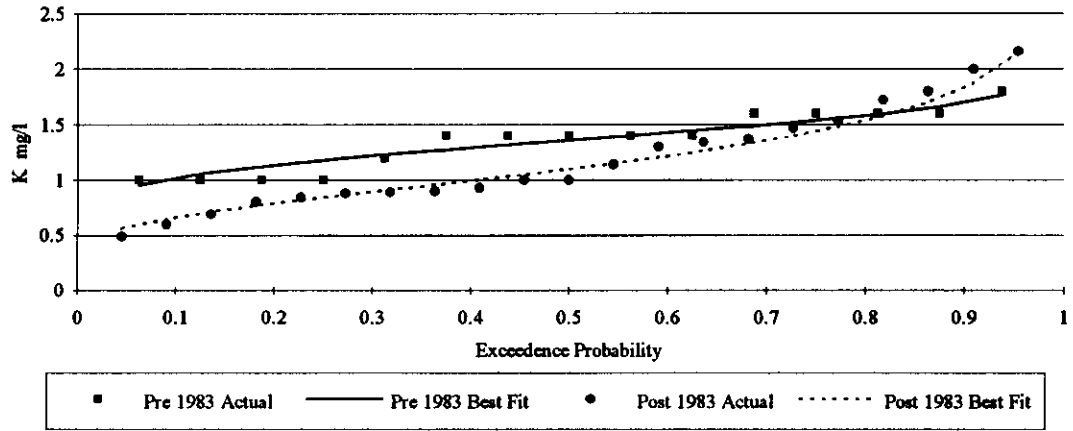
Distribution Analysis of Potassium for site BEH
on the Big Econlockhatchee River



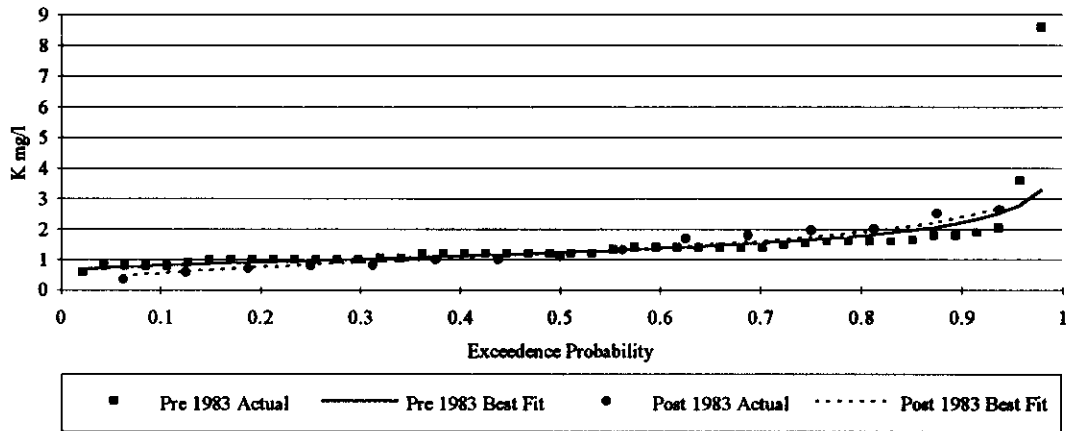
Distribution Analysis of Potassium for site BEG
on the Big Econlockhatchee River



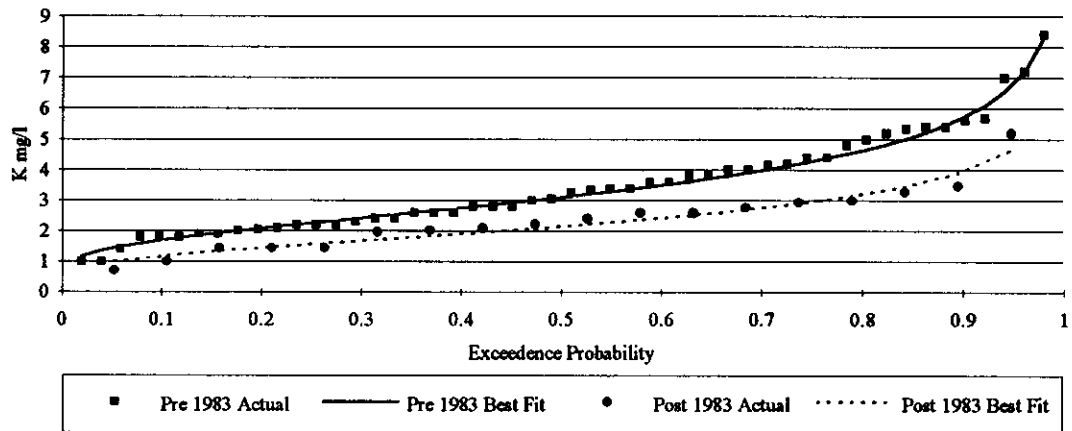
Comparison of Potassium Concentration Distributions
for site BEF on the Big Econlockhatchee River



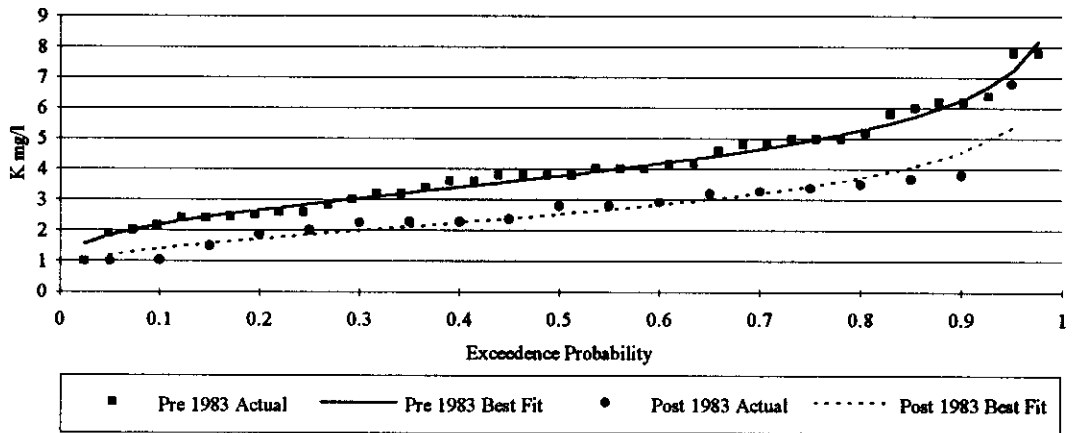
Comparison of Potassium Concentration Distributions
for site BEC on the Big Econlockhatchee River



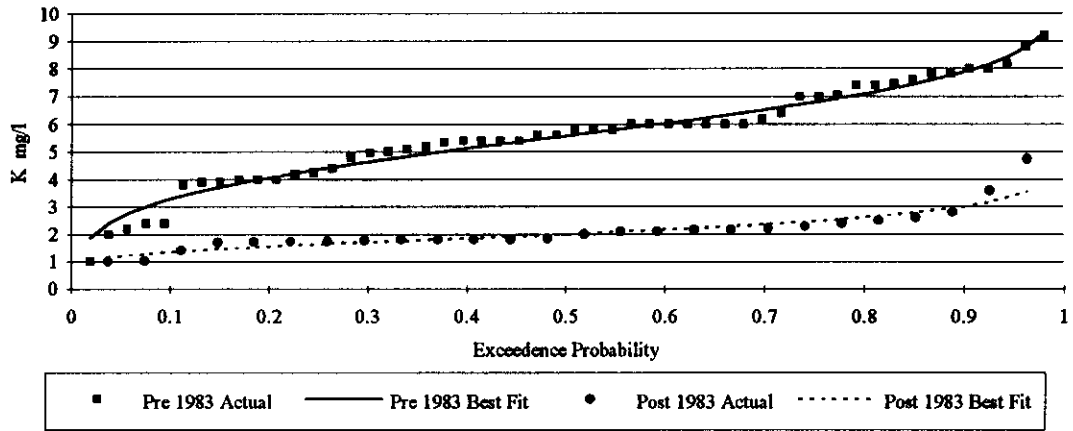
Comparison of Potassium Concentration Distributions
for site BED on the Big Econlockhatchee River



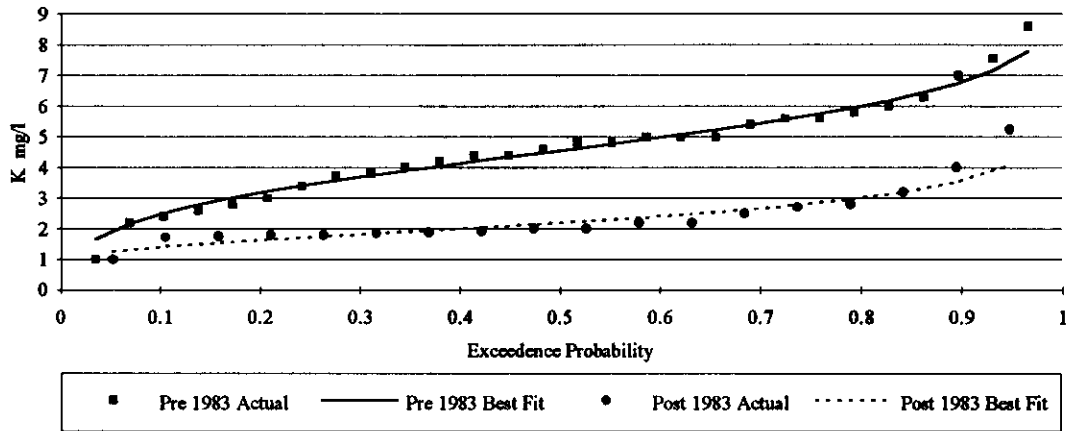
Comparison of Potassium Concentration Distributions
for site BEE on the Big Econlockhatchee River



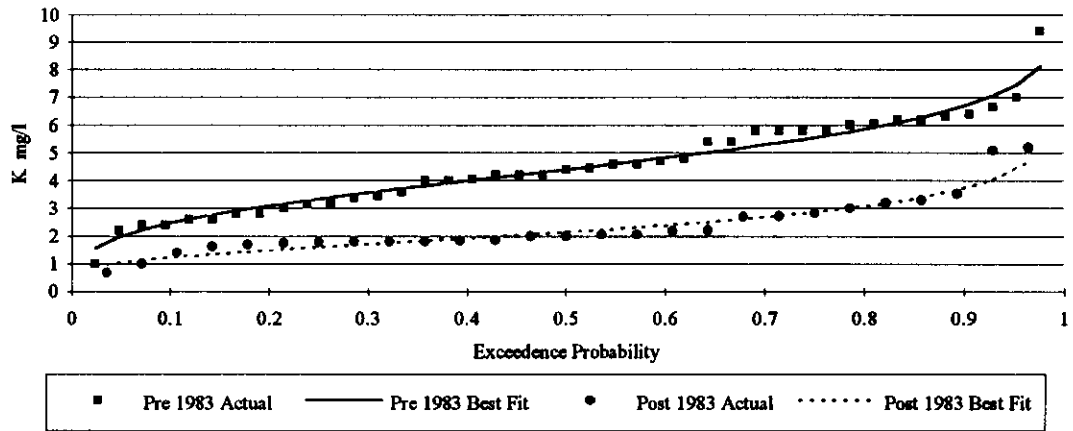
Comparison of Potassium Concentration Distributions
for site LEP on the Little Econlockhatchee River



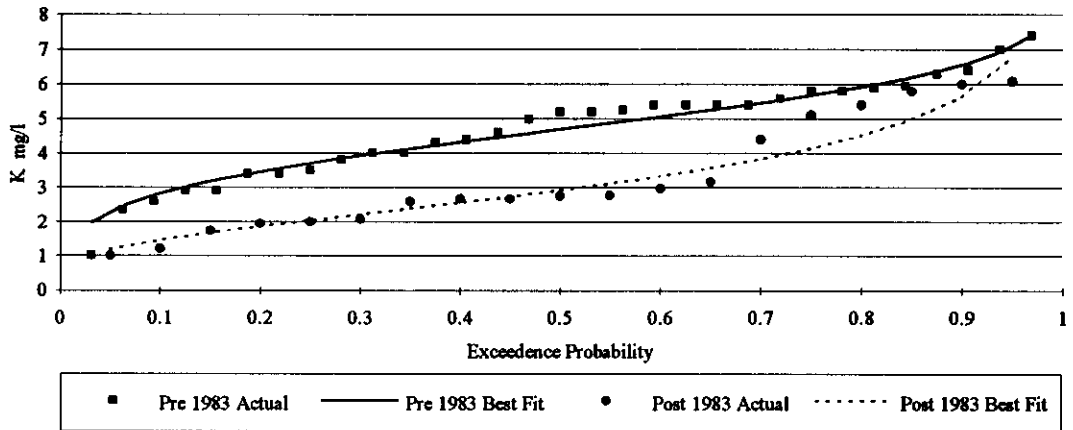
Comparison of Potassium Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Potassium Concentration Distributions
for site LER on the Little Econlockhatchee River



Comparison of Potassium Concentration Distributions
for site LES on the Little Econlockhatchee River

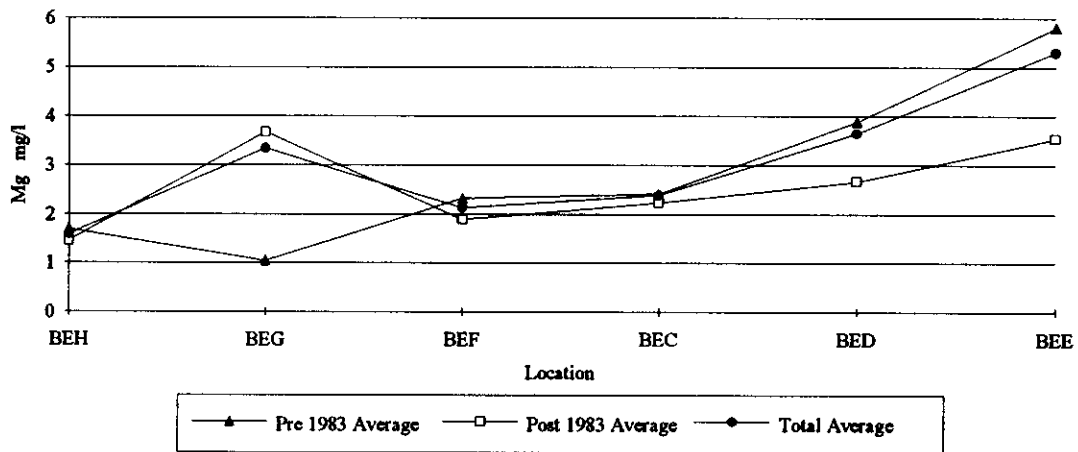


Probability Analysis of Magnesium

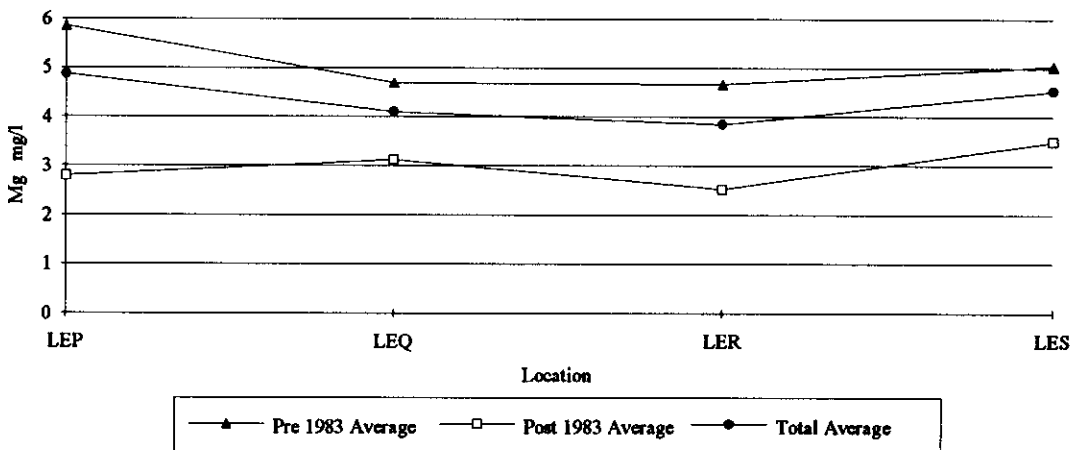
Magnesium is one of two primary Cations associated with water hardness. Magnesium hardness is typically derived from subsurface limestone formations and thus Magnesium hardness can be a general indicator of groundwater inputs to surface water flows.

The following figures illustrate the average magnesium concentrations at 6 sites on the Big Econlockhatchee River and 4 sites on the Little Econlockhatchee River. The results of the probability distribution analysis are included for the various sites. The analyses were split into pre and post 1983 where sufficient data exist. In the case of insufficient data for a reliable probability analysis, the pre and post data were combined and a single analysis was performed.

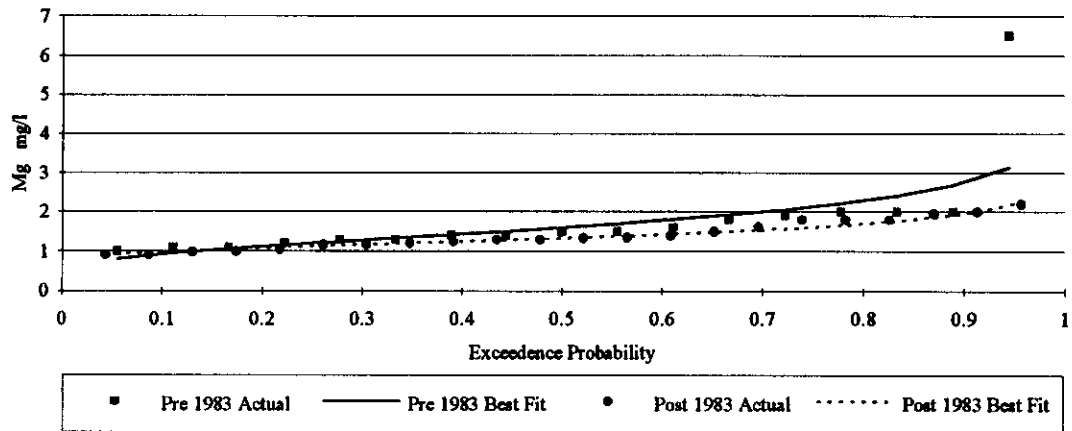
Average Magnesium Concentration on Big Econlockhatchee River with Location



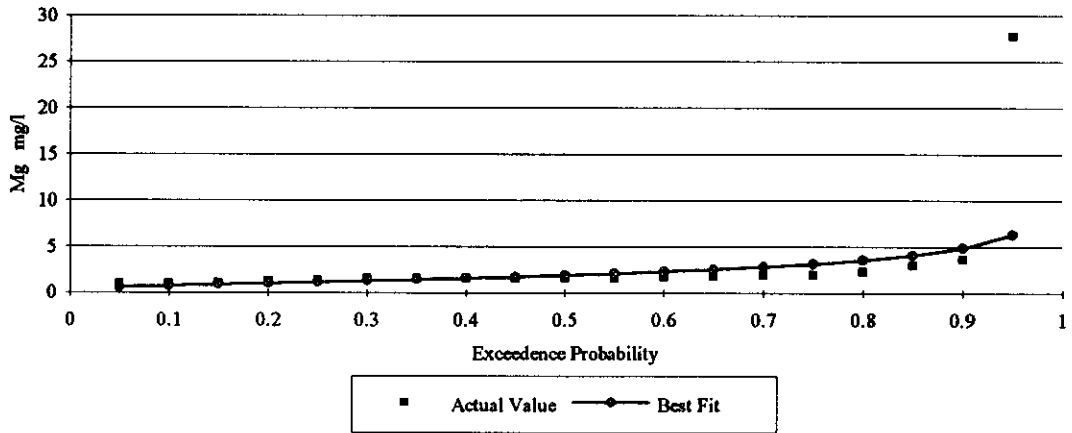
Average Magnesium Concentration on Little Econlockhatchee River with Location



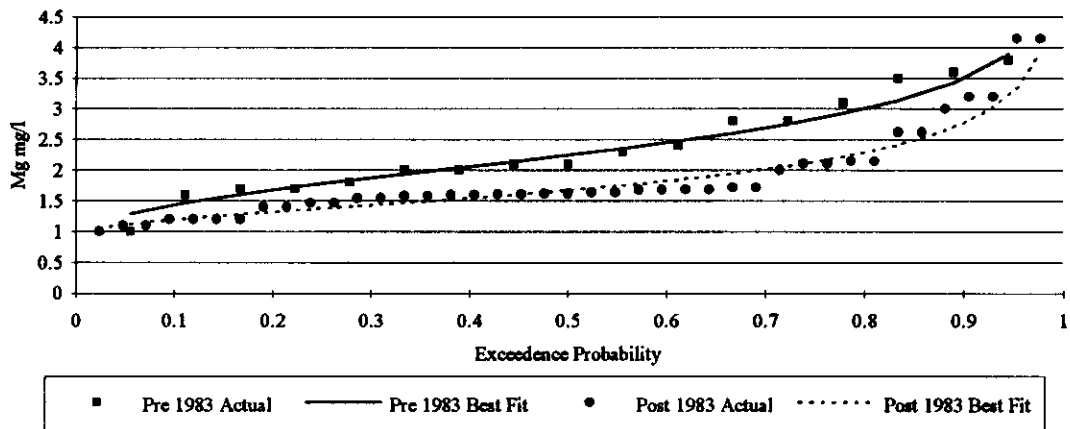
Comparison of Magnesium Concentration Distributions
for site BEH on the Big Econlockhatchee River



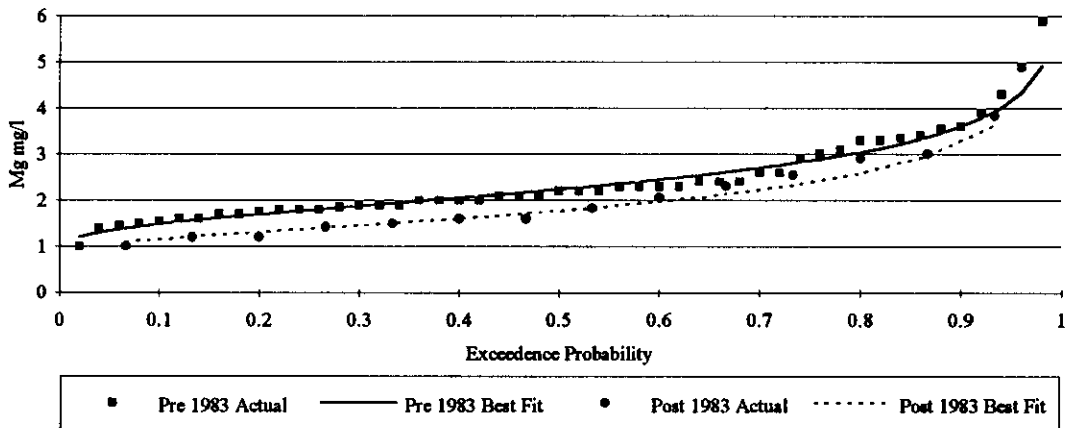
Distribution Analysis of Magnesium for site BEG
on the Big Econlockhatchee River



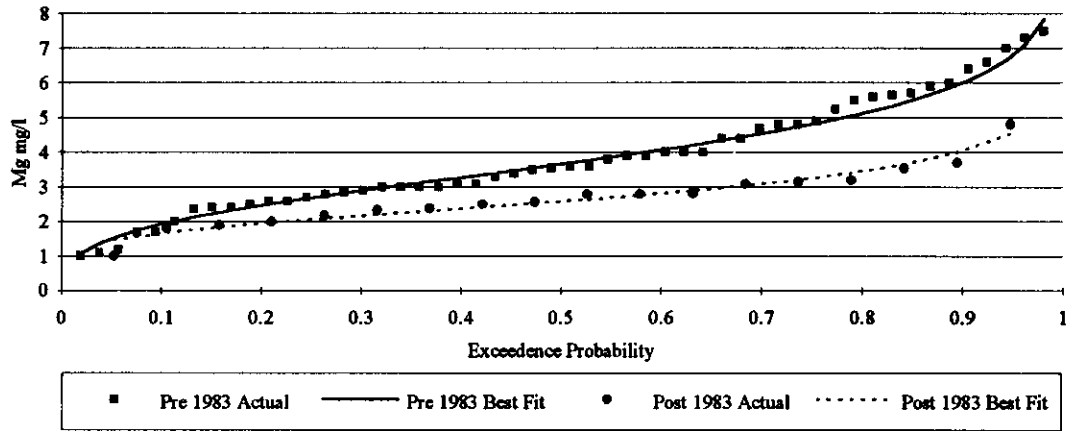
Comparison of Magnesium Concentration Distributions
for site BEF on the Big Econlockhatchee River



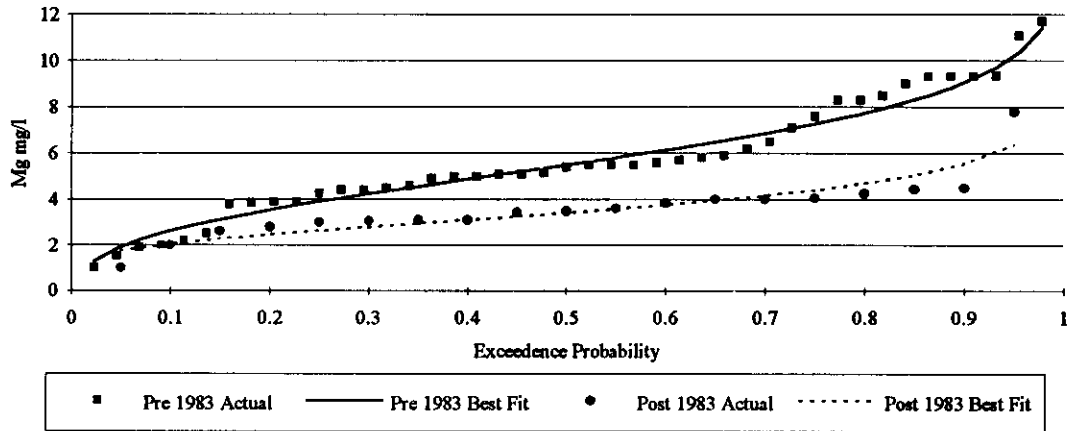
Comparison of Magnesium Concentration Distributions
for site BEC on the Big Econlockhatchee River



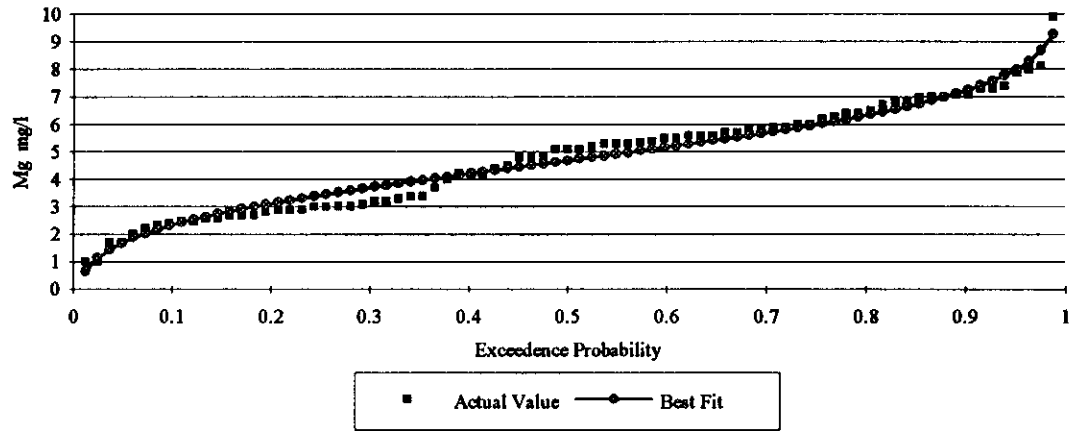
Comparison of Magnesium Concentration Distributions
for site BED on the Big Econlockhatchee River



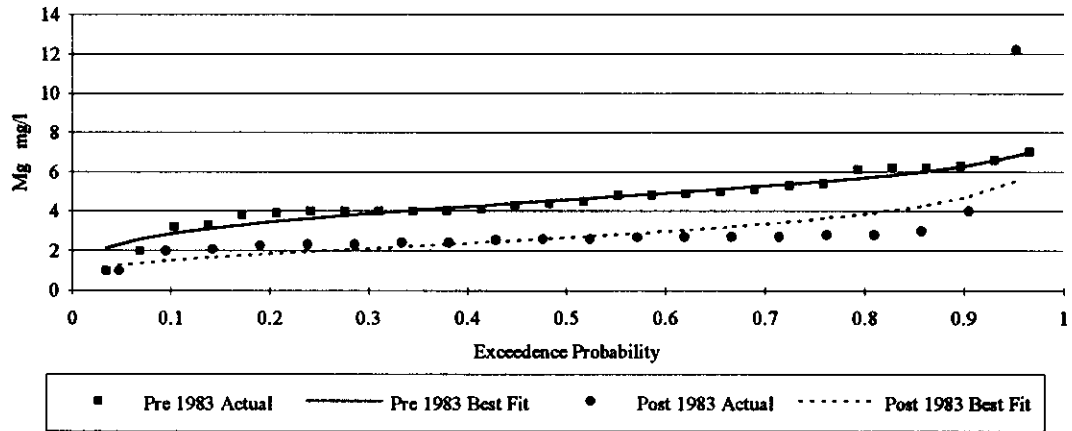
Comparison of Magnesium Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River



Distribution Analysis of Magnesium for site LEP
on the Little Econlockhatchee River

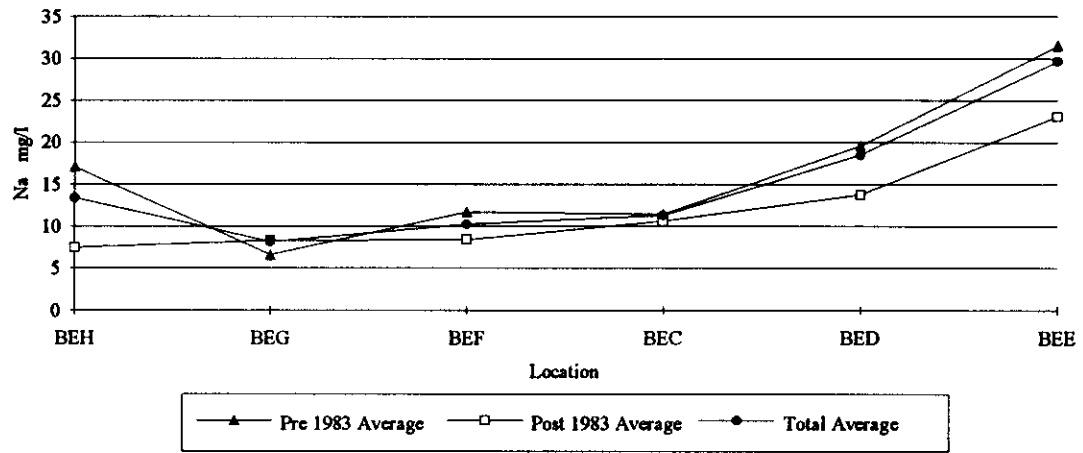


Comparison of Magnesium Concentration Distributions
for site LEQ on the Little Econlockhatchee River

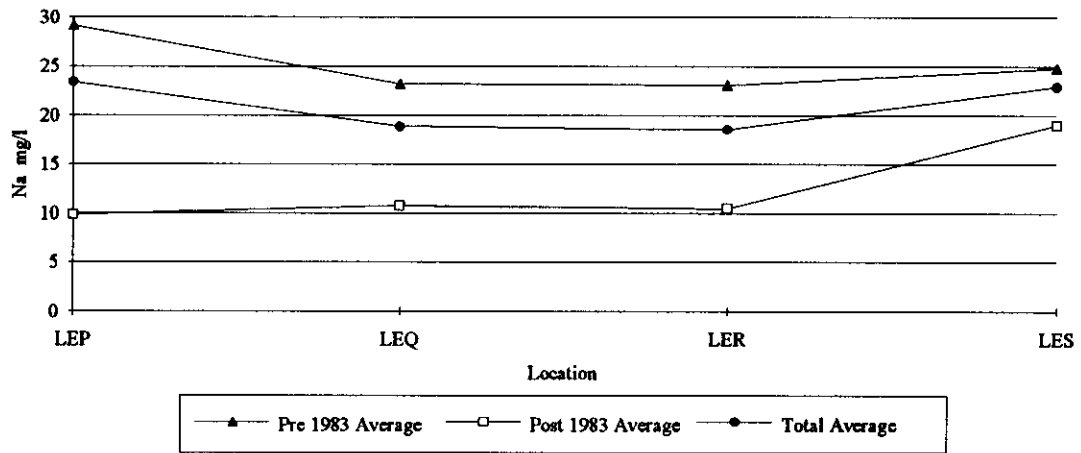


Probability Analysis of Sodium

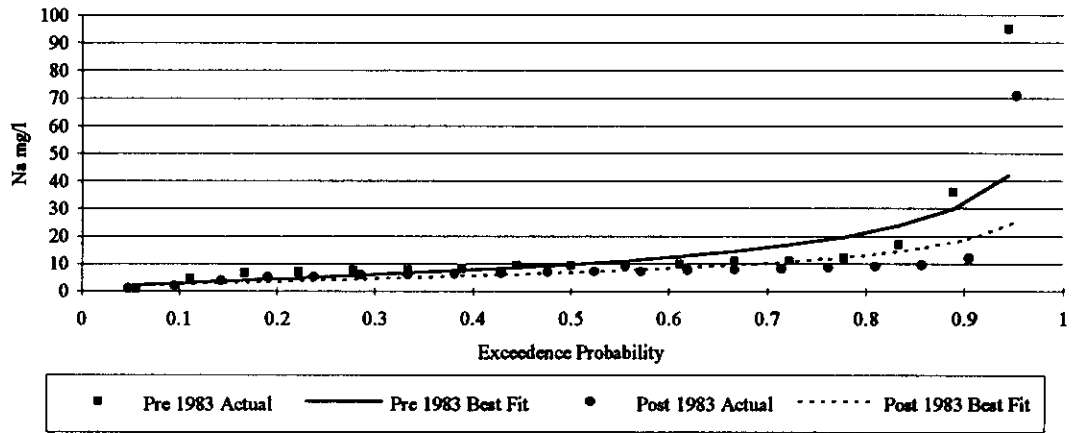
Average Sodium Concentration on Big Econlockhatchee River with Location



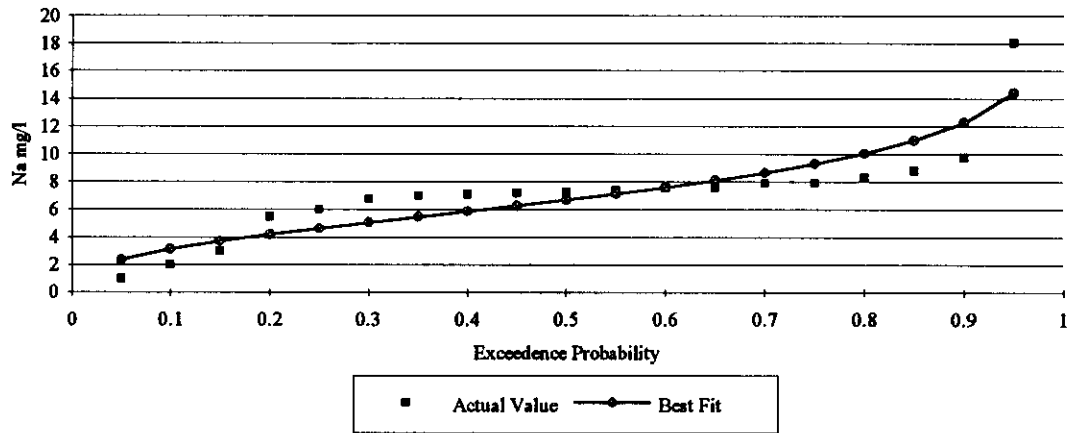
Average Sodium Concentration on Little Econlockhatchee River with Location



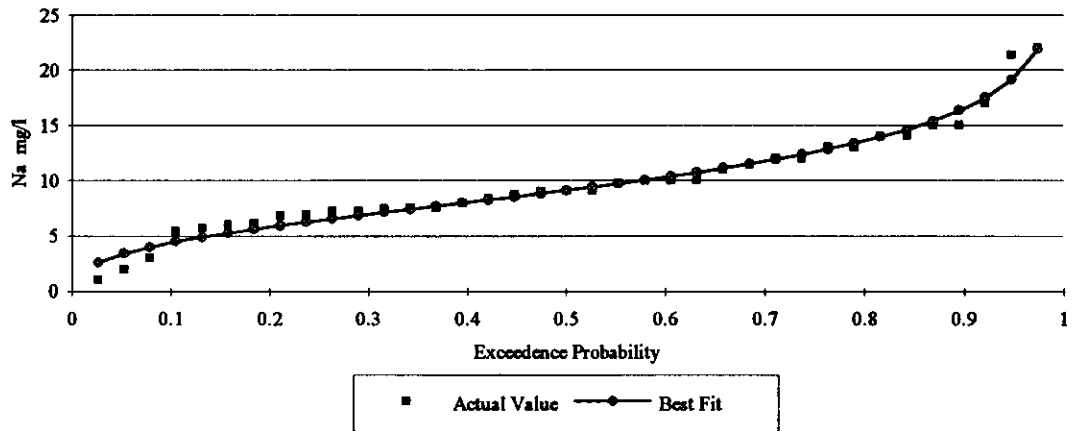
Comparison of Sodium Concentration Distributions
in mg/l for site BEH on the Big Econlockhatchee River



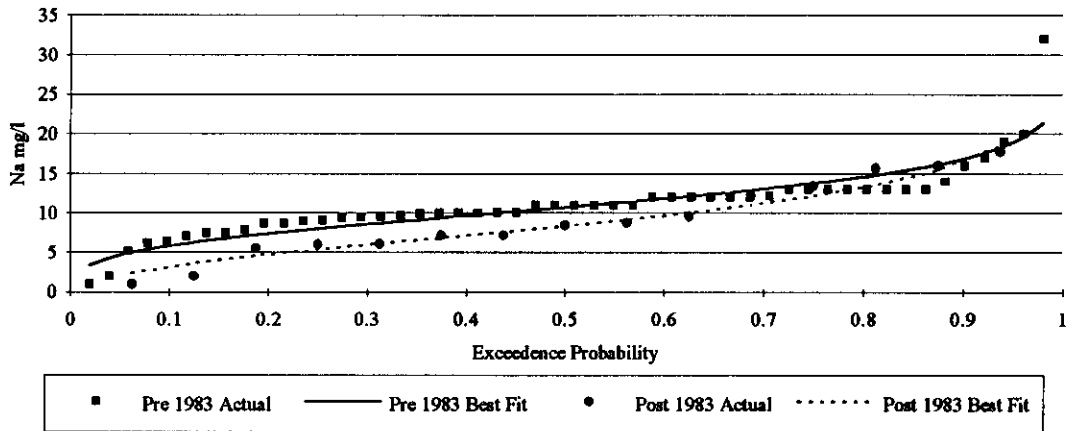
Distribution Analysis of Sodium for site BEG
on the Big Econlockhatchee River



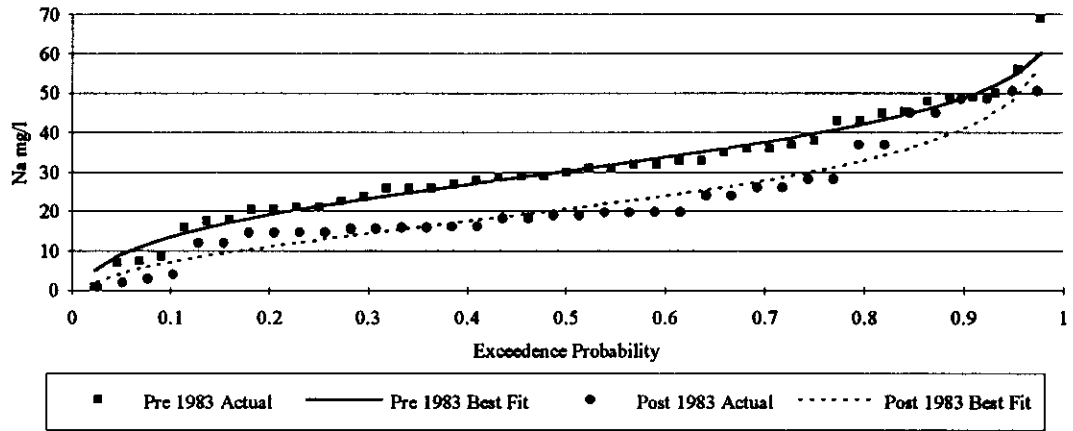
Distribution Analysis of Sodium for site BEF
on the Big Econlockhatchee River



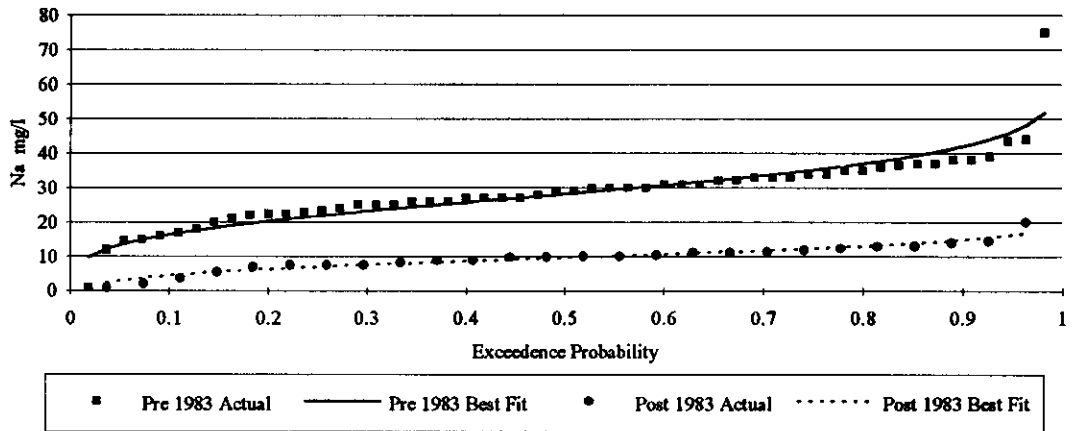
Comparison of Sodium Concentration Distributions
in mg/l for site BEC on the Big Econlockhatchee River



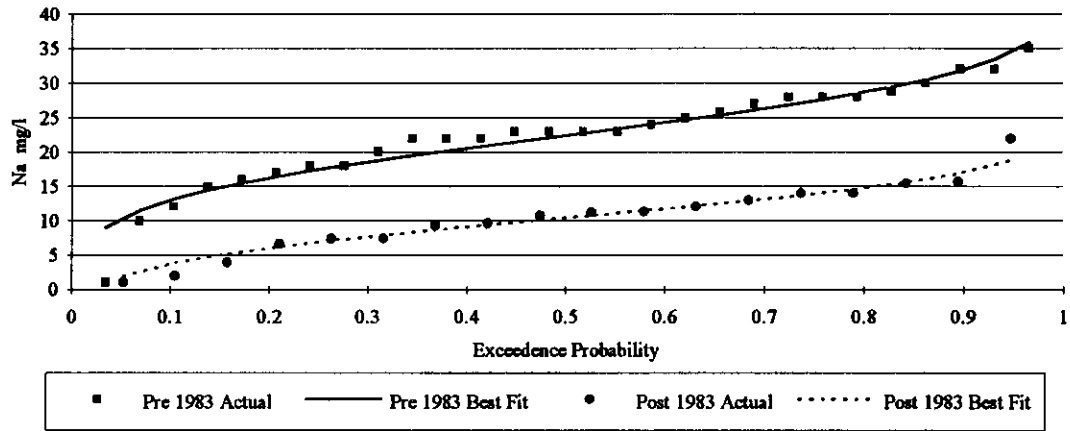
Comparison of Sodium Concentration Distributions
in mg/l for site BEE on the Big Econlockhatchee River



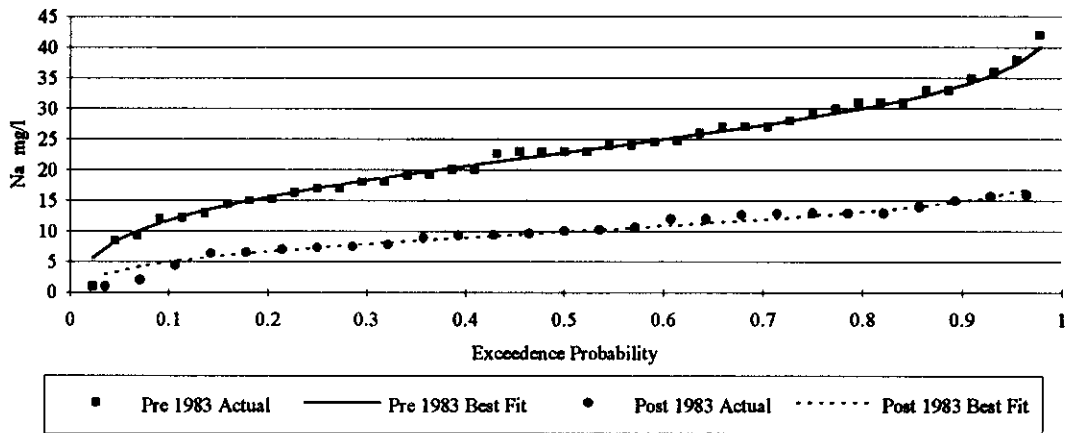
Comparison of Sodium Concentration Distributions
for site LEP on the Little Econlockhatchee River



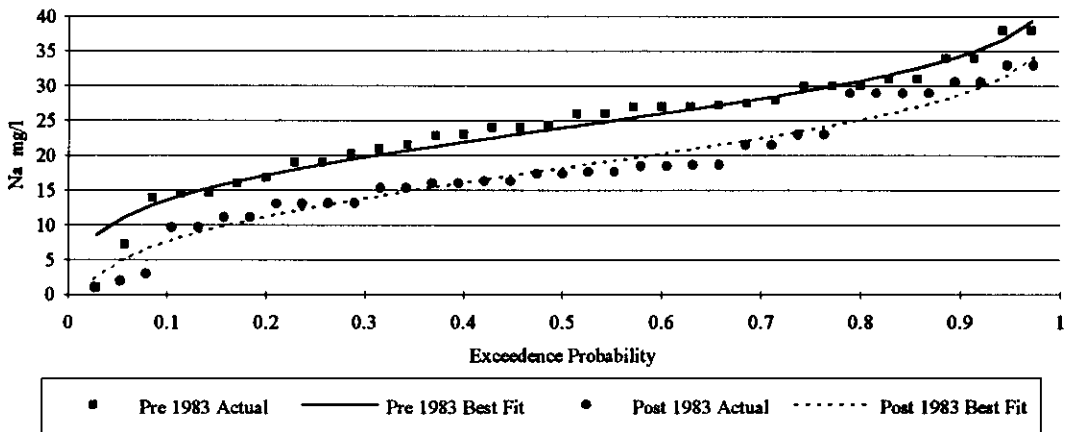
Comparison of Sodium Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Sodium Concentration Distributions
for site LER on the Little Econlockhatchee River

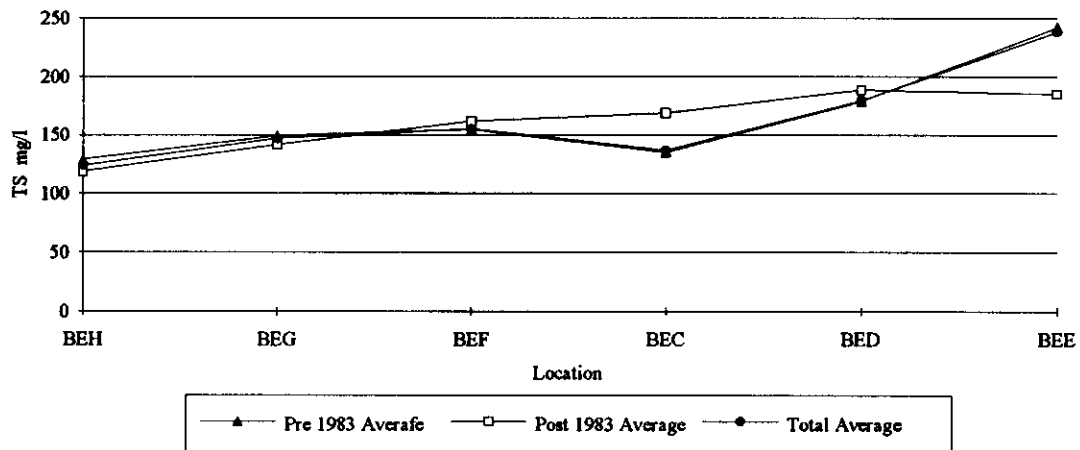


Comparison of Sodium Concentration Distributions
for site LES on the Little Econlockhatchee River

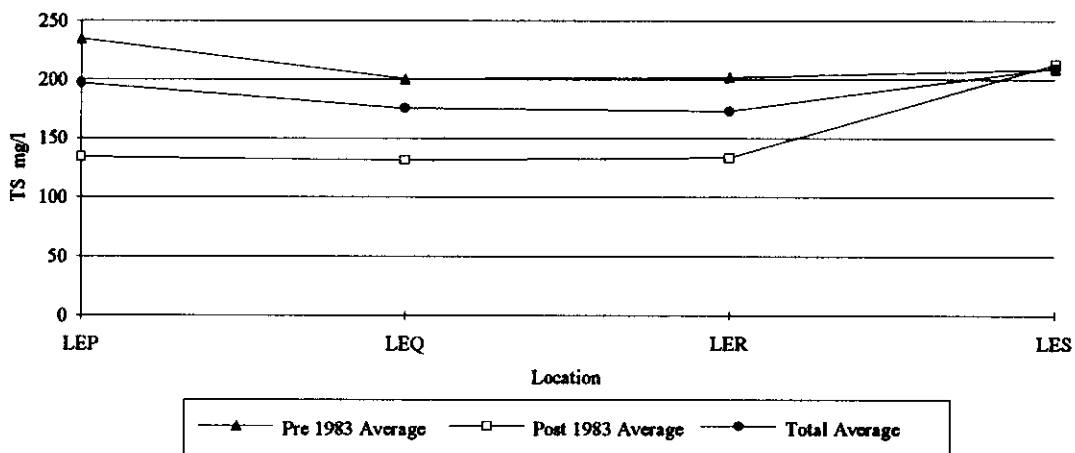


Probability Analysis of Total Solids

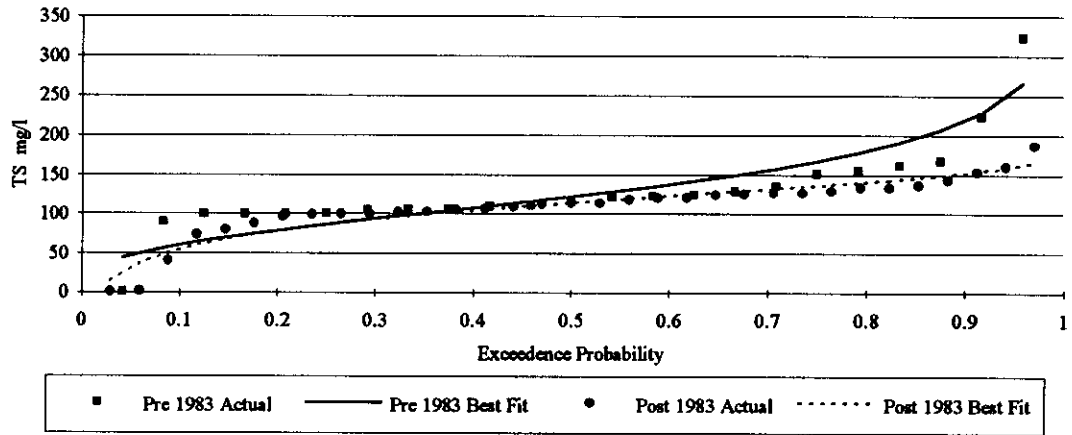
Average Total Solids Concentration on Big Econlockhatchee River with Location



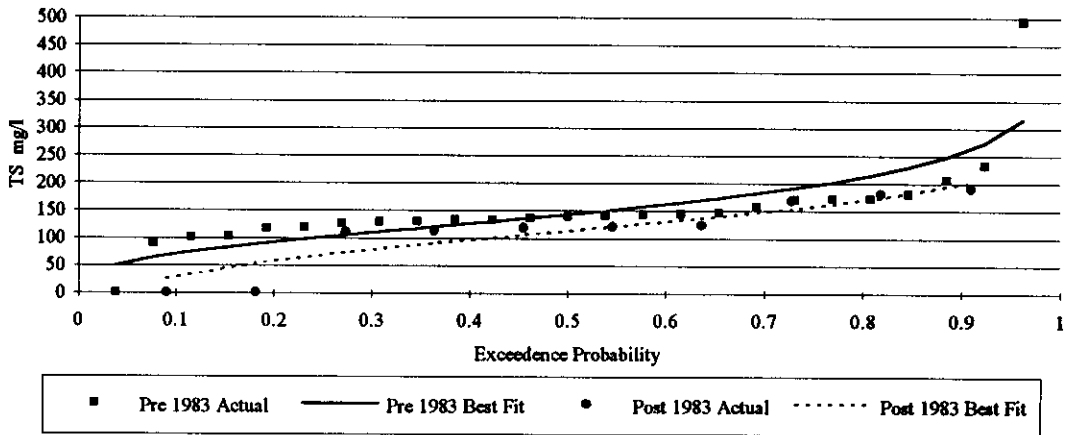
Average Total Solids Concentration on Little Econlockhatchee River with Location



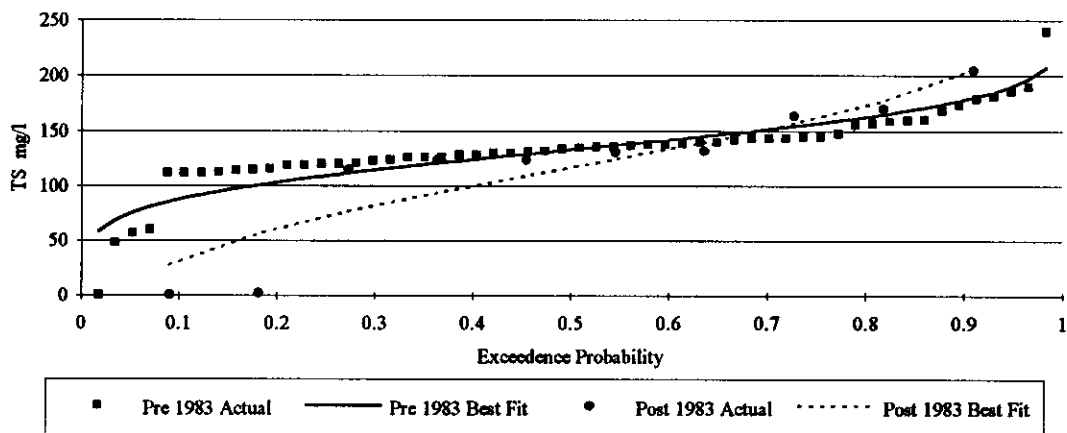
Comparison of Total Solids Concentration Distributions
for site BEH on the Big Econlockhatchee River



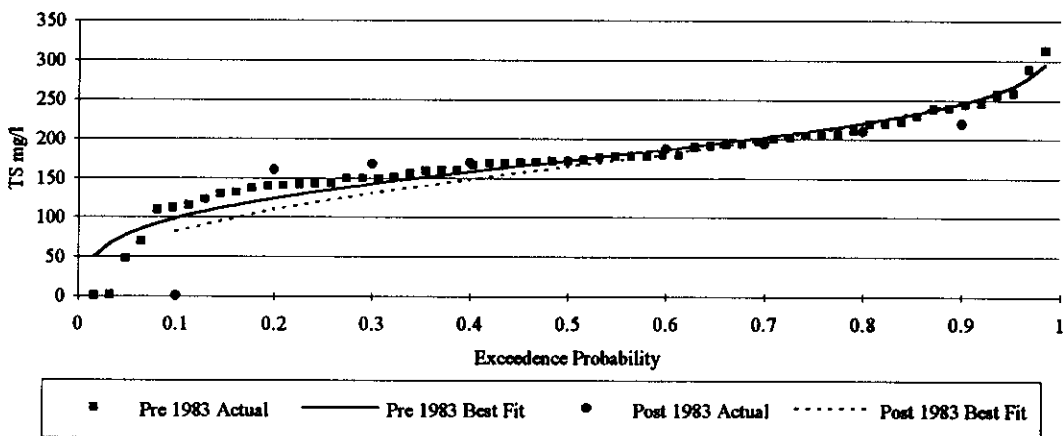
Comparison of Total Solids Concentration Distributions
for site BEF on the Big Econlockhatchee River



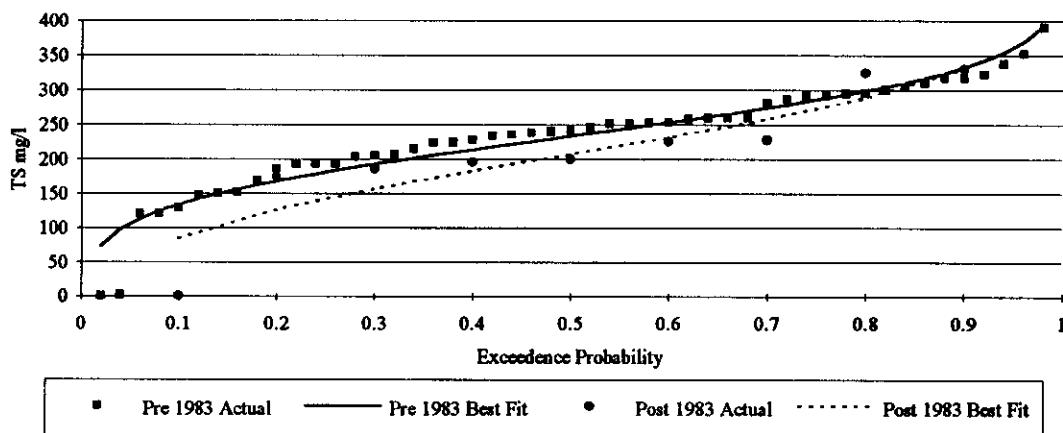
Comparison of Total Solids Concentration Distributions
for site BEC on the Big Eonlockhatchee River



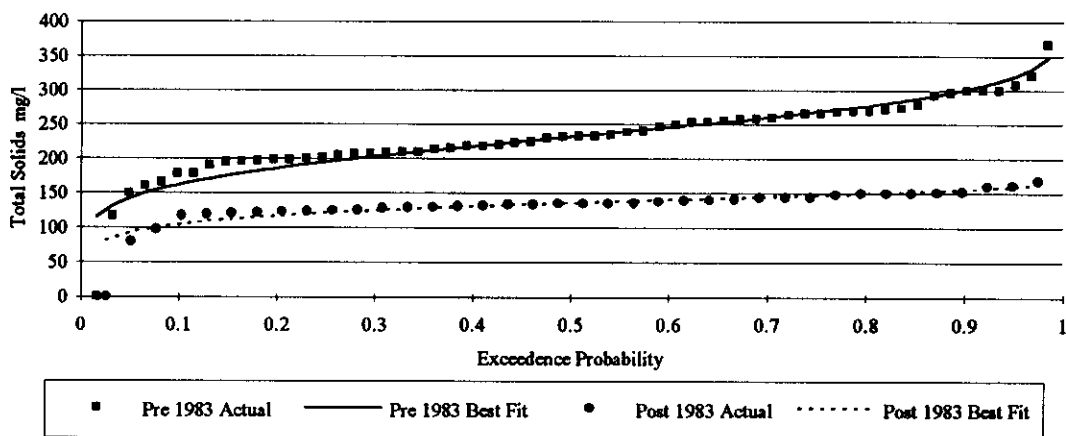
Comparison of Total Solids Concentration Distributions
for site BED on the Big Eonlockhatchee River



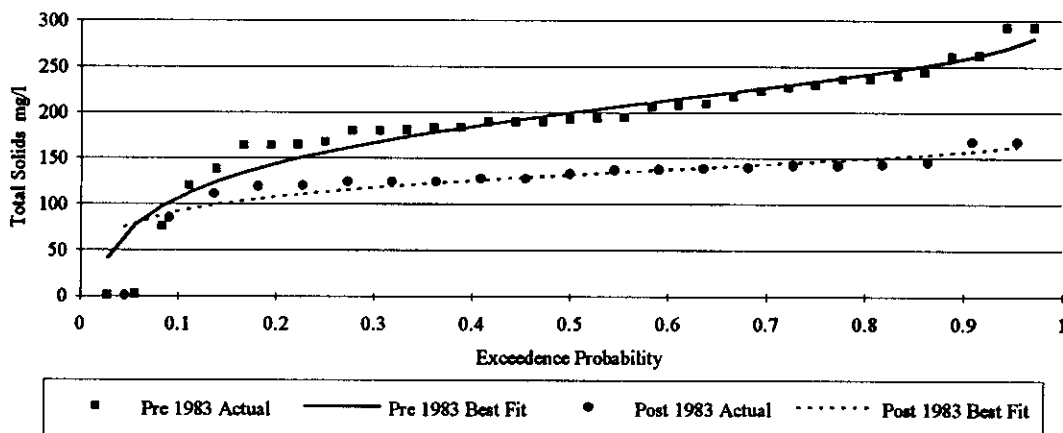
Comparison of Total Solids Concentration Distributions
for site BEE on the Big Econlockhatchee River



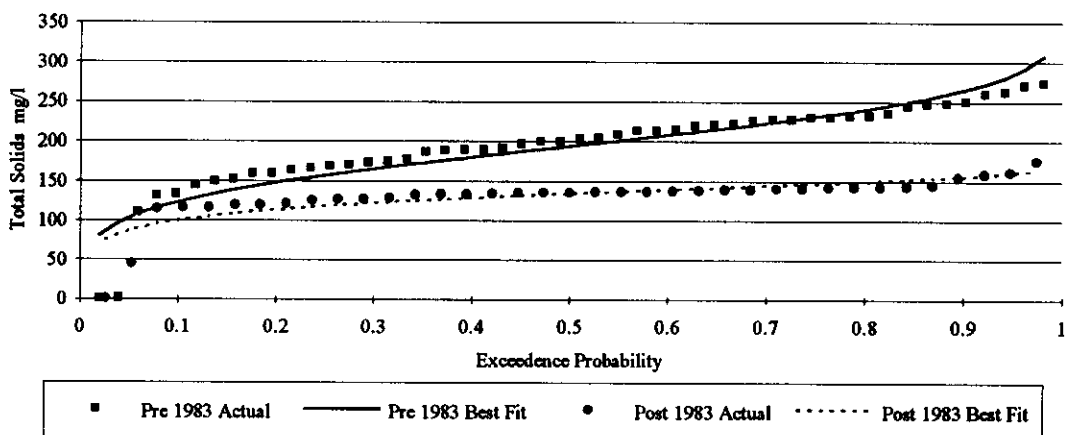
Comparison of Total Solids Concentration Distributions
for site LEP on the Little Econlockhatchee River



Comparison of Total Solids Concentration Distributions
for site LEQ on the Little Econlockhatchee River



Comparison of Total Solids Concentration Distributions
for site LER on the Little Econlockhatchee River



Comparison of Total Solids Concentration Distributions
for site LES on the Little Econlockhatchee River

