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Application of the BATHTUB Model to Selected Southeastern Reservoirs

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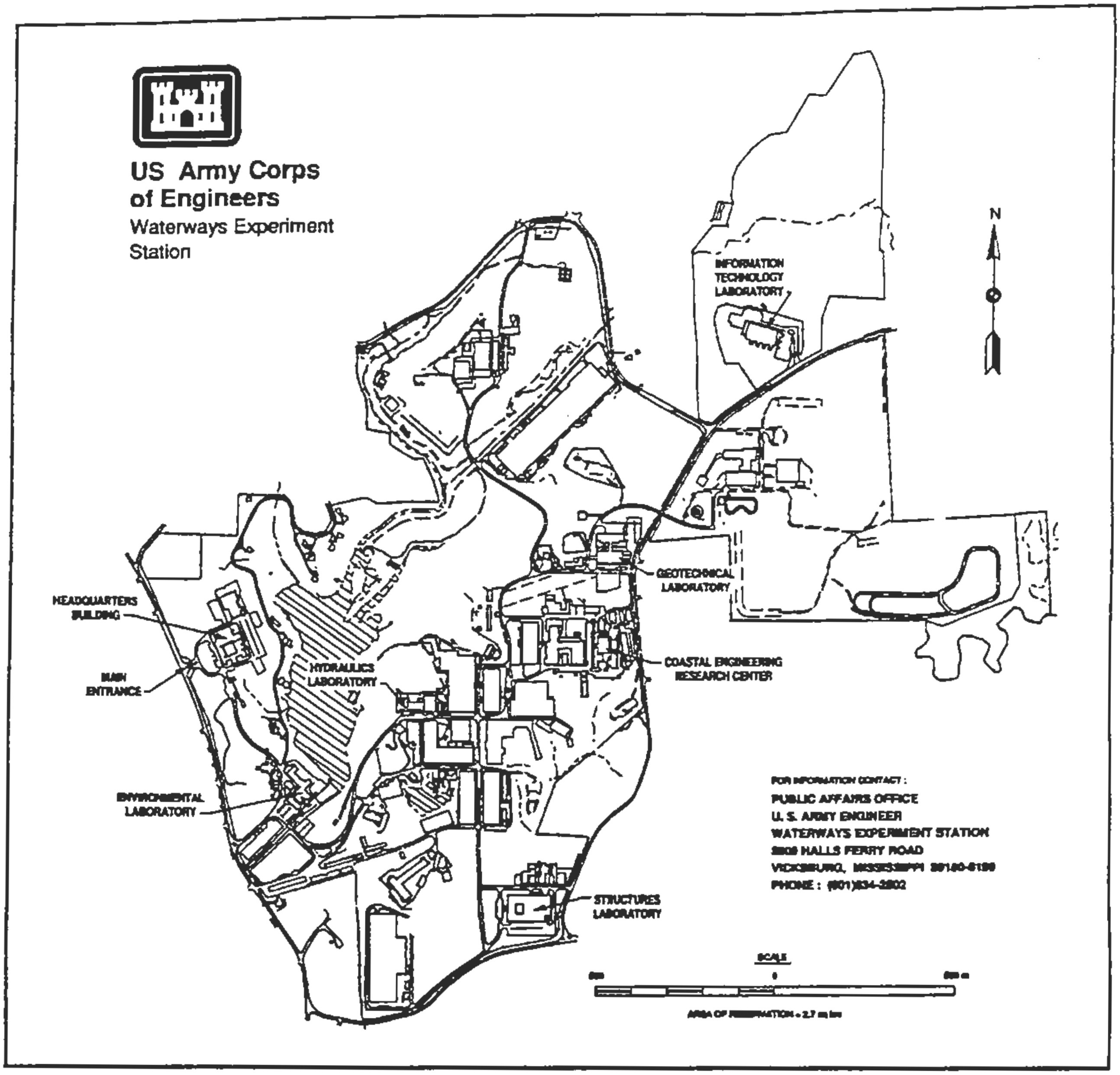

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Contents

Preface

The work described herein was conducted under a Military Interdepartmental Purchase Request by the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the U.S. Army Engineer District, Mobile.

This report was prepared by Dr. Robert H. Kennedy of the Environmental Processes and Effects Division (EPED), Environmental Laboratory (EL), WES. Ms. Kelly Johnson and Ms. Laura Scott, AScI Corporation, Alexandria, VA, and Ms. Katherine Long, EPED, assisted with site descriptions, data compilation, and selected analyses.

The work was performed under the general supervision of Dr. Richard E. Price, Acting Chief, Ecosystem Processes and Effects Branch, EPED; Mr. Donald L. Robey, Chief, EPED; and Dr. John W. Keeley, Director, EL.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

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1 Introduction

Eutrophication is the natural, long-term process by which lakes become enriched with nutrients, organic matter, and sediment. Symptomatic of the occurrence of this process are decreased water clarity, excessive algal production, reduced dissolved oxygen in bottom waters during stratified periods, and decreased volume. For lakes impacted by human activity in the watershed, this process is often greatly accelerated. Since reservoirs are commonly constructed on rivers and streams draining relatively large and often extensively developed watersheds, they receive elevated loads of nutrients and sediment and are, therefore, highly susceptible to accelerated eutrophication (Kennedy, Thornton, and Ford 1985).

The U.S. Army Corps of Engineers has erected dams in the Chattahoochee and Coosa river basins creating a series of large impoundments. These include Lake Sidney Lanier, West Point Lake, Walter F. George Lake (Chattahoochee River basin), and Allatoona Lake (Coosa River basin). The Chattahoochee River basin includes Atlanta, a large and growing population center, as well as extensive agricultural lands, both of which contribute significantly to accelerated eutrophication of these impoundments. Further, urban centers now place high demand on water, power, and recreation resources. The Coosa River basin above Allatoona Lake, while still relatively rural, has undergone significant development in recent years. This trend is expected to continue as increases in population associated with growth in and around Atlanta result in a northward expansion of metropolitan and residential areas.

Reallocating water in the Chattahoochee and Coosa river basins has been proposed as a means to better meet water demands of the area. Since such reallocations would impact water quantity, concerns over the potential for impacts to water quality have been raised. Water quality concerns related to population growth and resultant increases in the potential material loadings to both rivers have also been the subject of great debate.

Results of applying the empirical model BATHTUB to predict eutrophication responses of Lake Sidney Lanier, West Point Lake, Walter F. George Lake, and Allatoona Lake to a variety of conditions thought to affect nutrient levels and corresponding algal growth are summarized herein. Included are estimates of responses to changes in nutrient loading and water residence time. These responses to prescribed conditions could serve as decision-making aids to managers charged with optimizing the use of these valuable resources.

2 Site Description

River Basins

Chattahoochee River basin

The Chattahoochee River flows approximately 400 km from its headwaters in the Blue Ridge Mountains in northeast Georgia, to its confluence with the Flint River to form the Appalachicola River at Lake Seminole near Chattahoochee, FL. Draining approximately 19,500 km^2, the river flows southwest past Atlanta, to the Georgia-Alabama border before turning south. Along this course, waters are impounded by a total of 14 dams constructed to meet a variety of water uses. Included among these are Buford Dam (Lake Sidney Lanier), West Point Dam (West Point Lake), and Walter F. George Lock and Dam (Walter F. George Lake; Figure 1), all of which are operated by the U.S. Army Corps of Engineers (CE).

The drainage basin crosses three distinct physiographic regions. The Mountain region slopes steeply from the crest of the Blue Ridge Mountains (ca. 1,220 m NGVD) to the vicinity of Atlanta (ca. 305 m NGVD). The Piedmont Plateau region extends from the foothills of the Blue Ridge Mountains near Atlanta to the fall line just north of Columbus, GA. The remainder of the basin is located in the Upper Coastal Plain, a region characterized by low-lying and gently rolling topography. Average precipitation across the basin is high, ranging from 1.27 to 1.37 m. The underlying bedrock is igneous and metamorphic, and the waters of the Chattahoochee River are typically soft with low mineral content.

Coosa River basin

The Coosa River, a tributary of the Alabama River, arises in northeast Georgia with the confluence of the Etowah and Oostamaula rivers near Rome. Headwater areas are in the Appalachian Plateau and Valley physiographic regions (Wharton 1977), which exhibit steeply to moderately sloping topography. The area is currently sparsely populated, and natural areas are dominated by a mix of hardwood and coniferous forests. The CE has constructed two reservoirs in this portion of the basin; Carters Lake on the Coosawattee River and Allatoona Lake to the south on the Etowah River (Figure 1).

Reservoirs

Lake Sidney Lanier

Buford Dam and Lake Sidney Lanier is the uppermost CE water resource project on the Chattahoochee and Chestatee rivers. Authorized project purposes include flood control, hydropower, recreation, wildlife development, and streamflow regulation. Buford Dam, completed in 1957, is a 720-m-long, rolled, earth-filled structure with a top elevation of 337 m NGVD. The lake has an average surface area of 156 km^2 and a volume of 2,411 hm^3.

Watershed land uses include woodland (71 percent), pasture (12 percent), water (6 percent), crop (3 percent), and urban and developed land (9 percent). Potential direct sources of pollution are discharges from municipal sewage treatment plants on Flat Creek, animal food processing plants located to the north, and erosion from shorelines, haul forest roads, and construction sites. The soils are iron-stained clays, which make suspended sediments highly visible.

West Point Lake

Authorized project purposes for West Point Dam and Lake include flood control, hydropower, recreation, fish and wildlife development, and streamflow regulation for downstream navigation. West Point Dam is located nearly 8 miles north of West Point, GA; Walter F. George Lock and Dam is located 121 km downstream.

West Point Dam, a gravity-type structure 2,211 m long and 29.6 m high, combines a penstock intake section and powerhouse, a concrete overflow section, and earthen embankments. The maximum power pool elevation is 194 m NGVD in the summer and 191 m NGVD during winter. During summer, the surface area and volume average 104.8 km^2 and 746 hm^3, respectively; shoreline length averages 840 km (Georgia Department of Natural Resources 1991).

Water loads from the Chattahoochee River account for over 90 percent of the water budget. Other tributaries include Yellowjacket, Wehadkee, Whitewater, Potato, and Maple creeks, and New River. Impoundment resulted in the creation of several large embayments, particularly in the floodplains of Yellowjacket and Wehadkee creeks.

Chapter

Land uses in the West Point Lake drainage basin include forest (79 percent), rural (17 percent), and urban (4 percent). Original vegetation was mainly oak-hickory forest, little of which is left. At the time of the construction of West Point Dam, 50 percent of the city of Atlanta's effluent was being discharged into the Chattahoochee River between Lake Sidney Lanier and the West Point dam site. In the mid to late 1980s, there was an increase of phosphorus in point source discharges. In 1989, a regional phosphorus detergent ban reduced the phosphorus concentration of effluent by 50 percent. In 1991, a statewide phosphorus detergent ban was instituted (Georgia Department of Natural Resources 1991).

Walter F. George Lake

The Walter F. George Lock and Dam project was developed by the CE to provide or improve flood control, navigation, and hydroelectric power. It has become an important recreation resource as well, with some 7 million visitors annually.

The project, fully operational since May 1963, impounds a lake along the reach of the Chattahoochee River from the dam site near Columbus, GA, upstream to Phoenix City, AL. The average slope from the upper reaches of the pool to the dam is 0.19 m/km. The area acquired by the CE for project construction consists of level to undulating floodplain characterized by alluvial soils. The mean annual temperature of the region is 18.9 °C, while summer temperatures range from 30 to 40 °C. Average annual evaporation is 0.97 m/year, and average annual precipitation is 1.27 m/year, much of which occurs in winter and spring.

Walter F. George Lock and Dam is 4,141 m in length and has a maximum height of 34.7 m. The outlet structure consists of 14 tainter gates, with dimensions of 12.8 by 8.8 m, and four generating units. Each unit has the capacity of 32,500 kW, with the average annual production of 436 million kilowatts. The lock section has a total width of 50 m with inside chamber dimensions of 25 by 137 m, and its maximum lift is 26.8 m. The area of the lake at normal pool level (57.9 m NGVD) is 182.8 km^2; the volume at this elevation is 1,152.6 hm^3.

Allatoona Lake

Allatoona Dam and Lake, the oldest CE multipurpose reservoir in the southeast, provides flood control, power, and recreation in the Coosa River drainage basin. Allatoona Dam is located approximately 78 km upstream from Rome, GA, and 8 km due east of Cartersville, GA. The area of the drainage basin upstream of the impoundment is 2,845 km^2. The dam is a concrete gravity-type structure on a curved axis with an overall length of 311 m and a height of 58 m. The spillway is controlled by 11 tainter gates, 9 of which measure 12.2 by 7.9 m and 2 of which measure 6 by 7.9 m. Structures associated with power generation, which allow release of hypolimnetic water, are located on the left bank. Two units have a 36,000-kW capacity each, and one unit has a 2,000-kW capacity. Because of the relatively small size of the lake, power generation can cause lake surface levels to fluctuate widely; daily fluctuations of 1 m or more are not uncommon.

At normal pool elevation (256 m msl), the reservoir has a surface area of 48 km^2 and a volume of 453.4 hm^3. Mean and maximum depths are 9.4 and 44.2 m, respectively. A shoreline development ratio of 17.7 reflects the irregularity of the 432-km shoreline, which includes many coves and embayments. Allatoona Lake has two main arms, the streambeds of the Etowah River and Allatoona Creek, respectively. Bethany Bridge near the dam across the Allatoona Creek embayment and Knox Bridge across the Etowah River at the upper reach of the lake, with their associated abutments, somewhat constrict the reservoir at these locations.

Land uses in the 2,845-km^2 drainage area above Allatoona Dam include cropland and pasture, woodland, and forest. The closest large urban center is Atlanta, GA, 24 km outside the basin and about 72 km from the dam. Small urban areas within the basin include the towns of Canton, Jasper, Dawsonville, and Acworth, GA.

3 Modeling Approach

The empirical reservoir water quality model BATHTUB (Walker 1987) was used to address water quality concerns at the lakes in this study. Although based on theoretical concepts, such as mass balance and nutrient limitation of algal growth, the model does not attempt to simulate explicitly the dynamics of a reservoir in either space or time. Instead, BATHTUB produces spatially and temporally averaged estimates of reservoir water quality conditions.

BATHTUB, developed from a CE-wide database, models water quality conditions in a two-stage procedure involving two model types. First, nutrient concentrations are estimated based on nutrient loads, morphometry, and hydrology. Second, a eutrophication response model is executed to relate pool nutrient concentrations to chlorophyll concentrations and transparency. These models produce estimates of steady-state, long-term (growing season or annual), water quality conditions in the epilimnion and are not intended to predict or describe short-term, event-related dynamics in reservoirs or to generate vertical profiles of water quality conditions.

Three phases are involved in applying BATHTUB:

a. Analysis and reduction of tributary water quality data.

b. Analysis and reduction of pool water quality data.

c. Model implementation.

The first phase can be performed using the data reduction routine FLUX (Walker 1987). This program uses tributary flow and nutrient concentration data to estimate nutrient loadings. The second phase can be carried out using either PROFILE (Walker 1987), a data reduction routine for pool water quality data, or any statistical analysis software package. In the third phase, implementation of the BATHTUB model, descriptions of nutrient loads, and expected lake responses are evaluated and compared with observed data. Resulting model descriptions, appropriately calibrated and verified against an independent data set, can then be used to evaluate expected responses to selected management decisions. Further details of the development, assumptions, and use of these programs and empirical models can be found in Walker (1981, 1982, 1985, 1987).

4 Data Compilation and Analysis

Introduction

Data describing eutrophication response and nutrient loads were compiled, assessed, and summarized for each lake and its tributaries, respectively. Nutrient and water loads for major tributaries were, in general, determined using data describing daily flow conditions and water chemistry. Variables sought when compiling water chemistry data included total nitrogen, total phosphorus, soluble reactive phosphorus, nitrate and nitrite nitrogen, and ammonium nitrogen. Paired observations of flow and nutrient concentration and continuous flow measurements were assessed to identify a calculation method providing the best estimate of average load over the summer-growing season. In most cases, this was accomplished using the FLUX program (Walker 1987), which allows the user to address variability associated with changes in concentration, flow, and season. For tributaries lacking continuous flow data, simple flow-weighted averages were computed. In the absence of original data, loading estimates from other sources were evaluated and adopted.

Nutrient loads from nonpoint sources were estimated based on average concentrations determined for gauged tributaries, runoff coefficients, and drainage areas. Runoff from ungauged watershed areas was estimated from water export rates from gauged tributaries or published values. Drainage areas were delineated on maps, measured planimetrically, and proportionalized to reported drainage area data. In several instances, published nutrient export rates were evaluated and adopted.

Eutrophication response data were summarized for the upper, mixed-layer for the growing season (generally, April-October). Mixed-layer depths were determined based on review of temperature profiles. Independent summary values were obtained for individual model segments. For segments containing two or more sample stations, data were averaged. The location and size of segments were determined based on number and location of sampling sites, physical constrictions, location of streams, and longitudinal patterns in water chemistry. Eutrophication response

g Approach

Allatoona Lake

Allatoona Lake water quality data were obtained for 1973 and 1992. Sources for these data were, respectively, the U.S. Environmental Protection Agency's (USEPA) National Eutrophication Survey (NES) (USEPA 1978) and the USEPA-sponsored Clean Lake Phase I - Diagnostic/ Feasibility Study (CLDFS) conducted for the State of Georgia by Kennesaw State College (Dirnburger, Rascati, and Msimanga 1993). NES data were retrieved from the USEPA's STORET database, while the CLDFS data were provided by Kennesaw State College.[1] Station descriptions and their designated association with particular model segments (see Chapter 5) are presented in Table 1. NES data were collected on three occasions during the period June-November 1973; CLDFS data were collected approximately bimonthly during 1992.

Mean, mixed-layer, growing-season total phosphorus and nitrogen concentrations, chlorophyll *a* concentrations, and Secchi disk transparency values were computed for all model segments for which data were available. In cases where two or more stations were located in a single segment, data were averaged across stations. Data summaries (mean and coefficient of variation or CV) for 1973 and 1992 are presented in Tables 2 and 3. With the exception of total nitrogen concentrations, which were considerably higher in 1992, values obtained were similar for both years.

Given the lack of marked change in other water quality variables, observed differences in total nitrogen concentrations between years were unexpectedly large. Results of a review of water quality characteristics for other Georgia impoundments, as well as data for other CE reservoirs included in this study (Table 4), support the suggestion that reported total nitrogen concentrations for 1992 may be erroneous.

Mean flow and nutrient concentrations for selected tributaries to the lake and for contiguous land-use areas were computed for both study years. Seven tributary streams, including the Etowah River and the discharge from Lake Acworth, were sampled during the NES study in 1973. Flow and nutrient concentration data for these streams were adopted from NES (USEPA 1978) and are presented in Table 5. Data needed to compute

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1 Personal Communication, 1993, Harold McGinnis, Director, A. L. Burruss Institute of Public Service, Kennesaw State College, Marietta, GA.

CV values were not available. Noonday Creek and Little River, both of which were potentially impacted by discharges from sewage treatment facilities, exhibited the highest nutrient concentrations for inflowing streams.

Mean flow and nutrient concentrations for eleven tributary streams were computed for 1992 (Table 6). In addition to those identified in the 1973 study, tributary streams sampled in 1992 included Tanyard Creek, Kellog Creek, Owl Creek, and Rowland Creek. Since daily flow values were not available, nutrient concentrations for the modeling period were computed as flow-weighted means based on paired observations of concentration and flow.

Mean flows for contributing land-use areas for 1973 were calculated using a runoff coefficient of 0.31 m/year. This value was based on discharge and drainage area relationships for gauged tributary streams. In the absence of information describing land-use patterns in 1973, nutrient concentrations for contributing land-use areas were set equal to the average value for Allatoona Creek and Shoal Creek (Table 7). Conditions in these subbasins were assumed to be representative of conditions in ungauged portions of the basin. Computed values for total phosphorus and nitrogen were 36 μg P/L and 544 μg N/L, respectively.

Mean flows for contributing land-use areas for 1992 were calculated using a runoff coefficient of 0.26 m/year and the same computational approach discussed above for 1973. Estimated flows from contributing areas to each segment are presented in Table 8. Also presented in Table 8 are mean total phosphorus concentrations for contributing land-use areas. Because of considerations discussed above, total nitrogen concentrations were not computed.

Total phosphorus concentrations were estimated for four assumed land-use types in 1992. Land-use types were defined based on differences in tributary stream concentrations and the location of gauged streams. For areas assumed to be relatively unimpacted, the average of flow-weighted mean concentrations for Tanyard Creek, Allatoona Creek, and Shoal Creek was applied. Since marked differences were observed for Owl Creek and Kellog Creek (see Table 6), the total phosphorus concentration for contributing areas to model segment 7 was computed as the average of mean concentrations for each creek. Mean total phosphorus concentrations for Tanyard Creek and Rowland Creek were used for model segments 2 and 5, respectively. It was assumed that concentrations for these tributary streams were representative for concentrations in runoff from these subbasins.

Walter F. George Lake

Water quality data for Walter F. George Lake were collected as part of an USEPA-sponsored Clean Lakes Phase I -Diagnostic/Feasibility Study (CLDFS) performed by Auburn University.[1] Data included selected nutrient concentrations, in situ values, and chlorophyll concentrations for multiple stations for the period May-October 1992. Station names and locations are presented in Table 9. Because of the limited number of stations sampled during other years and the lack of reasonable information for the estimation of nutrient loads (see below), additional water quality descriptions sufficiently detailed for model evaluation were not available.

The existence of backwater areas upstream from Walter F. George Lake precluded computation of nutrient loads for the Chattahoochee River using paired observations of nutrient concentration and gauged flow. Instead time-weighted mean nutrient concentrations for the lake water quality sampling station located near Bluff Creek Park were used to estimate inflow nutrient concentrations. Mean flow was estimated from operations records[2] as the mean of differences in daily pool volume and discharge. Since a majority of the water load to Walter F. George Lake is associated with the Chattahoochee River, and since information required for estimating land-use nutrient contributions from contiguous areas was lacking, the Chattahoochee River inflow was assumed to be the sole source of water and nutrient loads.

Mean, mixed-layer total phosphorus and nitrogen concentrations, chlorophyll *a* concentrations, and Secchi disk transparency values were computed for the growing season for all model segments (Table 10). In general, nutrient concentrations declined with distance downstream. Chlorophyll *a* concentrations, however, were relatively unchanged across segments.

Lake Sidney Lanier

Water quality data for Lake Sidney Lanier were obtained only for 1973. Efforts to include data collected more recently were complicated by the limited number of stations sampled (often a single near-dam station), infrequent sample collection, or the lack of appropriate eutrophication response variables. Data collected as part of a USEPA-sponsored CLDFS performed by the University of Georgia[3] were not available at the time this study was conducted.

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1 Personal Communication, 1993, David Bayne, Department of Fisheries and Allied Aquaculture, Auburn University, Auburn, AL.

2 Personal Communication, 1993, Diane Findley, Planning Division, U.S. Army Engineer District, Mobile, Mobile, AL.

3 Personal Communication, 1993, Kathryn J. Hatcher, Institute of Natural Resources, University of Georgia, Athens, GA.

Data for 1973 were collected as part of the USEPA NES study (USEPA 1978). Stations for which data were available and the segments with which they were associated for the purpose of this study are listed in Table 11. Mean concentrations and associated CV values for total phosphorus, total nitrogen and chlorophyll *a* concentrations, and Secchi depths are presented in Table 12.

Low nutrient and chlorophyll *a* concentrations indicate that at the time of sample collection, Lake Sidney Lanier was oligotrophic to mesotrophic. A notable exception was segment 14, which was clearly influenced by excessive nutrient inputs from waste treatment facilities located on Flat Creek, a major tributary to this portion of the lake (see also below). Nutrient concentrations were also higher in the upstream portions of the Chattahoochee River arm (segment 16) and the Chestatee River arm (segment 4).

Mean streamflows and total phosphorus and nitrogen concentrations for major tributaries, also obtained from the NES study, are listed in Table 13. While similarities were apparent for most streams, Limestone Creek and, especially, Flat Creek exhibited markedly elevated total phosphorus concentrations. Total nitrogen concentrations for Flat Creek were also elevated. These observations were related to the existence of significant point and nonpoint nutrient sources. Values for nonpoint source inputs from contiguous watershed areas were based averaged values for selected gauged streams. Resulting values for total phosphorus and total nitrogen concentrations were 52 μg P/L and 850 μg N/L, respectively.

West Point Lake

Water quality data for West Point Lake were obtained for 1990 and 1991. Data describing water quality conditions at six stations located along the major axis of the Chattahoochee River portion of the lake were collected by the Georgia Department of Natural Resources (GDNR) (GDNR 1991). These data were collected as part of a GDNR intensive monitoring program conducted during the period April through October 1990.

Water quality data collected as part of an extensive survey conducted for the U.S. Army Engineer District, Mobile, by the U.S. Army Engineer Waterways Experiment Station (Kennedy et al. 1994) were used to estimate conditions during 1991. This study involved the collection of selected water quality data for 56 stations distributed throughout major portions of the lake, including embayments and large coves. Names of stations identified in the original data sets for each year and the model segment with which they were associated are presented in Table 14.

Mean, mixed-layer summaries of total nitrogen, total phosphorus, and chlorophyll *a* concentrations, and Secchi disk transparency were computed for each model segment for the growing season of each year. Station means were averaged for segments having multiple stations. Data summaries (mean and CV) for 1990 and 1991 are presented in Tables 15 and 16, respectively.

Nutrient and water loads for 1990 were computed based on information for the Chattahoochee River reported by the U.S. Geological Survey (USGS) (Stokes, McFarlane, and Buell 1990). Similar data for secondary tributaries were not available. Unfortunately, nutrient-loading information was limited to total phosphorus; appropriate data for computing total nitrogen loads were not collected for sites located reasonable distances upstream from the lake. Total phosphorus loads were computed using FLUX and total phosphorus concentrations observed at the USGS gauge site located at Franklin, GA. Since this area is frequently influenced by fluctuating lake levels, the USGS does not collect coincident discharge data. Therefore, flows were estimated based on observed flows at the USGS gauge at Whitesburg, GA. This was accomplished by estimating the rate of increase in flow between successive gauge sites and extrapolating observed flows at Whitesburg to Franklin. Mean flow and total phosphorus concentration determined for the growing season for 1990 were 3,926 hm^3/year (10^6 m^3/year) and 178.8 μg P/L, respectively.

In addition to flow and total phosphorus concentration data for 1991 for the Chattahoochee River at Franklin, GA, which were summarized using methods described above for 1990, data were also collected for selected secondary tributaries to the lake (Kennedy et al. 1994). Staff gauges were installed on Yellowjacket, Shoal, and Beech creeks, and observed weekly coincident with water sample collection. Stage-discharge relations, based on periodic measurement of streamflow, channel cross section, and stage by the USGS, were used to estimate flow from stage elevation. Continuous (daily) flow records were established by comparing observed flows with those recorded at the USGS gauge located on New River; resulting relations were used to generate daily records for each tributary based on daily flows in New River.

Estimates of discharge for Whitewater Creek were obtained using a small rotating bucket flowmeter. Multiple measurements were area-averaged using cross-section geometry (Kennedy et al. 1994). Flow measurements and the collection of water samples occurred weekly. Total phosphorus load for this tributary was computed as the product of the flow-weighted average total phosphorus concentration and average flow.

Nutrient load estimates were obtained from estimated flows and observed nutrient concentrations using FLUX. While nitrogen loads were computed for each of the sampled secondary tributaries, a similar estimate was not computed for the Chattahoochee River for reasons discussed above. Mean tributary flows and total phosphorus concentrations for 1991 are presented in Table 17.

The contribution of water and total phosphorus from ungauged areas contiguous with the lake for both 1990 and 1991 were based on estimated runoff and tributary nutrient data for 1991. In doing so, it was assumed

(a) that data for tributaries selected for sampling in 1991 were representative of land-use contributions and (b) that land use was unchanged. Resultant estimates and the model segment with which they are associated are presented in Table 18.

5 Model Application

Introduction

The empirical model BATHTUB (Walker 1987) was employed to describe eutrophication-related characteristics and to assess potential trophic responses to selected changes in loading. Data summarizing growing-season conditions were used to calibrate the model for each reservoir. Since these reservoirs exhibited marked spatial heterogeneity, calibration was based on regional groupings of model segments. In general, main stem segments were grouped to best describe longitudinal gradients in nutrient and chlorophyll *a* concentrations. Additionally, descriptions of segments located in major embayments were improved by regional calibration. Default model coefficients were applied to segments lacking observed data and a logical association with other regional groupings.

Calibrated models were verified by comparison of predicted and observed responses following application to an independent data set. As mentioned in Chapter 4, appropriate verification data sets were not available for Lake Sidney Lanier and Walter F. George Lake. Evaluations of model performance are presented in the following section.

Results

Allatoona Lake

A total of 10 model segments distributed across four regions were identified for Allatoona Lake based on morphometric, land-use, and water quality considerations (Figure 2, Table 19). Major regions included Allatoona Creek embayment (region 1), Little River embayment (region 2), Stamp Creek embayment (region 3), and the main portion of the pool extending from the Etowah River inflow to the dam (region 4). While region 2 and 3 consisted of a single segment each, region 1 and 4 consisted of 3 and 5 segments, respectively. The assignment of sampling stations and associated water quality summaries to model segments and regions were presented previously in Tables 1-3.

BATHTUB input files were constructed for 1973 and 1992 (see Appendix A). Since a greater number of stations were sampled during 1992, this year was used for model calibration. However, the lack of reasonable total nitrogen data in 1992 (see Chapter 4) precluded the use of a chlorophyll response model based on composite nutrient (sensu Walker 1985) concentration. Instead, a model incorporating the effects of phosphorus concentration, light, and flushing rate was used to describe chlorophyll response. Changes in pool total phosphorus concentration were described as a second-order reaction.

Comparisons of observed water quality conditions in 1992 and those predicted based on application of BATHTUB employing default coefficients are presented in Figure 3. While reasonable patterns of change in total phosphorus concentration were obtained, concentrations were poorly predicted for segments 1, 4, 6, and 7 (underpredicted) and segment 5 (overpredicted). Despite this, predictions of chlorophyll and Secchi disk responses were reasonable.

Model calibration by region greatly improved model prediction for all response variables (Figure 4). This process involved computation of calibration coefficients providing minimum differences between predicted and observed values across segments within each region. Resulting calibration factors are presented in Table 19.

It was noted that calibration factors for total phosphorus for regions 2 (factor = 6.912) and 3 (factor = 0.123) were unusually distant from a value of 1.0. These extreme deviations resulted from differences in concentration between tributary streams and the receiving lake segment. For Stamp Creek embayment, calculated mean inflow total phosphorus concentration was 24.4 μg P/L, while the mean mixed-layer total phosphorus concentration for segment 5, the segment into which Stamp Creek flows, was 33.8 μg P/L. Assuming both concentrations to be correct, such differences would suggest that other, unsampled sources of total phosphorus led to the observed total phosphorus concentration in Stamp Creek embayment. Thus, predictions for Stamp Creek embayment may be unreliable.

Differences between the mean total phosphorus concentrations for Noonday Creek and Little River (150.0 μg P/L and 50.0 μg P/L, respectively), and Noonday Creek embayment (segment 4) suggest that phosphorus losses because of sedimentation were high for this region of the lake. Alternatively, failure to use a sedimentation model addressing partitioning of phosphorus between particulate and dissolved forms inflated the calibration factor. However, assuming that conditions in this portion of the lake and basin remain relatively unchanged, reasonable predictions for this segment should be possible.

Applicability of the calibrated BATHTUB model for Allatoona Lake was verified by application using loading information for 1973. Comparisons between predicted and observed response variables (Figure 5) indicate that the model performs relatively well. While total phosphorus concentration was underpredicted for segments 6 and 8, water quality predictions for other segments and those for chlorophyll and Secchi disk were not significantly different from observed conditions. Performance of the model for regions 2 and 3 could not be evaluated because of lack of observed data (see Appendix A for BATHTUB input files).

Walter F. George Lake

Seven model segments were defined for Walter F. George Lake (Figure 6). These segments were associated as a single, linear region extending from a point near Bluff Creek Park to the dam. As indicated above, water quality data for the lake station at Bluff Creek Park were used for estimation of inflow conditions and were not included with observed lake water quality data for this application.

Since both nitrogen and phosphorus data were available for 1992, model options involving the prediction of chlorophyll response based on changes in composite nutrient concentration were evaluated. Comparison with model results in which chlorophyll responses were estimated based solely on total phosphorus concentration led to a decision to include both nutrients in subsequent model applications. The model estimated changes in chlorophyll based on the combined effects of composite nutrient concentration, light, and flushing. In the absence of information concerning nutrient partitioning, the availability factors for total nitrogen and phosphorus were set to a value of 1.0. Changes in total nitrogen and phosphorus were described as a second-order reaction.

Comparisons of observed and predicted water quality responses for 1992 based on application of BATHTUB employing default coefficients and the above model assumptions are presented in Figures 7 and 8. Total nitrogen and phosphorus concentrations were estimated reasonably well in mid and uplake segments, but underestimated in downstream segments. Chlorophyll concentrations and Secchi disk transparency were poorly estimated by the uncalibrated model.

Model calibration against observed data for 1992 greatly improved model predictions (Figures 9 and 10). During initial calibration attempts, accounting for the shape of longitudinal changes in water quality resulted in improved predictions for downstream segments but poor predictions for segment 1. This result was due to similarities in water quality conditions in segment 1 and those at the station used for describing inflow conditions. To compensate for this shortcoming, calibration factors for segment 1 were set to default values for all response variables. Resultant calibration factors are presented in Table 20 (see Appendix B for BATHTUB input files).

Lake Sidney Lanier

Morphologic and water quality features for Lake Sidney Lanier were addressed by delineating 21 model segments (Figure 11). Features addressed included embayments associated with the inflow of the Chestatee and Chattahoochee rivers, both of which exhibited longitudinal gradients; embayments associated with Wahoo Creek and neighboring tributaries; a series of small embayments associated with the main portion of the lake but receiving inflows from several secondary tributaries; and the area proximal to the confluence of the lake with Flat Creek, a tributary with markedly higher nutrient concentrations because of the influence of point sources.

Water quality and loading data collected in 1973 as part of an NES study were used for model evaluation and calibration. Since both nitrogen and phosphorus data were available, a response model incorporating the effects of composite nutrient concentration was applied (see Appendix C for BATHTUB input files). Initial application of the model using default coefficients indicated a reasonable correspondence between predicted and observed values (Figures 12 and 13).

Large differences were apparent, however, for nutrient concentrations for selected segments (Figure 12). Total nitrogen concentration was greatly overpredicted for segments 11 and 12. This observation may be related to overestimation of inflow nitrogen concentrations, which were based on a basin-wide summary, or the potentially long retention time in Young Deer and Bald Ridge embayments. Predicted total phosphorus concentrations were markedly below observed concentrations for segment 4 (Yellow Creek) and segment 9 (Four Mile Creek and Six Mile Creek embayment). While loading data were available for Four Mile Creek, potentially inaccurate estimates for Yellow Creek and Six Mile Creek may have led to poor predictions for these two segments. Reasonable predictions of chlorophyll concentration were obtained for most segments (Figure 13). Noteworthy is the two-fold overprediction for segment 16, located immediately downstream from the inflow of the Chattahoochee River.

Regional calibration greatly improved performance of the model (Figures 14 and 15). Segment associations for calibration were based on review of observed water quality data and iterative evaluation of model performance using alternative associations. Regional calibration groups and corresponding calibration factors are presented in Table 21. As discussed in Chapter 4, shortcomings in other data sets precluded verification of calibration values based on 1973 data.

West Point Lake

Twenty-two model segments were delineated for the application of BATHTUB to West Point Lake (Figure 16). The number and location of segments were based on recent assessments of patterns in water quality (Kennedy et al. 1994) and lake geometry. The Chattahoochee River portion of the lake was represented by 13 segments, while the two major embayments, Yellowjacket and Wehadkee Creek embayments, were each represented by a single segment each. Additional segments were added for major coves and other important embayment areas. These include Potato, Wolf, and Brush Creek embayments, New River and Maple Creek embayments, and Whitewater and Thompson Creek embayment.

Data for 1991 were used for initial model evaluation and for subsequent model calibration; verification of model calibration was performed using data for 1990 (see Appendix D for BATHTUB input files). As indicated in Chapter 4, the absence of adequate data describing total nitrogen loads to the lake from the Chattahoochee River precluded consideration of nitrogen in evaluations of models for describing or predicting chlorophyll *a* concentration. While this shortcoming could impact predictions in upstream reaches of the Chattahoochee River portion of the lake, where nitrogen to phosphorus ratios indicate the potential for limitation by phosphorus (Kennedy et al. 1994), highly turbid conditions and excessive nutrient concentrations suggest that other factors would control algal responses here.

Mixed-layer total phosphorus concentrations in 1991 decreased with increasing distance from the Chattahoochee River inflow (segments 12, 13, and 15), but were relatively unchanged in downstream portions of the lake (segments 17, 18, and 20-23). In general, total phosphorus concentrations for selected coves and embayments (segments 2, 5, and 7-9) were similar to or less than those observed in the downstream portion of the lake. Initial model application using default calibration resulted in overprediction of concentrations throughout the Chattahoochee River portion of the lake; predictions for cove and embayment sites were similar to those observed (Figure 17).

While predicted chlorophyll *a* concentrations were in reasonable agreement with those observed for the downstream portion of the lake and for coves and embayments, those for upstream segments were nearly double those observed (Figure 17). This latter difference was potentially related to the effects of nonalgal turbidity and inflow processes on expected relations between nutrient concentration and algal response.

Despite the above differences in chlorophyll *a* concentrations, marked differences between observed and predicted Secchi depth were not apparent for most upstream segments (Figure 17). Exceptions were segments 15 and 16, both of which are located near the region of transition from riverine to lake-like conditions. Since prediction of Secchi disk depth is based on the combined effects of predicted chlorophyll *a* concentrations and observed nonalgal turbidity, predicted values would be determined to a great extent by the presence of nonalgal particulates.

Model calibration greatly improved model performance (Figure 18). Longitudinal gradients in the main stem were well described, as were responses for major tributary embayments. Model calibration values and the assignment of model segments to regions are presented in Table 22.

Subsequent application of BATHTUB to observed data for 1990 provides independent evidence of model performance (Figure 19). As was noted for 1991, longitudinal gradients in the main stem were well described. Since data were not available for segments located in tributary embayments, verification of model performance in these areas of the lake was not possible.

6 Water Quality Response Assessment

Introduction

Two different loading scenarios, both of which are relevant to current management issues, were evaluated for each reservoir. In the first, observed inflow nutrient concentrations were increased and decreased by 50 percent while holding average water loads constant. Such changes would be expected if processes controlling nutrient contributions alone were affected by watershed activities. These would include, for example, decreased nutrient contributions from point sources following management efforts to increase wastewater treatment efficiencies or increases because of increased demands on existing waste treatment facilities. The second evaluation scenario involved similar changes in water inflow rates while holding nutrient concentrations constant. Although such changes result in 50-percent changes in nutrient mass loads (i.e., mass of nutrient delivered to the lake during the summary period), model assumptions are based on inflow nutrient concentrations; therefore, this scenario allows evaluation of changes in flushing rate. Such changes could occur if processes affecting change in the quantity of water delivered to the lake were modified. While other scenarios could be developed, these two provide a reasonable evaluation of the possible-direction and magnitude of lake response given changes in nutrient concentration or water loading. Results of these evaluations are presented in the following sections.

Results

Allatoona Lake

Changes in the average inflow total phosphorus concentration from the Etowah River markedly impacted mixed-layer total phosphorus concentrations in the upstream portion of the main stem of the lake (Figure 20). However, concentration changes in more downstream segments and, in particular, near the dam were proportionally smaller (± 15 percent). Sedimentary losses in upper to midlake regions would account for such differences. Increases in water retention time (i.e., decreased water inflow rate), while reducing total phosphorus concentrations throughout, did not result in marked longitudinal changes.

Trophic response to changes in inflow total phosphorus concentrations were pronounced in upstream segments because of increased nutrient availability (Figure 21). Like changes in mixed-layer nutrient concentrations, the magnitude of changes in chlorophyll eoncentration decreased with increasing distance downstream. Changes in Secchi depth, which are determined in the model by the combined effects of fixed values of nonalgal turbidity and predicted changes in chlorophyll concentration, were less pronounced. Changes in trophic response following changes in water inflow rate were minimal (Figure 22). Such a result would be expected given the small changes in nutrient levels and the fact that retention times are long relative to algal growth rates.

Walter F. George Lake

Changes in nutrient and trophic responses reflect the narrow morphometry and advective characteristics of Walter F. George Lake. As was noted from observed data, this impoundment exhibits marked gradients in water quality. Nutrient concentrations decrease dramatically through the transition from riverine to lake-like conditions in the upstream half of the lake, but are relatively unchanged in downstream areas. A similar pattern is predicted for potential changes in nutrient levels following changes in inflow nutrient concentrations (Figure 23). Because of the advective nature of the upstream reaches of the lake, changes in mixed-layer nutrient levels because of selected changes in water inflow rate are predicted only for downstream segments (Figure 23).

Predicted trophic responses (Figure 24) reflect the combined influences of longitudinal changes in mixed-layer nutrient concentrations and in-lake flow regime. Changes in chlorophyll concentration were greatest in upstream segments; concentrations declined sharply in midlake. It is interesting to note the possible downstream shift in chlorophyll maximum when inflow nutrient concentration was reduced by 50 percent. Changes in chlorophyll concentration in upstream areas were unchanged by changes in flow evaluated in this study. This would be expected since algal standing crop here is likely controlled by flushing rate. Secchi depths, while relatively unchanged at upstream locations, were greatly increased in downstream areas with a 50-percent decline in inflow nutrient concentrations.

Lake Sidney Lanier

Observed and predicted mixed-layer nutrient concentrations for model segments for the two major tributary arms of Lake Sidney Lanier are presented in Figure 25. Sharp declines in mixed-layer nutrient levels reflect sedimentary losses as channel dimensions and water residence increase. As a result, little change was predicted for downstream areas of the lake. Similar conclusions follow assessment of nutrient changes in response to changes in water inflow rates.

Few changes in trophic response are predicted for selected (±50 percent) changes in either inflow nutrient concentration or water load (Figure 26). This outcome is related, in part, to the small ratio of water load to lake volume. With the exception of the riverine-dominated portions of the lake, chlorophyll concentrations are low and nearly uniform across model segments.

Since Lake Sidney Lanier is morphologically complex, lake trophic responses were summarized for individual lake regions (Figure 27). Downstream regions of the lake and associated embayments (region 1) would be expected to change little following the changes in nutrient or water inputs chosen for this evaluation. However, moderate changes would be expected for the Chattahoochee and Chestatee River arms (region 3 and 4, respectively). Changes would be minimal for the Flat Creek area (region 2) and the Wahoo Creek embayment (region 5). Such a result would be expected since these areas are relatively isolated from inflows from the major tributaries. While data availability precluded realistic assessments of the Wahoo Creek embayment, manipulations of nutrient concentrations for Flat Creek markedly influenced trophic response in the Flat and Balus Creek embayment.

West Point Lake

West Point Lake exhibits strong longitudinal gradients in water quality. As documented by Kennedy, Thornton, and Gunkel (1982) and Kennedy et al. (1994), these gradients are related to mixing and flow regimes, high nutrient levels, and the influence of nonalgal turbidity on algal productivity. In general, nutrient and nonalgal turbidity levels decline sharply as riverine influences lessen with increased distance from the Chattahoochee River inflow. As nonalgal turbidity levels decrease (and light levels increase) because of sedimentation, algal production increases. This often results in a mid-lake maxima in the region immediately upstream from the Yellowjacket Creek confluence.

Nutrient and trophic responses predicted here are consistent with past observations of water quality patterns. While changes in inflow rate (±50 percent) had little effect on in-pool total phosphorus levels, marked changes followed changes in inflow total phosphorus concentration

(Figure 28). However, relative differences decreased with increased distance, and nutrient conditions near the dam changed little.

Changes in inflow nutrient concentration greatly influenced trophic response in mid and downlake regions (Figure 29). While the location of the chlorophyll maxima was unchanged, expected concentrations were markedly impacted. However, increases and decreases in inflow rate shifted the location of the chlorophyll maxima downstream and upstream, respectively (Figure 30). This result is anticipated since algal standing crop in this region of the lake is controlled in large part by flushing rate. Since the BATHTUB model does not predict nonalgal turbidity, such changes could not be directly assessed. However, it is possible that changes could accompany efforts to reduce loading from nonpoint sources. Such changes would change the light regime, thus dramatically influencing the distribution and quantity of algal biomass, particularly in the upper reaches of the lake. Kennedy et al. (1994) reached a similar conclusion after evaluating algal and nutrient data for the lake. Lakewide trophic responses to the combined effects of incremental changes in inflow rate and nutrient concentration are presented in Figure 31.

7 Summary

The BATHTUB model provides a means for assessing the potential effects of a variety of management alternatives involving changes in nutrient and/or water inputs to reservoirs. This report documents efforts to apply the model to Allatoona Lake, Walter F. George Lake, Lake Sidney Lanier, and West Point Lake. Underlying assumptions are discussed in the context of data reduction and model application.

Changes discussed here were limited to 50-percent increases and decreases in inflow nutrient concentration and discharge rate. The intent was to demonstrate application of the model and to delineate general directions of potential change in lake trophic response. Calibrated models developed here (see model input data sets in Appendices A-D) provide lake managers with the opportunity to assess additional or future management alternatives.

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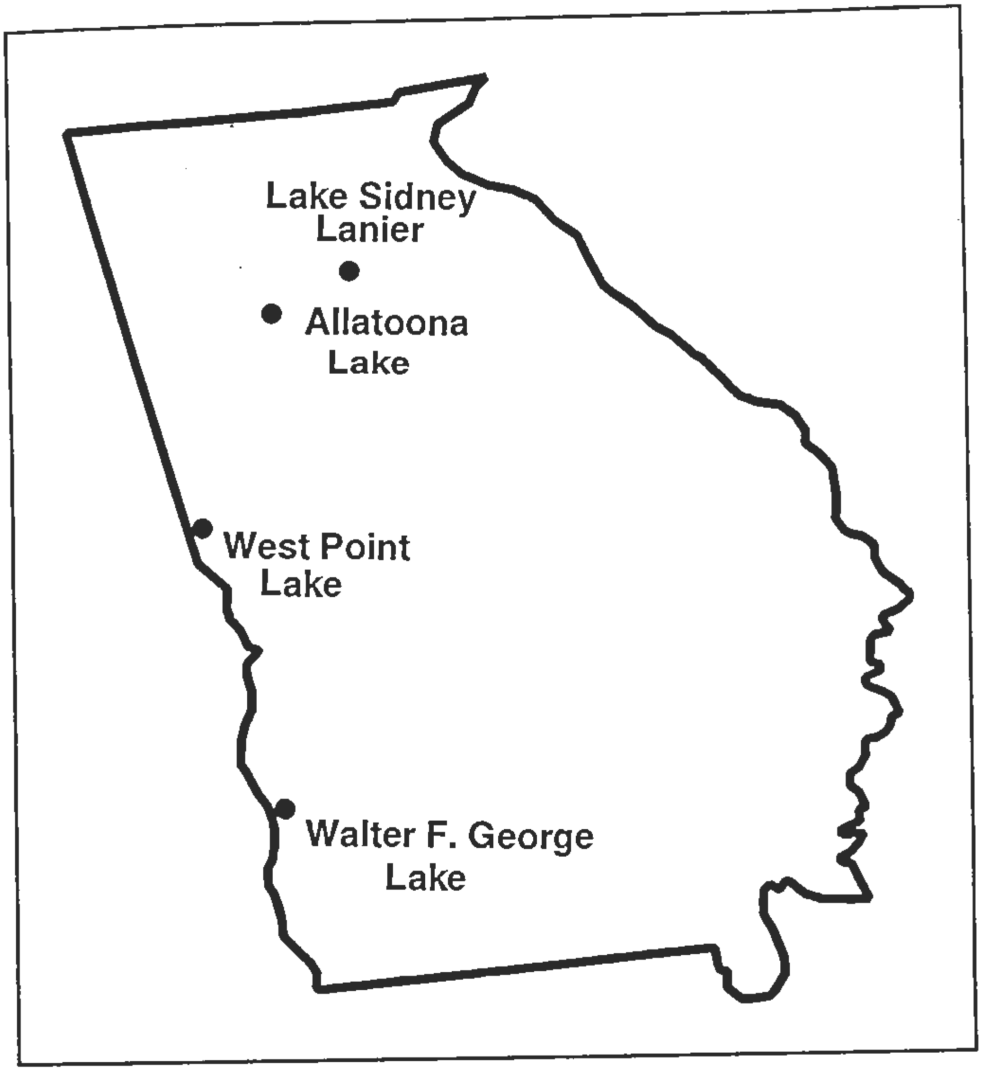

Figure 1. Map of study area indicating the locations of Allatoona Lake (Coosa River basin) and Lake Sidney Lanier, West Point Lake, and Walter F. George Lake (Chattahoochee River basin)

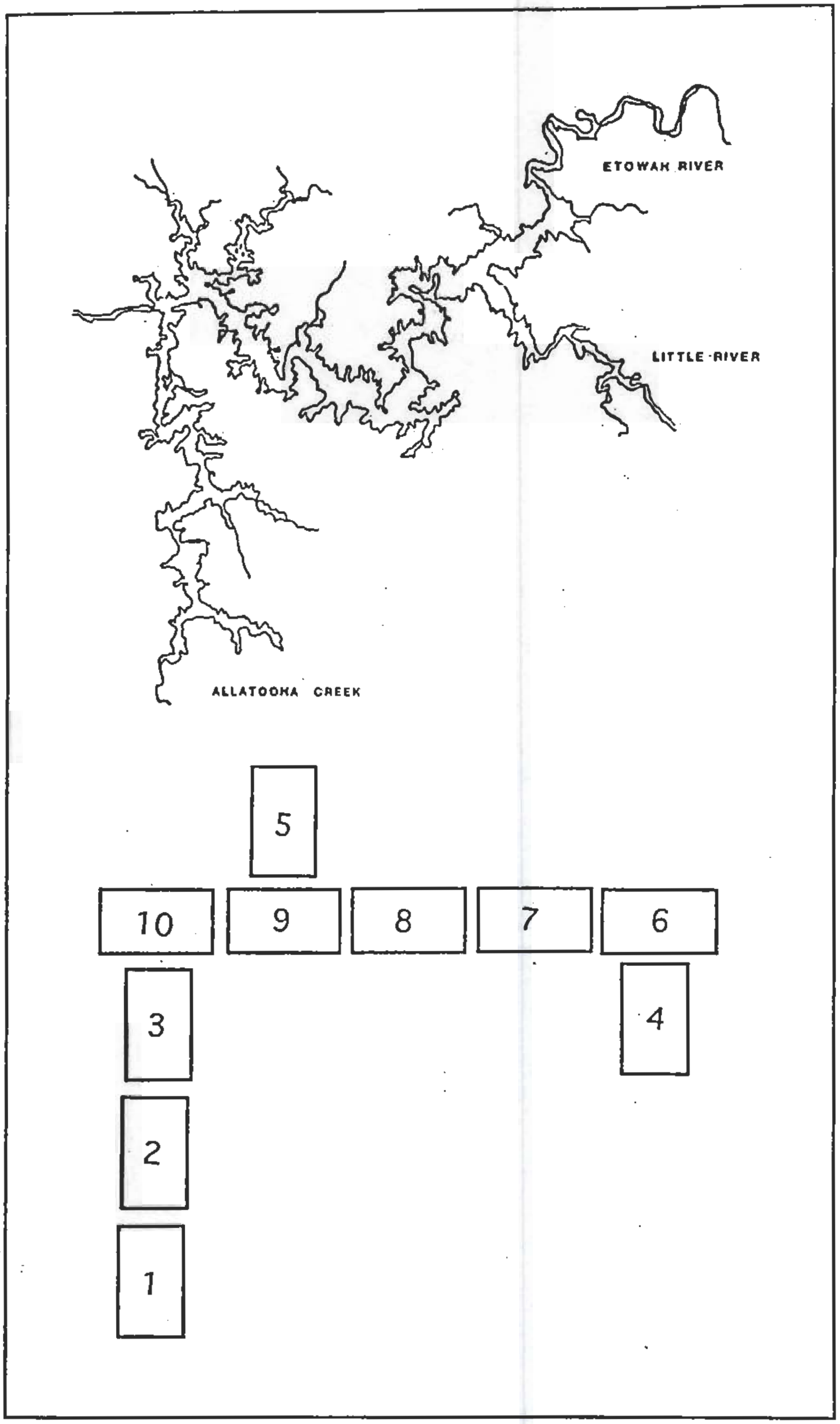

Figure 2. Map of Allatoona Lake (top) and assigned locations of model segments (bottom). Contiguous segments are hydraulically linked

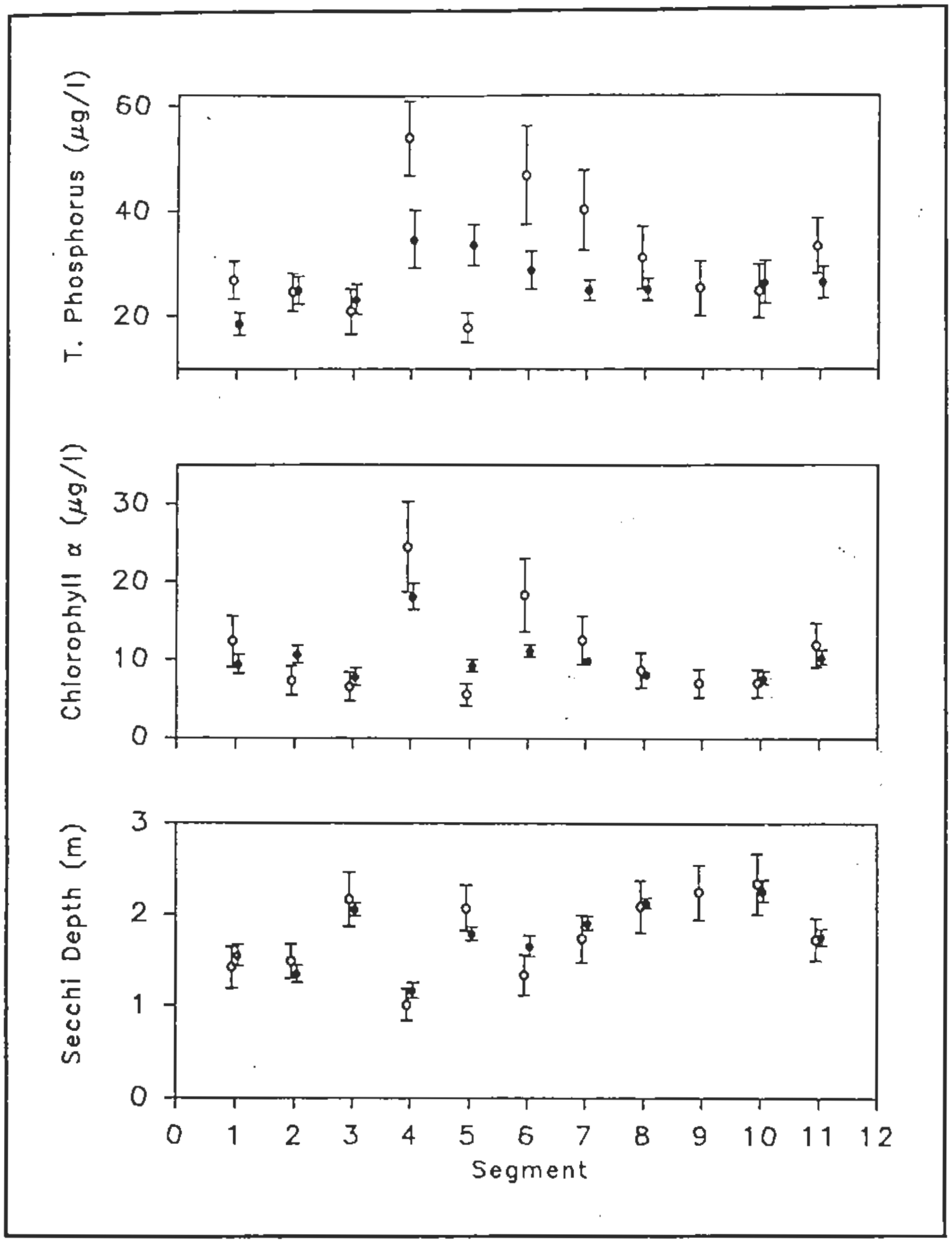

Figure 3. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of Allatoona Lake for 1992. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 11 represents the lakewide, weighted average

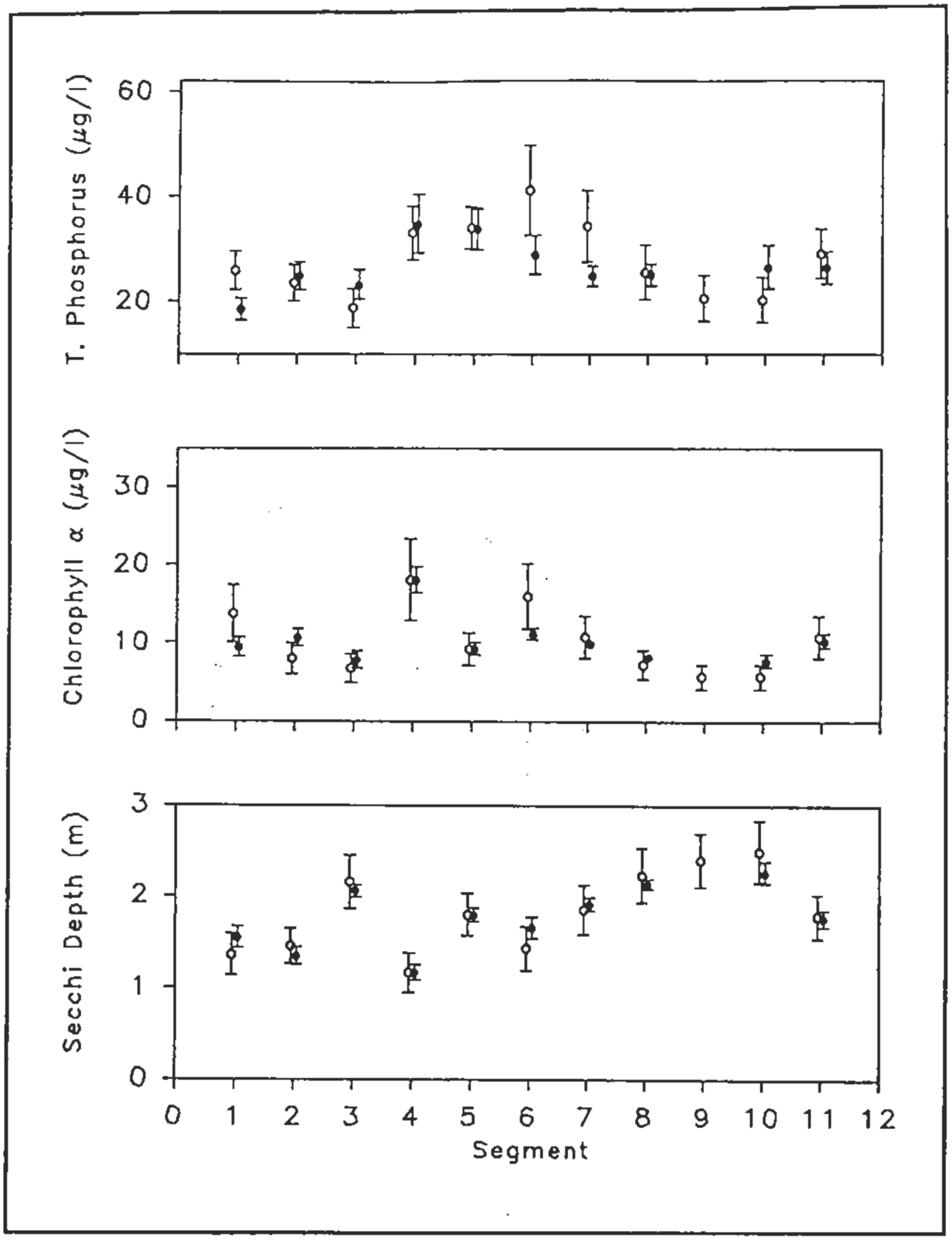

Figure 4. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of Allatoona Lake for 1992. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 11 represents the lakewide, weighted average

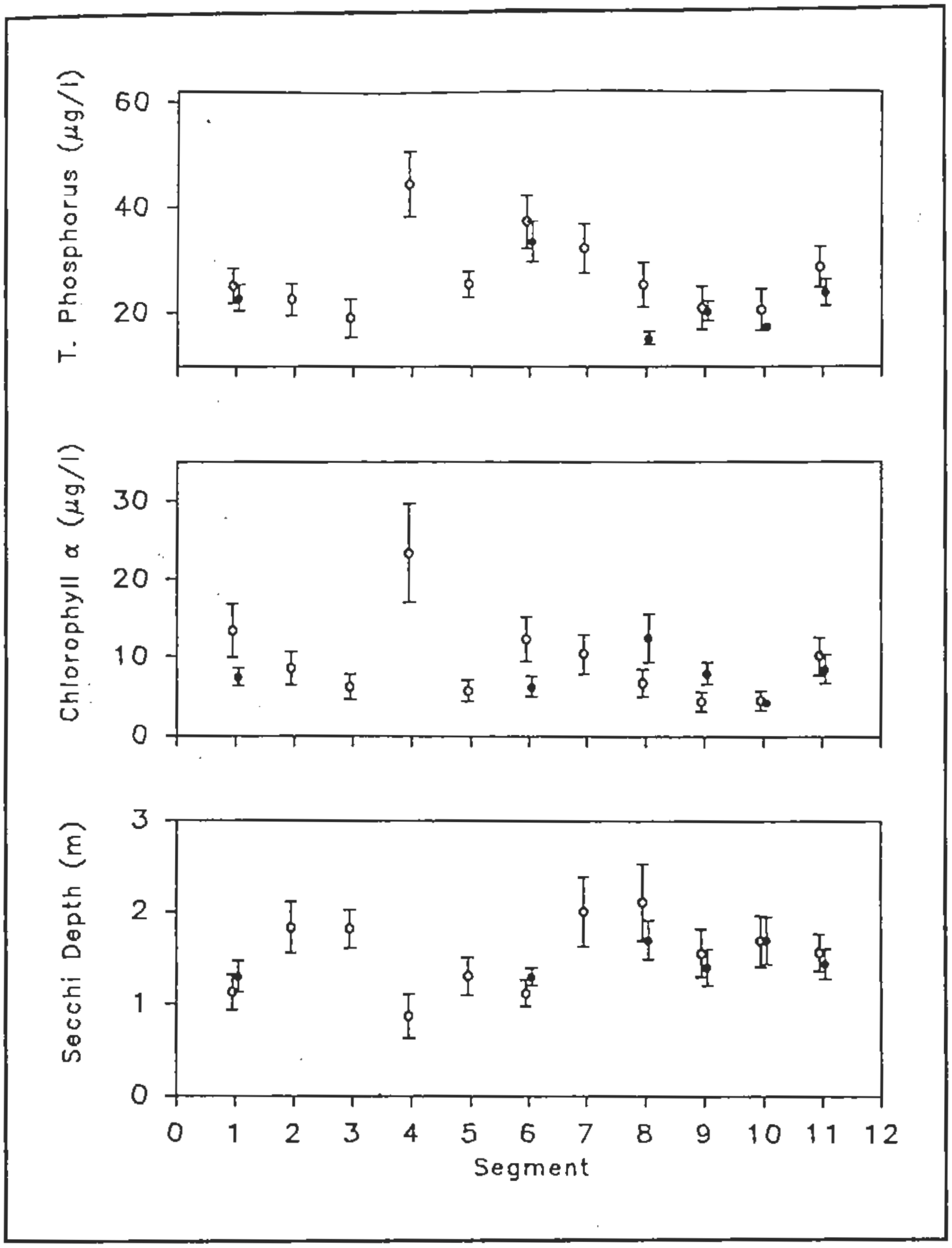

Figure 5. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of Allatoona Lake for 1973. Predicted values based on computed calibration factors for 1992. Vertical bars represent observed and predicted variability. Segment 11 represents the lakewide, weighted average

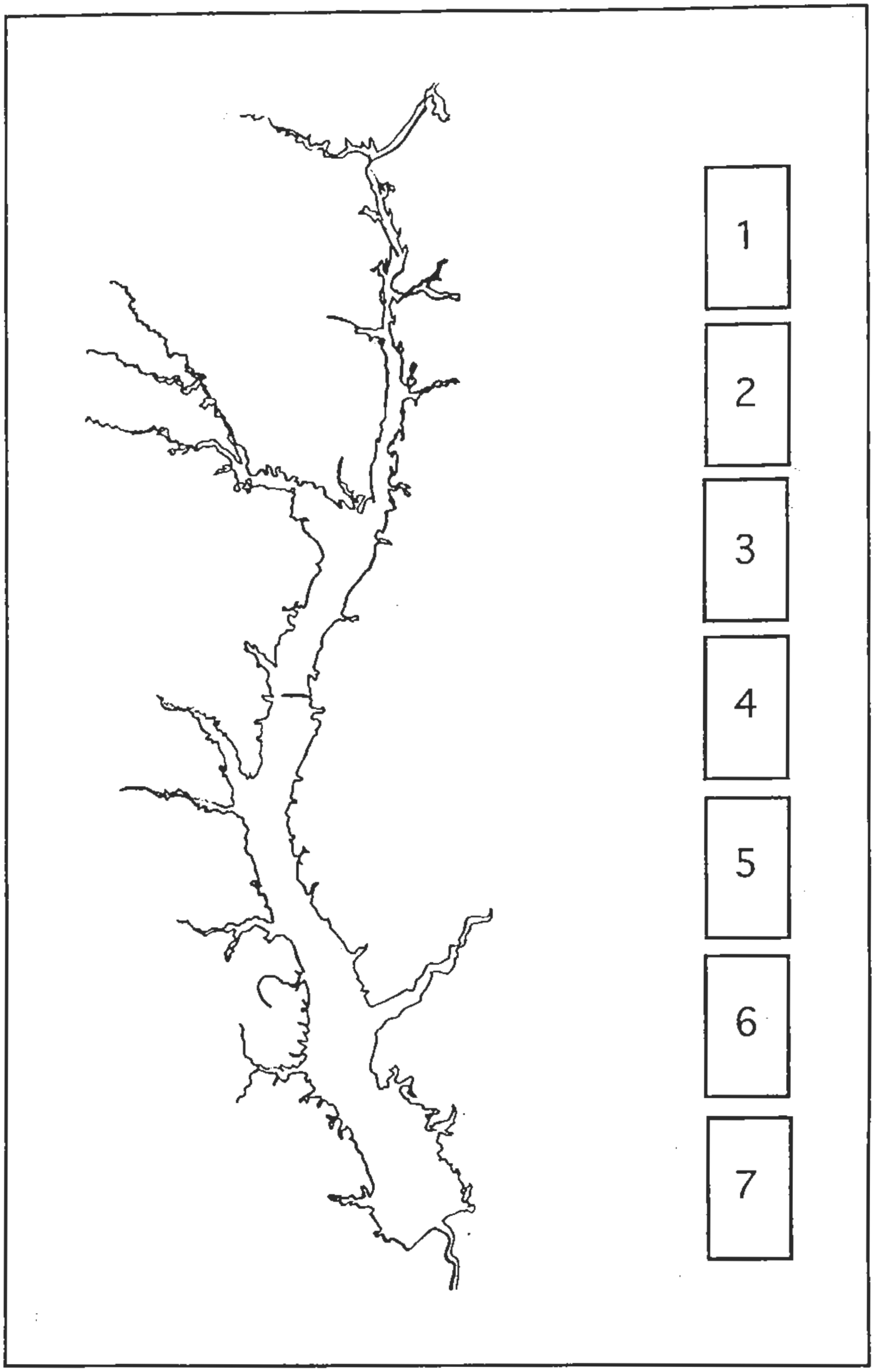

Figure 6. Map of Walter F. George Lake (left) and assigned locations of model segments (right). Contiguous segments are hydraulically linked

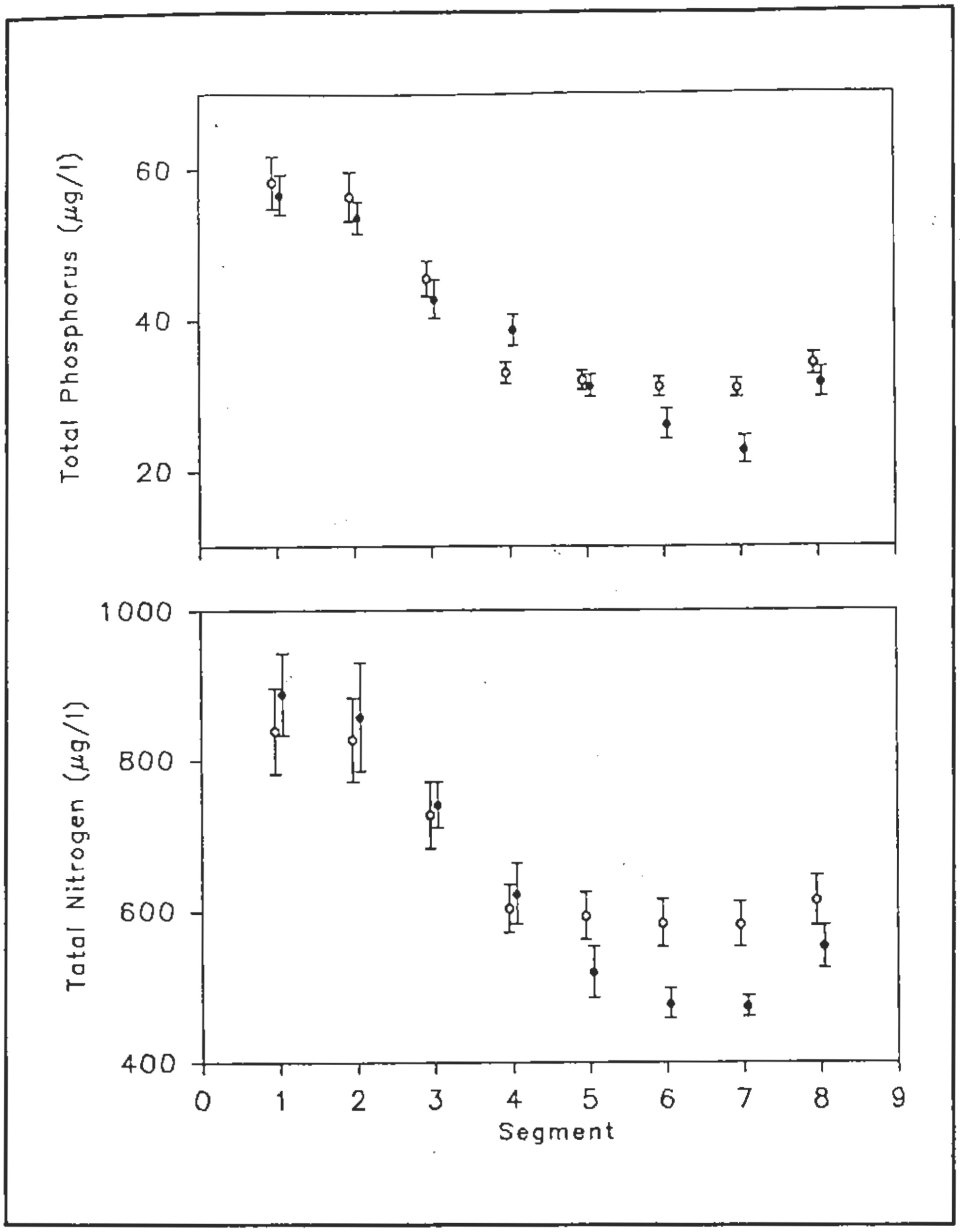

Figure 7. Observed (solid circles) and predicted (open circles) total phosphorus and total nitrogen concentrations for modeled segments of Walter F. George Lake for 1992. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 8 represents the lakewide, weighted average

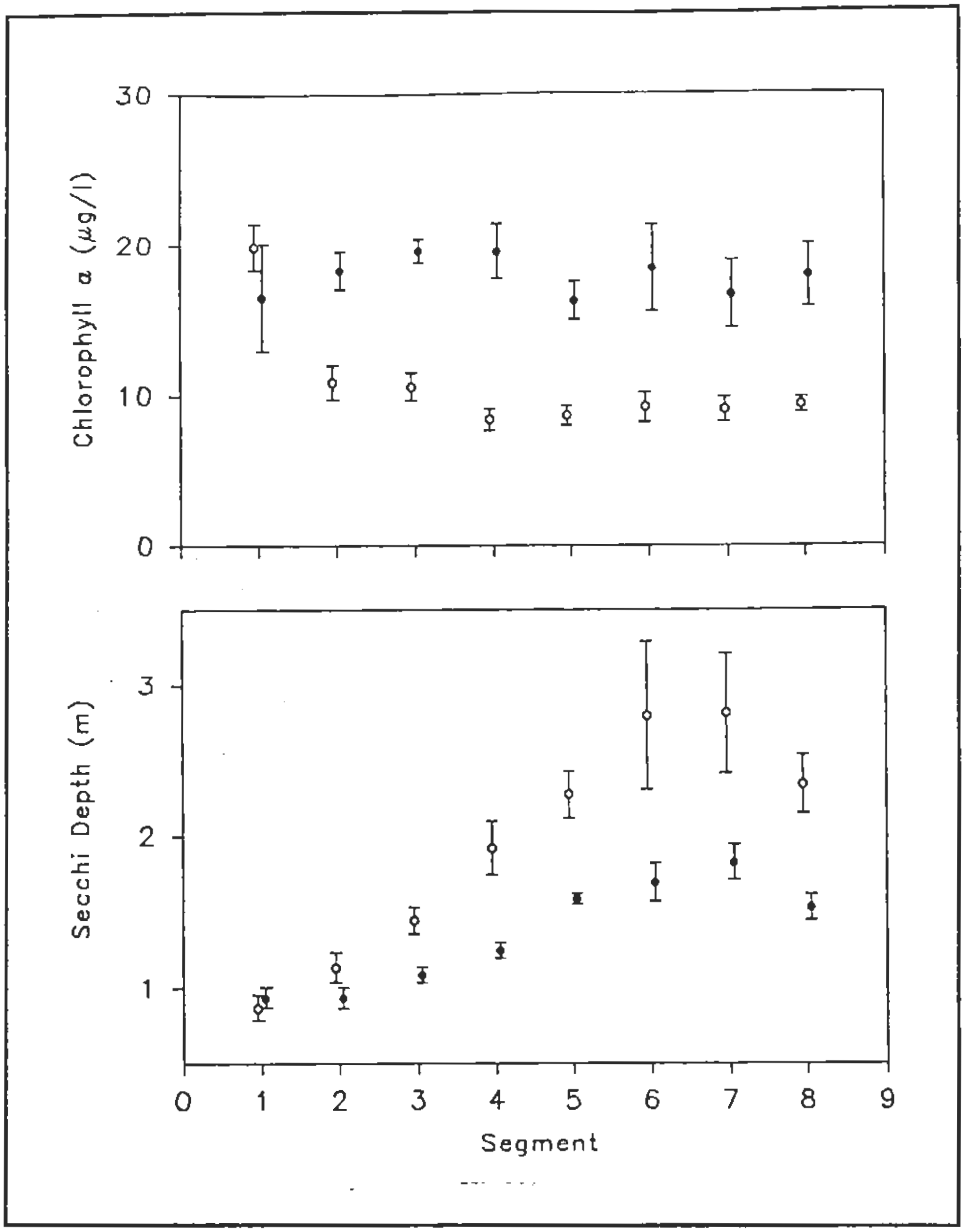

Figure 8. Observed (solid circles) and predicted (open circles) chlorophyll *a* concentrations and Secchi depths for modeled segments of Walter F. George Lake for 1992. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 8 represents the lakewide, weighted average

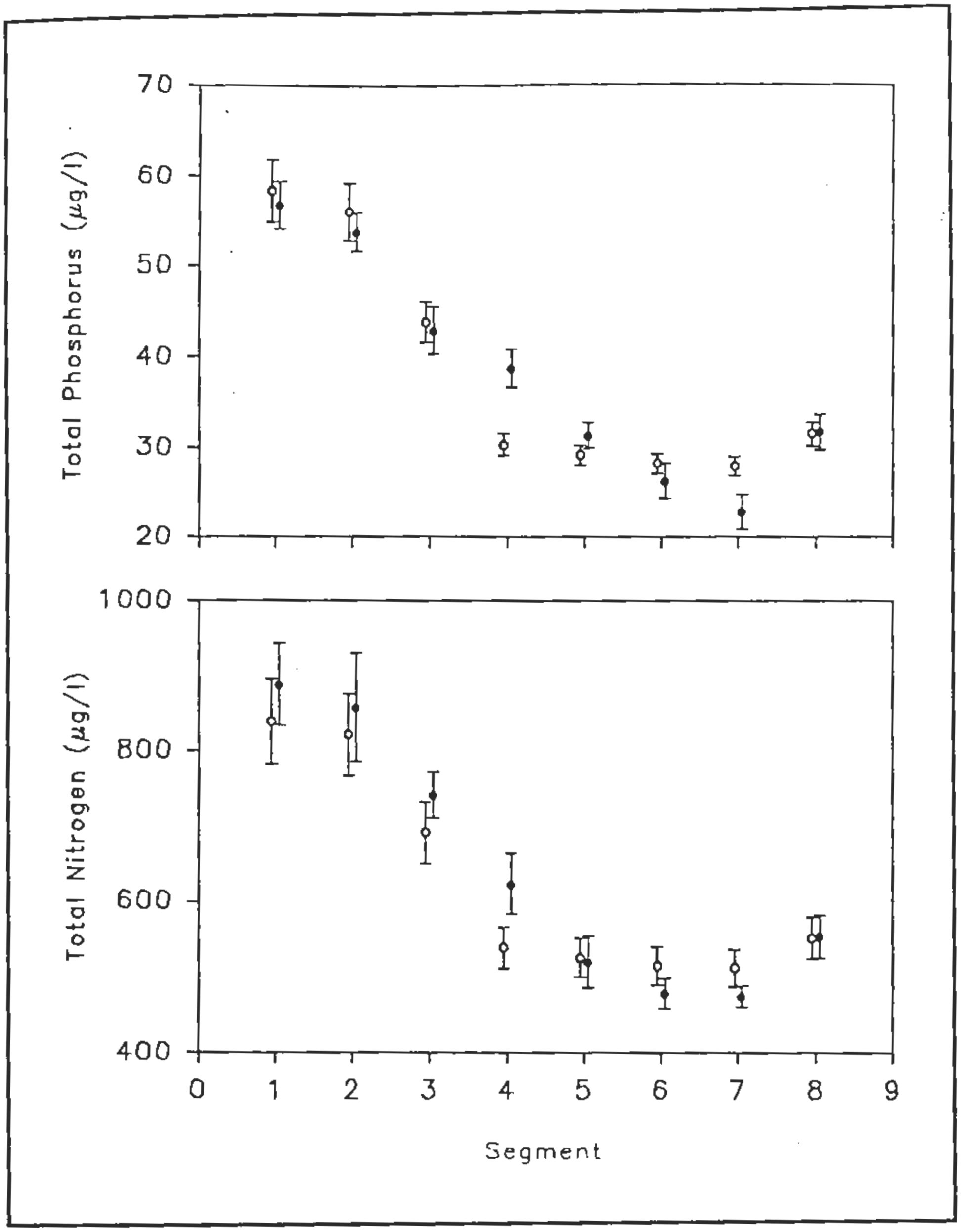

Figure 9. Observed (solid circles) and predicted (open circles) total phosphorus and total nitrogen concentrations for modeled segments of Walter F. George Lake for 1992. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 8 represents the lakewide, weighted average

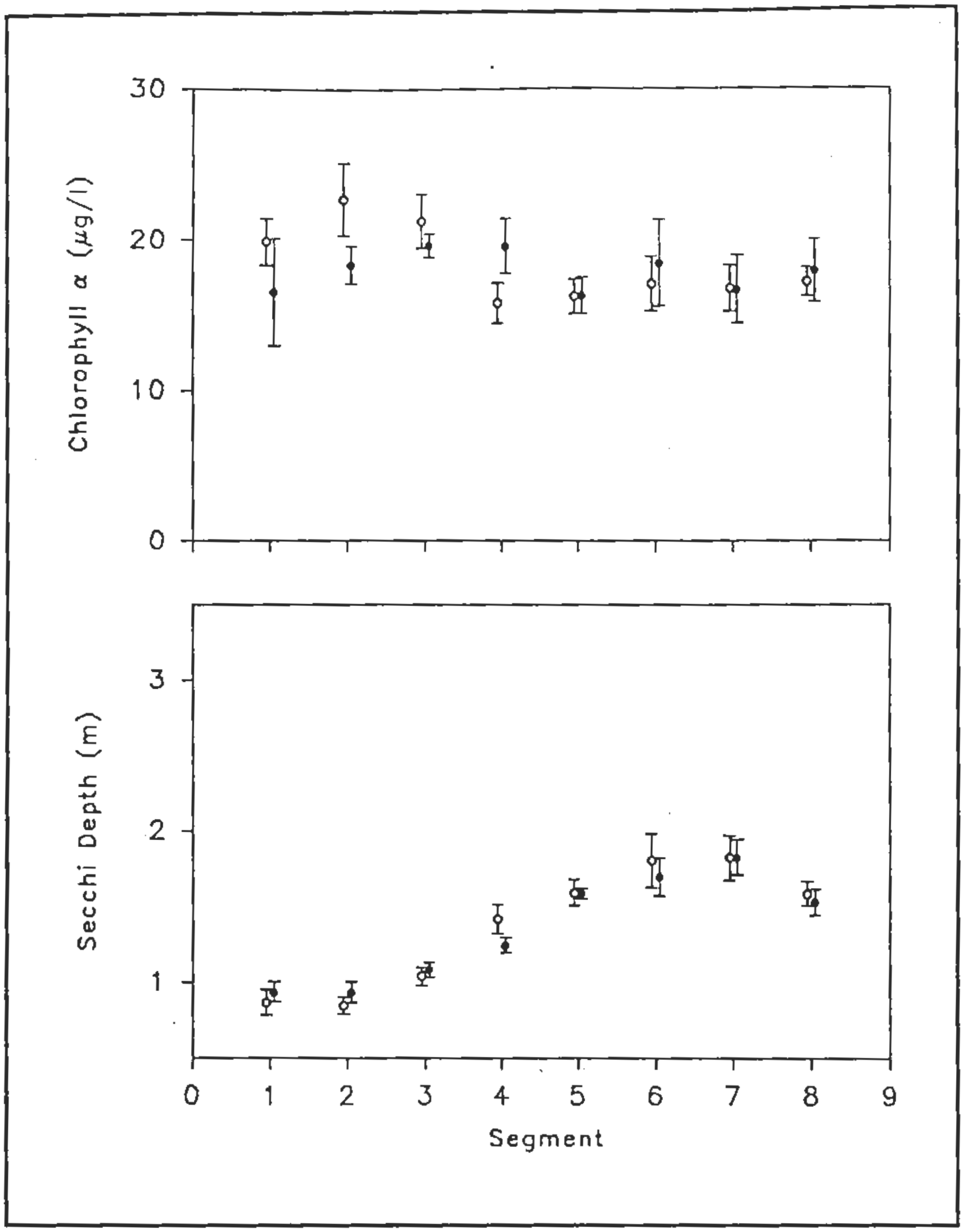

Figure 10. Observed (solid circles) and predicted (open circles) chlorophyll *a* concentrations and Secchi depths for modeled segments of Walter F. George Lake for 1992. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 8 represents the lakewide, weighted average

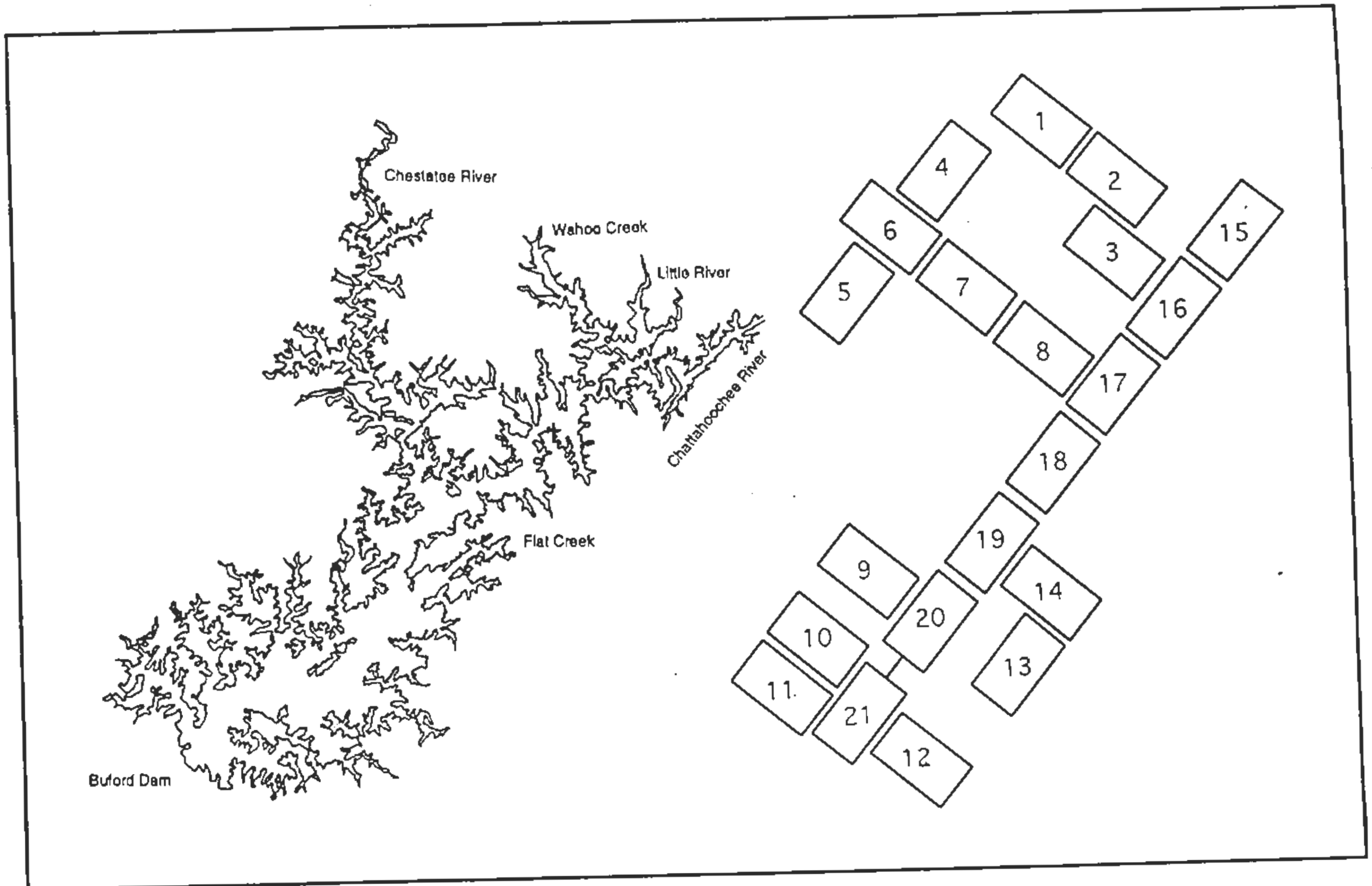

Figure 11. Map of Lake Sidney Lanier (left) and assigned locations of model segments (right). Contiguous segments are hydraulically linked

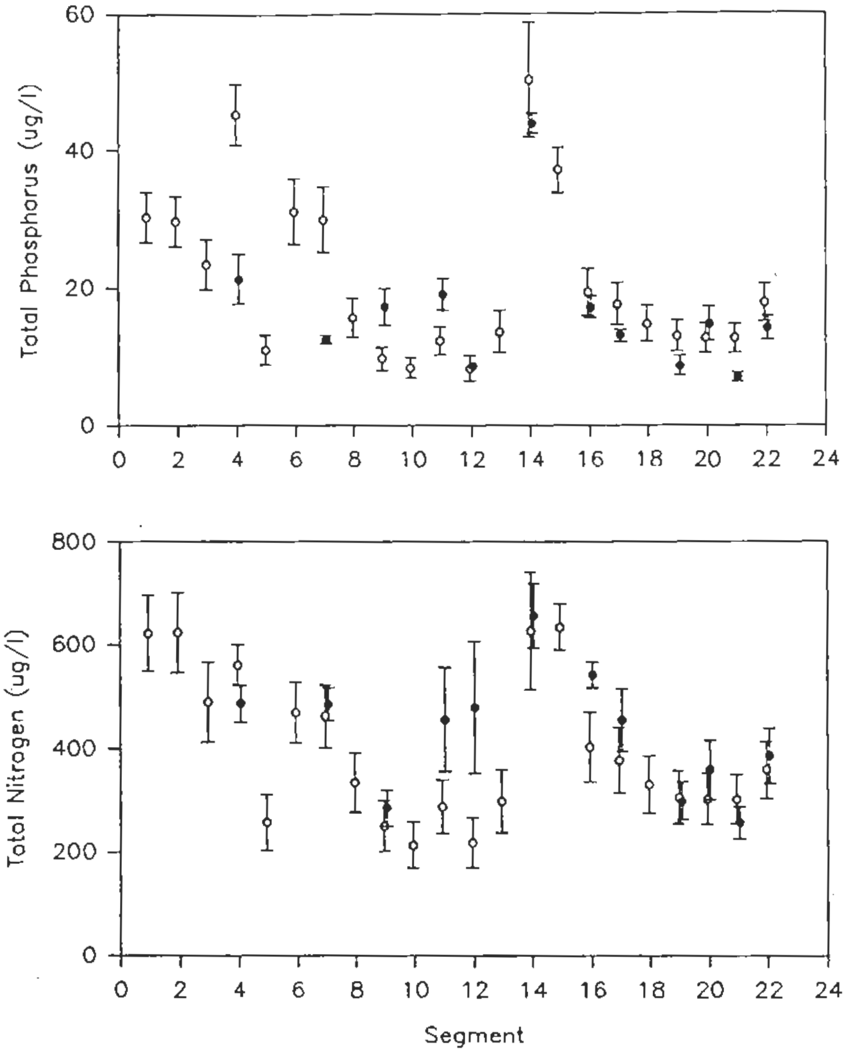

Figure 12. Observed (solid circles) and predicted (open circles) total phosphorus and total nitrogen concentrations for modeled segments of Lake Sidney Lanier for 1973. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 22 represents the lakewide, weighted average

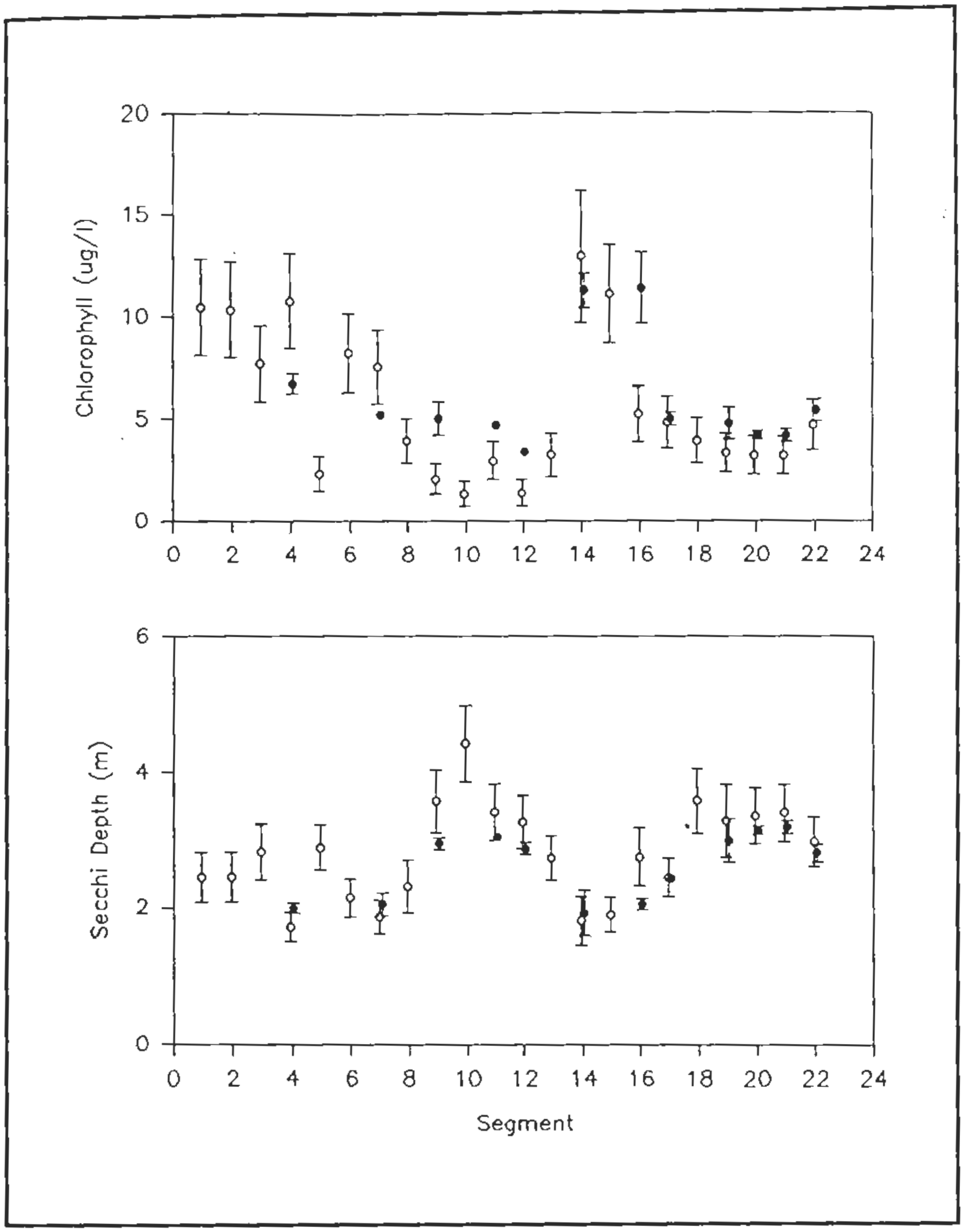

Figure 13. Observed (solid circles) and predicted (open circles) chlorophyll *a* concentrations and Secchi depths for modeled segments of Lake Sidney Lanier for 1973. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 22 represents the lakewide, weighted average

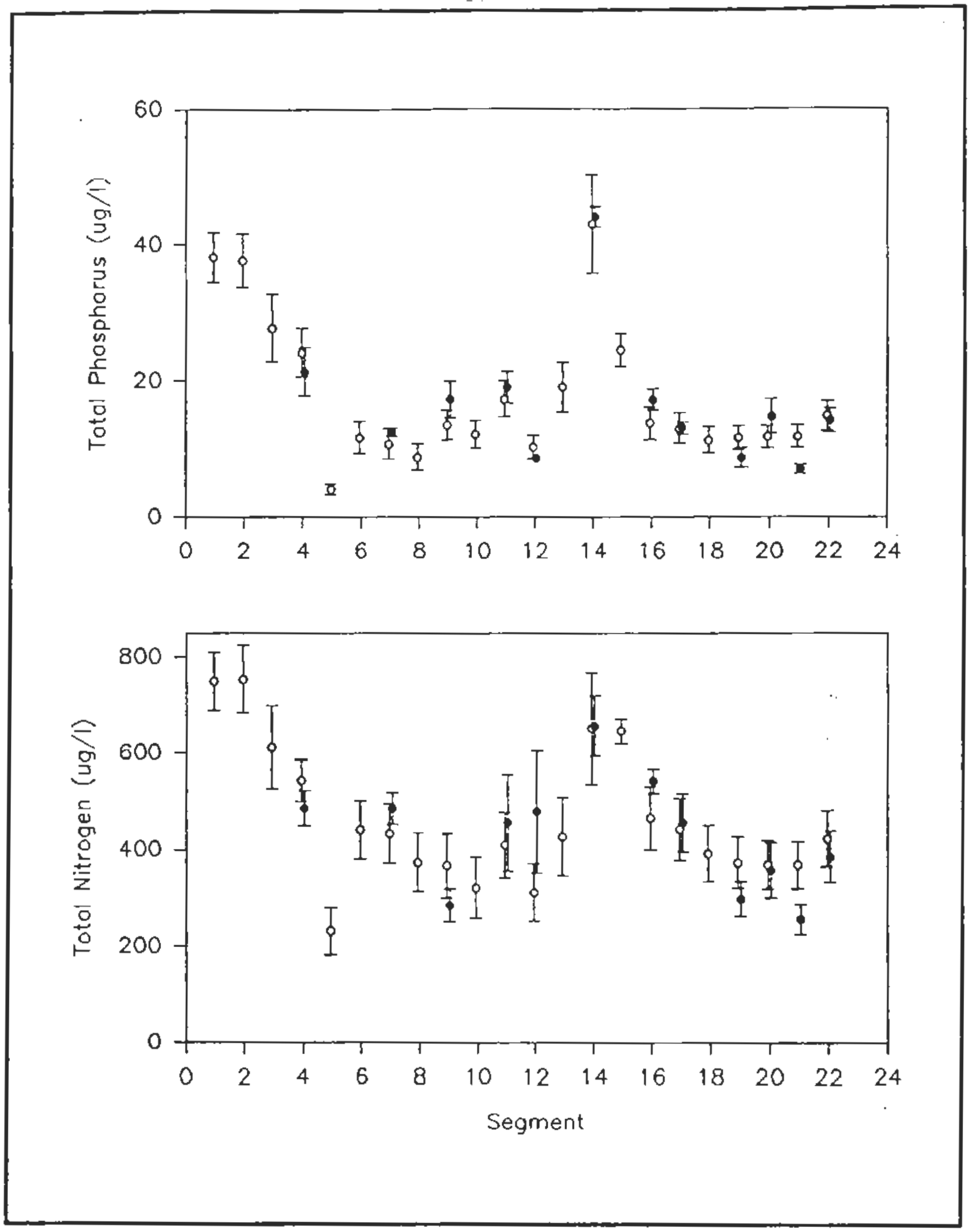

Figure 14. Observed (solid circles) and predicted (open circles) total phosphorus and total nitrogen concentrations for modeled segments of Lake Sidney Lanier for 1973. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 22 represents the lakewide, weighted average

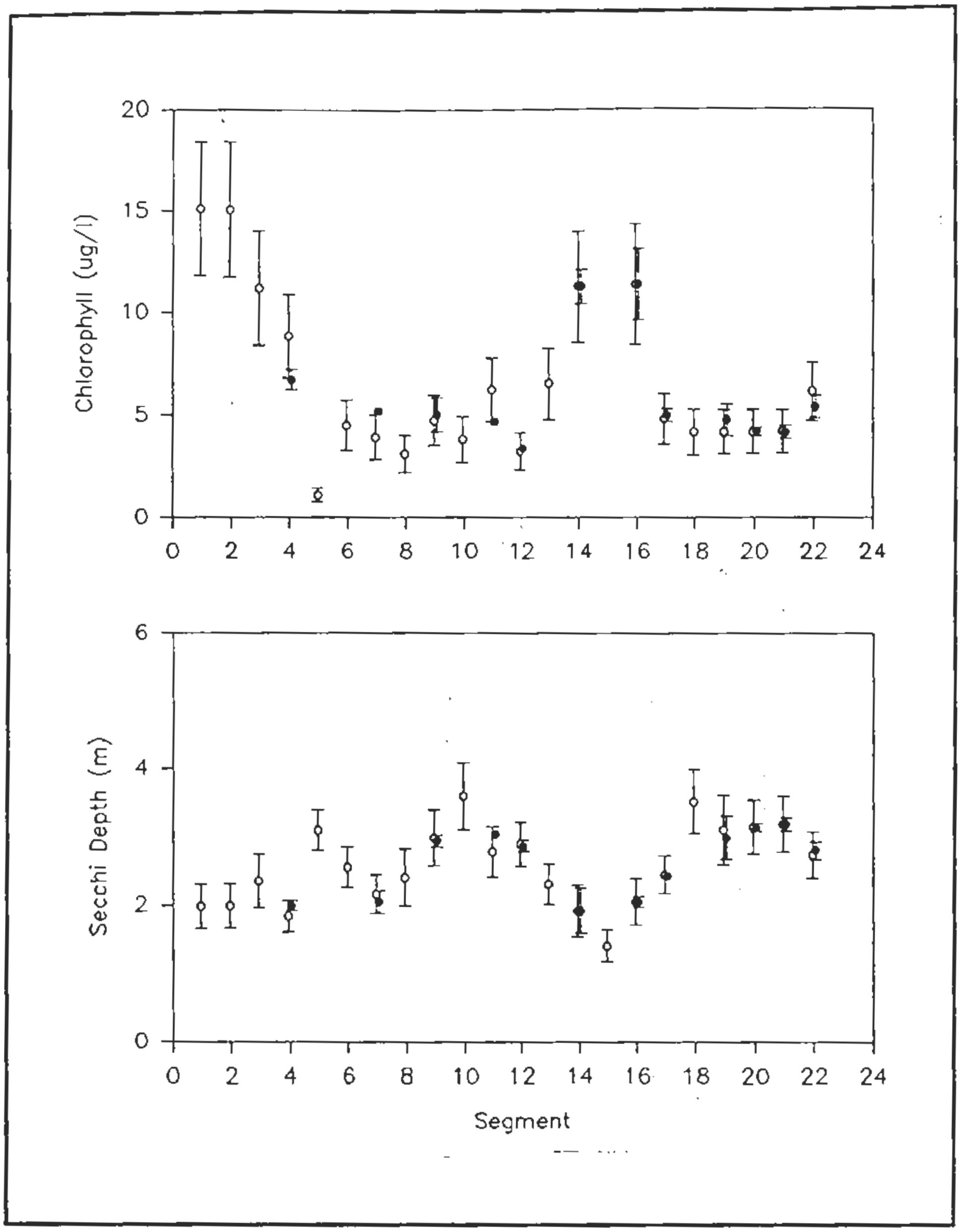

Figure 15. Observed (solid circles) and predicted (open circles) chlorophyll *a* concentrations and Secchi depths for modeled segments of Lake Sidney Lanier for 1973. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 22 represents the lakewide, weighted average

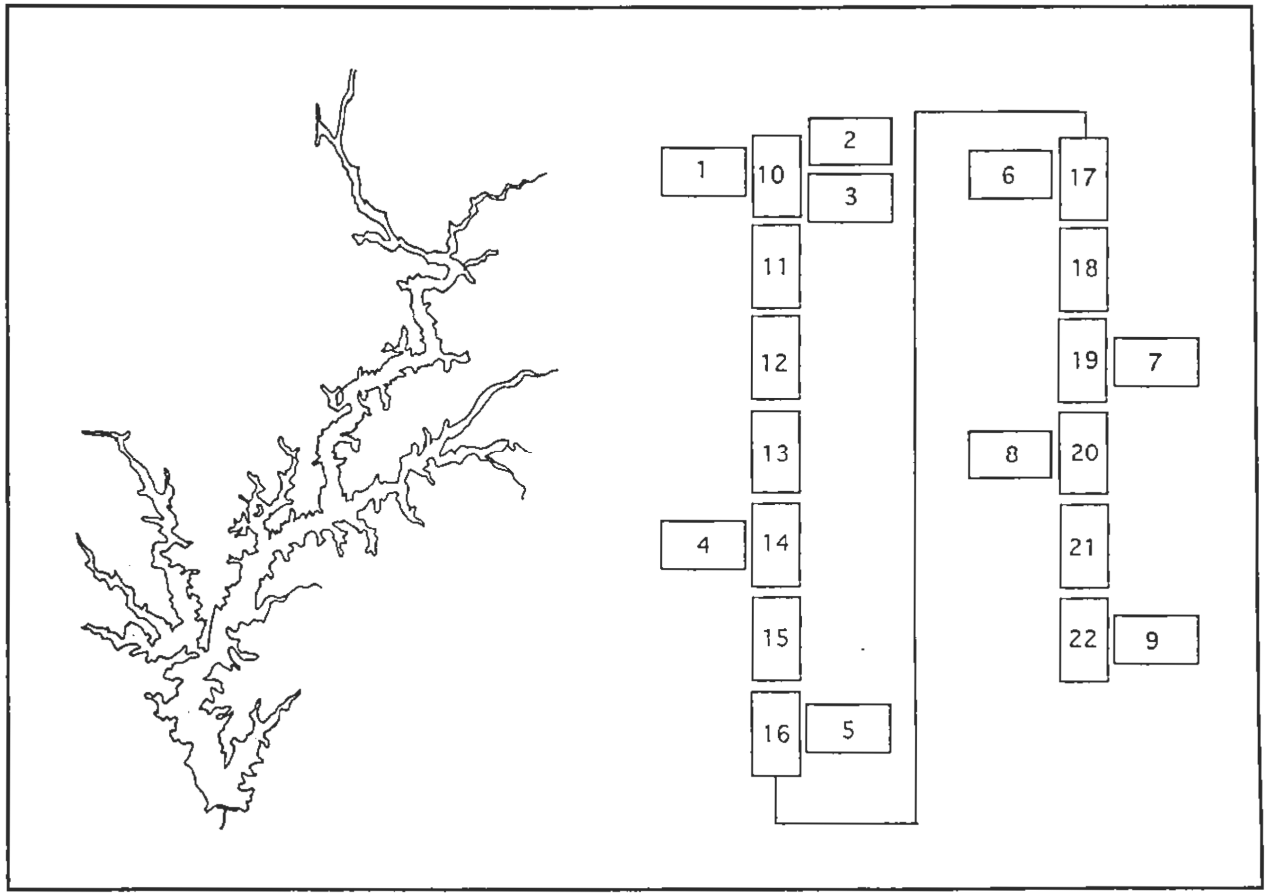

Figure 16. Map of West Point Lake (left) and assigned locations of model segments (right). Contiguous segments are hydraulically linked

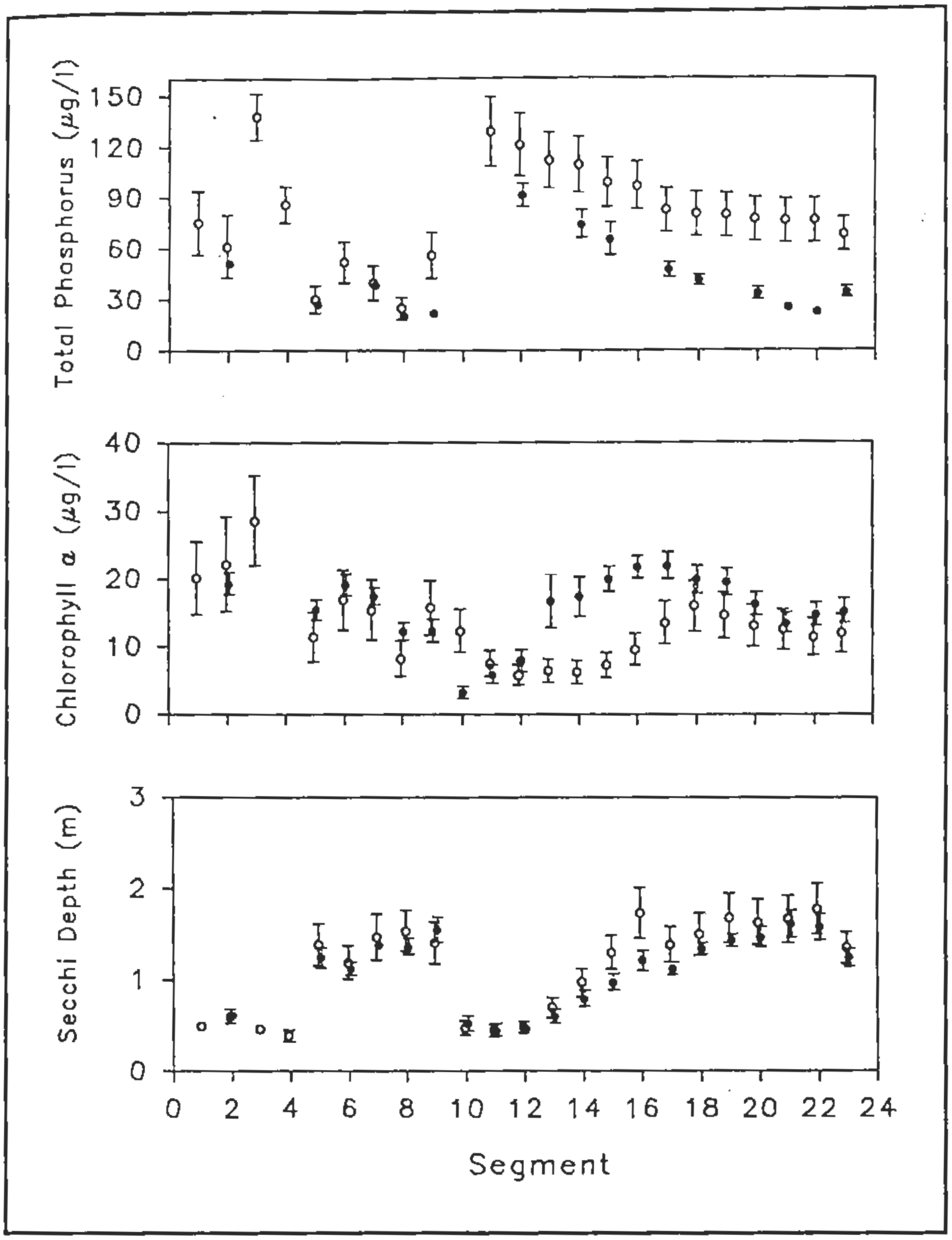

Figure 17. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of West Point Lake for 1991. Predicted values based on default calibration factors. Vertical bars represent observed and predicted variability. Segment 23 represents the lakewide, weighted average

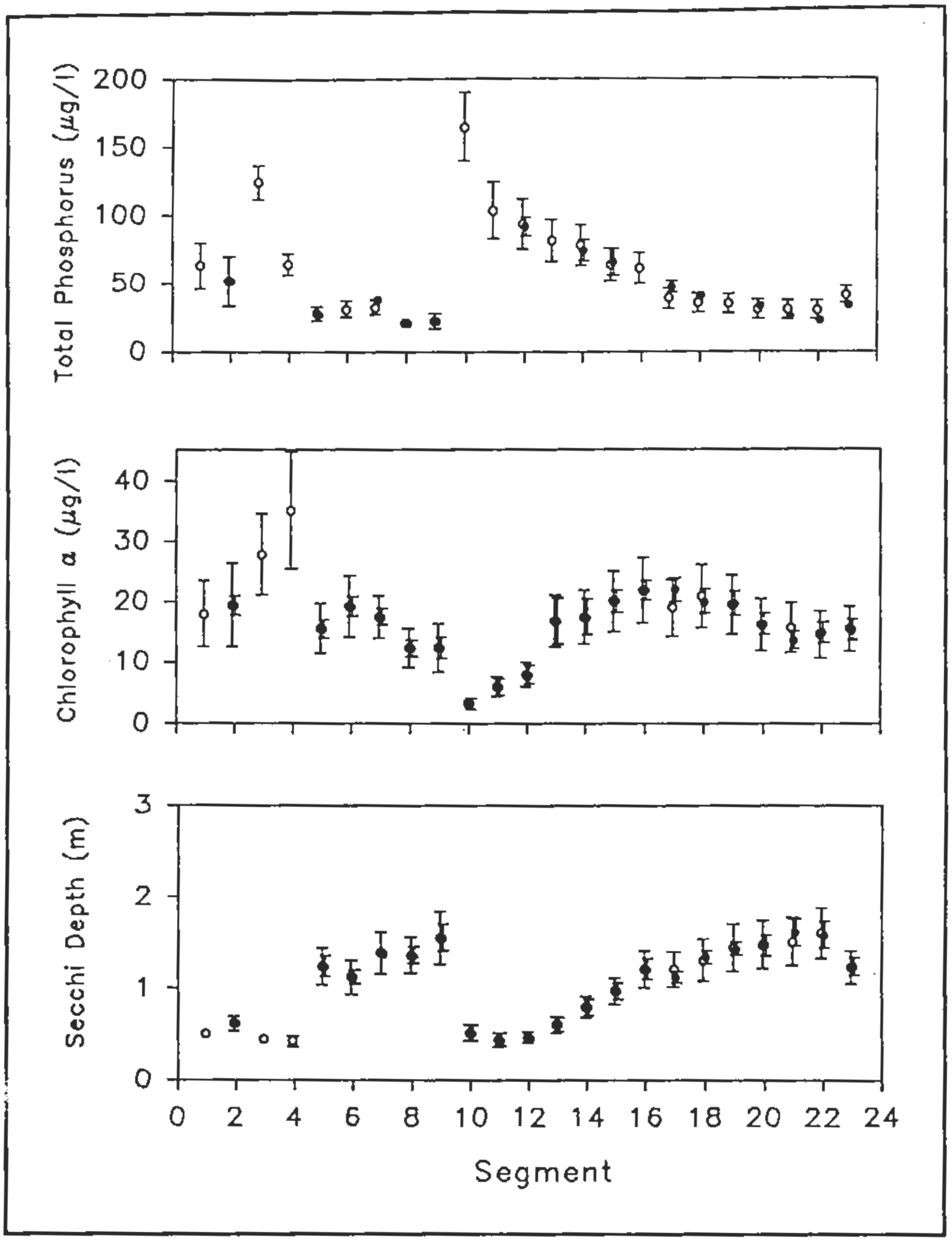

Figure 18. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of West Point Lake for 1991. Predicted values based on computed calibration factors. Vertical bars represent observed and predicted variability. Segment 23 represents the lakewide, weighted average

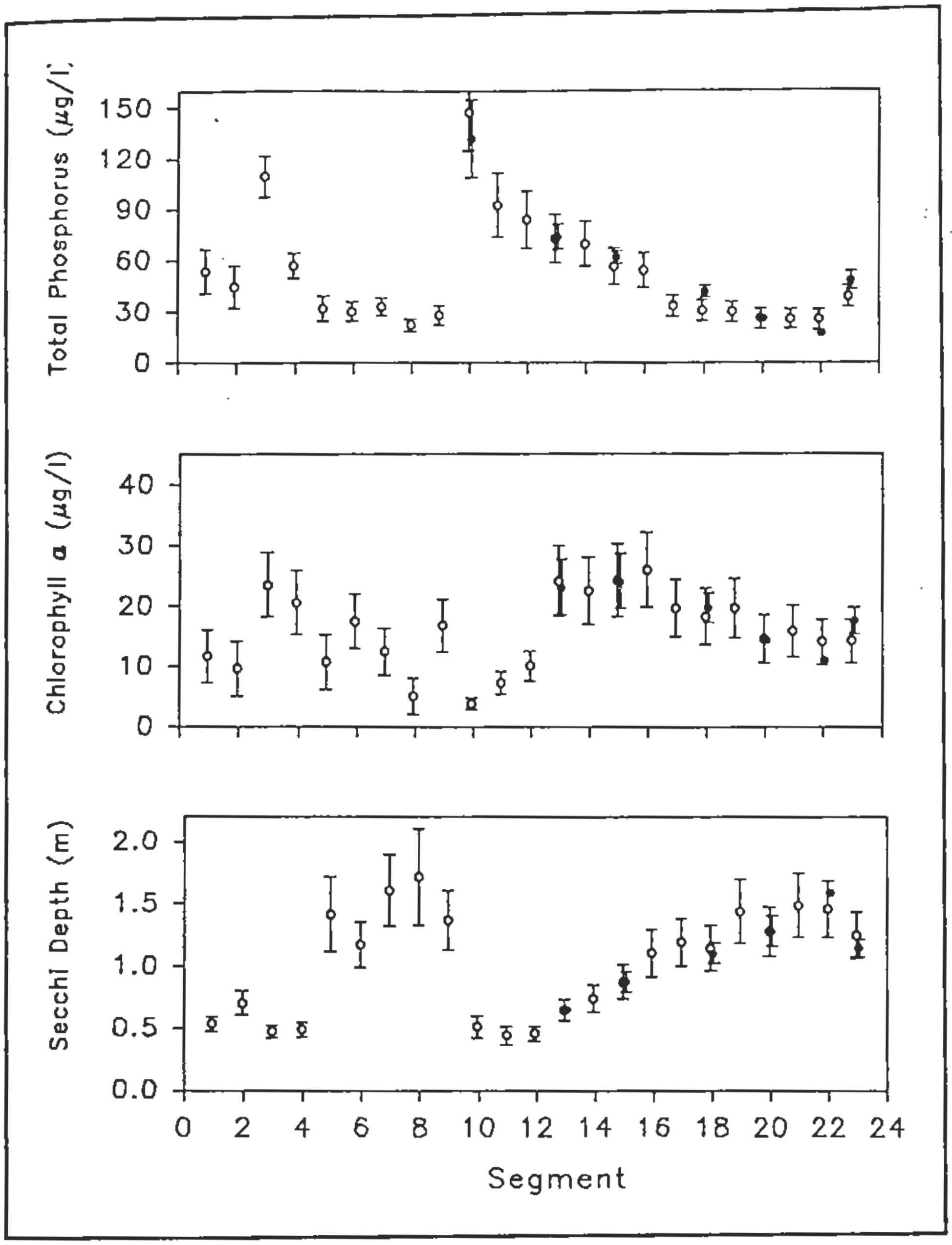

Figure 19. Observed (solid circles) and predicted (open circles) total phosphorus concentrations, chlorophyll *a* concentrations, and Secchi depths for modeled segments of West Point Lake for 1990. Predicted values based on computed calibration factors for 1991. Vertical bars represent observed and predicted variability. Segment 23 represents the lakewide, weighted average

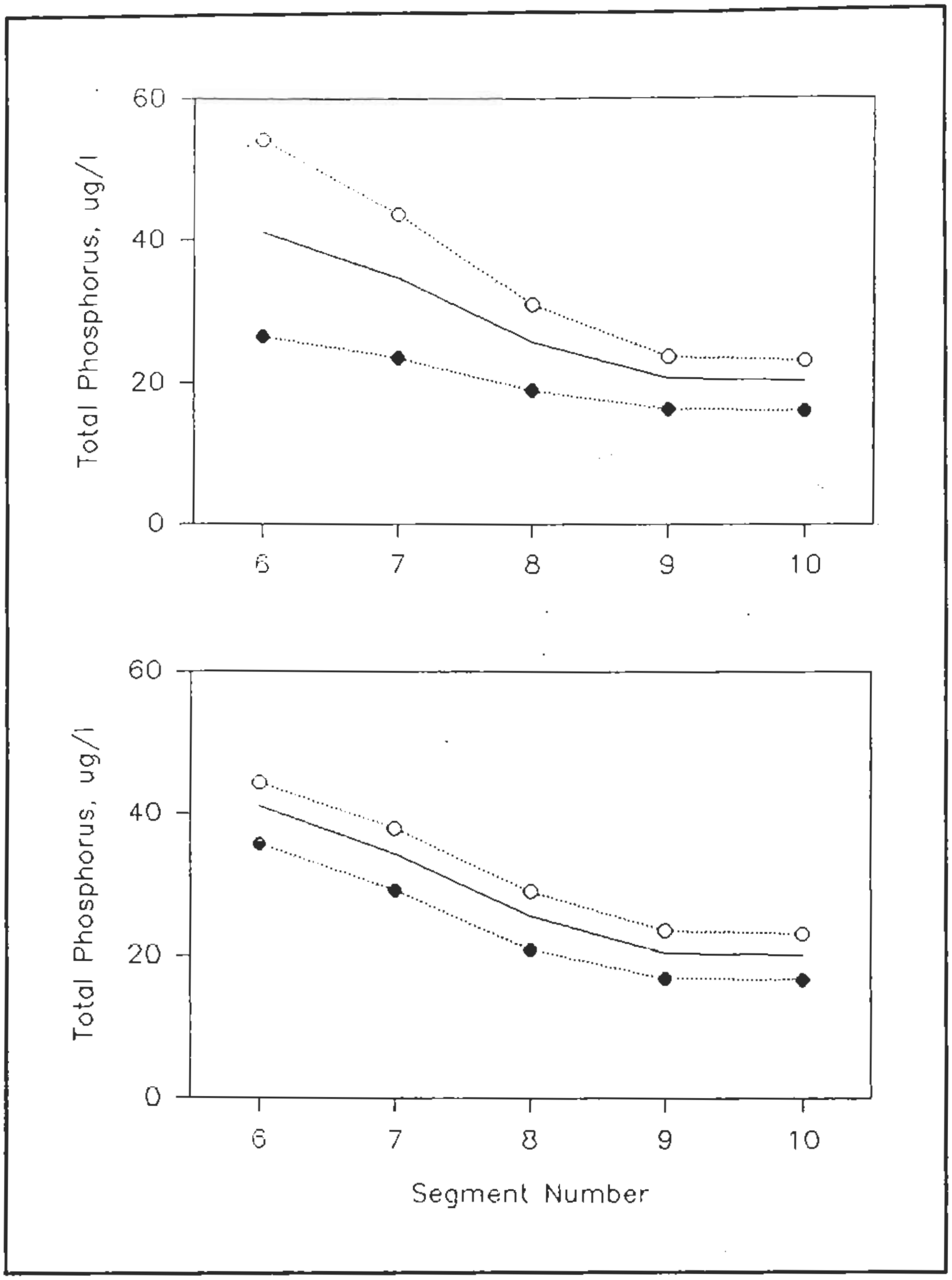

Figure 20. Predicted changes in total phosphorus concentrations in Allatoona Lake associated with changes in inflow nutrient concentration (upper) and inflow volume (lower). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

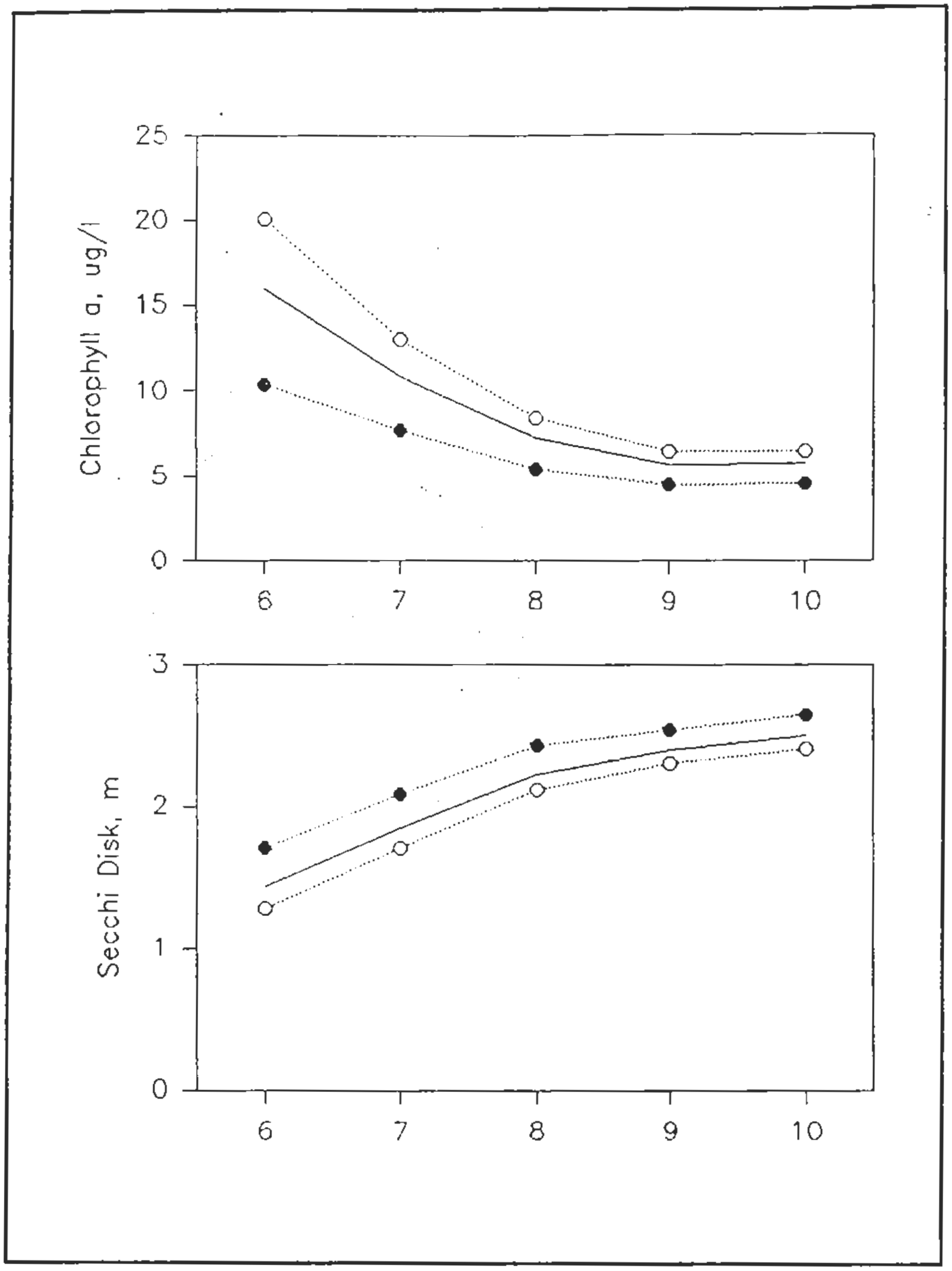

Figure 21. Predicted changes in chlorophyll *a* concentrations (upper) and Secchi depths (lower) in Allatoona Lake associated with changes in inflow nutrient concentration. Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

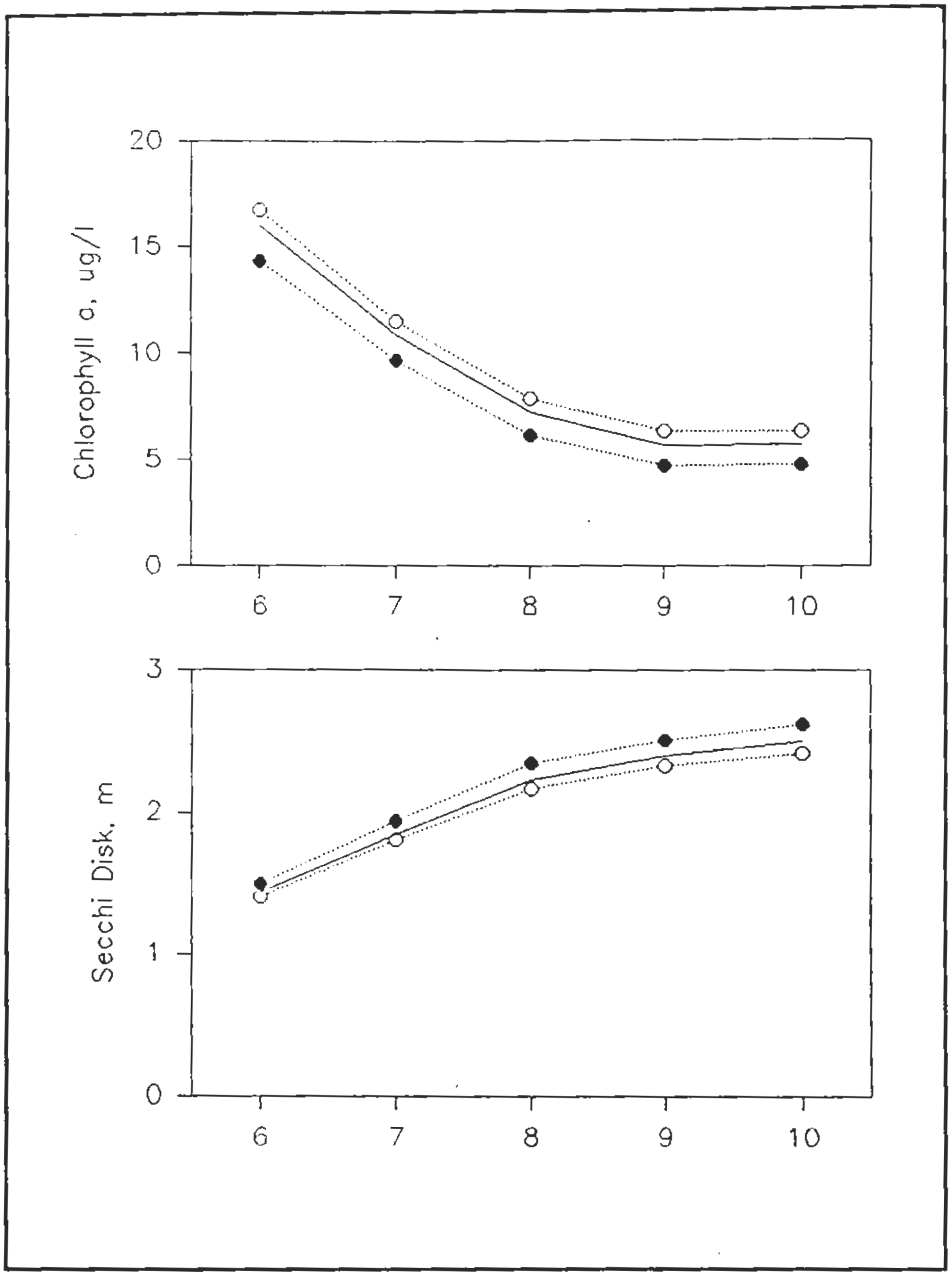

Figure 22. Predicted changes in chlorophyll *a* concentrations (upper) and Secchi depths (lower) in Allatoona Lake associated with changes in inflow volume. Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

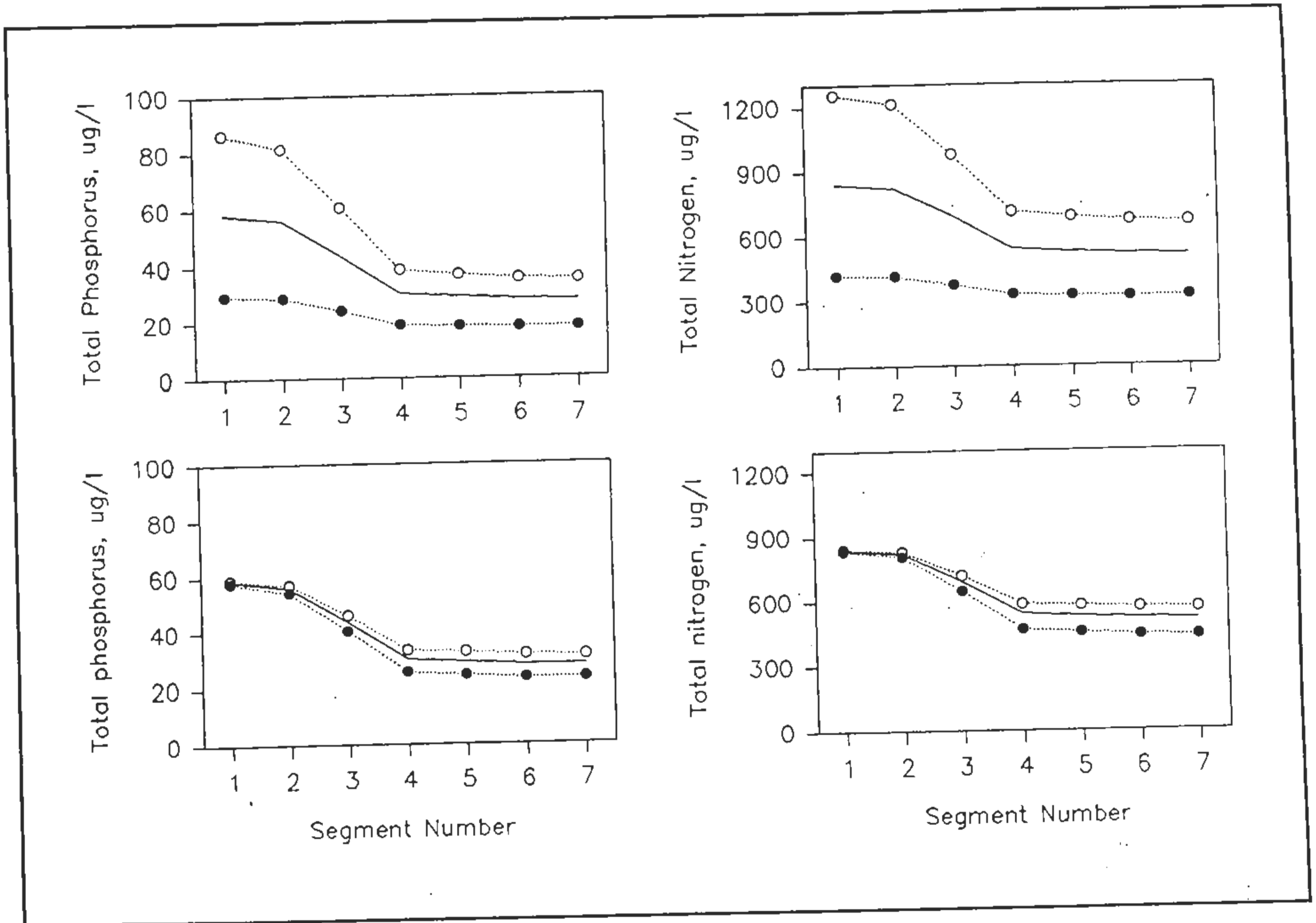

Figure 23. Predicted changes in phosphorus (left) and nitrogen (right) concentrations in Walter F. George Lake associated with changes in inflow nutrient concentration (upper) and inflow volume (lower). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data

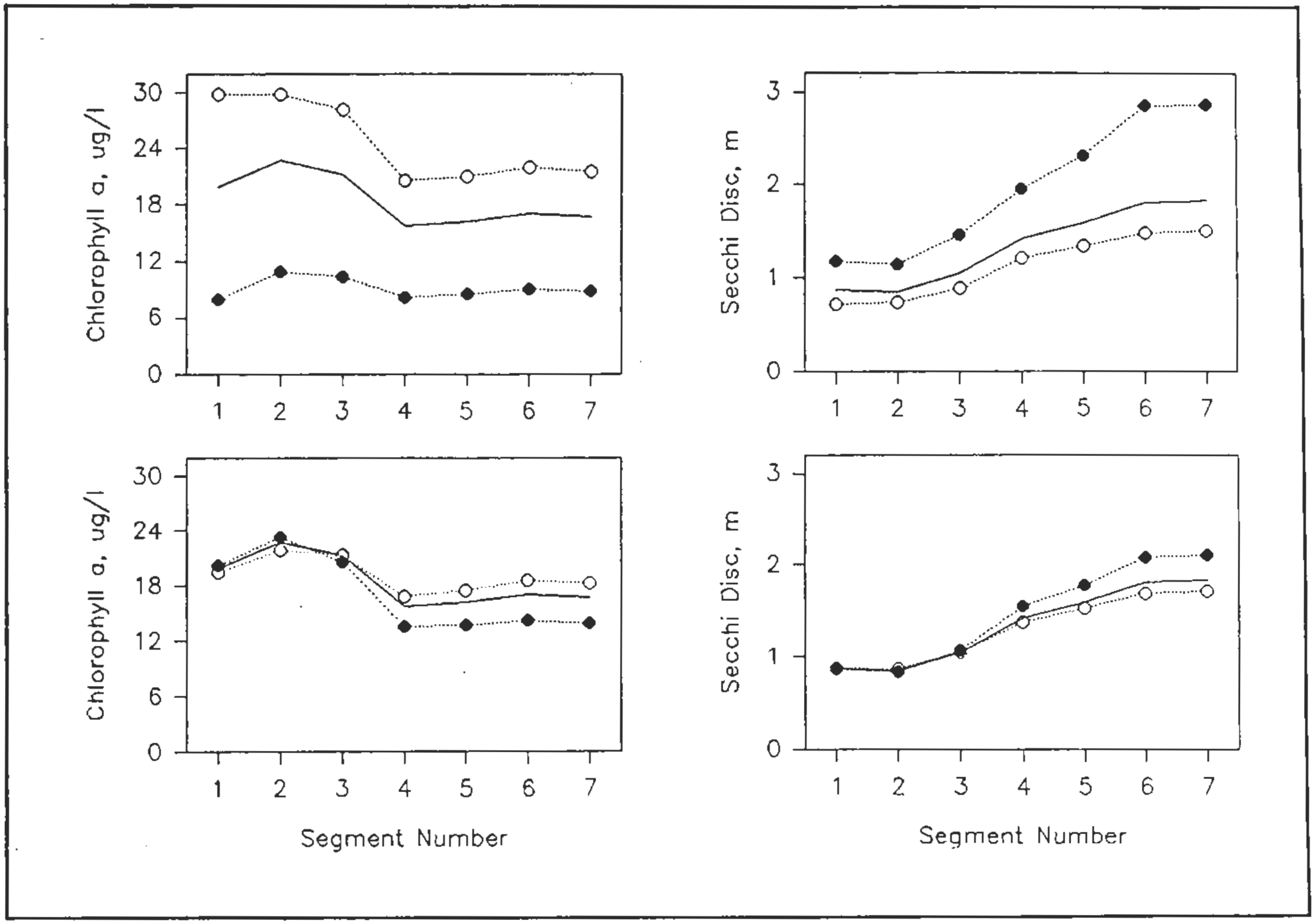

Figure 24. Predicted changes in chlorophyll *a* (left) and Secchi depth (right) in Walter F. George Lake associated with changes in inflow nutrient concentration (upper) and inflow volume (lower). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data

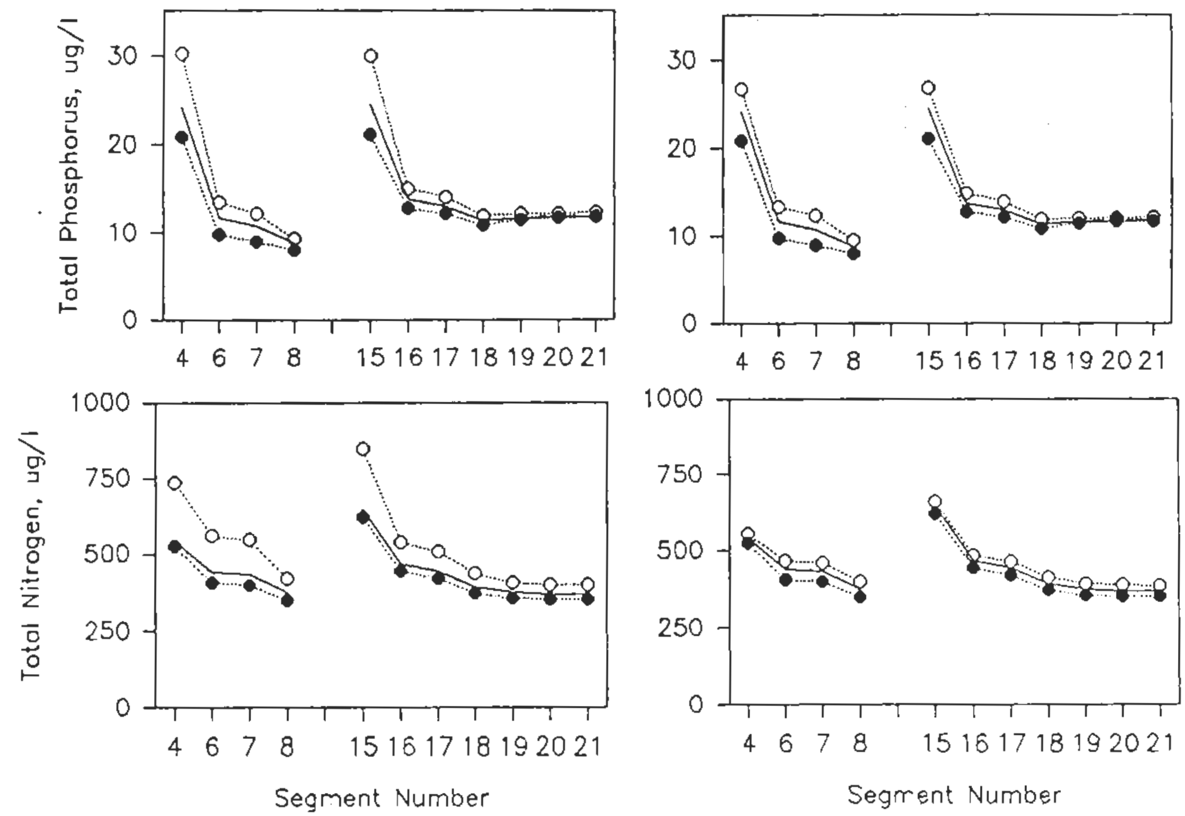

Figure 25. Predicted changes in phosphorus (upper) and nitrogen (lower) concentrations in Lake Sidney Lanier associated with changes in inflow nutrient concentration (left) and inflow volume (right). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data

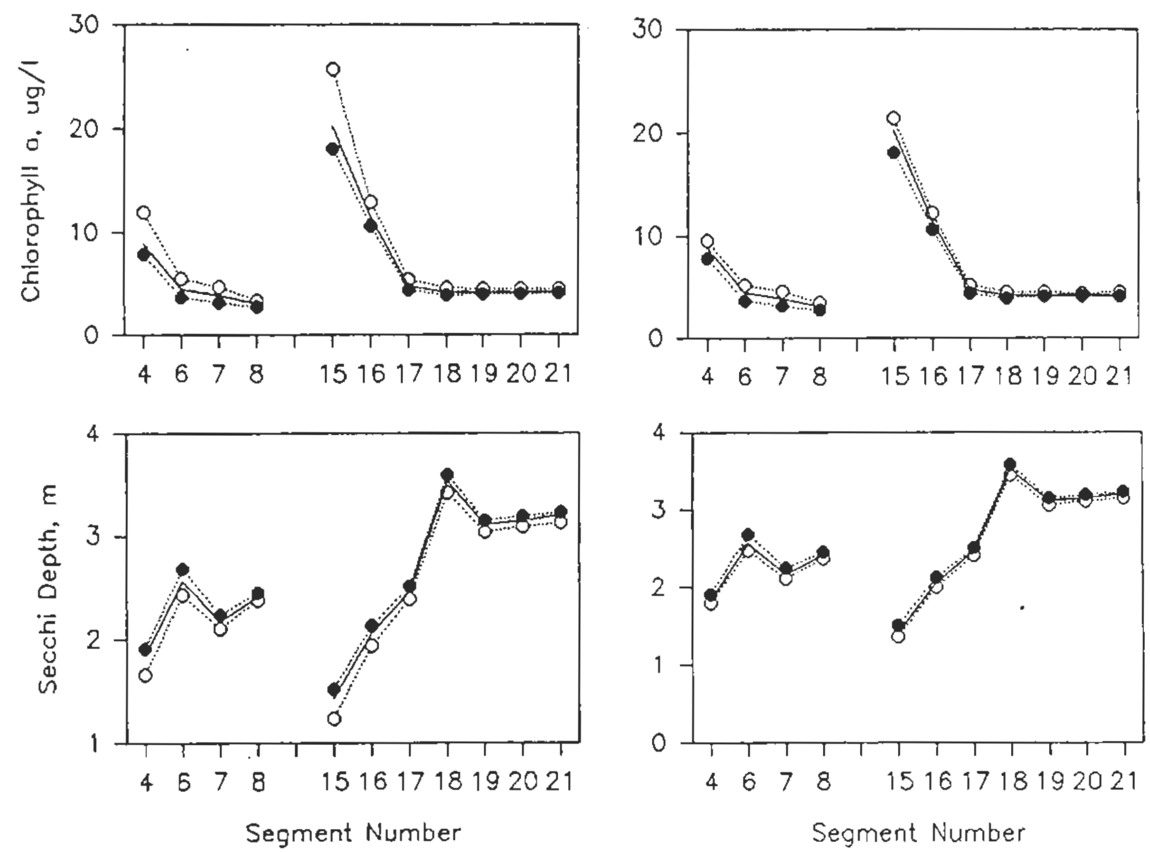

Figure 26. Predicted changes in chlorophyll *a* (upper) and Secchi depths (lower) in Lake Sidney Lanier associated with changes in inflow nutrient concentration (left) and inflow volume (right). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data

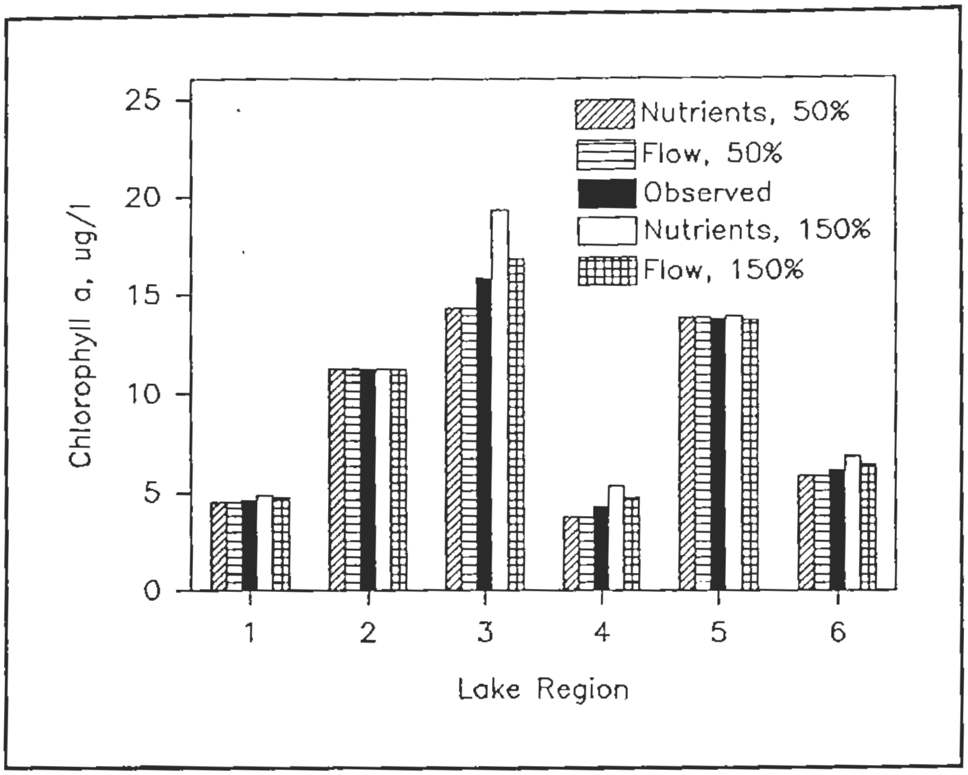

Figure 27. Trophic responses (i.e., changes in chlorophyll *a* concentrations) of major limnological regions (1-5) of Lake Sidney Lanier to changes in nutrient inflow concentrations and inflow volume. Region 6 is a lakewide summary of predicted responses

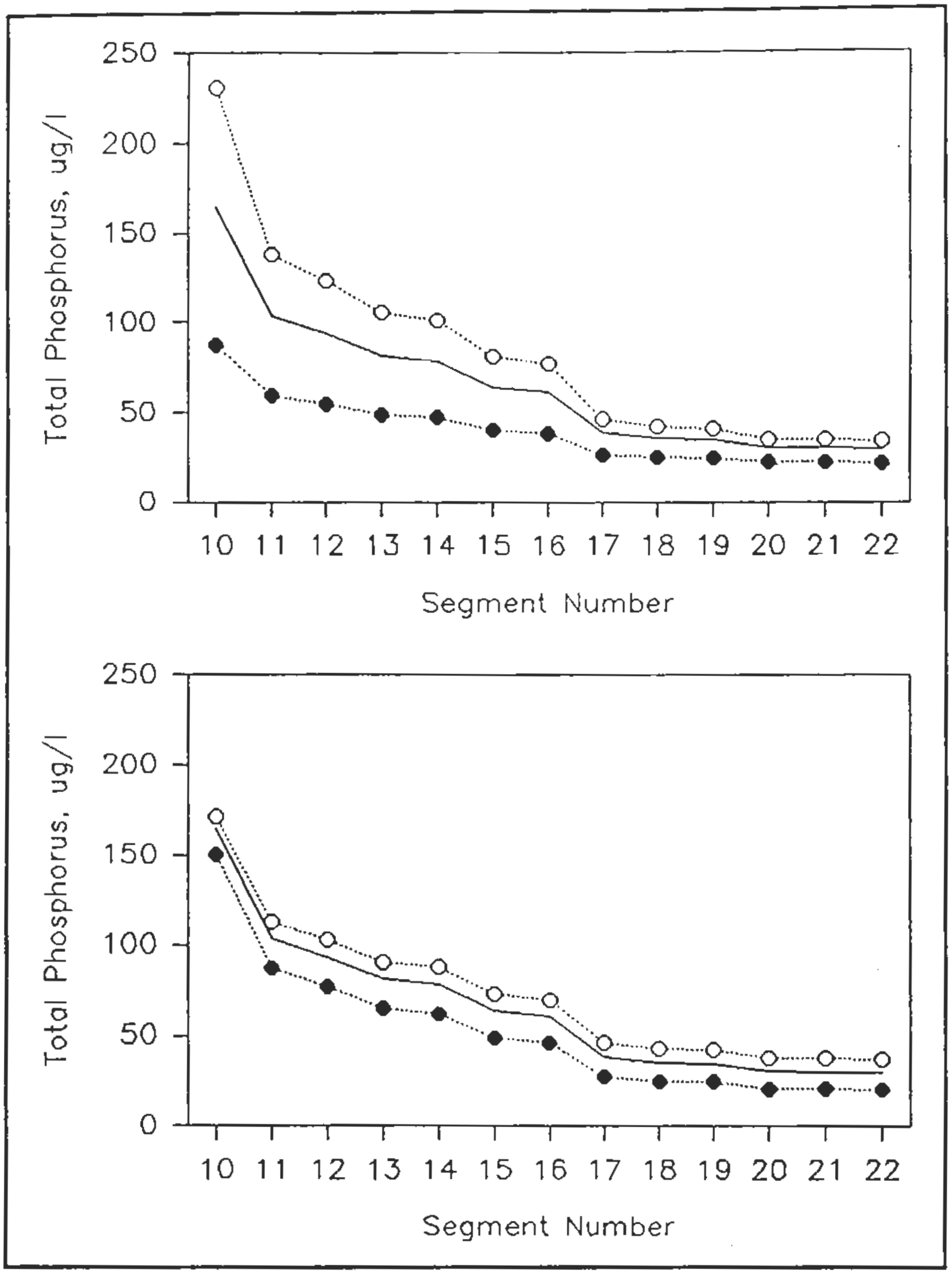

Figure 28. Predicted changes in total phosphorus concentrations in West Point Lake associated with changes in inflow nutrient concentration (upper) and inflow volume (lower). Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

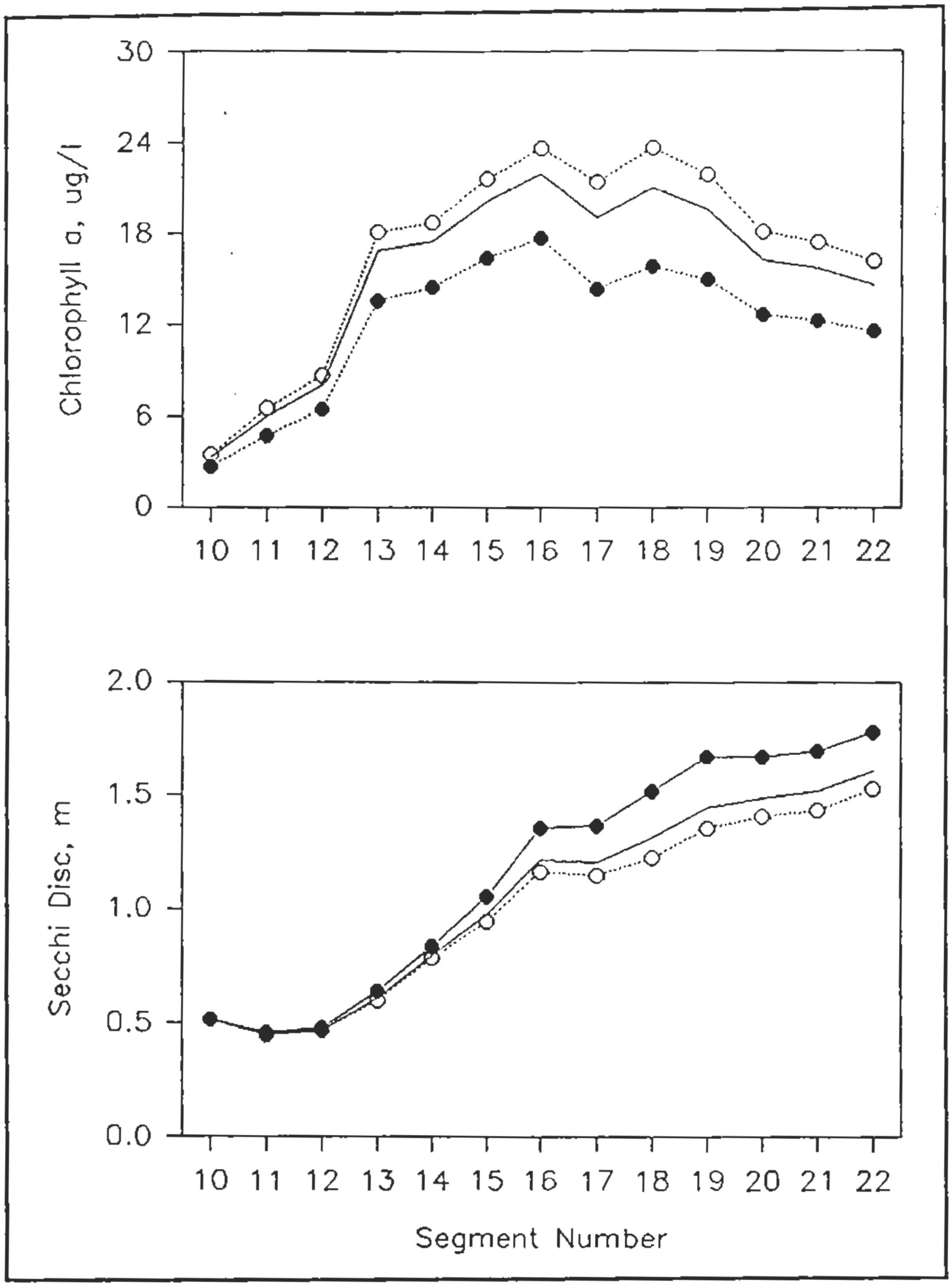

Figure 29. Predicted changes in chlorophyll *a* concentrations (upper) and Secchi depths (lower) in West Point Lake associated with changes in inflow nutrient concentration. Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

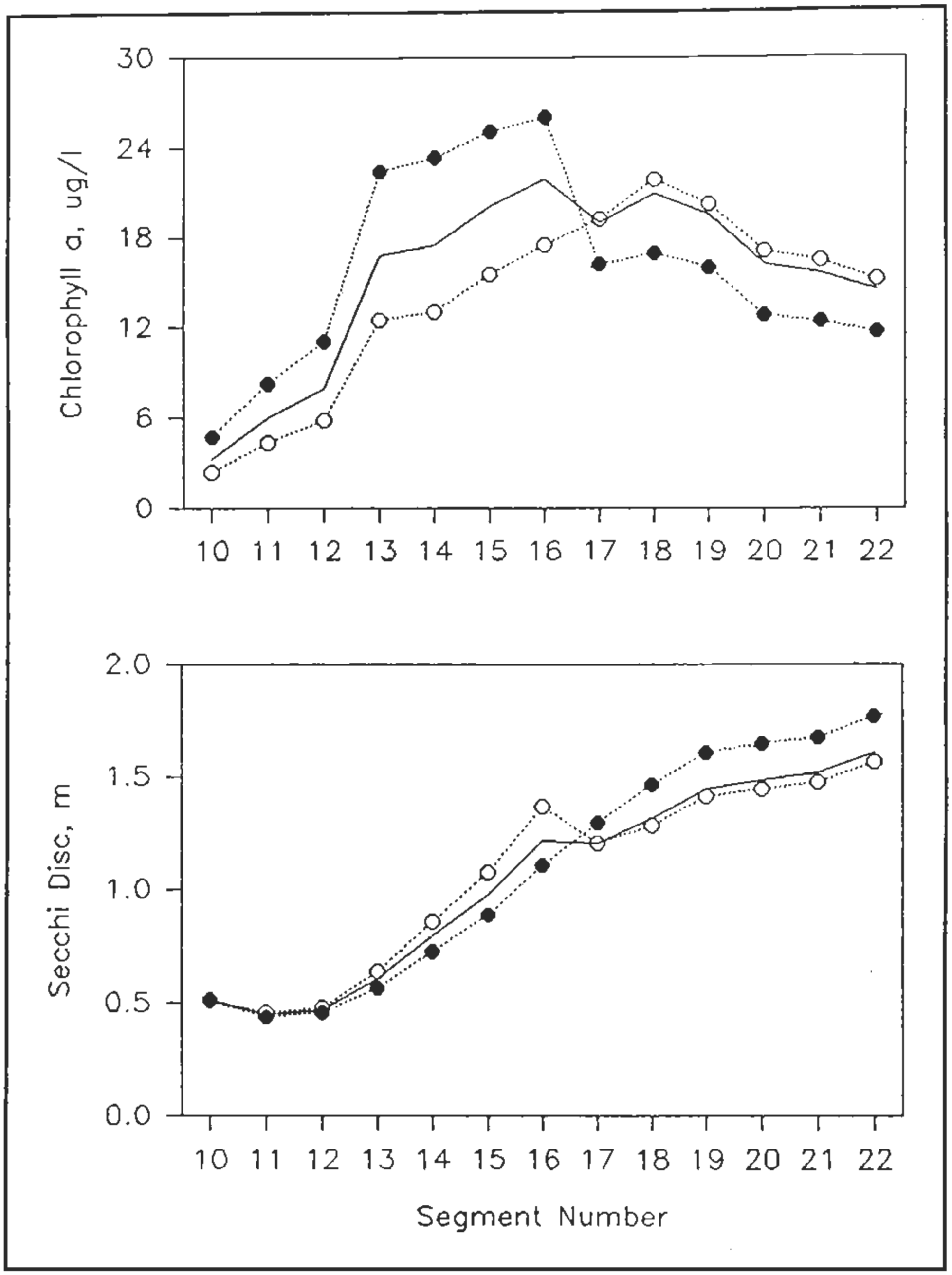

Figure 30. Predicted changes in chlorophyll *a* concentrations (upper) and Secchi depths (lower) in West Point Lake associated with changes in inflow volume. Predictions for increases of 50 percent (open circles) and decreases of 50 percent (closed circles) are compared with observed data (solid line)

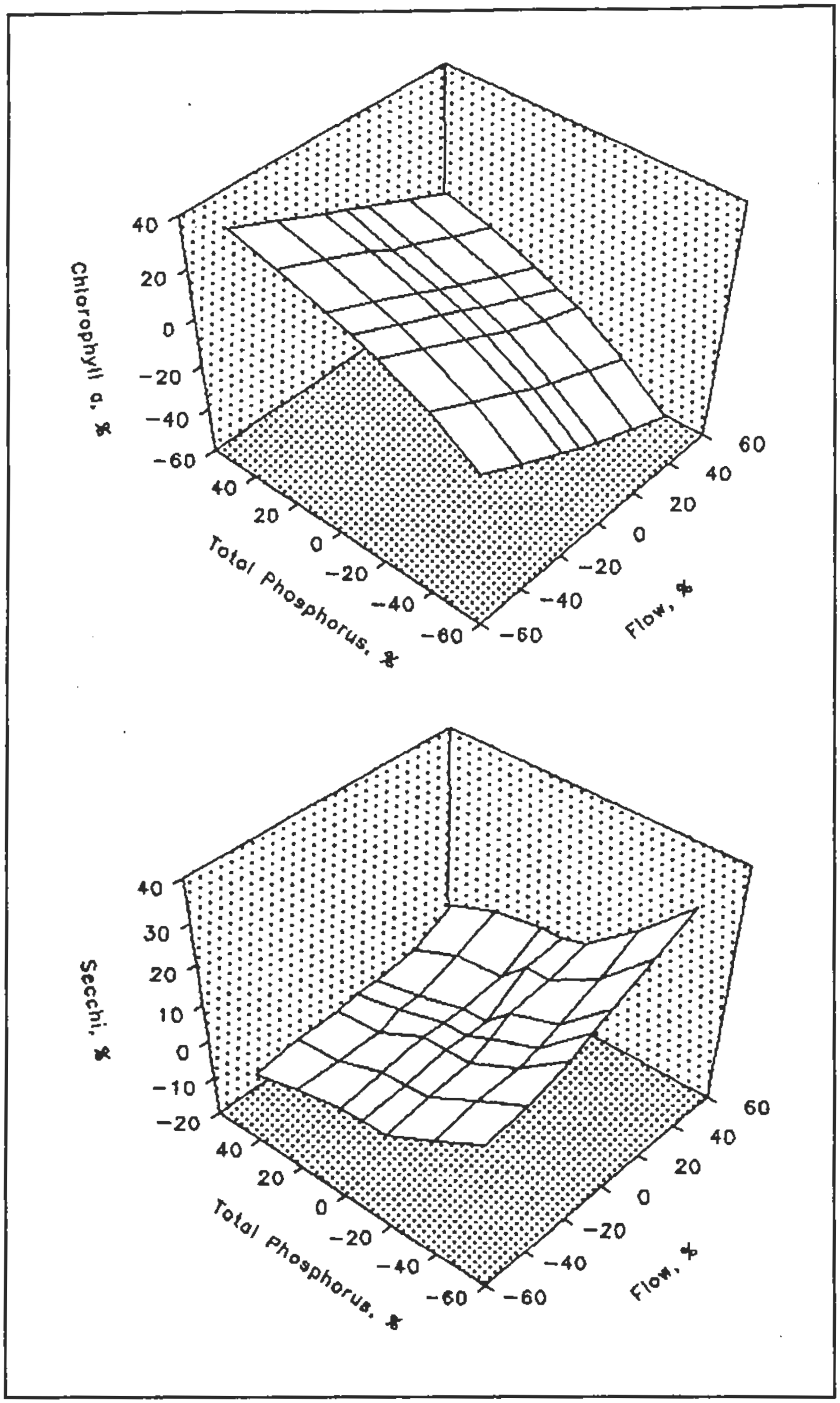

Figure 31. Predicted lakewide trophic response (i.e., changes in chlorophyll *a* concentrations and Secchi depths) of West Point Lake relative to changes in inflow nutrient concentration and inflow volume

Table 1
Water Quality Sampling Stations Associated with BATHTUB Model Segments for Allatoona Lake for Calibration (1992) and Verification (1973) Years (Station descriptions are those identified in the original data)

Segment	Station Descriptions	
	1973	1992
1	313	28A Marker
2	—	Tanyard Creek Embayment
3	—	8A-10A Marker
4	—	Little River Embayment
5	—	Carter Creek Embayment Stamp Creek Embayment
6	315 316	44E-45E Marker —
7	—	Kellog/Owl Creek Embayment 39E Marker
8	314	9E Marker 13E Marker 18E-19E Marker
9	312	—
10	311	1E Marker

Table 2
Mean, Mixed-Layer (i.e., depth < 6 m) Water Quality Conditions, Including Associated CV Values, for Allatoona Lake, May-October 1973 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
1	Mean CV	22.9 0.12	648.5 0.14	7.5 0.17	1.3 0.15
2	Mean CV	— —	— —	— —	— —
3	Mean CV	— —	— —	— —	— —
4	Mean CV	— —	— —	— —	— —
5	Mean CV	— —	— —	— —	— —
6	Mean CV	33.7 0.13	561.6 0.12	6.3 0.27	1.3 0.08
7	Mean CV	— —	— —	— —	— —
8	Mean CV	15.4 0.09	490.0 0.18	12.5 0.34	1.7 0.14
9	Mean CV	20.4 0.10	677.0 0.23	8.0 0.20	1.4 0.16
10	Mean CV	17.5 0.04	547.3 0.27	4.3 0.06	1.7 0.18

Table 3
Mean Mixed-Layer Water Quality Conditions and Associated CV Values for Allatoona Lake, May-October 1992 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
1	Mean CV	18.5 0.13	1,346.7 0.10	9.4 0.15	1.5 0.08
2	Mean CV	24.9 0.12	1,560.0 0.18	10.7 0.11	1.4 0.08
3	Mean CV	23.2 0.14	2,007.1 0.21	7.8 0.17	2.1 0.04
4	Mean CV	34.8 0.19	1,871.1 0.12	18.1 0.10	1.2 0.08
5	Mean CV	33.8 0.13	1,617.5 0.19	9.2 0.09	1.8 0.04
6	Mean CV	28.9 0.15	1,711.4 0.29	11.2 0.07	1.7 0.08
7	Mean CV	24.9 0.08	2,497.9 0.29	9.9 0.05	1.9 0.04
8	Mean CV	25.1 0.09	1,653.8 0.19	8.3 0.05	2.1 0.03
9	Mean CV	— —	— —	— —	— —
10	Mean CV	26.5 0.18	2,425.0 0.25	7.8 0.12	2.3 0.06

Table 4
Median Water Quality Characteristics of Selected Georgia Impoundments and of Those Included in This Study

Impoundment	Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m	Source
Clobert	30	440	15.3	0.9	USEPA
Commerce	70	785	29.3	0.4	USEPA
Chapman	20	470	10.8	1.4	USEPA
Olgethorpe	20	430	10.0	1.5	USEPA
Union Point	30	560	11.1	1.1	USEPA
Blalock	40	1,320	22.9	1.1	USEPA
Shamrock	50	1,020	29.8	1.0	USEPA
Brantley	35	800	22.6	0.6	USEPA
Clarks Hill	24	430	6.7	1.5	NES
Chatuge	14	330	6.3	3.0	NES
Burton	7	270	2.7	3.4	NES
Blackshear	35	690	1.9	0.8	NES
Blue Ridge	10	240	3.1	2.7	NES
Harding	114	880	7.4	0.8	NES
High Falls	47	830	15.1	1.0	NES
Jackson	94	980	14.6	1.0	NES
Nottely	15	325	6.7	2.4	NES
Allatoona					
1973	22	585	7.7	1.5	NES
1992	25	1,682	10.3	1.8	KSC
W. F. George					
1992	39	573	17.9	1.3	AU
Lanier					
1973	16	460	5.4	2.6	NES
West Point					
1990	52	734	18.6	1.1	GDNR
1991	39	797	14.5	1.1	USAEWES

Note: The following codes indicate data source:
USEPA -U.S. Environmental Protection Agency (1993), Region IV, Environmental Services Division, Athens, GA.
NES -USEPA National Eutrophication Survey.
KSC - Kennesaw State College, Marietta, GA.
AU - Auburn University, Auburn, AL.
GDNR - Georgia Department of Natural Resources (1991), Atlanta, GA.
USAEWES - U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Table 5
Mean Flows and Flow-Weighted Mean Total Phosphorus and Total Nitrogen Concentrations for 1973 for Selected Tributary Streams Entering Allatoona Lake (Based on data collected during the National Eutrophication Survey (U.S. Environmental Protection Agency 1978), May-October 1973)

Tributary Name	Flow, m^3/sec	Total Phosphorus µg P/L	Total Nitrogen µg N/L
Etowah River	34.59	51.0	587.0
Allatoona Creek	0.713	35.0	572.0
Acworth Lake Discharge	0.700	49.0	537.0
Noonday Creek	1.800	244.0	1,105.0
Little River	5.000	88.0	1,020.0
Shoal Creek	2.600	36.0	515.0
Stamp Creek	0.458	24.0	401.0

Table 6
Mean Flows and Flow-Weighted Mean Total Phosphorus Concentrations, Including Associated CV Values, for 1992 for Selected Tributary Streams Entering Allatoona Lake (Based on data collected by Kennesaw State College, May-October 1992. CV values were calculated as the standard error divided by the mean)

Tributary Name		Flow, m^3/sec	Total Phosphorus µg P/L
Etowah River	Mean CV	27.65 0.123	65.6 0.328
Allatoona Creek	Mean CV	0.305 0.187	44.5 0.219
Acworth Lake Discharge	Mean CV	0.131 0.123	22.4 0.089
Tanyard Creek	Mean CV	0.432 0.969	44.6 0.961
Kellog Creek	Mean CV	0.014 0.297	59.5 0.410
Owl Creek	Mean CV	0.025 0.156	133.8 0.275
Noonday Creek	Mean CV	1.577 0.194	150.0 0.205
Little River	Mean CV	4.068 0.184	50.0 0.200
Shoal Creek	Mean CV	1.518 0.130	37.9 0.127
Stamp Creek	Mean CV	0.346 0.087	24.4 0.190
Rowland Creek	Mean CV	0.026 0.265	65.0 0.285

Table 7
Contributing Area and Estimated Flow and Total Phosphorus and Nitrogen Concentrations for Ungauged Local Land-Use Areas for Allatoona Lake for 1973

Model Segment	Contributing Land-use Area km^2	Estimated Mean Flow[1] hm^3/year	Total Phosphorus[2] µg P/L	Total Nitrogen[2] µg N/L
1	46.18	14.32	36.0	544.0
2	95.18	29.51	36.0	544.0
3	11.65	3.61	36.0	544.0
4	62.65	19.42	36.0	544.0
5	29.72	9.21	36.0	544.0
6	36.14	11.20	36.0	544.0
7	62.65	19.30	36.0	544.0
8	39.76	12.33	36.0	544.0
9	11.65	3.61	36.0	544.0
10	96.38	29.88	36.0	544.0

[1] Estimated discharge for ungauged land-use areas based on an estimated runoff of 0.31 m/year.
[2] Total phosphorus and total nitrogen concentration estimated as the average of 1992 flow-weighted concentrations for Allatoona Creek and Shoal Creek.

Table 8
Contributing Areas and Estimated Flow and Total Phosphorus Concentrations for Ungauged Local Land-Use Areas for Allatoona Lake for 1992

Model Segment	Contributing Land-use Area km^2	Estimated Mean Flow[1] hm^3/year	Mean Total Phosphorus µg P/L	Remark[2]
1	46.18	12.01	42.3	1
2	95.18	24.75	44.6	2
3	11.65	3.03	42.3	1
4	62.65	16.29	42.3	1
5	29.72	7.73	65.0	3
6	36.14	9.40	42.3	1
7	62.65	16.29	52.0	4
8	39.76	10.34	42.3	1
9	11.65	3.03	42.3	1
10	96.38	26.06	42.3	1

[1] Estimated discharge for ungauged land-use areas based on an estimated runoff of 0.26 m/year.
[2] Estimates of total phosphorus concentration obtained from the following sources and/or methods:
1.Average of 1992 flow-weighted concentrations for Tanyard Creek, Allatoona Creek, and Shoal Creek.
2.Flow-weighted concentration for Tanyard Creek for 1992.
3.Flow-weighted concentration for Rowland Creek for 1992.
4.Average of 1992 flow-weighted concentrations for Owl Creek and Kellog Creek.

Table 9
Water Quality Sampling Stations Associated with BATHTUB Model Segments for Walter F. George Lake for 1992 (Station descriptions are those identified in the original data)

Segment	Station	Station Descriptions
1	7	Railroad Bridge near Omaha, GA (RM 120.3)[1]
2	6	Off Florence Marina State Park (RM 112.7)
3	5	Near Confluence of Cowikee Creek (RM 101.7)
4	4	Upstream from Highway 82 (RM 94.9)
5	3	Off Cheneyhatchee Creek embayment (RM 89.5)
6	2	Off Pataula Creek embayment (RM 82.3)
7	1	Walter F. George Forebay (RM 75.4)

[1] RM indicates approximate river mile.

Table 10
Mean Mixed-Layer Water Quality Conditions and Associated CV Values for Walter F. George Lake, May-October 1992 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
1	Mean CV	56.7 0.05	889.0 0.06	16.5 0.27	0.9 0.08
2	Mean CV	53.7 0.04	858.0 0.09	18.3 0.08	0.9 0.08
3	Mean CV	42.8 0.06	742.0 0.04	19.6 0.04	1.1 0.05
4	Mean CV	38.7 0.06	624.0 0.07	19.6 0.10	1.3 0.04
5	Mean CV	31.3 0.05	521.0 0.07	16.3 0.08	1.6 0.02
6	Mean CV	26.2 0.08	479.0 0.05	18.5 0.19	1.7 0.08
7	Mean CV	22.6 0.09	475.0 0.03	16.7 0.15	1.8 0.07

Table 11
Water Quality Sampling Stations Associated with BATHTUB Model Segments for Lake Sidney Lanier for 1973 (Station names and descriptions are those identified in the original data)

Segment	Station	Description
4	320	Wilkie Bridge
7	319	Boiling Bridge
9	316	Middle Six Mile Creek Arm
11	314	Mary Alice Park
12	313	Lanier Islands Beach
14	318	Near Buoy FC6
16	322	Thompson Bridge
17	321	Near Gainesville Marina
19	317	Main Channel Old Federal
20	315	Open Channel Tidwell Access
21	312	Buford Dam

Table 12
Mean Mixed-Layer Water Quality Conditions and Associated CV Values for Lake Sidney Lanier, May-October 1973 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
4	Mean CV	21.3 0.20	486.0 0.08	6.7 0.08	2.0 0.04
7	Mean CV	12.5 0.05	485.6 0.07	5.2 0.03	2.1 0.09
9	Mean CV	17.3 0.18	286.0 0.14	5.0 0.19	3.0 0.03
11	Mean CV	19.1 0.14	457.0 0.28	4.7 0.00	3.0 0.00
12	Mean CV	8.6 0.07	480.0 0.36	3.4 0.03	2.9 0.03
14	Mean CV	44.0 0.04	657.0 0.10	11.3 0.08	1.9 0.21
16	Mean CV	17.2 0.10	543.0 0.05	11.4 0.18	2.1 0.04
17	Mean CV	13.1 0.07	457.0 0.15	5.0 0.07	2.4 0.00
19	Mean CV	8.7 0.19	300.0 0.14	4.8 0.19	3.0 0.12
20	Mean CV	14.8 0.20	359.8 0.19	4.2 0.05	3.2 0.02
21	Mean CV	7.0 0.11	256.9 0.14	4.2 0.08	3.2 0.03

Table 13
Mean Flows and Flow-Weighted Mean Total Phosphorus and Total Nitrogen Concentrations for 1973 for Selected Tributary Streams Entering Lake Sidney Lanier (Based on data collected during the National Eutrophication Survey (U.S. Environmental Protection Agency 1978), May-October 1973)

Tributary Name	Flow, m^3/sec	Total Phosphorus µg P/L	Total Nitrogen µg N/L
Chattahoochee River	28.4	50	717
Chestatee River	15.8	69	623
Wahoo Creek	1.8	72	931
West Fork Little River	0.9	55	1,072
East Fork Little River	0.8	62	1,295
Flat Creek (F1)	0.3	2,234	10,324
Flat Creek (H1)	1.0	41	739
Limestone Creek	0.2	158	1,036
Four Mile Creek	0.3	52	1,293

Table 14
Water Quality Sampling Stations Associated with BATHTUB Model Segments for Calibration (1990) and Verification (1991) Years for West Point Lake (Station descriptions are those identified in the original data)

Segment	Station Descriptions	
	1990[1]	1991[2]
1	—	—
2	—	NR3
3	—	—
4	—	—
5	—	BEC1, YC10, YC13JC, YC17, YC27BEC, YC29, YC2HC, YC7
6	—	TC2, WWC2TC, WWC6, WWC9
7	—	—
8	—	SC2, VC3, WEC10, WEC18, WEC26, WEC29CC, WEC5VC, WEC6
9	—	MC2, MC2EC, MC7
10	CH-12	123
11	—	113, 110, 106
12	—	104, 101
13	CH-10	96, 89
14	—	84, 74, 71
15	CH-7	65, 60
16	—	56YC
17	—	50, 45
18	CH-5	41, 39
19	—	36AWIC, 29
20	CH-4	15IC, 16, 18BC, 21AC, 25WEC, IC2
21	—	WES1, WES2, 8
22	CH-3	1, 2MC, EC2

[1] Stations monitored by Georgia Department of Natural Resources (Georgia Department of Natural Resources 1991).
[2] Stations included in the water quality study conducted by U.S. Army Engineer Waterways Experiment Station for the U.S. Army Engineer District, Mobile (Kennedy et al. 1994).

Table 15
Mean Mixed-Layer Water Quality Conditions and Associated CV Values for West Point Lake, May-October 1990 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
10	Mean CV	132.0 0.21	1,526.0 0.17	— —	— —
13	Mean CV	74.0 0.11	1,060.0 0.11	23.2 0.25	0.7 0.00
15	Mean CV	62.0 0.06	716.0 0.25	24.2 0.23	0.9 0.10
18	Mean CV	42.0 0.09	752.0 0.08	19.8 0.14	1.10 0.08
20	Mean CV	26.0 0.09	630.0 0.15	14.4 0.05	1.3 0.10
22	Mean CV	17.5 0.06	517.0 0.14	11.2 0.17	1.6 0.08

Table 16
Mean Mixed-Layer Water Quality Conditions and Associated CV Values for West Point Lake, May-October 1991 (CV values calculated as the standard error divided by the mean)

Segment		Total Phosphorus µg P/L	Total Nitrogen µg N/L	Chlorophyll *a* µg/L	Secchi, m
2	Mean CV	51.5 0.06	652.0 0.17	19.4 0.09	0.6 0.00
5	Mean CV	27.5 0.12	595.0 0.14	15.5 0.11	1.3 0.10
6	Mean CV	— —	— —	19.2 0.09	1.1 0.07
7	Mean CV	38.6 0.07	926.0 0.02	17.5 0.08	1.4 0.03
8	Mean CV	20.6 0.04	471.0 0.24	12.3 0.12	1.4 0.07
9	Mean CV	22.3 0.10	605.0 0.05	12.4 0.16	1.6 0.10
10	Mean CV	— —	— —	3.3 0.37	0.5 0.19
11	Mean CV	— —	— —	6.0 0.29	0.4 0.18
12	Mean CV	91.8 0.08	1,085.0 0.09	8.0 0.24	0.5 0.12
13	Mean CV	— —	— —	16.8 0.30	0.6 0.14
14	Mean CV	77.2 0.12	1,087.0 0.05	17.5 0.20	0.8 0.13
15	Mean CV	66.0 0.17	856.0 0.22	20.1 0.10	1.0 0.10
16	Mean CV	— —	— —	21.9 0.08	1.2 0.10
17	Mean CV	47.5 0.10	965.0 0.07	22.0 0.10	1.1 0.06
18	Mean CV	41.4 0.08	932.0 0.05	20.0 0.11	1.4 0.05
19	Mean CV	— —	— —	19.7 0.11	1.4 0.05
20	Mean CV	33.5 0.12	797.0 0.10	16.4 0.12	1.5 0.08
21	Mean CV	25.8 0.06	722.0 0.06	13.6 0.12	1.6 0.10
22	Mean CV	23.0 0.03	675.0 0.07	14.9 0.13	1.6 0.10

Table 17
Mean Flows and Flow-Weighted Mean Total Phosphorus Concentrations for 1991 for Selected Tributary Streams Entering West Point Lake (Based on data collected by USGS (Chattahoochee River only) and the U.S. Army Engineer Waterways Experiment Station, May-October 1991)

Tributary Name	Flow, m^3/sec	Total Phosphorus, μg P/L
Chattahoochee River	160.8	198.8
Yellowjacket Creek	3.2	48.0
Shoal Creek	0.4	32.0
Beech Creek	0.5	39.0
Whitewater Creek	0.2	19.0

Table 18
Contributing Area and Estimated Flow and Total Phosphorus Concentrations for Ungauged Local Land-Use Areas for West Point Lake, 1990 and 1991

Segment	Contributing Land Area, km^2	1991 Estimated Flow[1] hm^3/year	1990 Estimated Flow[2] hm^3/year	Total Phosphorus[3] µg P/L
1	69.1	16.1	10.4	34.5
2	119.4	28.3	17.9	34.5
3	235.0	55.7	35.3	34.5
4	50.2	11.9	7.5	34.5
5	130.9	31.0	19.6	34.5
6	64.2	15.2	9.6	34.5
7	38.9	9.2	5.8	34.5
8	606.6	143.8	91.0	34.5
9	64.2	15.2	9.6	34.5
10	114.7	27.2	17.2	34.5
11	52.5	12.4	7.9	34.5
12	31.1	7.4	4.7	34.5
13	19.5	4.6	2.9	34.5
14	5.8	1.4	0.9	34.5
15	33.1	7.8	5.0	34.5
16	18.1	4.3	2.7	34.5
17	8.4	2.0	1.3	34.5
18	7.8	1.8	1.2	34.5
19	18.1	4.3	2.7	34.5
20	44.7	10.6	6.7	34.5
21	22.4	5.3	3.4	34.5
22	14.6	3.5	2.2	34.5

[1] Estimated discharge for ungauged land-use areas for 1991 based on an estimated runoff of 0.237 m/year.
[2] Estimated discharge for ungauged land-use areas for 1990 based on an estimated runoff of 0.150 m/year.
[3] Estimated total phosphorus concentration computed as the average of mean concentrations for Yellowjacket, Beech, Shoal, and Whitewater creeks for 1991.

Table 19
Regional Model Calibration Factors for BATHTUB for Allatoona Lake (Based on water quality data for 1992)

Region	Segments	Lake Region or Embayment	Total Phosphorus	Chlorophyll *a*
1	1-3	Allatoona Creek	1.105	1.140
2	4	Little River	6.912	1.277
3	5	Stamp Creek	0.123	0.893
4	6-10	Etowah River	1.442	0.976

Table 20
Regional Model Calibration Factors for BATHTUB for Walter F. George Lake (Based on water quality data for 1992)

Segments	Region	Phosphorus	Nitrogen	Chlorophyll *a*
1	Upper George Lake	1.00	1.00	1.00
2-7	Mid and Lower George Lake	1.31	1.56	2.10

Table 21
Regional and Local Model Calibration Factors for BATHTUB for Lake Sidney Lanier (Based on water quality data for 1973)

Region	Segment	Lake Region or Embayment	Total Phosphorus	Total Nitrogen	Chlorophyll *a*
1	1-3 9-11 12-13 17-21	Wahoo Creek North Embayments South Embayments Lower Chattahoochee	0.42	0.39	1.14
2	14	Flat Creek	1.43	0.94	0.91
3	15-16	Upper Chattahoochee	4.01	0.84	2.50
4	4-8	Chestatee River	6.94	1.25	1.18

Table 22
Regional and Local Model Calibration Factors for BATHTUB for West Point Lake (Based on water quality data for 1991)

Region	Segments	Lake Region or Embayment	Total Phosphorus	Chlorophyll *a*
1	7	Wilson Creek	0.29	1.37
2	5	Yellowjacket Creek	1.11	1.49
3	6	Whitewater Creek	1.00	1.76
4	8	Wehadkee Creek	1.05	1.81
5	10	Upper Chattahoochee	2.24	0.27
5	11	Upper Chattahoochee	2.24	0.85
5	12	Upper Chattahoochee	2.24	1.46
5	13	Upper Chattahoochee	2.24	2.82
5	14	Upper Chattahoochee	2.24	3.02
5	15	Upper Chattahoochee	2.24	3.10
5	16	Upper Chattahoochee	2.24	2.61
6	17-22	Lower Chattahoochee	9.25	2.07
7	9	Maple Creek	3.28	1.69
8	1-4	Upper Embayments	1.73	1.02

Appendix A
Model Input Files for Allatoona Lake

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ALLATOONA LAKE 1992 (TP MODEL - UNCALIBRATED)

INPUT GROUP 2 - PRINT OPTIONS

 1 LIST INPUTS                        0 NO
 2 HYDRAULICS & DISPERSION            1 YES
 3 GROSS WATER & MASS BALANCES        2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT       2 ESTIMATED CONCS
 5 SUMMARIZE BALANCES BY SEGMENT      1 OBSERVED CONCS
 6 COMPARE OBS & PREDICTED CONCS      1 ALL SEGMENTS
 7 DIAGNOSTICS                        1 ALL SEGMENTS
 8 PROFILES                           2 ESTIMATED & OBSERVED CONCS
 9 PLOTS                              2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS               0 NO

INPUT GROUP 3 - MODEL OPTIONS

 1 CONSERVATIVE SUBSTANCE             0 NOT COMPUTED
 2 PHOSPHORUS BALANCE                 1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                   0 NOT COMPUTED
 4 CHLOROPHYLL-A                      2 P, LIGHT, T
 5 SECCHI DEPTH                       1 VS. CHLA & TURBIDITY
 6 DISPERSION                         1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION             1 DECAY RATES
 8 NITROGEN CALIBRATION               1 DECAY RATES
 9 ERROR ANALYSIS                     1 MODEL & DATA
10 AVAILABILITY FACTORS               0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR      CV       FACTOR

 1 CONSERV        .00      .00         .00
 2 TOTAL P      30.00      .50        1.00
 3 TOTAL N     500.00      .50        1.00
 4 ORTHO P        .00      .00         .00
 5 INORG N        .00      .00         .00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER                           MEAN     CV

 1 PERIOD LENGTH     YRS            .586   .000
 2 PRECIPITATION M                  .746   .200
 3 EVAPORATION   M                  .759   .300
 4 INCREASE IN STORAGE M           -.070   .000
 5 FLOW FACTOR                     1.000   .000
 6 DISPERSION FACTOR               1.000   .700
 7 TOTAL AREA        KM2            .000   .000
 8 TOTAL VOLUME      HM3            .000   .000
```

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	6	Etowah River	1675.700	872.046	.123
2	4	10	Allatoona Disch	2900.800	1304.810	.194
3	1	1	Lk Acworth Disch	49.200	4.132	.123
4	1	1	Allatoona Creek	72.500	9.626	.187
5	2	1	Land Seg1	46.180	12.007	.000
6	2	2	Land Seg2	95.180	24.747	.000
7	2	3	Land Seg3	11.650	3.029	.000
8	1	4	Little River	354.800	128.298	.184
9	1	4	Noonday Creek	126.900	49.735	.194
10	1	6	Shoal Creek	173.500	47.862	.130
11	2	7	Land Seg7	62.650	16.185	.000
12	2	8	Land Seg8	39.760	10.338	.000
13	2	9	Land Seg9	11.650	3.029	.000
14	1	5	Stamp Creek	46.600	10.916	.087
15	2	5	Land Seg5	29.720	7.727	.000
16	2	10	Land Seg10	96.380	25.059	.000
17	2	4	Land Seg4	62.650	16.286	.000
18	2	6	Land Seg6	36.140	9.396	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N
1	.0/ .00	65.6/.33	.0/.00	.0/.00	.0/.00
2	.0/ .00	49.2/.38	.0/.00	.0/.00	.0/.00
3	.0/ .00	22.4/.09	.0/.00	.0/.00	.0/.00
4	.0/ .00	44.5/.22	.0/.00	.0/.00	.0/.00
5	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
6	.0/ .00	44.6/.00	.0/.00	.0/.00	.0/.00
7	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
8	.0/ .00	50.0/.20	.0/.00	.0/.00	.0/.00
9	.0/ .00	150.0/.20	.0/.00	.0/.00	.0/.00
10	.0/ .00	37.8/.13	.0/.00	.0/.00	.0/.00
11	.0/ .00	52.0/.00	.0/.00	.0/.00	.0/.00
12	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
13	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
14	.0/ .00	24.4/.19	.0/.00	.0/.00	.0/.00
15	.0/ .00	65.0/.00	.0/.00	.0/.00	.0/.00
16	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
17	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00
18	.0/ .00	42.3/.00	.0/.00	.0/.00	.0/.00

INPUT GROUP 8 - MODEL SEGMENTS

				--------- CALIBRATION FACTORS ----------					
SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	Segment 1.1	1.00	1.00	1.00	1.00	1.00	1.000
2	3	1	Segment 2.1	1.00	1.00	1.00	1.00	1.00	1.000
3	10	1	Segment 3.1	1.00	1.00	1.00	1.00	1.00	1.000
4	6	2	Segment 4.2	1.00	1.00	1.00	1.00	1.00	1.000
5	9	3	Segment 5.3	1.00	1.00	1.00	1.00	1.00	1.000
6	7	4	Segment 6.4	1.00	1.00	1.00	1.00	1.00	1.000
7	8	4	Segment 7.4	1.00	1.00	1.00	1.00	1.00	1.000
8	9	4	Segment 8.4	1.00	1.00	1.00	1.00	1.00	1.000
9	10	4	Segment 9.4	1.00	1.00	1.00	1.00	1.00	1.000
10	0	4	Segment 10.4	1.00	1.00	1.00	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	Segment 1.1	6.10	4.4550	2.03	2.03/ .12	.00/ .00	.0
2	Segment 2.1	5.00	3.6620	8.10	6.13/ .12	.00/ .00	.0
3	Segment 3.1	5.50	6.6320	12.15	7.28/ .12	.00/ .00	.0
4	Segment 4.2	10.50	4.5700	2.03	2.03/ .12	.00/ .00	.0
5	Segment 5.3	7.60	3.4310	10.12	6.80/ .12	.00/ .00	.0
6	Segment 6.4	10.00	7.4390	4.12	3.97/ .12	.00/ .00	.0
7	Segment 7.4	9.70	6.9780	8.10	6.13/ .12	.00/ .00	.0
8	Segment 8.4	8.20	6.4010	16.19	7.89/ .12	.00/ .00	.0
9	Segment 9.4	2.80	3.2010	24.29	8.36/ .12	.00/ .00	.0
10	Segment 10.4	1.20	.6920	29.35	8.39/ .12	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	.46	.0	18.5	1346.7	9.4	1.5	.0	.0	.0	.0
	CV:	.13	.00	.13	.10	.15	.08	.00	.00	.00	.00
2	MN:	.53	.0	24.9	1560.0	10.7	1.4	.0	.0	.0	.0
	CV:	.12	.00	.12	.18	.11	.08	.00	.00	.00	.00
3	MN:	.33	.0	23.2	2007.1	7.8	2.1	.0	.0	.0	.0
	CV:	.10	.00	.14	.21	.17	.04	.00	.00	.00	.00
4	MN:	.49	.0	34.8	1871.1	18.1	1.2	.0	.0	.0	.0
	CV:	.16	.00	.19	.12	.10	.08	.00	.00	.00	.00
5	MN:	.37	.0	33.8	1617.5	9.2	1.8	.0	.0	.0	.0
	CV:	.08	.00	.13	.19	.09	.04	.00	.00	.00	.00
6	MN:	.38	.0	28.9	1711.4	11.2	1.7	.0	.0	.0	.0
	CV:	.13	.00	.15	.29	.07	.08	.00	.00	.00	.00
7	MN:	.32	.0	24.9	2497.9	9.9	1.9	.0	.0	.0	.0
	CV:	.07	.00	.08	.29	.05	.04	.00	.00	.00	.00
8	MN:	.30	.0	25.1	1653.8	8.3	2.1	.0	.0	.0	.0
	CV:	.05	.00	.09	.19	.05	.03	.00	.00	.00	.00
9	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	MN:	.29	.0	26.5	2425.0	7.8	2.3	.0	.0	.0	.0
	CV:	.11	.00	.18	.25	.12	.06	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	General	Stamp	N/A	N/A	Rowland	Kellog	Owl	Tanyard
5	2	Land Seg1	46.18	.00	.00	.00	.00	.00	.00	.00
6	2	Land Seg2	.00	.00	.00	.00	.00	.00	.00	95.18
7	2	Land Seg3	11.65	.00	.00	.00	.00	.00	.00	.00
11	2	Land Seg7	.00	.00	.00	.00	.00	31.13	31.13	.00
12	2	Land Seg8	39.76	.00	.00	.00	.00	.00	.00	.00
13	2	Land Seg9	11.65	.00	.00	.00	.00	.00	.00	.00
15	2	Land Seg5	.00	.00	.00	.00	29.72	.00	.00	.00
16	2	Land Seg10	96.38	.00	.00	.00	.00	.00	.00	.00
17	2	Land Seg4	62.64	.00	.00	.00	.00	.00	.00	.00
18	2	Land Seg6	36.14	.00	.00	.00	.00	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	General		.26	.0	42.3	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
2	Stamp Creek		.26	.0	24.4	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
3	N/A		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
4	N/A		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
5	Rowland Spr		.26	.0	65.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
6	Kellog Cr.		.26	.0	59.5	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
7	Owl Cr.		.26	.0	133.8	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
8	Tanyard Cr.		.26	.0	44.6	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

Observed WQ data from Clean Lakes/Kennesaw State College
P, Light, Flushing Model

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ALLATOONA LAKE 1992 (TP MODEL - CALIBRATED)

INPUT GROUP 2 - PRINT OPTIONS

 1 LIST INPUTS                        0 NO
 2 HYDRAULICS & DISPERSION            1 YES
 3 GROSS WATER & MASS BALANCES        2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT       2 ESTIMATED CONCS
 5 SUMMARIZE BALANCES BY SEGMENT      1 OBSERVED CONCS
 6 COMPARE OBS & PREDICTED CONCS      1 ALL SEGMENTS
 7 DIAGNOSTICS                        1 ALL SEGMENTS
 8 PROFILES                           2 ESTIMATED & OBSERVED CONCS
 9 PLOTS                              2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS               0 NO

INPUT GROUP 3 - MODEL OPTIONS

 1 CONSERVATIVE SUBSTANCE             0 NOT COMPUTED
 2 PHOSPHORUS BALANCE                 1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                   0 NOT COMPUTED
 4 CHLOROPHYLL-A                      2 P, LIGHT, T
 5 SECCHI DEPTH                       1 VS. CHLA & TURBIDITY
 6 DISPERSION                         1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION             1 DECAY RATES
 8 NITROGEN CALIBRATION               1 DECAY RATES
 9 ERROR ANALYSIS                     1 MODEL & DATA
10 AVAILABILITY FACTORS               0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR       CV      FACTOR

 1 CONSERV         .00      .00        .00
 2 TOTAL P       30.00      .50       1.00
 3 TOTAL N      500.00      .50       1.00
 4 ORTHO P         .00      .00        .00
 5 INORG N         .00      .00        .00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER                          MEAN     CV
 1 PERIOD LENGTH      YRS          .586   .000
 2 PRECIPITATION M                 .746   .200
 3 EVAPORATION   M                 .759   .300
 4 INCREASE IN STORAGE M          -.070   .000
 5 FLOW FACTOR                    1.000   .000
 6 DISPERSION FACTOR              1.000   .700
 7 TOTAL AREA         KM2          .000   .000
 8 TOTAL VOLUME       HM3          .000   .000
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INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	6	Etowah River	1675.700	872.046	.123
2	4	10	Allatoona Disch	2900.800	1304.810	.194
3	1	1	Lk Acworth Disch	49.200	4.132	.123
4	1	1	Allatoona Creek	72.500	9.626	.187
5	2	1	Land Seg1	46.180	12.007	.000
6	2	2	Land Seg2	95.180	24.747	.000
7	2	3	Land Seg3	11.650	3.029	.000
8	1	4	Little River	354.800	128.298	.184
9	1	4	Noonday Creek	126.900	49.735	.194
10	1	6	Shoal Creek	173.500	47.862	.130
11	2	7	Land Seg7	62.650	16.185	.000
12	2	8	Land Seg8	39.760	10.338	.000
13	2	9	Land Seg9	11.650	3.029	.000
14	1	5	Stamp Creek	46.600	10.916	.087
15	2	5	Land Seg5	29.720	7.727	.000
16	2	10	Land Seg10	96.380	25.059	.000
17	2	4	Land Seg4	62.650	16.286	.000
18	2	6	Land Seg6	36.140	9.396	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	65.6/ .33	.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	49.2/ .38	.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	22.4/ .09	.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	44.5/ .22	.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	44.6/ .00	.0/ .00	.0/ .00	.0/ .00	.0
7	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	50.0/ .20	.0/ .00	.0/ .00	.0/ .00	.0
9	.0/ .00	150.0/ .20	.0/ .00	.0/ .00	.0/ .00	.0
10	.0/ .00	37.8/ .13	.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	52.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	24.4/ .19	.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	65.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0
18	.0/ .00	42.3/ .00	.0/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

SEG	OUTFLOW	GROUP	SEGMENT NAME	CALIBRATION FACTORS P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	Segment 1.1	1.05	1.00	1.14	1.00	1.00	1.000
2	3	1	Segment 2.1	1.05	1.00	1.14	1.00	1.00	1.000
3	10	1	Segment 3.1	1.05	1.00	1.14	1.00	1.00	1.000
4	6	2	Segment 4.2	6.91	1.00	1.28	1.00	1.00	1.000
5	9	3	Segment 5.3	.12	1.00	.89	1.00	1.00	1.000
6	7	4	Segment 6.4	1.47	1.00	.98	1.00	1.00	1.000
7	8	4	Segment 7.4	1.47	1.00	.98	1.00	1.00	1.000
8	9	4	Segment 8.4	1.47	1.00	.98	1.00	1.00	1.000
9	10	4	Segment 9.4	1.47	1.00	.98	1.00	1.00	1.000
10	0	4	Segment 10.4	1.47	1.00	.98	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	Segment 1.1	6.10	4.4550	2.03	2.03/ .12	.00/ .00	.0
2	Segment 2.1	5.00	3.6620	8.10	6.13/ .12	.00/ .00	.0
3	Segment 3.1	5.50	6.6320	12.15	7.28/ .12	.00/ .00	.0
4	Segment 4.2	10.50	4.5700	2.03	2.03/ .12	.00/ .00	.0
5	Segment 5.3	7.60	3.4310	10.12	6.80/ .12	.00/ .00	.0
6	Segment 6.4	10.00	7.4390	4.12	3.97/ .12	.00/ .00	.0
7	Segment 7.4	9.70	6.9780	8.10	6.13/ .12	.00/ .00	.0
8	Segment 8.4	8.20	6.4010	16.19	7.89/ .12	.00/ .00	.0
9	Segment 9.4	2.80	3.2010	24.29	8.36/ .12	.00/ .00	.0
10	Segment 10.4	1.20	.6920	29.35	8.39/ .12	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	.46	.0	18.5	1346.7	9.4	1.5	.0	.0	.0	.0
	CV:	.13	.00	.13	.10	.15	.08	.00	.00	.00	.00
2	MN:	.53	.0	24.9	1560.0	10.7	1.4	.0	.0	.0	.0
	CV:	.12	.00	.12	.18	.11	.08	.00	.00	.00	.00
3	MN:	.33	.0	23.2	2007.1	7.8	2.1	.0	.0	.0	.0
	CV:	.10	.00	.14	.21	.17	.04	.00	.00	.00	.00
4	MN:	.49	.0	34.8	1871.1	18.1	1.2	.0	.0	.0	.0
	CV:	.16	.00	.19	.12	.10	.08	.00	.00	.00	.00
5	MN:	.37	.0	33.8	1617.5	9.2	1.8	.0	.0	.0	.0
	CV:	.08	.00	.13	.19	.09	.04	.00	.00	.00	.00
6	MN:	.38	.0	28.9	1711.4	11.2	1.7	.0	.0	.0	.0
	CV:	.13	.00	.15	.29	.07	.08	.00	.00	.00	.00
7	MN:	.32	.0	24.9	2497.9	9.9	1.9	.0	.0	.0	.0
	CV:	.07	.00	.08	.29	.05	.04	.00	.00	.00	.00
8	MN:	.30	.0	25.1	1653.8	8.3	2.1	.0	.0	.0	.0
	CV:	.05	.00	.09	.19	.05	.03	.00	.00	.00	.00
9	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	MN:	.29	.0	26.5	2425.0	7.8	2.3	.0	.0	.0	.0
	CV:	.11	.00	.18	.25	.12	.06	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	General	Stamp	N/A	N/A	Rowland	Kellog	Owl	Tanyard
5	2	Land Seg1	46.18	.00	.00	.00	.00	.00	.00	.00
6	2	Land Seg2	.00	.00	.00	.00	.00	.00	.00	95.18
7	2	Land Seg3	11.65	.00	.00	.00	.00	.00	.00	.00
11	2	Land Seg7	.00	.00	.00	.00	.00	31.13	31.13	.00
12	2	Land Seg8	39.76	.00	.00	.00	.00	.00	.00	.00
13	2	Land Seg9	11.65	.00	.00	.00	.00	.00	.00	.00
15	2	Land Seg5	.00	.00	.00	.00	29.72	.00	.00	.00
16	2	Land Seg10	96.38	.00	.00	.00	.00	.00	.00	.00
17	2	Land Seg4	62.64	.00	.00	.00	.00	.00	.00	.00
18	2	Land Seg6	36.14	.00	.00	.00	.00	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	General		.26	.0	42.3	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
2	Stamp Creek		.26	.0	24.4	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
3	N/A		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
4	N/A		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
5	Rowland Spr		.26	.0	65.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
6	Kellog cr.		.26	.0	59.5	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
7	Owl Cr.		.26	.0	133.8	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
8	Tanyard Cr.		.26	.0	44.6	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

Observed WQ data from Clean Lakes/Kennesaw State College
P, Light, Flush Model
Regional calibration

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ALLATOONA LAKE 1973 (TP MODEL- VERIFICATION)

INPUT GROUP 2 - PRINT OPTIONS

 1 LIST INPUTS                        0 NO
 2 HYDRAULICS & DISPERSION            1 YES
 3 GROSS WATER & MASS BALANCES        2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT       2 ESTIMATED CONCS
 5 SUMMARIZE BALANCES BY SEGMENT      1 OBSERVED CONCS
 6 COMPARE OBS & PREDICTED CONCS      1 ALL SEGMENTS
 7 DIAGNOSTICS                        1 ALL SEGMENTS
 8 PROFILES                           2 ESTIMATED & OBSERVED CONCS
 9 PLOTS                              2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS               0 NO

INPUT GROUP 3 - MODEL OPTIONS

 1 CONSERVATIVE SUBSTANCE             0 NOT COMPUTED
 2 PHOSPHORUS BALANCE                 1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                   0 NOT COMPUTED
 4 CHLOROPHYLL-A                      2 P, LIGHT, T
 5 SECCHI DEPTH                       1 VS. CHLA & TURBIDITY
 6 DISPERSION                         1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION             1 DECAY RATES
 8 NITROGEN CALIBRATION               1 DECAY RAYES
 9 ERROR ANALYSIS                     1 MODEL & DATA
10 AVAILABILITY FACTORS               0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR      CV      FACTOR

 1 CONSERV         .00     .00         .00
 2 TOTAL P       30.00     .50        1.00
 3 TOTAL N      500.00     .50        1.00
 4 ORTHO P         .00     .00         .00
 5 INORG N         .00     .00         .00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER                          MEAN     CV

 1 PERIOD LENGTH     YRS           .586   .000
 2 PRECIPITATION M                 .900   .200
 3 EVAPORATION   M                 .808   .300
 4 INCREASE IN STORAGE M         -2.230   .000
 5 FLOW FACTOR                    1.000   .000
 6 DISPERSION FACTOR              1.000   .700
 7 TOTAL AREA        KM2           .000   .000
 8 TOTAL VOLUME      HM3           .000   .000
```

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	6	Etowah River	1675.700	1091.280	.000
2	4	10	Allatoona Disch	2900.800	2576.080	.000
3	1	1	Lk Acworth Disch	49.200	22.070	.000
4	1	1	Allatoona Creek	31.540	22.475	.000
5	2	1	Land Seg1	46.180	14.316	.000
6	2	2	Land Seg2	95.180	29.506	.000
7	2	3	Land Seg3	11.650	3.612	.000
8	1	4	Little River	354.800	157.700	.000
9	1	4	Noonday Creek	126.900	56.770	.000
10	1	6	Shoal Creek	173.500	82.000	.000
11	2	7	Land Seg7	62.650	19.298	.000
12	2	8	Land Seg8	39.760	12.326	.000
13	2	9	Land Seg9	11.650	3.612	.000
14	1	5	Stamp Creek	46.600	14.446	.000
15	2	5	Land Seg5	29.720	9.213	.000
16	2	10	Land Seg10	96.380	29.878	.000
17	2	4	Land Seg4	62.650	19.418	.000
18	2	6	Land Seg6	36.140	11.203	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	51.0/ .15	587.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	32.0/ .19	.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	49.0/ .00	537.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	35.0/ .00	572.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
7	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	88.0/ .00	1020.0/ .00	.0/ .00	.0/ .00	.0
9	.0/ .00	244.0/ .00	1105.0/ .00	.0/ .00	.0/ .00	.0
10	.0/ .00	36.0/ .00	515.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	24.0/ .00	401.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0
18	.0/ .00	36.0/ .00	544.0/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

				--------- CALIBRATION FACTORS ----------					
SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	Segment 1.1	1.05	1.00	1.14	1.00	1.00	1.000
2	3	1	Segment 2.1	1.05	1.00	1.14	1.00	1.00	1.000
3	10	1	Segment 3.1	1.05	1.00	1.14	1.00	1.00	1.000
4	6	2	Segment 4.2	6.91	1.00	1.28	1.00	1.00	1.000
5	9	3	Segment 5.3	.12	1.00	.89	1.00	1.00	1.000
6	7	4	Segment 6.4	1.47	1.00	.98	1.00	1.00	1.000
7	8	4	Segment 7.4	1.47	1.00	.98	1.00	1.00	1.000
8	9	4	Segment 8.4	1.47	1.00	.98	1.00	1.00	1.000
9	10	4	Segment 9.4	1.47	1.00	.98	1.00	1.00	1.000
10	0	4	Segment 10.4	1.47	1.00	.98	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	Segment 1.1	6.10	4.4550	2.03	2.03/ .12	.00/ .00	.0
2	Segment 2.1	5.00	3.6620	8.10	6.13/ .12	.00/ .00	.0
3	Segment 3.1	5.50	6.6320	12.15	7.28/ .12	.00/ .00	.0
4	Segment 4.2	10.50	4.5700	2.03	2.03/ .12	.00/ .00	.0
5	Segment 5.3	7.60	3.4310	10.12	6.80/ .12	.00/ .00	.0
6	Segment 6.4	10.00	7.4390	4.12	3.97/ .12	.00/ .00	.0
7	Segment 7.4	9.70	6.9780	8.10	6.13/ .12	.00/ .00	.0
8	Segment 8.4	8.20	6.4010	16.19	7.89/ .12	.00/ .00	.0
9	Segment 9.4	2.80	3.2010	24.29	8.36/ .12	.00/ .00	.0
10	Segment 10.4	1.20	.6920	29.35	8.39/ .12	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	.65	.0	22.3	.0	7.5	1.3	.0	.0	.0	.0
	CV:	.19	.00	.39	.00	.46	.13	.00	.00	.00	.00
2	MN:	.37	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.20	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	MN:	.43	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	.68	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.71	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	MN:	.65	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.20	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	MN:	.63	.0	26.6	.0	6.3	1.3	.0	.0	.0	.0
	CV:	.46	.00	.30	.00	.75	.36	.00	.00	.00	.00
7	MN:	.29	.0	.0	.0	.0	.0	.0	4.0	.0	.0
	CV:	.36	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	MN:	.34	.0	14.3	.0	12.5	1.7	.0	.0	.0	.0
	CV:	.45	.00	.13	.00	.59	.07	.00	.00	.00	.00
9	MN:	.55	.0	19.6	.0	8.0	1.4	.0	.0	.0	.0
	CV:	.29	.00	.20	.00	.64	.17	.00	.00	.00	.00
10	MN:	.52	.0	19.3	.0	4.3	1.7	.0	.0	.0	.0
	CV:	.23	.00	.19	.00	.35	.19	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	landuse1	landuse2	landuse3	landuse4
5	2	Land Seg1	46.18	.00	.00	.00
6	2	Land Seg2	95.18	.00	.00	.00
7	2	Land Seg3	11.65	.00	.00	.00
11	2	Land Seg7	62.25	.00	.00	.00
12	2	Land Seg8	39.76	.00	.00	.00
13	2	Land Seg9	11.65	.00	.00	.00
15	2	Land Seg5	29.72	.00	.00	.00
16	2	Land Seg10	96.38	.00	.00	.00
17	2	Land Seg4	62.64	.00	.00	.00
18	2	Land Seg6	36.14	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	landuse1		.31	.0	36.0	544.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
2	landuse2		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
3	landuse3		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					
4	landuse4		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	
		CV:	.00					

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

Observed WQ data from NES
P, Light, Flush Model
Stream loads from NES
Regional calibration from 1992
Landuse from NES

Appendix B
Model Input Files For Walter F. George Lake

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W. F. GEORGE 1992 (P&N MODEL - UNCALIBRATED)

INPUT GROUP 2 - PRINT OPTIONS

 1 LIST INPUTS                        0 NO
 2 HYDRAULICS & DISPERSION            1 YES
 3 GROSS WATER & MASS BALANCES        2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT       2 ESTIMATED CONCS
 5 SUMMARIZE BALANCES BY SEGMENT      2 ESTIMATED CONCS
 6 COMPARE OBS & PREDICTED CONCS      1 ALL SEGMENTS
 7 DIAGNOSTICS                        1 ALL SEGMENTS
 8 PROFILES                           1 ESTIMATED CONCENTRATIONS
 9 PLOTS                              0 NO
10 SENSITIVITY ANALYSIS               0 NO

INPUT GROUP 3 - MODEL OPTIONS

 1 CONSERVATIVE SUBSTANCE             0 NOT COMPUTED
 2 PHOSPHORUS BALANCE                1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                  1 2ND ORDER, AVAIL N
 4 CHLOROPHYLL-A                     1 P, N, LIGHT, Y
 5 SECCHI DEPTH                      1 VS. CHLA & TURBIDITY
 6 DISPERSION                        1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION            1 DECAY RATES
 8 NITROGEN CALIBRATION              1 DECAY RATES
 9 ERROR ANALYSIS                    1 MODEL & DATA
10 AVAILABILITY FACTORS              0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR       CV       FACTOR

 1 CONSERV          .00     .00          .00
 2 TOTAL P        30.00     .50         1.00
 3 TOTAL N      1000.00     .50         1.00
 4 ORTHO P        15.00     .50          .00
 5 INORG N       500.00     .50          .00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER                             MEAN      CV

 1 PERIOD LENGTH     YRS              .583    .000
 2 PRECIPITATION M                    .000    .000
 3 EVAPORATION   M                    .000    .000
 4 INCREASE IN STORAGE M             -.384    .000
 5 FLOW FACTOR                       1.000    .000
 6 DISPERSION FACTOR                 1.000    .000
 7 TOTAL AREA        KM2           182.000    .000
 8 TOTAL VOLUME      HM3          1152.600    .000
```

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	1	Lake Inflow	15731.590	5245.800	.034
2	4	7	Lake Outflow	19321.400	5264.766	.038

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/.00	59.7/.06	847.0/.07	.0/.00	.0/.00	.0
2	.0/.00	.0/.00	.0/.00	.0/.00	.0/.00	.0

INPUT GROUP 8 - MODEL SEGMENTS

SEG	OUTFLOW	GROUP	SEGMENT NAME	------- CALIBRATION FACTORS ------ P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	Upper Lake	1.00	1.00	1.00	1.00	1.00	1.000
2	3	1	Florence	1.00	1.00	1.00	1.00	1.00	1.000
3	4	1	Cowikee	1.00	1.00	1.00	1.00	1.00	1.000
4	5	1	US82	1.00	1.00	1.00	1.00	1.00	1.000
5	6	1	Cheneyhtch	1.00	1.00	1.00	1.00	1.00	1.000
6	7	1	Pataula	1.00	1.00	1.00	1.00	1.00	1.000
7	0	1	Forebay	1.00	1.00	1.00	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	Upper Lake	8.53	3.4000	5.00	2.39/.12	.00/.00	.0
2	Florence	12.55	5.0000	5.00	6.34/.12	.00/.00	.0
3	Cowikee	14.32	11.5000	5.00	6.34/.12	.00/.00	.0
4	US82	9.81	27.5000	6.70	7.15/.12	.00/.00	.0
5	Cheneyhtch	10.14	28.4000	7.30	7.39/.12	.00/.00	.0
6	Pataula	11.58	46.3000	8.00	7.59/.12	.00/.00	.0
7	Forebay	5.95	28.6000	8.70	7.75/.12	.00/.00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTAL P MG/M3	TOTAL N MG/M3	CHL-A MG/M3	SECCHI M
1	MN:	.65	.0	56.7	889.0	16.5	.9
	CV:	.21	.00	.05	.06	.27	.08
2	MN:	.61	.0	53.7	858.0	18.3	.9
	CV:	.15	.00	.04	.09	.08	.08
3	MN:	.43	.0	42.8	742.0	19.6	1.1
	CV	.11	.00	.06	.04	.04	.05
4	MN:	.31	.0	38.7	624.0	19.6	1.3
	CV:	.20	.00	.06	.07	.10	.04
5	MN:	.22	.0	31.3	521.0	16.3	1.6
	CV:	.16	.00	.05	.07	.08	.02
6	MN:	.13	.0	26.2	479.0	18.5	1.7
	CV:	.78	.00	.08	.05	.19	.08
7	MN:	.13	.0	22.8	475.0	16.7	1.8
	CV:	.58	.00	.09	.03	.15	.07

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

NONE

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

NONE

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.00
2	N DECAY RATE	1.000	.00
3	CHL-A MODEL	1.000	.00
4	SECCHI MODEL	1.000	.00
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.025	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

1992 Auburn Water Quality Data
P and N Model
TN and TP availability set to 1.0
Inflow = Station 8

W. F. GEORGE 1992 (P&N MODEL - CALIBRATED)

INPUT GROUP 2 - PRINT OPTIONS

1	LIST INPUTS	0 NO
2	HYDRAULICS & DISPERSION	1 YES
3	GROSS WATER & MASS BALANCES	2 ESTIMATED CONCS
4	DETAILED BALANCES BY SEGMENT	2 ESTIMATED CONCS
5	SUMMARIZE BALANCES BY SEGMENT	2 ESTIMATED CONCS
6	COMPARE OBS & PREDICTED CONCS	1 ALL SEGMENTS
7	DIAGNOSTICS	1 ALL SEGMENTS
8	PROFILES	1 ESTIMATED CONCENTRATIONS
9	PLOTS	0 NO
10	SENSITIVITY ANALYSIS	0 NO

INPUT GROUP 3 - MODEL OPTIONS

1	CONSERVATIVE SUBSTANCE	0 NOT COMPUTED
2	PHOSPHORUS BALANCE	1 2ND ORDER, AVAIL P
3	NITROGEN BALANCE	1 2ND ORDER, AVAIL N
4	CHLOROPHYLL-A	1 P, N, LIGHT, T
5	SECCHI DEPTH	1 VS. CHLA & TURBIDITY
6	DISPERSION	1 FISCHER-NUMERIC
7	PHOSPHORUS CALIBRATION	1 DECAY RATES
8	NITROGEN CALIBRATION	1 DECAY RATES
9	ERROR ANALYSIS	1 MODEL & DATA
10	AVAILABILITY FACTORS	0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

VARIABLE	ATMOSPHERIC LOADINGS KG/KM2-YR	CV	AVAILABILITY FACTOR
1 CONSERV	.00	.00	.00
2 TOTAL P	30.00	.50	1.00
3 TOTAL N	1000.00	.50	1.00
4 ORTHO P	15.00	.50	.00
5 INORG N	500.00	.50	.00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER		MEAN	CV
1 PERIOD LENGTH	YRS	.583	.000
2 PRECIPITATION	M	.000	.000
3 EVAPORATION	M	.000	.000
4 INCREASE IN STORAGE	M	-.384	.000
5 FLOW FACTOR		1.000	.000
6 DISPERSION FACTOR		1.000	.000
7 TOTAL AREA	KM2	182.000	.000
8 TOTAL VOLUME	HM3	1152.600	.000

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	1	Lake Inflow	15731.590	5245.800	.034
2	4	7	Lake Outflow	19321.400	5264.766	.038

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .0	59.7/.06	847.0/.07	.0/.00	.0/.00	.0
2	.0/ .00	.0/.00	.0/.00	.0/.00	.0/.00	.0

INPUT GROUP 8 - MODEL SEGMENTS

SEG	OUTFLOW	GROUP	SEGMENT NAME	------- CALIBRATION FACTORS ------ P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	Upper Lake	1.00	1.00	1.00	1.00	1.00	1.000
2	3	1	Florence	1.31	1.56	2.10	1.00	1.00	1.000
3	4	1	Cowikee	1.31	1.56	2.10	1.00	1.00	1.000
4	5	1	US82	1.31	1.56	2.10	1.00	1.00	1.000
5	6	1	Cheneyhtch	1.31	1.56	2.10	1.00	1.00	1.000
6	7	1	Pataula	1.31	1.56	2.10	1.00	1.00	1.000
7	0	1	Forebay	1.31	1.56	2.10	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	Upper Lake	8.53	3.4000	5.00	2.39/.12	.00/.00	.0
2	Florence	12.55	5.0000	5.00	6.34/.12	.00/.00	.0
3	Cowikee	14.32	11.5000	5.00	6.34/.12	.00/.00	.0
4	US82	9.81	27.5000	6.70	7.15/.12	.00/.00	.0
5	Cheneyhtch	10.14	28.4000	7.30	7.39/.12	.00/.00	.0
6	Pataula	11.58	46.3000	8.00	7.59/.12	.00/.00	.0
7	Forebay	5.95	28.6000	8.70	7.75/.12	.00/.00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3
1	MN:	.65	.0	56.7	889.0	16.5	.9	.0	.0
	CV:	.21	.00	.05	.06	.27	.08	.00	.00
2	MN:	.61	.0	53.7	858.0	18.3	.9	.0	.0
	CV:	.15	.00	.04	.09	.08	.08	.00	.00
3	MN:	.43	.0	42.8	742.0	19.6	1.1	.0	.0
	CV:	.11	.00	.06	.04	.04	.05	.00	.00
4	MN:	.31	.0	38.7	624.0	19.6	1.3	.0	.0
	CV:	.20	.00	.06	.07	.10	.04	.00	.00
5	MN:	.22	.0	31.3	521.0	16.3	1.6	.0	.0
	CV:	.16	.00	.05	.07	.08	.02	.00	.00
6	MN:	.13	.0	26.2	479.0	18.5	1.7	.0	.0
	CV:	.78	.00	.08	.05	.19	.08	.00	.00
7	MN:	.13	.0	22.8	475.0	16.7	1.8	.0	.0
	CV:	.58	.00	.09	.03	.15	.07	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

NONE

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

NONE

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.00
2	N DECAY RATE	1.000	.00
3	CHL-A MODEL	1.000	.00
4	SECCHI MODEL	1.000	.00
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.025	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

1992 Auburn Water Quality data
P and N Model
TN and TP availbility set to 1.0
Inflow = Station 8
Calibrated with 1992 data
Segment 1 set to defaults (not calibrated)

Appendix C
Model Input Files for Lake Sidney Lanier

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Lanier UNCALIBRATED 1973

 INPUT GROUP 2 - PRINT OPTIONS
  1 LIST INPUTS                          0 NO
  2 HYDRAULICS & DISPERSION              1 YES
  3 GROSS WATER & MASS BALANCES          2 ESTIMATED CONCS
  4 DETAILED BALANCES BY SEGMENT         0 NO
  5 SUMMARIZE BALANCES BY SEGMENT        0 NO
  6 COMPARE OBS & PREDICTED CONCS        0 NO
  7 DIAGNOSTICS                          1 ALL SEGMENTS
  8 PROFILES                             1 ESTIMATED CONCENTRATIONS
  9 PLOTS                                2 GEOMETRIC SCALE
 10 SENSITIVITY ANALYSIS                 0 NO

 INPUT GROUP 3 - MODEL OPTIONS
  1 CONSERVATIVE SUBSTANCE               0 NOT COMPUTED
  2 PHOSPHORUS BALANCE                   1 2ND ORDER, AVAIL P
  3 NITROGEN BALANCE                     1 2ND ORDER, AVAIL N
  4 CHLOROPHYLL-A                        1 P, N, LIGHT, T
  5 SECCHI DEPTH                         1 VS. CHLA & TURBIDITY
  6 DISPERSION                           1 FISCHER-NUMERIC
  7 PHOSPHORUS CALIBRATION               1 DECAY RATES
  8 NITROGEN CALIBRATION                 1 DECAY RATES
  9 ERROR ANALYSIS                       1 MODEL & DATA
 10 AVAILABILITY FACTORS                 0 MODEL 1 ONLY

 INPUT GROUP 4 - VARIABLES
             ATMOSPHERIC LOADINGS AVAILABILITY
 VARIABLE      KG/KM2-YR       CV      FACTOR
  1 CONSERV          .00      .00         .00
  2 TOTAL P        25.40      .50        1.00
  3 TOTAL N       927.00      .50        1.00
  4 ORTHO P        13.00      .50         .00
  5 INORG N       450.00      .50         .00

 INPUT GROUP 5 - GLOBAL PARAMETERS
 PARAMETER                          MEAN     CV
  1 PERIOD LENGTH     YRS           .583   .000
  2 PRECIPITATION M                 .932   .200
  3 EVAPORATION   M                1.148   .300
  4 INCREASE IN STORAGE M         -1.058   .000
  5 FLOW FACTOR                    1.000   .000
  6 DISPERSION FACTOR              1.000   .700
  7 TOTAL AREA        KM2        155.979   .000
  8 TOTAL VOLUME      HM3       2411.739   .000
```

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	15	CHATTAHOOCHEE RV	11137.000	895.740	.000
2	2	1	Runoff 1	249.000	79.060	.000
3	2	2	Runoff 2	496.000	157.391	.000
4	2	3	Runoff 3	65.300	20.700	.000
5	2	4	Runoff 4	261.100	82.769	.000
6	2	5	Runoff 5	23.300	7.386	.000
7	2	6	Runoff 6	30.300	9.605	.000
8	2	7	Runoff 7	28.000	8.876	.000
9	2	8	Runoff 8	37.300	11.824	.000
10	2	9	Runoff 9	74.600	23.648	.000
11	2	10	Runoff 10	35.000	11.095	.000
12	2	11	Runoff 11	207.400	65.746	.000
13	2	12	Runoff 12	28.000	8.876	.000
14	2	13	Runoff 13	42.000	13.314	.000
15	2	14	Runoff 14	93.200	29.544	.000
16	2	15	Runoff 15	815.800	258.609	.000
17	2	16	Runoff 16	23.300	7.354	.000
18	2	17	Runoff 17	32.600	10.334	.000
19	2	18	Runoff 18	32.600	10.334	.000
20	2	19	Runoff 19	67.600	21.429	.000
21	2	20	Runoff 20	102.600	32.524	.000
22	2	21	Runoff 21	7.000	2.219	.000
23	1	4	CHESTATEE RIVER	613.800	498.330	.000
24	1	3	WAHOO CREEK TRIB	64.700	57.772	.000
25	1	2	W FORK LITTLE RV	46.600	28.386	.000
26	1	2	E FORK LITTLE RV	41.400	25.232	.000
27	1	14	FLAT CREEK (F1)	15.500	9.462	.000
28	1	15	LIMESTONE CREEK	10.400	6.308	.000
29	1	14	FLAT CREEK (H1)	46.600	31.540	.000
30	1	9	FOUR MILE CREEK	20.700	9.462	.000
31	1	21	OUTFLOW	689.900	2691.370	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	50.0/ .00	717.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
7	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
9	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
10	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
18	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
19	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
20	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
21	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
22	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
23	.0/ .00	69.0/ .00	623.0/ .00	.0/ .00	.0/ .00	.0
24	.0/ .00	72.0/ .00	931.0/ .00	.0/ .00	.0/ .00	.0
25	.0/ .00	55.0/ .00	1072.0/ .00	.0/ .00	.0/ .00	.0
26	.0/ .00	62.0/ .00	1295.0/ .00	.0/ .00	.0/ .00	.0
27	.0/ .00	2234.0/ .00	10324.0/ .00	.0/ .00	.0/ .00	.0
28	.0/ .00	158.0/ .00	1036.0/ .00	.0/ .00	.0/ .00	.0
29	.0/ .00	41.0/ .00	739.0/ .00	.0/ .00	.0/ .00	.0
30	.0/ .00	52.0/ .00	1293.0/ .00	.0/ .00	.0/ .00	.0
31	.0/ .00	14.8/ .00	359.9/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
				----------- CALIBRATION FACTORS -----------					
1	2	1	WAHOO CREEK	1.00	1.00	1.00	1.00	1.00	1.000
2	3	1	WEST FORK	1.00	1.00	1.00	1.00	1.00	1.000
3	16	1	WAHOO-LITTLE RIV	1.00	1.00	1.00	1.00	1.00	1.000
4	6	4	YELLOW CREEK	1.00	1.00	1.00	1.00	1.00	1.000
5	6	4	THOMPSON CREEK	1.00	1.00	1.00	1.00	1.00	1.000
6	7	4	CHEST1	1.00	1.00	1.00	1.00	1.00	1.000
7	8	4	TAYLOR CREEK	1.00	1.00	1.00	1.00	1.00	1.000
8	18	4	LATHAM CREEK	1.00	1.00	1.00	1.00	1.00	1.000
9	20	1	SIX-FOUR MILE	1.00	1.00	1.00	1.00	1.00	1.000
10	21	1	YOUNG DEER CRK	1.00	1.00	1.00	1.00	1.00	1.000
11	21	1	BALD BRIDGE CRK	1.00	1.00	1.00	1.00	1.00	1.000
12	21	1	SHOAL CREEK	1.00	1.00	1.00	1.00	1.00	1.000
13	14	1	BALUS CREEK	1.00	1.00	1.00	1.00	1.00	1.000
14	19	2	FLAT CREEK	1.00	1.00	1.00	1.00	1.00	1.000
15	16	1	CHAT1	1.00	1.00	1.00	1.00	1.00	1.000
16	17	3	CHAT2-SARDIS-ADA	1.00	1.00	1.00	1.00	1.00	1.000
17	18	1	CHAT3	1.00	1.00	1.00	1.00	1.00	1.000
18	19	1	CHAT4-CHEST BAY	1.00	1.00	1.00	1.00	1.00	1.000
19	20	1	CHAT5-2-MILE,MUD	1.00	1.00	1.00	1.00	1.00	1.000
20	21	1	CHAT6-FLOWRY,BIG	1.00	1.00	1.00	1.00	1.00	1.000
21	0	1	CHAT7-BUFORD DAM	1.00	1.00	1.00	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	WAHOO CREEK	3.80	2.3890	5.69	6.00/ .12	.00/ .00	.0
2	WEST FORK	5.00	2.6550	16.07	6.00/ .12	.00/ .00	.0
3	WAHOO-LITTLE RIV	5.00	3.8570	15.12	6.00/ .12	.00/ .00	.0
4	YELLOW CREEK	11.30	5.8370	9.62	6.00/ .12	.00/ .00	.0
5	THOMPSON CREEK	5.00	3.3130	11.77	6.00/ .00	.00/ .00	.0
6	CHEST1	3.00	3.3740	16.53	6.00/ .12	.00/ .00	.0
7	TAYLOR CREEK	5.00	2.1580	15.50	6.00/ .12	.00/ .00	.0
8	LATHAM CREEK	5.00	10.7300	20.36	6.00/ .00	.00/ .00	.0
9	SIX-FOUR MILE	6.30	7.6730	17.84	6.00/ .00	.00/ .00	.0
10	YOUNG DEER CRK	5.00	4.1130	16.31	6.00/ .12	.00/ .00	.0
11	BALD BRIDGE CRK	7.50	7.1530	18.92	6.00/ .00	.00/ .00	.0
12	SHOAL CREEK	3.80	5.7880	22.21	6.00/ .00	.00/ .00	.0
13	BALUS CREEK	2.50	1.3850	21.43	6.00/ .12	.00/ .00	.0
14	FLAT CREEK	5.80	3.7410	19.22	6.00/ .00	.00/ .00	.0
15	CHAT1	15.00	6.8800	12.57	6.00/ .12	.00/ .00	.0
16	CHAT2-SARDIS-ADA	5.00	8.9030	14.74	6.00/ .00	.00/ .00	.0
17	CHAT3	6.30	9.6640	18.58	6.00/ .00	.00/ .00	.0
18	CHAT4-CHEST BAY	5.00	8.8780	24.34	6.00/ .12	.00/ .00	.0
19	CHAT5-2-MILE,MUD	6.20	22.8600	21.97	6.00/ .00	.00/ .00	.0
20	CHAT6-FLOWRY,BIG	5.00	25.2400	24.13	6.00/ .12	.00/ .00	.0
21	CHAT7-BUFORD DAM	5.00	11.2700	27.72	6.00/ .00	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID	CONSER	TOTALP	TOTALN	CHL-A	SECCHI	ORG-N	TP-OP	HODV	MODV
		1/M	?	MG/M3	MG/M3	MG/M3	M	MG/M3	MG/M3	MG/M3-D	MG/M3-D
1	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	.37	.0	21.3	486.0	6.7	2.0	.0	6.8	.0	.0
	CV:	.06	.00	.20	.08	.08	.04	.00	.22	.00	.00
5	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	MN:	.38	.0	12.5	485.6	5.2	2.1	.0	9.0	.0	.0
	CV:	.11	.00	.05	.07	.03	.09	.00	.00	.00	.00
8	MN:	.35	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.22	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	MN:	.24	.0	17.3	286.0	5.0	3.0	.0	3.6	.0	.0
	CV:	.09	.00	.18	.14	.19	.03	.00	.18	.00	.00
10	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	MN:	.23	.0	19.1	457.0	4.7	3.0	.0	5.4	.0	.0
	CV:	.00	.00	.14	.28	.00	.00	.00	.20	.00	.00
12	MN:	.28	.0	8.6	480.0	3.4	2.9	.0	3.8	.0	.0
	CV:	.04	.00	.07	.36	.03	.03	.00	.24	.00	.00
13	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	MN:	.29	.0	44.0	657.0	11.3	1.9	.0	30.0	.0	.0
	CV:	.38	.00	.04	.10	.08	.21	.00	.00	.00	.00
15	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	MN:	.26	.0	17.2	543.0	11.4	2.1	.0	2.4	.0	.0
	CV:	.18	.00	.10	.05	.18	.04	.00	.16	.00	.00
17	MN:	.31	.0	13.1	457.0	5.0	2.4	.0	3.6	.0	.0
	CV:	.02	.00	.07	.15	.07	.00	.00	.10	.00	.00
18	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19	MN:	.24	.0	8.7	300.0	4.8	3.0	.0	6.0	.0	.0
	CV:	.19	.00	.19	.14	.19	.12	.00	.26	.00	.00
20	MN:	.23	.0	14.8	359.8	4.2	3.2	.0	12.5	.0	.0
	CV:	.03	.00	.20	.19	.05	.02	.00	.10	.00	.00
21	MN:	.23	.0	7.0	256.9	4.2	3.2	.0	5.0	.0	.0
	CV:	.05	.00	.11	.14	.08	.03	.00	.07	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	landuse1	landuse2	landuse3	landuse4
2	2	Runoff 1	249.40	.00	.00	.00
3	2	Runoff 2	496.50	.00	.00	.00
4	2	Runoff 3	65.30	.00	.00	.00
5	2	Runoff 4	261.10	.00	.00	.00
6	2	Runoff 5	23.30	.00	.00	.00
7	2	Runoff 6	30.30	.00	.00	.00
8	2	Runoff 7	28.00	.00	.00	.00
9	2	Runoff 8	37.30	.00	.00	.00
10	2	Runoff 9	74.60	.00	.00	.00
11	2	Runoff 10	35.00	.00	.00	.00
12	2	Runoff 11	207.40	.00	.00	.00
13	2	Runoff 12	28.00	.00	.00	.00
14	2	Runoff 13	42.00	.00	.00	.00
15	2	Runoff 14	93.20	.00	.00	.00
16	2	Runoff 15	815.80	.00	.00	.00
17	2	Runoff 16	23.20	.00	.00	.00
18	2	Runoff 17	32.60	.00	.00	.00
19	2	Runoff 18	32.60	.00	.00	.00
20	2	Runoff 19	67.60	.00	.00	.00
21	2	Runoff 20	102.60	.00	.00	.00
22	2	Runoff 21	7.00	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	landuse1		.32	.0	52.0	850.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
2	landuse2		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
3	landuse3		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
4	landuse4		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

Lanier CALIBRATION SET 1973

INPUT GROUP 2 - PRINT OPTIONS

1	LIST INPUTS	0 NO
2	HYDRAULICS & DISPERSION	1 YES
3	GROSS WATER & MASS BALANCES	2 ESTIMATED CONCS
4	DETAILED BALANCES BY SEGMENT	0 NO
5	SUMMARIZE BALANCES BY SEGMENT	0 NO
6	COMPARE OBS & PREDICTED CONCS	0 NO
7	DIAGNOSTICS	1 ALL SEGMENTS
8	PROFILES	1 ESTIMATED CONCENTRATIONS
9	PLOTS	2 GEOMETRIC SCALE
10	SENSITIVITY ANALYSIS	0 NO

INPUT GROUP 3 - MODEL OPTIONS

1	CONSERVATIVE SUBSTANCE	0 NOT COMPUTED
2	PHOSPHORUS BALANCE	1 2ND ORDER, AVAIL P
3	NITROGEN BALANCE	1 2ND ORDER, AVAIL N
4	CHLOROPHYLL-A	1 P, N, LIGHT, T
5	SECCHI DEPTH	1 VS. CHLA & TURBIDITY
6	DISPERSION	1 FISCHER-NUMERIC
7	PHOSPHORUS CALIBRATION	1 DECAY RATES
8	NITROGEN CALIBRATION	1 DECAY RATES
9	ERROR ANALYSIS	1 MODEL & DATA
10	AVAILABILITY FACTORS	0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

VARIABLE	ATMOSPHERIC LOADINGS KG/KM2-YR	CV	AVAILABILITY FACTOR
1 CONSERV	.00	.00	.00
2 TOTAL P	25.40	.50	1.00
3 TOTAL N	927.00	.50	1.00
4 ORTHO P	13.00	.50	.00
5 INORG N	450.00	.50	.00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER		MEAN	CV
1 PERIOD LENGTH	YRS	.583	.000
2 PRECIPITATION	M	.932	.200
3 EVAPORATION	M	1.148	.300
4 INCREASE IN STORAGE	M	-1.058	.000
5 FLOW FACTOR		1.000	.000
6 DISPERSION FACTOR		1.000	.700
7 TOTAL AREA	KM2	155.979	.000
8 TOTAL VOLUME	HM3	2411.739	.000

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	15	CHATTAHOOCHEE RV	11137.000	895.740	.000
2	2	1	Runoff 1	249.000	79.060	.000
3	2	2	Runoff 2	496.000	157.391	.000
4	2	3	Runoff 3	65.300	20.700	.000
5	2	4	Runoff 4	261.100	82.769	.000
6	2	5	Runoff 5	23.300	7.386	.000
7	2	6	Runoff 6	30.300	9.605	.000
8	2	7	Runoff 7	28.000	8.876	.000
9	2	8	Runoff 8	37.300	11.824	.000
10	2	9	Runoff 9	74.600	23.648	.000
11	2	10	Runoff 10	35.000	11.095	.000
12	2	11	Runoff 11	207.400	65.746	.000
13	2	12	Runoff 12	28.000	8.876	.000
14	2	13	Runoff 13	42.000	13.314	.000
15	2	14	Runoff 14	93.200	29.544	.000
16	2	15	Runoff 15	815.800	258.609	.000
17	2	16	Runoff 16	23.300	7.354	.000
18	2	17	Runoff 17	32.600	10.334	.000
19	2	18	Runoff 18	32.600	10.334	.000
20	2	19	Runoff 19	67.600	21.429	.000

21	2	20	Runoff 20	102.600	32.524	.000
22	2	21	Runoff 21	7.000	2.219	.000
23	1	4	CHESTATEE RIVER	613.800	498.330	.000
24	1	3	WAHOO CREEK TRIB	64.700	57.772	.000
25	1	2	W FORK LITTLE RV	46.600	28.386	.000
26	1	2	E FORK LITTLE RV	41.400	25.232	.000
27	1	14	FLAT CREEK (F1)	15.500	9.462	.000
28	1	15	LIMESTONE CREEK	10.400	6.308	.000
29	1	14	FLAT CREEK (H1)	46.600	31.540	.000
30	1	9	FOUR MILE CREEK	20.700	9.462	.000
31	1	21	OUTFLOW	689.900	2691.370	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	50.0/ .00	717.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
7	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
9	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
10	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
18	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
19	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
20	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
21	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
22	.0/ .00	52.0/ .00	850.0/ .00	.0/ .00	.0/ .00	.0
23	.0/ .00	69.0/ .00	623.0/ .00	.0/ .00	.0/ .00	.0
24	.0/ .00	72.0/ .00	931.0/ .00	.0/ .00	.0/ .00	.0
25	.0/ .00	55.0/ .00	1072.0/ .00	.0/ .00	.0/ .00	.0
26	.0/ .00	62.0/ .00	1295.0/ .00	.0/ .00	.0/ .00	.0
27	.0/ .00	2234.0/ .00	10324.0/ .00	.0/ .00	.0/ .00	.0
28	.0/ .00	158.0/ .00	1036.0/ .00	.0/ .00	.0/ .00	.0
29	.0/ .00	41.0/ .00	739.0/ .00	.0/ .00	.0/ .00	.0
30	.0/ .00	52.0/ .00	1293.0/ .00	.0/ .00	.0/ .00	.0
31	.0/ .00	14.8/ .00	359.9/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

				----------- CALIBRATION FACTORS -----------					
SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	2	1	WAHOO CREEK	.42	.39	1.14	1.00	1.00	1.000
2	3	1	WEST FORK	.42	.39	1.14	1.00	1.00	1.000
3	16	1	WAHOO-LITTLE RIV	.42	.39	1.14	1.00	1.00	1.000
4	6	4	YELLOW CREEK	6.94	1.25	1.18	1.00	1.00	1.000
5	6	4	THOMPSON CREEK	6.94	1.25	1.18	1.00	1.00	1.000
6	7	4	CHEST1	6.94	1.25	1.18	1.00	1.00	1.000
7	8	4	TAYLOR CREEK	6.94	1.25	1.18	1.00	1.00	1.000
8	18	4	LATHAM CREEK	6.94	1.25	1.18	1.00	1.00	1.000
9	20	1	SIX-FOUR MILE	.42	.39	1.14	1.00	1.00	1.000
10	21	1	YOUNG DEER CRK	.42	.39	1.14	1.00	1.00	1.000
11	21	1	BALD BRIDGE CRK	.42	.39	1.14	1.00	1.00	1.000
12	21	1	SHOAL CREEK	.42	.39	1.14	1.00	1.00	1.000
13	14	1	BALUS CREEK	.42	.39	1.14	1.00	1.00	1.000
14	19	2	FLAT CREEK	1.43	.94	.91	1.00	1.00	1.000
15	16	3	CHAT1	4.01	.84	2.50	1.00	1.00	1.000
16	17	3	CHAT2-SARDIS-ADA	4.01	.84	2.50	1.00	1.00	1.000
17	18	1	CHAT3	.42	.39	1.14	1.00	1.00	1.000
18	19	1	CHAT4-CHEST BAY	.42	.39	1.14	1.00	1.00	1.000
19	20	1	CHAT5-2-MILE,MUD	.42	.39	1.14	1.00	1.00	1.000
20	21	1	CHAT6-FLOWRY,BIG	.42	.39	1.14	1.00	1.00	1.000

21	0	1	CHAT7-BUFORD DAM	.42	.39	1.14	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	WAHOO CREEK	3.80	2.3890	5.69	6.00/ .12	.00/ .00	.0
2	WEST FORK	5.00	2.6550	16.07	6.00/ .12	.00/ .00	.0
3	WAHOO-LITTLE RIV	5.00	3.8570	15.12	6.00/ .12	.00/ .00	.0
4	YELLOW CREEK	11.30	5.8370	9.62	6.00/ .12	.00/ .00	.0
5	THOMPSON CREEK	5.00	3.3130	11.77	6.00/ .00	.00/ .00	.0
6	CHEST1	3.00	3.3740	16.53	6.00/ .12	.00/ .00	.0
7	TAYLOR CREEK	5.00	2.1580	15.50	6.00/ .12	.00/ .00	.0
8	LATHAM CREEK	5.00	10.7300	20.36	6.00/ .00	.00/ .00	.0
9	SIX-FOUR MILE	6.30	7.6730	17.84	6.00/ .00	.00/ .00	.0
10	YOUNG DEER CRK	5.00	4.1130	16.31	6.00/ .12	.00/ .00	.0
11	BALD BRIDGE CRK	7.50	7.1530	18.92	6.00/ .00	.00/ .00	.0
12	SHOAL CREEK	3.80	5.7880	22.21	6.00/ .00	.00/ .00	.0
13	BALUS CREEK	2.50	1.3850	21.43	6.00/ .12	.00/ .00	.0
14	FLAT CREEK	5.80	3.7410	19.22	6.00/ .00	.00/ .00	.0
15	CHAT1	15.00	6.8800	12.57	6.00/ .12	.00/ .00	.0
16	CHAT2-SARDIS-ADA	5.00	8.9030	14.74	6.00/ .00	.00/ .00	.0
17	CHAT3	6.30	9.6640	18.58	6.00/ .00	.00/ .00	.0
18	CHAT4-CHEST BAY	5.00	8.8780	24.34	6.00/ .12	.00/ .00	.0
19	CHAT5-2-MILE,MUD	6.20	22.8600	21.97	6.00/ .00	.00/ .00	.0
20	CHAT6-FLOWRY,BIG	5.00	25.2400	24.13	6.00/ .12	.00/ .00	.0
21	CHAT7-BUFORD DAM	5.00	11.2700	27.72	6.00/ .00	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBIO 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	.37	.0	21.3	486.0	6.7	2.0	.0	6.8	.0	.0
	CV:	.06	.00	.20	.08	.08	.04	.00	.22	.00	.00
5	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	MN:	.38	.0	12.5	485.6	5.2	2.1	.0	9.0	.0	.0
	CV:	.11	.00	.05	.07	.03	.09	.00	.00	.00	.00
8	MN:	.35	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.22	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	MN:	.24	.0	17.3	286.0	5.0	3.0	.0	3.6	.0	.0
	CV:	.09	.00	.18	.14	.19	.03	.00	.18	.00	.00
10	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	MN:	.23	.0	19.1	457.0	4.7	3.0	.0	5.4	.0	.0
	CV:	.00	.00	.14	.28	.00	.00	.00	.20	.00	.00
12	MN:	.28	.0	8.6	480.0	3.4	2.9	.0	3.8	.0	.0
	CV:	.04	.00	.07	.36	.03	.03	.00	.24	.00	.00
13	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
14	MN:	.29	.0	44.0	657.0	11.3	1.9	.0	30.0	.0	.0
	CV:	.38	.00	.04	.10	.08	.21	.00	.00	.00	.00
15	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
16	MN:	.26	.0	17.2	543.0	11.4	2.1	.0	2.4	.0	.0
	CV:	.18	.00	.10	.05	.18	.04	.00	.16	.00	.00
17	MN:	.31	.0	13.1	457.0	5.0	2.4	.0	3.6	.0	.0
	CV:	.02	.00	.07	.15	.07	.00	.00	.10	.00	.00
18	MN:	.20	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19	MN:	.24	.0	8.7	300.0	4.8	3.0	.0	6.0	.0	.0
	CV:	.19	.00	.19	.14	.19	.12	.00	.26	.00	.00
20	MN:	.23	.0	14.8	359.8	4.2	3.2	.0	12.5	.0	.0

CV:	.03	.00	.20	.19	.05	.02	.00	.10	.00	.00
21 MN:	.23	.0	7.0	256.9	4.2	3.2	.0	5.0	.0	.0
CV:	.05	.00	.11	.14	.08	.03	.00	.07	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	landuse1	landuse2	landuse3	landuse4
2	2	Runoff 1	249.40	.00	.00	.00
3	2	Runoff 2	496.50	.00	.00	.00
4	2	Runoff 3	65.30	.00	.00	.00
5	2	Runoff 4	261.10	.00	.00	.00
6	2	Runoff 5	23.30	.00	.00	.00
7	2	Runoff 6	30.30	.00	.00	.00
8	2	Runoff 7	28.00	.00	.00	.00
9	2	Runoff 8	37.30	.00	.00	.00
10	2	Runoff 9	74.60	.00	.00	.00
11	2	Runoff 10	35.00	.00	.00	.00
12	2	Runoff 11	207.40	.00	.00	.00
13	2	Runoff 12	28.00	.00	.00	.00
14	2	Runoff 13	42.00	.00	.00	.00
15	2	Runoff 14	93.20	.00	.00	.00
16	2	Runoff 15	815.80	.00	.00	.00
17	2	Runoff 16	23.20	.00	.00	.00
18	2	Runoff 17	32.60	.00	.00	.00
19	2	Runoff 18	32.60	.00	.00	.00
20	2	Runoff 19	67.60	.00	.00	.00
21	2	Runoff 20	102.60	.00	.00	.00
22	2	Runoff 21	7.00	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	landuse1		.32	.0	52.0	850.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
2	landuse2		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
3	landuse3		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
4	landuse4		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

Appendix D
Model Input Files for West Point Lake

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West Point 1991 (P Uncalibated)

INPUT GROUP 2 - PRINT OPTIONS
 1 LIST INPUTS                     0 NO
 2 HYDRAULICS & DISPERSION         1 YES
 3 GROSS WATER & MASS BALANCES     2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT    0 NO
 5 SUMMARIZE BALANCES BY SEGMENT   0 NO
 6 COMPARE OBS & PREDICTED CONCS   0 NO
 7 DIAGNOSTICS                     1 ALL SEGMENTS
 8 PROFILES                        1 ESTIMATED CONCENTRATIONS
 9 PLOTS                           2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS            0 NO

INPUT GROUP 3 - MODEL OPTIONS
 1 CONSERVATIVE SUBSTANCE          0 NOT COMPUTED
 2 PHOSPHORUS BALANCE              1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                0 NOT COMPUTED
 4 CHLOROPHYLL-A                   2 P, LIGHT, T
 5 SECCHI DEPTH                    1 VS. CHLA & TURBIDITY
 6 DISPERSION                      1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION          1 DECAY RATES
 8 NITROGEN CALIBRATION            1 DECAY RATES
 9 ERROR ANALYSIS                  1 MODEL & OATA
10 AVAILABILITY FACTORS            0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES
            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR      CV      FACTOR
 1 CONSERV         .00     .00         .00
 2 TOTAL P       30.00     .50        1.00
 3 TOTAL N     1000.00     .50        1.00
 4 ORTHO P       15.00     .50         .00
 5 INORG N      500.00     .50         .00

INPUT GROUP 5 - GLOBAL PARAMETERS
PARAMETER                        MEAN     CV
 1 PERIOD LENGTH      YRS        .583   .000
 2 PRECIPITATION M               .790   .200
 3 EVAPORATION    M             1.000   .300
 4 INCREASE IN STORAGE M       -1.580   .000
 5 FLOW FACTOR                  1.000   .000
 6 DISPERSION FACTOR            1.000   .700
 7 TOTAL AREA         KM2        .000   .000
 8 TOTAL VOLUME       HM3        .000   .000

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS
ID TYPE SEG NAME            DRAINAGE AREA   MEAN FLOW  CV OF MEAN FLOW
                                      KM2      HM3/YR
 1   1   10 CHAT AT FRANK        6941.000    5070.940         .000
 2   2    1 BRUSH                  69.070      16.133         .000
 3   2    2 NEW RIVER             119.400      28.298         .000
 4   2    3 POTATO                235.000      55.695         .000
 5   2    4 WOLF                   50.200      11.897         .000
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6	1	5	YELLOWJACKET	50.200	99.739	.000
7	2	5	YC	7.390	1.751	.000
8	1	5	SHOAL	22.500	12.000	.000
9	1	5	BEECH	29.430	16.000	.000
10	2	5	B3A	7.780	1.844	.000
11	2	5	B3B	7.780	1.844	.000
12	2	5	DIXIE	5.830	1.382	.000
13	2	5	JACKSON	48.620	11.523	.000
14	2	5	J1	8.750	2.074	.000
15	2	5	Y1A	5.830	1.382	.000
16	2	5	WILLOW/SHERWOOD	38.890	9.217	.000
17	1	6	WHITEWATER	86.550	5.000	.000
18	2	6	THOMPSON	64.180	15.211	.000
19	2	7	WILSON	38.900	9.219	.000
20	2	8	WEHADKEE	81.350	19.280	.000
21	2	8	GUSS	180.890	42.871	.000
22	2	8	CANEY	97.250	23.048	.000
23	2	8	L.WEHADKEE	132.260	31.346	.000
24	2	8	WE2	31.120	7.375	.000
25	2	8	WE3	9.720	2.304	.000
26	2	8	STROUD	40.840	9.679	.000
27	2	8	VEASEY	33.060	7.835	.000
28	2	9	MAPLE	64.180	15.211	.000
29	2	10	TALLEY	35.010	8.297	.000
30	2	10	ZACHARY	35.010	8.297	.000
31	2	10	Z1-Z2	44.720	10.599	.000
32	2	11	B2	52.510	12.445	.000
33	2	12	P5-P6	31.110	7.373	.000
34	2	13	P7	19.450	4.610	.000
35	2	14	P8	5.830	1.382	.000
36	2	15	P9	33.060	7.835	.000
37	2	16	J2A	18.080	4.285	.000
38	2	17	J2B	8.360	1.981	.000
39	2	18	W2	7.780	1.844	.000
40	2	19	W3	18.080	4.285	.000
41	2	20	WI1/W12	44.730	10.601	.000
42	2	21	WI3/V2A	22.360	5.299	.000
43	2	22	V2B	14.580	3.455	.000
44	4	22	CHAT AT WP	9194.000	5885.000	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	198.8/ .10	.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	48.0/ .15	964.0/ .11	25.5/ .35	242.4/ .09	.0
7	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	32.0/ .10	702.0/ .02	5.4/ .13	242.4/ .09	.0
9	.0/ .00	39.0/ .06	751.0/ .05	9.5/ .16	206.8/ .08	.0
10	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	19.0/ .02	725.0/ .03	3.8/ .11	160.2/ .10	.0
18	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
19	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
20	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
21	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
22	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
23	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
24	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
25	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
26	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0

27	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
28	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
29	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
30	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
31	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
32	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
33	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
34	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
35	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
36	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
37	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
38	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
39	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
40	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
41	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
42	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
43	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
44	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

				----------- CALIBRATION FACTORS -----------					
SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	10	8	BR	1.00	1.00	1.00	1.00	1.00	1.000
2	10	8	NR	1.00	1.00	1.00	1.00	1.00	1.000
3	10	8	PO	1.00	1.00	1.00	1.00	1.00	1.000
4	14	8	WO	1.00	1.00	1.00	1.00	1.00	1.000
5	16	2	YE	1.00	1.00	1.00	1.00	1.00	1.000
6	17	3	WH	1.00	1.00	1.00	1.00	1.00	1.000
7	19	1	WI	1.00	1.00	1.00	1.00	1.00	1.000
8	20	4	WE	1.00	1.00	1.00	1.00	1.00	1.000
9	22	7	MA	1.00	1.00	1.00	1.00	1.00	1.000
10	11	5	CH1	1.00	1.00	1.00	1.00	1.00	1.000
11	12	5	CH2	1.00	1.00	1.00	1.00	1.00	1.000
12	13	5	CH3	1.00	1.00	1.00	1.00	1.00	1.000
13	14	5	CH4	1.00	1.00	1.00	1.00	1.00	1.000
14	15	5	CH5	1.00	1.00	1.00	1.00	1.00	1.000
15	16	5	CH6	1.00	1.00	1.00	1.00	1.00	1.000
16	17	5	CH7	1.00	1.00	1.00	1.00	1.00	1.000
17	18	6	CH8	1.00	1.00	1.00	1.00	1.00	1.000
18	19	6	CH9	1.00	1.00	1.00	1.00	1.00	1.000
19	20	6	CH10	1.00	1.00	1.00	1.00	1.00	1.000
20	21	6	CH11	1.00	1.00	1.00	1.00	1.00	1.000
21	22	6	CH12	1.00	1.00	1.00	1.00	1.00	1.000
22	0	6	CH13	1.00	1.00	1.00	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

		LENGTH	AREA	ZMEAN	ZMIX	ZHYP	TARGET P
ID	LABEL	KM	KM2	M	M	M	PPB
1	BR	2.50	.6900	2.21	2.21/ .12	.00/ .00	.0
2	NR	4.60	1.3500	1.89	1.89/ .12	.00/ .00	.0
3	PO	1.70	.6900	2.21	2.21/ .12	.00/ .00	.0
4	WO	1.70	.2400	.34	.34/ .12	.00/ .00	.0
5	YE	19.70	12.8000	4.25	4.06/ .12	.00/ .00	.0
6	WH	5.40	6.0900	5.40	4.83/ .12	.00/ .00	.0
7	WI	2.50	1.0800	4.80	4.45/ .12	.00/ .00	.0
8	WE	19.60	16.7600	6.26	5.31/ .12	.00/ .00	.0
9	MA	5.00	9.2100	8.26	6.19/ .12	.00/ .00	.0
10	CH1	8.30	3.0800	2.82	2.82/ .12	.00/ .00	.0
11	CH2	2.50	1.8200	3.56	3.52/ .12	.00/ .00	.0
12	CH3	2.50	1.8900	4.48	4.23/ .12	.00/ .00	.0
13	CH4	2.50	3.9300	5.26	4.74/ .12	.00/ .00	.0
14	CH5	3.90	3.9700	7.11	5.72/ .12	.00/ .00	.0
15	CH6	2.50	4.6700	7.66	5.96/ .12	.00/ .00	.0
16	CH7	1.30	.6500	7.42	5.86/ .12	.00/ .00	.0
17	CH8	2.50	4.6500	8.03	6.11/ .12	.00/ .00	.0
18	CH9	1.70	5.2000	7.03	5.68/ .12	.00/ .00	.0
19	CH10	2.50	3.6100	8.96	6.44/ .12	.00/ .00	.0
20	CH11	2.50	11.2700	9.82	6.71/ .12	.00/ .00	.0
21	CH12	2.50	6.8900	10.83	6.98/ .12	.00/ .00	.0

22 CH13 1.70 4.2800 14.46 7.68/ .12 .00/ .00 .0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID	CONSER	TOTALP	TOTALN	CHL-A	SECCHI	ORG-N	TP-OP	HODV	MODV
		1/M	?	MG/M3	MG/M3	MG/M3	M	MG/M3	MG/M3	MG/M3-D	MG/M3-D
1	MN:	1.62	.0	.0	.0	.D	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	MN:	1.22	63.8	51.5	652.0	19.4	.6	.0	.0	.0	.0
	CV:	.03	.18	.06	.17	.09	.00	.00	.00	.00	.00
3	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	MN:	.49	72.6	27.5	595.0	15.5	1.3	.0	.0	.0	.0
	CV:	.18	.10	.12	.14	.11	.10	.00	.00	.00	.00
6	MN:	.50	.0	.0	.0	19.2	1.1	.0	.0	.0	.0
	CV:	.14	.00	.00	.00	.09	.07	.00	.00	.00	.00
7	MN:	.37	80.7	38.6	926.0	17.5	1.4	.0	.0	.0	.0
	CV:	.10	.03	.07	.02	.08	.03	.00	.00	.00	.00
8	MN:	.48	65.5	20.6	471.0	12.3	1.4	.0	.0	.0	.0
	CV:	.12	.03	.04	.24	.12	.07	.00	.00	.00	.00
9	MN:	.39	78.3	22.3	605.0	12.4	1.6	.0	.0	.0	.0
	CV:	.19	.02	.10	.07	.16	.10	.00	.00	.00	.00
10	MN:	1.86	86.0	.0	.0	3.3	.5	.0	.0	.0	.0
	CV:	.20	.00	.00	.00	.37	.19	.00	.00	.00	.00
11	MN:	2.10	.0	.0	.0	6.0	.4	.0	.0	.0	.0
	CV:	.19	.00	.00	.00	.29	.18	.00	.00	.00	.00
12	MN:	1.97	82.4	91.8	1085.0	8.0	.5	.0	.0	.0	.0
	CV:	.13	.01	.08	.09	.24	.12	.00	.00	.00	.00
13	MN:	1.30	.0	.0	.0	16.8	.6	.0	.0	.0	.0
	CV:	.19	.00	.00	.00	.30	.14	.00	.00	.00	.00
14	MN:	.90	77.2	74.5	1087.0	17.5	.8	.0	.0	.0	.0
	CV:	.20	.07	.12	.05	.20	.13	.00	.00	.00	.00
15	MN:	.62	79.7	66.0	856.0	20.1	1.0	.0	.0	.0	.0
	CV:	.18	.03	.17	.22	.10	.10	.00	.00	.00	.00
16	MN:	.38	.0	.0	.0	21.9	1.2	.0	.0	.0	.0
	CV:	.23	.00	.00	.00	.08	.10	.00	.00	.00	.00
17	MN:	.44	79.3	47.5	965.0	22.0	1.1	.0	.0	.0	.0
	CV:	.15	.00	.10	.07	.10	.06	.00	.00	.00	.00
18	MN:	.34	80.8	41.4	932.0	20.0	1.4	.0	.0	.0	.0
	CV:	.17	.02	.08	.05	.11	.05	.00	.00	.00	.00
19	MN:	.30	.0	.0	.0	19.7	1.4	.0	.0	.0	.0
	CV:	.18	.00	.00	.00	.11	.05	.00	.00	.00	.00
20	MN:	.35	79.1	33.5	797.0	16.4	1.5	.0	.0	.0	.0
	CV:	.19	.03	.12	.10	.12	.08	.00	.00	.00	.00
21	MN:	.35	77.2	25.8	722.0	13.6	1.6	.0	.0	.0	.0
	CV:	.20	.03	.06	.06	.12	.10	.00	.00	.00	.00
22	MN:	.33	79.3	23.0	675.0	14.9	1.6	.0	.0	.0	.0
	CV:	.22	.00	.03	.07	.13	.10	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	Averaged	landuse2	landuse3	landuse4
2	2	BRUSH	68.07	.00	.00	.00
3	2	NEW RIVER	119.40	.00	.00	.00
4	2	POTATO	235.00	.00	.00	.00
5	2	WOLF	50.20	.00	.00	.00
7	2	YC	7.39	.00	.00	.00
8	1	SHOAL	22.50	.00	.00	.00
10	2	B3A	7.78	.00	.00	.00
11	2	B3B	7.78	.00	.00	.00
12	2	DIXIE	5.83	.00	.00	.00
13	2	JACKSON	48.62	.00	.00	.00
14	2	J1	8.75	.00	.00	.00
15	2	Y1A	5.83	.00	.00	.00
16	2	WILLOW/SHERWOOD	38.89	.00	.00	.00
18	2	THOMPSON	64.18	.00	.00	.00
19	2	WILSON	38.90	.00	.00	.00
20	2	WEHADKEE	81.35	.00	.00	.00

21	2 GUSS	180.89	.00	.00	.00
22	2 CANEY	97.25	.00	.00	.00
23	2 L.WEHADKEE	132.26	.00	.00	.00
24	2 WE2	31.12	.00	.00	.00
25	2 WE3	9.72	.00	.00	.00
26	2 STROUD	40.84	.00	.00	.00
27	2 VEASEY	33.06	.00	.00	.00
28	2 MAPLE	64.18	.00	.00	.00
29	2 TALLEY	35.01	.00	.00	.00
30	2 ZACHARY	35.01	.00	.00	.00
31	2 Z1-Z2	44.72	.00	.00	.00
32	2 B2	52.51	.00	.00	.00
33	2 P5-P6	31.11	.00	.00	.00
34	2 P7	19.45	.00	.00	.00
35	2 P8	5.83	.00	.00	.00
36	2 P9	33.06	.00	.00	.00
37	2 J2A	18.08	.00	.00	.00
38	2 J2B	8.36	.00	.00	.00
39	2 W2	7.78	.00	.00	.00
40	2 W3	18.08	.00	.00	.00
41	2 WI1/W12	44.73	.00	.00	.00
42	2 WI3/V2A	22.36	.00	.00	.00
43	2 V2B	14.58	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC	LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1	Averaged Use		.24	.0	34.5	.0	.0	.0
		CV:	.00	.00	.15	.00	.00	.00
2	landuse2		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
3	landuse3		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00
4	landuse4		.00	.0	.0	.0	.0	.0
		CV:	.00	.00	.00	.00	.00	.00

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES

Water quality data for 1991
WES Landsat study
WES tributary data from 1991
  for YC, BC, SC and WC
Landuse is tributary average
P, Light, Flushing Model
(Uncalibrated)

West Point 1991 (P Calibrated)

INPUT GROUP 2 - PRINT OPTIONS

1	LIST INPUTS	0 NO
2	HYDRAULICS & DISPERSION	1 YES
3	GROSS WATER & MASS BALANCES	2 ESTIMATED CONCS
4	DETAILED BALANCES BY SEGMENT	0 NO
5	SUMMARIZE BALANCES BY SEGMENT	0 NO
6	COMPARE OBS & PREDICTED CONCS	0 NO
7	DIAGNOSTICS	1 ALL SEGMENTS
8	PROFILES	1 ESTIMATED CONCENTRATIONS
9	PLOTS	2 GEOMETRIC SCALE
10	SENSITIVITY ANALYSIS	0 NO

INPUT GROUP 3 - MODEL OPTIONS

1	CONSERVATIVE SUBSTANCE	0 NOT COMPUTED
2	PHOSPHORUS BALANCE	1 2ND ORDER, AVAIL P
3	NITROGEN BALANCE	0 NOT COMPUTED
4	CHLOROPHYLL-A	2 P, LIGHT, T
5	SECCHI DEPTH	1 VS. CHLA & TURBIDITY
6	DISPERSION	1 FISCHER-NUMERIC
7	PHOSPHORUS CALIBRATION	1 DECAY RATES
8	NITROGEN CALIBRATION	1 DECAY RATES
9	ERROR ANALYSIS	1 MODEL & DATA
10	AVAILABILITY FACTORS	0 MODEL 1 ONLY

INPUT GROUP 4 - VARIABLES

VARIABLE	ATMOSPHERIC LOADINGS KG/KM2-YR	CV	AVAILABILITY FACTOR
1 CONSERV	.00	.00	.00
2 TOTAL P	30.00	.50	1.00
3 TOTAL N	1000.00	.50	1.00
4 ORTHO P	15.00	.50	.00
5 INORG N	500.00	.50	.00

INPUT GROUP 5 - GLOBAL PARAMETERS

PARAMETER		MEAN	CV
1 PERIOD LENGTH	YRS	.583	.000
2 PRECIPITATION	M	.790	.200
3 EVAPORATION	M	1.000	.300
4 INCREASE IN STORAGE	M	-1.580	.000
5 FLOW FACTOR		1.000	.000
6 DISPERSION FACTOR		1.000	.700
7 TOTAL AREA	KM2	.000	.000
8 TOTAL VOLUME	HM3	.000	.000

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS

ID	TYPE	SEG	NAME	DRAINAGE AREA KM2	MEAN FLOW HM3/YR	CV OF MEAN FLOW
1	1	10	CHAT AT FRANK	6941.000	5070.940	.000
2	2	1	BRUSH	69.070	16.133	.000
3	2	2	NEW RIVER	119.400	28.298	.000
4	2	3	POTATO	235.000	55.695	.000
5	2	4	WOLF	50.200	11.897	.000
6	1	5	YELLOWJACKET	50.200	99.739	.000
7	2	5	YC	7.390	1.751	.000
8	1	5	SHOAL	22.500	12.000	.000
9	1	5	BEECH	29.430	16.000	.000
10	2	5	B3A	7.780	1.844	.000
11	2	5	B3B	7.780	1.844	.000
12	2	5	DIXIE	5.830	1.382	.000
13	2	5	JACKSON	48.620	11.523	.000
14	2	5	J1	8.750	2.074	.000
15	2	5	Y1A	5.830	1.382	.000
16	2	5	WILLOW/SHERWOOD	38.890	9.217	.000
17	1	6	WHITEWATER	86.550	5.000	.000
18	2	6	THOMPSON	64.180	15.211	.000
19	2	7	WILSON	38.900	9.219	.000
20	2	8	WEHADKEE	81.350	19.280	.000

21	2	8	GUSS	180.890	42.871	.000
22	2	8	CANEY	97.250	23.048	.000
23	2	8	L.WEHADKEE	132.260	31.346	.000
24	2	8	WE2	31.120	7.375	.000
25	2	8	WE3	9.720	2.304	.000
26	2	8	STROUD	40.840	9.679	.000
27	2	8	VEASEY	33.060	7.835	.000
28	2	9	MAPLE	64.180	15.211	.000
29	2	10	TALLEY	35.010	8.297	.000
30	2	10	ZACHARY	35.010	8.297	.000
31	2	10	Z1-Z2	44.720	10.599	.000
32	2	11	B2	52.510	12.445	.000
33	2	12	P5-P6	31.110	7.373	.000
34	2	13	P7	19.450	4.610	.000
35	2	14	P8	5.830	1.382	.000
36	2	15	P9	33.060	7.835	.000
37	2	16	J2A	18.080	4.285	.000
38	2	17	J2B	8.360	1.981	.000
39	2	18	W2	7.780	1.844	.000
40	2	19	W3	18.080	4.285	.000
41	2	20	WI1/W12	44.730	10.601	.000
42	2	21	WI3/V2A	22.360	5.299	.000
43	2	22	V2B	14.580	3.455	.000
44	4	22	CHAT AT WP	9194.000	5885.000	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	.0/ .00	198.8/ .10	.0/ .00	.0/ .00	.0/ .00	.0
2	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	48.0/ .15	964.0/ .11	25.5/ .35	242.4/ .09	.0
7	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	32.0/ .10	702.0/ .02	5.4/ .13	242.4/ .09	.0
9	.0/ .00	39.0/ .06	751.0/ .05	9.5/ .16	206.8/ .08	.0
10	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	19.0/ .02	725.0/ .03	3.8/ .11	160.2/ .10	.0
18	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
19	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
20	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
21	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
22	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
23	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
24	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
25	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
26	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
27	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
28	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
29	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
30	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
31	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
32	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
33	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
34	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
35	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
36	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
37	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
38	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
39	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
40	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
41	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0

42	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
43	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
44	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

				----------- CALIBRATION FACTORS -----------					
SEG	OUTFLOW	GROUP	SEGMENT NAME	P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	10	8	BR	1.73	1.00	1.02	1.00	1.00	1.000
2	10	8	NR	1.73	1.00	1.02	1.00	1.00	1.000
3	10	8	PO	1.73	1.00	1.02	1.00	1.00	1.000
4	14	8	WO	1.73	1.00	1.02	1.00	1.00	1.000
5	16	2	YE	1.11	1.00	1.49	1.00	1.00	1.000
6	17	3	WH	1.00	1.00	1.76	1.00	1.00	1.000
7	19	1	WI	.29	1.00	1.37	1.00	1.00	1.000
8	20	4	WE	1.05	1.00	1.81	1.00	1.00	1.000
9	22	7	MA	3.28	1.00	1.69	1.00	1.00	1.000
10	11	5	CH1	2.24	1.00	.27	1.00	1.00	1.000
11	12	5	CH2	2.24	1.00	.85	1.00	1.00	1.000
12	13	5	CH3	2.24	1.00	1.46	1.00	1.00	1.000
13	14	5	CH4	2.24	1.00	2.82	1.00	1.00	1.000
14	15	5	CH5	2.24	1.00	3.02	1.00	1.00	1.000
15	16	5	CH6	2.24	1.00	3.10	1.00	1.00	1.000
16	17	5	CH7	2.24	1.00	2.61	1.00	1.00	1.000
17	18	6	CH8	9.25	1.00	2.07	1.00	1.00	1.000
18	19	6	CH9	9.25	1.00	2.07	1.00	1.00	1.000
19	20	6	CH10	9.25	1.00	2.07	1.00	1.00	1.000
20	21	6	CH11	9.25	1.00	2.07	1.00	1.00	1.000
21	22	6	CH12	9.25	1.00	2.07	1.00	1.00	1.000
22	0	6	CH13	9.25	1.00	2.07	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	BR	2.50	.6900	2.21	2.21/ .12	.00/ .00	.0
2	NR	4.60	1.3500	1.89	1.89/ .12	.00/ .00	.0
3	PO	1.70	.6900	2.21	2.21/ .12	.00/ .00	.0
4	WO	1.70	.2400	.34	.34/ .12	.00/ .00	.0
5	YE	19.70	12.8000	4.25	4.06/ .12	.00/ .00	.0
6	WH	5.40	6.0900	5.40	4.83/ .12	.00/ .00	.0
7	WI	2.50	1.0800	4.80	4.45/ .12	.00/ .00	.0
8	WE	19.60	16.7600	6.26	5.31/ .12	.00/ .00	.0
9	MA	5.00	9.2100	8.26	6.19/ .12	.00/ .00	.0
10	CH1	8.30	3.0800	2.82	2.82/ .12	.00/ .00	.0
11	CH2	2.50	1.8200	3.56	3.52/ .12	.00/ .00	.0
12	CH3	2.50	1.8900	4.48	4.23/ .12	.00/ .00	.0
13	CH4	2.50	3.9300	5.26	4.74/ .12	.00/ .00	.0
14	CH5	3.90	3.9700	7.11	5.72/ .12	.00/ .00	.0
15	CH6	2.50	4.6700	7.66	5.96/ .12	.00/ .00	.0
16	CH7	1.30	.6500	7.42	5.86/ .12	.00/ .00	.0
17	CH8	2.50	4.6500	8.03	6.11/ .12	.00/ .00	.0
18	CH9	1.70	5.2000	7.03	5.68/ .12	.00/ .00	.0
19	CH10	2.50	3.6100	8.96	6.44/ .12	.00/ .00	.0
20	CH11	2.50	11.2700	9.82	6.71/ .12	.00/ .00	.0
21	CH12	2.50	6.8900	10.83	6.98/ .12	.00/ .00	.0
22	CH13	1.70	4.2800	14.46	7.68/ .12	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	MN:	1.22	63.8	51.5	652.0	19.4	.6	.0	.0	.0	.0
	CV:	.03	.18	.06	.17	.09	.00	.00	.00	.00	.00
3	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	MN:	.49	72.6	27.5	595.0	15.5	1.3	.0	.0	.0	.0
	CV:	.18	.10	.12	.14	.11	.10	.00	.00	.00	.00

6 MN:	.50	.0	.0	.0	19.2	1.1	.0	.0	.0	.0
CV:	.14	.00	.00	.00	.09	.07	.00	.00	.00	.00
7 MN:	.37	80.7	38.6	926.0	17.5	1.4	.0	.0	.0	.0
CV:	.10	.03	.07	.02	.08	.03	.00	.00	.00	.00
8 MN:	.48	65.5	20.6	471.0	12.3	1.4	.0	.0	.0	.0
CV:	.12	.03	.04	.24	.12	.07	.00	.00	.00	.00
9 MN:	.39	78.3	22.3	605.0	12.4	1.6	.0	.0	.0	.0
CV:	.19	.02	.10	.07	.16	.10	.00	.00	.00	.00
10 MN:	1.86	86.0	.0	.0	3.3	.5	.0	.0	.0	.0
CV:	.20	.00	.00	.00	.37	.19	.00	.00	.00	.00
11 MN:	2.10	.0	.0	.0	6.0	.4	.0	.0	.0	.0
CV:	.19	.00	.00	.00	.29	.18	.00	.00	.00	.00
12 MN:	1.97	82.4	91.8	1085.0	8.0	.5	.0	.0	.0	.0
CV:	.13	.01	.08	.09	.24	.12	.00	.00	.00	.00
13 MN:	1.30	.0	.0	.0	16.8	.6	.0	.0	.0	.0
CV:	.19	.00	.00	.00	.30	.14	.00	.00	.00	.00
14 MN:	.90	77.2	74.5	1087.0	17.5	.8	.0	.0	.0	.0
CV:	.20	.07	.12	.05	.20	.13	.00	.00	.00	.00
15 MN:	.62	79.7	66.0	856.0	20.1	1.0	.0	.0	.0	.0
CV:	.18	.03	.17	.22	.10	.10	.00	.00	.00	.00
16 MN:	.38	.0	.0	.0	21.9	1.2	.0	.0	.0	.0
CV:	.23	.00	.00	.00	.08	.10	.00	.00	.00	.00
17 MN:	.44	79.3	47.5	965.0	22.0	1.1	.0	.0	.0	.0
CV:	.15	.00	.10	.07	.10	.06	.00	.00	.00	.00
18 MN:	.34	80.8	41.4	932.0	20.0	1.4	.0	.0	.0	.0
CV:	.17	.02	.08	.05	.11	.05	.00	.00	.00	.00
19 MN:	.30	.0	.0	.0	19.7	1.4	.0	.0	.0	.0
CV:	.18	.00	.00	.00	.11	.05	.00	.00	.00	.00
20 MN:	.35	79.1	33.5	797.0	16.4	1.5	.0	.0	.0	.0
CV:	.19	.03	.12	.10	.12	.08	.00	.00	.00	.00
21 MN:	.35	77.2	25.8	722.0	13.6	1.6	.0	.0	.0	.0
CV:	.20	.03	.06	.06	.12	.10	.00	.00	.00	.00
22 MN:	.33	79.3	23.0	675.0	14.9	1.6	.0	.0	.0	.0
CV:	.22	.00	.03	.07	.13	.10	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	Averaged	landuse2	landuse3	landuse4
2	2	BRUSH	68.07	.00	.00	.00
3	2	NEW RIVER	119.40	.00	.00	.00
4	2	POTATO	235.00	.00	.00	.00
5	2	WOLF	50.20	.00	.00	.00
7	2	YC	7.39	.00	.00	.00
8	1	SHOAL	22.50	.00	.00	.00
10	2	B3A	7.78	.00	.00	.00
11	2	B3B	7.78	.00	.00	.00
12	2	DIXIE	5.83	.00	.00	.00
13	2	JACKSON	48.62	.00	.00	.00
14	2	J1	8.75	.00	.00	.00
15	2	Y1A	5.83	.00	.00	.00
16	2	WILLOW/SHERWOOD	38.89	.00	.00	.00
18	2	THOMPSON	64.18	.00	.00	.00
19	2	WILSON	38.90	.00	.00	.00
20	2	WEHADKEE	81.35	.00	.00	.00
21	2	GUSS	180.89	.00	.00	.00
22	2	CANEY	97.25	.00	.00	.00
23	2	L.WEHADKEE	132.26	.00	.00	.00
24	2	WE2	31.12	.00	.00	.00
25	2	WE3	9.72	.00	.00	.00
26	2	STROUD	40.84	.00	.00	.00
27	2	VEASEY	33.06	.00	.00	.00
28	2	MAPLE	64.18	.00	.00	.00
29	2	TALLEY	35.01	.00	.00	.00
30	2	ZACHARY	35.01	.00	.00	.00
31	2	Z1-Z2	44.72	.00	.00	.00
32	2	B2	52.51	.00	.00	.00
33	2	P5-P6	31.11	.00	.00	.00
34	2	P7	19.45	.00	.00	.00
35	2	P8	5.83	.00	.00	.00
36	2	P9	33.06	.00	.00	.00

37	2 J2A	18.08	.00	.00	.00
38	2 J2B	8.36	.00	.00	.00
39	2 W2	7.78	.00	.00	.00
40	2 W3	18.08	.00	.00	.00
41	2 WI1/W12	44.73	.00	.00	.00
42	2 WI3/V2A	22.36	.00	.00	.00
43	2 V2B	14.58	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1 Averaged Use		.24	.0	34.5	.0	.0	.0
	CV:	.00	.00	.15	.00	.00	.00
2 landuse2		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00
3 landuse3		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00
4 landuse4		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00

INPUT GROUP 13 - MODEL COEFFICIENTS

IC	COEFFICIENT	MEAN	CV
1	P DECAY RATE	1.000	.45
2	N DECAY RATE	1.000	.55
3	CHL-A MODEL	1.000	.26
4	SECCHI MODEL	1.000	.10
5	ORGANIC N MODEL	1.000	.12
6	TP-OP MODEL	1.000	.15
7	HODV MODEL	1.000	.15
8	MODV MODEL	1.000	.22
9	BETA M2/MG	.020	.00
10	MINIMUM QS	.100	.00
11	FLUSHING EFFECT	1.000	.00
12	CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES
Water quality data for 1991
 WES Landsat study
 WES tributary data from 1991
   for YC, BC, SC and WC
Landuse is tributary average
P, Light, Flushing Model
(Calibrated)

Regional and local calibration

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WEST POINT 90  (P Verification)

INPUT GROUP 2 - PRINT OPTIONS
 1 LIST INPUTS                          0 NO
 2 HYDRAULICS & DISPERSION              1 YES
 3 GROSS WATER & MASS BALANCES          2 ESTIMATED CONCS
 4 DETAILED BALANCES BY SEGMENT         0 NO
 5 SUMMARIZE BALANCES BY SEGMENT        0 NO
 6 COMPARE OBS & PREDICTED CONCS        0 NO
 7 DIAGNOSTICS                          0 NO
 8 PROFILES                             1 ESTIMATED CONCENTRATIONS
 9 PLOTS                                2 GEOMETRIC SCALE
10 SENSITIVITY ANALYSIS                 0 NO

INPUT GROUP 3 - MODEL OPTIONS
 1 CONSERVATIVE SUBSTANCE               0 NOT COMPUTED
 2 PHOSPHORUS BALANCE                   1 2ND ORDER, AVAIL P
 3 NITROGEN BALANCE                     0 NOT COMPUTED
 4 CHLOROPHYLL-A                        2 P, LIGHT, T
 5 SECCHI DEPTH                         1 VS. CHLA & TURBIDITY
 6 DISPERSION                           1 FISCHER-NUMERIC
 7 PHOSPHORUS CALIBRATION               1 DECAY RATES
 8 NITROGEN CALIBRATION                 1 DECAY RATES
 9 ERROR ANALYSIS                       1 MODEL & DATA
10 AVAILABILITY FACTORS                 1 ALL MODELS EXCEPT 2

INPUT GROUP 4 - VARIABLES
            ATMOSPHERIC LOADINGS AVAILABILITY
VARIABLE     KG/KM2-YR     CV      FACTOR
 1 CONSERV         .00     .00        .00
 2 TOTAL P       30.00     .50       1.00
 3 TOTAL N     1000.00     .50       1.00
 4 ORTHO P       15.00     .50        .00
 5 INORG N      500.00     .50        .00

INPUT GROUP 5 - GLOBAL PARAMETERS
PARAMETER                          MEAN     CV
 1 PERIOD LENGTH      YRS          .583   .000
 2 PRECIPITATION M                 .501   .200
 3 EVAPORATION    M               1.222   .300
 4 INCREASE IN STORAGE M         -1.250   .000
 5 FLOW FACTOR                    1.000   .000
 6 DISPERSION FACTOR              1.000   .700
 7 TOTAL AREA          KM2         .000   .000
 8 TOTAL VOLUME        HM3         .000   .000

INPUT GROUP 6 - TRIBUTARY DRAINAGE AREAS AND FLOWS
ID TYPE SEG NAME               DRAINAGE AREA   MEAN FLOW  CV OF MEAN FLOW
                                         KM2      HM3/YR
 1   1   10 CHAT AT FRANK           6941.000    3926.000         .000
 2   2    1 Brush                     68.070      10.211         .000
 3   2    2 Newriver                 119.400      17.910         .000
 4   2    3 Potato                   235.300      35.295         .000
 5   2    4 Wolf                      29.170       4.376         .000
 6   2    5 Yellowjacket              50.200       7.530         .000
 7   2    5 Yc                         7.390       1.109         .000
 8   2    5 shoal                     22.500       3.375         .000
 9   2    5 beech                     29.430       4.415         .000
10   2    5 b3a                        7.780       1.167         .000
11   2    5 b3b                        7.780       1.167         .000
12   2    5 dixie                      5.830        .875         .000
13   2    5 jackson                   48.620       7.293         .000
14   2    5 J1                         8.750       1.313         .000
15   2    5 y1a                        5.830        .875         .000
16   2    5 Willow/Sherwood           38.890       5.833         .000
17   2    6 whitewater                86.550      12.983         .000
18   2    6 thompson                  64.180       9.627         .000
19   2    7 wilson                    38.900       5.835         .000
20   2    8 wehadkee                  81.350      12.203         .000
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21	2	8	guss	180.890	27.134	.000
22	2	8	caney	97.250	14.588	.000
23	2	8	l.wehadkee	132.260	19.839	.000
24	2	8	we2	31.120	4.668	.000
25	2	8	we3	9.720	1.458	.000
26	2	8	stroud	40.840	6.126	.000
27	2	8	veasey	33.060	4.959	.000
28	2	9	maple	64.180	9.627	.000
29	2	10	talley	27.230	4.085	.000
30	2	10	zachary	35.010	5.252	.000
31	2	10	z1-z2	44.720	6.708	.000
32	2	11	b2	52.510	7.877	.000
33	2	12	p5-p6	31.110	4.667	.000
34	2	13	p7	19.450	2.918	.000
35	2	14	p8	5.830	.875	.000
36	2	15	p9	33.060	4.959	.000
37	2	16	j2a	18.080	2.712	.000
38	2	17	j2b	8.360	1.254	.000
39	2	18	w2	7.780	1.167	.000
40	2	19	w3	18.080	2.712	.000
41	2	20	wi1/wi2	44.730	6.710	.000
42	2	21	wi3/v2a	22.360	3.354	.000
43	2	22	v2b	14.580	2.187	.000
44	4	22	dis.chat.wp	9194.000	4209.520	.000

INPUT GROUP 7 - TRIBUTARY CONCENTRATIONS (PPB): MEAN/CV

ID	CONSERV	TOTAL P	TOTAL N	ORTHO P	INORG N	ECORG P
1	97.9/ .02	178.8/ .10	1385.8/ .08	62.6/ .08	1105.4/ .07	.0
2	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
3	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
4	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
5	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
6	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
7	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
8	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
9	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
10	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
11	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
12	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
13	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
14	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
15	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
16	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
17	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
18	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
19	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
20	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
21	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
22	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
23	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
24	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
25	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
26	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
27	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
28	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
29	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
30	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
31	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
32	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
33	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
34	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
35	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
36	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
37	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
38	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
39	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
40	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
41	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
42	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0

43	.0/ .00	34.5/ .15	.0/ .00	.0/ .00	.0/ .00	.0
44	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0/ .00	.0

INPUT GROUP 8 - MODEL SEGMENTS

SEG	OUTFLOW	GROUP	SEGMENT NAME	----------- CALIBRATION FACTORS ----------- P SED	N SED	CHL-A	SECCHI	HOD	DISP
1	10	8	BR	1.73	1.00	1.02	1.00	1.00	1.000
2	10	8	NR	1.73	1.00	1.02	1.00	1.00	1.000
3	10	8	PO	1.73	1.00	1.02	1.00	1.00	1.000
4	14	8	WO	1.73	1.00	1.02	1.00	1.00	1.000
5	16	2	YE	1.11	1.00	1.49	1.00	1.00	1.000
6	17	3	WH	1.00	1.00	1.76	1.00	1.00	1.000
7	19	1	WI	.29	1.00	1.37	1.00	1.00	1.000
8	20	4	WE	1.05	1.00	1.81	1.00	1.00	1.000
9	22	7	MA	3.28	1.00	1.69	1.00	1.00	1.000
10	11	5	CH1	2.24	1.00	.27	1.00	1.00	1.000
11	12	5	CH2	2.24	1.00	.85	1.00	1.00	1.000
12	13	5	CH3	.24	1.00	1.46	1.00	1.00	1.000
13	14	5	CH4	2.24	1.00	2.82	1.00	1.00	1.000
14	15	5	CH5	2.24	1.00	3.02	1.00	1.00	1.000
15	16	5	CH6	2.24	1.00	3.10	1.00	1.00	1.000
16	17	5	CH7	2.24	1.00	2.61	1.00	1.00	1.000
17	18	6	CH8	9.25	1.00	2.07	1.00	1.00	1.000
18	19	6	CH9	9.25	1.00	2.07	1.00	1.00	1.000
19	20	6	CH10	9.25	1.00	2.07	1.00	1.00	1.000
20	21	6	CH11	9.25	1.00	2.07	1.00	1.00	1.000
21	22	6	CH12	9.25	1.00	2.07	1.00	1.00	1.000
22	0	6	CH13	9.25	1.00	2.07	1.00	1.00	1.000

INPUT GROUP 9 - SEGMENT MORPHOMETRY: MEAN/CV

ID	LABEL	LENGTH KM	AREA KM2	ZMEAN M	ZMIX M	ZHYP M	TARGET P PPB
1	BR	2.50	.6900	2.21	2.21/ .12	.00/ .00	.0
2	NR	4.60	1.3500	1.89	1.89/ .12	.00/ .00	.0
3	PO	1.70	.6900	2.21	2.21/ .12	.00/ .00	.0
4	WO	1.70	.2400	.34	.34/ .12	.00/ .00	.0
5	YE	19.70	12.8000	4.25	4.06/ .12	.00/ .00	.0
6	WH	5.40	6.0900	5.40	4.83/ .12	.00/ .00	.0
7	WI	2.50	1.0800	4.81	4.46/ .12	.00/ .00	.0
8	WE	19.60	16.7600	6.26	5.31/ .12	.00/ .00	.0
9	MA	5.00	9.2100	8.26	6.19/ .12	.00/ .00	.0
10	CH1	8.30	3.0800	2.82	2.82/ .12	.00/ .00	.0
11	CH2	2.50	1.8200	3.56	3.52/ .12	.00/ .00	.0
12	CH3	2.50	1.8900	4.48	4.23/ .12	.00/ .00	.0
13	CH4	2.50	3.9300	5.26	4.74/ .12	.00/ .00	.0
14	CH5	3.90	3.9700	7.11	5.72/ .12	.00/ .00	.0
15	CH6	2.50	4.6700	7.66	5.96/ .12	.00/ .00	.0
16	CH7	1.30	.6500	7.42	5.86/ .12	.00/ .00	.0
17	CH8	2.50	4.6500	8.03	6.11/ .12	.00/ .00	.0
18	CH9	1.70	5.2000	7.03	5.68/ .12	.00/ .00	.0
19	CH10	2.50	3.6100	8.96	6.44/ .12	.00/ .00	.0
20	CH11	2.50	11.2700	9.82	6.71/ .12	.00/ .00	.0
21	CH12	2.50	6.8900	10.83	6.98/ .12	.00/ .00	.0
22	CH13	1.70	4.2800	14.46	7.68/ .12	.00/ .00	.0

INPUT GROUP 10 - OBSERVED WATER QUALITY

SEG		TURBID 1/M	CONSER ?	TOTALP MG/M3	TOTALN MG/M3	CHL-A MG/M3	SECCHI M	ORG-N MG/M3	TP-OP MG/M3	HODV MG/M3-D	MODV MG/M3-D
1	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	MN:	1.22	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4	MN:	1.62	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5	MN:	.49	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.18	.00	.00	.00	.00	.00	.00	.00	.00	.00
6	MN:	.50	.0	.0	.0	.0	.0	.0	.0	.0	.0

	CV:	.14	.00	.00	.00	.00	.00	.00	.00	.00	.00
7	MN:	.37	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00
8	MN:	.48	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.12	.00	.00	.00	.00	.00	.00	.00	.00	.00
9	MN:	.39	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.19	.00	.00	.00	.00	.00	.00	.00	.00	.00
10	MN:	1.86	103.0	132.0	1526.0	.0	.0	.0	.0	.0	.0
	CV:	.20	.00	.21	.17	.00	.00	.00	.00	.00	.00
11	MN:	2.10	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.19	.00	.00	.00	.00	.00	.00	.00	.00	.00
12	MN:	1.97	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.13	.00	.00	.00	.00	.00	.00	.00	.00	.00
13	MN:	1.05	87.2	74.0	1060.0	23.2	.7	.0	.0	.0	.0
	CV:	.11	.15	.11	.11	.25	.00	.00	.00	.00	.00
14	MN:	.90	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.20	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	MN:	.65	89.6	62.0	716.0	24.2	.9	.0	.0	.0	.0
	CV:	.24	.10	.06	.25	.23	.10	.00	.00	.00	.00
16	MN:	.38	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.23	.00	.00	.00	.00	.00	.00	.00	.00	.00
17	MN:	.44	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.15	.00	.00	.00	.00	.00	.00	.00	.00	.00
18	MN:	.50	88.2	42.0	752.0	19.8	1.1	.0	.0	.0	.0
	CV:	.18	.08	.09	.08	.14	.08	.00	.00	.00	.00
19	MN:	.30	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.18	.00	.00	.00	.00	.00	.00	.00	.00	.00
20	MN:	.49	85.0	26.0	630.0	14.4	1.3	.0	.0	.0	.0
	CV:	.16	.09	.09	.15	.05	.10	.00	.00	.00	.00
21	MN:	.35	.0	.0	.0	.0	.0	.0	.0	.0	.0
	CV:	.20	.00	.00	.00	.00	.00	.00	.00	.00	.00
22	MN:	.40	82.0	17.5	517.0	11.2	1.6	.0	.0	.0	.0
	CV:	.04	.06	.14	.17	.08	.00	.00	.00	.00	.00

INPUT GROUP 11 - NON-POINT WATERSHED AREAS (KM2)

ID	COD	NAME	landuse1	landuse2	landuse3	landuse4
2	2	Brush	68.07	.00	.00	.00
3	2	Newriver	119.40	.00	.00	.00
4	2	Potato	235.30	.00	.00	.00
5	2	Wolf	29.17	.00	.00	.00
6	2	Yellowjacket	50.20	.00	.00	.00
7	2	Yc	7.39	.00	.00	.00
8	2	shoal	22.50	.00	.00	.00
9	2	beech	29.43	.00	.00	.00
10	2	b3a	7.78	.00	.00	.00
11	2	b3b	7.78	.00	.00	.00
12	2	dixie	5.83	.00	.00	.00
13	2	jackson	48.62	.00	.00	.00
14	2	j1	8.75	.00	.00	.00
15	2	y1a	5.83	.00	.00	.00
16	2	Willow/Sherwood	38.89	.00	.00	.00
17	2	whitewater	86.55	.00	.00	.00
18	2	thompson	64.18	.00	.00	.00
19	2	wilson	38.90	.00	.00	.00
20	2	wehadkee	81.35	.00	.00	.00
21	2	guss	180.89	.00	.00	.00
22	2	caney	97.25	.00	.00	.00
23	2	l.wehadkee	132.26	.00	.00	.00
24	2	we2	31.12	.00	.00	.00
25	2	we3	9.72	.00	.00	.00
26	2	stroud	40.84	.00	.00	.00
27	2	veasey	33.06	.00	.00	.00
28	2	maple	64.18	.00	.00	.00
29	2	talley	27.23	.00	.00	.00
30	2	zachary	35.01	.00	.00	.00
31	2	z1-z2	44.72	.00	.00	.00
32	2	b2	52.51	.00	.00	.00
33	2	p5-p6	31.11	.00	.00	.00

34	2 p7	19.45	.00	.00	.00
35	2 p8	5.83	.00	.00	.00
36	2 p9	33.06	.00	.00	.00
37	2 j2a	18.08	.00	.00	.00
38	2 j2b	8.36	.00	.00	.00
39	2 w2	7.78	.00	.00	.00
40	2 w3	18.08	.00	.00	.00
41	2 wi1/wi2	44.73	.00	.00	.00
42	2 wi3/v2a	22.36	.00	.00	.00
43	2 v2b	14.58	.00	.00	.00

INPUT GROUP 12 - NON-POINT EXPORT CONCENTRATIONS

IC LAND USE		RUNOFF M/YR	CONSERV PPB	TOTAL P PPB	TOTAL N PPB	ORTHO P PPB	INORG N PPB
1 landuse1		.15	.0	34.5	.0	.0	.0
	CV:	.00	.00	.15	.00	.00	.00
2 landuse2		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00
3 landuse3		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00
4 landuse4		.00	.0	.0	.0	.0	.0
	CV:	.00	.00	.00	.00	.00	.00

INPUT GROUP 13 - MODEL COEFFICIENTS

IC COEFFICIENT	MEAN	CV
1 P DECAY RATE	1.000	.45
2 N DECAY RATE	1.000	.55
3 CHL-A MODEL	1.000	.26
4 SECCHI MODEL	1.000	.10
5 ORGANIC N MODEL	1.000	.12
6 TP-OP MODEL	1.000	.15
7 HODV MODEL	1.000	.15
8 MODV MODEL	1.000	.22
9 BETA M2/MG	.020	.00
10 MINIMUM QS	.100	.00
11 FLUSHING EFFECT	1.000	.00
12 CHLOROPHYLL-A CV	.620	.00

INPUT GROUP 14 - CASE NOTES
West Point Lake 1990
Verification of calibration
Data from GaEPD
P, Light, Flushing Model
Regional and local calibration
from 1991

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Eutrophication and eutrophication potential at selected Corps of Engineers reservoirs were evaluated using the model BATHTUB. Reservoirs included in the study were Allatoona Lake, Walter F. George Lake, West Point Lake, and Lake Sidney Lanier. BATHTUB models were calibrated using historic water quality data for each lake. Lake responses were evaluated based on estimates of nutrient loading and flushing rates. Calibrated models provide one means for evaluating management alternatives.

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