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Maloney, Kelly O.

Modeling Seasonal Variation in Dissolved Absorbance of Ultraviolet...

June 2000

Modeling seasonal variation in dissolved absorbance of ultraviolet radiation in two dimictic, mid-latitudinal lakes.

By

Kelly O. Maloney

A Thesis
Presented to the Graduate and Research Committee
Of Lehigh University
In Candidacy for the Degree of
Master of Science

In
Earth and Environmental Sciences

Lehigh University

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This thesis is accepted and approved in partial fulfillment of the requirements for the Master of Science

4 May 2000

Date

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ABSTRACT

Lake Lacawac and Lake Giles, located in Northeastern Pennsylvania, are two small lakes with small watersheds. Lake Lacawac is a high humic lake with associated high dissolved absorbance; while Lake Giles is a low humic lake with associated low dissolved absorbance. Seasonal variation in dissolved absorbance occurs in the epilimnion of both lakes. This study attempted to quantify the importance that mixing, photobleaching, sediment release, rainfall, runoff, and water column microbial processes play in this seasonal variation of both lakes. Photobleaching accounted for a majority of the removal of dissolved absorbance when the other variables remained relatively constant. The deepening of the mixed layer resulted in upwelling of higher dissolved absorbance waters from the hypolimnion, which primarily resulted from benthic substrate release. Different processes drove the sediment contribution in the two lakes. In Lake Lacawac the formation of an anoxic layer forced the sediments anoxic, which caused them to release dissolved absorbing substances. Preliminary findings have shown that reduced iron released from anoxic sediments could cause this increase in dissolved absorbance of lake water. This process needs to be investigated further. Lake Giles did not go anoxic, however, release of dissolved absorbance occurred from moss, which covers the majority of the substrate. Rainfall and runoff effects were difficult to quantify, but appeared to be seasonal and/or dependent on previous climatic/soil conditions. Runoff played an important role during large events for both lakes, and was attributed to runoff carrying the high absorbance waters of the bog. Rainfall was important only in the low-humic lake. The water column microbial component was a sink in Lake Lacawac and took too much out and in Lake Giles it was a source and put too much in.

Introduction:

This study is part of an ongoing research project with the objective to model seasonal changes in the attenuation of ultra violet radiation, UVR, within a water column associated with changes in dissolved compounds (i.e. dissolved organic carbon, DOC), particulate matter and water as driven by the dynamic interaction between UVR irradiance and a combination of biotic and abiotic processes. This research focused on modeling the seasonal trends of dissolved UVR absorbance at 320 nm (ad_320) in two dimictic, temperate lakes, one humic, mesotrophic and the other clear, oligotrophic lake. We studied the importance that mixing, photobleaching, sediment production/consumption, rainfall, runoff, and water column biota have on this seasonal variation.

UVR is the part of the solar spectrum below the 400 nm wavelength range. Wavelengths less than 280 nm are absorbed or reflected by the earth's atmosphere; therefore, only the 280-400 nm range reaches the Earth's surface. The short wavelength UV-B portion (280-320 nm) has recently become a topic of major concern due to the fact that the amount reaching the earth's surface is increasing (Madronich 1994). This is a result of depletion of the stratospheric ozone layer, which absorbs damaging UV-B radiation. There is some debate on whether this is a natural phenomenon or if it is due to anthropogenic production of chlorofluorocarbons. Whatever the cause, this increase is of great concern because there is evidence that UV-B radiation affects both the biotic and abiotic components of aquatic systems. The absorbance of UV-B radiation can alleviate these effects. Epilimnetic UV attenuation (K_{duv}) has been shown to vary seasonally (Morris and Hargreaves 1997). This study attempts to quantify the factors that affect dissolved UV-B absorbance that lead to this seasonal pattern, by using the dissolved 320 nm absorbance as a proxy for the entire UV-B range.

Absorption coefficients can be used to measure the depth to which the UV radiation penetrates the water column. Absorption coefficients are directly related to the amount of DOC in the water column, the higher the DOC concentration, the higher the absorption coefficient, and less transparent the water column. The absorption coefficient, *a*, is –LN(T) for a 1 m path in non-scattering media; where T is transmittance (Kirk 1994b). UVR attenuation is strongly regulated by the amount of DOC in the water column. Except in very clear lakes, a high DOC concentration leads to a higher attenuation in the epilimnetic region, a lower DOC concentration leads to a more transparent water column (Morris et al. 1995) and thus lower *a* values. Chromophoric dissolved organic matter, CDOM, is the portion of DOC that absorbs UVR. It protects aquatic biota from UVR primarily in the UVB range (280-320 nm) but also the UVA range (320-400 nm) (Vincent et al. 1998). Dissolved absorbance at 320 nm (ad_320) was the proxy used to represent the measured value of CDOM in this model.

UVR inactivation of microbial cells (loss of ability to reproduce) has been reported (Harm, 1980). It has been shown that aquatic organisms are affected by UV radiation (Calkins and Thordardottir 1980, Williamson 1995, Williamson et al 1996). Smith et al. (1992) have shown that phytoplankton processes such as photoinhibition, photoprotection, and photosynthesis are altered in Antarctic lakes due to UVR. There is evidence that zooplankton community diel patterns, such as vertical migration and predator avoidance, can be altered by UV-B radiation (Williamson 1995, Williamson et al 1996). Different species have been shown to respond differently to the same UVR intensity (Siebeck et al. 1994). Absorption by CDOM of incoming UVR in aquatic systems can reduce these effects.

UVR is strongly absorbed by humic substances in aquatic systems (Allard et al 1994, Frimmel 1994, Kirk 1994b). The molecular structure of humic substances is poorly understood, so molar concentrations cannot be used to represent humic levels; Therefore, total dissolved organic carbon (DOC) is used (Frimmel 1994). Morris et al. (1995) studied the role DOC plays in attenuating UVR in 65 lakes of Alaska, Colorado, Pennsylvania and the Bariloche region of Argentina. They found that UVR attenuation varied among the lakes according to DOC concentration. This evidence suggests that lakes with higher DOC levels have a greater capacity for UVR attenuation.

However, UVR also affects the structure of humic material in an aquatic system. UVR breaks down recalcitrant, large molecular weight DOC, into bioavailable, low molecular DOC (Frimmel 1994; Strome and Miller 1978, Salonen and Vahatalo 1994, Miller and Moran 1997, Frimmel and Bauer 1987). Bacteria can mineralize this low molecular weight DOC. UVR photooxidizes or photodegrades DOC resulting in formation of hydrogen peroxide (Cooper et. al 1989, Scully et. al 1995, Scully and McQueen 1996) and carbon monoxide (Miller and Moran 1997). However, the photosensitivity of DOC to UVR is dependent on the humic substance (Amador et al. 1991) and season (Lindell et al, 1996; Sopka 1999). Different humic materials react differently to the same UVR. Photosensitivity of DOC in two Swedish lakes (Lindell et al. 1996) and Lakes Lacawac and Giles 9Sopka 1999) varies depending on the time of year, being most photosensitive during spring and photorecalcitrant in summer. These sensitivity parameters of DOC to photooxidation make it essential to quantify the sources and sinks on a seasonal basis.

CDOM has allochthonous (terrestrial) and autochthonous (internal) sources in a lake. Examples of allochthonous sources are soil decay products from terrestrial plants and mosses brought in via watershed runoff and seepage into the lake. DOM in inland lakes is thought to be largely of terrestrial, allochthonous, origin (Salonen and Vahalalo 1994, Vincent et al. 1998, Molot and Dillon 1996). A source of autochthonous CDOM has been found to be from algal production (Nelson et al. 1996) and possibly from littoral and benthic plants. Therefore, the amount of source CDOM in an inland lake is directly related to the size and characteristics of the catchment area and algal production of CDOM. In clear lakes the addition of UV absorbing substances by rainfall is a potentially important source. DOC is removed from the system by UVR, microbial mineralization, and outflow. Mid-latitudinal lakes experience seasonal changes in UVR intensity, algal production, precipitation, water column mixing, etc. and at least one of these factors changes the rate of photobleaching of CDOM by solar UVR (Morris and Hargreaves, 1997).

The model accounted for all inputs and outputs of CDOM by direct and indirect measurements. The finished model consisted of sub-models that accounted for mixing depth, photobleaching, sediment release, rainfall/runoff, and water column microbial variables. The depth of the mixed layer was directly measured via temperature sensors on lake weather stations. Photobleaching was measured indirectly by multiplying a photobleaching factor, determined from lake experiments, by Sopka (1999) by the amount of incoming solar UVR at 320 nm, measured by the Lacawac GUV weather station. Sediment release was indirectly estimated by multiplying a release rate, determined from summer in situ carboy experiments, by the area of the substrate. Rainfall measurements were taken by the lake weather stations, while runoff values were indirectly estimated by subtracting rainfall by lake level change during the rainfall event. Bog areas were calculated with the aid of a GPS survey of the perimeter of the bog. Arcview and Arcinfo were used to estimate the lake, bog, and watershed areas. The biotic flux was indirectly estimated by multiplying a measured biotic factor from 1998 lake incubations (Sopka 1999) by incident UVR.

Variable entry into the model was based on assumed importance and confidence in the variable data. The order in which variables were run in the model was mixing, photobleaching, sediment release, rainfall/runoff, and then water column biotic.

Methods

A copy of the Stella 5.0 (High Performance Systems Inc.) and all spreadsheet/database models and/or data can be accessed by contacting Bruce Hargreaves, 212 Williams Hall, Lehigh University, Bethlehem PA.

Site location:

Lake Lacawac and Lake Giles are the two study sites for this experiment. They are located in the Pocono Plateau of northeastern Pennsylvania. The geographic and morphometric properties of both lakes are listed in Table 1 (Moeller et al. 1995). The lake and basin drainage areas of Lake Giles are approximately twice that of Lake Lacawac. Lake Giles volume is more than four times that of L. Lacawac.

For ease in describing the processes involved in developing the model, L. Lacawac and L. Giles will be separated. Lake Lacawac was the pilot model and will be discussed first.

Lake Lacawac Variable Data:

Lake water samples were frequently taken at 1-meter intervals and filtered (GF/F Whatman). The filtrate was analyzed in a Shimadzu UV160 Spectrophotometer in a quartz cuvette for 200 – 800 nm values. Water spectra were measured on each date and values subtracted from lake water spectra to obtain net OD_λ. These values were converted to Ad_λ as per Kirk (1994): $Ad = OD_\lambda \bullet Ln(10)/l$; where l is the path length in meters. Volume weighted ad_320 values throughout the year for the epilimnion, metalimnion, hypolimnion, and the entire water column sections of the lake were calculated. Ad_320 values were multiplied by their respective volume and summed for each stratum. This summed value was divided by the percentage of lake volume of the strata to obtain the volume-weighted ad_320. For example, if we have a 2 m mix layer with an ad_320 of 10 m^{-1} from 0 to 1m and 9.0 m^{-1} from 1 m to 2m. If 0 to 1m was 20% of the lake then the volume weighted ad_320 would be 10 m^{-1}*20 or 200 m^{-1} for that 1 m interval. If 1 to 2 m was 10% of the lake then the volume-weighted ad_320 would be 9.0 m^{-1}*10 or 90 m^{-1} for that 1 m interval. The volume weighted values were added (200 m^{-1}+90 m^{-1}) and divided by the percent volume of entire strata, in this case 30%. The volume weighted ad_320 for the epilimnion would be 290 m^{-1}/30 m^{-1} or 9.6 m^{-1}. This process was automated by entering the PCLP ad_320 values into an MS Excel spreadsheet model that volume weighted the ad_320 values using percent volume at depth outlined in Table 2. The metalimnion was arbitrarily assigned a thickness of 2 m. The hypolimnion started at the bottom of the metalimnion. Within the model, the initial volume-weighted ad_320 value, units m^{-1}, was multiplied by the respective volume (units m^3) to obtain a CDOM unit (CU) with the units of m^2. The CU allowed a mass-balance approach to track the ad_320. The calculated values for each section of the water column were compared with model predictions for each section.

Mid latitudinal dimictic lakes turnover twice per year, once in the spring and once in the fall. They also exhibit seasonal variations in the thickness of the mixed layer. These variations result in transfer of materials from deeper metalimnetic and hypolimnetic waters to the epilimnion. These variations are the driving force behind bulk movement in the water column; therefore, a representation of this process was first developed with the use of measured temperature data. Temperature stratification was the proxy used for the depth of the mixing layer. The Lake Lacawac weather station has thermistors at 1m intervals from the surface to 8 m and then another sensor at 10 m. The thermistors report temperature at 15-minute intervals. For development of the mixing depth model, the minimum temperature recorded for a day was used. A temperature difference of ≥1 °C over a 1 m interval identified the thermocline and thus defined the bottom of the mixed layer. A spreadsheet using Microsoft Excel was used to automate this process which was tested by manually deriving the mixed depth using the same time period and weather station temperature data. Since the deployment of the weather station was on May 1, 1999, this marked the beginning of the modeled period.

Removal of ad_320 nm absorbing substances by UVR was estimated by multiplying a previously measured photobleaching factor, PF, taken from in situ quartz tube incubations (Sopka 1999) by the total daily measured amount of incoming solar radiation at 320 nm throughout the modeled period. The PF values were taken from the work of Sopka (1999), reported in $((KJ\ m)/(nm\ m^2))^{-1}$. There was a linear relationship between ad_320 and PF in 1998 (Figure 1): PF is equal to 0.0033*abs – 0.002 ($r2 = 0.85$, $n = 5$). This equation was used to calculate the PF for 1999. The incoming solar radiation at 320 nm is measured by a GUV 521 sensor and Campbell CR10 datalogger at 15-minute intervals in uW cm^{-2} nm^{-1}. These values were summed for the day and the summed value was multiplied by 9 to convert to J $m^{-2}nm^{-1}$. This value was divided by 1000 to obtain appropriate units with the PF to estimate loss of ad_320 by photobleaching.

The Sediment release variable was based on field experiments for both lake systems during the summer of 1999. Sediment "release" of ad_320 was measured with the use of SCUBA on the dates outlined in Table 3. Five twenty-liter carboys were used for these experiments. The bottoms of the carboys were removed. Rubber stoppers with two holes for tubing were placed in the carboy's neck. Two pieces of tubing, one approximately 0.1 m and the other approximately 1 m were inserted through the stoppers. The 1 m tubing was used for sample collection (the long length to assure the diver collecting the sample could see the tubing during collection). The 0.1 m tubing was used for water replenishment in the carboy during sample collection. The carboys were slowly placed on the lake bottom. A 60 cc syringe was used to collect the sample, attached to the 1 m tubing. The first sample in each syringe was used as a rinse and discarded. The second sample was placed into a 250 ml polycarbonate bottle and used for analysis. Samples were taken at initial deployment and at 6-day intervals. Control samples were taken at the same time next to the carboy. Ad_320 values for all samples were measured with a Shimadzu UV160 UV-Visible Spectrophotometer at the Lacawac Field Laboratory after GF/F filtration. Samples were kept anoxic by filtering them directly from the syringe. The sediment release of ad_320 substances was calculated per m^2 and therefore total sediment release is related to the substrate area of the anoxic layer. The area of the anoxic layer substrate was used to scale experimental data to whole lake values for Lake Lacawac. The anoxic layer was estimated using dissolved oxygen (DO) profiles. The profiles were 1 m interval DO measurements taken with a YSI 5739 DO Probe and a YSI Model 58 DO meter. Additional DO profiles were performed during the sediment "release" experiments. A DO level less than 0.5 mg/l signified the anoxic layer. This value was close to the instrument's level of detection. DO values between profile dates were interpolated between measurements

The effect of oxygenation on anoxic hypolimnetic water was studied on October 16, 1999. Here 3 replicates of 2 m water, representing oxygenated water, and 11 m water, representing anoxic water, were sampled and placed into 310 ml BOD bottles. Samples were filtered using a 10 cc syringe with a Whatman GF/F filter attached to it. This was performed to obtain an initial ad_320 reading. The samples were aerated using compressed air. The experiment was run for 2 hrs and the ad_320 of each sample was measured hourly.

The main allochthonous input of UVR absorbing substances is from the watershed, primarily as runoff. In order to estimate this input, rainfall values must first be quantified. Rainfall measurements were taken by an unheated rain gauge on the weather station with a resolution of 0.1 mm, summed at 15-minute intervals. Rainwater ad_320 was estimated from rainfall that was collected on the Lacawac dock with a funnel and which was passed through a 64 um screen mesh on dates listed in Table 4. The sample was collected in a one-liter polycarbonate bottle, which was rinsed with deionized (DI) water prior to deployment. Runoff values were estimated by subtracting rainfall from lake-level change over the entire storm event. Lake level measurements were taken hourly with a H310 vented pressure sensor (Dengn Analysis Associates) with a 0.1 mm resolution (Farkas 1998). Because of the high ad_320 of the interstitial water in the bog, the remainder of the watershed was assumed to be an insignificant source of ad_320 (values listed in Appendix K); therefore only runoff flowing through the bog was used. Runoff ad_320 was estimated by sampling bog water via two lysimeters and three randomly picked sites. As summer 1999 progressed the water level in the bog dropped and these sites were moved closer to the lake. Approximately 250 ml was collected at each site. The perimeter of the bog was outlined in May 1999 using Trimble GPS receivers. The GPS points were processed using Arcinfo/Arcview to estimate the area of the bog and upland watershed. The topographic watershed, as outlined on the published 7.5 minute topographic sheet, was digitized from Moeller et al (1995). Contour intervals were estimated in Arcinfo using a Digital Elevation Model, DEM, downloaded from the USGS. The contours were used to estimate the upland watershed area that flowed through the bog.

Sestonic production/consumption of a_d320 were derived from measurements taken in 1998 (Sopka 1999). She estimated this value by quartz tube *in situ* incubations of approximately 7 days with 0.2 μm filtered and 48 μm screened water. Microbial effects on CDOM were calculated by subtracting the 0.2 μm filtered ad_320 change in lake incubations from the change in ad_320 for the 48 μm screened incubation. Her research found that sestonic, presumably microbial, effect on Lacawac was primarily consumption of ad_320. The rate was roughly correlated with photobleaching and 70 percent of photobleached CDOM was used as an estimate of microbial effects.

Water samples were filtered through double Whatman GF/F filters. The ad_320 values were measured with a Shimadzu UV160U UV Visible Recording Spectrophotometer. Samples were measure in a 10 cm quartz cuvette, except for some Lacawac and bog samples that were run in a 1cm quartz cuvette as a result of high ad_320.

Lake Lacawac: The Model

A model for L. Lacawac 1999 was created first using High Performance Systems, Inc's Stella 5.0 program (Figure 2). To test the model, 1998 data were substituted for the 1999 data and the model was run. All calculated values are listed in Appendix A. A description of key terms used by Stella follows. A reservoir is a stock that collects what flows into and out of it. A conveyor moves material into and out of a reservoir. A converter allows the modeler to manipulate data (i.e. perform multiplication, graphical functions, IF/Then relationships, etc.) to adjust (convert) input data into output data in the correct format. Spreadsheet data were copied and then pasted into the respective Stella reservoir. An in depth description of the 1999 Lacawac model follows.

The first part of the model developed was the mixing depth section. The measured mixed depth was copied to the model under the Epilimnetic Depth Input conveyor. The initial epilimnetic volume reservoir was equal to the volume of the epilimnion (1 m) on May 1, 1999: (V_{epi}) = 197,000 m^3. The metalimnion initial volume (V_{meta}) was 326,940 m^3 (1-3 m). The initial hypolimnion volume (V_{hypo}) was 596,060 m^3 (3 m+). The lake volume (V_{total}) was initially set to 1.12×10^6 m^3 from Moeller et al. (1995). The incoming measured depth was compared to the current modeled depth; any difference would cause a volume transfer of the difference to the respective reservoir. The volume transferred (V_{trans}) was computed in the converter called Epi Depth for the epilimnion and Hypo depth for the hypolimnion. In these converters the percentage of volumes from Table 2 were entered and these converters calculated the volume transfer as expressed As:

$$V_{trans} = V_{initial} - V_{input} \quad \text{(eqn 1)}$$

where $V_{initial}$ was the model's reservoir volume and V_{input} is the volume calculated in the Epi Depth or Hypo Depth converter. This section of the model was tested by running the model and comparing modeled volume transfer to the percentage volume.

The CDOM section of the model was created next. Here the beginning dates were crucial, as data were only available for a certain start date. For L. Lacawac that date was May 10, 1999 (this value was used as the May 1, 1999 value for the model). The initial ad_320 values for the epilimnion ($ad320_{initepi}$), metalimnion ($ad320_{initmeta}$), and hypolimnion ($ad320_{inithypo}$); (7.98, 8.16, 8.09 m^{-1} respectively) were placed in each reservoir (epi ad_320, meta ad_320 or hypo ad_320) and multiplied by the initial volume (V_{epi}, V_{meta}, V_{hypo}) of each layer (epi, meta, hypo) to obtain a weighted amount with unit m^2, referred to as a CDOM unit (CU). Dividing the CU value by the respective volume gave a modeled value of ad_320 with units m^{-1}. This acted as a concentration and had the units of m^{-1}, the model representation of ad_320. The CDOM section was then linked to the mixing section by connecting the volume transfer (V_{etrans}, V_{mtrans}, V_{htrans}) to the CDOM mass transfer. This enabled the volume transfer (V_{trans}) to be multiplied by the respective CDOM ($ad320_{emTrans}$, $ad320_{Trans}$, $ad320_{hmTrans}$) and placed in the correct reservoir. The following three equations mathematically represent adjustments to CDOM for epilimnion (ad_320_{epi}), metalimnion (ad_320_{meta}), and hypolimnion (ad_320_{hypo}). The water column ad_320 was calculated by summing the CU values for the epilimnion, metalimnion, and hypolimnion and the dividing by the total lake volume.

$$ad\_320_{epi} = \frac{[(ad320_{initepi} * V_{epi}) + (V_{etrans} * ad320_{emTrans})]}{V_{epi} + V_{etrans}} \quad \text{(eqn 2)}$$

$$ad\_320_{meta} = \frac{[(ad320_{initmeta} * V_{meta}) + (V_{mtrans} * ad320\ _{Trans})]}{V_{meta} + V_{metrans}} \quad \text{(eqn 3)}$$

$$ad\_320_{hypo} = \frac{[(ad320_{inithypo} * V_{hypo}) + (V_{mhtrans} * ad320_{mhTrans})]}{V_{hypo} + V_{hypotrans}} \quad \text{(eqn 4)}$$

$$ad\_320_{wc} = \frac{CU_{epi} + CU_{meta} + CU_{hypo}}{V_{total}} \quad \text{(eqn 5)}$$

PF values were copied into the PF Coefficient conveyor and UVR320 values were copied into the UVR320 conveyor. The incoming 320 nm solar radiation was accounted for by creating a conveyor to link the UVR 320 nm data from the MS Excel spreadsheet. The data was divided by 1000 to convert from J m^{-2} nm^{-1} to KJ m^{-2} nm^{-1}. This enabled the PF to be multiplied by the UVR320 to obtain the amount of ad_320 removed by photobleaching. Since PF only removes ad_320 from the epilimnion, equation 2 was modified to equation 6 to account for PF.

$$ad\_320_{epi} = \frac{[(ad320_{initepi} * V_{epi}) + (V_{etrans} * ad320_{emTrans}) - (PF * UVR320)]}{V_{epi} + V_{etrans}} \quad \text{(eqn 6)}$$

Anoxic layer measurements were copied into the Anoxic Layer conveyor. These were multiplied by the anoxic substrate calculated in the model in the Anoxic Substrate Area converter using the substrate area percentage listed in Table 5. The anoxic area in m^2 (Anox) was multiplied by the sediment release rate CU m^{-2} (CU_{Sed}) calculated from the sediment "release" experiments. This new variable only affected ad_320_{hypo} calculations, therefore equation 4 was modified to equation 7 to account for sediment release of ad_320.

$$ad\_320_{hypo} = \frac{[(ad320_{inithypo} * V_{hypo}) + (V_{htrans} * ad320_{hmTrans}) + (Anox * CU_{Sed})]]}{V_{hypo} + V_{htrans}} \quad \text{(eqn 7)}$$

Rainfall and runoff ad_320 values were next entered into the model. The rainfall volume (P) was calculated by multiplying the amount of rainfall by the lake area. This value was multiplied by the ad_320 average value for rainfall ($ad320_{rain}$), which was calculated as the average ad_320 for the sample dates listed in Table 4. Runoff ad_320 input was calculated by multiplying the runoff volume m^3 (R) by the runoff ad_320 value m^{-1} ($ad320_{runoff}$). Rainfall and runoff were assumed to only affect the epilimnion, therefore equation 6 was modified to incorporate rainfall and runoff fluxes.

ad_320_{epi} =

$$\frac{[(ad320_{initepi} * V_{epi}) + (V_{etrans} * ad320_{emTrans}) - (PF * UVR320) + (R * ad320_{runoff}) + (P * ad320_{rain})]}{V_{epi} + V_{etrans}} \quad \text{(eqn 8)}$$

Biotic ad_320 values were estimated as 70 percent of photobleaching, so equation 9 was derived to account for biotic consumption.

ad_320_{epi} = (eqn 9)

$$\frac{[(ad320_{initepi} * V_{epi}) + (V_{etrans} * ad320_{emTrans}) - (PF * UVR320) + (R * ad320_{runoff}) + (P * ad320_{rain}) - (0.7 * (PF * UVR320))]}{V_{epi} + V_{etrans}}$$

The model was tested using data collected for 1998. All procedures were followed exactly as stated for the 1999 data calculations with the following exceptions. The weather station was deployed on April 5, 1998 and the first PCLP profile was completed on April 26, 1998. These ad_320 profile values were used as the May 1, 1998 values in the model. The initial epilimnetic, metalimnetic and hypolimnetic ad_320 values were 10.55, 10.35 and 9.22 m^{-1} respectively. The epilimnetic depth was 1m on May 1, 1998, metalimnion was 1-3 m and the hypolimnion was 3m+. The volumes were 197,000, 326,940 and 596,060 m^3 respectively. The PF values were taken from the work of Sopka (1998). PF values between Sopka's experimental dates were linearly interpreted. Dissolved oxygen profiles were not taken for 1998. These values were estimated for 1998 from previous year's DO trends, ad_320 profiles and epilimnetic depth. All variable data are listed in Appendix B.

Lake Giles Variable Data:

The epilimnion of Lake Giles was calculated slightly differently than Lake Lacawac. Because the lake is twice as deep, the weather station has thermistors at 2 m intervals from 2-16 m and then one at 20 m. Therefore, the metalimnion was arbitrarily assigned a thickness of 4 m. The hypolimnion started at the bottom of the metalimnion (epilimnion +4 m). A 1°C shift in temperature over a 2 m depth signified the bottom of the epilimnion. The deployment of the weather station was May 28, 1999, so the initial date for the mixing model was set at June 1, 1999.

Calculations of ad_320 were performed following L. Lacawac's procedures, however the 4 m metalimnetic layer was used in place of the 2 m layer.

PF values were taken from the work of C. Sopka and linear interpolation was performed as above. However no direct relationship between ad_320 and PF was observed as for Lacawac (Figure 1) so the experimental values from C. Sopka (1998) were used for the 1999 model. UVR320 values were also taken from the Lacawac GUV station.

Lake Giles does not form an anoxic layer. Enough light reaches the lake bottom enabling moss (*Orepanocladus fluitans*) to grow on most of the lake bottom. Moss production of ad_320 was measured in a similar way to Lake Lacawac's sediment "release" experiment. The same experimental setup was used, however the carboys were placed over moss and sediment (Table 6), to measure net release by moss and underlying sediment. The area coverage of moss on the substrate of Lake Giles was used to scale experimental data to whole lake values.

Rainfall and runoff values were estimated following the procedures outlined above. A GPS survey of the bog in the southwest corner was not available, so the watershed flow through the bog was estimated using the contour lines generated by the DEM in arcinfo/view. Runoff from the bog was estimated as 100 m^{-1} (Appendix K).

Lake Giles, The Model:

The Lake Lacawac model was used to build the Lake Giles model. Lake Giles does not develop an anoxic layer, therefore the anoxic section of the Lacawac Model was removed and replaced with a moss production conveyor that affected all three layers (Figure 2). All other sections were kept identical to Lacawac. All variables were calculated and entered as stated above using values for Lake Giles 1999. Variable data for L. Giles 1999 are listed in Appendix C.

The initial volume of the epilimnion, metalimnion and hypolimnion were 811,768, 1,397,500, and 2,670,700 m^3 respectively. The starting epilimnetic depth was 2 m on June 1, 1999. The incoming measured depth was compared to the modeled depth. Any difference would cause a volume transfer of the difference to the respective reservoir. The volume transferred was computed by a converter called Epi Depth. In this convertor the percentage of volumes from Table 7 were entered and this converter calculated the volume transfer. This section of the model was tested by running the model and comparing modeled volume transfer to the percentage volume.

The initial ad_320 values were 0.865, 0.916, and 1.03 m^{-1} for the epilimnion, metalimnion and hypolimnion. These values were multiplied by the initial volume of each respective reservoir. This value was the initial ad_320 mass used in the model.

Moss release (CU_{MR}) input values were directly related to substrate area. The assumption that half the substrate area above 8 m and the entire substrate area below 8 m were covered by moss was derived from visual observations using SCUBA. The substrate area for each section was derived by multiplying the depth by the converter in the model. The converter multiplied the depth by the percentage area outlined in Table 8. The absence of an anoxic layer and presence of the moss release required a modification to the equation 7 calculation of ad_320_{hypo} shown in equation 9. The Anox and Sed variables were replaced with Moss area and CU_{MR}. This variable also influenced the ad_320_{epi} and ad_320_{meta} calculations. The following three equations were used to calculate ad_320 for each layer. The ad_320_{wc} equation was not changed.

$$ad\_320_{hypo} = \frac{[(ad320_{inithypo} * V_{hypo}) + (V_{htrans} * ad320_{hmTrans}) + (MA * CU_{MR})]]}{V_{hypo} + V_{htrans}} \quad \text{(eq 10)}$$

$$ad\_320_{epi} = \quad \text{(eq 11)}$$

$$\frac{[(ad320_{initepi} * V_{epi}) + (V_{etrans} * ad320_{emTrans}) - (PF * UVR320) + (R * ad320_{runoff}) + (P * ad320_{rain}) - (B * ad320_{bio}) + (MA * CU_{MR})]}{V_{epi} + V_{etrans}}$$

$$ad\_320_{meta} = \frac{[(ad320_{initmeta} * V_{meta}) + (V_{mtrans} * ad320_{Trans}) + (MA * CU_{MR})]}{V_{meta} + V_{mtrans}} \quad \text{(eq 12)}$$

Rainfall and runoff values were calculated following L. Lacawac's protocol. Runoff was assumed to be negligible from the watershed area not flowing through the bog, therefore the amount of runoff flowing through the bog was used.

Biotic production values were taken from the work of Sopka 1998. July and August were the only months with significant values (July 17th and August 12th) and only for the metalimnion and hypolimnion. Values were extrapolated from July 1st (assumed 0) to July 17th to August 12th and to August 31st (assumed 0). These values were used in the 1999 Giles model. Therefore, equations 12 and 10 were modified to account for biotic production to equation 13 and 14 respectively.

$ad\_320_{meta} =$

$$\frac{[(ad320_{initmeta} * V_{meta}) + (V_{mtrans} * ad320_{Trans}) + (MA * CU_{MR}) + (ad320_{bio} * V_{meta})]}{V_{meta} + V_{mtrans}} \quad \text{(eq 13)}$$

$ad\_320_{hypo} =$

$$\frac{[(ad320_{inithypo} * V_{hypo}) + (V_{htrans} * ad320_{hmTrans}) + (MA * CU_{MR}) + (ad320_{bio} * V_{hypo})]]}{V_{hypo} + V_{htrans}}$$

(eq 14)

The Giles model was tested using data gathered in 1998. For 1998 the starting epilimnetic depth was 3 m which yielded 1,189,400 m^3 for the epilimnion. The metalimnion was 1,322,100 m^3 and the hypolimnion was 2,368,500 m^3. The initial ad_320 values were 0.5982, 0.6576, and 0.7286 respectively. All other input values are listed in Appendix D. The weather station was deployed early April so the start date of the model was May 1, 1998.

Variable Sensitivity Analysis

A sensitivity analysis was performed on each variable for the 1999 Lacawac and Giles models. Because the epilimnion and hypolimnion were affected by different variables for a majority of the year, these two sections of the model were tested. All variables were set to measured values. One variable at a time was reduced by 10% and then increased by 10%, each time running the model. At the end of the variable's analysis it was returned to its measured value and the next variable was analyzed. For this analysis rainfall and runoff were separated and tested independently. The percent difference of the sensitivity run from the initial model run was used to signal dates of sensitivity. The data was normalized by dividing the percentage by the number of days between measured dates. For example, if the initial model run was 10.00 m^{-1} and the –10% PF analysis was 9.00 m^{-1}, the percentage change would be ((10-9)/10)*100 or 10%. If the number of days between sampling dates was 10 then the normalized values would be 10%/10 or 1% per day. A large value indicates a date where the model is sensitive to this variable.

Results

Lake Lacawac Variable Data

Lake Lacawac showed similar trends in epilimnetic depth in 1998 and 1999 (Figure 3A). The mixed layer remained between 1 and 3 meters from May 1 to August 9. Early in May 1998 the lake completely mixed, but this did not occur in 1999. The epilimnetic layer began to deepen at the end of September in both years and completely turned over by mid-November. The modeled mixed depth was tested by comparing it to PUV temperature profiles (Figure 3A). The modeled trend followed the PUV values.

Volume weighted ad_320 values showed similar patterns in both years (Figure 4). Figure 4A shows the epilimnetic ad_320. In 1998 the epilimnion ad_320 was higher than 1999. In both years the epilimnetic values were near 10 after turnover. The hypolimnion showed a similar trend of ad_320 increase starting in early July (Figure 4B). The water column volume weighted ad_320 showed a higher initial ad_320 on May 1 for 1998 that continued throughout the summer months until turnover. Both years had similar ad_320 values after turnover, mid-October.

PF values showed different trends in the two study years (Figure 5A). In 1998 the PF was high May through August but then tailed off through December. In 1999 the PF (estimated from ad_320) showed the opposite trend with low values from May through

August and then increased the remainder of the year. The incoming solar radiation exhibited similar patterns for both years with one exception (Figure 5B). During the month of June in 1998 the incoming solar radiation was low relative to the rest of the year. This was not seen in 1999.

Results by sediment "release" of ad_320 are listed in Table 3. An increase in ad_320 occurred in carboys near or below the anoxic layer (Figures 6-8). The two week experiment showed that the deployed w/o stopper carboy took longer to release ad_320 but after the 12 day period showed similar changes as the deployed with stopper carboys (Figures 7 and 8). Carboy S2 never showed signs of an increase in ad_320 and was not used in the calculations. The average change in ad_320 for the ca. 7 m August 10, 1999 and the ca. 6 m August 28, 1999 were divided by 6 to give the average ad_320 change per day. The change in ad_320 for the sediment release (CU_{Sed}) in CU per day per m^2 was calculated with the following equation:

$$CU_{Sed} = \frac{[(Carboy\,Volume) * (Average\ ad\_320 change\ per\ day)]}{Bottom\ \ area\,of\ carboy} \qquad \text{(eqn 13)}$$

The bottom area of the carboy was 0.045 m^2, and the carboy volume (empty) was 0.02 m^3. The average ad_320 change was 3.4 $m^{-1}\ d^{-1}$. The change in CDOM was calculated using equation 13 as 0.75 CU per day per meter. The carboy volume was assigned a value of 10 liters (total volume of 20 L divided by two because half the carboy was imbedded in the sediments).

The oxygenation of anoxic hypolimnetic water, taken from11m, in the laboratory caused the ad_320 to increase approximately 4 times from near 24 m^{-1} to 85 m^{-1} (Figure 9). Oxygenation of the oxic epilimnetic water did not show this increase.

Rain and runoff values were sporadic and showed no significant trends other than reduced events during the summer months of June – August (Figure 10A and B). A tropical storm on September 16, 1999 yielded a significant amount of runoff. The area of the bog was calculated with GIS as 134,200 m^2. The bog and watershed section lying above the bog was 288,350 m^2 while the watershed was calculated as 418,600 m^2 (Figure 11). Runoff flowing through the bog was calculated as 68.9 percent of total runoff (100 * 288,350/418,600). Runoff ad_320 was estimated as 128.7 m^{-1}, Bog 1 on the eastern shore, and Bog 5 (lysimeter) on the northern shore with the other samples taken in between them (Table 4B).

Lake Lacawac, The Model:

The 1999 model was run in a sequential order adding a variable each time it was run and compared to the measured ad_320 values. Mixing was abbreviated Mix, photobleaching PF, sediment release Sed, rainfall and runoff RR and Biotic Bio. So a model labeled Model Mix_PF_Sed_RR_Bio would have all the variables active. The order of the variables was mixing, PF, sediment release, Rain/Runoff and then Biotic. The outputs of the model were graphed on the same axis for the epilimnion, hypolimnion and water column (Figures 12, 13, 14). Mixing alone had no effect on the slope of the line. The addition of PF caused the slope to turn negative for the epilimnion and water column. The addition of the sediment release caused the trend to follow the measured trend until early November, where it turns positive for both the epilimnion and water column. The sediment release also caused an increase in hypolimnetic ad_320 in early July, which continued to a peak immediately before turnover in late October. Rainfall and runoff caused peaks in the ad_320 trend near rainfall events. At September 16, 1999 the rainfall/runoff caused a large peak of absorbance in both the epilimnion and water column model outputs. The biotic variable forced the trend negative with the same peak near early September for the epilimnion and water column. The hypolimnion trend was not changed however the magnitude was not as great.

The 1998 model results showed the same trends (Figure 12, 13, 14). The mixing alone had no effect on the slopes of the graphs. PF caused the slope to turn negative for the epilimnion and water column. The sediment release again caused the epilimnetic and water column ad_320 to level out early July and then increase. The sediment release also caused the same gradual increase that led to a peak before turnover in the hypolimnion ad_320. The rainfall and runoff values also gave sporadic peaks in ad_320 but were mainly emphasized in the earlier month of May and June. The biotic variable forced the trend slightly more negative for the epilimnion and water column but had no observed effect on the hypolimnion trend. The biotic variable caused the trend to deviate further from the measured trend until early September, however after this point the trend was more closely aligned to the measured trend.

Analysis of the model's fit to the measured data was performed by looking at the changes in ad_320 from one date to the next. The change in the model between two dates was then subtracted by the change in measured ad_320 between the same dates. The closer to zero of this value meant that the model more closely matched the measured change for that time period. The further from zero indicated a point where the model deviated from the measured trend. Values are listed in Appendix G for 1999 and Appendix H for 1998. The epilimnion values for 1999 showed similar trends for all four-model runs until early September, when the M_PF_Seds_RR run shows a large value, 2.0 m^{-1}, that does not occur in the earlier runs (Figure 15). The M_PF_Sed shows a smaller decrease than the other models and follows the measured trend up to early November. The Hypolimnion models all show a range from –2.00 to 1.00 until early August and then show a range near –65.00 and 50.00, returning to the range of –2.0 to 0.00 in mid-November (Figure 16). The water column models showed similar trends (range -1.00 to 1.00) until early September and then a large peak for the M_PF_Seds_RR model (Figure 17). The addition of the biotic variable does not cause large changes (as seen in with the addition of the runoff variable) in these values (Figures 15, 16, 17).

Analysis of the Lacawac 1998 model was performed following 1999's difference technique. The epilimnion values for 1998 ranged from –3.00 to 4.00 (Figure 15). The 4.00 value occurred near the end of May. The –3.00 values occurred early May and November. The M_PF and the M_PF_Sed lines followed the same trend until September. The M_PF_Sed_RR shows a large peak (4.00) early June and then a large trough (-2.00) June 14). The M_PF_Seds_RR_Bio line increases negative values May through July and then follows the trends of the other model lines. The remainder of the values was between zero and one. The hypolimnion was between –2.00 and 1.00 until September and then –30.00 to 46.00 for the remainder of the year (Figure 16). The M_PF followed the trend of the M_PF_Sed. The M_PF_Sed_RR showed deviations closer to zero during the June and July months, however large deviations occurred during May and early June. All models showed the same trend. The water column values ranged between –1.00 and 1.00 throughout the year (Figure 17). Similar trends were seen in all four runs of the model.

Lake Giles Variable Data:

Lake Giles showed similar epilimnetic depth trends in 1998 and 1999 (Figure 18). For both years the epilimnetic depth is between 2 and 6 meters until early September, when it begins to deepen until turnover in early November 1999 and mid November 1998. The model for 1999 followed PUV derived mixing depths indicated on Figure 18.

Volume weighted ad_320 values for the epilimnion exhibited similar trends for 1998 and 1999; initially starting high then lessening over the summer months only to "reset" to high ad_320 near fall turnover (Figure 19). The epilimnetic ad_320 was initially near 1.0 m^{-1} and reduced in both years to near 0.5 m^{-1} in mid summer. The epilimnetic ad_320 consistently rose to near 0.8 m^{-1} by early December. In 1999 the ad_320 was much lower than 1998 values for June through August. The hypolimnion was near 1.0 on June 1 and steadily rose throughout the year until turnover and reached near 1.5 m^{-1} for both years. The water column ad_320 remained near 0.8 m-1 throughout the year with peaks in early June 1998 and early September 1999. A trough is seen early July 1999.

PF values were the same for each year (Figure 20A). They lessened from 0.045 to 0.0150 from May to mid August and then were constant until early October when they began to rise up to 0.045 in mid-November. The solar radiation values were the same as L. Lacawac's with the lower values present during the month of June in 1998 (Figure 20B).

Moss production (CU_{MR}) of ad_320 is listed in Table 6. Both replicates (M-carboys) showed an increase in ad_320 over the two-week period (Figure 21). Sediment without moss (S-carboys) all showed a decrease in ad_320, however we were interested in net production so these values were not used in the model under the assumption that this decrease also occurred in the M-series carboys and most of the substrate is covered by moss. Daily per m^2 values were calculated with one modification to equation 13, the carboys were gently placed over the moss and not imbedded into the sediments so there is no volume correction needed (equation 14), however the volume of the carboy was 20 l.

$$CU_{MR} = \frac{Volume\ of\ Carboy * Average\ ad\_320\ change}{Bottom\ area\ of\ Carboy} \qquad \text{(eqn 14)}$$

The average ad_320 change was 0.45 m^{-1} by moss production per 15 days, so the net gain for moss is 0.03 m^{-1} per day. Using equation 14, the average daily per m^2 moss production of CU was 0.013 CU per day per m^2.

Similar to L. Lacawac, rainfall and runoff events for L. Giles were random (Figure 22). The watershed for L. Giles does not yield much runoff. Only two peaks are seen in 1998 in mid-May and early June. Only one major peak is seen in 1999 in mid-September. The bog's watershed area was calculated using GIS as 165,000 m^2 or 12.5% of the total (1.324.00 m^2) (Figure 23). The water flowing through the bog and carrying its CDOM to the lake was 12.5% of total runoff. Runoff ad_320 from the bog was estimated as 100 m^{-1} (Appendix K). The remainder of the watershed was assumed to contribute insignificant amounts of CDOM due to its low runoff ad_320 (Appendix K).

Lake Giles, The Model:

The 1999 Lake Giles model was also run in a sequential order. The first variable was mixing (mix) followed by photobleaching (PF), Moss Release (Sed), Rain/runoff (RR), and then biotic (Bio). The outputs of the model were graphed on the same axis for epilimnion, hypolimnion and water column (Figures 24, 25, 26). The mixing variable accounts for no change in the slope of the three models. The addition of PF forces the epilimnetic and water column trends negative. Moss release causes the negative slope to flatten out by mid-July for the epilimnion. RR causes the line to move towards the measured line and the Bio variable causes the modeled line to reach the measured line in early August. The hypolimnion values only showed observed change with the addition of the Bio variable. The water column's line trend is negative only with the PF variable. The Sed variable lessens the slope and the addition of RR causes a positive slope in early September. The Bio variable increases the slope close to the measured line.

The same trends can be seen in the 1998 model data (Figures 24, 25, 26). The mixing variable alone doesn't change the slope of the line. The addition of PF forces the slope negative in the epilimnion and water column. The addition of the Moss release variable lessens the PF slope effect and creates a positive slope in early November. The rain/runoff variable doesn't affect the trend of the line except in early May/June. The Bio variable pushes the slope positive in mid-July to early September

The analysis of the models' fit to measured data was performed following L. Lacawac's procedures. Values are listed in Appendix I for 1999 and Appendix J for 1998. The epilimnion difference values for 1999 ranged from -0.50 to 0.40 (Figure 27). A large peak occurred near the end of June for all runs while the largest trough appeared mid-September dampening with the addition of RR. The Bio variable generally increases the values by early September. Trends were consistent with each model. The hypolimnion differences ranged from –0.50 to 0.50 (Figure 28). Here the M_PF_Sed and M_PF_sed_RR cause a larger difference. The Addition of Bio causes larger values in September, Mid October and November; while creating smaller values mid April and Mid September. The water column range was -0.40 to 0.30 (Figure 29). A peak near

0.20 occurs with all model runs near the end of June and early October. A large trough, -0.40, occurs mid September, partly alleviated with the addition of the RR variable. The Bio variable caused a larger value to occur early September.

Values for the 1998 epilimnion showed large differences before July lessening afterwards (Figure 27). The addition of the Bio variable caused large values mid September. A large value occurred in mid October for all models. The 1998 hypolimnion values showed a large trough in early June and a peak in mid-November for all models. The Bio variable caused larger values to occur mid-July, early August and Late September. The remainder of the year the differences remained small (Figure 28). The water column ranged from –0.20 to 0.10 after mid-June, however, a larger trough (–0.7 to -0.5) was observed in early June for all models (Figure 29).

Variable Sensitivity Analysis

The sensitivity analysis results are listed in Tables 9 for L. Lacawac and Table 10 for L. Giles. For the epilimnion of Lacawac, the PF variable showed large values build as the summer progressed. The sediment release variable deviated further as the year progressed form the end of July. The rainfall variable caused little deviation between the +/-10% runs. The runoff showed deviations throughout the year. The biotic variable showed sensitivity similarly to PF. The Lacawac hypolimnion PF runs showed large deviations on and after October 28, 1999. The sediment release variable showed larger deviation as the year progressed from June 18. Rainfall showed no large deviation as the year progressed. Runoff showed large deviation on and after October 28, 1999. The biotic variable showed large deviations on and after October 28, 1999.

The PF variable for the epilimnion of L. Giles showed large deviations throughout the year with the largest values occurring during June and July. The sediment release showed deviations after August. The rainfall and runoff variables showed large deviations after September 2. The biotic variable showed deviations on and after September 2, 1999. PF showed deviations in the hypolimnion on many dates most prominently on July 7 and November 13, 1999. Sediment release showed deviations to start during July. Rainfall and runoff caused no deviations until November 13, 1999. The biotic variable analysis showed deviations starting on August 16.

Discussion

Seasonal stratification and the resultant deepening of the mixed layer played an important role in the variations of ad_320 in the epilimnion in both lakes. This was evident in the Lacawac models where the high ad_320 hypolimnion caused an increase in the epilimnion of 1-2 m^{-1} in both years immediately after turnover. Smaller fluctuations were seen throughout the rest of the year as the modeled epilimnion transferred water from the metalimnion and hypolimnion to the epilimnion, thus causing an increase or decrease in the epilimnion ad_320. The resolution of the mixed layer was 1 m for L. Lacawac and 2 m for L. Giles. This resolution may not be sensitive enough to estimate ad_320 flow, especially when the epilimnion is shallow because this is where the bulk of the lake volume resides and small errors in mixed depth can result in large errors in ad_320 transfer.

Photobleaching affected both models in a similar fashion. For both lakes in 1999 the photobleaching reduced ad_320 in the epilimnion and water column. This signifies that photobleaching is a significant sink for ad_320 for both lake systems. Photobleaching caused the modeled ad_320 to follow the ad_320 measured trend for 1999 until early Fall when the modeled trend deviated from the measured. This is due to other ad_320 in-fluxes (i.e. Sediment and Moss release, mixing depth) increasing in importance while Photobleaching lessens due to decreasing UVR at this time. For 1998 neither model followed the measured trends. This could be explained by the amount of rainfall (external factor) that occurred during the Spring and early Summer months. Photobleaching tracks the measured value well when no outside factors are present. A problem with this variable was that experimental data were only available for 1998, and PF was modeled for Lacawac in 1999. This leads to an oversimplification of the PF for 1999, which could lead to errors in the removal of ad_320 by photobleaching. The sensitivity analysis suggests that the model is sensitive to this variable for both lakes during the summer months when solar UV is high.

Seasonal variation in hypolimnetic ad_320 has been observed in both lakes, most prominently in L. Lacawac. The greatest variation occurs in L. Lacawac's hypolimnion where the ad_320 ranges from approximately 10 m^{-1} in late Spring/Early summer to 50 or 60 m^{-1} by late Fall (pre-turnover). Lake Giles' hypolimnion also increases but only slightly in comparison to L. Lacawac. The formation of the anoxic layer in L. Lacawac, not present in L. Giles, was found to be the reason for this large increase in ad_320. As the summer progresses the anoxic layer area increases, the amount of sediment "release" of ad_320 was found to be directly related to anoxic substrate area. However, the estimated release value did not increase to the ad_320 measured values. The increase in absorbance due to oxidation of anoxic water can account for these high ad_320 readings in Lacawac's hypolimnion during the late summer and fall months. This absorbance may be "artificially" created in the sample containers and does not naturally occur in the lake. The addition of the sediment release estimate caused the Lacawac 1999 model to follow the same trend as the measured up to early November. This relationship was not seen in 1998 where the anoxic layer depths were estimated and not measured. The sensitivity analysis showed that both models were moderately sensitive in the hypolimnion to this variable mid-July to turnover (end October, early November). The Lacawac model showed most sensitivity during and after turnover (October 28, 1999)

The addition of the Rainfall and Runoff variables to the model forced the model's trend to show large deviations. These deviations occurred near large rainfall and runoff events suggesting a flaw in the rainfall/runoff ad_320 calculation method. For Lake Lacawac, in 1999 a tropical storm with a measured 130 mm rainfall and a calculated 73 mm runoff occurred. The measured values immediately after showed no change in ad_320, however the model yields a large increase in ad_320 for the epilimnion and water column. The measured values do ultimately reach the modeled representation but a few months later. This could be a result of a slow release of ad_320 from the bog, occurring as a result of a “dried” bog from the year’s drought. In Lake Giles the ad_320 does show a large increase after the tropical storm and the model underestimates this change. In 1998 large rain/runoff events occurred in the late Spring and early Summer. Here the reverse trend is seen as the Lacawac model underestimates the increase in the measured ad_320. The same pattern is seen in Lake Giles as the modeled values underestimate the measured ad_320 values. These two events, occurring at different times of the year for two separate years and lakes, suggest seasonal fluctuations in the watershed characteristics that affects both runoff amount and ad_320. The sensitivity analysis suggests that both models are sensitive to the runoff variable near large precipitation/runoff events. The rainfall variable was shown not to be sensitive for the Lacawac model, but sensitive in the Giles model during large precipitation events.

The biotic variable in 1999 caused the Lacawac model trend to deviate farther from the measured. For Lacawac 1998 the model trend was forced much lower than the measured. The difference analysis technique suggests that this variable does not account for much of the changes between dates for Lacawac. For Lake Giles the biotic variable appears to account for a large part of the increase in ad_320 in August and September for both years, however the analysis of differences technique suggests that it may be adding the amount at the wrong time. The sensitivity analysis showed that the model was moderately sensitive to this variable in the summer months for the L. Lacawac epilimnion and August to September for L. Giles epilimnion. The hypolimnion only showed sensitivity in L. Lacawac during turnover and July/August for L. Giles.

In conclusion the Lacawac models seem to work well with the mixing, PF and sediment release variables, however data must be collected for each year as proven by the sediment release variable. Mixing was shown to be an important variable. This was indicated by the sensitivity analysis where all variables increased in sensitivity during turnover. The variable that is least understood is runoff as indicated by large changes in measured ad_320 near rain events that are not correctly represented by the models. This was shown where the model does not account for increases in measured ad_320. An in depth study of the seasonal changes within the watershed (i.e. retention, ad_320) should be conducted to better estimate this value. A more accurate estimation of runoff needs to be developed taking into account the lake level. The biotic variable appears to over estimate the removal of ad_320. This variable also needs further study to yield a more refined value. The Giles Model showed similar trends for both years and was moderately successful in representing measured values. Although the Biotic variable appears to work, analysis of the data suggests that it is too crude and needs refinement. The main problem in modeling Lake Giles is with the low ad_320 values. These values can be close to the measuring capabilities of the instruments and/or sampling error. Confidence intervals for the measured values for both lakes need to be calculated. It is possible that the modeled values would lie within these confidence intervals.

The major factors affecting the seasonal variation of ad_320 are mixing, photobleaching, sediment (substrate) production/consumption, and watershed runoff. In high humic lakes the water column microbial component appears to be overshadowed by the other processes. However, in low humic lakes this variable may play a more significant role in the level of ad_320 and may account for the large variations seen in the measured data, however the difficulty in modeling these lakes is heightened by the low ad_320 values.

Table 1. Geographic and morphometric characteristics of Lake Lacawac and Lake Giles (taken from Moeller, et al. 1995).

	L. Lacawac	L. Giles
Drainage Area	0.70 km^2	1.83 km^2
(including lake)		
Lake Area	0.214 km^2	0.481 km^2
Lake Volume	1.12x106 m^3	4.88x106 m^3
Max. Depth	13.0 m	24.1 m
Mean Depth	5.2 m	10.1 m
Hydraulic Retention	3.3 yr	5.6 yr
Elevation (Lake Surface)	439 m	428 m
Latitude	41° 23'57" N	41° 22'57" N
Longitude	75° 17'35" W	75° 05'33" W
County (PA)	Wayne	Pike

Table 2. Lake Lacawac cumulative volume per meter. Derived from Moeller et al. 1995 - Limnology of L. Lacawac, Giles and Waynewood.

Depth (m)	Poly. Vol. cumulative %	Volume Above (m3)
0.5	9.1	103552
1	17.6	200841
2	33.1	378431
3	46.8	534288
4	58.6	669515
5	68.8	785216
6	77.3	882494
7	84.3	962452
8	89.9	1026193
9	94.1	1074821
10	97.1	1109438
11	99.0	1131148
12	99.9	1141054
13	100.0	1142027

Table 3. Sediment release experiments in Lake lacawac 1999

Date	seds out #1 (7m)	seds out #1 (7m)	S1(7m)	S2 (7m)	S3 (7m)	oxic out (5m)	oxic out (5m)	M1(5m)	M2 (5m)
8/10/99	13.12	13.12	12.85	14.34	14.87	7.14	7.14	6.34	6.17
8/16/99	12.95	11.63	24.49	13.76	27.98	6.12	6.13	8.79	7.71
Change 6days	-0.18	-1.49	11.63	-0.58	13.11	-1.02	-1.00	2.46	1.54
average			12.37						
	seds out #1(6m)	seds out#2 (6m)	(6m)	S2 (6m)	S3 (6m)	oxic out (3m)	oxic out (3m)	M1 (3m)	M2 (3m)
8/16/99	11.53	11.94	6.92	7.66	6.54	5.69	5.69	5.44	5.59
8/22/99	6.13	6.06	10.55	7.18	11.45	5.47	5.66	5.87	5.44
Change 6days	-5.40	-5.88	3.63	-0.48	4.91	-0.22	-0.03	0.43	-0.15
		6m	Deploy w/ stopper (6m)		Deployed w/o stoppers (6m)			5m	4m
	seds out #1 (6m)	seds out#2 (6m)	S1	S2	S3	carboy m1	carboy m2		
8/22/99	5.87	5.70	5.96	6.04	6.29	6.80	6.10		
8/28/99	7.48	8.08	25.61	8.15	10.71	9.10	11.85	5.67	6.24
9/3/99	6.08	6.92	57.00	10.29	30.33	47.14	39.32	6.86	5.27
Change 6days	1.61	2.38	19.64	2.11	4.42	2.30	5.75	1.19	-0.98
Change 12 day	0.21	1.22	51.04	4.24	24.04	40.34	33.22		
Change last 6d	-1.39	-1.16	31.39	2.13	19.62	38.04	27.48	1.19	-0.98
three deploy w/o stopper					28.38				

INTENTIONAL SECOND EXPOSURE

Table 3. Sediment release experiments in Lake lacawac 1999

Date	seds out #1 (7m)	seds out #1 (7m)	S1(7m)	S2 (7m)	S3 (7m)	oxic out (5m)	oxic out (5m)	M1(5m)	M2 (5m)
8/10/99	13.12	13.12	12.85	14.34	14.87	7.14	7.14	6.34	6.17
8/16/99	12.95	11.63	24.49	13.76	27.98	6.12	6.13	8.79	7.71
Change 6days	-0.18	-1.49	11.63	-0.58	13.11	-1.02	-1.00	2.46	1.54
average			12.37						
	seds out #1(6m)	seds out#2 (6m)	(6m)	S2 (6m)	S3 (6m)	oxic out (3m)	oxic out (3m)	M1 (3m)	M2 (3m)
8/16/99	11.53	11.94	6.92	7.66	6.54	5.69	5.69	5.44	5.59
8/22/99	6.13	6.06	10.55	7.18	11.45	5.47	5.66	5.87	5.44
Change 6days	-5.40	-5.88	3.63	-0.48	4.91	-0.22	-0.03	0.43	-0.15
		6m	Deploy w/ stopper (6m)		Deployed w/o stoppers (6m)			5m	4m
	seds out #1 (6m)	seds out#2 (6m)	S1	S2	S3	carboy m1	carboy m2		
8/22/99	5.87	5.70	5.96	6.04	6.29	6.80	6.10		
8/28/99	7.48	8.08	25.61	8.15	10.71	9.10	11.85	5.67	6.24
9/3/99	6.08	6.92	57.00	10.29	30.33	47.14	39.32	6.86	5.27
Change 6days	1.61	2.38	19.64	2.11	4.42	2.30	5.75	1.19	-0.98
Change 12 day	0.21	1.22	51.04	4.24	24.04	40.34	33.22		
Change last 6d	-1.39	-1.16	31.39	2.13	19.62	38.04	27.48	1.19	-0.98
three deploy w/o stopper					28.38				

Table 4A. Lacawac rainfall ad_320 values.

Date	5/19/99	6/7/99	6/15/99	6/17/99	6/28/99
ad_320nm	0.678878	8.340404	3.332991	1.244294	1.119253
Average			2.943164		

Table 4B. Lacawac bog ad_320 values.

	Bog 1	Bog 2	Bog 3	Bog 4	Bog 5	Avg
5/28/99	87.43235	68.32218	33.1903	332.3164	248.1553	153.8833
6/10/99	95.67265	84.84015	81.77283	139.991	121.2261	104.7005
6/18/99	245.4285	40.35986	70.01101	221.063	217.8157	158.9356
7/8/99					95.68698	95.68698
Average						128.3016

Table 5. Lake Lacawac substrate area by meter depth. Derived from Moeller et al. 1995 - Limnology of L. Lacawac, Giles and Waynewood.

Depth (m)	Area (m2)	% Surface area	area above depth	% surface area
0	214575.81	100.00		
1	190320.40	88.70	24255.42	11.30
2	166064.98	77.39	48510.83	22.61
3	145306.86	67.72	69268.95	32.28
4	124548.74	58.04	90027.08	41.96
5	106272.56	49.53	108303.25	50.47
6	87996.39	41.01	126579.42	58.99
7	73894.40	34.44	140681.41	65.56
8	59792.42	27.87	154783.39	72.13
9	42870.04	19.98	171705.78	80.02
10	25947.65	12.09	188628.16	87.91
11	15342.96	7.15	199232.85	92.85
12	4738.27	2.21	214575.81	100
			Assumed Bottom	

Table 6. Lake Giles 1999 moss/sediment release experiments

Date	seds out #1 (22m)	seds out #1 (22m)	carboy S1 (22m)	carboy S2 (22m)	carboy S3 (22m)	moss outside (13m)	moss M1 (13m)	Moss M2 (13m)
7/19/99	2.425							
7/26/99	2.360	2.417	1.996	1.989	2.119	1.367	1.942	1.545
8/10/99	2.246	2.686	1.857	1.704	1.908	1.874	2.247	2.090
Change 6d	-0.064	-0.007	-0.429	-0.435	-0.305	0.507	0.306	0.545
Change 22d	-0.178	0.261	-0.568	-0.721	-0.517			
Average			-0.602				0.425	

Table 7. Lake Giles cumulative volume per meter.

Depth	% cumulative volume	Volume above (m3)
0.1	0.87	42378
0.5	4.30	210006
1	8.51	415303
2	16.63	811768
3	24.37	1189398
4	31.73	1548190
5	38.69	1888145
6	45.27	2209264
7	51.47	2511546
8	57.27	2794991
9	62.70	3059599
10	67.73	3305370
11	72.38	3532305
12	76.65	3740403
14	84.02	4100088
16	89.84	4384426
18	94.13	4593417
20	96.87	4727061
22	98.06	4785357

Table 8. Lake Giles substrate area by meter depth.

Depth (m)	Poly. Model area %	Area above (m2)	Area Below (m2)	Total area (m2)
1	6.30	30313	450687	481000
2	12.40	59663	421337	
3	18.31	88052	392948	
4	24.01	115478	365522	
5	29.51	141943	339057	
6	34.81	167446	313554	
7	39.91	191986	289014	
8	44.82	215565	265435	
9	49.52	238182	242818	
10	54.02	259836	221164	
11	58.32	280529	200471	
12	62.42	300259	180741	
13	66.33	319028	161972	
14	70.03	336835	144165	
15	73.53	353679	127321	
16	76.83	369562	111438	
17	79.93	384483	96517	
18	82.84	398441	82559	
19	85.54	411438	69562	
20	88.04	423472	57528	
21	90.34	434545	46455	
22	92.44	444656	36344	
23	94.35	453804	27196	
24	96.05	461991	19009	

Table 9a. Sensitivity analysis of variable data for epilimnion and hypolimnion for L. Lacawac 1999 model. Model was run with +/- 10 percent for each variable resetting other variable to original value. All values are % change in model from initial conditions per day.

Epilimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
5/1/99	7.98	7.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/18/99	7.61	6.00	-0.21	0.21	0.00	0.00	0.00	0.00	0.00	0.00	-0.09	0.09
5/26/99	7.77	6.41	-0.43	0.41	0.00	0.00	0.00	-0.02	0.08	-0.08	-0.18	0.16
6/7/99	7.30	5.92	-0.35	0.34	0.00	0.00	0.00	-0.01	0.03	-0.03	-0.14	0.14
6/18/99	6.90	5.47	-0.48	0.48	0.00	0.00	0.02	-0.02	0.03	-0.03	-0.20	0.20
7/3/99	6.29	4.31	-0.65	0.63	0.00	0.00	0.02	-0.02	0.05	-0.05	-0.26	0.26
7/15/99	6.01	4.19	-0.88	0.88	0.04	-0.04	0.02	-0.02	0.06	-0.06	-0.36	0.36
7/28/99	6.05	4.20	-0.86	0.86	0.09	-0.09	0.02	-0.02	0.04	-0.04	-0.35	0.35
8/12/99	5.58	3.84	-0.90	0.92	0.10	-0.12	0.02	-0.02	0.05	-0.03	-0.36	0.38
8/25/99	5.51	3.95	-1.07	1.07	0.16	-0.16	0.02	-0.02	0.10	-0.08	-0.43	0.45
9/18/99	6.84	7.35	-0.31	0.31	0.10	-0.12	0.01	-0.02	0.14	-0.15	-0.13	0.12
10/11/99	7.43	7.71	-0.32	0.32	0.14	-0.15	0.01	-0.02	0.14	-0.14	-0.14	0.13
10/28/99	8.92	8.48	-0.40	0.40	0.24	-0.26	0.02	-0.01	0.16	-0.16	-0.17	0.17
11/9/99	9.87	8.45	-0.59	0.59	0.34	-0.38	0.03	-0.03	0.25	-0.25	-0.25	0.25
12/5/99	10.78	8.54	-0.28	0.29	0.15	-0.17	0.01	-0.01	0.14	-0.13	-0.12	0.12

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Table 9a. Sensitivity analysis of variable data for epilimnion and hypolimnion for L. Lacawac 1999 model. Model was run with +/- 10 percent for each variable resetting other variable to original value. All values are % change in model from initial conditions per day.

Epilimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
5/1/99	7.98	7.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/18/99	7.61	6.00	-0.21	0.21	0.00	0.00	0.00	0.00	0.00	0.00	-0.09	0.09
5/26/99	7.77	6.41	-0.43	0.41	0.00	0.00	0.00	-0.02	0.08	-0.08	-0.18	0.16
6/7/99	7.30	5.92	-0.35	0.34	0.00	0.00	0.00	-0.01	0.03	-0.03	-0.14	0.14
6/18/99	6.90	5.47	-0.48	0.48	0.00	0.00	0.02	-0.02	0.03	-0.03	-0.20	0.20
7/3/99	6.29	4.31	-0.65	0.63	0.00	0.00	0.02	-0.02	0.05	-0.05	-0.26	0.26
7/15/99	6.01	4.19	-0.88	0.88	0.04	-0.04	0.02	-0.02	0.06	-0.06	-0.36	0.36
7/28/99	6.05	4.20	-0.86	0.86	0.09	-0.09	0.02	-0.02	0.04	-0.04	-0.35	0.35
8/12/99	5.58	3.84	-0.90	0.92	0.10	-0.12	0.02	-0.02	0.05	-0.03	-0.36	0.38
8/25/99	5.51	3.95	-1.07	1.07	0.16	-0.16	0.02	-0.02	0.10	-0.08	-0.43	0.45
9/18/99	6.84	7.35	-0.31	0.31	0.10	-0.12	0.01	-0.02	0.14	-0.15	-0.13	0.12
10/11/99	7.43	7.71	-0.32	0.32	0.14	-0.15	0.01	-0.02	0.14	-0.14	-0.14	0.13
10/28/99	8.92	8.48	-0.40	0.40	0.24	-0.26	0.02	-0.01	0.16	-0.16	-0.17	0.17
11/9/99	9.87	8.45	-0.59	0.59	0.34	-0.38	0.03	-0.03	0.25	-0.25	-0.25	0.25
12/5/99	10.78	8.54	-0.28	0.29	0.15	-0.17	0.01	-0.01	0.14	-0.13	-0.12	0.12

Table 9b. See comments for Table 9a.

Hypolimnion												
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
5/1/99	8.09	8.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/18/99	8.13	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/26/99	7.68	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/7/99	8.59	7.16	-0.13	0.13	0.00	0.00	0.00	0.00	0.02	-0.02	-0.06	0.06
6/18/99	8.95	7.38	-0.15	0.14	0.02	-0.04	0.00	-0.01	0.01	-0.02	-0.06	0.05
7/3/99	10.16	7.67	-0.13	0.12	0.06	-0.08	0.00	-0.01	0.01	-0.02	-0.05	0.05
7/15/99	10.65	8.26	-0.17	0.16	0.15	-0.18	0.00	-0.01	0.01	-0.02	-0.07	0.07
7/28/99	12.34	8.24	-0.20	0.20	0.18	-0.21	0.00	-0.01	0.02	-0.02	-0.08	0.08
8/12/99	13.14	9.82	-0.14	0.14	0.22	-0.26	0.00	-0.01	0.01	-0.01	-0.06	0.05
8/25/99	18.07	11.20	-0.15	0.16	0.33	-0.37	0.01	0.00	0.01	-0.01	-0.06	0.07
9/18/99	22.64	13.02	-0.09	0.09	0.22	-0.25	0.00	0.00	0.01	-0.01	-0.04	0.04
10/11/99	73.48	18.90	-0.06	0.06	0.29	-0.33	0.00	0.00	0.00	0.00	-0.03	0.03
10/28/99	8.92	8.48	-0.40	0.40	0.24	-0.26	0.02	-0.01	0.16	-0.16	-0.17	0.17
11/9/99	9.87	8.45	-0.59	0.59	0.34	-0.38	0.03	-0.03	0.25	-0.25	-0.25	0.25
12/5/99	10.78	8.54	-0.28	0.29	0.15	-0.17	0.01	-0.01	0.14	-0.13	-0.12	0.12

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Table 9b. See comments for Table 9a.

Hypolimnion													
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
5/1/99	8.09	8.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/18/99	8.13	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/26/99	7.68	8.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/7/99	8.59	7.16	-0.13	0.13	0.00	0.00	0.00	0.00	0.02	-0.02	-0.06	0.06
6/18/99	8.95	7.38	-0.15	0.14	0.02	-0.04	0.00	-0.01	0.01	-0.02	-0.06	0.05
7/3/99	10.16	7.67	-0.13	0.12	0.06	-0.08	0.00	-0.01	0.01	-0.02	-0.05	0.05
7/15/99	10.65	8.26	-0.17	0.16	0.15	-0.18	0.00	-0.01	0.01	-0.02	-0.07	0.07
7/28/99	12.34	8.24	-0.20	0.20	0.18	-0.21	0.00	-0.01	0.02	-0.02	-0.08	0.08
8/12/99	13.14	9.82	-0.14	0.14	0.22	-0.26	0.00	-0.01	0.01	-0.01	-0.06	0.05
8/25/99	18.07	11.20	-0.15	0.16	0.33	-0.37	0.01	0.00	0.01	-0.01	-0.06	0.07
9/18/99	22.64	13.02	-0.09	0.09	0.22	-0.25	0.00	0.00	0.01	-0.01	-0.04	0.04
10/11/99	73.48	18.90	-0.06	0.06	0.29	-0.33	0.00	0.00	0.00	0.00	-0.03	0.03
10/28/99	8.92	8.48	-0.40	0.40	0.24	-0.26	0.02	-0.01	0.16	-0.16	-0.17	0.17
11/9/99	9.87	8.45	-0.59	0.59	0.34	-0.38	0.03	-0.03	0.25	-0.25	-0.25	0.25
12/5/99	10.78	8.54	-0.28	0.29	0.15	-0.17	0.01	-0.01	0.14	-0.13	-0.12	0.12

Table 10a. Sensitivity analysis of variable data for epilimnion and hypolimnion for L. Giles 1999 model. Model was run with +/- 10 percent for each variable, resetting other variables to original value. All values are % change in model from initial conditions per day.

Epilimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
6/1/99	0.87	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/10/99	0.64	0.65	-0.51	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/15/99	0.52	0.54	-1.48	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/21/99	0.68	0.58	-1.15	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/1/99	0.31	0.50	-1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/7/99	0.43	0.50	-1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/21/99	0.40	0.54	-0.66	0.66	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/16/99	0.57	0.40	-0.67	0.67	0.10	-0.10	0.00	0.00	0.00	0.00	0.00	0.00
9/2/99	0.50	0.47	-0.88	0.88	0.13	-0.13	0.13	0.00	0.00	0.00	0.13	-0.13
9/18/99	0.92	0.72	-0.69	0.69	0.09	-0.09	0.09	-0.09	0.17	-0.17	0.17	-0.17
10/7/99	0.75	0.86	-0.49	0.49	0.06	-0.06	0.06	-0.06	0.12	-0.12	0.18	-0.18
10/21/99	0.73	0.90	-0.63	0.56	0.08	-0.16	0.08	-0.16	0.08	-0.16	0.24	-0.32
11/13/99	0.74	1.05	-0.29	0.33	0.08	-0.04	0.04	-0.04	0.08	-0.04	0.21	-0.17
12/2/99	1.07	1.02	-0.41	0.41	0.10	-0.10	0.05	-0.05	0.05	-0.05	0.21	-0.21

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Table 10a. Sensitivity analysis of variable data for epilimnion and hypolimnion for L. Giles 1999 model. Model was run with +/- 10 percent for each variable, resetting other variables to original value. All values are % change in model from initial conditions per day.

Epilimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
6/1/99	0.87	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/10/99	0.64	0.65	-0.51	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/15/99	0.52	0.54	-1.48	1.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/21/99	0.68	0.58	-1.15	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/1/99	0.31	0.50	-1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/7/99	0.43	0.50	-1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/21/99	0.40	0.54	-0.66	0.66	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/16/99	0.57	0.40	-0.67	0.67	0.10	-0.10	0.00	0.00	0.00	0.00	0.00	0.00
9/2/99	0.50	0.47	-0.88	0.88	0.13	-0.13	0.13	0.00	0.00	0.00	0.13	-0.13
9/18/99	0.92	0.72	-0.69	0.69	0.09	-0.09	0.09	-0.09	0.17	-0.17	0.17	-0.17
10/7/99	0.75	0.86	-0.49	0.49	0.06	-0.06	0.06	-0.06	0.12	-0.12	0.18	-0.18
10/21/99	0.73	0.90	-0.63	0.56	0.08	-0.16	0.08	-0.16	0.08	-0.16	0.24	-0.32
11/13/99	0.74	1.05	-0.29	0.33	0.08	-0.04	0.04	-0.04	0.08	-0.04	0.21	-0.17
12/2/99	1.07	1.02	-0.41	0.41	0.10	-0.10	0.05	-0.05	0.05	-0.05	0.21	-0.21

Table 10b. See comments for Table 10A.

Hypolimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
6/1/99	1.07	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/10/99	1.08	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/15/99	1.16	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/21/99	1.27	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/1/99	1.09	1.03	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/7/99	1.05	0.91	-0.18	0.37	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/21/99	1.19	0.93	-0.15	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00
8/16/99	1.74	1.17	-0.07	0.03	0.03	-0.07	0.00	0.00	0.00	0.00	0.07	-0.07
9/2/99	1.85	1.66	-0.04	0.07	0.07	-0.04	0.00	0.00	0.00	0.00	0.25	-0.21
9/18/99	1.98	2.04	-0.06	0.03	0.06	-0.06	0.00	0.00	0.00	0.00	0.31	-0.31
10/7/99	2.05	2.15	-0.05	0.05	0.05	-0.05	0.00	0.00	0.00	0.00	0.27	-0.27
10/21/99	3.86	2.20	-0.06	0.06	0.10	-0.10	0.00	0.00	0.00	0.00	0.36	-0.36
11/13/99	0.74	1.05	-0.29	0.33	0.08	-0.04	0.04	-0.04	0.08	-0.04	0.21	-0.17
12/2/99	1.07	1.02	-0.41	0.41	0.10	-0.10	0.05	-0.05	0.05	-0.05	0.21	-0.21

INTENTIONAL SECOND EXPOSURE

Table 10b. See comments for Table 10A.

Hypolimnion			% change from model per day									
Date	Measured	Model Initial	- 10% PF	+10% PF	-10%Sed	+10%Sed	-10%Rain	+10%rain	-10% Runoff	+10% Runoff	-10% Biotic	+10% Biotic
6/1/99	1.07	1.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/10/99	1.08	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/15/99	1.16	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/21/99	1.27	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/1/99	1.09	1.03	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/7/99	1.05	0.91	-0.18	0.37	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/21/99	1.19	0.93	-0.15	0.08	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00
8/16/99	1.74	1.17	-0.07	0.03	0.03	-0.07	0.00	0.00	0.00	0.00	0.07	-0.07
9/2/99	1.85	1.66	-0.04	0.07	0.07	-0.04	0.00	0.00	0.00	0.00	0.25	-0.21
9/18/99	1.98	2.04	-0.06	0.03	0.06	-0.06	0.00	0.00	0.00	0.00	0.31	-0.31
10/7/99	2.05	2.15	-0.05	0.05	0.05	-0.05	0.00	0.00	0.00	0.00	0.27	-0.27
10/21/99	3.86	2.20	-0.06	0.06	0.10	-0.10	0.00	0.00	0.00	0.00	0.36	-0.36
11/13/99	0.74	1.05	-0.29	0.33	0.08	-0.04	0.04	-0.04	0.08	-0.04	0.21	-0.17
12/2/99	1.07	1.02	-0.41	0.41	0.10	-0.10	0.05	-0.05	0.05	-0.05	0.21	-0.21

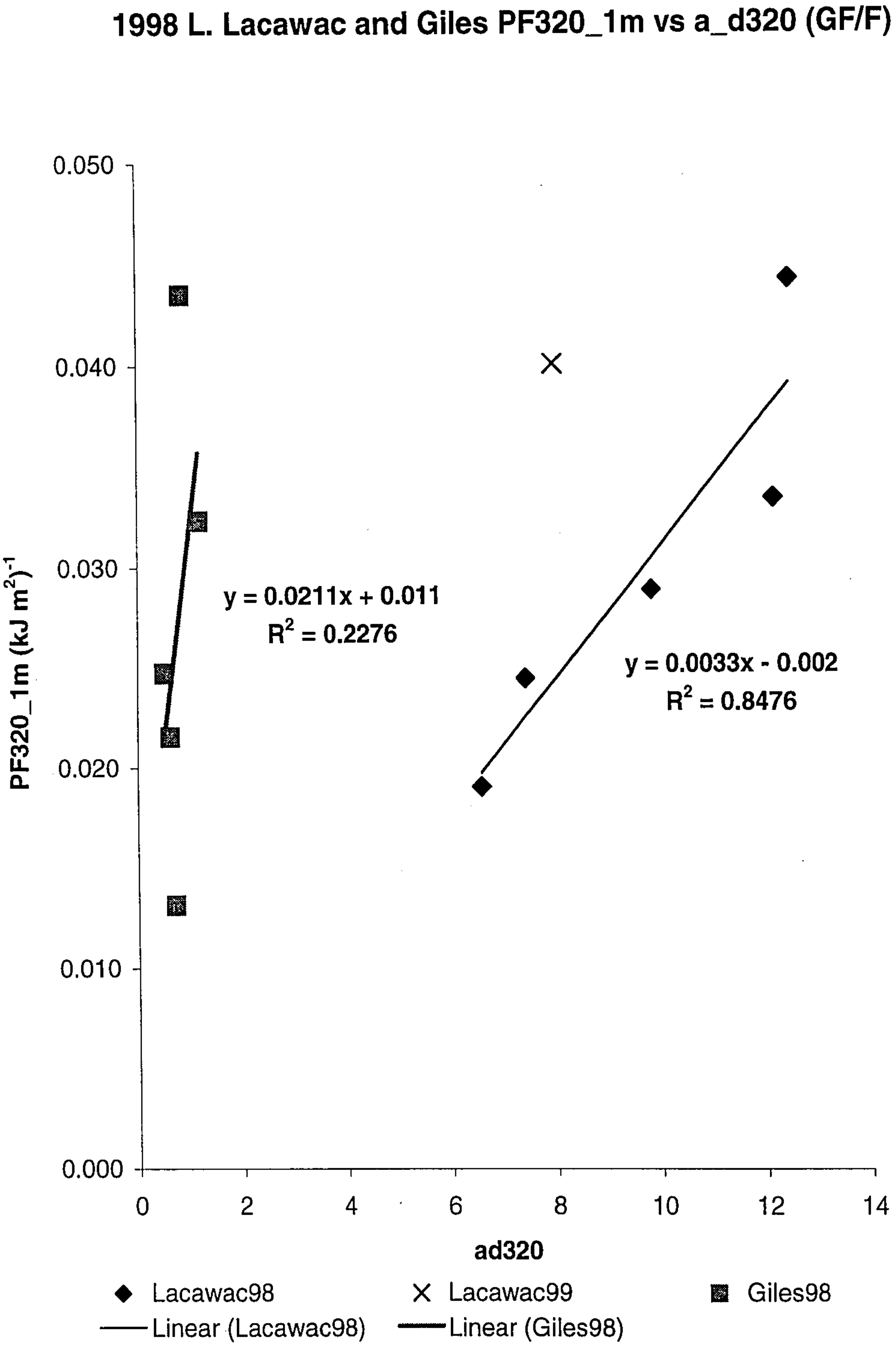


Figure 1. Lake Lacawac and Giles 1998 PF320 vs ad_320. Values taken from Sopka (1998). Lacawac 1998 linear relationship used to estimated Lacawac1999 PF from ad_320.

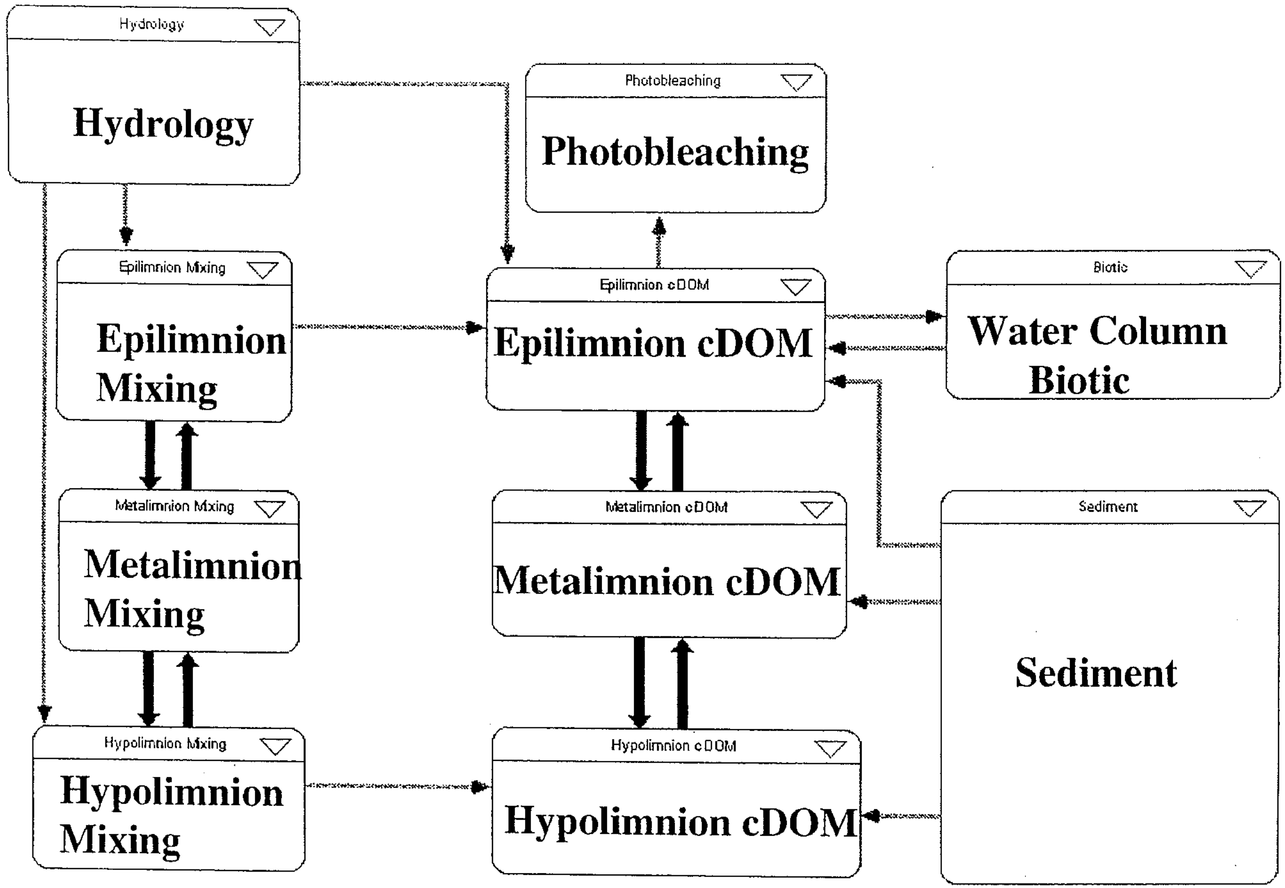
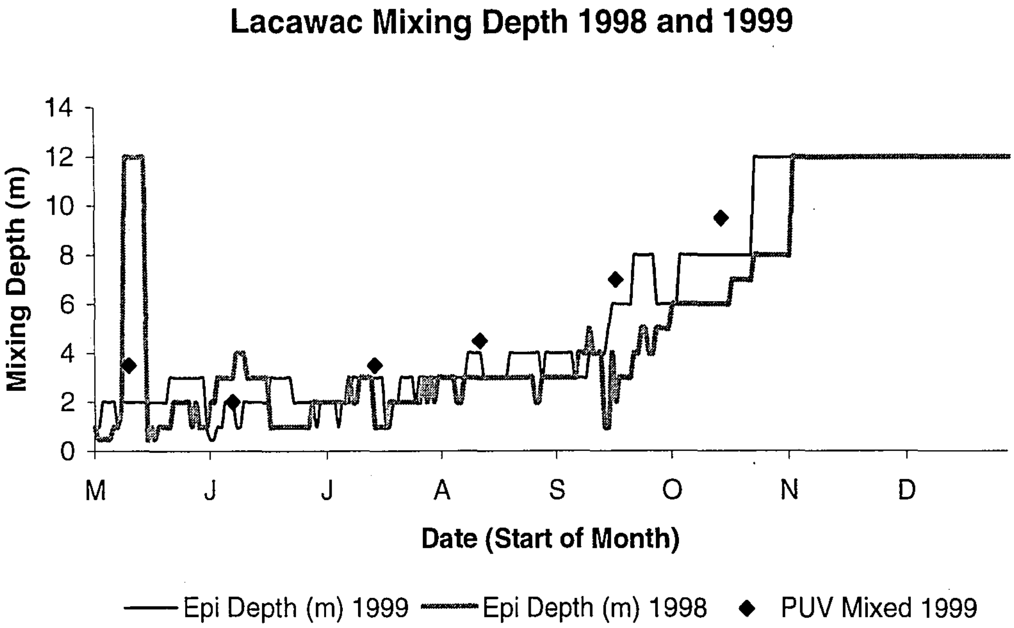


Figure 2. Schematic representation of both models.



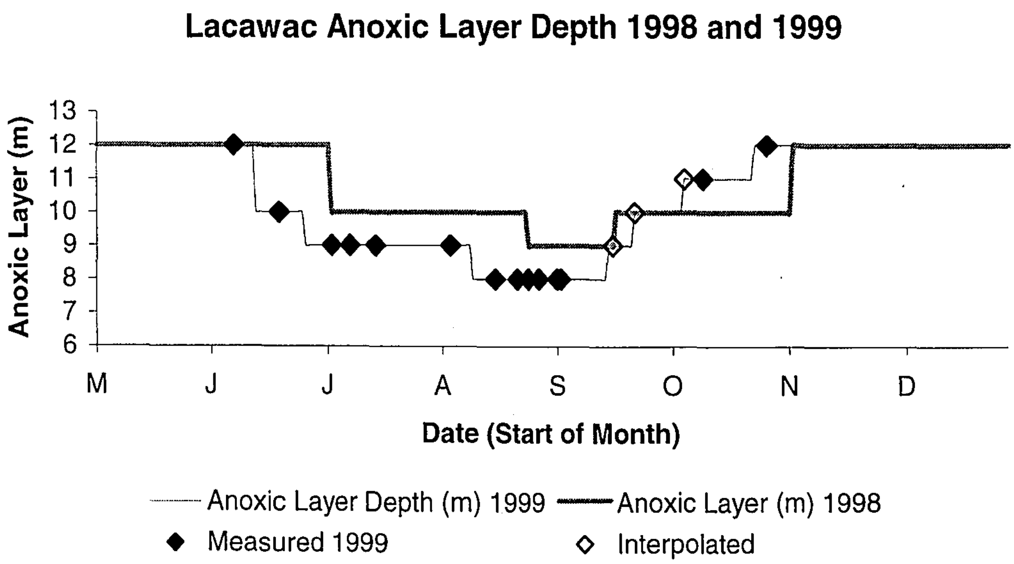


Figure 3. Mixing and Anoxic Layer Depths for Lake Lacawac 1998 and 1999.

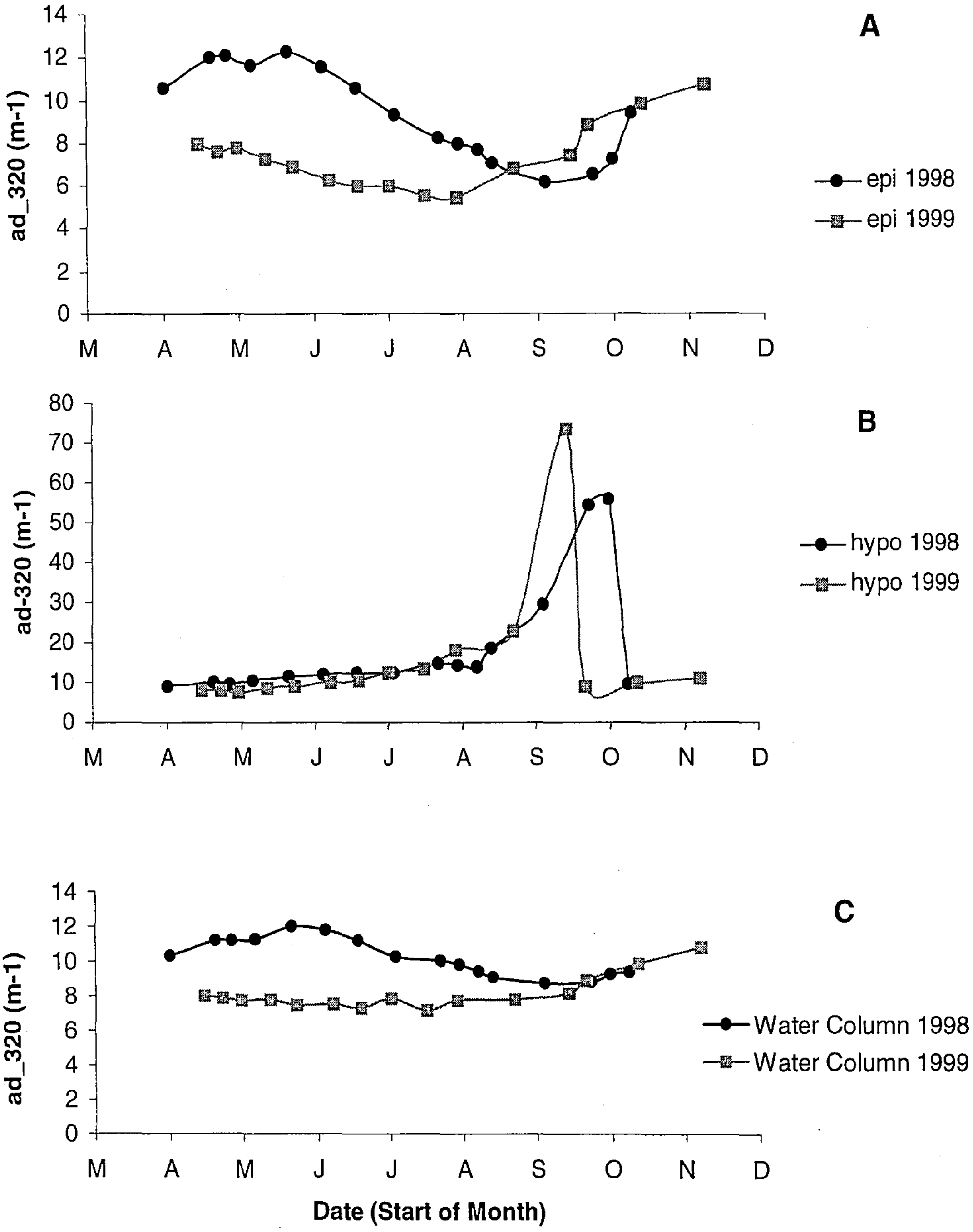
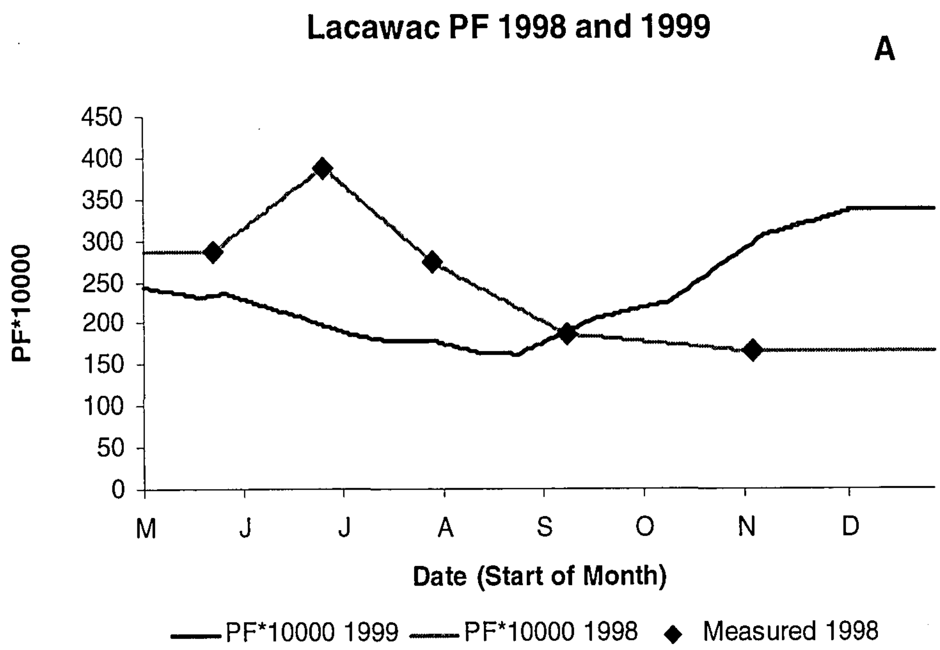


Figure 4. Measured volume weighted ad_320 values for L. Lacawac 1999 and 1998. (A) epilimnion, (B) hypolimnion, and (C) entire water column. Turnover was on 10/25/99 and 11/4/98.



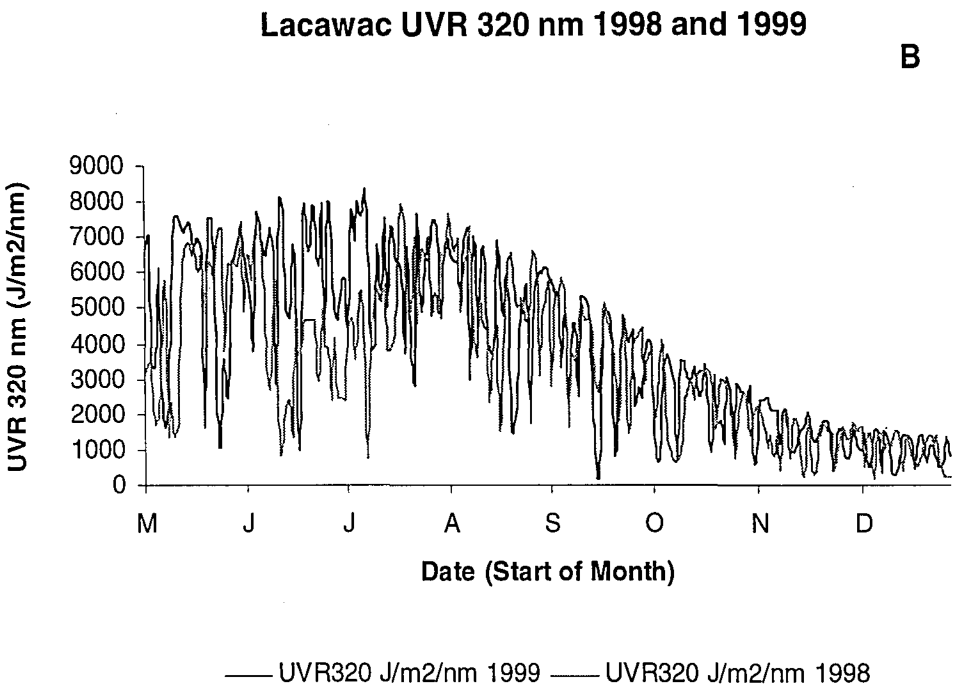
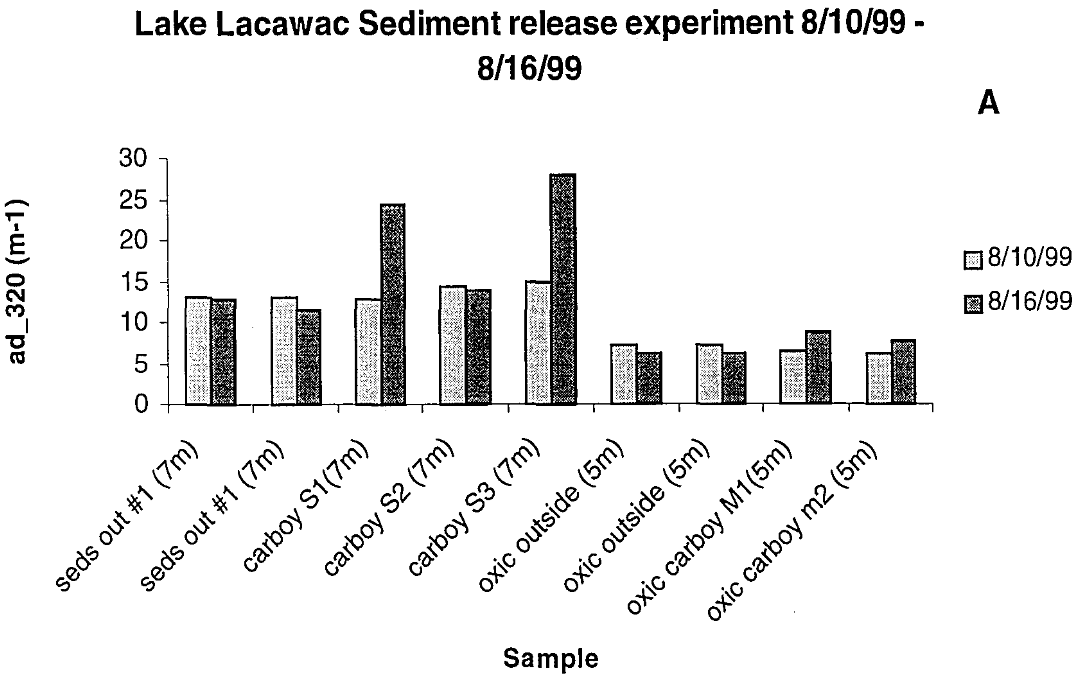


Figure 5. L. Lacawac PF and UVR 320nm for 1998 and 1999. (A) Shows PF and (B) displays UVR at 320 nm.



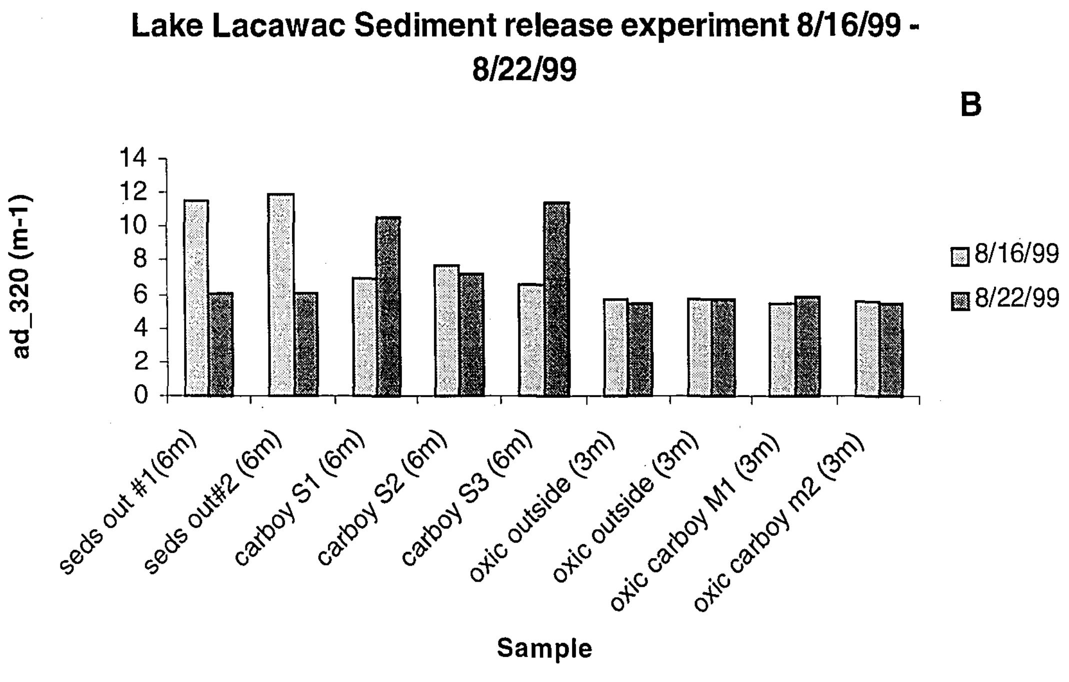


Figure 6. Lake Lacawac sediment release results. (A) Experiment from 8/10 to 8/16/99. (B) Results from experiment of 8/16 – 8/22/99. Seds out is sample outside carboy, S1, S2, S3, M1 and M2 are the names of the carboy replicates.

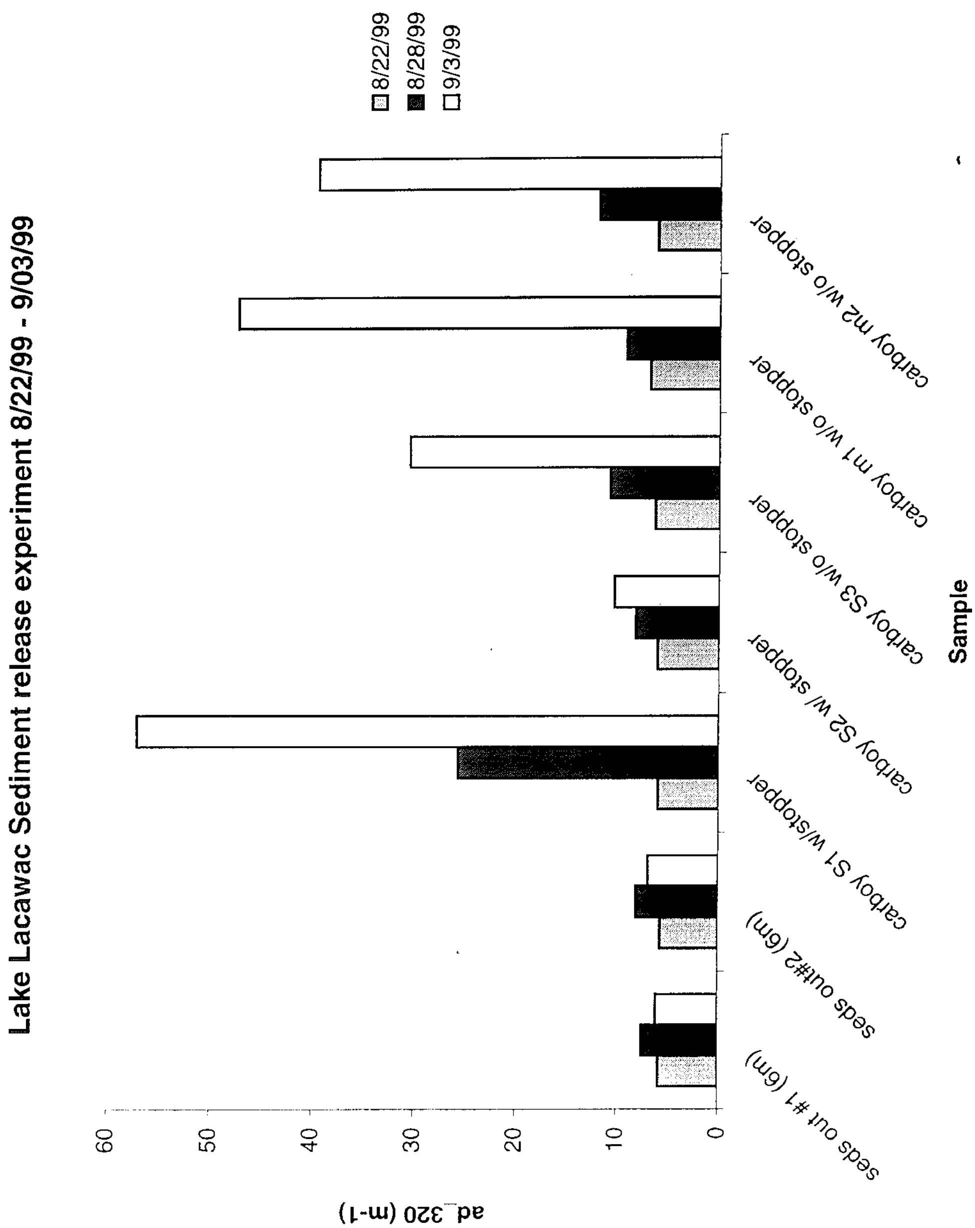


Figure 7. Lake Lacawac Sediment Release two-week experiment (8/22/99-9/3/99). With Stopper means deployed with stopper in carboy, w/o stopper means stopper inserted after deployment.

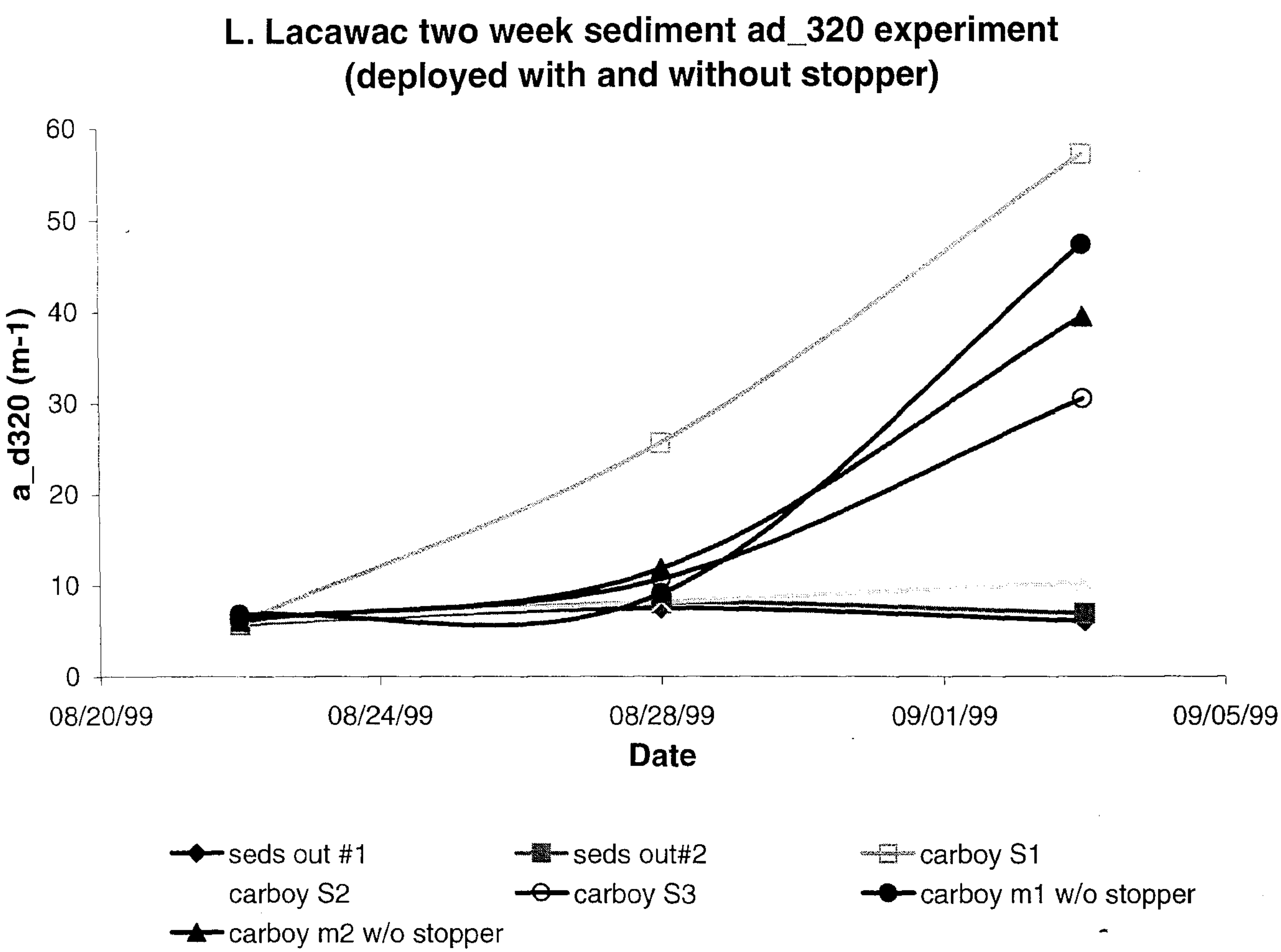


Figure 8. L. Lacawac two-week sediment release experiment, ad_320 versus time.

INTENTIONAL SECOND EXPOSURE

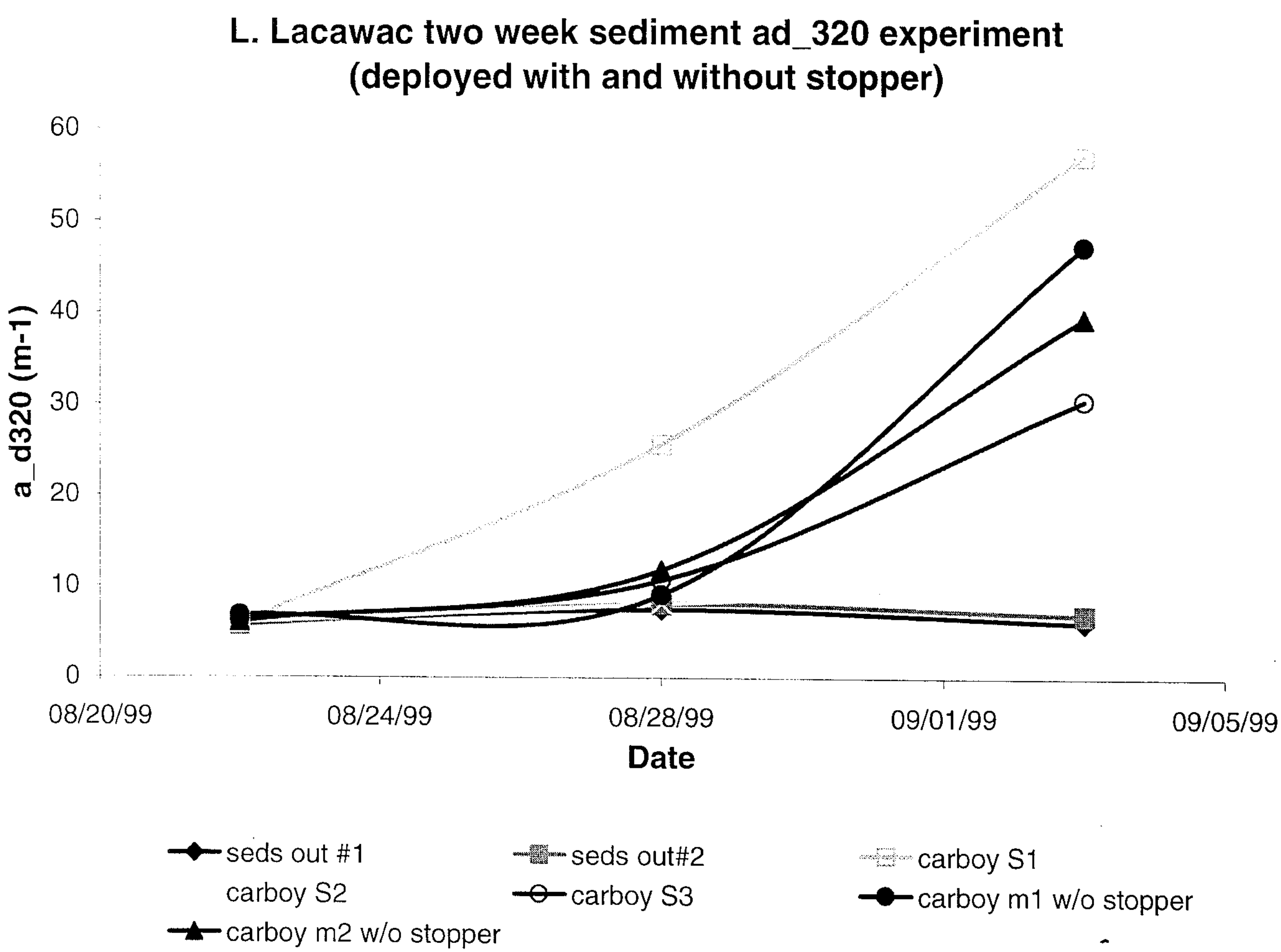


Figure 8. L. Lacawac two-week sediment release experiment, ad_320 versus time.

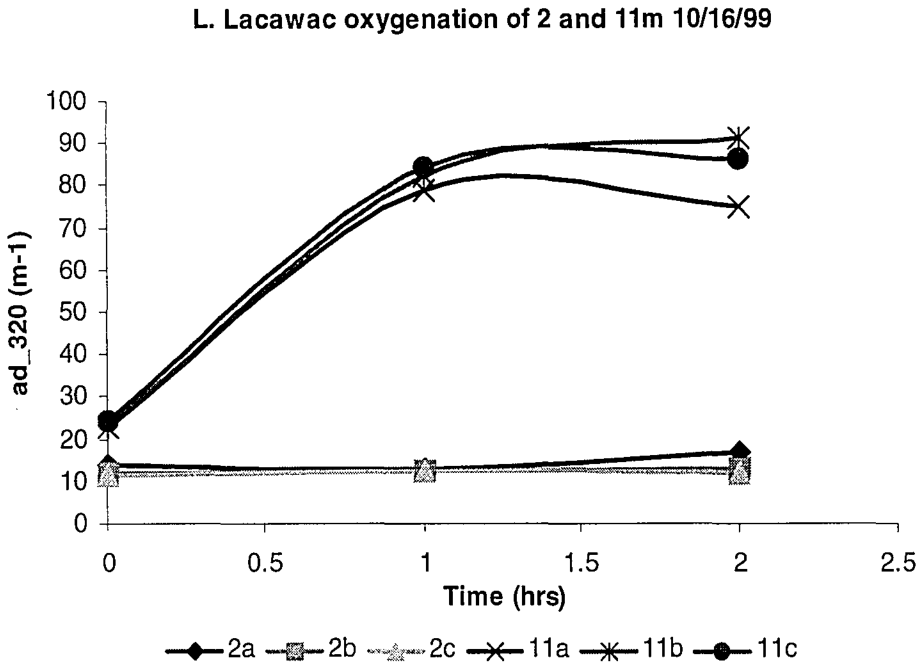


Figure 9. Increase in ad_320 due to oxygenation of anoxic L. Lacawac water. 11 m represents anoxic layer, while 2m represents oxygenated water.

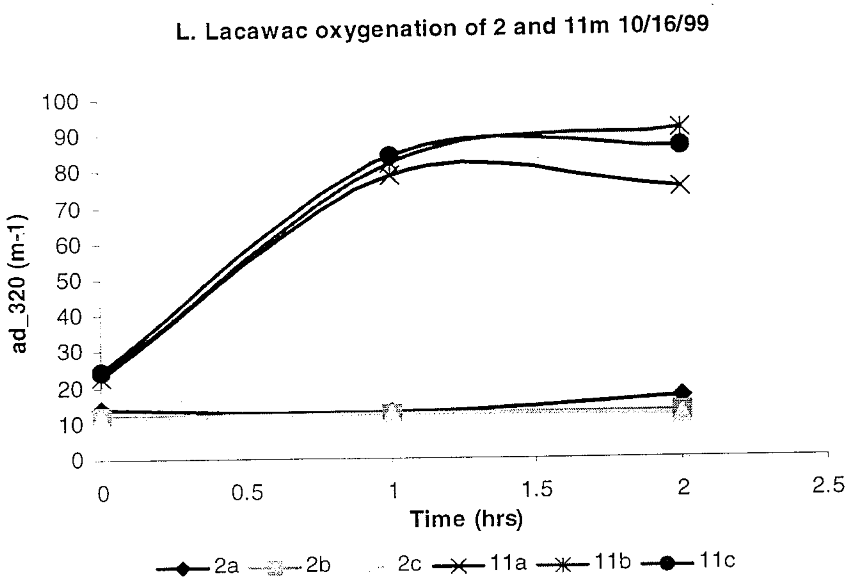


Figure 9. Increase in ad_320 due to oxygenation of anoxic L. Lacawac water. 11 m represents anoxic layer, while 2m represents oxygenated water.

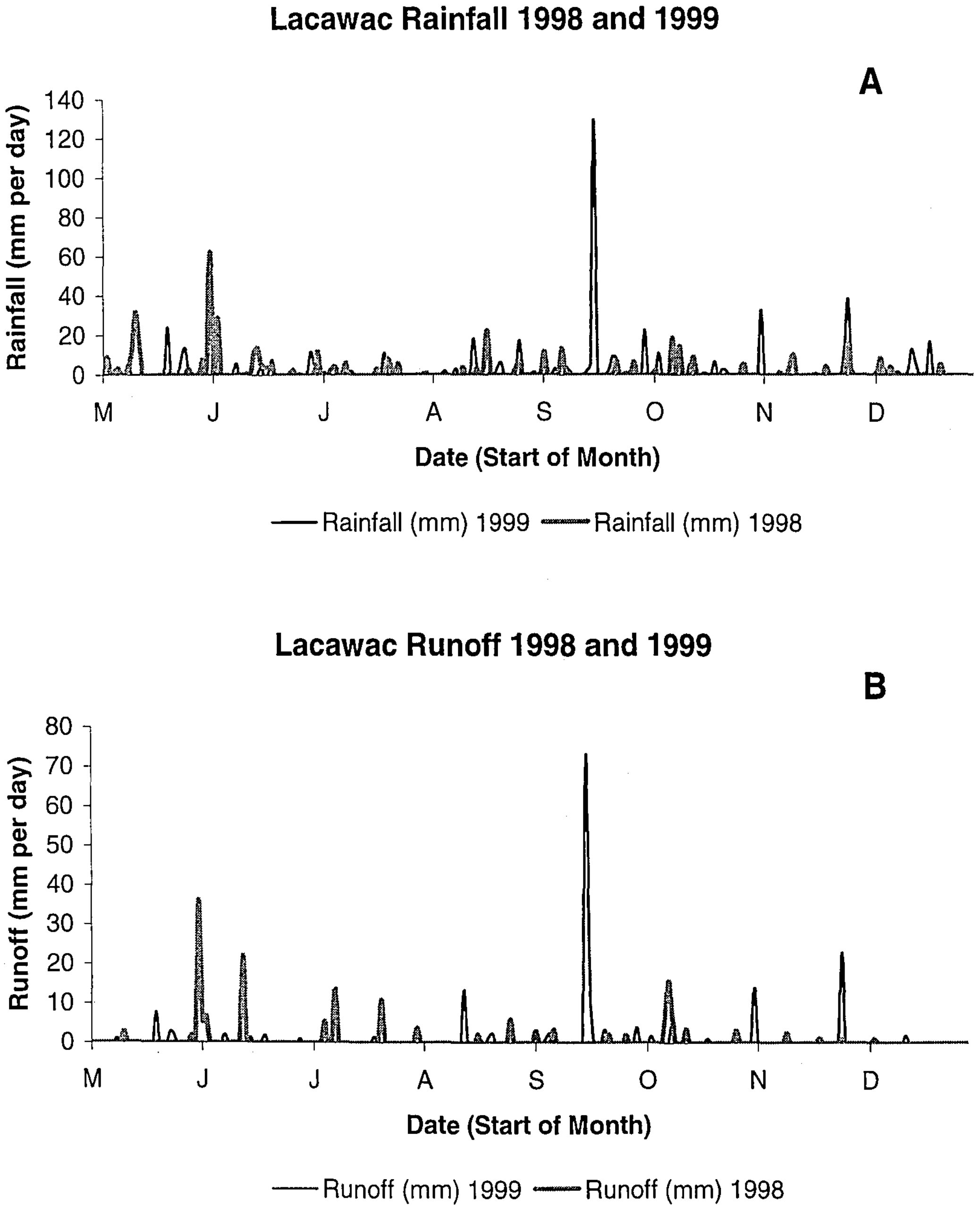


Figure 10. Lake Lacawac rainfall and runoff values for 1999 and 1998. (A) shows rainfall and (B) shows runoff values.

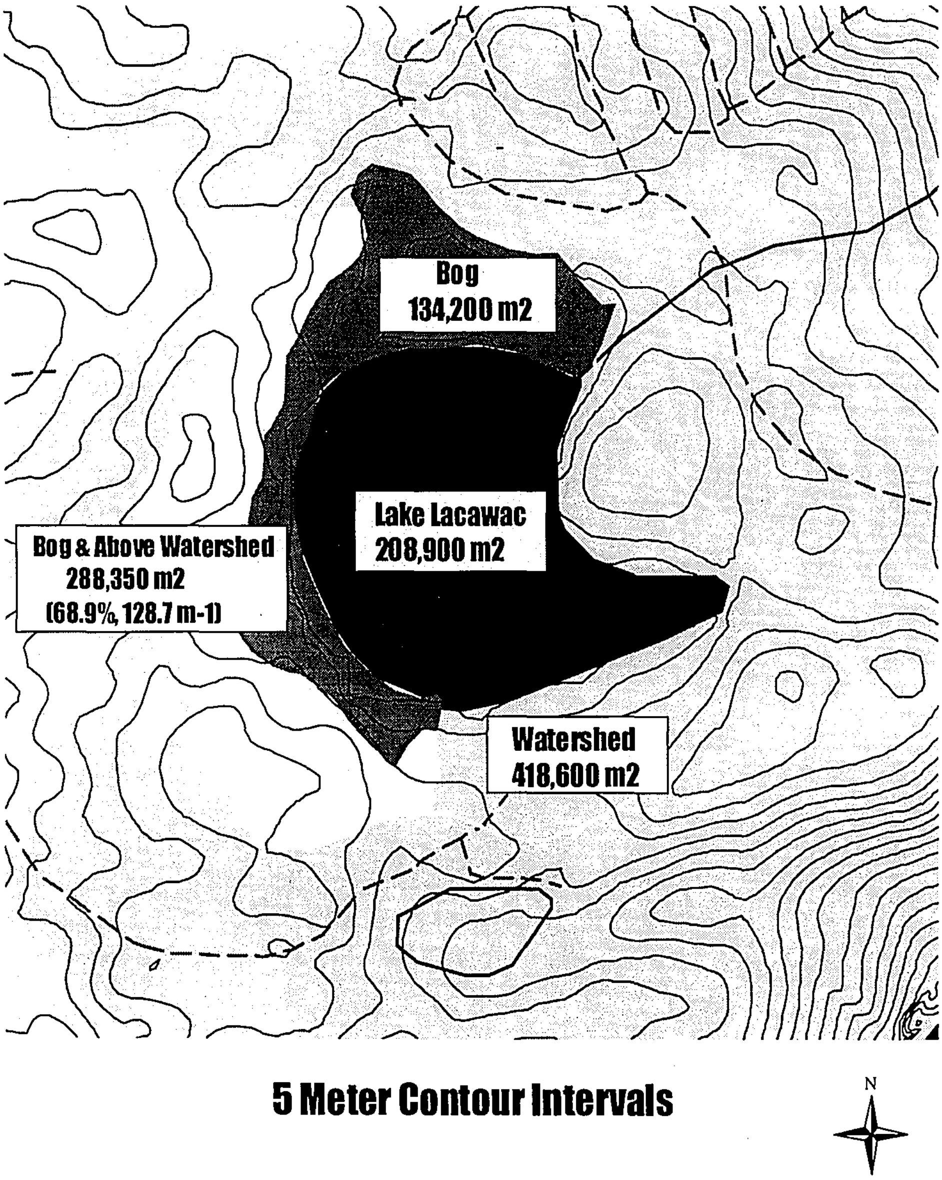


Figure 11. Area and 5 meter contour map of L. Lacawac. Watershed area and Watershed area flowing through bog. Calculated from DEMs downloaded from the USGS.

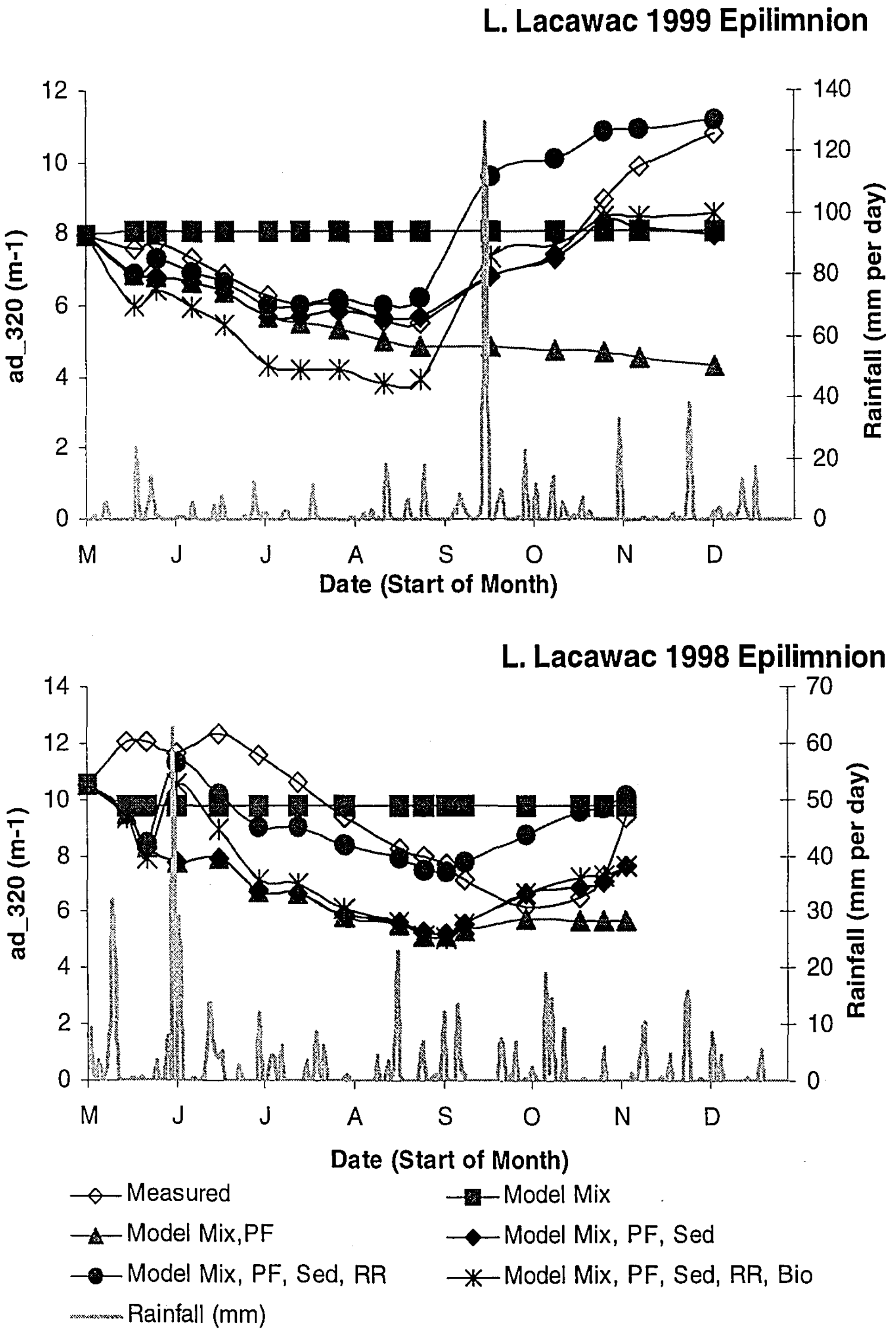


Figure 12. Model outputs for 1999 (Top) and 1998 (Bottom) Lacawac epilimnion. Daily rainfall was also graphed on a second axis.

INTENTIONAL SECOND EXPOSURE

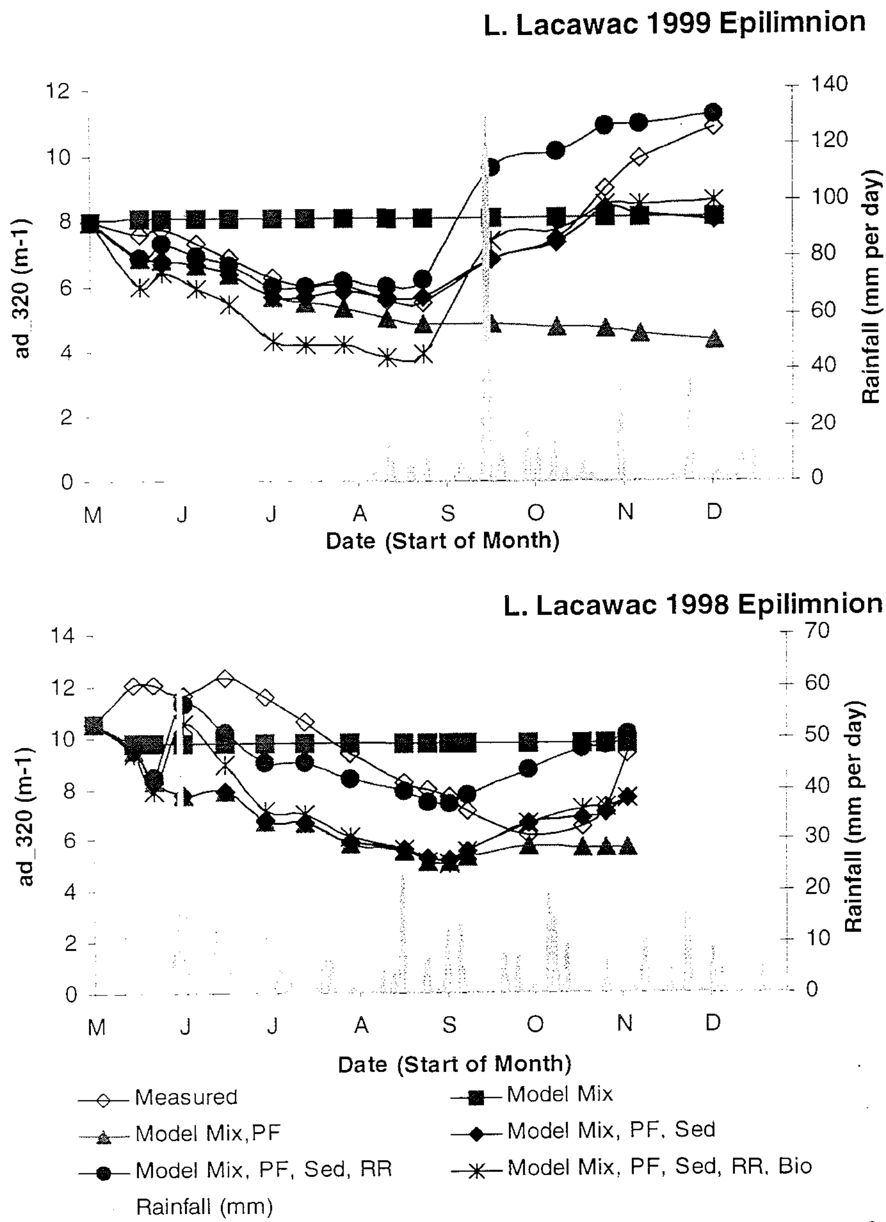


Figure 12. Model outputs for 1999 (Top) and 1998 (Bottom) Lacawac epilimnion. Daily rainfall was also graphed on a second axis.

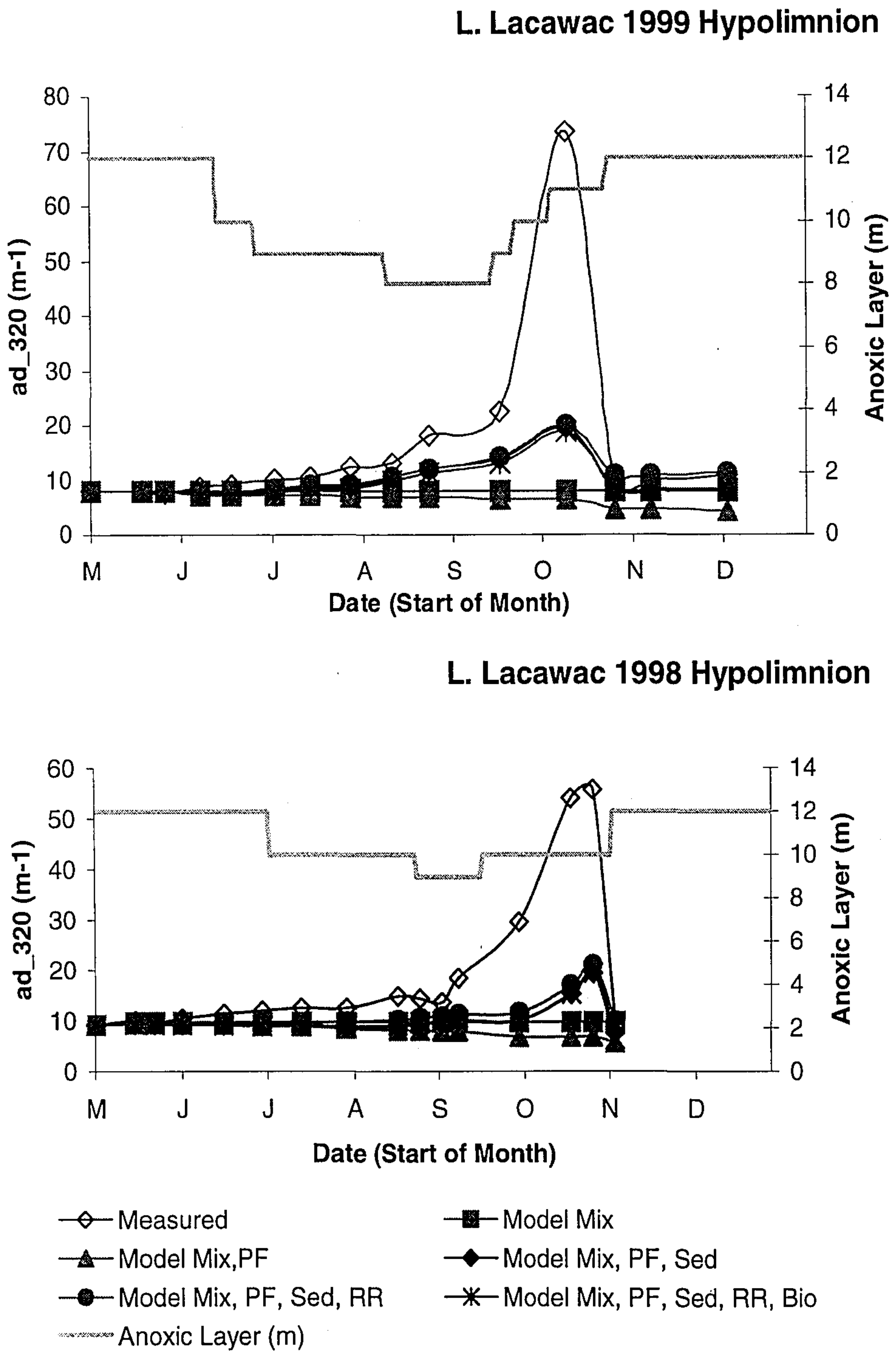


Figure 13. Model outputs for 1999 (Top) and 1998 (Bottom) for Lacawac Hypolimnion. The anoxic layer depth was added on a second axis.

INTENTIONAL SECOND EXPOSURE

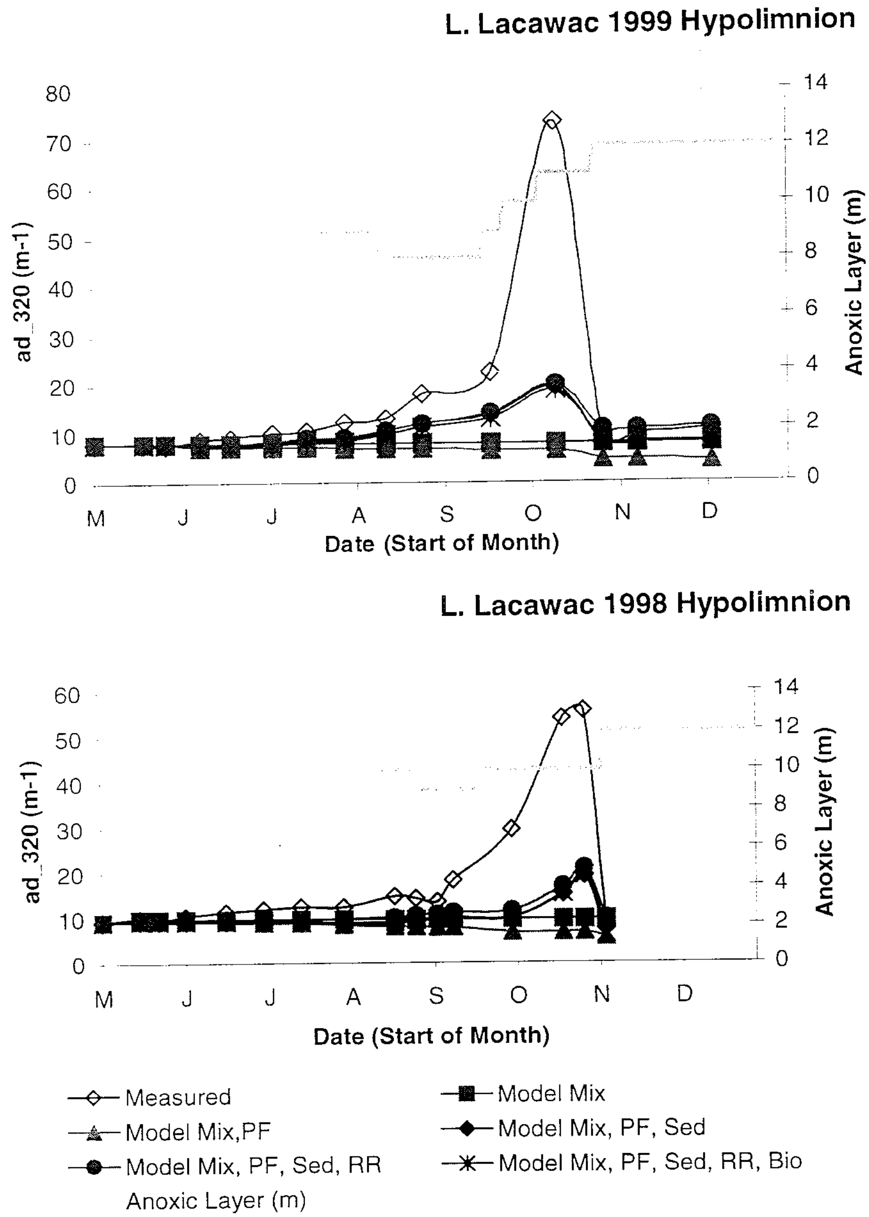


Figure 13. Model outputs for 1999 (Top) and 1998 (Bottom) for Lacawac Hypolimnion. The anoxic layer depth was added on a second axis.

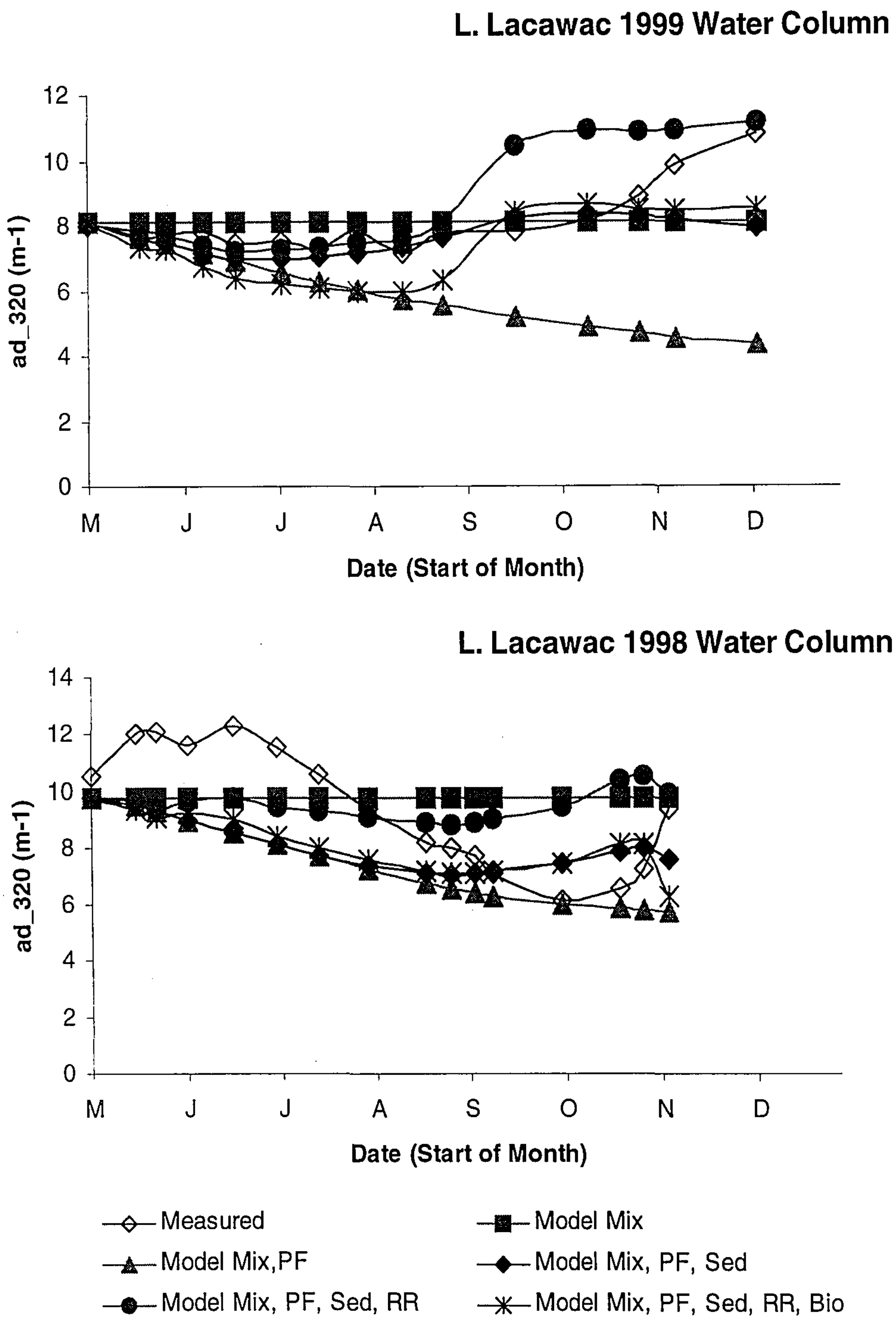


Figure 14. Model outputs for 1999 (Top) and 1998 (Bottom) for Lacawac Water Column.

INTENTIONAL SECOND EXPOSURE

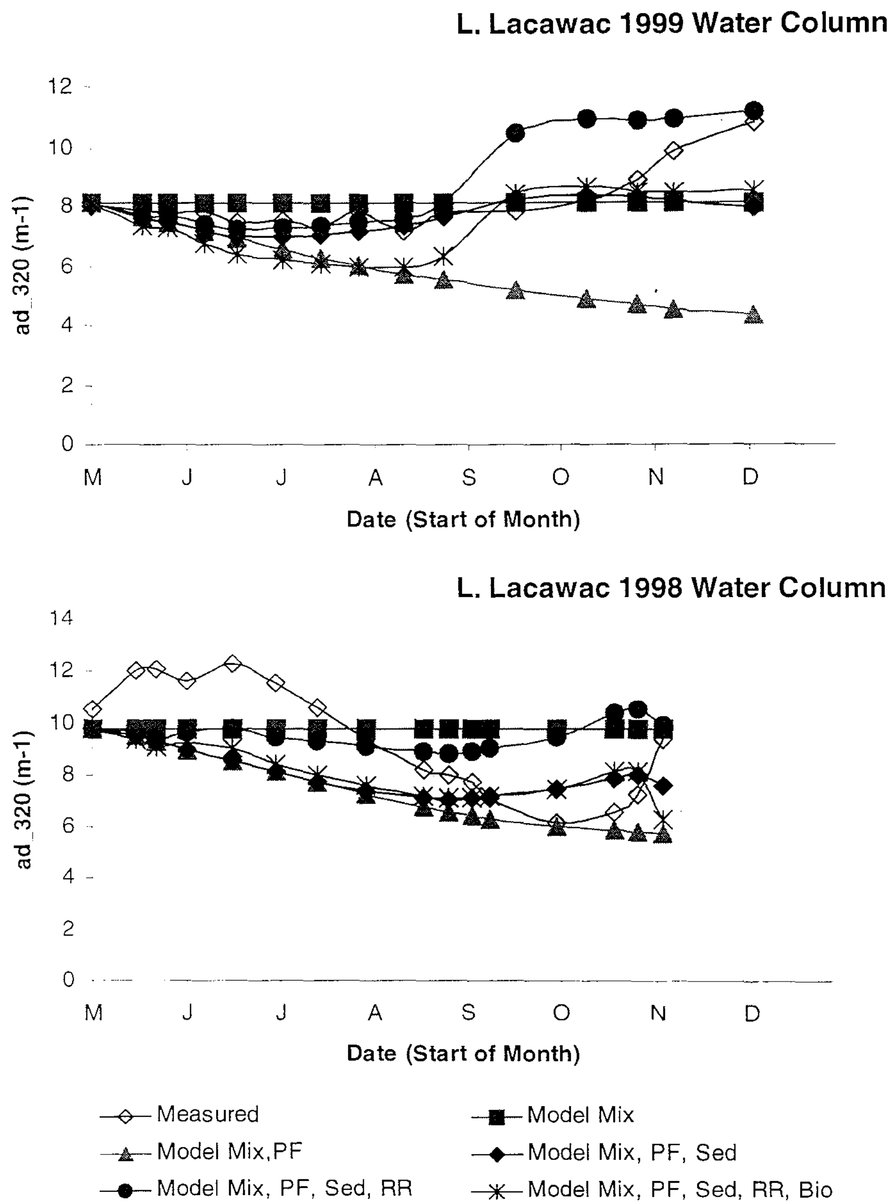


Figure 14. Model outputs for 1999 (Top) and 1998 (Bottom) for Lacawac Water Column.

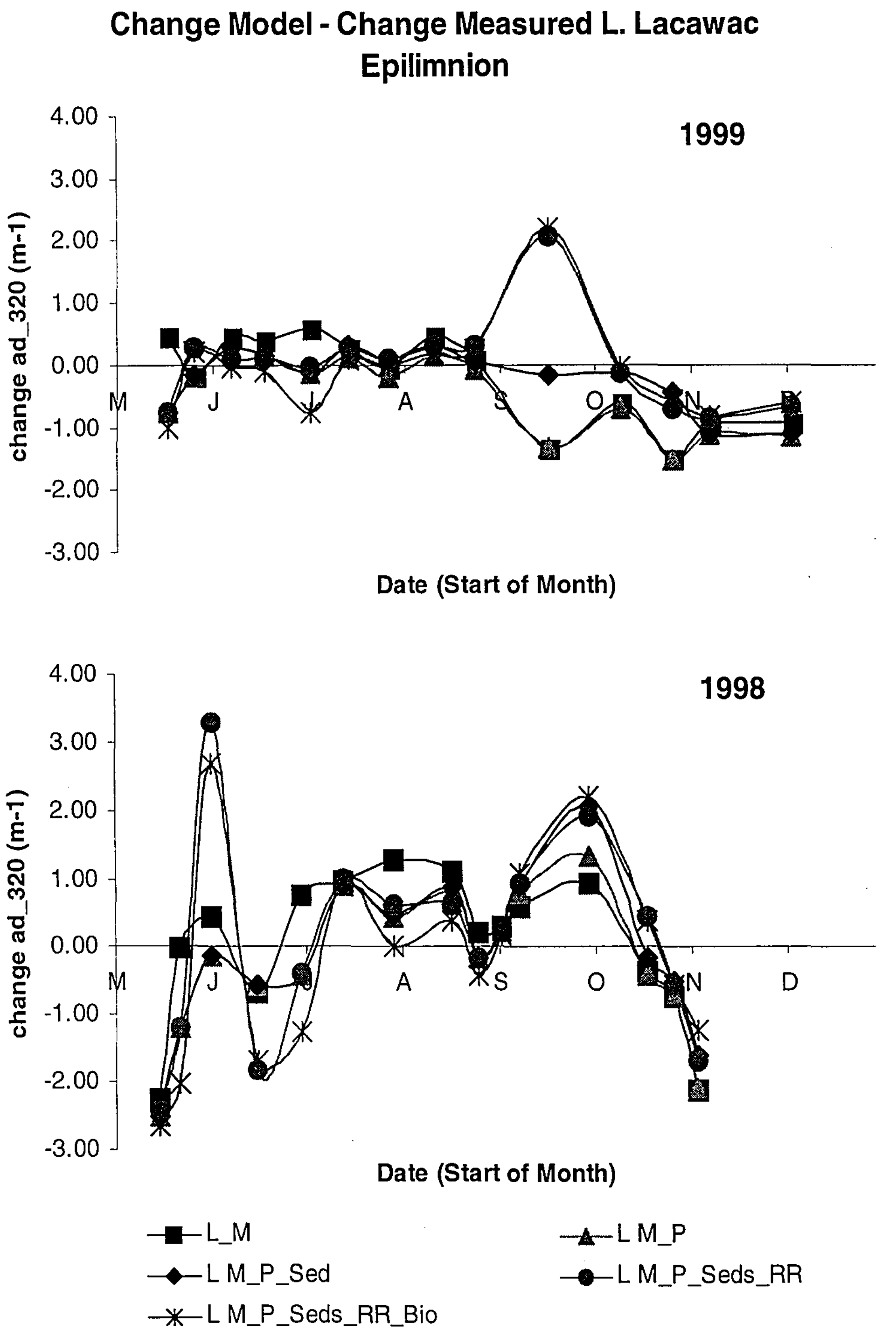


Figure 15. Analysis of L. Lacawac model epilimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

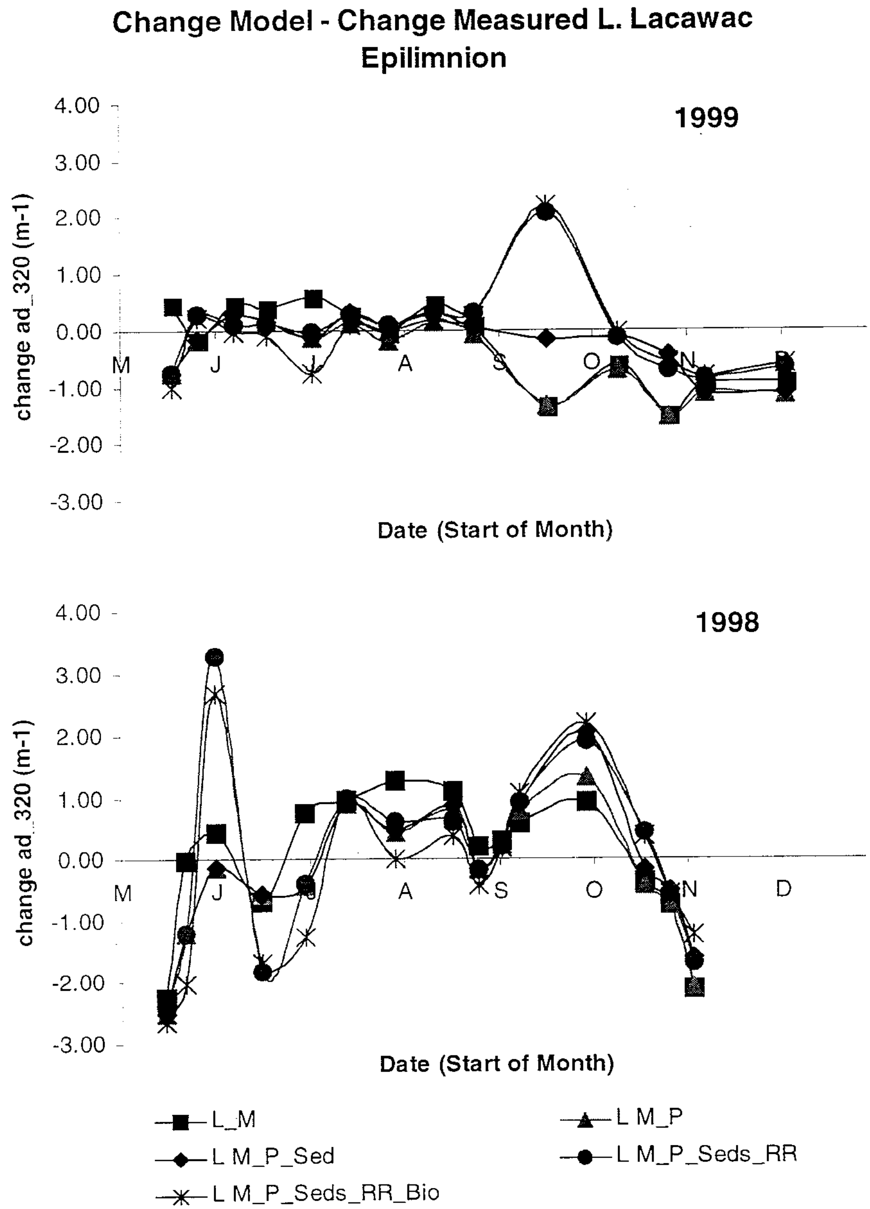


Figure 15. Analysis of L. Lacawac model epilimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

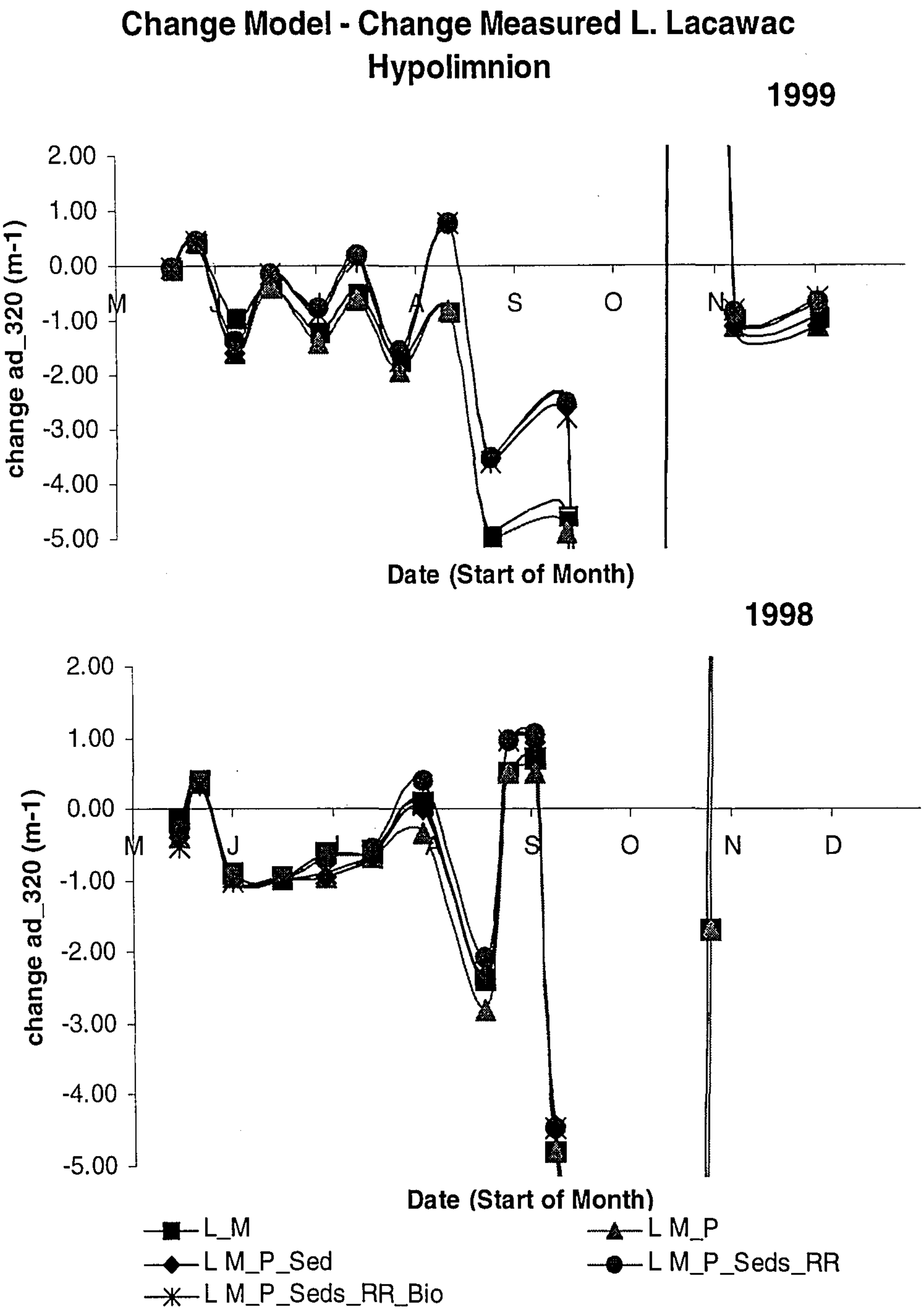


Figure 16. Analysis of L. Lacawac model hypolimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

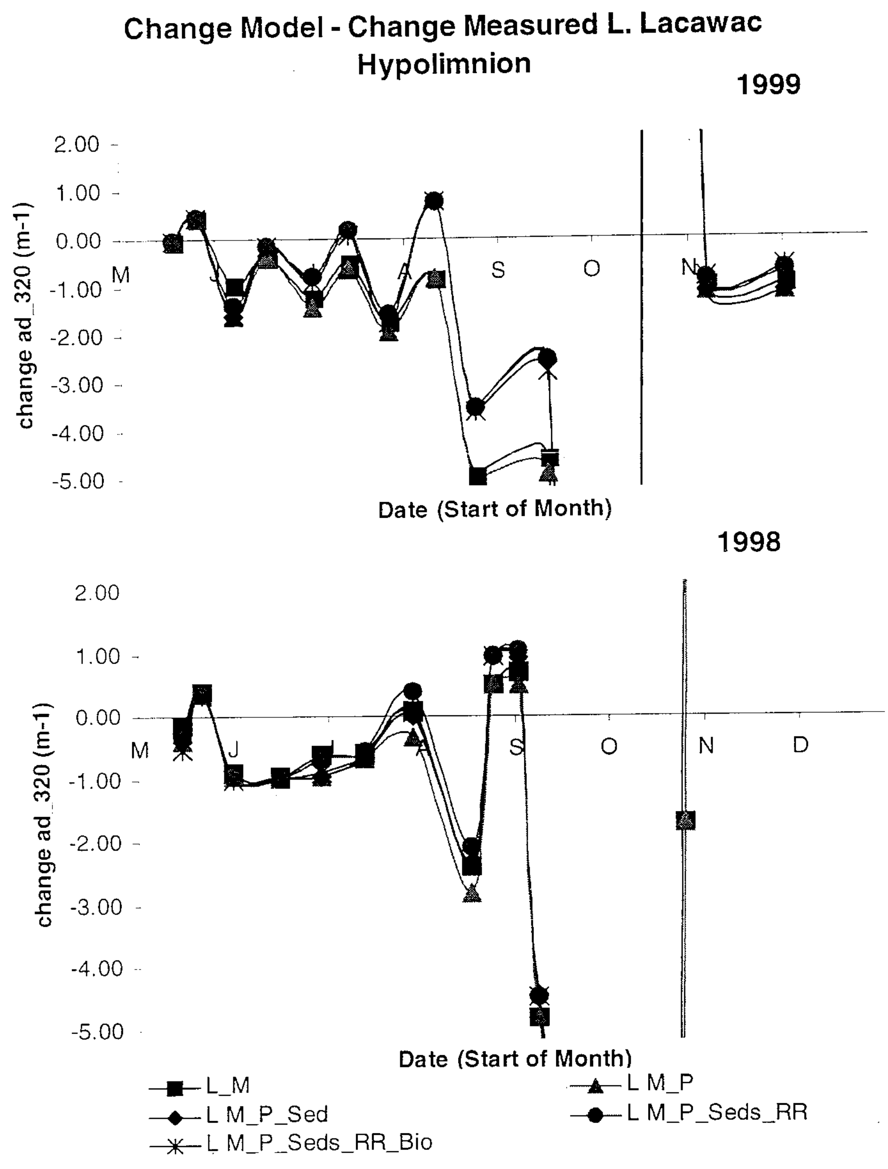


Figure 16. Analysis of L. Lacawac model hypolimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

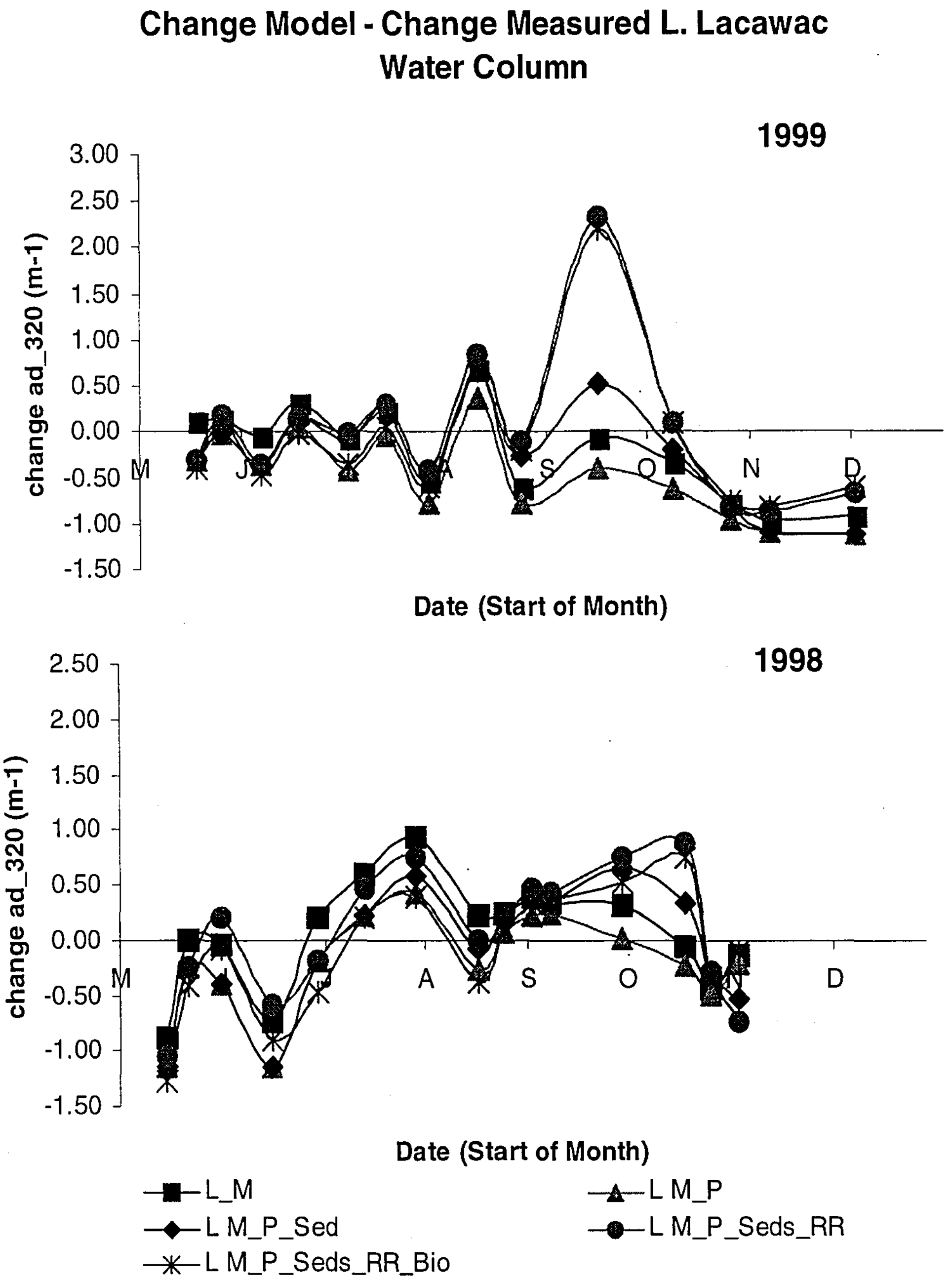


Figure 17. Analysis of L. Lacawac model water column output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

INTENTIONAL SECOND EXPOSURE

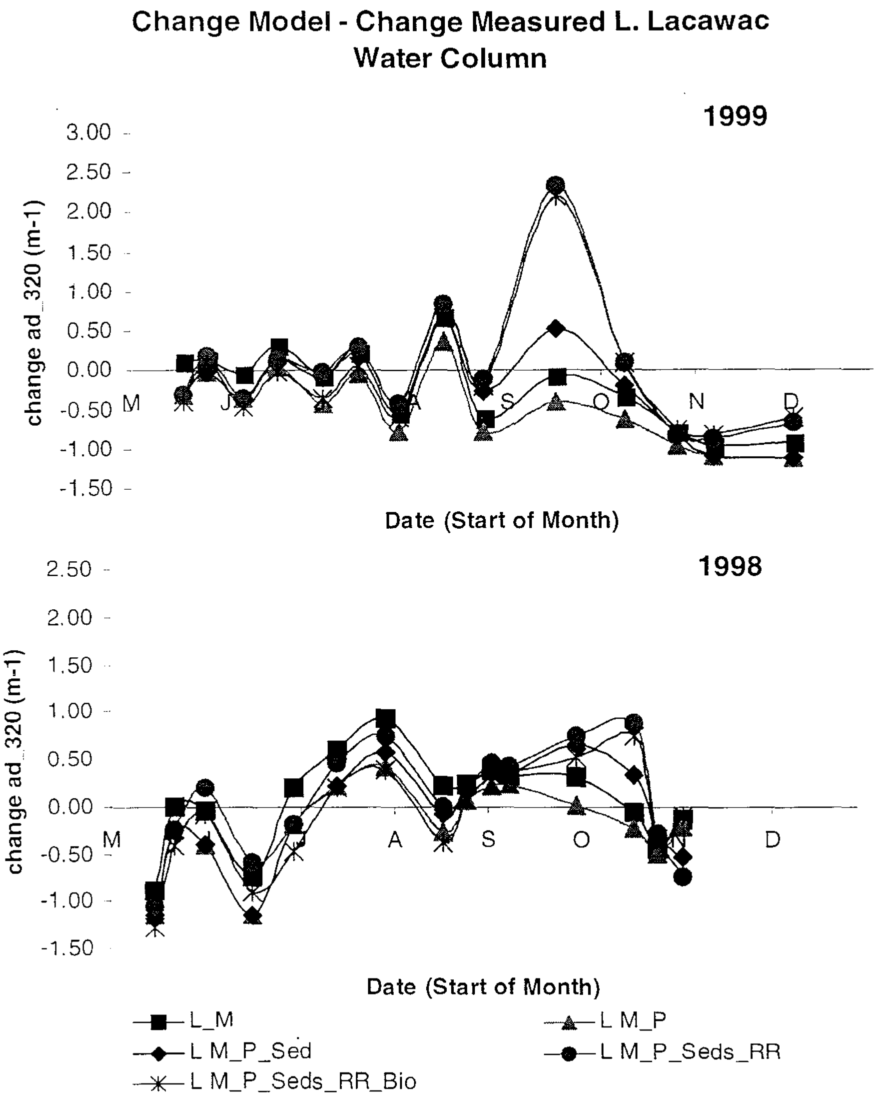


Figure 17. Analysis of L. Lacawac model water column output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

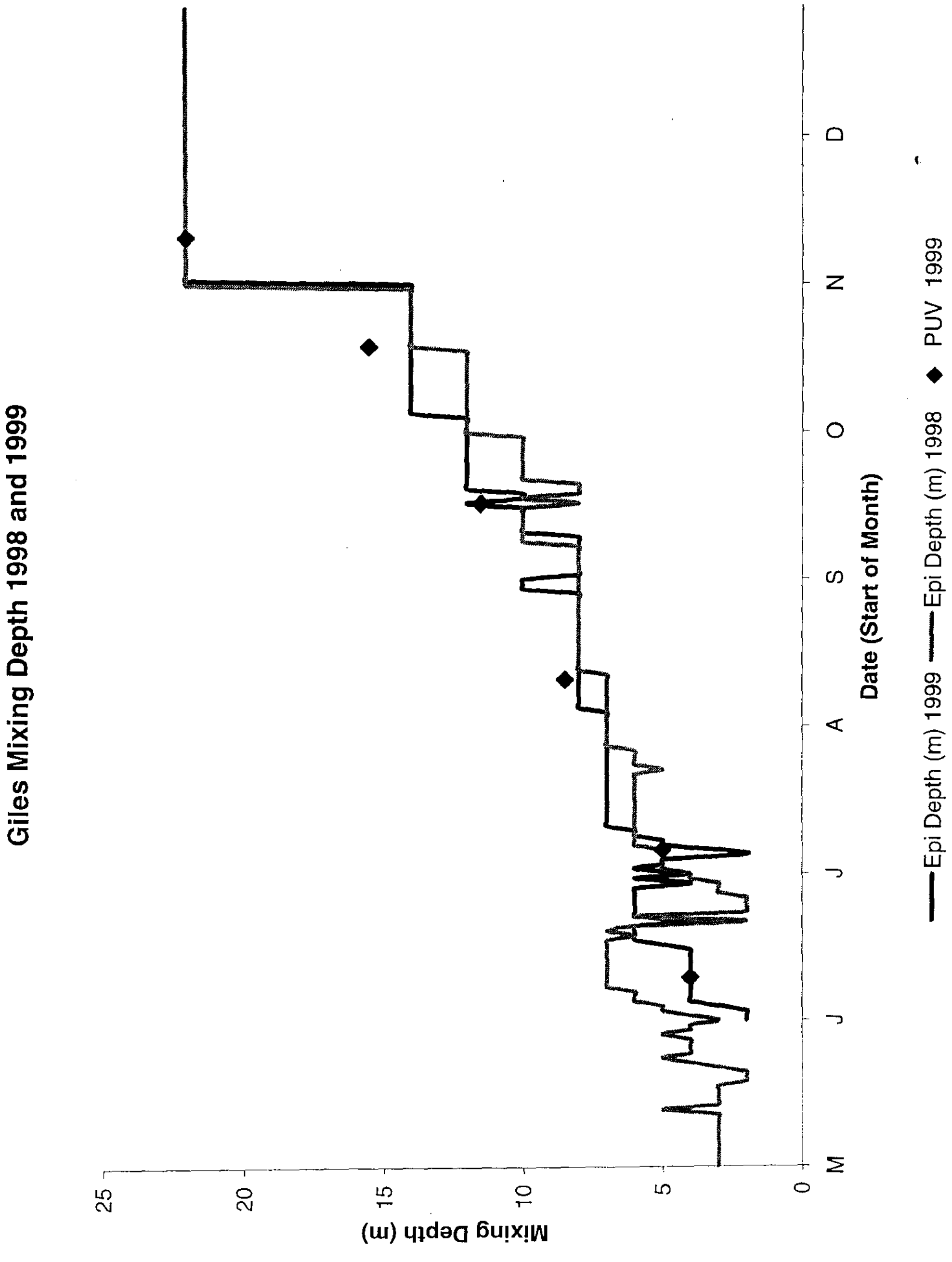


Figure 18. Mixing depth for L. Giles 1999 and 1998

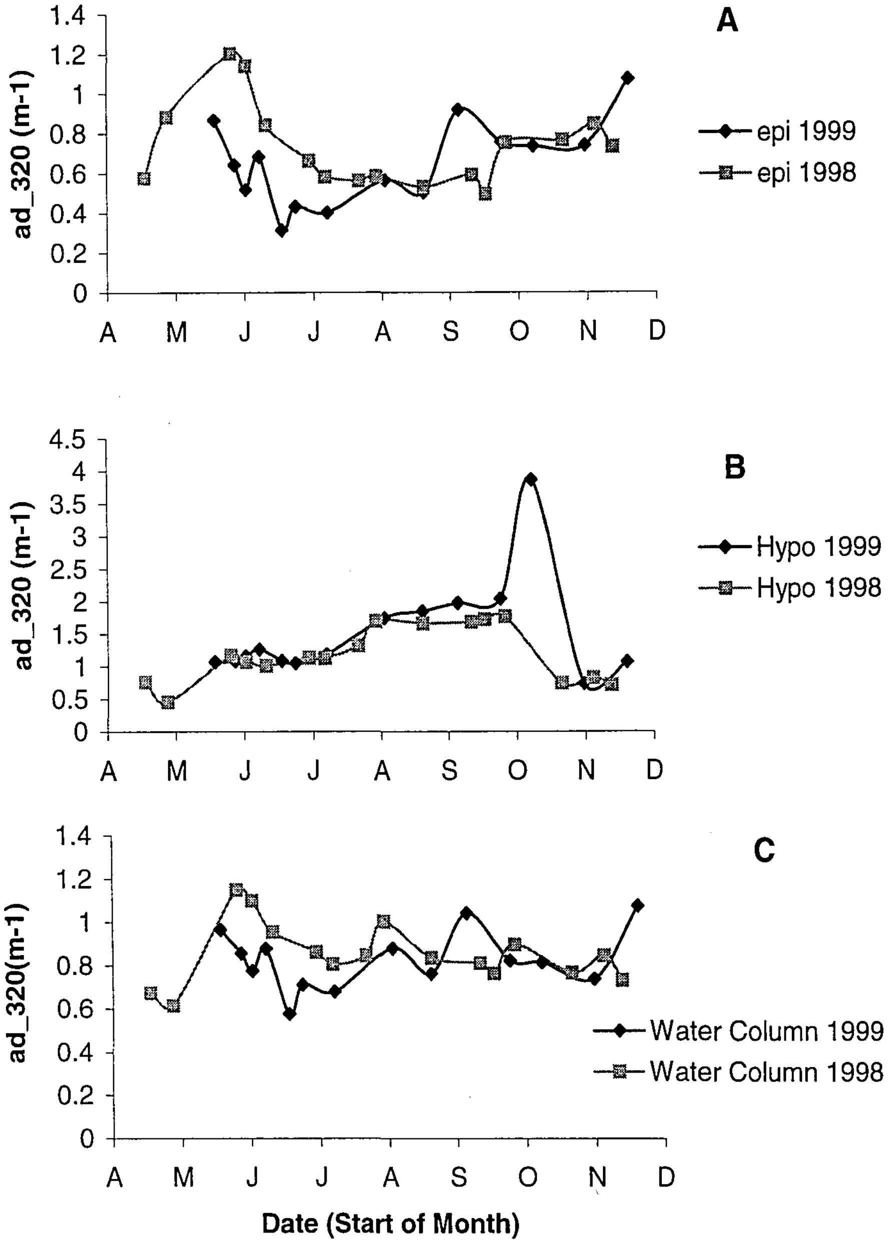
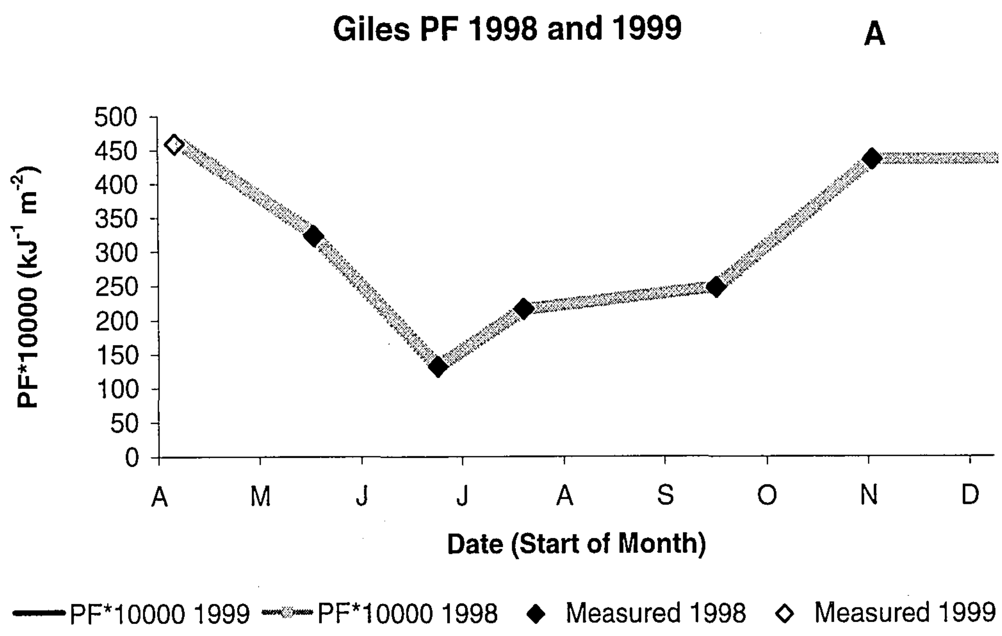


Figure 19. Measured volume weighted ad_320 values for L. Giles 1999 and 1998. (A) epilimnion, (B) hypolimnion, and (C) entire water column. Turnover occurred on 11/4/99 and 11/3/98.



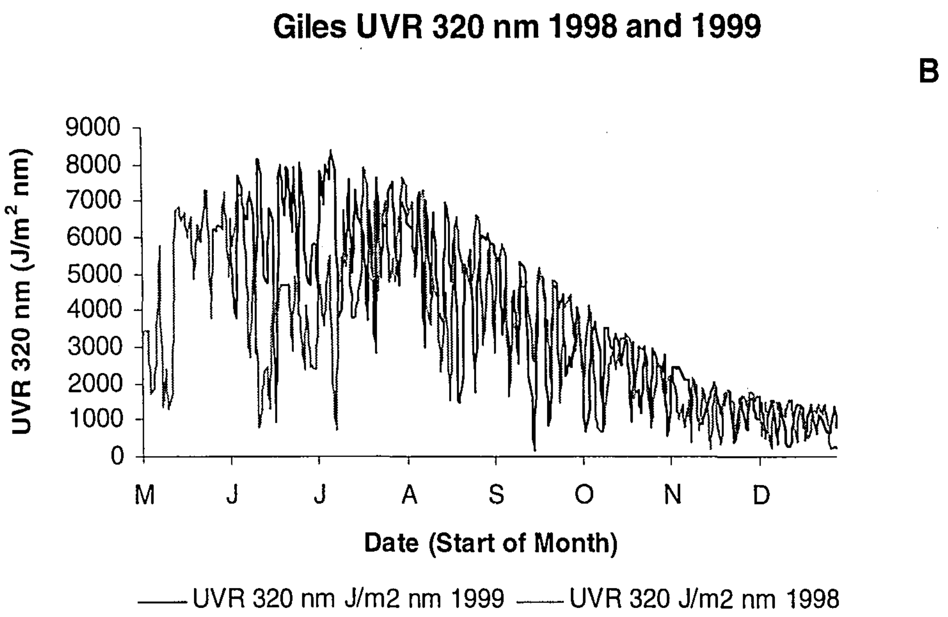


Figure 20. L. Giles PF and daily UVR 320nm for 1998 and 1999. (A) Shows PF and (B) displays UVR at 320 nm. Diamonds in A represent PUV derived mixed depth.

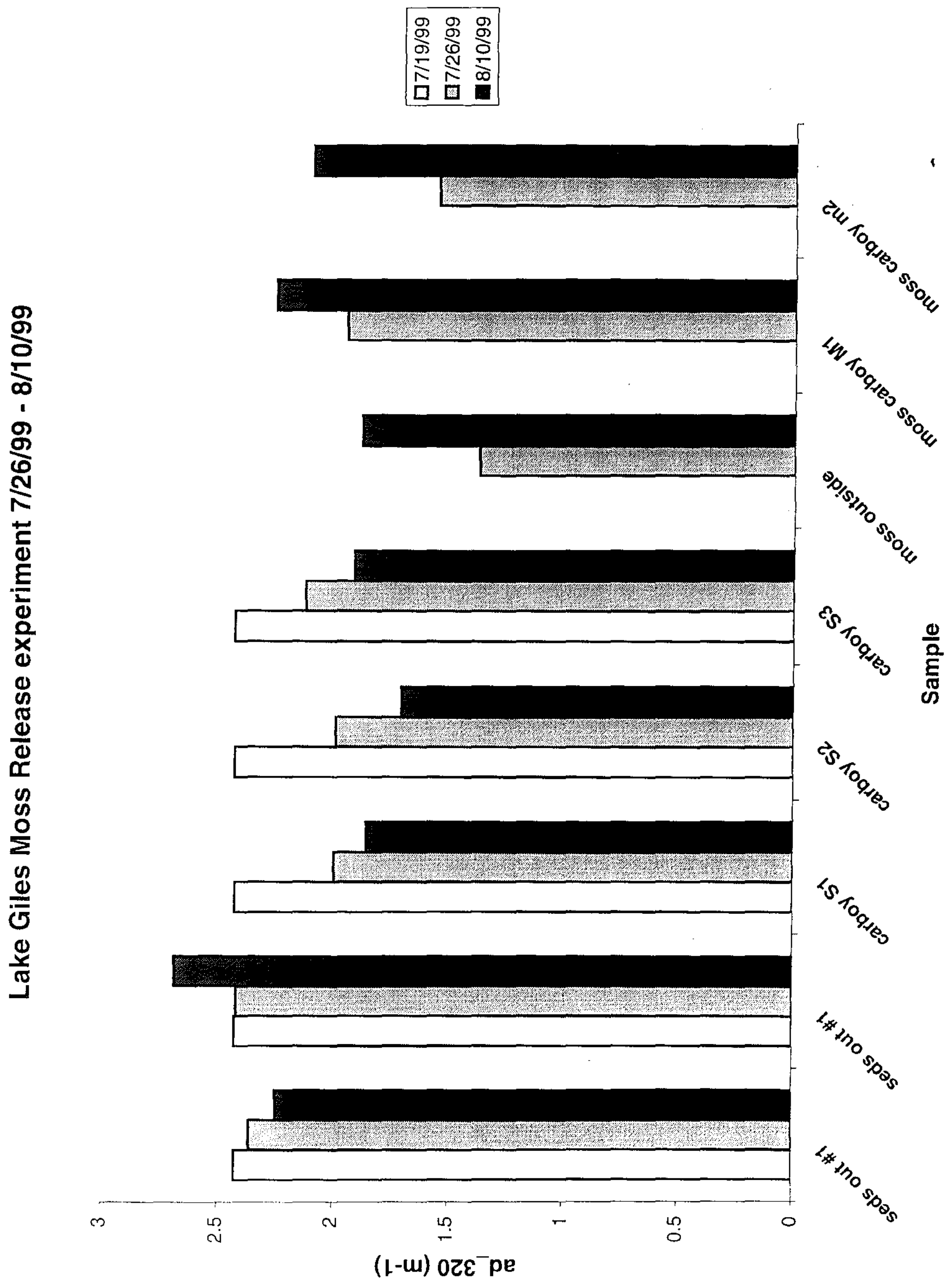
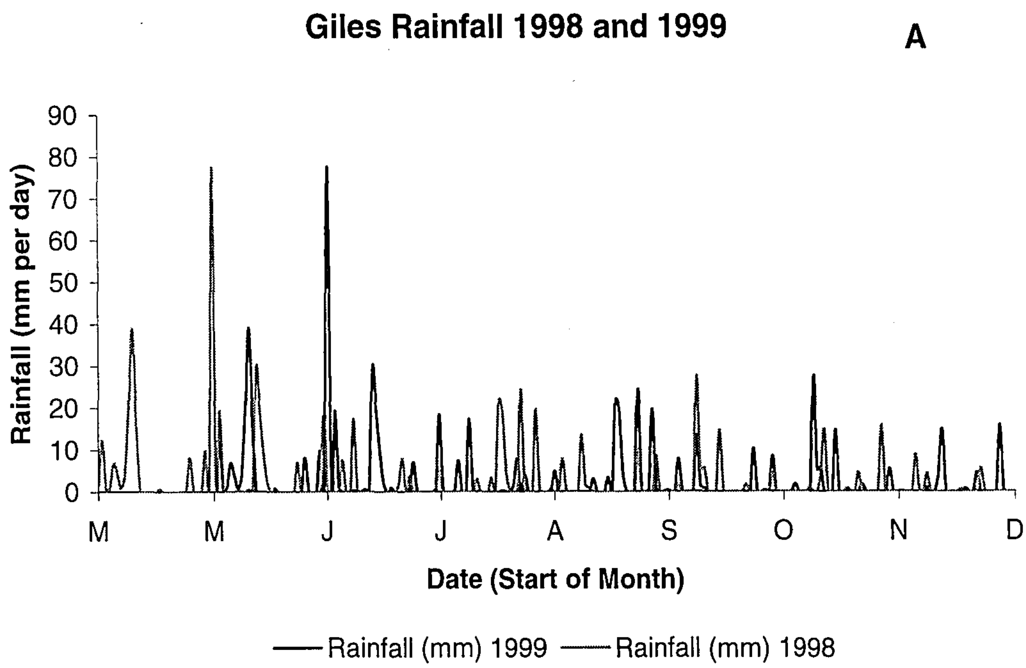


Figure 21. L. Giles moss release experiment from 7/19 to 8/10/99.



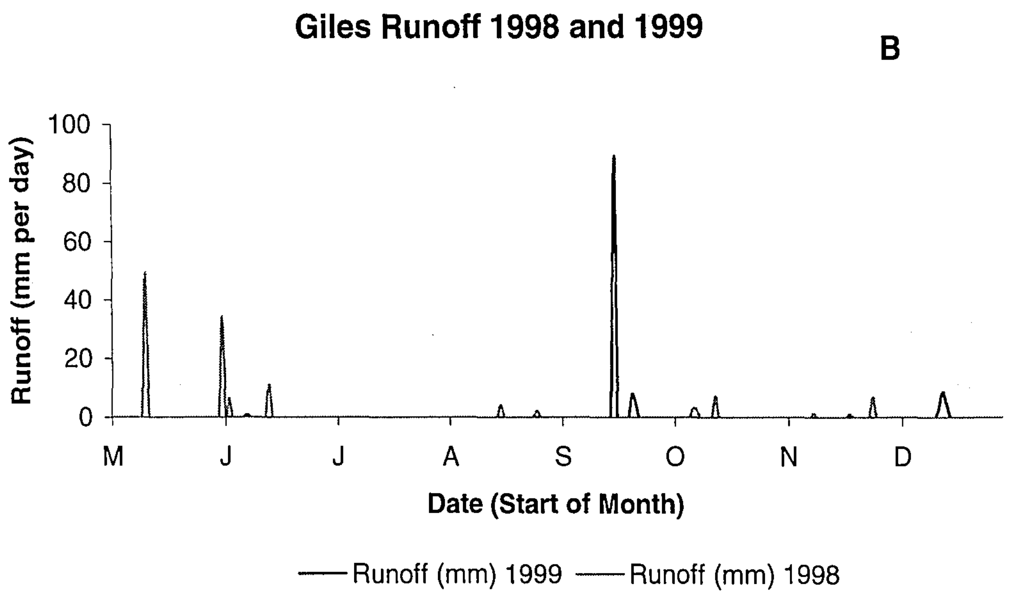


Figure 22. Lake Giles rainfall and runoff values for 1999 and 1998. (A) Shows rainfall and (B) shows runoff values.

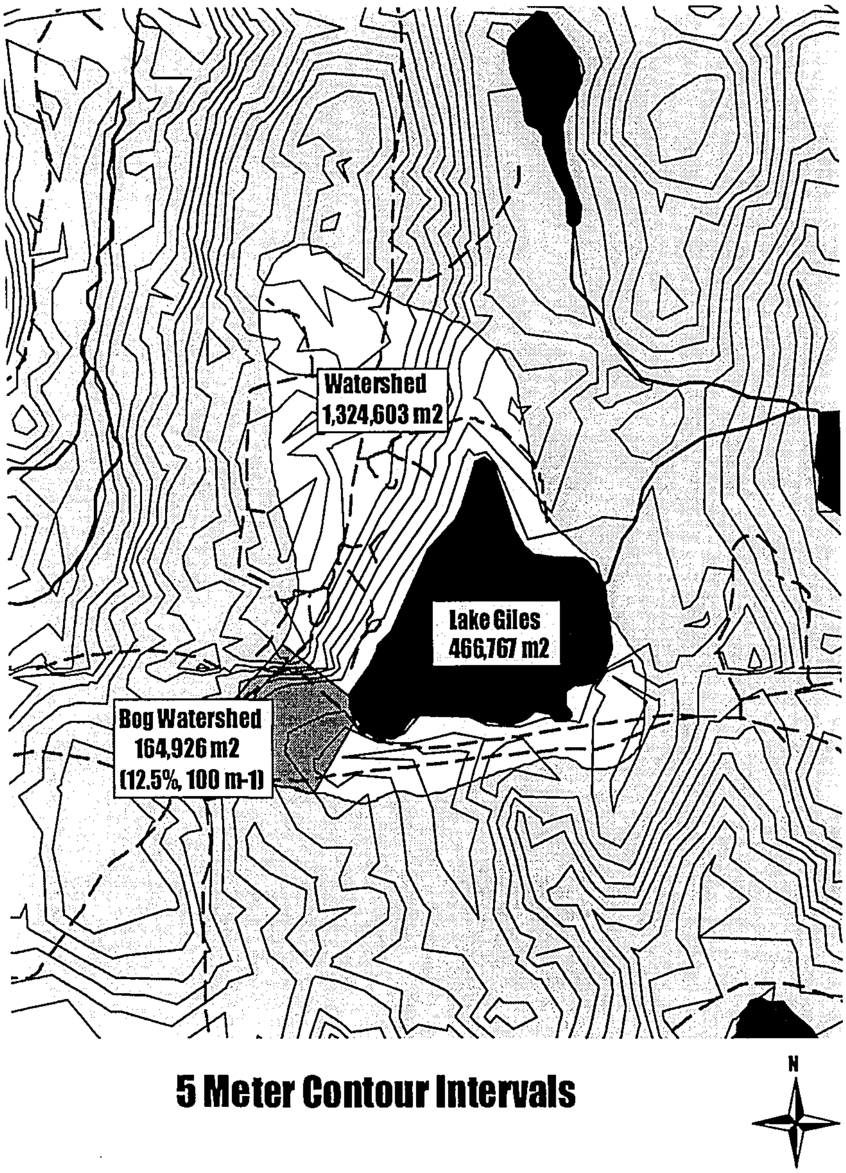


Figure 23. Area and 5 meter contour map of L. Giles. Watershed and Watershed flowing through bog areas displayed. Calculated from DEM downloaded from USGS.

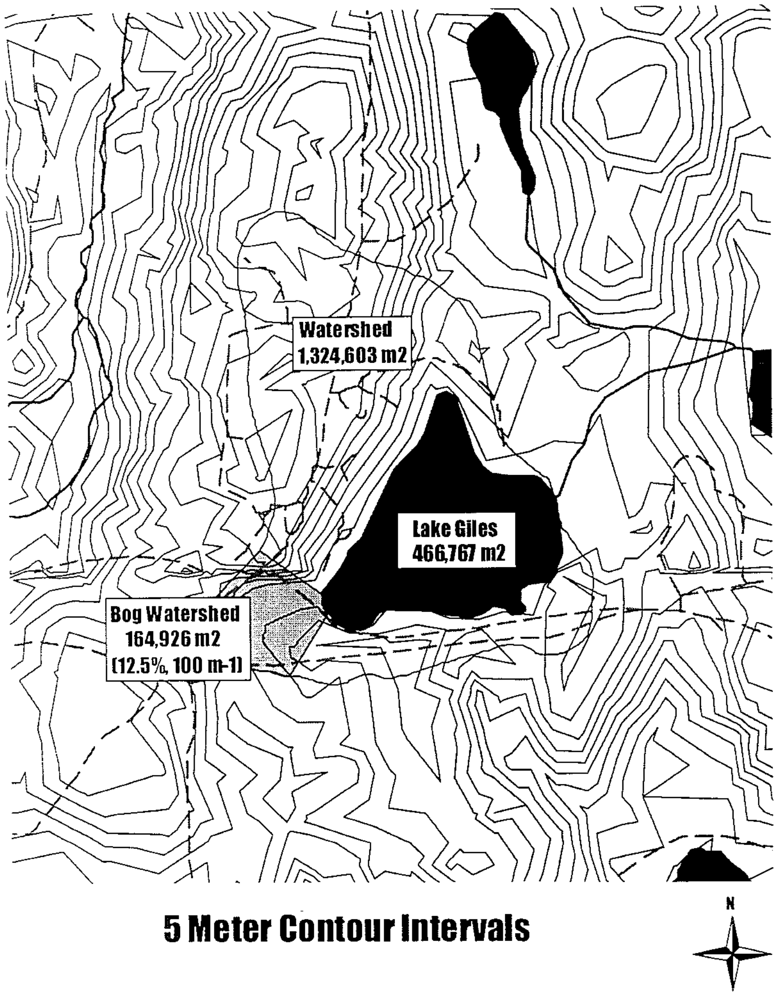


Figure 23. Area and 5 meter contour map of L. Giles. Watershed and Watershed flowing through bog areas displayed. Calculated from DEM downloaded from USGS.

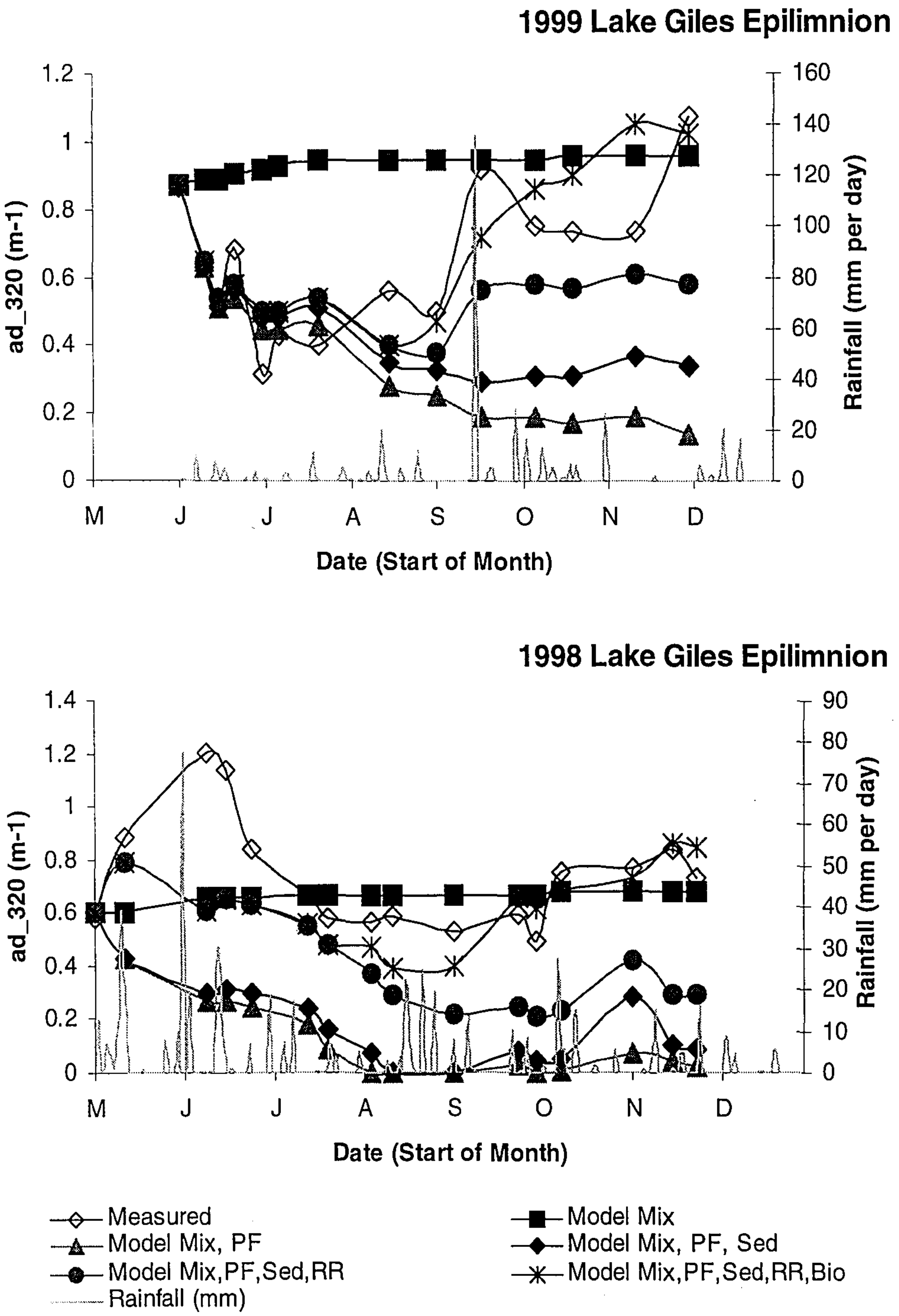


Figure 24. Model outputs for 1999 (Top) and 1998 (Bottom) Giles epilimnion. Daily rainfall was also graphed on a second axis.

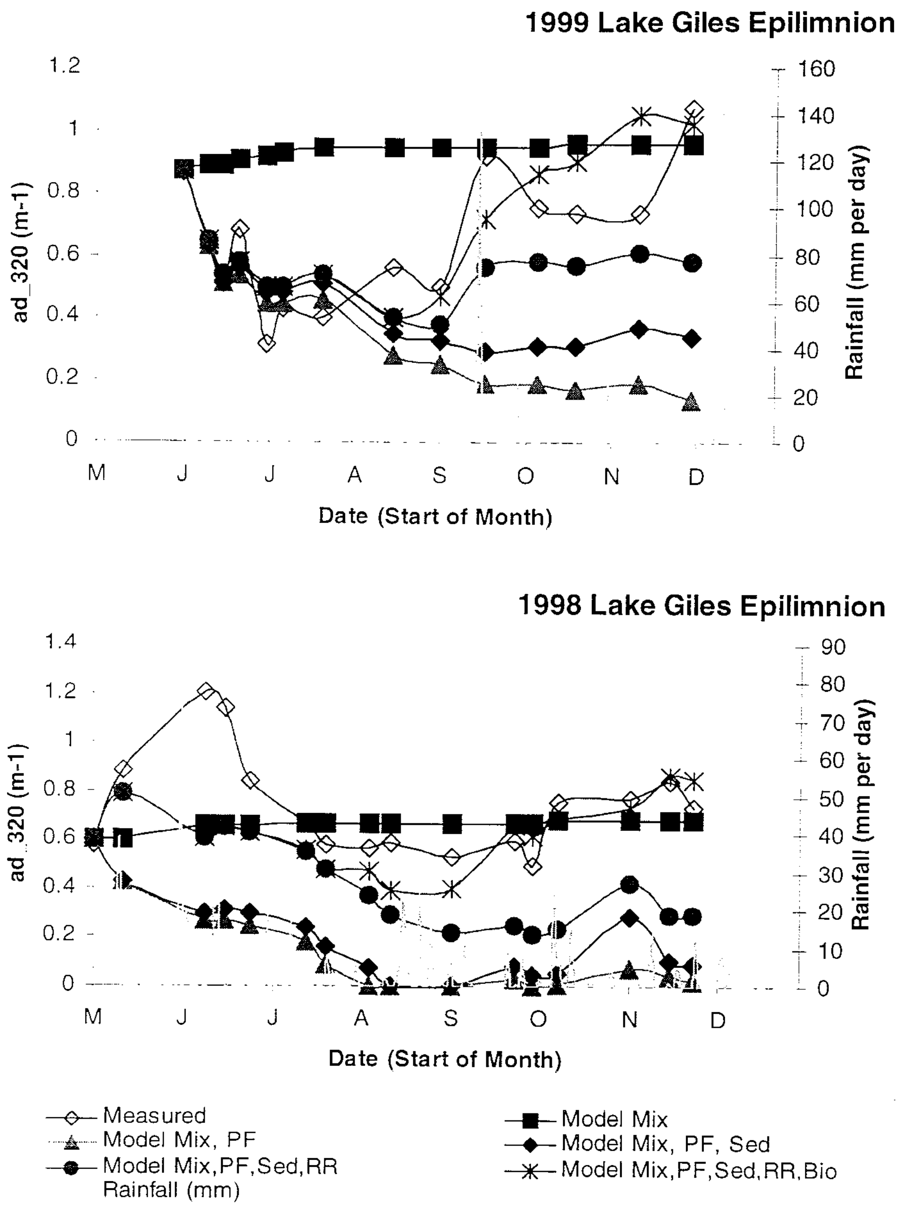


Figure 24. Model outputs for 1999 (Top) and 1998 (Bottom) Giles epilimnion. Daily rainfall was also graphed on a second axis.

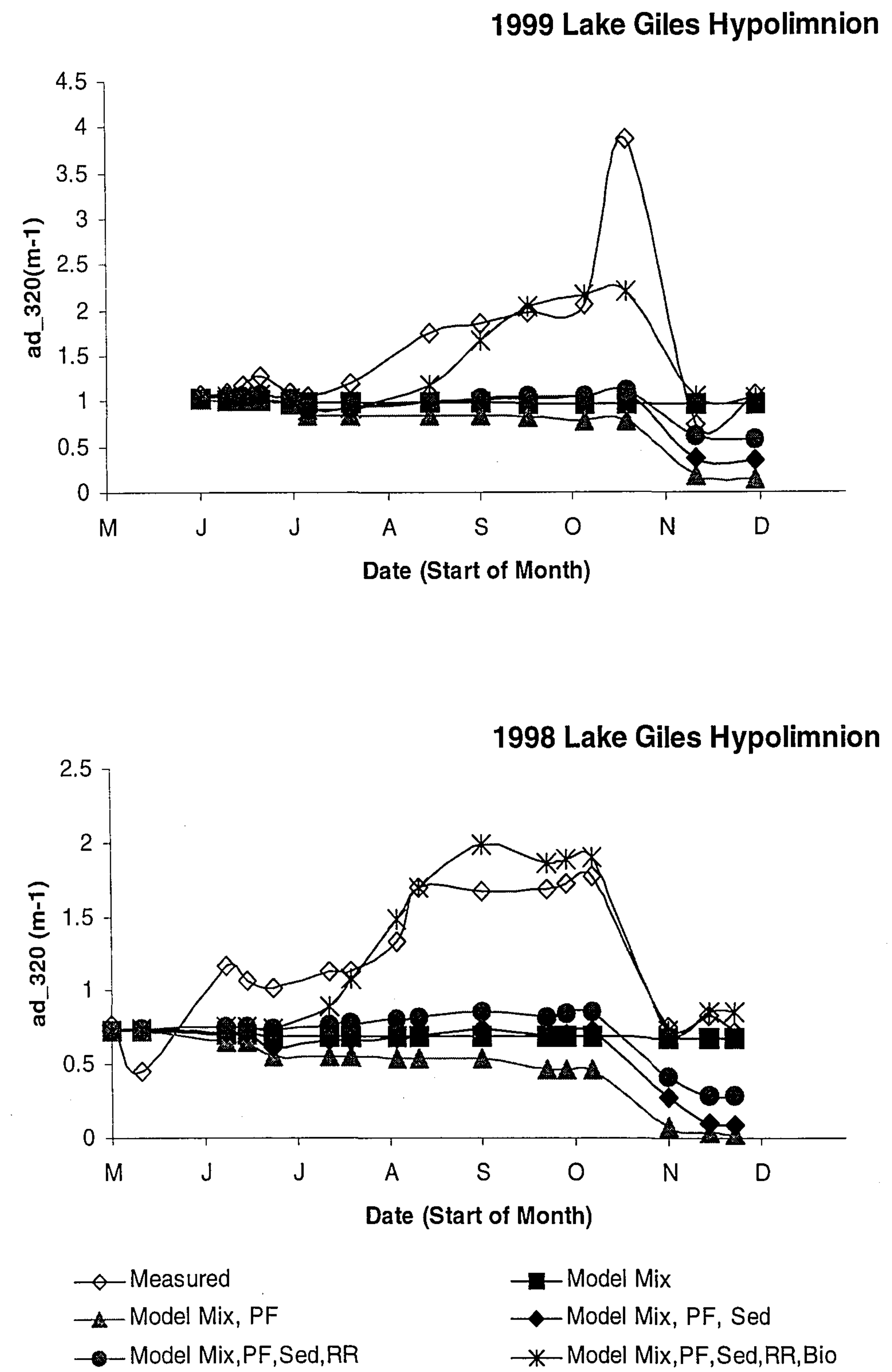


Figure 25. Model outputs for 1999 (Top) and 1998 (Bottom) for Giles Hypolimnion.

INTENTIONAL SECOND EXPOSURE

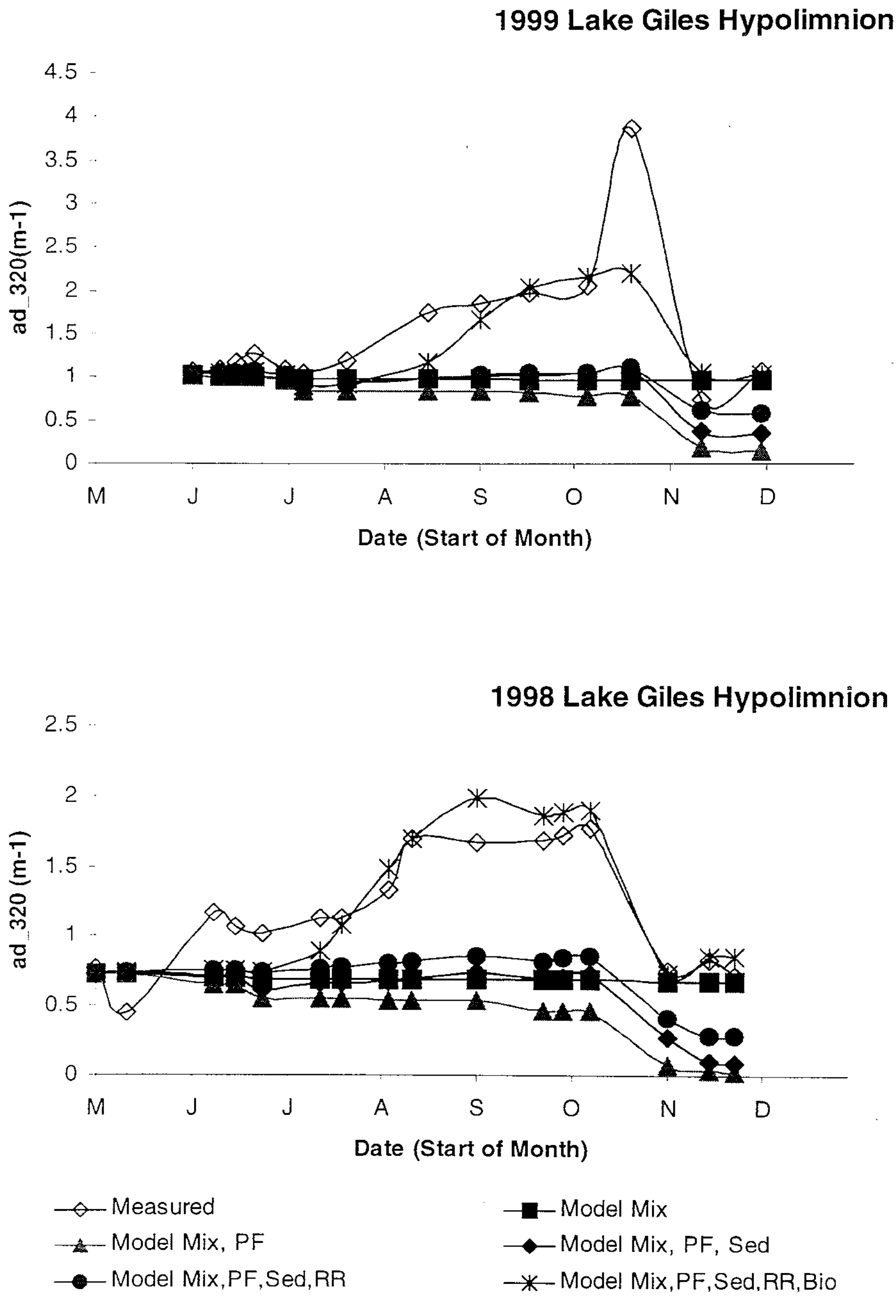


Figure 25. Model outputs for 1999 (Top) and 1998 (Bottom) for Giles Hypolimnion.

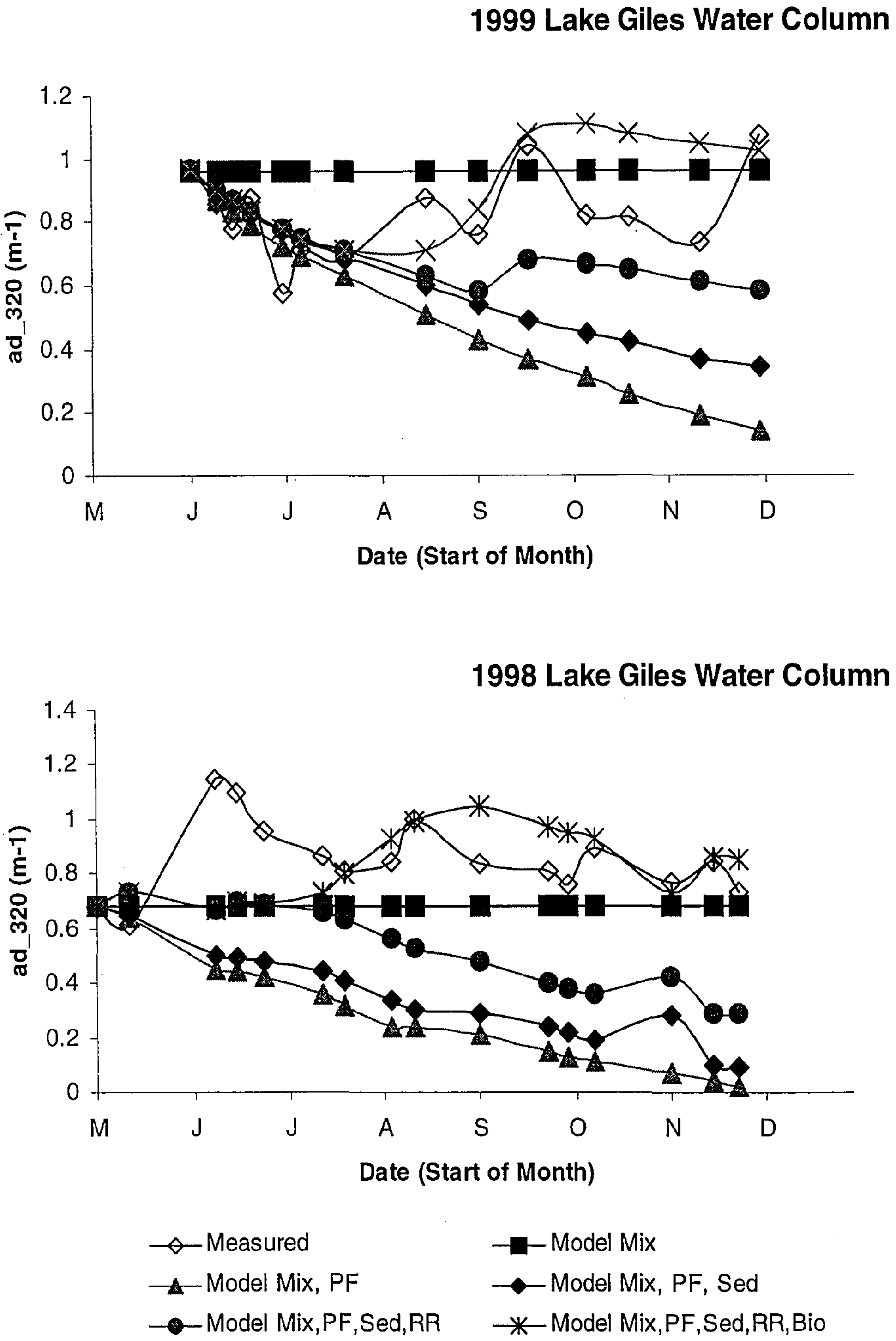
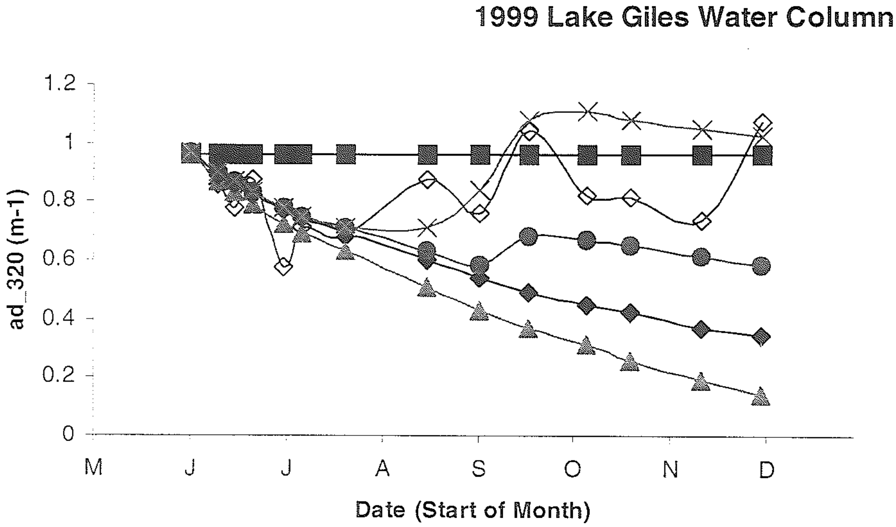


Figure 26. Model outputs for 1999 (Top) and 1998 (Bottom) for Giles Water Column.



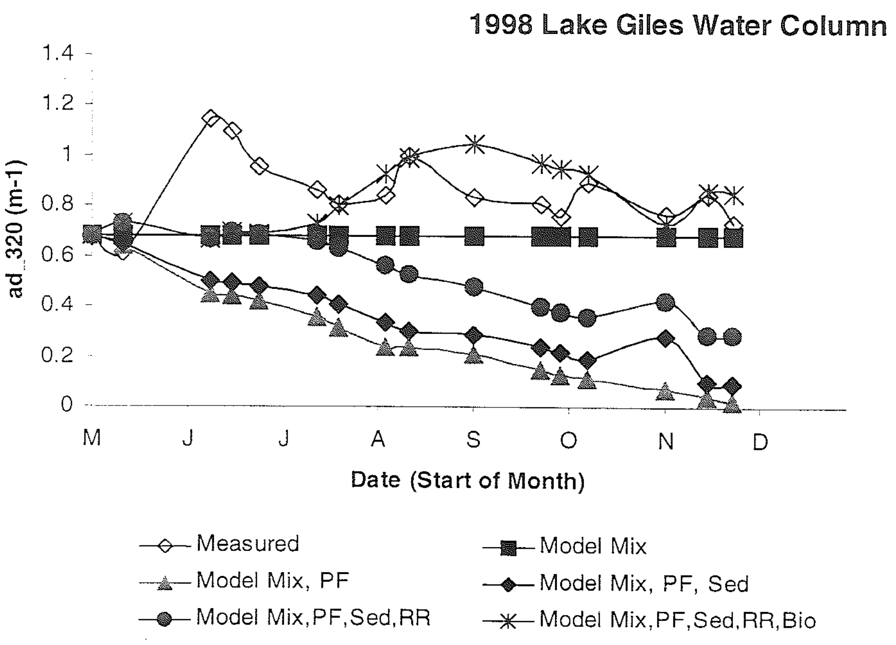


Figure 26. Model outputs for 1999 (Top) and 1998 (Bottom) for Giles Water Column.

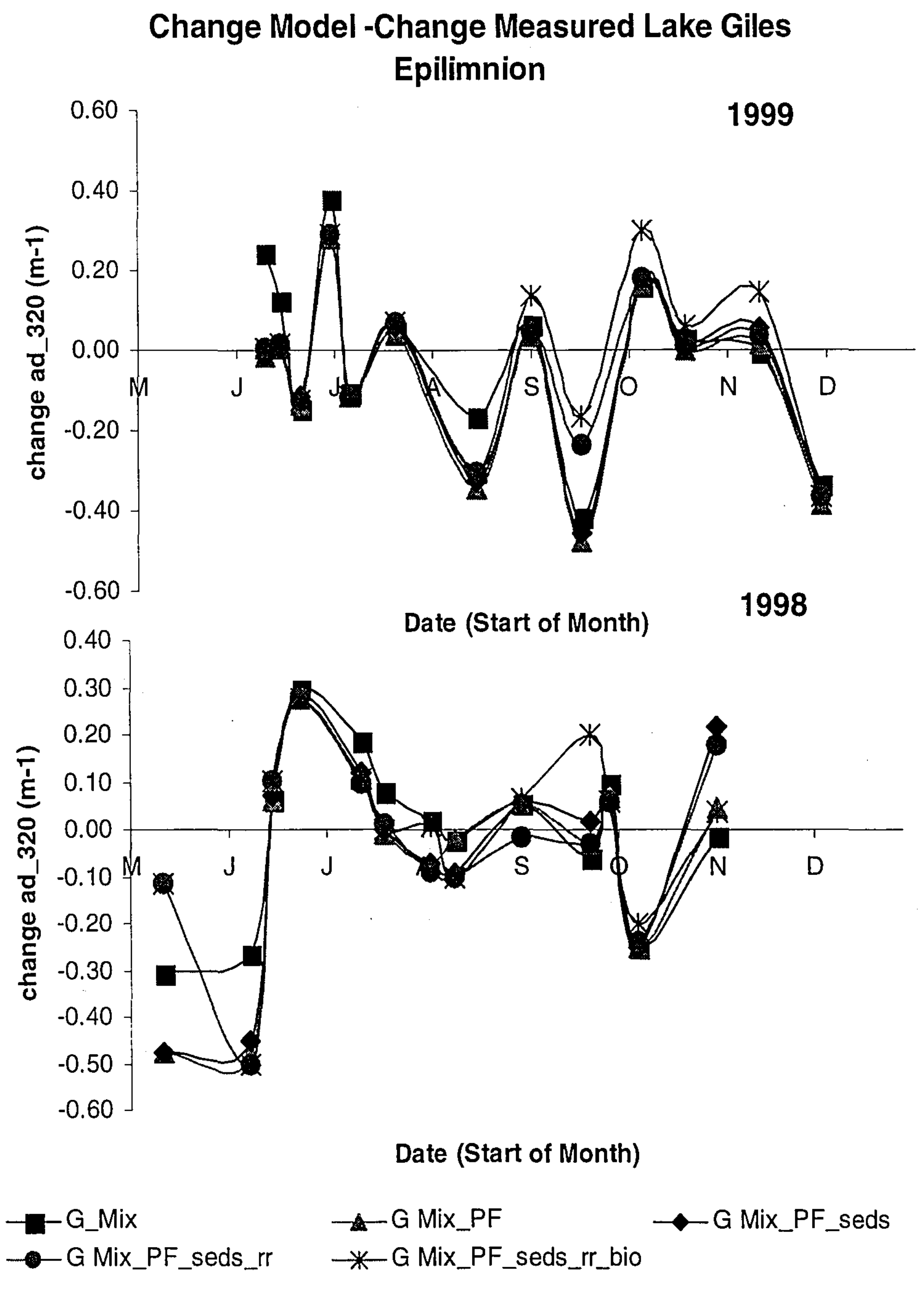


Figure 27. Analysis of L. Giles model epilimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

INTENTIONAL SECOND EXPOSURE

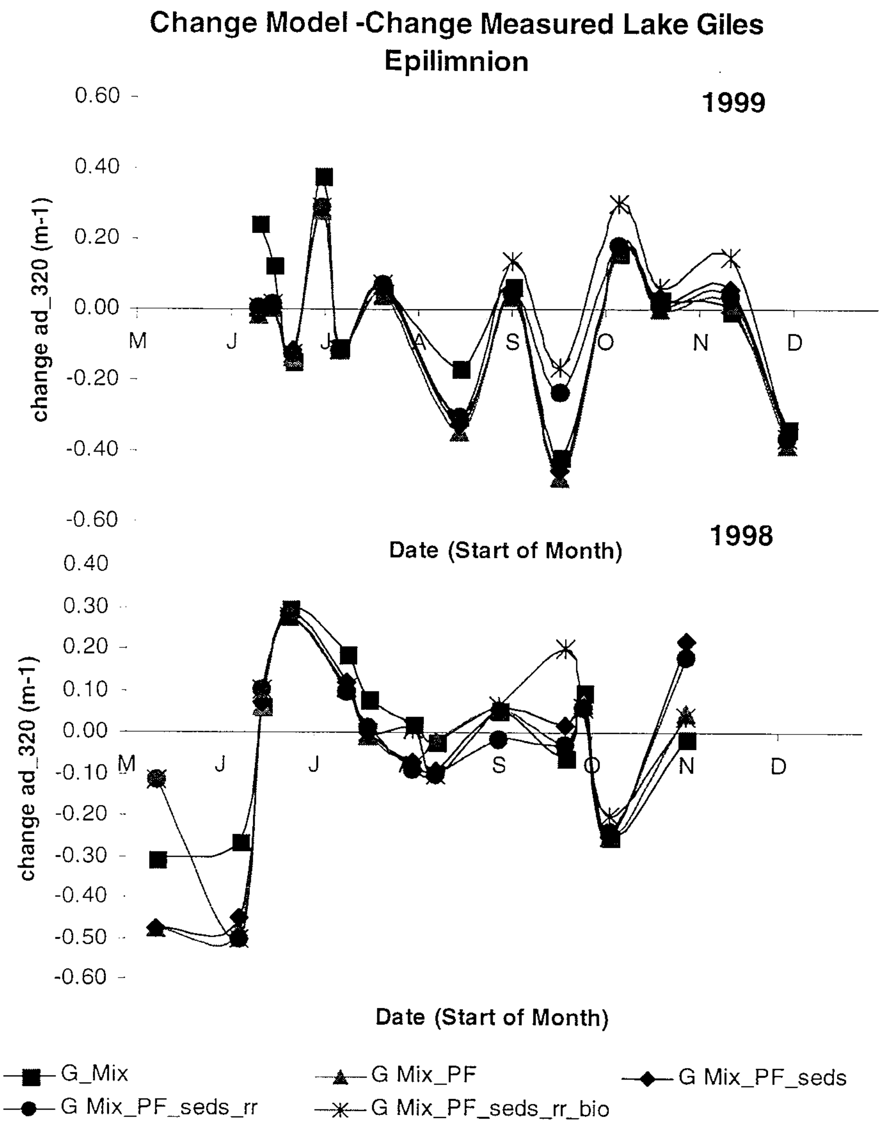


Figure 27. Analysis of L. Giles model epilimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

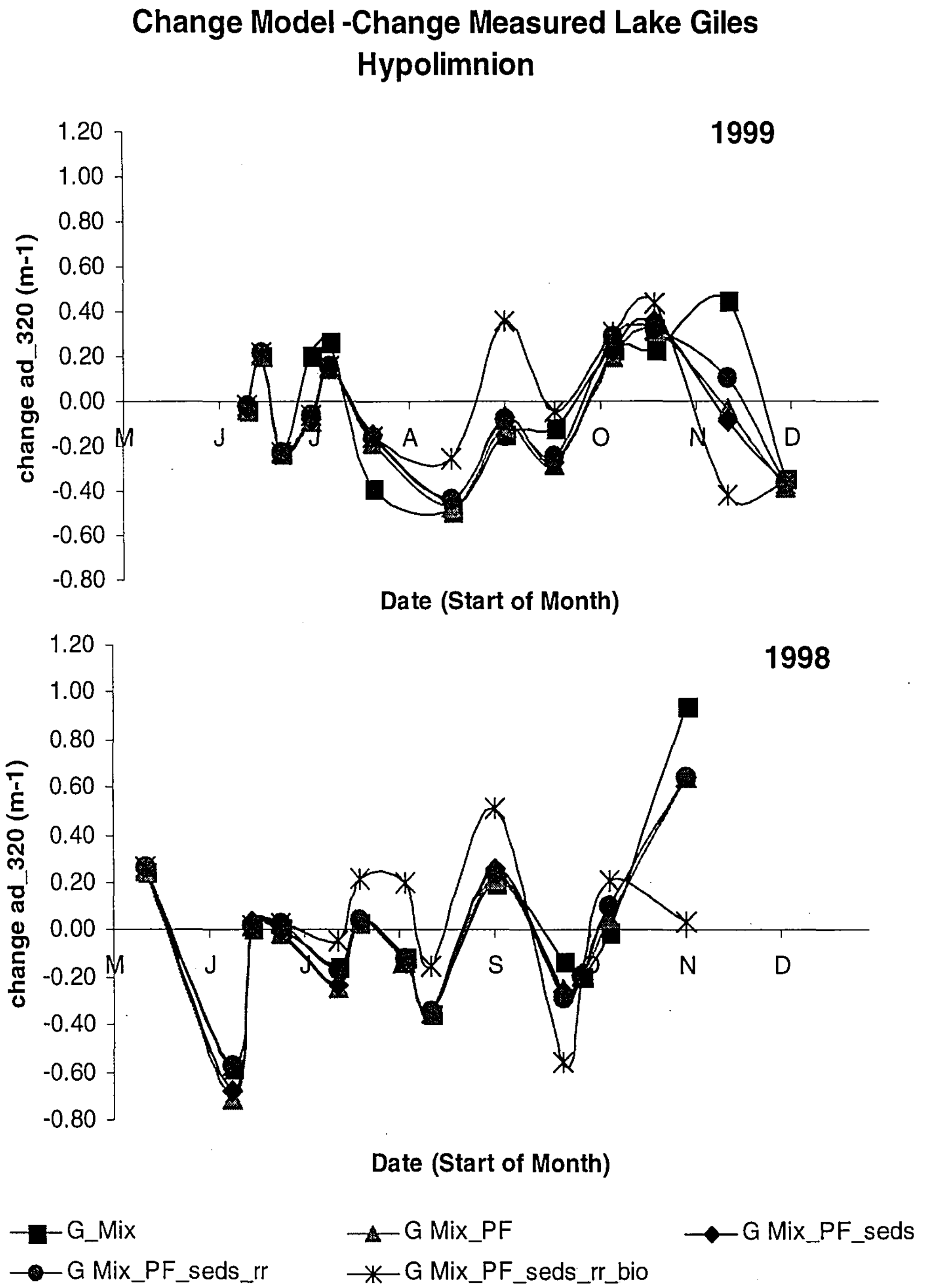


Figure 28. Analysis of L. Giles model hypolimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

INTENTIONAL SECOND EXPOSURE

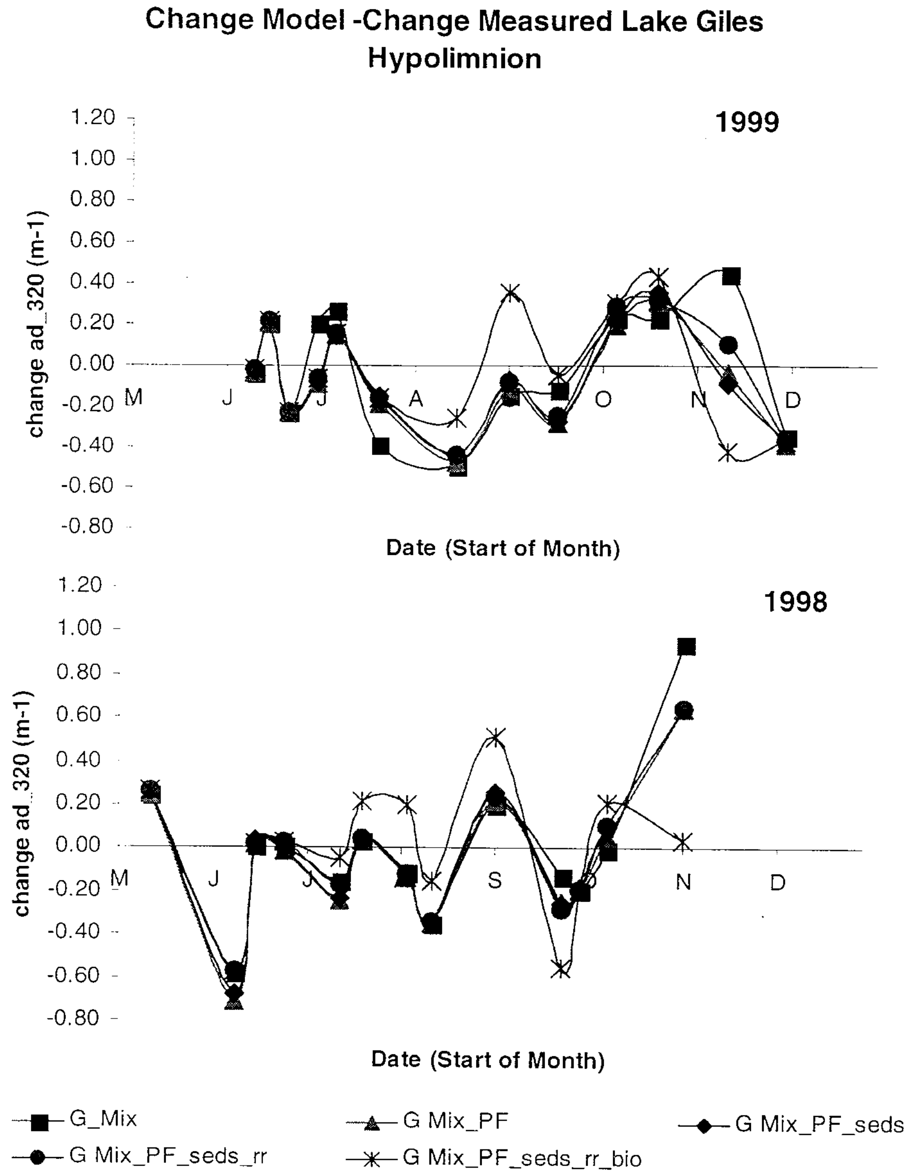


Figure 28. Analysis of L. Giles model hypolimnion output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

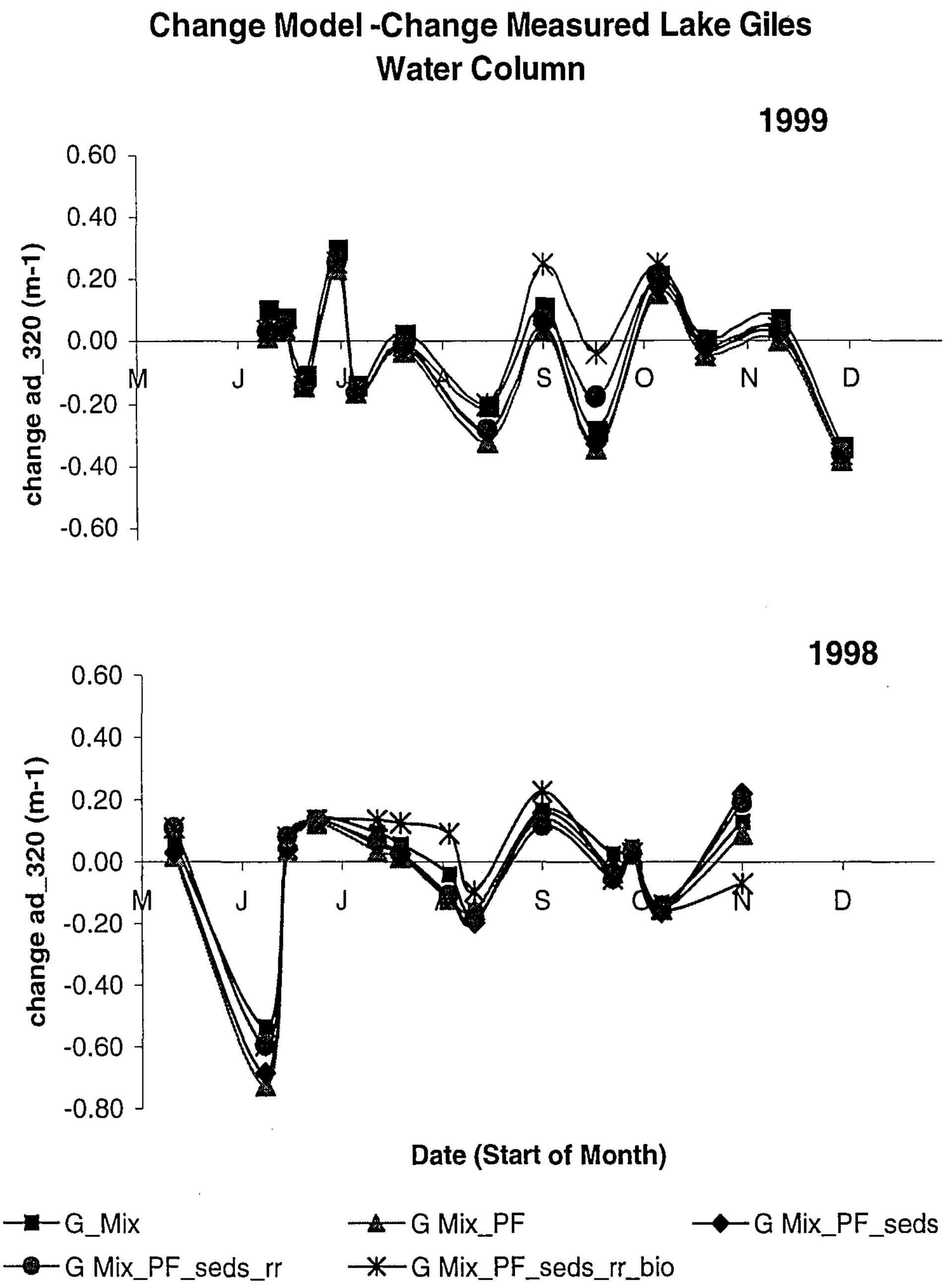


Figure 29. Analysis of L. Giles model water column output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

INTENTIONAL SECOND EXPOSURE

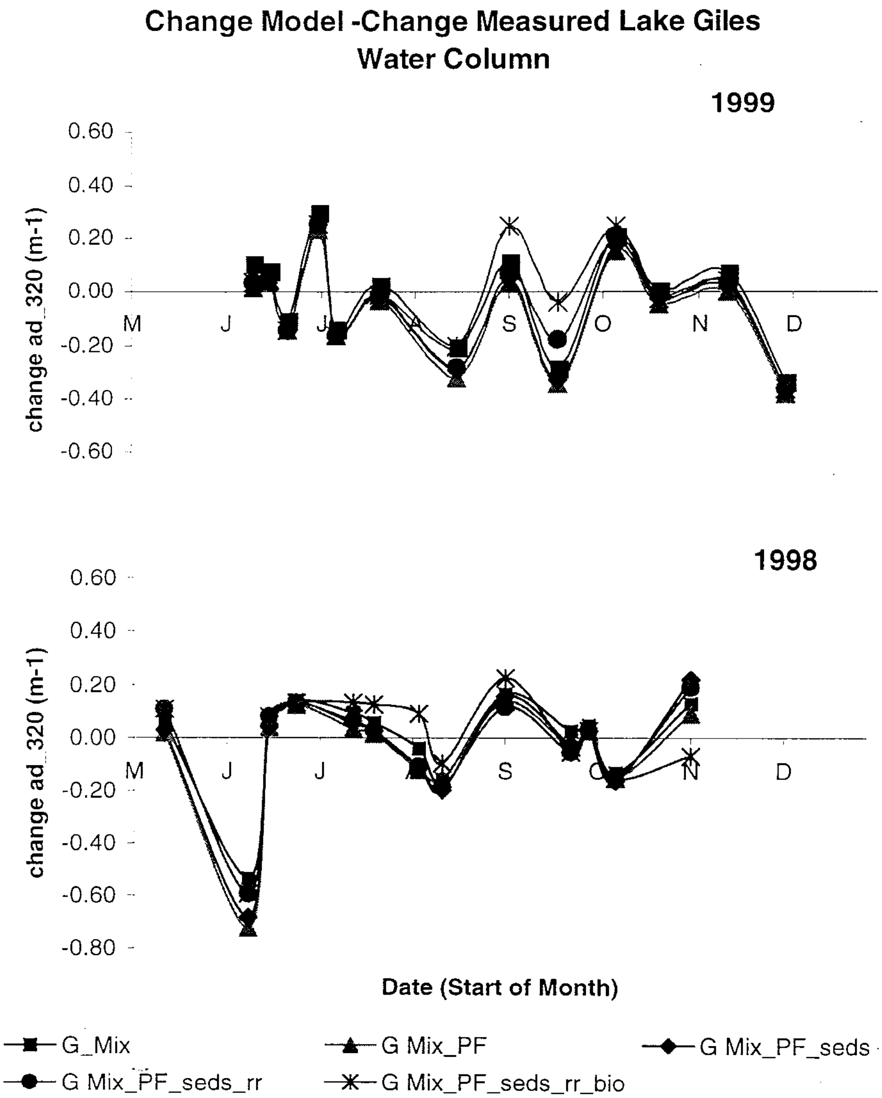


Figure 29. Analysis of L. Giles model water column output for 1999 (Top) and 1998 (Bottom). Values are changes in modeled ad_320 between two dates minus changes in profile ad_320 of the same dates. Values further from zero indicate a larger deviation in the modeled output from the measured.

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Appendix A. Variable Data for Lake Iacawac 1999.

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
5/1/99	121	1	798	816	809	802	12	0	0	243	6541
5/2/99	122	1	798	816	809	802	12	0	0	243	7030
5/3/99	123	2	798	816	809	802	12	0.3	0	242	3453
5/4/99	124	2	798	816	809	802	12	1.2	0	241	3333
5/5/99	125	2	798	816	809	802	12	0	0	241	6119
5/6/99	126	2	798	816	809	802	12	0	0	240	3440
5/7/99	127	1	798	816	809	802	12	0	0	239	1630
5/8/99	128	2	798	816	809	802	12	5.8	1.2	239	2536
5/9/99	129	2	798	816	809	802	12	0	0	238	4735
5/10/99	130	2	798	816	809	802	12	0	0	237	7534
5/11/99	131	2	798	816	809	802	12	0	0	237	7577
5/12/99	132	2	798	816	809	802	12	0	0	236	7398
5/13/99	133	2	798	816	809	802	12	0.3	0	235	7145
5/14/99	134	2	798	816	809	802	12	0	0	234	7404
5/15/99	135	2	798	816	809	802	12	0	0	234	7060
5/16/99	136	2	798	816	809	802	12	0.2	0	233	6745
5/17/99	137	2	798	816	809	802	12	0	0	232	6932
5/18/99	138	2	761	775	813	789	12	0.7	0	231	6533
5/19/99	139	2	761	775	813	789	12	24.3	7.7	232	1620
5/20/99	140	2	761	775	813	789	12	0	0	232	7549
5/21/99	141	3	761	775	813	789	12	0	0	233	7562
5/22/99	142	3	761	775	813	789	12	0	0	234	6073
5/23/99	143	3	761	775	813	789	12	9.1	2.9	234	1185
5/24/99	144	3	761	775	813	789	12	13.7	2.3	235	2541
5/25/99	145	3	761	775	813	789	12	1.2	0	236	3545
5/26/99	146	3	777	783	768	776	12	1.2	0	236	2502
5/27/99	147	3	777	783	768	776	12	0.1	0	235	6176
5/28/99	148	3	777	783	768	776	12	0	0	234	6387
5/29/99	149	3	777	783	768	776	12	0	0	232	6821
5/30/99	150	3	777	783	768	776	12	0	0	231	7437
5/31/99	151	1	777	783	768	776	12	0	0	230	6623

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
6/1/99	152	0.5	777	783	768	776	12	0	0	229	5892
6/2/99	153	0.5	777	783	768	776	12	0.7	0	227	4959
6/3/99	154	1	777	783	768	776	12	0.4	0	226	3889
6/4/99	155	1	777	783	768	776	12	0	0	225	7643
6/5/99	156	2	777	783	768	776	12	0	0	224	7229
6/6/99	157	2	777	783	768	776	12	0	0	222	6695
6/7/99	158	2	730	720	859	780	12	5.9	2.1	221	6504
6/8/99	159	1	730	720	859	780	12	0.1	0	220	7261
6/9/99	160	1	730	720	859	780	12	0	0	219	6272
6/10/99	161	2	730	720	859	780	12	0	0	217	2858
6/11/99	162	2	730	720	859	780	12	0	0	216	8078
6/12/99	163	2	730	720	859	780	12	0	0	215	7578
6/13/99	164	2	730	720	859	780	10	0	0	214	4954
6/14/99	165	2	730	720	859	780	10	4.4	1.6	213	4740
6/15/99	166	2	730	720	859	780	10	0	0	211	6805
6/16/99	167	2	730	720	859	780	10	0	0	210	6311
6/17/99	168	3	730	720	859	780	10	7.9	0	209	967
6/18/99	169	3	690	756	895	749	10	1.2	2	208	6952
6/19/99	170	3	690	756	895	749	10	0	0	206	7969
6/20/99	171	3	690	756	895	749	10	0	0	205	6627
6/21/99	172	3	690	756	895	749	10	0	0	204	7906
6/22/99	173	3	690	756	895	749	10	0	0	202	7812
6/23/99	174	2	690	756	895	749	10	0	0	201	6173
6/24/99	175	2	690	756	895	749	10	0	0	200	7885
6/25/99	176	2	690	756	895	749	10	1	0	198	4257
6/26/99	177	2	690	756	895	749	9	0	0	197	7956
6/27/99	178	2	690	756	895	749	9	0	0	196	6349
6/28/99	179	2	690	756	895	749	9	11.9	1	194	4981
6/29/99	180	1	690	756	895	749	9	5	0	193	4677
6/30/99	181	2	690	756	895	749	9	0	0	192	5769
7/1/99	182	2	690	756	895	749	9	0	0	190	5763

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
7/2/99	183	2	690	756	895	749	9	1.6	0	189	4143
7/3/99	184	2	629	642	1016	754	9	0.1	0	188	7733
7/4/99	185	2	629	642	1016	754	9	0	0	187	6891
7/5/99	186	1	629	642	1016	754	9	0	0	186	7996
7/6/99	187	2	629	642	1016	754	9	0	0	185	7611
7/7/99	188	2	629	642	1016	754	9	0	0	185	8368
7/8/99	189	2	629	642	1016	754	9	0	0	184	7478
7/9/99	190	3	629	642	1016	754	9	2.3	0	183	3848
7/10/99	191	3	629	642	1016	754	9	2	0	182	4117
7/11/99	192	3	629	642	1016	754	9	0	0	181	6755
7/12/99	193	3	629	642	1016	754	9	0	0	181	5492
7/13/99	194	3	629	642	1016	754	9	0	0	180	7567
7/14/99	195	3	629	642	1016	754	9	0	0	179	5016
7/15/99	196	3	601	736	1065	731	9	0	0	178	7247
7/16/99	197	3	601	736	1065	731	9	0	0	178	6551
7/17/99	198	3	601	736	1065	731	9	0	0	178	6315
7/18/99	199	1	601	736	1065	731	9	0.2	0	179	6055
7/19/99	200	1	601	736	1065	731	9	11.4	1.6	179	3757
7/20/99	201	2	601	736	1065	731	9	1.3	0	179	6717
7/21/99	202	2	601	736	1065	731	9	0	0	179	4147
7/22/99	203	3	601	736	1065	731	9	0	0	179	2948
7/23/99	204	3	601	736	1065	731	9	0.2	0	179	7631
7/24/99	205	3	601	736	1065	731	9	0.1	0	179	4904
7/25/99	206	3	601	736	1065	731	9	0.1	0	179	6387
7/26/99	207	2	601	736	1065	731	9	0	0	179	6294
7/27/99	208	3	601	736	1065	731	9	0	0	179	7059
7/28/99	209	3	605	804	1234	784	9	0	0	180	7482
7/29/99	210	3	605	804	1234	784	9	0	0	178	6274
7/30/99	211	3	605	804	1234	784	9	0.3	0	177	4726
7/31/99	212	3	605	804	1234	784	9	0	0	176	6635
8/1/99	213	3	605	804	1234	784	9	0.5	0	175	6936

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
8/2/99	214	3	605	804	1234	784	9	0	0	174	6499
8/3/99	215	3	605	804	1234	784	9	0	0	173	6337
8/4/99	216	3	605	804	1234	784	9	0	0	172	6249
8/5/99	217	3	605	804	1234	784	9	2.2	0	171	5364
8/6/99	218	3	605	804	1234	784	9	0	0	170	6788
8/7/99	219	3	605	804	1234	784	9	0	0	169	7161
8/8/99	220	3	605	804	1234	784	9	3.5	0	168	2992
8/9/99	221	4	605	804	1234	784	9	0	0	167	6996
8/10/99	222	4	605	804	1234	784	8	0.5	0	166	4524
8/11/99	223	4	605	804	1234	784	8	0.1	0	165	5071
8/12/99	224	4	558	837	1314	716	8	0	0	164	6699
8/13/99	225	3	558	837	1314	716	8	18.5	13.5	164	3941
8/14/99	226	3	558	837	1314	716	8	5	0	164	3921
8/15/99	227	3	558	837	1314	716	8	0.5	0	164	3664
8/16/99	228	3	558	837	1314	716	8	0.1	0	163	6854
8/17/99	229	3	558	837	1314	716	8	0	0	163	6141
8/18/99	230	3	558	837	1314	716	8	0	0	163	4792
8/19/99	231	3	558	837	1314	716	8	0	0	163	5919
8/20/99	232	4	558	837	1314	716	8	4.4	1.6	163	1760
8/21/99	233	4	558	837	1314	716	8	6.5	2.5	162	1464
8/22/99	234	4	558	837	1314	716	8	0.1	0	162	2577
8/23/99	235	4	558	837	1314	716	8	0.1	0	162	5221
8/24/99	236	4	558	837	1314	716	8	0	0	162	4826
8/25/99	237	4	551	744	1807	776	8	0	0	162	5585
8/26/99	238	4	551	744	1807	776	8	17.6	2.4	164	1727
8/27/99	239	4	551	744	1807	776	8	2.2	0	165	4038
8/28/99	240	4	551	744	1807	776	8	0	0	167	5752
8/29/99	241	3	551	744	1807	776	8	0	0	169	6028
8/30/99	242	4	551	744	1807	776	8	0	0	171	5957
8/31/99	243	4	551	744	1807	776	8	0	0	173	6113
9/1/99	244	4	551	744	1807	776	8	0	0	175	5807

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
9/2/99	245	4	551	744	1807	776	8	0	0	176	5758
9/3/99	246	4	551	744	1807	776	8	0	0	178	5457
9/4/99	247	4	551	744	1807	776	8	0	0	180	5352
9/5/99	248	4	551	744	1807	776	8	3.4	1.6	182	3311
9/6/99	249	4	551	744	1807	776	8	1.7	2.5	184	4801
9/7/99	250	3	551	744	1807	776	8	8.5	0	186	2298
9/8/99	251	3	551	744	1807	776	8	5	0	187	3600
9/9/99	252	3	551	744	1807	776	8	2.7	0	189	4538
9/10/99	253	3	551	744	1807	776	8	0.7	0	191	2527
9/11/99	254	4	551	744	1807	776	8	0	0	193	5310
9/12/99	255	4	551	744	1807	776	8	0	0	195	5265
9/13/99	256	4	551	744	1807	776	8	0	0	196	5036
9/14/99	257	4	551	744	1807	776	8	2.2	0	198	2577
9/15/99	258	4	551	744	1807	776	8	6	0	200	1345
9/16/99	259	5	551	744	1807	776	9	130	73	202	307
9/17/99	260	6	551	744	1807	776	9	0	17	204	4278
9/18/99	261	6	684	752	2264	781	9	0	1	206	4925
9/19/99	262	6	684	752	2264	781	9	0.1	0	207	4876
9/20/99	263	6	684	752	2264	781	9	2.9	0	207	3479
9/21/99	264	6	684	752	2264	781	9	9.6	3.4	208	832
9/22/99	265	6	684	752	2264	781	9	8.7	1.3	209	2285
9/23/99	266	8	684	752	2264	781	10	0	0	210	4646
9/24/99	267	8	684	752	2264	781	10	0	0	211	4535
9/25/99	268	8	684	752	2264	781	10	0.3	0	212	4050
9/26/99	269	8	684	752	2264	781	10	0.1	0	212	4340
9/27/99	270	8	684	752	2264	781	10	0	0	213	2270
9/28/99	271	8	684	752	2264	781	10	0.5	0	214	2738
9/29/99	272	6	684	752	2264	781	10	0	0	215	2432
9/30/99	273	6	684	752	2264	781	10	22.9	4.1	216	3360
10/1/99	274	6	684	752	2264	781	10	0	0	217	4083
10/2/99	275	6	684	752	2264	781	10	0	0	218	3817

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
10/3/99	276	6	684	752	2264	781	10	0	0	218	1814
10/4/99	277	6	684	752	2264	781	10	11.2	1.8	219	663
10/5/99	278	8	684	752	2264	781	10	0	0	220	1591
10/6/99	279	8	684	752	2264	781	11	0.1	0	221	3083
10/7/99	280	8	684	752	2264	781	11	0	0	222	3671
10/8/99	281	8	684	752	2264	781	11	0	0	223	3265
10/9/99	282	8	684	752	2264	781	11	3.7	0	223	2634
10/10/99	283	8	684	752	2264	781	11	13.7	4.3	224	748
10/11/99	284	8	743	1256	7348	815	11	0	0	225	3497
10/12/99	285	8	743	1256	7348	815	11	0	0	228	3487
10/13/99	286	8	743	1256	7348	815	11	5.9	0	231	3014
10/14/99	287	8	743	1256	7348	815	11	3.7	2.4	234	3010
10/15/99	288	8	743	1256	7348	815	11	0	0	237	3335
10/16/99	289	8	743	1256	7348	815	11	0	0	240	2912
10/17/99	290	8	743	1256	7348	815	11	1.3	0	243	2498
10/18/99	291	8	743	1256	7348	815	11	0.4	0	245	3363
10/19/99	292	8	743	1256	7348	815	11	0.5	0	248	3038
10/20/99	293	8	743	1256	7348	815	11	6.9	1.1	251	959
10/21/99	294	8	743	1256	7348	815	11	0.1	0	254	3088
10/22/99	295	8	743	1256	7348	815	11	2.8	0	257	1744
10/23/99	296	8	743	1256	7348	815	11	2.8	0	260	1804
10/24/99	297	8	743	1256	7348	815	11	0.1	0	263	1225
10/25/99	298	12	743	1256	7348	815	12	0	0	266	2954
10/26/99	299	12	743	1256	7348	815	12	0	0	269	2457
10/27/99	300	12	743	1256	7348	815	12	0	0	271	1199
10/28/99	301	12	892	892	892	892	12	0	0	274	2885
10/29/99	302	12	892	892	892	892	12	0	0	277	2605
10/30/99	303	12	892	892	892	892	12	0	0	280	2545
10/31/99	304	12	892	892	892	892	12	0	0	282	2339
11/1/99	305	12	892	892	892	892	12	0.1	0	285	2745
11/2/99	306	12	892	892	892	892	12	33	14	287	556

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
11/3/99	307	12	892	892	892	892	12	0	0	290	1603
11/4/99	308	12	892	892	892	892	12	0	0	293	2409
11/5/99	309	12	892	892	892	892	12	0	0	295	2384
11/6/99	310	12	892	892	892	892	12	0	0	298	2447
11/7/99	311	12	892	892	892	892	12	0	0	301	2186
11/8/99	312	12	892	892	892	892	12	0	0	303	2111
11/9/99	313	12	987	987	987	987	12	0	0	306	2084
11/10/99	314	12	987	987	987	987	12	0.7	0	307	1177
11/11/99	315	12	987	987	987	987	12	0	0	308	2150
11/12/99	316	12	987	987	987	987	12	0	0	309	1388
11/13/99	317	12	987	987	987	987	12	0	0	310	953
11/14/99	318	12	987	987	987	987	12	0.6	0	311	917
11/15/99	319	12	987	987	987	987	12	0	0	313	1195
11/16/99	320	12	987	987	987	987	12	0	0	314	1537
11/17/99	321	12	987	987	987	987	12	0	0	315	1658
11/18/99	322	12	987	987	987	987	12	0	0	316	2031
11/19/99	323	12	987	987	987	987	12	0	0	317	1854
11/20/99	324	12	987	987	987	987	12	1.7	0	318	1211
11/21/99	325	12	987	987	987	987	12	0.1	0	320	1406
11/22/99	326	12	987	987	987	987	12	0.2	0	321	1414
11/23/99	327	12	987	987	987	987	12	0.7	0	322	1789
11/24/99	328	12	987	987	987	987	12	0.1	0	323	1764
11/25/99	329	12	987	987	987	987	12	13.5	0	324	396
11/26/99	330	12	987	987	987	987	12	38.4	23	325	522
11/27/99	331	12	987	987	987	987	12	4.1	0	326	1605
11/28/99	332	12	987	987	987	987	12	0	0	328	1451
11/29/99	333	12	987	987	987	987	12	0.2	0	329	815
11/30/99	334	12	987	987	987	987	12	0	0	330	744
12/1/99	335	12	987	987	987	987	12	0	0	331	1572
12/2/99	336	12	987	987	987	987	12	0	0	332	1548
12/3/99	337	12	987	987	987	987	12	0	0	333	1065

Appendix A. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
12/4/99	338	12	987	987	987	987	12	2.3	0	335	997
12/5/99	339	12	1078	1078	1078	1078	12	0	0	336	1454
12/6/99	340	12	1078	1078	1078	1078	12	4.1	0	336	513
12/7/99	341	12	1078	1078	1078	1078	12	0	0	336	919
12/8/99	342	12	1078	1078	1078	1078	12	0	0	336	1540
12/9/99	343	12	1078	1078	1078	1078	12	0	0	336	1533
12/10/99	344	12	1078	1078	1078	1078	12	2.1	0	336	353
12/11/99	345	12	1078	1078	1078	1078	12	0	0	336	1475
12/12/99	346	12	1078	1078	1078	1078	12	0	0	336	1277
12/13/99	347	12	1078	1078	1078	1078	12	2.9	0	336	552
12/14/99	348	12	1078	1078	1078	1078	12	13.4	2	336	272
12/15/99	349	12	1078	1078	1078	1078	12	6.7	0	336	421
12/16/99	350	12	1078	1078	1078	1078	12	0.6	0	336	1062
12/17/99	351	12	1078	1078	1078	1078	12	0	0	336	1399
12/18/99	352	12	1078	1078	1078	1078	12	0	0	336	1420
12/19/99	353	12	1078	1078	1078	1078	12	17	0	336	1313
12/20/99	354	12	1078	1078	1078	1078	12	0.2	0	336	465
12/21/99	355	12	1078	1078	1078	1078	12	0	0	336	932
12/22/99	356	12	1078	1078	1078	1078	12	0	0	336	1400
12/23/99	357	12	1078	1078	1078	1078	12	0	0	336	1114
12/24/99	358	12	1078	1078	1078	1078	12	0	0	336	649
12/25/99	359	12	1078	1078	1078	1078	12	0	0	336	1127
12/26/99	360	12	1078	1078	1078	1078	12	0	0	336	979
12/27/99	361	12	1078	1078	1078	1078	12	0	0	336	766
12/28/99	362	12	1078	1078	1078	1078	12	0	0	336	539
12/29/99	363	12	1078	1078	1078	1078	12	0.2	0	336	673
12/30/99	364	12	1078	1078	1078	1078	12	0	0	336	1343
12/31/99	365	12	1078	1078	1078	1078	12	0	0	336	794

Appendix B. Variable data for Lake Lacawac 1998.

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
5/1/98	121	1	1055	1035	922	978	12	2.2	0	286	3129
5/2/98	122	0.5	1055	1035	922	978	12	9.3	0	286	3450
5/3/98	123	0.5	1055	1035	922	978	12	1.1	0	286	3432
5/4/98	124	0.5	1055	1035	922	978	12	0.6	0	286	1748
5/5/98	125	0.5	1055	1035	922	978	12	3.6	0	286	1970
5/6/98	126	1	1055	1035	922	978	12	1.1	0	286	2850
5/7/98	127	1	1055	1035	922	978	12	0	0	286	5771
5/8/98	128	2	1055	1035	922	978	12	3.7	0	286	1447
5/9/98	129	12	1055	1035	922	978	12	14.3	0	286	2365
5/10/98	130	12	1055	1035	922	978	12	32.1	2.9	286	1320
5/11/98	131	12	1055	1035	922	978	12	16.3	0	286	1922
5/12/98	132	12	1055	1035	922	978	12	0.3	0	286	4678
5/13/98	133	12	1055	1035	922	978	12	0	0	286	6671
5/14/98	134	12	1055	1035	922	978	12	0	0	286	6827
5/15/98	135	0.5	1204	1214	1120	1120	12	0	0	286	6478
5/16/98	136	1	1204	1214	1120	1120	12	0	0	286	6704
5/17/98	137	0.5	1204	1214	1120	1120	12	0.5	0	286	6026
5/18/98	138	1	1204	1214	1120	1120	12	0	0	286	6532
5/19/98	139	1	1204	1214	1120	1120	12	0	0	286	4879
5/20/98	140	1	1204	1214	1120	1120	12	0.6	0	286	6341
5/21/98	141	1	1204	1214	1120	1120	12	0	0	286	6095
5/22/98	142	2	1207	1152	953	1121	12	0	0	286	5911
5/23/98	143	2	1207	1152	953	1121	12	0	0	289	7205
5/24/98	144	2	1207	1152	953	1121	12	0	0	292	7274
5/25/98	145	2	1207	1152	953	1121	12	3.4	0	295	3795
5/26/98	146	2	1207	1152	953	1121	12	0	0	298	6250
5/27/98	147	1	1207	1152	953	1121	12	0	0	301	6188
5/28/98	148	2	1207	1152	953	1121	12	0	0	303	6325
5/29/98	149	1	1207	1152	953	1121	12	8	2	306	6210
5/30/98	150	1	1207	1152	953	1121	12	0	0	309	7269
5/31/98	151	1	1207	1152	953	1121	12	62.8	36.2	312	4911

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
6/1/98	152	2	1164	1157	1042	1126	12	0.4	5.6	315	6511
6/2/98	153	2	1164	1157	1042	1126	12	29.2	6.8	318	5763
6/3/98	154	3	1164	1157	1042	1126	12	1.2	0	321	6602
6/4/98	155	3	1164	1157	1042	1126	12	0	0	324	7059
6/5/98	156	3	1164	1157	1042	1126	12	0	0	327	7174
6/6/98	157	3	1164	1157	1042	1126	12	0	0	330	6516
6/7/98	158	3	1164	1157	1042	1126	12	0.3	0	333	3760
6/8/98	159	4	1164	1157	1042	1126	12	0.1	0	335	2766
6/9/98	160	4	1164	1157	1042	1126	12	0	0	338	5711
6/10/98	161	4	1164	1157	1042	1126	12	0.8	0	341	5815
6/11/98	162	3	1164	1157	1042	1126	12	0.2	0	344	860
6/12/98	163	3	1164	1157	1042	1126	12	11.9	22.1	347	1450
6/13/98	164	3	1164	1157	1042	1126	12	13.9	1.1	350	2147
6/14/98	165	3	1164	1157	1042	1126	12	5.6	0	353	2421
6/15/98	166	3	1164	1157	1042	1126	12	4	0	356	1378
6/16/98	167	3	1232	1168	1136	1199	12	4.1	0	359	4627
6/17/98	168	1	1232	1168	1136	1199	12	5.1	0	362	3654
6/18/98	169	1	1232	1168	1136	1199	12	0.1	0	365	4318
6/19/98	170	1	1232	1168	1136	1199	12	0	0	367	4689
6/20/98	171	1	1232	1168	1136	1199	12	0	0	370	4682
6/21/98	172	1	1232	1168	1136	1199	12	0	0	373	4694
6/22/98	173	1	1232	1168	1136	1199	12	0	0	376	4690
6/23/98	174	1	1232	1168	1136	1199	12	2.9	0	379	2909
6/24/98	175	1	1232	1168	1136	1199	12	0	0	382	4939
6/25/98	176	1	1232	1168	1136	1199	12	0	0	385	3924
6/26/98	177	1	1232	1168	1136	1199	12	0	0	388	3839
6/27/98	178	1	1232	1168	1136	1199	12	0	0	385	2372
6/28/98	179	2	1232	1168	1136	1199	12	0	0	381	4153
6/29/98	180	2	1232	1168	1136	1199	12	0	0	378	2444
6/30/98	181	2	1156	1195	1199	1178	12	12.1	0	374	2470
7/1/98	182	2	1156	1195	1199	1178	12	0	0	371	2400

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
7/2/98	183	2	1156	1195	1199	1178	12	0	0	367	4228
7/3/98	184	2	1156	1195	1199	1178	10	0	0	364	4714
7/4/98	185	2	1156	1195	1199	1178	10	3.4	0	360	3543
7/5/98	186	2	1156	1195	1199	1178	10	4.5	5.5	357	4325
7/6/98	187	2	1156	1195	1199	1178	10	0	0	354	5411
7/7/98	188	2	1156	1195	1199	1178	10	0	0	350	2736
7/8/98	189	3	1156	1195	1199	1178	10	6.4	13.6	347	733
7/9/98	190	2	1156	1195	1199	1178	10	0	0	343	3942
7/10/98	191	2	1156	1195	1199	1178	10	0.1	0	340	5462
7/11/98	192	3	1156	1195	1199	1178	10	0	0	336	5579
7/12/98	193	3	1156	1195	1199	1178	10	0	0	333	5201
7/13/98	194	3	1156	1195	1199	1178	10	0	0	329	5620
7/14/98	195	3	1061	1134	1259	1119	10	0	0	326	3807
7/15/98	196	1	1061	1134	1259	1119	10	0	0	322	3920
7/16/98	197	1	1061	1134	1259	1119	10	0.1	0	319	4257
7/17/98	198	1	1061	1134	1259	1119	10	3.5	0	316	5492
7/18/98	199	1	1061	1134	1259	1119	10	0	0	312	7868
7/19/98	200	2	1061	1134	1259	1119	10	0	0	309	7124
7/20/98	201	2	1061	1134	1259	1119	10	8.7	0	305	4875
7/21/98	202	2	1061	1134	1259	1119	10	4	11	302	4894
7/22/98	203	2	1061	1134	1259	1119	10	0	0	298	7006
7/23/98	204	2	1061	1134	1259	1119	10	6.1	0	295	4552
7/24/98	205	2	1061	1134	1259	1119	10	0.1	0	291	6686
7/25/98	206	2	1061	1134	1259	1119	10	0	0	288	6451
7/26/98	207	2	1061	1134	1259	1119	10	0	0	285	6976
7/27/98	208	2	1061	1134	1259	1119	10	0	0	281	4852
7/28/98	209	3	1061	1134	1259	1119	10	0	0	278	5430
7/29/98	210	2	1061	1134	1259	1119	10	0.1	0	274	4834
7/30/98	211	3	932	1054	1249	1026	10	0.7	0	272	6566
7/31/98	212	2	932	1054	1249	1026	10	1.2	3.8	270	6434
8/1/98	213	3	932	1054	1249	1026	10	0	0	268	7644

Appendix B. (Continued)

		Epi Depth	ad_320*100				Anoxic Layer	Rainfall	Runoff		Light
Date	Julian Day	(m)	epi	meta	hypo	Water Col.	(m)	(mm)	(mm)	PRF*10000	j/m2/nm
8/2/98	214	3	932	1054	1249	1026	10	0	0	266	7263
8/3/98	215	3	932	1054	1249	1026	10	0	0	264	6607
8/4/98	216	3	932	1054	1249	1026	10	0	0	261	6905
8/5/98	217	3	932	1054	1249	1026	10	0	0	259	4919
8/6/98	218	2	932	1054	1249	1026	10	0	0	257	6222
8/7/98	219	2	932	1054	1249	1026	10	0	0	255	6492
8/8/98	220	3	932	1054	1249	1026	10	0	0	253	7254
8/9/98	221	3	932	1054	1249	1026	10	0	0	251	4433
8/10/98	222	3	932	1054	1249	1026	10	4.4	0	249	3614
8/11/98	223	3	932	1054	1249	1026	10	0	0	247	5228
8/12/98	224	3	932	1054	1249	1026	10	0	0	245	4516
8/13/98	225	3	932	1054	1249	1026	10	0	0	243	4362
8/14/98	226	3	932	1054	1249	1026	10	3.3	0	240	2338
8/15/98	227	3	932	1054	1249	1026	10	0	0	238	3874
8/16/98	228	3	932	1054	1249	1026	10	3.7	0	236	4430
8/17/98	229	3	932	1054	1249	1026	10	22.7	2.3	234	1529
8/18/98	230	3	821	991	1488	1004	10	0.9	0	232	3231
8/19/98	231	3	821	991	1488	1004	10	0	0	230	6095
8/20/98	232	3	821	991	1488	1004	10	0	0	228	6538
8/21/98	233	3	821	991	1488	1004	10	0	0	226	5943
8/22/98	234	3	821	991	1488	1004	10	0	0	224	5030
8/23/98	235	3	821	991	1488	1004	10	0	0	222	5186
8/24/98	236	3	821	991	1488	1004	10	0	0	219	5136
8/25/98	237	3	821	991	1488	1004	9	3.5	0	217	4638
8/26/98	238	3	799	996	1436	980	9	6.9	6.1	215	5359
8/27/98	239	2	799	996	1436	980	9	0	0	213	6604
8/28/98	240	2	799	996	1436	980	9	0.1	0	211	6353
8/29/98	241	3	799	996	1436	980	9	0.2	0	209	3087
8/30/98	242	3	799	996	1436	980	9	1.2	0	207	4765
8/31/98	243	3	799	996	1436	980	9	0.1	0	205	5211
9/1/98	244	3	799	996	1436	980	9	0	0	203	5712

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
9/2/98	245	3	799	996	1436	980	9	12	3	201	2820
9/3/98	246	3	770	972	1365	942	9	0.2	0	198	5473
9/4/98	247	3	770	972	1365	942	9	0	0	196	5164
9/5/98	248	3	770	972	1365	942	9	0	0	194	5821
9/6/98	249	3	770	972	1365	942	9	0	0	192	5261
9/7/98	250	3	770	972	1365	942	9	13.6	3.4	190	1628
9/8/98	251	4	770	972	1365	942	9	1.6	0	188	3734
9/9/98	252	4	711	845	1845	909	9	1	0	186	3499
9/10/98	253	4	711	845	1845	909	9	0	0	186	4041
9/11/98	254	5	711	845	1845	909	9	0	0	185	5198
9/12/98	255	4	711	845	1845	909	9	0	0	185	4656
9/13/98	256	4	711	845	1845	909	9	0	0	185	4725
9/14/98	257	4	711	845	1845	909	9	0	0	184	4279
9/15/98	258	1	711	845	1845	909	9	0	0	184	3138
9/16/98	259	1	711	845	1845	909	9	0	0	183	2674
9/17/98	260	4	711	845	1845	909	9	0	0	183	4483
9/18/98	261	2	711	845	1845	909	10	0	0	183	5140
9/19/98	262	3	711	845	1845	909	10	0	0	182	4493
9/20/98	263	3	711	845	1845	909	10	0.1	0	182	3879
9/21/98	264	3	711	845	1845	909	10	0	0	182	3683
9/22/98	265	3	711	845	1845	909	10	7.7	2.3	181	1831
9/23/98	266	4	711	845	1845	909	10	0	0	181	4801
9/24/98	267	4	711	845	1845	909	10	0	0	180	4696
9/25/98	268	5	711	845	1845	909	10	1.2	0	180	1458
9/26/98	269	5	711	845	1845	909	10	0	0	180	3730
9/27/98	270	4	711	845	1845	909	10	6.9	2.1	179	4107
9/28/98	271	4	711	845	1845	909	10	0.1	0	179	4219
9/29/98	272	5	711	845	1845	909	10	0	0	179	4434
9/30/98	273	5	711	845	1845	909	10	0	0	178	2880
10/1/98	274	5	617	861	2957	876	10	0.2	0	178	3605
10/2/98	275	5	617	861	2957	876	10	0	0	177	3737

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
10/3/98	276	6	617	861	2957	876	10	2.4	0	177	1887
10/4/98	277	6	617	861	2957	876	10	0	0	177	2583
10/5/98	278	6	617	861	2957	876	10	0	0	176	4105
10/6/98	279	6	617	861	2957	876	10	0.1	0	176	3896
10/7/98	280	6	617	861	2957	876	10	0	0	176	1464
10/8/98	281	6	617	861	2957	876	10	19.2	6.8	175	798
10/9/98	282	6	617	861	2957	876	10	1.3	15.7	175	667
10/10/98	283	6	617	861	2957	876	10	14.6	8.4	175	700
10/11/98	284	6	617	861	2957	876	10	0	0	174	925
10/12/98	285	6	617	861	2957	876	10	0	0	174	2407
10/13/98	286	6	617	861	2957	876	10	0	0	173	2524
10/14/98	287	6	617	861	2957	876	10	9.3	3.7	173	2940
10/15/98	288	6	617	861	2957	876	10	0	0	173	2380
10/16/98	289	6	617	861	2957	876	10	0	0	172	3084
10/17/98	290	6	617	861	2957	876	10	0.1	0	172	3216
10/18/98	291	6	617	861	2957	876	10	0	0	172	3143
10/19/98	292	7	617	861	2957	876	10	0	0	171	3299
10/20/98	293	7	654	2071	5409	883	10	0	0	171	3076
10/21/98	294	7	654	2071	5409	883	10	0.5	0	170	1589
10/22/98	295	7	654	2071	5409	883	10	0	0	170	1702
10/23/98	296	7	654	2071	5409	883	10	0	0	170	2989
10/24/98	297	7	654	2071	5409	883	10	0	0	169	2943
10/25/98	298	8	654	2071	5409	883	10	0	0	169	2873
10/26/98	299	8	654	2071	5409	883	10	0	0	169	2208
10/27/98	300	8	654	2071	5409	883	10	0	0	168	829
10/28/98	301	8	727	4014	5578	926	10	5.8	3.2	168	1222
10/29/98	302	8	727	4014	5578	926	10	0	0	168	2256
10/30/98	303	8	727	4014	5578	926	10	0	0	167	2560
10/31/98	304	8	727	4014	5578	926	10	0	0	167	2064
11/1/98	305	8	727	4014	5578	926	10	0	0	166	1398
11/2/98	306	8	727	4014	5578	926	10	0	0	166	2003

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 epi	meta	hypo	Water Col.	Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
11/3/98	307	8	727	4014	5578	926	10	0	0	166	2227
11/4/98	308	12	727	4014	5578	926	12	0	0	165	2132
11/5/98	309	12	938	938	938	938	12	0	0	165	1661
11/6/98	310	12	938	938	938	938	12	0	0	165	1025
11/7/98	311	12	938	938	938	938	12	1.5	0	165	1404
11/8/98	312	12	938	938	938	938	12	0.1	0	165	814
11/9/98	313	12	938	938	938	938	12	0	0	165	1503
11/10/98	314	12	938	938	938	938	12	5.2	0	165	394
11/11/98	315	12	938	938	938	938	12	10.4	2.6	165	2085
11/12/98	316	12	938	938	938	938	12	0	0	165	1767
11/13/98	317	12	938	938	938	938	12	0	0	165	735
11/14/98	318	12	938	938	938	938	12	0	0	165	1881
11/15/98	319	12	938	938	938	938	12	0	0	165	1711
11/16/98	320	12	938	938	938	938	12	0	0	165	1102
11/17/98	321	12	938	938	938	938	12	0.6	0	165	223
11/18/98	322	12	938	938	938	938	12	0	0	165	1939
11/19/98	323	12	938	938	938	938	12	0	0	165	1249
11/20/98	324	12	938	938	938	938	12	4.7	1.3	165	313
11/21/98	325	12	938	938	938	938	12	0	0	165	972
11/22/98	326	12	938	938	938	938	12	0	0	165	1703
11/23/98	327	12	938	938	938	938	12	0	0	165	1751
11/24/98	328	12	938	938	938	938	12	0	0	165	1542
11/25/98	329	12	938	938	938	938	12	0	0	165	1488
11/26/98	330	12	938	938	938	938	12	15.9	1.1	165	487
11/27/98	331	12	938	938	938	938	12	0	0	165	1124
11/28/98	332	12	938	938	938	938	12	0	0	165	1625
11/29/98	333	12	938	938	938	938	12	0	0	165	1504
11/30/98	334	12	938	938	938	938	12	0	0	165	1270
12/1/98	335	12	938	938	938	938	12	0.2	0	165	1732
12/2/98	336	12	938	938	938	938	12	0	0	165	1721
12/3/98	337	12	938	938	938	938	12	0	0	165	1530

Appendix B. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100				Anoxic Layer (m)	Rainfall (mm)	Runoff (mm)	PRF*10000	Light j/m2/nm
			epi	meta	hypo	Water Col.					
12/4/98	338	12	938	938	938	938	12	0	0	165	1622
12/5/98	339	12	938	938	938	938	12	8.8	1.2	165	538
12/6/98	340	12	938	938	938	938	12	0.1	0	165	1448
12/7/98	341	12	938	938	938	938	12	0	0	165	1005
12/8/98	342	12	938	938	938	938	12	4.5	0	165	201
12/9/98	343	12	938	938	938	938	12	0	0	165	1469
12/10/98	344	12	938	938	938	938	12	0	0	165	1464
12/11/98	345	12	938	938	938	938	12	0	0	165	995
12/12/98	346	12	938	938	938	938	12	0	0	165	1235
12/13/98	347	12	895	895	895	895	12	0	0	165	1089
12/14/98	348	12	895	895	895	895	12	0	0	165	1421
12/15/98	349	12	895	895	895	895	12	0	0	165	1522
12/16/98	350	12	895	895	895	895	12	0	0	165	1023
12/17/98	351	12	895	895	895	895	12	0.6	0	165	393
12/18/98	352	12	895	895	895	895	12	0	0	165	1420
12/19/98	353	12	895	895	895	895	12	0	0	165	795
12/20/98	354	12	895	895	895	895	12	0	0	165	897
12/21/98	355	12	895	895	895	895	12	0.5	0	165	523
12/22/98	356	12	895	895	895	895	12	5.7	0	165	735
12/23/98	357	12	895	895	895	895	12	0	0	165	1222
12/24/98	358	12	895	895	895	895	12	0	0	165	1212
12/25/98	359	12	895	895	895	895	12	0	0	165	1410
12/26/98	360	12	895	895	895	895	12	0	0	165	1121
12/27/98	361	12	895	895	895	895	12	0	0	165	1387
12/28/98	362	12	895	895	895	895	12	0	0	165	631
12/29/98	363	12	895	895	895	895	12	0	0	165	248
12/30/98	364	12	895	895	895	895	12	0	0	165	257
12/31/98	365	12	895	895	895	895	12	0	0	165	252

Appendix C. Variable Data for Lake Giles 1999

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
6/1/99	152	2	87	107	96	0	0	357	5892
6/2/99	153	2	87	107	96	0.6	0	353	4959
6/3/99	154	2	87	107	96	0	0	350	3889
6/4/99	155	3	87	107	96	0	0	347	7643
6/5/99	156	4	87	107	96	0	0	343	7229
6/6/99	157	4	87	107	96	0	0	340	6695
6/7/99	158	4	87	107	96	11.1	1	337	6504
6/8/99	159	4	87	107	96	0	0	333	7261
6/9/99	160	4	87	107	96	0	0	330	6272
6/10/99	161	4	64	108	86	0	0	323	2858
6/11/99	162	4	64	108	86	0	0	318	8078
6/12/99	163	4	64	108	86	0	0	313	7578
6/13/99	164	4	64	108	86	2.9	0	308	4954
6/14/99	165	4	64	108	86	8.4	0	303	4740
6/15/99	166	4	52	116	77	0	0	298	6805
6/16/99	167	4	52	116	77	0	0	292	6311
6/17/99	168	5	52	116	77	5.9	0	287	967
6/18/99	169	6	52	116	77	2	0	282	6952
6/19/99	170	6	52	116	77	0	0	277	7969
6/20/99	171	6	52	116	77	0	0	272	6627
6/21/99	172	6	68	127	88	0	0	266	7906
6/22/99	173	4	68	127	88	0	0	261	7812
6/23/99	174	6	68	127	88	0	0	256	6173
6/24/99	175	6	68	127	88	0	0	251	7885
6/25/99	176	6	68	127	88	1.3	0	246	4257
6/26/99	177	6	68	127	88	0	0	241	7956
6/27/99	178	6	68	127	88	0	0	235	6349
6/28/99	179	6	68	127	88	3.7	0	230	4981
6/29/99	180	6	68	127	88	0.3	0	225	4677
6/30/99	181	4	68	127	88	0	0	220	5769
7/1/99	182	6	31	109	58	0	0	215	5763

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
7/2/99	183	4	31	109	58	0.4	0	209	4143
7/3/99	184	6	31	109	58	0.1	0	204	7733
7/4/99	185	5	31	109	58	0	0	199	6891
7/5/99	186	5	31	109	58	0	0	194	7996
7/6/99	187	2	31	109	58	0	0	189	7611
7/7/99	188	3	21	105	64	0	0	183	8368
7/8/99	189	5	21	105	64	0	0	178	7478
7/9/99	190	5	21	105	64	3.2	0	173	3848
7/10/99	191	6	21	105	64	3.2	0	168	4117
7/11/99	192	6	21	105	64	0	0	163	6755
7/12/99	193	7	21	105	64	0	0	158	5492
7/13/99	194	7	21	105	64	0.1	0	152	7567
7/14/99	195	7	21	105	64	0	0	147	5016
7/15/99	196	7	21	105	64	0	0	142	7247
7/16/99	197	7	21	105	64	0	0	137	6551
7/17/99	198	7	21	105	64	0	0	132	6315
7/18/99	199	7	21	105	64	0	0	135	6055
7/19/99	200	7	21	105	64	12	0	138	3757
7/20/99	201	7	21	105	64	1.2	0	141	6717
7/21/99	202	7	40	119	68	0	0	145	4147
7/22/99	203	7	40	119	68	0	0	148	2948
7/23/99	204	7	40	119	68	0	0	151	7631
7/24/99	205	7	40	119	68	0	0	154	4904
7/25/99	206	7	40	119	68	0	0	158	6387
7/26/99	207	7	40	119	68	0	0	161	6294
7/27/99	208	7	40	119	68	0	0	164	7059
7/28/99	209	7	40	119	68	0	0	167	7482
7/29/99	210	7	40	119	68	3.2	0	170	6274
7/30/99	211	7	40	119	68	5.3	0	174	4726
7/31/99	212	7	40	119	68	0.1	0	177	6635
8/1/99	213	7	40	119	68	0.7	0	180	6936

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
8/2/99	214	7	40	119	68	0	0	183	6499
8/3/99	215	7	40	119	68	0	0	187	6337
8/4/99	216	7	40	119	68	0	0	190	6249
8/5/99	217	7	40	119	68	1.1	0	193	5364
8/6/99	218	8	40	119	68	0	0	196	6788
8/7/99	219	8	40	119	68	0	0	200	7161
8/8/99	220	8	40	119	68	4.5	0	203	2992
8/9/99	221	8	40	119	68	0	0	206	6996
8/10/99	222	8	40	119	68	0.5	0	209	4524
8/11/99	223	8	40	119	68	0.1	0	213	5071
8/12/99	224	8	40	119	68	0	0	216	6699
8/13/99	225	8	40	119	68	20.5	0	216	3941
8/14/99	226	8	40	119	68	7.9	0	217	3921
8/15/99	227	8	40	119	68	0.7	0	217	3664
8/16/99	228	8	57	174	88	0	0	218	6854
8/17/99	229	8	57	174	88	0	0	218	6141
8/18/99	230	8	57	174	88	0	0	219	4792
8/19/99	231	8	57	174	88	0	0	220	5919
8/20/99	232	8	57	174	88	5.4	0	220	1760
8/21/99	233	8	57	174	88	0.2	0	221	1464
8/22/99	234	8	57	174	88	0.1	0	221	2577
8/23/99	235	8	57	174	88	0	0	222	5221
8/24/99	236	8	57	174	88	0	0	222	4826
8/25/99	237	8	57	174	88	0	0	223	5585
8/26/99	238	8	57	174	88	12.5	0	223	1727
8/27/99	239	8	57	174	88	1.9	0	224	4038
8/28/99	240	8	57	174	88	0	0	225	5752
8/29/99	241	8	57	174	88	0	0	225	6028
8/30/99	242	8	57	174	88	0	0	226	5957
8/31/99	243	10	57	174	88	0	0	226	6113
9/1/99	244	10	57	174	88	0	0	227	5807

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
9/2/99	245	10	50	185	76	0	0	227	5758
9/3/99	246	8	50	185	76	0	0	228	5457
9/4/99	247	8	50	185	76	0	0	228	5352
9/5/99	248	8	50	185	76	0	0	229	3311
9/6/99	249	8	50	185	76	0	0	229	4801
9/7/99	250	8	50	185	76	0	0	230	2298
9/8/99	251	8	50	185	76	0	0	231	3600
9/9/99	252	8	50	185	76	0	0	231	4538
9/10/99	253	8	50	185	76	0	0	232	2527
9/11/99	254	8	50	185	76	0	0	232	5310
9/12/99	255	10	50	185	76	0	0	233	5265
9/13/99	256	10	50	185	76	0	0	233	5036
9/14/99	257	10	50	185	76	0.4	0	234	2577
9/15/99	258	10	50	185	76	0.4	0	234	1345
9/16/99	259	10	50	185	76	136	89	235	307
9/17/99	260	10	50	185	76	0	0	235	4278
9/18/99	261	12	92	198	104	0	0	236	4925
9/19/99	262	10	92	198	104	0	0	237	4876
9/20/99	263	10	92	198	104	1.2	0	237	3479
9/21/99	264	12	92	198	104	4.1	7.9	238	832
9/22/99	265	12	92	198	104	5.7	5.3	238	2285
9/23/99	266	12	92	198	104	0	0	239	4646
9/24/99	267	12	92	198	104	0	0	239	4535
9/25/99	268	12	92	198	104	0.3	0	240	4050
9/26/99	269	12	92	198	104	0	0	240	4340
9/27/99	270	12	92	198	104	0	0	241	2270
9/28/99	271	12	92	198	104	0.3	0	241	2738
9/29/99	272	12	92	198	104	0	0	242	2432
9/30/99	273	12	92	198	104	28.7	0	243	3360
10/1/99	274	12	92	198	104	0	0	243	4083
10/2/99	275	12	92	198	104	0	0	244	3817

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
10/3/99	276	12	92	198	104	0	0	244	1814
10/4/99	277	12	92	198	104	17.2	0	245	663
10/5/99	278	12	92	198	104	0	0	245	1591
10/6/99	279	12	92	198	104	0	0	246	3083
10/7/99	280	14	75	205	82	0	0	246	3671
10/8/99	281	14	75	205	82	0	0	247	3265
10/9/99	282	14	75	205	82	4.1	0	248	2634
10/10/99	283	14	75	205	82	13.7	0	252	748
10/11/99	284	14	75	205	82	0	0	256	3497
10/12/99	285	14	75	205	82	0	0	260	3487
10/13/99	286	14	75	205	82	4.4	0	264	3014
10/14/99	287	14	75	205	82	5.1	0	268	3010
10/15/99	288	14	75	205	82	0	0	272	3335
10/16/99	289	14	75	205	82	0	0	276	2912
10/17/99	290	14	75	205	82	1.3	0	280	2498
10/18/99	291	14	75	205	82	1.6	0	284	3363
10/19/99	292	14	75	205	82	0.9	0	288	3038
10/20/99	293	14	75	205	82	7	0	292	959
10/21/99	294	14	73	386	81	0	0	296	3088
10/22/99	295	14	73	386	81	5.9	0	300	1744
10/23/99	296	14	73	386	81	2.4	0	304	1804
10/24/99	297	14	73	386	81	0	0	308	1225
10/25/99	298	14	73	386	81	0	0	312	2954
10/26/99	299	14	73	386	81	0	0	316	2457
10/27/99	300	14	73	386	81	0	0	320	1199
10/28/99	301	14	73	386	81	0	0	324	2885
10/29/99	302	14	73	386	81	0	0	328	2605
10/30/99	303	14	73	386	81	0	0	332	2545
10/31/99	304	14	73	386	81	0	0	336	2339
11/1/99	305	14	73	386	81	0	0	339	2745
11/2/99	306	14	73	386	81	27	0	343	556

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
11/3/99	307	14	73	386	81	0.1	0	347	1603
11/4/99	308	22	73	386	81	0	0	351	2409
11/5/99	309	22	73	386	81	0	0	355	2384
11/6/99	310	22	73	386	81	0	0	359	2447
11/7/99	311	22	73	386	81	0	0	363	2186
11/8/99	312	22	73	386	81	0	0	367	2111
11/9/99	313	22	73	386	81	0	0	371	2084
11/10/99	314	22	73	386	81	0.2	0	375	1177
11/11/99	315	22	73	386	81	0.1	0	379	2150
11/12/99	316	22	73	386	81	0	0	383	1388
11/13/99	317	22	74	74	74	0	0	387	953
11/14/99	318	22	74	74	74	0	0	391	917
11/15/99	319	22	74	74	74	0.1	0	395	1195
11/16/99	320	22	74	74	74	0	0	399	1537
11/17/99	321	22	74	74	74	0	0	403	1658
11/18/99	322	22	74	74	74	0	0	407	2031
11/19/99	323	22	74	74	74	0	0	411	1854
11/20/99	324	22	74	74	74	2.1	0	415	1211
11/21/99	325	22	74	74	74	0	0	419	1406
11/22/99	326	22	74	74	74	0	0	423	1414
11/23/99	327	22	74	74	74	0	0	427	1789
11/24/99	328	22	74	74	74	0	0	431	1764
11/25/99	329	22	74	74	74	0	0	435	396
11/26/99	330	22	74	74	74	0	0	435	522
11/27/99	331	22	74	74	74	0.1	0	435	1605
11/28/99	332	22	74	74	74	0	0	435	1451
11/29/99	333	22	74	74	74	0.2	0	435	815
11/30/99	334	22	74	74	74	0	0	435	744
12/1/99	335	22	74	74	74	0	0	435	1572
12/2/99	336	22	107	107	107	0	0	435	1548
12/3/99	337	22	107	107	107	0	0	435	1065

Appendix C. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm
			epi	hypo	Water Column				
12/4/99	338	22	107	107	107	0	0	435	997
12/5/99	339	22	107	107	107	0.1	0	435	1454
12/6/99	340	22	107	107	107	6.6	0	435	513
12/7/99	341	22	107	107	107	0	0	435	919
12/8/99	342	22	107	107	107	0	0	435	1540
12/9/99	343	22	107	107	107	0	0	435	1533
12/10/99	344	22	107	107	107	2.4	0	435	353
12/11/99	345	22	107	107	107	0	0	435	1475
12/12/99	346	22	107	107	107	0	0	435	1277
12/13/99	347	22	107	107	107	2.6	0	435	552
12/14/99	348	22	107	107	107	20.8	3.3	435	272
12/15/99	349	22	107	107	107	3.3	8.7	435	421
12/16/99	350	22	107	107	107	0.2	4.8	435	1062
12/17/99	351	22	107	107	107	0	0	435	1399
12/18/99	352	22	107	107	107	0	0	435	1420
12/19/99	353	22	107	107	107	0	0	435	1313
12/20/99	354	22	107	107	107	17.1	0	435	465
12/21/99	355	22	107	107	107	0.1	0	435	932
12/22/99	356	22	107	107	107	0	0	435	1400
12/23/99	357	22	107	107	107	0	0	435	1114
12/24/99	358	22	107	107	107	0	0	435	649
12/25/99	359	22	107	107	107	0	0	435	1127
12/26/99	360	22	107	107	107	0	0	435	979
12/27/99	361	22	107	107	107	0	0	435	766
12/28/99	362	22	107	107	107	0	0	435	539
12/29/99	363	22	107	107	107	0	0	435	673
12/30/99	364	22	107	107	107	0.1	0	435	1343
12/31/99	365	22	107	107	107	0	0	435	794

Appendix D. Variable Data for Lake Giles 1998

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
5/1/98	121	3	58	77	67	1.8	0	459	3129	0
5/2/98	122	3	58	77	67	12.4	0	456	3450	0
5/3/98	123	3	58	77	67	0.3	0	453	3432	0
5/4/98	124	3	58	77	67	1.3	0	449	1748	0
5/5/98	125	3	58	77	67	6.9	0	446	1970	0
5/6/98	126	3	58	77	67	4	0	443	2850	0
5/7/98	127	3	58	77	67	0.9	0	439	5771	0
5/8/98	128	3	58	77	67	4.1	0	436	1447	0
5/9/98	129	3	58	77	67	18.6	0	433	2365	0
5/10/98	130	3	58	77	67	39.2	49.6	429	1320	0
5/11/98	131	3	88	46	61	17.5	0	426	1922	0
5/12/98	132	3	88	46	61	0.1	0	423	4678	0
5/13/98	133	5	88	46	61	0	0	419	6671	0
5/14/98	134	3	88	46	61	0	0	416	6827	0
5/15/98	135	3	88	46	61	0	0	413	6478	0
5/16/98	136	3	88	46	61	0	0	410	6704	0
5/17/98	137	3	88	46	61	0.8	0	406	6026	0
5/18/98	138	3	88	46	61	0	0	403	6532	0
5/19/98	139	2	88	46	61	0	0	400	4879	0
5/20/98	140	2	88	46	61	0	0	396	6341	0
5/21/98	141	2	88	46	61	0	0	393	6095	0
5/22/98	142	3	88	46	61	0	0	390	5911	0
5/23/98	143	4	88	46	61	0	0	386	7205	0
5/24/98	144	5	88	46	61	0	0	383	7274	0
5/25/98	145	4	88	46	61	8.1	0	380	3795	0
5/26/98	146	4	88	46	61	0.1	0	376	6250	0
5/27/98	147	4	88	46	61	0	0	373	6188	0
5/28/98	148	4	88	46	61	0	0	370	6325	0
5/29/98	149	5	88	46	61	9.9	0	366	6210	0
5/30/98	150	4	88	46	61	0	0	363	7269	0
5/31/98	151	4	88	46	61	77.6	34.4	360	4911	0

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
6/1/98	152	3	88	46	61	0.7	0	357	6511	0
6/2/98	153	4	88	46	61	19.4	6.6	353	5763	0
6/3/98	154	5	88	46	61	1.1	0	350	6602	0
6/4/98	155	5	88	46	61	0	0	347	7059	0
6/5/98	156	6	88	46	61	0	0	343	7174	0
6/6/98	157	6	88	46	61	0	0	340	6516	0
6/7/98	158	6	88	46	61	0.3	0	337	3760	0
6/8/98	159	7	120	117	115	0.1	0	333	2766	0
6/9/98	160	7	120	117	115	0	0	330	5711	0
6/10/98	161	7	120	117	115	0.6	0	323	5815	0
6/11/98	162	7	120	117	115	0.4	0	318	860	0
6/12/98	163	7	120	117	115	29.8	0	313	1450	0
6/13/98	164	7	120	117	115	19.9	11.2	308	2147	0
6/14/98	165	7	120	117	115	9.2	0	303	2421	0
6/15/98	166	7	114	107	110	1.9	0	298	1378	0
6/16/98	167	7	114	107	110	0	0	292	4627	0
6/17/98	168	7	114	107	110	1	0	287	3654	0
6/18/98	169	7	114	107	110	0	0	282	4318	0
6/19/98	170	6	114	107	110	0	0	277	4689	0
6/20/98	171	7	114	107	110	0	0	272	4682	0
6/21/98	172	6	114	107	110	0	0	266	4694	0
6/22/98	173	2	114	107	110	0	0	261	4690	0
6/23/98	174	6	114	107	110	7.1	0	256	2909	0
6/24/98	175	2	84	102	96	0	0	251	4939	0
6/25/98	176	2	84	102	96	0	0	246	3924	0
6/26/98	177	2	84	102	96	0	0	241	3839	0
6/27/98	178	2	84	102	96	0	0	235	2372	0
6/28/98	179	3	84	102	96	0	0	230	4153	0
6/29/98	180	3	84	102	96	0	0	225	2444	0
6/30/98	181	3	84	102	96	18.5	0	220	2470	0
7/1/98	182	4	84	102	96	0	0	215	2400	2

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
7/2/98	183	4	84	102	96	0	0	209	4228	3
7/3/98	184	5	84	102	96	0	0	204	4714	5
7/4/98	185	5	84	102	96	0.3	0	199	3543	6
7/5/98	186	5	84	102	96	7.5	0	194	4325	8
7/6/98	187	5	84	102	96	0	0	189	5411	9
7/7/98	188	5	84	102	96	0	0	183	2736	11
7/8/98	189	6	84	102	96	17.4	0	178	733	12
7/9/98	190	6	84	102	96	0.1	0	173	3942	14
7/10/98	191	6	84	102	96	0	0	168	5462	16
7/11/98	192	6	84	102	96	0	0	163	5579	17
7/12/98	193	6	84	102	96	0	0	158	5201	19
7/13/98	194	6	66	114	86	0	0	152	5620	20
7/14/98	195	6	66	114	86	0	0	147	3807	22
7/15/98	196	6	66	114	86	0	0	142	3920	23
7/16/98	197	6	66	114	86	0	0	137	4257	25
7/17/98	198	6	66	114	86	0.4	0	132	5492	27
7/18/98	199	6	66	114	86	0	0	135	7868	26
7/19/98	200	6	66	114	86	0	0	138	7124	26
7/20/98	201	6	58	113	81	1.9	0	141	4875	26
7/21/98	202	6	58	113	81	7.9	0	145	4894	26
7/22/98	203	6	58	113	81	0	0	148	7006	26
7/23/98	204	6	58	113	81	3.9	0	151	4552	26
7/24/98	205	5	58	113	81	0	0	154	6686	26
7/25/98	206	6	58	113	81	0	0	158	6451	26
7/26/98	207	6	58	113	81	0	0	161	6976	26
7/27/98	208	6	58	113	81	0	0	164	4852	25
7/28/98	209	6	58	113	81	0	0	167	5430	25
7/29/98	210	7	58	113	81	0	0	170	4834	25
7/30/98	211	7	58	113	81	0.9	0	174	6566	25
7/31/98	212	7	58	113	81	5	0	177	6434	25
8/1/98	213	7	58	113	81	0	0	180	7644	25

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
8/2/98	214	7	58	113	81	0	0	183	7263	25
8/3/98	215	7	58	113	81	0	0	187	6607	25
8/4/98	216	7	56	133	85	0	0	190	6905	24
8/5/98	217	7	56	133	85	0	0	193	4919	24
8/6/98	218	7	56	133	85	0	0	196	6222	24
8/7/98	219	7	56	133	85	0	0	200	6492	24
8/8/98	220	7	56	133	85	0	0	203	7254	24
8/9/98	221	7	56	133	85	0	0	206	4433	24
8/10/98	222	7	56	133	85	3	0	209	3614	24
8/11/98	223	7	56	133	85	0	0	213	5228	24
8/12/98	224	7	58	170	100	0	0	216	4516	24
8/13/98	225	7	58	170	100	0	0	216	4362	22
8/14/98	226	8	58	170	100	3.5	0	217	2338	21
8/15/98	227	8	58	170	100	0.1	0	217	3874	20
8/16/98	228	8	58	170	100	21.9	4.4	218	4430	19
8/17/98	229	8	58	170	100	19.5	0	218	1529	18
8/18/98	230	8	58	170	100	4.2	0	219	3231	17
8/19/98	231	8	58	170	100	0	0	220	6095	15
8/20/98	232	8	58	170	100	0	0	220	6538	14
8/21/98	233	8	58	170	100	0	0	221	5943	13
8/22/98	234	8	58	170	100	24.5	0	221	5030	12
8/23/98	235	8	58	170	100	0	0	222	5186	11
8/24/98	236	8	58	170	100	0	0	222	5136	9
8/25/98	237	8	58	170	100	0	0	223	4638	8
8/26/98	238	8	58	170	100	19.7	2.3	223	5359	7
8/27/98	239	8	58	170	100	0	0	224	6604	6
8/28/98	240	8	58	170	100	0	0	225	6353	5
8/29/98	241	8	58	170	100	0	0	225	3087	4
8/30/98	242	8	58	170	100	0.4	0	226	4765	2
8/31/98	243	8	58	170	100	0	0	226	5211	1
9/1/98	244	8	58	170	100	0	0	227	5712	0

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
9/2/98	245	8	53	167	84	7.9	0	227	2820	0
9/3/98	246	8	53	167	84	0.2	0	228	5473	0
9/4/98	247	8	53	167	84	0	0	228	5164	0
9/5/98	248	8	53	167	84	0	0	229	5821	0
9/6/98	249	8	53	167	84	0	0	229	5261	0
9/7/98	250	8	53	167	84	13.6	0	230	1628	0
9/8/98	251	8	53	167	84	1.5	0	231	3734	0
9/9/98	252	8	53	167	84	1	0	231	3499	0
9/10/98	253	10	53	167	84	0	0	232	4041	0
9/11/98	254	10	53	167	84	0	0	232	5198	0
9/12/98	255	10	53	167	84	0	0	233	4656	0
9/13/98	256	10	53	167	84	0	0	233	4725	0
9/14/98	257	10	53	167	84	0	0	234	4279	0
9/15/98	258	10	53	167	84	0	0	234	3138	0
9/16/98	259	10	53	167	84	0	0	235	2674	0
9/17/98	260	10	53	167	84	0	0	235	4483	0
9/18/98	261	8	53	167	84	0	0	236	5140	0
9/19/98	262	10	53	167	84	0	0	237	4493	0
9/20/98	263	8	53	167	84	0	0	237	3879	0
9/21/98	264	8	53	167	84	0	0	238	3683	0
9/22/98	265	8	53	167	84	10.4	0	238	1831	0
9/23/98	266	10	53	167	84	0	0	239	4801	0
9/24/98	267	10	59	169	81	0	0	239	4696	0
9/25/98	268	10	59	169	81	0.5	0	240	1458	0
9/26/98	269	10	59	169	81	0	0	240	3730	0
9/27/98	270	10	59	169	81	8.5	0	241	4107	0
9/28/98	271	10	59	169	81	0	0	241	4219	0
9/29/98	272	10	59	169	81	0	0	242	4434	0
9/30/98	273	10	49	173	76	0	0	243	2880	0
10/1/98	274	10	49	173	76	0	0	243	3605	0
10/2/98	275	10	49	173	76	0	0	244	3737	0

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
10/3/98	276	12	49	173	76	1.8	0	244	1887	0
10/4/98	277	12	49	173	76	0	0	245	2583	0
10/5/98	278	12	49	173	76	0	0	245	4105	0
10/6/98	279	12	49	173	76	0	0	246	3896	0
10/7/98	280	12	49	173	76	0	0	246	1464	0
10/8/98	281	12	49	173	76	27.7	3.3	247	798	0
10/9/98	282	12	75	177	90	5.5	2.5	248	667	0
10/10/98	283	12	75	177	90	5.8	0	252	700	0
10/11/98	284	12	75	177	90	0	0	256	925	0
10/12/98	285	12	75	177	90	0	0	260	2407	0
10/13/98	286	12	75	177	90	0	0	264	2524	0
10/14/98	287	12	75	177	90	14.8	7.2	268	2940	0
10/15/98	288	12	75	177	90	0	0	272	2380	0
10/16/98	289	12	75	177	90	0	0	276	3084	0
10/17/98	290	12	75	177	90	0.1	0	280	3216	0
10/18/98	291	12	75	177	90	0	0	284	3143	0
10/19/98	292	12	75	177	90	0.1	0	288	3299	0
10/20/98	293	12	75	177	90	0	0	292	3076	0
10/21/98	294	14	75	177	90	1.8	0	296	1589	0
10/22/98	295	14	75	177	90	0.1	0	300	1702	0
10/23/98	296	14	75	177	90	0	0	304	2989	0
10/24/98	297	14	75	177	90	0	0	308	2943	0
10/25/98	298	14	75	177	90	0	0	312	2873	0
10/26/98	299	14	75	177	90	0	0	316	2208	0
10/27/98	300	14	75	177	90	0	0	320	829	0
10/28/98	301	14	75	177	90	5.5	0	324	1222	0
10/29/98	302	14	75	177	90	0	0	328	2256	0
10/30/98	303	14	75	177	90	0	0	332	2560	0
10/31/98	304	14	75	177	90	0	0	336	2064	0
11/1/98	305	14	75	177	90	0	0	339	1398	0
11/2/98	306	14	75	177	90	0	0	343	2003	0

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
11/3/98	307	22	77	75	77	0	0	347	2227	0
11/4/98	308	22	77	75	77	0	0	351	2132	0
11/5/98	309	22	77	75	77	0	0	355	1661	0
11/6/98	310	22	77	75	77	0	0	359	1025	0
11/7/98	311	22	77	75	77	1	0	363	1404	0
11/8/98	312	22	77	75	77	0.1	0	367	814	0
11/9/98	313	22	77	75	77	0	0	371	1503	0
11/10/98	314	22	77	75	77	4.5	1.5	375	394	0
11/11/98	315	22	77	75	77	15	0	379	2085	0
11/12/98	316	22	77	75	77	0	0	383	1767	0
11/13/98	317	22	77	75	77	0	0	387	735	0
11/14/98	318	22	77	75	77	0	0	391	1881	0
11/15/98	319	22	77	75	77	0	0	395	1711	0
11/16/98	320	22	77	75	77	0	0	399	1102	0
11/17/98	321	22	84	83	84	0.8	0	403	223	0
11/18/98	322	22	84	83	84	0	0	407	1939	0
11/19/98	323	22	84	83	84	0	0	411	1249	0
11/20/98	324	22	84	83	84	4.7	1.3	415	313	0
11/21/98	325	22	84	83	84	0	0	419	972	0
11/22/98	326	22	84	83	84	0	0	423	1703	0
11/23/98	327	22	84	83	84	0	0	427	1751	0
11/24/98	328	22	84	83	84	0	0	431	1542	0
11/25/98	329	22	73	72	73	0	0	435	1488	0
11/26/98	330	22	73	72	73	15.9	7.1	435	487	0
11/27/98	331	22	73	72	73	0	0	435	1124	0
11/28/98	332	22	73	72	73	0	0	435	1625	0
11/29/98	333	22	73	72	73	0	0	435	1504	0
11/30/98	334	22	73	72	73	0	0	435	1270	0
12/1/98	335	22	73	72	73	0.2	0	435	1732	0
12/2/98	336	22	73	72	73	0	0	435	1721	0
12/3/98	337	22	73	72	73	0	0	435	1530	0

Appendix D. (Continued)

Date	Julian Day	Epi Depth (m)	ad_320*100 (m-1)			Rainfall (mm)	Runoff (mm)	PRF*10000 (KJ/m2/nm)	UVR 320nm J/m2/nm	Biotic*1000 (m-1)
			epi	hypo	Water Column					
12/4/98	338	22	73	72	73	0	0	435	1622	0
12/5/98	339	22	73	72	73	8.8	0	435	538	0
12/6/98	340	22	73	72	73	0.1	0	435	1448	0
12/7/98	341	22	73	72	73	0	0	435	1005	0
12/8/98	342	22	73	72	73	4.5	0	435	201	0
12/9/98	343	22	73	72	73	0	0	435	1469	0
12/10/98	344	22	73	72	73	0	0	435	1464	0
12/11/98	345	22	73	72	73	0	0	435	995	0
12/12/98	346	22	73	72	73	0	0	435	1235	0
12/13/98	347	22	73	72	73	0	0	435	1089	0
12/14/98	348	22	73	72	73	0	0	435	1421	0
12/15/98	349	22	73	72	73	0	0	435	1522	0
12/16/98	350	22	73	72	73	0	0	435	1023	0
12/17/98	351	22	73	72	73	0.6	0	435	393	0
12/18/98	352	22	73	72	73	0	0	435	1420	0
12/19/98	353	22	73	72	73	0	0	435	795	0
12/20/98	354	22	73	72	73	0	0	435	897	0
12/21/98	355	22	73	72	73	0.5	0	435	523	0
12/22/98	356	22	73	72	73	5.7	0	435	735	0
12/23/98	357	22	73	72	73	0	0	435	1222	0
12/24/98	358	22	73	72	73	0	0	435	1212	0
12/25/98	359	22	73	72	73	0	0	435	1410	0
12/26/98	360	22	73	72	73	0	0	435	1121	0
12/27/98	361	22	73	72	73	0	0	435	1387	0
12/28/98	362	22	73	72	73	0	0	435	631	0
12/29/98	363	22	73	72	73	0	0	435	248	0
12/30/98	364	22	73	72	73	0	0	435	257	0
12/31/98	365	22	73	72	73	0	0	435	252	0

Appendix E. Sample of L. Lacawac 1999 model Relationships. Conveyor input values are Listed in Appendices A and B.

Epilimnetic_Vol(t) = Epilimnetic_Vol(t - dt) + (- Epi:Meta_Vol_Flow) * dt

INIT Epilimnetic_Vol = 197000
Epi:Meta_Vol_Flow = epi_volume_change
Epi_depth = IF(Epilimnetic_Depth_Input = 12) THEN(LakeVolume) ELSE(IF(Epilimnetic_Depth_Input = 10) THEN(LakeVolume*0.9715)ELSE(IF(Epilimnetic_Depth_Input=8) THEN(LakeVolume*0.8985)ELSE(IF(Epilimnetic_Depth_Input=7) THEN(LakeVolume*0.8428)ELSE(IF(Epilimnetic_Depth_Input=6) THEN(LakeVolume*0.7727) ELSE(IF(Epilimnetic_Depth_Input=5) THEN(LakeVolume*0.6876)ELSE(IF(Epilimnetic_Depth_Input=4) THEN(LakeVolume*0.5863)ELSE(IF(Epilimnetic_Depth_Input=3) THEN(LakeVolume*0.4678)ELSE(IF(Epilimnetic_Depth_Input=2) THEN(LakeVolume*0.3314)ELSE(IF(Epilimnetic_Depth_Input=1) THEN(LakeVolume*0.1759)ELSE(IF(Epilimnetic_Depth_Input=0.5) THEN(LakeVolume*0.097) ELSE(0))))))))))
epi_volume_change = IF(Epilimnetic_Vol=Epi_depth) THEN(0)ELSE(Epilimnetic_Vol-Epi_depth)
Measure_Mix = Epilimnetic_Depth_Input
Mixed_layer = -Epilimnetic_Depth_Input
LakeVolume(t) = LakeVolume(t - dt) + (runoff_m3 + rain_m3 - evaporation - outflow&seepage) * dt

INIT LakeVolume = 1.12E6
runoff_m3 = (Runoff_mm/1000)*Lake_Area*runoff_adjust
rain_m3 = (rain_mm/1000)*Lake_Area*rain_adjust
evaporation = rain_m3+runoff_m3
outflow&seepage = 0
Rainfall_mm(t) = Rainfall_mm(t - dt) + (- rain_mm) * dt

INIT Rainfall_mm =

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

rain_mm = CONVEYOR OUTFLOW
Runoff_in(t) = Runoff_in(t - dt) + (- Runoff_mm) * dt

INIT Runoff_in = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

Runoff_mm = CONVEYOR OUTFLOW
anoxic_substrate_area = IF(Anoxic_depth = 12) then 0 else (If(Anoxic_depth=11) then Lake_Area*0.0715 else (if(Anoxic_depth=10) then Lake_Area*0.1209 else (IF(Anoxic_depth=9) then Lake_Area*0.1998 else (if(Anoxic_depth=8) then Lake_Area*0.2787 else (if(Anoxic_depth=7) then

Appendix E. (Continued)

Lake_Area*0.3444 else (if(Anoxic_depth=6) then Lake_Area*0.4101 else (if(Anoxic_depth=5) then Lake_Area*0.4953 else 0)))))))
cdom_anoxic = IF(anoxic_substrate_area=0) then 0 else((cDOM_anoxic_Flux*(anoxic_substrate_area)))
cDOM_anoxic_Flux = 0.75
Epilimnetic_ad320_cDOM_Mass(t) = Epilimnetic_ad320_cDOM_Mass(t - dt) + (ad320_cDOM_Algal_Prod + ad320_cDOM_runoff + mix_seds + rain_cdom - ad320_cDOM_Bleach - Microbes_net_usage1 - Epi_ad320:meta_ad320_flow) * dt

INIT Epilimnetic_ad320_cDOM_Mass = 197000*10.55
ad320_cDOM_Algal_Prod = Julian_Day*0
ad320_cDOM_runoff = runoff_m3*ad320_cDOM_Conc_runoff
mix_seds = 1
rain_cdom = rain_m3*rain_cdom_abs
ad320_cDOM_Bleach = kj_convert*PRF_correct*214000*Bleach_factor
Microbes_net_usage1 = Epilimnetic_Vol*Microbes_net_usage*Microbe_Factor
Epi_ad320:meta_ad320_flow = IF(Epi:Meta_Vol_Flow<0) then Epi:Meta_Vol_Flow*ad320_meta_model else (Epi:Meta_Vol_Flow*ad320epi_model)
ad320_cDOM_Conc_runoff = 88.7
rain_cdom_abs = 2.9
Hypolimnetic_ad320_cDOM_Mass(t) = Hypolimnetic_ad320_cDOM_Mass(t - dt) + (ad320_cdom_Groundwater + ad_320cDOM_Seds + Meta:hypo_ad320_flow - Unmix_ad320_cDOM_Bact_use) * dt

INIT Hypolimnetic_ad320_cDOM_Mass = 596060*9.22
ad320_cdom_Groundwater = 0
ad_320cDOM_Seds = if (Epilimnetic_Depth_Input = 12) then 0 else cdom_anoxic
Meta:hypo_ad320_flow = IF(Meta:Hypo_Vol_Flow>0) then Meta:Hypo_Vol_Flow*ad320_meta_model else ad320hypo_model*Meta:Hypo_Vol_Flow
Unmix_ad320_cDOM_Bact_use = 0
Hypolimnetic_Vol(t) = Hypolimnetic_Vol(t - dt) + (Meta:Hypo_Vol_Flow - seepage) * dt

INIT Hypolimnetic_Vol = 596060
Meta:Hypo_Vol_Flow = hypo_volume_change
seepage = 0
Hypolimnetic_Depth_Input = IF(Epilimnetic_Depth_Input<=10) then Epilimnetic_Depth_Input +2 else (12 - Epilimnetic_Depth_Input)
Hypo_depth = IF(Hypolimnetic_Depth_Input = 12) THEN (0)ELSE(IF(Hypolimnetic_Depth_Input = 11) THEN(LakeVolume*(1-0.9858)) else(IF(Hypolimnetic_Depth_Input = 10) THEN(LakeVolume*(1-0.9715))else(IF(Hypolimnetic_Depth_Input = 9) THEN(LakeVolume*(1-0.9351))ELSE(IF(Hypolimnetic_Depth_Input=8) THEN(LakeVolume*(1-0.8988))ELSE(IF(Hypolimnetic_Depth_Input=7) THEN(LakeVolume*(1-0.8428))ELSE(IF(Hypolimnetic_Depth_Input=6) THEN(LakeVolume*(1-0.7727)) ELSE(IF(Hypolimnetic_Depth_Input=5) THEN(LakeVolume*(1-0.6876))ELSE(IF(Hypolimnetic_Depth_Input=4) THEN(LakeVolume*(1-0.5862))ELSE(IF(Hypolimnetic_Depth_Input=3) THEN(LakeVolume*(1-0.4678))ELSE(IF(Hypolimnetic_Depth_Input=2) THEN(LakeVolume*(1-0.3314))ELSE(IF(Hypolimnetic_Depth_Input=1) THEN(LakeVolume*(1-0.1759))ELSE(IF(Hypolimnetic_Depth_Input=0.5) THEN(LakeVolume*(1-0.097)) ELSE(0))))))))))))
hypo_volume_change = IF(Hypolimnetic_Vol=Hypo_depth) THEN(0)ELSE(Hypo_depth-Hypolimnetic_Vol)
cdom_seds_oxic = oxic_hypo_area*oxic_seds_cDOM_Flux

Appendix E. (Continued)

oxic_seds_cDOM_Flux = 0.33
Metalimnetic_ad320_mass(t) = Metalimnetic_ad320_mass(t - dt) + (Epi_ad320:meta_ad320_flow + meta_seds - Meta:hypo_ad320_flow - Bio_meta_out) * dt

INIT Metalimnetic_ad320_mass = 10.35*326940
Epi_ad320:meta_ad320_flow (IN SECTOR: Epilimnion cDOM)
meta_seds = cdom_seds_oxic*meta_seds_adjust
Meta:hypo_ad320_flow (IN SECTOR: Hypolimnion cDOM)
Bio_meta_out = 0
Metalimnetic_Vol(t) = Metalimnetic_Vol(t - dt) + (Epi:Meta_Vol_Flow - Meta:Hypo_Vol_Flow) * dt

INIT Metalimnetic_Vol = 326940
Epi:Meta_Vol_Flow (IN SECTOR: Epilimnion Mixing)
Meta:Hypo_Vol_Flow (IN SECTOR: Hypolimnion Mixing)
PRF_coefficient(t) = PRF_coefficient(t - dt) + (- PRF) * dt

INIT PRF_coefficient = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

PRF = CONVEYOR OUTFLOW
UV320(t) = UV320(t - dt) + (- UV320_out) * dt

INIT UV320 = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

UV320_out = CONVEYOR OUTFLOW
kj_convert = UV320_out/1000
PRF_correct = PRF/10000
Anoxic_layer(t) = Anoxic_layer(t - dt) + (- Anoxic_depth) * dt

INIT Anoxic_layer = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

Anoxic_depth = CONVEYOR OUTFLOW
Day(t) = Day(t - dt) + (- Julian_Day) * dt

Appendix E. (Continued)

INIT Day = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

Julian_Day = CONVEYOR OUTFLOW

Epilimnetic_Depth(t) = Epilimnetic_Depth(t - dt) + (- Epilimnetic_Depth_Input) * dt

INIT Epilimnetic_Depth = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

Epilimnetic_Depth_Input = CONVEYOR OUTFLOW

Measure_ad320_epi(t) = Measure_ad320_epi(t - dt) + (- ad320_epi_measure) * dt

INIT Measure_ad320_epi = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

ad320_epi_measure = CONVEYOR OUTFLOW

Measure_ad320_hypo(t) = Measure_ad320_hypo(t - dt) + (- ad320_hypo_measure) * dt

INIT Measure_ad320_hypo = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

ad320_hypo_measure = CONVEYOR OUTFLOW

Measure_meta_ad320(t) = Measure_meta_ad320(t - dt) + (- meta_ad320_measure) * dt

INIT Measure_meta_ad320 = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

Appendix E. (Continued)

CAPACITY = INF
meta_ad320_measure = CONVEYOR OUTFLOW
Microbes(t) = Microbes(t - dt) + (- Microbes_2) * dt

INIT Microbes = See Appendix A

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF
Microbes_2 = CONVEYOR OUTFLOW
Water_Col_ad_320(t) = Water_Col_ad_320(t - dt) + (- WC_ad320_measure) * dt

INIT Water_Col_ad_320 = See Appendix A

TRANSIT TIME = 246

INFLOW LIMIT = INF

CAPACITY = INF
WC_ad320_measure = CONVEYOR OUTFLOW
ad320epi_model = Epilimnetic_ad320_cDOM_Mass/Epilimnetic_Vol
ad320hypo_model = IF(Hypolimnetic_Vol=0) then ad320epi_model else (Hypolimnetic_ad320_cDOM_Mass/Hypolimnetic_Vol)
ad320_meta_actual = meta_ad320_measure/100
ad320_meta_model = IF(Metalimnetic_Vol=0) then ad320epi_model else ((Metalimnetic_ad320_mass/Metalimnetic_Vol))
Bleach_factor = 1
Epi_ad320_actual = ad320_epi_measure/100
Hypo_ad320_actual = ad320_hypo_measure/100
hypo_and_meta_weighted = If(Hypolimnetic_Vol = 0 and Metalimnetic_Vol=0) then ad320epi_model else if(Hypolimnetic_Vol=0) then (Metalimnetic_ad320_mass/Metalimnetic_Vol) else (if(Metalimnetic_Vol=0) then (Hypolimnetic_ad320_cDOM_Mass/Hypolimnetic_Vol) else (Metalimnetic_ad320_mass+Hypolimnetic_ad320_cDOM_Mass)/(Metalimnetic_Vol+Hypolimnetic_Vol))
Lake_Area = 214575
meta_seds_adjust = 1
Microbes_net_usage = Microbes_2/1000
Microbe_Factor = 1
Mixed_depth_substrate_area = IF(Epilimnetic_Depth_Input = 12) then Lake_Area else (If(Epilimnetic_Depth_Input=11) then Lake_Area*0.9285 else (if(Epilimnetic_Depth_Input=10) then Lake_Area*0.8791 else (IF(Epilimnetic_Depth_Input=9) then Lake_Area*0.8002 else (if(Epilimnetic_Depth_Input=8) then Lake_Area*0.7213 else (if(Epilimnetic_Depth_Input=7) then Lake_Area*0.6556 else (if(Epilimnetic_Depth_Input=6) then Lake_Area*0.5899 else (if(Epilimnetic_Depth_Input=5) then Lake_Area*0.5047 else (if(Epilimnetic_Depth_Input=4) then Lake_Area*0.4196 else (if(Epilimnetic_Depth_Input=3) then Lake_Area*0.3228 else (if(Epilimnetic_Depth_Input=2)

Appendix E. (Continued)

then Lake_Area*0.2261 else (if(Epilimnetic_Depth_Input=1) then Lake_Area*0.1130 else (if(Epilimnetic_Depth_Input=0.5) then Lake_Area*0.9485 else 0)))))))))))
oxic_hypo_area = IF (anoxic_substrate_area+Mixed_depth_substrate_area >= 214575.81) then 0 else (214575.81-(anoxic_substrate_area+Mixed_depth_substrate_area))
rain_adjust = 1
runoff_adjust = 1
Watercolumn_ad320_measure = WC_ad320_measure/100
WC_ad320_cDOM = (Epilimnetic_ad320_cDOM_Mass+Hypolimnetic_ad320_cDOM_Mass+Metalimnetic_ad320_mass)/LakeVolume
Weeks = Julian_Day/7

Appendix F. Sample of L. Giles 1999 model Relationships. Conveyor inputs are listed in Appendices C and D.

Epilimnetic_Vol(t) = Epilimnetic_Vol(t - dt) + (- Epi:Meta_Vol_Flow) * dt

INIT Epilimnetic_Vol = 811768
Epi:Meta_Vol_Flow = epi_volume_change
Epi_depthvol = IF(Epilimnetic_Depth_Input = 22) THEN(LakeVolume) ELSE IF(Epilimnetic_Depth_Input = 20) THEN(LakeVolume*0.96866) ELSE IF(Epilimnetic_Depth_Input = 18) THEN(LakeVolume*0.941274) ELSE IF(Epilimnetic_Depth_Input = 16) THEN(LakeVolume*0.898448) ELSE(IF(Epilimnetic_Depth_Input = 14) THEN(LakeVolume*0.840182)ELSE(IF(Epilimnetic_Depth_Input=12) THEN(LakeVolume*0.766476)ELSE(IF(Epilimnetic_Depth_Input=10) THEN(LakeVolume*0.67733)ELSE(IF(Epilimnetic_Depth_Input=8) THEN(LakeVolume*0.572744) ELSE(IF(Epilimnetic_Depth_Input=7) THEN(LakeVolume*0.514661)ELSE(IF(Epilimnetic_Depth_Input=6) THEN(LakeVolume*0.452718)ELSE(IF(Epilimnetic_Depth_Input=5) THEN(LakeVolume*0.386915)ELSE(IF(Epilimnetic_Depth_Input=4) THEN(LakeVolume*0.317252)ELSE(IF(Epilimnetic_Depth_Input=3) THEN(LakeVolume*0.243729)ELSE(IF(Epilimnetic_Depth_Input=2) THEN(LakeVolume*0.166346) ELSE((IF(Epilimnetic_Depth_Input=1) THEN(LakeVolume*0.085103)ELSE(IF(Epilimnetic_Depth_Input=0.5) THEN(LakeVolume*0.043034)ELSE IF(Epilimnetic_Depth_Input = 0.1) THEN(LakeVolume*0.008684) ELSE(0)))))))))))))
epi_volume_change = IF(Epilimnetic_Vol=Epi_depthvol) THEN(0)ELSE(Epilimnetic_Vol-Epi_depthvol)
Measure_Mix = Epilimnetic_Depth_Input
Mixed_layer = -Epilimnetic_Depth_Input
LakeVolume(t) = LakeVolume(t - dt) + (runoff + rain_m3 - evaporation - outflow&seepage) * dt

INIT LakeVolume = 4880000
runoff = (runoff_m/1000*Lake_Area)*runoff_factor
rain_m3 = ((Lake_Area*rain_mm)/1000)*Rain_Factor
evaporation = (rain_m3+runoff)
outflow&seepage = 0
Rainfall_mm(t) = Rainfall_mm(t - dt) + (- rain_mm) * dt

INIT Rainfall_mm Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

rain_mm = CONVEYOR OUTFLOW
runoff_mm(t) = runoff_mm(t - dt) + (- runoff_m) * dt

INIT runoff_mm = Values in Appendix C or D

TRANSIT TIME = 214

Appendix F. (Continued)

INFLOW LIMIT = INF

CAPACITY = INF

runoff_m = CONVEYOR OUTFLOW
Rain_Factor = 1
Epilimnetic__ad320_Mass(t) = Epilimnetic__ad320_Mass(t - dt) + (ad320_ad320_Algal_Prod + ad320__runoff + Moss_ad320_flux_Epi + precip_cdom - ad320__Bleach - ad320_ad320_runoff_out - Epi_ad320:meta_ad320_flow) * dt
INIT Epilimnetic__ad320_Mass = 811768*0.8658381
ad320_ad320_Algal_Prod = Julian_Day*0
ad320__runoff = runoff*ad320_Conc_runoff
Moss_ad320_flux_Epi = IF(Epilimnetic_Depth_Input) < 8 then (epi_area*moss_flux_above_8m) else (215565*moss_flux_above_8m+((epi_area-215565)*moss_flux_below_8m))
precip_cdom = rain_m3*precip_ad320_Flux
ad320__Bleach = (kj_convert*PRF_correct*214000)*PRF_factor
ad320_ad320_runoff_out = 0
Epi_ad320:meta_ad320_flow = IF(Epi:Meta_Vol_Flow<0) then Epi:Meta_Vol_Flow*ad320_meta else (Epi:Meta_Vol_Flow*ad320epi)
ad320_Conc_runoff = 12.5
precip_ad320_Flux = 2.9
PRF_factor = 1
Hypolimnetic_ad320__Mass(t) = Hypolimnetic_ad320__Mass(t - dt) + (ad320__Groundwater + Moss_ad320_flux_Hypo + Meta:hypo_ad320_flow + Biotic_Hypo) * dt

INIT Hypolimnetic_ad320__Mass = 2.6707e6*1.027411
ad320__Groundwater = 0
Moss_ad320_flux_Hypo = If(Epilimnetic_Depth_Input=22) then 0 else IF(Hypolimnetic_Depth_Input)>7 then (Hypo_Area*moss_flux_below_8m) else (265435*moss_flux_below_8m+((Hypo_Area-265435)*moss_flux_above_8m))
Meta:hypo_ad320_flow = IF(Meta:Hypo_Vol_Flow>0) then Meta:Hypo_Vol_Flow*ad320_meta else ad320hypo*Meta:Hypo_Vol_Flow
Biotic_Hypo = Hypolimnetic_Vol*Biotic1000
Hypolimnetic_Vol(t) = Hypolimnetic_Vol(t - dt) + (Meta:Hypo_Vol_Flow - seepage) * dt

INIT Hypolimnetic_Vol = 2.6707E6
Meta:Hypo_Vol_Flow = hypo_volume_change
seepage = 0
Hypolimnetic_Depth_Input = If (Epilimnetic_Depth_Input > 17) then (22- Epilimnetic_Depth_Input) else (Epilimnetic_Depth_Input+4)
Hypo_depthvol = IF(Hypolimnetic_Depth_Input = 22) THEN(LakeVolume) ELSE IF(Hypolimnetic_Depth_Input = 20) THEN(LakeVolume*(1-0.96866)) Else IF(Hypolimnetic_Depth_Input = 18) THEN(LakeVolume*(1-0.941274)) ELSE IF(Hypolimnetic_Depth_Input = 16) THEN(LakeVolume*(1-0.898448)) ELSE(IF(Hypolimnetic_Depth_Input = 14) THEN(LakeVolume*(1-0.840182))ELSE(IF(Hypolimnetic_Depth_Input=12) THEN(LakeVolume*(1-0.766476))ELSE(IF(Hypolimnetic_Depth_Input=11) THEN(LakeVolume*(1-0.723833))ELSE(IF(Hypolimnetic_Depth_Input=10) THEN(LakeVolume*(1-0.67733))ELSE(IF(Hypolimnetic_Depth_Input=9) THEN(LakeVolume*(1-0.626967))ELSE(IF(Hypolimnetic_Depth_Input=8) THEN(LakeVolume*(1-0.572744))

Appendix F. (Continued)

ELSE(IF(Hypolimnetic_Depth_Input=7) THEN(LakeVolume*(1-0.514661))ELSE(IF(Hypolimnetic_Depth_Input=6) THEN(LakeVolume*(1-0.452718))ELSE(IF(Hypolimnetic_Depth_Input=5) THEN(LakeVolume*(1-0.386915))ELSE(IF(Hypolimnetic_Depth_Input=4) THEN(LakeVolume*(1-0.317252))ELSE(IF(Hypolimnetic_Depth_Input=3) THEN(LakeVolume*(1-0.243729))ELSE(IF(Hypolimnetic_Depth_Input=2) THEN(LakeVolume*(1-0.166346)) ELSE((IF(Hypolimnetic_Depth_Input=1) THEN(LakeVolume*(1-0.085103))ELSE(IF(Hypolimnetic_Depth_Input=0.5) THEN(LakeVolume*(1-0.043034))ELSE IF(Hypolimnetic_Depth_Input = 0.1) THEN(LakeVolume*(1-0.008684)) ELSE(0)))))))))))))))
hypo_volume_change = IF(Hypolimnetic_Vol=Hypo_depthvol) THEN(0)ELSE(Hypo_depthvol-Hypolimnetic_Vol)
Metalimnetic_ad320_mass(t) = Metalimnetic_ad320_mass(t - dt) + (Epi_ad320:meta_ad320_flow + Moss_ad320_flux_meta + Biotic_meta - Meta:hypo_ad320_flow) * dt

INIT Metalimnetic_ad320_mass = 1.3975e6*0.916345
Epi_ad320:meta_ad320_flow (IN SECTOR: Epilimnion cDOM)
Moss_ad320_flux_meta = meta_area*moss_flux_below_8m
Biotic_meta = Metalimnetic_Vol*Biotic1000
Meta:hypo_ad320_flow (IN SECTOR: Hypolimnion cDOM)
Metalimnetic_Vol(t) = Metalimnetic_Vol(t - dt) + (Epi:Meta_Vol_Flow - Meta:Hypo_Vol_Flow) * dt

INIT Metalimnetic_Vol = 1.3975E6
Epi:Meta_Vol_Flow (IN SECTOR: Epilimnion Mixing)
Meta:Hypo_Vol_Flow (IN SECTOR: Hypolimnion Mixing)
PRF_coefficient(t) = PRF_coefficient(t - dt) + (- PRF) * dt

INIT PRF_coefficient = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

PRF = CONVEYOR OUTFLOW
UV320(t) = UV320(t - dt) + (- UV320_out) * dt

INIT UV320 = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

UV320_out = CONVEYOR OUTFLOW
kj_convert = UV320_out/1000
PRF_correct = PRF/10000
Biotic(t) = Biotic(t - dt) + (- Biotc1) * dt

Appendix F. (Continued)

INIT Biotic = Values in Appendix C or D

TRANSIT TIME = 245

INFLOW LIMIT = INF

CAPACITY = INF

Biotc1 = CONVEYOR OUTFLOW

Day(t) = Day(t - dt) + (- Julian_Day) * dt

INIT Day = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

Julian_Day = CONVEYOR OUTFLOW

Epilimnetic_Depth(t) = Epilimnetic_Depth(t - dt) + (- Epilimnetic_Depth_Input) * dt

INIT Epilimnetic_Depth = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

Epilimnetic_Depth_Input = CONVEYOR OUTFLOW

Measure_ad320_epi(t) = Measure_ad320_epi(t - dt) + (- ad320_epi_measure) * dt

INIT Measure_ad320_epi = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

ad320_epi_measure = CONVEYOR OUTFLOW

Measure_ad320_hypo(t) = Measure_ad320_hypo(t - dt) + (- ad320_hypo_measure) * dt

INIT Measure_ad320_hypo = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF

Appendix F. (Continued)

ad320_hypo_measure = CONVEYOR OUTFLOW
Measure_meta_ad320(t) = Measure_meta_ad320(t - dt) + (- meta_ad320_measure) * dt

INIT Measure_meta_ad320 = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF
meta_ad320_measure = CONVEYOR OUTFLOW
Measure_Water_Column_ad320(t) = Measure_Water_Column_ad320(t - dt) + (- Measure_WC_ad320) * dt

INIT Measure_Water_Column_ad320 = Values in Appendix C or D

TRANSIT TIME = 214

INFLOW LIMIT = INF

CAPACITY = INF
Measure_WC_ad320 = CONVEYOR OUTFLOW
ad320epi = Epilimnetic__ad320_Mass/Epilimnetic_Vol
ad320hypo = IF(Hypolimnetic_Vol=0) then ad320epi else (Hypolimnetic_ad320__Mass/Hypolimnetic_Vol)
ad320_meta = IF(Metalimnetic_Vol=0) then ad320epi else ((Metalimnetic_ad320_mass/Metalimnetic_Vol))
ad320_meta_actual = meta_ad320_measure/100
ad320_Wc_actual = Measure_WC_ad320/100
Biotic1000 = Biotc1/1000*biotic_adjust
biotic_adjust = 1
Epi_ad320_actual = ad320_epi_measure/100
epi_area = IF(Epilimnetic_Depth_Input=22) then Lake_Area else if(Epilimnetic_Depth_Input=21) then (Lake_Area*0.90342) else if(Epilimnetic_Depth_Input=20) then (Lake_Area*0.8804) else if(Epilimnetic_Depth_Input=19) then (Lake_Area*0.85538) else if(Epilimnetic_Depth_Input=18) then (Lake_Area*0.82836) else if(Epilimnetic_Depth_Input=17) then (Lake_Area*0.79934) else if(Epilimnetic_Depth_Input=16) then (Lake_Area*0.76832) else if(Epilimnetic_Depth_Input=15) then (Lake_Area*0.7353) else if(Epilimnetic_Depth_Input=14) then (Lake_Area*0.70028) else if(Epilimnetic_Depth_Input=13) then (Lake_Area*0.66326) else if(Epilimnetic_Depth_Input=12) then (Lake_Area*0.62424) else if(Epilimnetic_Depth_Input=11) then (Lake_Area*0.58322) else if(Epilimnetic_Depth_Input=10) then (Lake_Area*0.5402) else if(Epilimnetic_Depth_Input=9) then (Lake_Area*0.49518) else if(Epilimnetic_Depth_Input=8) then (Lake_Area*0.44816) else if(Epilimnetic_Depth_Input=7) then (Lake_Area*0.39914) else if(Epilimnetic_Depth_Input=6) then (Lake_Area*0.34812) else if(Epilimnetic_Depth_Input=5) then (Lake_Area*0.2951) else if(Epilimnetic_Depth_Input=4) then (Lake_Area*0.24008) else if(Epilimnetic_Depth_Input=3) then (Lake_Area*0.18306) else if(Epilimnetic_Depth_Input=2) then (Lake_Area*0.12404) else if(Epilimnetic_Depth_Input=1) then (Lake_Area*0.06302) else (0)

Appendix F. (Continued)

Hypo_ad320_actual = ad320_hypo_measure/100
Hypo_Area = IF(Hypolimnetic_Depth_Input=22) then 0 else if(Hypolimnetic_Depth_Input=21) then (Lake_Area*(1-0.90342)) else if(Hypolimnetic_Depth_Input=20) then (Lake_Area*(1-0.8804)) else if(Hypolimnetic_Depth_Input=19) then (Lake_Area*(1-0.85538)) else if(Hypolimnetic_Depth_Input=18) then (Lake_Area*(1-0.82836)) else if(Hypolimnetic_Depth_Input=17) then (Lake_Area*(1-0.79934)) else if(Hypolimnetic_Depth_Input=16) then (Lake_Area*(1-0.76832)) else if(Hypolimnetic_Depth_Input=15) then (Lake_Area*(1-0.7353)) else if(Hypolimnetic_Depth_Input=14) then (Lake_Area*(1-0.70028)) else if(Hypolimnetic_Depth_Input=13) then (Lake_Area*(1-0.66326)) else if(Hypolimnetic_Depth_Input=12) then (Lake_Area*(1-0.62424)) else if(Hypolimnetic_Depth_Input=11) then (Lake_Area*(1-0.58322)) else if(Hypolimnetic_Depth_Input=10) then (Lake_Area*(1-0.5402)) else if(Hypolimnetic_Depth_Input=9) then (Lake_Area*(1-0.49518)) else if(Hypolimnetic_Depth_Input=8) then (Lake_Area*(1-0.44816)) else if(Hypolimnetic_Depth_Input=7) then (Lake_Area*(1-0.39914)) else if(Hypolimnetic_Depth_Input=6) then (Lake_Area*(1-0.34812)) else if(Hypolimnetic_Depth_Input=5) then (Lake_Area*(1-0.2951)) else if(Hypolimnetic_Depth_Input=4) then (Lake_Area*(1-0.24008)) else if(Hypolimnetic_Depth_Input=3) then (Lake_Area*(1-0.18306)) else if(Hypolimnetic_Depth_Input=2) then (Lake_Area*(1-0.12404)) else if(Hypolimnetic_Depth_Input=1) then (Lake_Area*(1-0.06302)) else (0)
Lake_Area = 481000
meta_area = IF(Epilimnetic_Depth_Input+Hypolimnetic_Depth_Input=22) then 0 else (Lake_Area-(Hypo_Area+epi_area))
Moss_above_8m_factor = 1
moss_flux_above_8m = 0.013*Moss_above_8m_factor
Moss_Flux_below8m_Adjust = 1
moss_flux_below_8m = 0.013*Moss_Flux_below8m_Adjust
runoff_factor = 1
Volume_Check = Epilimnetic_Vol+Hypolimnetic_Vol+Metalimnetic_Vol
WC_ad320 =
(Epilimnetic__ad320_Mass+Hypolimnetic_ad320__Mass+Metalimnetic_ad320_mass)/LakeVolume
Weeks = Julian_Day/7

Appendix G. Data Output and Analysis Table of Lake Lacawac 1999 model. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diifs of Diffs was calculated by subtracting the modeled differences by the measured difference. all values are ad_320 unless otherwise noted.

L99 M_P_seds_rr_Bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.00	7.89	8.10	7.35	7.61	7.75	8.13	7.89	-1.98	0.01	-0.74	-0.37	0.04	-0.12	-1.61	-0.03	-0.62
05/26/99	6.41	7.99	8.10	7.29	7.77	7.83	7.68	7.76	0.41	0.00	-0.06	0.16	-0.45	-0.13	0.25	0.45	0.07
06/07/99	5.92	7.16	7.16	6.75	7.30	7.20	8.59	7.80	-0.49	-0.94	-0.54	-0.46	0.91	0.04	-0.03	-1.85	-0.58
06/18/99	5.47	7.02	7.36	6.40	6.90	7.56	8.95	7.49	-0.45	0.20	-0.35	-0.40	0.37	-0.31	-0.05	-0.17	-0.04
07/03/99	4.31	6.16	7.60	6.14	6.29	6.42	10.16	7.54	-1.16	0.24	-0.26	-0.61	1.20	0.05	-0.55	-0.96	-0.31
07/15/99	4.17	6.82	8.11	5.98	6.01	7.36	10.65	7.31	-0.14	0.51	-0.16	-0.29	0.49	-0.23	0.15	0.02	0.07
07/28/99	4.15	6.50	8.05	5.89	6.05	8.04	12.34	7.84	-0.02	-0.06	-0.09	0.04	1.69	0.53	-0.06	-1.75	-0.62
08/12/99	3.78	7.67	9.49	5.80	5.58	8.37	13.14	7.16	-0.37	1.44	-0.09	-0.46	0.80	-0.67	0.09	0.64	0.58
08/25/99	3.87	7.54	10.72	6.11	5.51	7.44	18.07	7.76	0.09	1.23	0.31	-0.08	4.94	0.59	0.17	-3.71	-0.28
09/18/99	7.17	10.81	12.32	8.15	6.84	7.52	22.64	7.81	3.30	1.60	2.04	1.33	4.57	0.05	1.97	-2.97	1.99
10/11/99	7.47	15.44	17.66	8.34	7.43	12.56	73.48	8.15	0.30	5.34	0.19	0.59	50.84	0.34	-0.29	-45.50	-0.15
10/28/99	8.14	8.14	8.14	8.14	8.92	8.92	8.92	8.92	0.67	-9.52	-0.20	1.49	-64.56	0.77	-0.82	55.04	-0.97
11/09/99	8.11	8.11	8.11	8.11	9.87	9.87	9.87	9.87	-0.03	-0.03	-0.03	0.95	0.95	0.95	-0.98	-0.98	-0.98
12/05/99	8.20	8.20	8.20	8.20	10.78	10.78	10.78	10.78	0.09	0.09	0.09	0.91	0.91	0.91	-0.82	-0.82	-0.82

INTENTIONAL SECOND EXPOSURE

Appendix G. Data Output and Analysis Table of Lake Lacawac 1999 model. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diifs of Diffs was calculated by subtracting the modeled differences by the measured difference. all values are ad_320 unless otherwise noted.

L99 M_P_seds_rr_Bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.00	7.89	8.10	7.35	7.61	7.75	8.13	7.89	-1.98	0.01	-0.74	-0.37	0.04	-0.12	-1.61	-0.03	-0.62
05/26/99	6.41	7.99	8.10	7.29	7.77	7.83	7.68	7.76	0.41	0.00	-0.06	0.16	-0.45	-0.13	0.25	0.45	0.07
06/07/99	5.92	7.16	7.16	6.75	7.30	7.20	8.59	7.80	-0.49	-0.94	-0.54	-0.46	0.91	0.04	-0.03	-1.85	-0.58
06/18/99	5.47	7.02	7.36	6.40	6.90	7.56	8.95	7.49	-0.45	0.20	-0.35	-0.40	0.37	-0.31	-0.05	-0.17	-0.04
07/03/99	4.31	6.16	7.60	6.14	6.29	6.42	10.16	7.54	-1.16	0.24	-0.26	-0.61	1.20	0.05	-0.55	-0.96	-0.31
07/15/99	4.17	6.82	8.11	5.98	6.01	7.36	10.65	7.31	-0.14	0.51	-0.16	-0.29	0.49	-0.23	0.15	0.02	0.07
07/28/99	4.15	6.50	8.05	5.89	6.05	8.04	12.34	7.84	-0.02	-0.06	-0.09	0.04	1.69	0.53	-0.06	-1.75	-0.62
08/12/99	3.78	7.67	9.49	5.80	5.58	8.37	13.14	7.16	-0.37	1.44	-0.09	-0.46	0.80	-0.67	0.09	0.64	0.58
08/25/99	3.87	7.54	10.72	6.11	5.51	7.44	18.07	7.76	0.09	1.23	0.31	-0.08	4.94	0.59	0.17	-3.71	-0.28
09/18/99	7.17	10.81	12.32	8.15	6.84	7.52	22.64	7.81	3.30	1.60	2.04	1.33	4.57	0.05	1.97	-2.97	1.99
10/11/99	7.47	15.44	17.66	8.34	7.43	12.56	73.48	8.15	0.30	5.34	0.19	0.59	50.84	0.34	-0.29	-45.50	-0.15
10/28/99	8.14	8.14	8.14	8.14	8.92	8.92	8.92	8.92	0.67	-9.52	-0.20	1.49	-64.56	0.77	-0.82	55.04	-0.97
11/09/99	8.11	8.11	8.11	8.11	9.87	9.87	9.87	9.87	-0.03	-0.03	-0.03	0.95	0.95	0.95	-0.98	-0.98	-0.98
12/05/99	8.20	8.20	8.20	8.20	10.78	10.78	10.78	10.78	0.09	0.09	0.09	0.91	0.91	0.91	-0.82	-0.82	-0.82

Appendix G (Continued)

L99 M_P_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.86	7.98	8.10	7.66	7.61	7.75	8.13	7.89	-1.12	0.01	-0.43	-0.37	0.04	-0.12	-0.75	-0.03	-0.31
05/26/99	7.29	8.03	8.10	7.71	7.77	7.83	7.68	7.76	0.43	0.00	0.05	0.16	-0.45	-0.13	0.27	0.45	0.18
06/07/99	6.93	7.62	7.62	7.39	7.30	7.20	8.59	7.80	-0.36	-0.48	-0.32	-0.46	0.91	0.04	0.10	-1.39	-0.36
06/18/99	6.66	7.58	7.85	7.23	6.90	7.56	8.95	7.49	-0.27	0.23	-0.16	-0.40	0.37	-0.31	0.13	-0.14	0.15
07/03/99	6.02	7.20	8.28	7.26	6.29	6.42	10.16	7.54	-0.64	0.43	0.03	-0.61	1.20	0.05	-0.03	-0.77	-0.02
07/15/99	6.01	7.80	8.96	7.33	6.01	7.36	10.65	7.31	-0.01	0.68	0.07	-0.29	0.49	-0.23	0.28	0.19	0.30
07/28/99	6.14	7.88	9.11	7.45	6.05	8.04	12.34	7.84	0.13	0.15	0.12	0.04	1.69	0.53	0.09	-1.54	-0.41
08/12/99	5.99	8.94	10.69	7.61	5.58	8.37	13.14	7.16	-0.15	1.58	0.16	-0.46	0.80	-0.67	0.31	0.78	0.83
08/25/99	6.21	9.11	12.12	8.09	5.51	7.44	18.07	7.76	0.22	1.43	0.48	-0.08	4.94	0.59	0.30	-3.51	-0.11
09/18/99	9.62	12.68	14.18	10.47	6.84	7.52	22.64	7.81	3.41	2.06	2.38	1.33	4.57	0.05	2.08	-2.51	2.33
10/11/99	10.07	17.61	20.06	10.90	7.43	12.56	73.48	8.15	0.45	5.88	0.43	0.59	50.84	0.34	-0.14	-44.96	0.09
10/28/99	10.85	10.85	10.85	10.85	8.92	8.92	8.92	8.92	0.78	-9.21	-0.05	1.49	-64.56	0.77	-0.71	55.35	-0.82
11/09/99	10.93	10.93	10.93	10.93	9.87	9.87	9.87	9.87	0.08	0.08	0.08	0.95	0.95	0.95	-0.87	-0.87	-0.87
12/05/99	11.17	11.17	11.17	11.17	10.78	10.78	10.78	10.78	0.24	0.24	0.24	0.91	0.91	0.91	-0.67	-0.67	-0.67

INTENTIONAL SECOND EXPOSURE

Appendix G (Continued)

L99 M_P_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.86	7.98	8.10	7.66	7.61	7.75	8.13	7.89	-1.12	0.01	-0.43	-0.37	0.04	-0.12	-0.75	-0.03	-0.31
05/26/99	7.29	8.03	8.10	7.71	7.77	7.83	7.68	7.76	0.43	0.00	0.05	0.16	-0.45	-0.13	0.27	0.45	0.18
06/07/99	6.93	7.62	7.62	7.39	7.30	7.20	8.59	7.80	-0.36	-0.48	-0.32	-0.46	0.91	0.04	0.10	-1.39	-0.36
06/18/99	6.66	7.58	7.85	7.23	6.90	7.56	8.95	7.49	-0.27	0.23	-0.16	-0.40	0.37	-0.31	0.13	-0.14	0.15
07/03/99	6.02	7.20	8.28	7.26	6.29	6.42	10.16	7.54	-0.64	0.43	0.03	-0.61	1.20	0.05	-0.03	-0.77	-0.02
07/15/99	6.01	7.80	8.96	7.33	6.01	7.36	10.65	7.31	-0.01	0.68	0.07	-0.29	0.49	-0.23	0.28	0.19	0.30
07/28/99	6.14	7.88	9.11	7.45	6.05	8.04	12.34	7.84	0.13	0.15	0.12	0.04	1.69	0.53	0.09	-1.54	-0.41
08/12/99	5.99	8.94	10.69	7.61	5.58	8.37	13.14	7.16	-0.15	1.58	0.16	-0.46	0.80	-0.67	0.31	0.78	0.83
08/25/99	6.21	9.11	12.12	8.09	5.51	7.44	18.07	7.76	0.22	1.43	0.48	-0.08	4.94	0.59	0.30	-3.51	-0.11
09/18/99	9.62	12.68	14.18	10.47	6.84	7.52	22.64	7.81	3.41	2.06	2.38	1.33	4.57	0.05	2.08	-2.51	2.33
10/11/99	10.07	17.61	20.06	10.90	7.43	12.56	73.48	8.15	0.45	5.88	0.43	0.59	50.84	0.34	-0.14	-44.96	0.09
10/28/99	10.85	10.85	10.85	10.85	8.92	8.92	8.92	8.92	0.78	-9.21	-0.05	1.49	-64.56	0.77	-0.71	55.35	-0.82
11/09/99	10.93	10.93	10.93	10.93	9.87	9.87	9.87	9.87	0.08	0.08	0.08	0.95	0.95	0.95	-0.87	-0.87	-0.87
12/05/99	11.17	11.17	11.17	11.17	10.78	10.78	10.78	10.78	0.24	0.24	0.24	0.91	0.91	0.91	-0.67	-0.67	-0.67

Appendix G (Continued)

L99 M_P_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.85	7.98	8.10	7.65	7.61	7.75	8.13	7.89	-1.13	0.01	-0.44	-0.37	0.04	-0.12	-0.76	-0.03	-0.32
05/26/99	6.83	8.03	8.10	7.49	7.77	7.83	7.68	7.76	-0.02	0.00	-0.16	0.16	-0.45	-0.13	-0.18	0.45	-0.03
06/07/99	6.65	7.43	7.43	7.17	7.30	7.20	8.59	7.80	-0.18	-0.67	-0.32	-0.46	0.91	0.04	0.28	-1.58	-0.36
06/18/99	6.39	7.38	7.66	7.00	6.90	7.56	8.95	7.49	-0.26	0.23	-0.17	-0.40	0.37	-0.31	0.14	-0.14	0.14
07/03/99	5.65	6.94	8.07	6.98	6.29	6.42	10.16	7.54	-0.74	0.41	-0.02	-0.61	1.20	0.05	-0.13	-0.79	-0.07
07/15/99	5.68	7.55	8.74	7.05	6.01	7.36	10.65	7.31	0.03	0.67	0.07	-0.29	0.49	-0.23	0.32	0.18	0.30
07/28/99	5.82	7.61	8.87	7.16	6.05	8.04	12.34	7.84	0.14	0.13	0.11	0.04	1.69	0.53	0.10	-1.56	-0.42
08/12/99	5.67	8.69	10.45	7.32	5.58	8.37	13.14	7.16	-0.15	1.58	0.16	-0.46	0.80	-0.67	0.31	0.78	0.83
08/25/99	5.65	8.85	11.88	7.66	5.51	7.44	18.07	7.76	-0.02	1.43	0.34	-0.08	4.94	0.59	0.06	-3.51	-0.25
09/18/99	6.83	12.36	13.89	8.24	6.84	7.52	22.64	7.81	1.18	2.01	0.58	1.33	4.57	0.05	-0.15	-2.56	0.53
10/11/99	7.29	17.32	19.78	8.38	7.43	12.56	73.48	8.15	0.46	5.89	0.14	0.59	50.84	0.34	-0.13	-44.95	-0.20
10/28/99	8.32	8.32	8.32	8.32	8.92	8.92	8.92	8.92	1.03	-11.46	-0.06	1.49	-64.56	0.77	-0.46	53.10	-0.83
11/09/99	8.17	8.17	8.17	8.17	9.87	9.87	9.87	9.87	-0.15	-0.15	-0.15	0.95	0.95	0.95	-1.10	-1.10	-1.10
12/05/99	7.96	7.96	7.96	7.96	10.78	10.78	10.78	10.78	-0.21	-0.21	-0.21	0.91	0.91	0.91	-1.12	-1.12	-1.12

INTENTIONAL SECOND EXPOSURE

Appendix G (Continued)

L99 M_P_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.85	7.98	8.10	7.65	7.61	7.75	8.13	7.89	-1.13	0.01	-0.44	-0.37	0.04	-0.12	-0.76	-0.03	-0.32
05/26/99	6.83	8.03	8.10	7.49	7.77	7.83	7.68	7.76	-0.02	0.00	-0.16	0.16	-0.45	-0.13	-0.18	0.45	-0.03
06/07/99	6.65	7.43	7.43	7.17	7.30	7.20	8.59	7.80	-0.18	-0.67	-0.32	-0.46	0.91	0.04	0.28	-1.58	-0.36
06/18/99	6.39	7.38	7.66	7.00	6.90	7.56	8.95	7.49	-0.26	0.23	-0.17	-0.40	0.37	-0.31	0.14	-0.14	0.14
07/03/99	5.65	6.94	8.07	6.98	6.29	6.42	10.16	7.54	-0.74	0.41	-0.02	-0.61	1.20	0.05	-0.13	-0.79	-0.07
07/15/99	5.68	7.55	8.74	7.05	6.01	7.36	10.65	7.31	0.03	0.67	0.07	-0.29	0.49	-0.23	0.32	0.18	0.30
07/28/99	5.82	7.61	8.87	7.16	6.05	8.04	12.34	7.84	0.14	0.13	0.11	0.04	1.69	0.53	0.10	-1.56	-0.42
08/12/99	5.67	8.69	10.45	7.32	5.58	8.37	13.14	7.16	-0.15	1.58	0.16	-0.46	0.80	-0.67	0.31	0.78	0.83
08/25/99	5.65	8.85	11.88	7.66	5.51	7.44	18.07	7.76	-0.02	1.43	0.34	-0.08	4.94	0.59	0.06	-3.51	-0.25
09/18/99	6.83	12.36	13.89	8.24	6.84	7.52	22.64	7.81	1.18	2.01	0.58	1.33	4.57	0.05	-0.15	-2.56	0.53
10/11/99	7.29	17.32	19.78	8.38	7.43	12.56	73.48	8.15	0.46	5.89	0.14	0.59	50.84	0.34	-0.13	-44.95	-0.20
10/28/99	8.32	8.32	8.32	8.32	8.92	8.92	8.92	8.92	1.03	-11.46	-0.06	1.49	-64.56	0.77	-0.46	53.10	-0.83
11/09/99	8.17	8.17	8.17	8.17	9.87	9.87	9.87	9.87	-0.15	-0.15	-0.15	0.95	0.95	0.95	-1.10	-1.10	-1.10
12/05/99	7.96	7.96	7.96	7.96	10.78	10.78	10.78	10.78	-0.21	-0.21	-0.21	0.91	0.91	0.91	-1.12	-1.12	-1.12

Appendix G (Continued)

L99 M_P									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.85	7.98	8.10	7.65	7.61	7.75	8.13	7.89	-1.13	0.01	-0.44	-0.37	0.04	-0.12	-0.76	-0.03	-0.32
05/26/99	6.83	8.03	8.10	7.49	7.77	7.83	7.68	7.76	-0.02	0.00	-0.16	0.16	-0.45	-0.13	-0.18	0.45	-0.03
06/07/99	6.65	7.43	7.43	7.17	7.30	7.20	8.59	7.80	-0.18	-0.67	-0.32	-0.46	0.91	0.04	0.28	-1.58	-0.36
06/18/99	6.39	7.30	7.43	6.92	6.90	7.56	8.95	7.49	-0.26	0.00	-0.25	-0.40	0.37	-0.31	0.14	-0.37	0.06
07/03/99	5.65	6.64	7.23	6.55	6.29	6.42	10.16	7.54	-0.74	-0.20	-0.37	-0.61	1.20	0.05	-0.13	-1.40	-0.42
07/15/99	5.49	6.79	7.10	6.28	6.01	7.36	10.65	7.31	-0.16	-0.13	-0.27	-0.29	0.49	-0.23	0.13	-0.62	-0.04
07/28/99	5.32	6.31	6.86	6.02	6.05	8.04	12.34	7.84	-0.17	-0.24	-0.26	0.04	1.69	0.53	-0.21	-1.93	-0.79
08/12/99	5.02	6.56	6.86	5.72	5.58	8.37	13.14	7.16	-0.30	0.00	-0.30	-0.46	0.80	-0.67	0.16	-0.80	0.37
08/25/99	4.86	6.19	6.77	5.54	5.51	7.44	18.07	7.76	-0.16	-0.09	-0.18	-0.08	4.94	0.59	-0.08	-5.03	-0.77
09/18/99	4.85	6.24	6.44	5.19	6.84	7.52	22.64	7.81	-0.01	-0.33	-0.35	1.33	4.57	0.05	-1.34	-4.90	-0.40
10/11/99	4.73	6.43	6.44	4.90	7.43	12.56	73.48	8.15	-0.12	0.00	-0.29	0.59	50.84	0.34	-0.71	-50.84	-0.63
10/28/99	4.70	4.70	4.70	4.70	8.92	8.92	8.92	8.92	-0.03	-1.74	-0.20	1.49	-64.56	0.77	-1.52	62.82	-0.97
11/09/99	4.55	4.55	4.55	4.55	9.87	9.87	9.87	9.87	-0.15	-0.15	-0.15	0.95	0.95	0.95	-1.10	-1.10	-1.10
12/05/99	4.33	4.33	4.33	4.33	10.78	10.78	10.78	10.78	-0.22	-0.22	-0.22	0.91	0.91	0.91	-1.13	-1.13	-1.13

Appendix G (Continued)

L99 M_P	Output From Stella Model				Actual Measured Values				Differences: Model Output (Mo)			Differences: Measured Values (Mv)			Diffs of Diffs: Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	6.85	7.98	8.10	7.65	7.61	7.75	8.13	7.89	-1.13	0.01	-0.44	-0.37	0.04	-0.12	-0.76	-0.03	-0.32
05/26/99	6.83	8.03	8.10	7.49	7.77	7.83	7.68	7.76	-0.02	0.00	-0.16	0.16	-0.45	-0.13	-0.18	0.45	-0.03
06/07/99	6.65	7.43	7.43	7.17	7.30	7.20	8.59	7.80	-0.18	-0.67	-0.32	-0.46	0.91	0.04	0.28	-1.58	-0.36
06/18/99	6.39	7.30	7.43	6.92	6.90	7.56	8.95	7.49	-0.26	0.00	-0.25	-0.40	0.37	-0.31	0.14	-0.37	0.06
07/03/99	5.65	6.64	7.23	6.55	6.29	6.42	10.16	7.54	-0.74	-0.20	-0.37	-0.61	1.20	0.05	-0.13	-1.40	-0.42
07/15/99	5.49	6.79	7.10	6.28	6.01	7.36	10.65	7.31	-0.16	-0.13	-0.27	-0.29	0.49	-0.23	0.13	-0.62	-0.04
07/28/99	5.32	6.31	6.86	6.02	6.05	8.04	12.34	7.84	-0.17	-0.24	-0.26	0.04	1.69	0.53	-0.21	-1.93	-0.79
08/12/99	5.02	6.56	6.86	5.72	5.58	8.37	13.14	7.16	-0.30	0.00	-0.30	-0.46	0.80	-0.67	0.16	-0.80	0.37
08/25/99	4.86	6.19	6.77	5.54	5.51	7.44	18.07	7.76	-0.16	-0.09	-0.18	-0.08	4.94	0.59	-0.08	-5.03	-0.77
09/18/99	4.85	6.24	6.44	5.19	6.84	7.52	22.64	7.81	-0.01	-0.33	-0.35	1.33	4.57	0.05	-1.34	-4.90	-0.40
10/11/99	4.73	6.43	6.44	4.90	7.43	12.56	73.48	8.15	-0.12	0.00	-0.29	0.59	50.84	0.34	-0.71	-50.84	-0.63
10/28/99	4.70	4.70	4.70	4.70	8.92	8.92	8.92	8.92	-0.03	-1.74	-0.20	1.49	-64.56	0.77	-1.52	62.82	-0.97
11/09/99	4.55	4.55	4.55	4.55	9.87	9.87	9.87	9.87	-0.15	-0.15	-0.15	0.95	0.95	0.95	-1.10	-1.10	-1.10
12/05/99	4.33	4.33	4.33	4.33	10.78	10.78	10.78	10.78	-0.22	-0.22	-0.22	0.91	0.91	0.91	-1.13	-1.13	-1.13

Appendix G (Continued)

L99_M									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	8.08	8.10	8.10	8.09	7.61	7.75	8.13	7.89	0.10	0.01	0.00	-0.37	0.04	-0.12	0.47	-0.03	0.12
05/26/99	8.08	8.10	8.10	8.09	7.77	7.83	7.68	7.76	0.00	0.00	0.00	0.16	-0.45	-0.13	-0.16	0.45	0.13
06/07/99	8.09	8.09	8.09	8.09	7.30	7.20	8.59	7.80	0.01	-0.01	0.00	-0.46	0.91	0.04	0.47	-0.92	-0.04
06/18/99	8.09	8.09	8.09	8.09	6.90	7.56	8.95	7.49	0.00	0.00	0.00	-0.40	0.37	-0.31	0.40	-0.37	0.31
07/03/99	8.09	8.09	8.09	8.09	6.29	6.42	10.16	7.54	0.00	0.00	0.00	-0.61	1.20	0.05	0.61	-1.20	-0.05
07/15/99	8.09	8.09	8.09	8.09	6.01	7.36	10.65	7.31	0.00	0.00	0.00	-0.29	0.49	-0.23	0.29	-0.49	0.23
07/28/99	8.09	8.09	8.09	8.09	6.05	8.04	12.34	7.84	0.00	0.00	0.00	0.04	1.69	0.53	-0.04	-1.69	-0.53
08/12/99	8.09	8.09	8.09	8.09	5.58	8.37	13.14	7.16	0.00	0.00	0.00	-0.46	0.80	-0.67	0.46	-0.80	0.67
08/25/99	8.09	8.09	8.09	8.09	5.51	7.44	18.07	7.76	0.00	0.00	0.00	-0.08	4.94	0.59	0.08	-4.94	-0.59
09/18/99	8.09	8.09	8.09	8.09	6.84	7.52	22.64	7.81	0.00	0.00	0.00	1.33	4.57	0.05	-1.33	-4.57	-0.05
10/11/99	8.09	8.09	8.09	8.09	7.43	12.56	73.48	8.15	0.00	0.00	0.00	0.59	50.84	0.34	-0.59	-50.84	-0.34
10/28/99	8.09	8.09	8.09	8.09	8.92	8.92	8.92	8.92	0.00	0.00	0.00	1.49	-64.56	0.77	-1.49	64.56	-0.77
11/09/99	8.09	8.09	8.09	8.09	9.87	9.87	9.87	9.87	0.00	0.00	0.00	0.95	0.95	0.95	-0.95	-0.95	-0.95
12/05/99	8.09	8.09	8.09	8.09	10.78	10.78	10.78	10.78	0.00	0.00	0.00	0.91	0.91	0.91	-0.91	-0.91	-0.91

INTENTIONAL SECOND EXPOSURE

Appendix G (Continued)

L99_M									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/99	7.98	8.16	8.09	8.09	7.98	8.16	8.09	8.02									
05/18/99	8.08	8.10	8.10	8.09	7.61	7.75	8.13	7.89	0.10	0.01	0.00	-0.37	0.04	-0.12	0.47	-0.03	0.12
05/26/99	8.08	8.10	8.10	8.09	7.77	7.83	7.68	7.76	0.00	0.00	0.00	0.16	-0.45	-0.13	-0.16	0.45	0.13
06/07/99	8.09	8.09	8.09	8.09	7.30	7.20	8.59	7.80	0.01	-0.01	0.00	-0.46	0.91	0.04	0.47	-0.92	-0.04
06/18/99	8.09	8.09	8.09	8.09	6.90	7.56	8.95	7.49	0.00	0.00	0.00	-0.40	0.37	-0.31	0.40	-0.37	0.31
07/03/99	8.09	8.09	8.09	8.09	6.29	6.42	10.16	7.54	0.00	0.00	0.00	-0.61	1.20	0.05	0.61	-1.20	-0.05
07/15/99	8.09	8.09	8.09	8.09	6.01	7.36	10.65	7.31	0.00	0.00	0.00	-0.29	0.49	-0.23	0.29	-0.49	0.23
07/28/99	8.09	8.09	8.09	8.09	6.05	8.04	12.34	7.84	0.00	0.00	0.00	0.04	1.69	0.53	-0.04	-1.69	-0.53
08/12/99	8.09	8.09	8.09	8.09	5.58	8.37	13.14	7.16	0.00	0.00	0.00	-0.46	0.80	-0.67	0.46	-0.80	0.67
08/25/99	8.09	8.09	8.09	8.09	5.51	7.44	18.07	7.76	0.00	0.00	0.00	-0.08	4.94	0.59	0.08	-4.94	-0.59
09/18/99	8.09	8.09	8.09	8.09	6.84	7.52	22.64	7.81	0.00	0.00	0.00	1.33	4.57	0.05	-1.33	-4.57	-0.05
10/11/99	8.09	8.09	8.09	8.09	7.43	12.56	73.48	8.15	0.00	0.00	0.00	0.59	50.84	0.34	-0.59	-50.84	-0.34
10/28/99	8.09	8.09	8.09	8.09	8.92	8.92	8.92	8.92	0.00	0.00	0.00	1.49	-64.56	0.77	-1.49	64.56	-0.77
11/09/99	8.09	8.09	8.09	8.09	9.87	9.87	9.87	9.87	0.00	0.00	0.00	0.95	0.95	0.95	-0.95	-0.95	-0.95
12/05/99	8.09	8.09	8.09	8.09	10.78	10.78	10.78	10.78	0.00	0.00	0.00	0.91	0.91	0.91	-0.91	-0.91	-0.91

Appendix H. Data Output and Analysis Table of Lake Lacawac 1998 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diifs of Diffs was calculated by subtracting the modeled differences by the measured difference. All values are ad_320 values unless otherwise noted.

L_M_P_Seds_RR_Bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.40	9.40	9.40	9.40	12.04	12.14	9.92	11.20	-1.15	0.18	-0.38	1.49	0.70	0.89	-2.64	-0.52	-1.27
5/22	7.41	9.34	9.34	9.00	12.07	11.52	9.53	11.21	-1.99	-0.06	-0.40	0.03	-0.39	0.01	-2.02	0.33	-0.41
6/1	9.67	8.10	9.22	8.97	11.64	11.57	10.42	11.26	2.26	-0.12	-0.03	-0.43	0.89	0.05	2.69	-1.01	-0.08
6/16	8.68	8.50	9.17	8.79	12.32	11.68	11.36	11.99	-0.99	-0.05	-0.18	0.68	0.94	0.73	-1.67	-0.99	-0.91
6/30	6.68	8.72	8.89	8.11	11.56	11.95	11.99	11.78	-2.00	-0.28	-0.68	-0.76	0.63	-0.21	-1.24	-0.91	-0.47
7/14	6.68	8.32	8.87	7.72	10.61	11.34	12.59	11.19	0.00	-0.02	-0.39	-0.95	0.59	-0.59	0.95	-0.61	0.20
7/30	5.41	6.79	8.83	7.18	9.32	10.54	12.49	10.26	-1.27	-0.04	-0.54	-1.29	-0.10	-0.93	0.02	0.06	0.39
8/18	4.70	7.33	8.84	6.57	8.21	9.91	14.88	10.04	-0.71	0.01	-0.61	-1.11	2.39	-0.22	0.40	-2.38	-0.39
8/26	4.05	7.33	9.28	6.40	7.99	9.96	14.36	9.80	-0.65	0.44	-0.17	-0.22	-0.52	-0.24	-0.43	0.96	0.07
9/3	3.93	7.14	9.46	6.36	7.70	9.72	13.65	9.42	-0.12	0.18	-0.04	-0.29	-0.71	-0.38	0.17	0.89	0.34
9/9	4.42	8.32	9.81	6.37	7.11	8.45	18.45	9.09	0.49	0.35	0.01	-0.59	4.81	-0.33	1.08	-4.46	0.34
10/1	5.67	7.74	9.37	6.57	6.17	8.61	29.57	8.76	1.25	-0.44	0.20	-0.94	11.11	-0.32	2.19	-11.55	0.52
10/20	6.43	10.82	14.64	7.37	6.54	20.71	54.09	8.83	0.76	5.27	0.80	0.37	24.52	0.06	0.39	-19.25	0.74
10/28	6.59	13.81	18.63	7.46	7.27	40.14	55.78	9.26	0.16	3.99	0.09	0.73	1.69	0.43	-0.57	2.30	-0.34
11/5	7.49	7.49	7.49	7.49	9.38	9.42	9.38	9.38	0.90	-11.14	0.03	2.12	-46.39	0.13	-1.22	35.25	-0.10

INTENTIONAL SECOND EXPOSURE

Appendix H. Data Output and Analysis Table of Lake Lacawac 1998 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diifs of Diffs was calculated by subtracting the modeled differences by the measured difference. All values are ad_320 values unless otherwise noted.

L M_P_Seds_RR_Bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.40	9.40	9.40	9.40	12.04	12.14	9.92	11.20	-1.15	0.18	-0.38	1.49	0.70	0.89	-2.64	-0.52	-1.27
5/22	7.41	9.34	9.34	9.00	12.07	11.52	9.53	11.21	-1.99	-0.06	-0.40	0.03	-0.39	0.01	-2.02	0.33	-0.41
6/1	9.67	8.10	9.22	8.97	11.64	11.57	10.42	11.26	2.26	-0.12	-0.03	-0.43	0.89	0.05	2.69	-1.01	-0.08
6/16	8.68	8.50	9.17	8.79	12.32	11.68	11.36	11.99	-0.99	-0.05	-0.18	0.68	0.94	0.73	-1.67	-0.99	-0.91
6/30	6.68	8.72	8.89	8.11	11.56	11.95	11.99	11.78	-2.00	-0.28	-0.68	-0.76	0.63	-0.21	-1.24	-0.91	-0.47
7/14	6.68	8.32	8.87	7.72	10.61	11.34	12.59	11.19	0.00	-0.02	-0.39	-0.95	0.59	-0.59	0.95	-0.61	0.20
7/30	5.41	6.79	8.83	7.18	9.32	10.54	12.49	10.26	-1.27	-0.04	-0.54	-1.29	-0.10	-0.93	0.02	0.06	0.39
8/18	4.70	7.33	8.84	6.57	8.21	9.91	14.88	10.04	-0.71	0.01	-0.61	-1.11	2.39	-0.22	0.40	-2.38	-0.39
8/26	4.05	7.33	9.28	6.40	7.99	9.96	14.36	9.80	-0.65	0.44	-0.17	-0.22	-0.52	-0.24	-0.43	0.96	0.07
9/3	3.93	7.14	9.46	6.36	7.70	9.72	13.65	9.42	-0.12	0.18	-0.04	-0.29	-0.71	-0.38	0.17	0.89	0.34
9/9	4.42	8.32	9.81	6.37	7.11	8.45	18.45	9.09	0.49	0.35	0.01	-0.59	4.81	-0.33	1.08	-4.46	0.34
10/1	5.67	7.74	9.37	6.57	6.17	8.61	29.57	8.76	1.25	-0.44	0.20	-0.94	11.11	-0.32	2.19	-11.55	0.52
10/20	6.43	10.82	14.64	7.37	6.54	20.71	54.09	8.83	0.76	5.27	0.80	0.37	24.52	0.06	0.39	-19.25	0.74
10/28	6.59	13.81	18.63	7.46	7.27	40.14	55.78	9.26	0.16	3.99	0.09	0.73	1.69	0.43	-0.57	2.30	-0.34
11/5	7.49	7.49	7.49	7.49	9.38	9.42	9.38	9.38	0.90	-11.14	0.03	2.12	-46.39	0.13	-1.22	35.25	-0.10

Appendix H. (Continued)

L_M_P_Seds_RR									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.62	9.62	9.62	9.62	12.04	12.14	9.92	11.20	-0.93	0.40	-0.16	1.49	0.70	0.89	-2.42	-0.30	-1.05
5/22	8.46	9.59	9.59	9.39	12.07	11.52	9.53	11.21	-1.16	-0.03	-0.23	0.03	-0.39	0.01	-1.19	0.36	-0.24
6/1	11.32	8.86	9.52	9.64	11.64	11.57	10.42	11.26	2.86	-0.07	0.25	-0.43	0.89	0.05	3.29	-0.96	0.20
6/16	10.17	9.41	9.49	9.79	12.32	11.68	11.36	11.99	-1.15	-0.03	0.15	0.68	0.94	0.73	-1.83	-0.97	-0.58
6/30	9.01	9.81	9.46	9.40	11.56	11.95	11.99	11.78	-1.16	-0.03	-0.39	-0.76	0.63	-0.21	-0.40	-0.66	-0.18
7/14	9.04	9.49	9.50	9.28	10.61	11.34	12.59	11.19	0.03	0.04	-0.12	-0.95	0.59	-0.59	0.98	-0.55	0.47
7/30	8.37	8.94	9.80	9.10	9.32	10.54	12.49	10.26	-0.67	0.30	-0.18	-1.29	-0.10	-0.93	0.62	0.40	0.75
8/18	7.88	9.19	10.12	8.87	8.21	9.91	14.88	10.04	-0.49	0.32	-0.23	-1.11	2.39	-0.22	0.62	-2.07	-0.01
8/26	7.50	9.19	10.57	8.83	7.99	9.96	14.36	9.80	-0.38	0.45	-0.04	-0.22	-0.52	-0.24	-0.16	0.97	0.20
9/3	7.42	9.27	10.90	8.91	7.70	9.72	13.65	9.42	-0.08	0.33	0.08	-0.29	-0.71	-0.38	0.21	1.04	0.46
9/9	7.76	10.14	11.25	9.00	7.11	8.45	18.45	9.09	0.34	0.35	0.09	-0.59	4.81	-0.33	0.93	-4.46	0.42
10/1	8.73	10.26	11.65	9.43	6.17	8.61	29.57	8.76	0.97	0.40	0.43	-0.94	11.11	-0.32	1.91	-10.71	0.75
10/20	9.54	13.21	17.00	10.36	6.54	20.71	54.09	8.83	0.81	5.35	0.93	0.37	24.52	0.06	0.44	-19.17	0.87
10/28	9.70	16.20	21.04	10.50	7.27	40.14	55.78	9.26	0.16	4.04	0.14	0.73	1.69	0.43	-0.57	2.35	-0.29
11/5	10.14	25.30	9.90	9.90	9.38	9.42	9.38	9.38	0.44	-11.14	-0.60	2.12	-46.39	0.13	-1.68	35.25	-0.73

Appendix H.(Continued)

L M_P_Seds_RR									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.62	9.62	9.62	9.62	12.04	12.14	9.92	11.20	-0.93	0.40	-0.16	1.49	0.70	0.89	-2.42	-0.30	-1.05
5/22	8.46	9.59	9.59	9.39	12.07	11.52	9.53	11.21	-1.16	-0.03	-0.23	0.03	-0.39	0.01	-1.19	0.36	-0.24
6/1	11.32	8.86	9.52	9.64	11.64	11.57	10.42	11.26	2.86	-0.07	0.25	-0.43	0.89	0.05	3.29	-0.96	0.20
6/16	10.17	9.41	9.49	9.79	12.32	11.68	11.36	11.99	-1.15	-0.03	0.15	0.68	0.94	0.73	-1.83	-0.97	-0.58
6/30	9.01	9.81	9.46	9.40	11.56	11.95	11.99	11.78	-1.16	-0.03	-0.39	-0.76	0.63	-0.21	-0.40	-0.66	-0.18
7/14	9.04	9.49	9.50	9.28	10.61	11.34	12.59	11.19	0.03	0.04	-0.12	-0.95	0.59	-0.59	0.98	-0.55	0.47
7/30	8.37	8.94	9.80	9.10	9.32	10.54	12.49	10.26	-0.67	0.30	-0.18	-1.29	-0.10	-0.93	0.62	0.40	0.75
8/18	7.88	9.19	10.12	8.87	8.21	9.91	14.88	10.04	-0.49	0.32	-0.23	-1.11	2.39	-0.22	0.62	-2.07	-0.01
8/26	7.50	9.19	10.57	8.83	7.99	9.96	14.36	9.80	-0.38	0.45	-0.04	-0.22	-0.52	-0.24	-0.16	0.97	0.20
9/3	7.42	9.27	10.90	8.91	7.70	9.72	13.65	9.42	-0.08	0.33	0.08	-0.29	-0.71	-0.38	0.21	1.04	0.46
9/9	7.76	10.14	11.25	9.00	7.11	8.45	18.45	9.09	0.34	0.35	0.09	-0.59	4.81	-0.33	0.93	-4.46	0.42
10/1	8.73	10.26	11.65	9.43	6.17	8.61	29.57	8.76	0.97	0.40	0.43	-0.94	11.11	-0.32	1.91	-10.71	0.75
10/20	9.54	13.21	17.00	10.36	6.54	20.71	54.09	8.83	0.81	5.35	0.93	0.37	24.52	0.06	0.44	-19.17	0.87
10/28	9.70	16.20	21.04	10.50	7.27	40.14	55.78	9.26	0.16	4.04	0.14	0.73	1.69	0.43	-0.57	2.35	-0.29
11/5	10.14	25.30	9.90	9.90	9.38	9.42	9.38	9.38	0.44	-11.14	-0.60	2.12	-46.39	0.13	-1.68	35.25	-0.73

Appendix H.(Continued)

L_M_P_Sed	Output From Stella Model				Actual Measured Values				Differences: Model Output (Mo)			Differences: Measured Values (Mv)			Diffs of Diffs: Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.52	9.52	9.52	9.52	12.04	12.14	9.92	11.20	-1.03	0.30	-0.26	1.49	0.70	0.89	-2.52	-0.40	-1.15
5/22	8.35	9.49	9.49	9.29	12.07	11.52	9.53	11.21	-1.17	-0.03	-0.23	0.03	-0.39	0.01	-1.20	0.36	-0.24
6/1	7.78	8.76	9.42	8.94	11.64	11.57	10.42	11.26	-0.57	-0.07	-0.35	-0.43	0.89	0.05	-0.14	-0.96	-0.40
6/16	7.90	8.62	9.39	8.52	12.32	11.68	11.36	11.99	0.12	-0.03	-0.42	0.68	0.94	0.73	-0.56	-0.97	-1.15
6/30	6.72	8.41	9.07	8.12	11.56	11.95	11.99	11.78	-1.18	-0.32	-0.40	-0.76	0.63	-0.21	-0.42	-0.95	-0.19
7/14	6.67	8.27	8.98	7.75	10.61	11.34	12.59	11.19	-0.05	-0.09	-0.37	-0.95	0.59	-0.59	0.90	-0.68	0.22
7/30	5.86	7.02	8.88	7.40	9.32	10.54	12.49	10.26	-0.81	-0.10	-0.35	-1.29	-0.10	-0.93	0.48	0.00	0.58
8/18	5.62	7.63	8.95	7.10	8.21	9.91	14.88	10.04	-0.24	0.07	-0.30	-1.11	2.39	-0.22	0.87	-2.32	-0.08
8/26	5.24	7.63	9.40	7.06	7.99	9.96	14.36	9.80	-0.38	0.45	-0.04	-0.22	-0.52	-0.24	-0.16	0.97	0.20
9/3	5.23	7.64	9.63	7.13	7.70	9.72	13.65	9.42	-0.01	0.23	0.07	-0.29	-0.71	-0.38	0.28	0.94	0.45
9/9	5.55	8.67	9.99	7.14	7.11	8.45	18.45	9.09	0.32	0.36	0.01	-0.59	4.81	-0.33	0.91	-4.45	0.34
10/1	6.66	8.51	9.99	7.47	6.17	8.61	29.57	8.76	1.11	0.00	0.33	-0.94	11.11	-0.32	2.05	-11.11	0.65
10/20	6.88	11.52	15.34	7.86	6.54	20.71	54.09	8.83	0.22	5.35	0.39	0.37	24.52	0.06	-0.15	-19.17	0.33
10/28	7.10	14.53	19.38	7.99	7.27	40.14	55.78	9.26	0.22	4.04	0.13	0.73	1.69	0.43	-0.51	2.35	-0.30
11/5	7.61	23.65	7.58	7.58	9.38	9.42	9.38	9.38	0.51	-11.80	-0.41	2.12	-46.39	0.13	-1.61	34.59	-0.54

INTENTIONAL SECOND EXPOSURE

Appendix H.(Continued)

L M_P_Sed									Differences							Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.52	9.52	9.52	9.52	12.04	12.14	9.92	11.20	-1.03	0.30	-0.26	1.49	0.70	0.89	-2.52	-0.40	-1.15
5/22	8.35	9.49	9.49	9.29	12.07	11.52	9.53	11.21	-1.17	-0.03	-0.23	0.03	-0.39	0.01	-1.20	0.36	-0.24
6/1	7.78	8.76	9.42	8.94	11.64	11.57	10.42	11.26	-0.57	-0.07	-0.35	-0.43	0.89	0.05	-0.14	-0.96	-0.40
6/16	7.90	8.62	9.39	8.52	12.32	11.68	11.36	11.99	0.12	-0.03	-0.42	0.68	0.94	0.73	-0.56	-0.97	-1.15
6/30	6.72	8.41	9.07	8.12	11.56	11.95	11.99	11.78	-1.18	-0.32	-0.40	-0.76	0.63	-0.21	-0.42	-0.95	-0.19
7/14	6.67	8.27	8.98	7.75	10.61	11.34	12.59	11.19	-0.05	-0.09	-0.37	-0.95	0.59	-0.59	0.90	-0.68	0.22
7/30	5.86	7.02	8.88	7.40	9.32	10.54	12.49	10.26	-0.81	-0.10	-0.35	-1.29	-0.10	-0.93	0.48	0.00	0.58
8/18	5.62	7.63	8.95	7.10	8.21	9.91	14.88	10.04	-0.24	0.07	-0.30	-1.11	2.39	-0.22	0.87	-2.32	-0.08
8/26	5.24	7.63	9.40	7.06	7.99	9.96	14.36	9.80	-0.38	0.45	-0.04	-0.22	-0.52	-0.24	-0.16	0.97	0.20
9/3	5.23	7.64	9.63	7.13	7.70	9.72	13.65	9.42	-0.01	0.23	0.07	-0.29	-0.71	-0.38	0.28	0.94	0.45
9/9	5.55	8.67	9.99	7.14	7.11	8.45	18.45	9.09	0.32	0.36	0.01	-0.59	4.81	-0.33	0.91	-4.45	0.34
10/1	6.66	8.51	9.99	7.47	6.17	8.61	29.57	8.76	1.11	0.00	0.33	-0.94	11.11	-0.32	2.05	-11.11	0.65
10/20	6.88	11.52	15.34	7.86	6.54	20.71	54.09	8.83	0.22	5.35	0.39	0.37	24.52	0.06	-0.15	-19.17	0.33
10/28	7.10	14.53	19.38	7.99	7.27	40.14	55.78	9.26	0.22	4.04	0.13	0.73	1.69	0.43	-0.51	2.35	-0.30
11/5	7.61	23.65	7.58	7.58	9.38	9.42	9.38	9.38	0.51	-11.80	-0.41	2.12	-46.39	0.13	-1.61	34.59	-0.54

Appendix H (Continued)

L M P									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.52	9.52	9.52	9.52	12.04	12.14	9.92	11.20	-1.03	0.30	-0.26	1.49	0.70	0.89	-2.52	-0.40	-1.15
5/22	8.35	9.49	9.49	9.29	12.07	11.52	9.53	11.21	-1.17	-0.03	-0.23	0.03	-0.39	0.01	-1.20	0.36	-0.24
6/1	7.78	8.76	9.42	8.94	11.64	11.57	10.42	11.26	-0.57	-0.07	-0.35	-0.43	0.89	0.05	-0.14	-0.96	-0.40
6/16	7.90	8.62	9.39	8.52	12.32	11.68	11.36	11.99	0.12	-0.03	-0.42	0.68	0.94	0.73	-0.56	-0.97	-1.15
6/30	6.72	8.41	9.07	8.12	11.56	11.95	11.99	11.78	-1.18	-0.32	-0.40	-0.76	0.63	-0.21	-0.42	-0.95	-0.19
7/14	6.67	8.27	8.98	7.75	10.61	11.34	12.59	11.19	-0.05	-0.09	-0.37	-0.95	0.59	-0.59	0.90	-0.68	0.22
7/30	5.84	6.93	8.54	7.24	9.32	10.54	12.49	10.26	-0.83	-0.44	-0.51	-1.29	-0.10	-0.93	0.46	-0.34	0.42
8/18	5.54	7.33	8.13	6.74	8.21	9.91	14.88	10.04	-0.30	-0.41	-0.50	-1.11	2.39	-0.22	0.81	-2.80	-0.28
8/26	5.16	7.33	8.13	6.57	7.99	9.96	14.36	9.80	-0.38	0.00	-0.17	-0.22	-0.52	-0.24	-0.16	0.52	0.07
9/3	5.12	6.97	7.93	6.41	7.70	9.72	13.65	9.42	-0.04	-0.20	-0.16	-0.29	-0.71	-0.38	0.25	0.51	0.22
9/9	5.32	7.41	7.93	6.31	7.11	8.45	18.45	9.09	0.20	0.00	-0.10	-0.59	4.81	-0.33	0.79	-4.81	0.23
10/1	5.72	6.47	6.82	6.01	6.17	8.61	29.57	8.76	0.40	-1.11	-0.30	-0.94	11.11	-0.32	1.34	-12.22	0.02
10/20	5.68	6.70	6.82	5.85	6.54	20.71	54.09	8.83	-0.04	0.00	-0.16	0.37	24.52	0.06	-0.41	-24.52	-0.22
10/28	5.68	6.76	6.82	5.79	7.27	40.14	55.78	9.26	0.00	0.00	-0.06	0.73	1.69	0.43	-0.73	-1.69	-0.49
11/5	5.71	6.82	5.71	5.71	9.38	9.42	9.38	9.38	0.03	-1.11	-0.08	2.12	-46.39	0.13	-2.09	45.28	-0.21

Appendix H (Continued)

L M_P									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.52	9.52	9.52	9.52	12.04	12.14	9.92	11.20	-1.03	0.30	-0.26	1.49	0.70	0.89	-2.52	-0.40	-1.15
5/22	8.35	9.49	9.49	9.29	12.07	11.52	9.53	11.21	-1.17	-0.03	-0.23	0.03	-0.39	0.01	-1.20	0.36	-0.24
6/1	7.78	8.76	9.42	8.94	11.64	11.57	10.42	11.26	-0.57	-0.07	-0.35	-0.43	0.89	0.05	-0.14	-0.96	-0.40
6/16	7.90	8.62	9.39	8.52	12.32	11.68	11.36	11.99	0.12	-0.03	-0.42	0.68	0.94	0.73	-0.56	-0.97	-1.15
6/30	6.72	8.41	9.07	8.12	11.56	11.95	11.99	11.78	-1.18	-0.32	-0.40	-0.76	0.63	-0.21	-0.42	-0.95	-0.19
7/14	6.67	8.27	8.98	7.75	10.61	11.34	12.59	11.19	-0.05	-0.09	-0.37	-0.95	0.59	-0.59	0.90	-0.68	0.22
7/30	5.84	6.93	8.54	7.24	9.32	10.54	12.49	10.26	-0.83	-0.44	-0.51	-1.29	-0.10	-0.93	0.46	-0.34	0.42
8/18	5.54	7.33	8.13	6.74	8.21	9.91	14.88	10.04	-0.30	-0.41	-0.50	-1.11	2.39	-0.22	0.81	-2.80	-0.28
8/26	5.16	7.33	8.13	6.57	7.99	9.96	14.36	9.80	-0.38	0.00	-0.17	-0.22	-0.52	-0.24	-0.16	0.52	0.07
9/3	5.12	6.97	7.93	6.41	7.70	9.72	13.65	9.42	-0.04	-0.20	-0.16	-0.29	-0.71	-0.38	0.25	0.51	0.22
9/9	5.32	7.41	7.93	6.31	7.11	8.45	18.45	9.09	0.20	0.00	-0.10	-0.59	4.81	-0.33	0.79	-4.81	0.23
10/1	5.72	6.47	6.82	6.01	6.17	8.61	29.57	8.76	0.40	-1.11	-0.30	-0.94	11.11	-0.32	1.34	-12.22	0.02
10/20	5.68	6.70	6.82	5.85	6.54	20.71	54.09	8.83	-0.04	0.00	-0.16	0.37	24.52	0.06	-0.41	-24.52	-0.22
10/28	5.68	6.76	6.82	5.79	7.27	40.14	55.78	9.26	0.00	0.00	-0.06	0.73	1.69	0.43	-0.73	-1.69	-0.49
11/5	5.71	6.82	5.71	5.71	9.38	9.42	9.38	9.38	0.03	-1.11	-0.08	2.12	-46.39	0.13	-2.09	45.28	-0.21

Appendix H (Continued)

L_M									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.78	9.78	9.78	9.78	12.04	12.14	9.92	11.20	-0.77	0.56	0.00	1.49	0.70	0.89	-2.26	-0.14	-0.89
5/22	9.78	9.78	9.78	9.78	12.07	11.52	9.53	11.21	0.00	0.00	0.00	0.03	-0.39	0.01	-0.03	0.39	-0.01
6/1	9.78	9.78	9.78	9.78	11.64	11.57	10.42	11.26	0.00	0.00	0.00	-0.43	0.89	0.05	0.43	-0.89	-0.05
6/16	9.78	9.78	9.78	9.78	12.32	11.68	11.36	11.99	0.00	0.00	0.00	0.68	0.94	0.73	-0.68	-0.94	-0.73
6/30	9.78	9.78	9.78	9.78	11.56	11.95	11.99	11.78	0.00	0.00	0.00	-0.76	0.63	-0.21	0.76	-0.63	0.21
7/14	9.78	9.78	9.78	9.78	10.61	11.34	12.59	11.19	0.00	0.00	0.00	-0.95	0.59	-0.59	0.95	-0.59	0.59
7/30	9.78	9.78	9.78	9.78	9.32	10.54	12.49	10.26	0.00	0.00	0.00	-1.29	-0.10	-0.93	1.29	0.10	0.93
8/18	9.78	9.78	9.78	9.78	8.21	9.91	14.88	10.04	0.00	0.00	0.00	-1.11	2.39	-0.22	1.11	-2.39	0.22
8/26	9.78	9.78	9.78	9.78	7.99	9.96	14.36	9.80	0.00	0.00	0.00	-0.22	-0.52	-0.24	0.22	0.52	0.24
9/3	9.78	9.78	9.78	9.78	7.70	9.72	13.65	9.42	0.00	0.00	0.00	-0.29	-0.71	-0.38	0.29	0.71	0.38
9/9	9.78	9.78	9.78	9.78	7.11	8.45	18.45	9.09	0.00	0.00	0.00	-0.59	4.81	-0.33	0.59	-4.81	0.33
10/1	9.78	9.78	9.78	9.78	6.17	8.61	29.57	8.76	0.00	0.00	0.00	-0.94	11.11	-0.32	0.94	-11.11	0.32
10/20	9.78	9.78	9.78	9.78	6.54	20.71	54.09	8.83	0.00	0.00	0.00	0.37	24.52	0.06	-0.37	-24.52	-0.06
10/28	9.78	9.78	9.78	9.78	7.27	40.14	55.78	9.26	0.00	0.00	0.00	0.73	1.69	0.43	-0.73	-1.69	-0.43
11/5	9.78	9.78	9.78	9.78	9.38	9.42	9.38	9.38	0.00	0.00	0.00	2.12	-46.39	0.13	-2.12	46.39	-0.13

Appendix H (Continued)

L_M									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
5/1	10.55	10.35	9.22	9.78	10.55	10.35	9.22	10.31									
5/15	9.78	9.78	9.78	9.78	12.04	12.14	9.92	11.20	-0.77	0.56	0.00	1.49	0.70	0.89	-2.26	-0.14	-0.89
5/22	9.78	9.78	9.78	9.78	12.07	11.52	9.53	11.21	0.00	0.00	0.00	0.03	-0.39	0.01	-0.03	0.39	-0.01
6/1	9.78	9.78	9.78	9.78	11.64	11.57	10.42	11.26	0.00	0.00	0.00	-0.43	0.89	0.05	0.43	-0.89	-0.05
6/16	9.78	9.78	9.78	9.78	12.32	11.68	11.36	11.99	0.00	0.00	0.00	0.68	0.94	0.73	-0.68	-0.94	-0.73
6/30	9.78	9.78	9.78	9.78	11.56	11.95	11.99	11.78	0.00	0.00	0.00	-0.76	0.63	-0.21	0.76	-0.63	0.21
7/14	9.78	9.78	9.78	9.78	10.61	11.34	12.59	11.19	0.00	0.00	0.00	-0.95	0.59	-0.59	0.95	-0.59	0.59
7/30	9.78	9.78	9.78	9.78	9.32	10.54	12.49	10.26	0.00	0.00	0.00	-1.29	-0.10	-0.93	1.29	0.10	0.93
8/18	9.78	9.78	9.78	9.78	8.21	9.91	14.88	10.04	0.00	0.00	0.00	-1.11	2.39	-0.22	1.11	-2.39	0.22
8/26	9.78	9.78	9.78	9.78	7.99	9.96	14.36	9.80	0.00	0.00	0.00	-0.22	-0.52	-0.24	0.22	0.52	0.24
9/3	9.78	9.78	9.78	9.78	7.70	9.72	13.65	9.42	0.00	0.00	0.00	-0.29	-0.71	-0.38	0.29	0.71	0.38
9/9	9.78	9.78	9.78	9.78	7.11	8.45	18.45	9.09	0.00	0.00	0.00	-0.59	4.81	-0.33	0.59	-4.81	0.33
10/1	9.78	9.78	9.78	9.78	6.17	8.61	29.57	8.76	0.00	0.00	0.00	-0.94	11.11	-0.32	0.94	-11.11	0.32
10/20	9.78	9.78	9.78	9.78	6.54	20.71	54.09	8.83	0.00	0.00	0.00	0.37	24.52	0.06	-0.37	-24.52	-0.06
10/28	9.78	9.78	9.78	9.78	7.27	40.14	55.78	9.26	0.00	0.00	0.00	0.73	1.69	0.43	-0.73	-1.69	-0.43
11/5	9.78	9.78	9.78	9.78	9.38	9.42	9.38	9.38	0.00	0.00	0.00	2.12	-46.39	0.13	-2.12	46.39	-0.13

Appendix I. Data Output and Analysis Table of Lake Giles 1999 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diffs of Diffs was calculated by subtracting the modeled differences by the measured difference. All Values are ad_320 values unless otherwise noted.

G99 M_P_seds_rr_bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.65	1.04	0.97	0.90	0.64	1.08	0.98	0.86	-0.22	0.05	-0.07	-0.22	0.06	-0.11	0.00	-0.01	0.04
06/15/99	0.54	1.05	0.98	0.87	0.52	1.16	0.77	0.77	-0.11	0.01	-0.03	-0.13	-0.21	-0.08	0.02	0.22	0.05
06/21/99	0.58	1.06	1.01	0.83	0.68	1.27	1.02	0.88	0.04	0.03	-0.04	0.16	0.25	0.10	-0.12	-0.22	-0.14
07/01/99	0.50	1.03	0.70	0.78	0.31	1.09	0.78	0.58	-0.08	-0.31	-0.05	-0.37	-0.25	-0.30	0.29	-0.06	0.25
07/07/99	0.50	0.91	0.59	0.75	0.43	1.05	0.51	0.71	0.00	-0.11	-0.03	0.12	-0.27	0.13	-0.12	0.16	-0.16
07/21/99	0.54	0.93	0.85	0.71	0.40	1.19	0.93	0.68	0.04	0.26	-0.04	-0.03	0.41	-0.03	0.07	-0.15	-0.01
08/16/99	0.40	1.17	1.09	0.71	0.57	1.74	1.42	0.88	-0.14	0.24	0.00	0.16	0.49	0.20	-0.30	-0.25	-0.20
09/02/99	0.47	1.66	1.59	0.84	0.50	1.85	1.56	0.76	0.07	0.50	0.13	-0.06	0.14	-0.12	0.13	0.36	0.25
09/18/99	0.72	2.04	1.66	1.08	0.92	1.98	1.67	1.04	0.25	0.07	0.24	0.41	0.12	0.28	-0.16	-0.05	-0.04
10/07/99	0.86	2.15	1.73	1.11	0.75	2.05	1.43	0.82	0.14	0.07	0.03	-0.16	-0.24	-0.22	0.30	0.31	0.25
10/21/99	0.90	2.20	1.93	1.08	0.73	3.86	1.20	0.81	0.04	0.20	-0.03	-0.02	-0.23	-0.01	0.06	0.43	-0.02
11/13/99	1.05	1.05	1.05	1.05	0.74	0.74	0.74	0.74	0.15	-0.88	-0.03	0.00	-0.46	-0.08	0.15	-0.42	0.05
12/02/99	1.02	1.02	1.02	1.02	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

Appendix I. Data Output and Analysis Table of Lake Giles 1999 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diffs of Diffs was calculated by subtracting the modeled differences by the measured difference. All Values are ad_320 values unless otherwise noted.

G99 M_P_seds_rr_bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.65	1.04	0.97	0.90	0.64	1.08	0.98	0.86	-0.22	0.05	-0.07	-0.22	0.06	-0.11	0.00	-0.01	0.04
06/15/99	0.54	1.05	0.98	0.87	0.52	1.16	0.77	0.77	-0.11	0.01	-0.03	-0.13	-0.21	-0.08	0.02	0.22	0.05
06/21/99	0.58	1.06	1.01	0.83	0.68	1.27	1.02	0.88	0.04	0.03	-0.04	0.16	0.25	0.10	-0.12	-0.22	-0.14
07/01/99	0.50	1.03	0.70	0.78	0.31	1.09	0.78	0.58	-0.08	-0.31	-0.05	-0.37	-0.25	-0.30	0.29	-0.06	0.25
07/07/99	0.50	0.91	0.59	0.75	0.43	1.05	0.51	0.71	0.00	-0.11	-0.03	0.12	-0.27	0.13	-0.12	0.16	-0.16
07/21/99	0.54	0.93	0.85	0.71	0.40	1.19	0.93	0.68	0.04	0.26	-0.04	-0.03	0.41	-0.03	0.07	-0.15	-0.01
08/16/99	0.40	1.17	1.09	0.71	0.57	1.74	1.42	0.88	-0.14	0.24	0.00	0.16	0.49	0.20	-0.30	-0.25	-0.20
09/02/99	0.47	1.66	1.59	0.84	0.50	1.85	1.56	0.76	0.07	0.50	0.13	-0.06	0.14	-0.12	0.13	0.36	0.25
09/18/99	0.72	2.04	1.66	1.08	0.92	1.98	1.67	1.04	0.25	0.07	0.24	0.41	0.12	0.28	-0.16	-0.05	-0.04
10/07/99	0.86	2.15	1.73	1.11	0.75	2.05	1.43	0.82	0.14	0.07	0.03	-0.16	-0.24	-0.22	0.30	0.31	0.25
10/21/99	0.90	2.20	1.93	1.08	0.73	3.86	1.20	0.81	0.04	0.20	-0.03	-0.02	-0.23	-0.01	0.06	0.43	-0.02
11/13/99	1.05	1.05	1.05	1.05	0.74	0.74	0.74	0.74	0.15	-0.88	-0.03	0.00	-0.46	-0.08	0.15	-0.42	0.05
12/02/99	1.02	1.02	1.02	1.02	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

Appendix I. (Continued)

G99 M_P_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.65	1.04	0.97	0.90	0.64	1.08	0.98	0.86	-0.22	0.05	-0.07	-0.22	0.06	-0.11	0.00	-0.01	0.04
06/15/99	0.54	1.05	0.98	0.87	0.52	1.16	0.77	0.77	-0.11	0.01	-0.03	-0.13	-0.21	-0.08	0.02	0.22	0.05
06/21/99	0.58	1.06	1.01	0.83	0.68	1.27	1.02	0.88	0.04	0.03	-0.04	0.16	0.25	0.10	-0.12	-0.22	-0.14
07/01/99	0.50	1.03	0.70	0.78	0.31	1.09	0.78	0.58	-0.08	-0.31	-0.05	-0.37	-0.25	-0.30	0.29	-0.06	0.25
07/07/99	0.50	0.91	0.59	0.75	0.43	1.05	0.51	0.71	0.00	-0.11	-0.03	0.12	-0.27	0.13	-0.12	0.16	-0.16
07/21/99	0.54	0.93	0.85	0.71	0.40	1.19	0.93	0.68	0.04	0.26	-0.04	-0.03	0.41	-0.03	0.07	-0.15	-0.01
08/16/99	0.40	0.99	0.90	0.63	0.57	1.74	1.42	0.88	-0.14	0.05	-0.08	0.16	0.49	0.20	-0.30	-0.44	-0.28
09/02/99	0.38	1.02	0.96	0.58	0.50	1.85	1.56	0.76	-0.02	0.06	-0.05	-0.06	0.14	-0.12	0.04	-0.08	0.07
09/18/99	0.56	1.04	0.83	0.68	0.92	1.98	1.67	1.04	0.18	-0.13	0.10	0.41	0.12	0.28	-0.23	-0.25	-0.18
10/07/99	0.58	1.05	0.88	0.67	0.75	2.05	1.43	0.82	0.02	0.05	-0.01	-0.16	-0.24	-0.22	0.18	0.29	0.21
10/21/99	0.57	1.10	0.97	0.65	0.73	3.86	1.20	0.81	-0.01	0.09	-0.02	-0.02	-0.23	-0.01	0.01	0.32	-0.01
11/13/99	0.61	0.61	0.61	0.61	0.74	0.74	0.74	0.74	0.04	-0.36	-0.04	0.00	-0.46	-0.08	0.04	0.10	0.04
12/02/99	0.58	0.58	0.58	0.58	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

INTENTIONAL SECOND EXPOSURE

Appendix I. (Continued)

G99 M_P_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.65	1.04	0.97	0.90	0.64	1.08	0.98	0.86	-0.22	0.05	-0.07	-0.22	0.06	-0.11	0.00	-0.01	0.04
06/15/99	0.54	1.05	0.98	0.87	0.52	1.16	0.77	0.77	-0.11	0.01	-0.03	-0.13	-0.21	-0.08	0.02	0.22	0.05
06/21/99	0.58	1.06	1.01	0.83	0.68	1.27	1.02	0.88	0.04	0.03	-0.04	0.16	0.25	0.10	-0.12	-0.22	-0.14
07/01/99	0.50	1.03	0.70	0.78	0.31	1.09	0.78	0.58	-0.08	-0.31	-0.05	-0.37	-0.25	-0.30	0.29	-0.06	0.25
07/07/99	0.50	0.91	0.59	0.75	0.43	1.05	0.51	0.71	0.00	-0.11	-0.03	0.12	-0.27	0.13	-0.12	0.16	-0.16
07/21/99	0.54	0.93	0.85	0.71	0.40	1.19	0.93	0.68	0.04	0.26	-0.04	-0.03	0.41	-0.03	0.07	-0.15	-0.01
08/16/99	0.40	0.99	0.90	0.63	0.57	1.74	1.42	0.88	-0.14	0.05	-0.08	0.16	0.49	0.20	-0.30	-0.44	-0.28
09/02/99	0.38	1.02	0.96	0.58	0.50	1.85	1.56	0.76	-0.02	0.06	-0.05	-0.06	0.14	-0.12	0.04	-0.08	0.07
09/18/99	0.56	1.04	0.83	0.68	0.92	1.98	1.67	1.04	0.18	-0.13	0.10	0.41	0.12	0.28	-0.23	-0.25	-0.18
10/07/99	0.58	1.05	0.88	0.67	0.75	2.05	1.43	0.82	0.02	0.05	-0.01	-0.16	-0.24	-0.22	0.18	0.29	0.21
10/21/99	0.57	1.10	0.97	0.65	0.73	3.86	1.20	0.81	-0.01	0.09	-0.02	-0.02	-0.23	-0.01	0.01	0.32	-0.01
11/13/99	0.61	0.61	0.61	0.61	0.74	0.74	0.74	0.74	0.04	-0.36	-0.04	0.00	-0.46	-0.08	0.04	0.10	0.04
12/02/99	0.58	0.58	0.58	0.58	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

Appendix I. (Continued)

G99 M_P_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.63	1.04	0.97	0.89	0.64	1.08	0.98	0.86	-0.24	0.05	-0.08	-0.22	0.06	-0.11	-0.02	-0.01	0.03
06/15/99	0.51	1.05	0.98	0.86	0.52	1.16	0.77	0.77	-0.12	0.01	-0.03	-0.13	-0.21	-0.08	0.01	0.22	0.05
06/21/99	0.56	1.06	1.01	0.82	0.68	1.27	1.02	0.88	0.05	0.03	-0.04	0.16	0.25	0.10	-0.11	-0.22	-0.14
07/01/99	0.48	1.03	0.69	0.77	0.31	1.09	0.78	0.58	-0.08	-0.32	-0.05	-0.37	-0.25	-0.30	0.29	-0.07	0.25
07/07/99	0.48	0.90	0.57	0.74	0.43	1.05	0.51	0.71	0.00	-0.12	-0.03	0.12	-0.27	0.13	-0.12	0.15	-0.16
07/21/99	0.51	0.93	0.84	0.69	0.40	1.19	0.93	0.68	0.03	0.27	-0.05	-0.03	0.41	-0.03	0.06	-0.14	-0.02
08/16/99	0.35	0.98	0.89	0.60	0.57	1.74	1.42	0.88	-0.16	0.05	-0.09	0.16	0.49	0.20	-0.32	-0.44	-0.29
09/02/99	0.33	1.01	0.96	0.54	0.50	1.85	1.56	0.76	-0.02	0.07	-0.06	-0.06	0.14	-0.12	0.04	-0.07	0.06
09/18/99	0.29	1.03	0.81	0.49	0.92	1.98	1.67	1.04	-0.04	-0.15	-0.05	0.41	0.12	0.28	-0.45	-0.27	-0.33
10/07/99	0.31	1.04	0.80	0.45	0.75	2.05	1.43	0.82	0.02	-0.01	-0.04	-0.16	-0.24	-0.22	0.18	0.23	0.18
10/21/99	0.31	1.09	0.92	0.42	0.73	3.86	1.20	0.81	0.00	0.12	-0.03	-0.02	-0.23	-0.01	0.02	0.35	-0.02
11/13/99	0.37	0.37	0.37	0.37	0.74	0.74	0.74	0.74	0.06	-0.55	-0.05	0.00	-0.46	-0.08	0.06	-0.09	0.03
12/02/99	0.34	0.34	0.34	0.34	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

INTENTIONAL SECOND EXPOSURE

Appendix I. (Continued)

G99 M_P_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.97	0.87	1.07	0.92	0.96									
06/10/99	0.63	1.04	0.97	0.89	0.64	1.08	0.98	0.86	-0.24	0.05	-0.08	-0.22	0.06	-0.11	-0.02	-0.01	0.03
06/15/99	0.51	1.05	0.98	0.86	0.52	1.16	0.77	0.77	-0.12	0.01	-0.03	-0.13	-0.21	-0.08	0.01	0.22	0.05
06/21/99	0.56	1.06	1.01	0.82	0.68	1.27	1.02	0.88	0.05	0.03	-0.04	0.16	0.25	0.10	-0.11	-0.22	-0.14
07/01/99	0.48	1.03	0.69	0.77	0.31	1.09	0.78	0.58	-0.08	-0.32	-0.05	-0.37	-0.25	-0.30	0.29	-0.07	0.25
07/07/99	0.48	0.90	0.57	0.74	0.43	1.05	0.51	0.71	0.00	-0.12	-0.03	0.12	-0.27	0.13	-0.12	0.15	-0.16
07/21/99	0.51	0.93	0.84	0.69	0.40	1.19	0.93	0.68	0.03	0.27	-0.05	-0.03	0.41	-0.03	0.06	-0.14	-0.02
08/16/99	0.35	0.98	0.89	0.60	0.57	1.74	1.42	0.88	-0.16	0.05	-0.09	0.16	0.49	0.20	-0.32	-0.44	-0.29
09/02/99	0.33	1.01	0.96	0.54	0.50	1.85	1.56	0.76	-0.02	0.07	-0.06	-0.06	0.14	-0.12	0.04	-0.07	0.06
09/18/99	0.29	1.03	0.81	0.49	0.92	1.98	1.67	1.04	-0.04	-0.15	-0.05	0.41	0.12	0.28	-0.45	-0.27	-0.33
10/07/99	0.31	1.04	0.80	0.45	0.75	2.05	1.43	0.82	0.02	-0.01	-0.04	-0.16	-0.24	-0.22	0.18	0.23	0.18
10/21/99	0.31	1.09	0.92	0.42	0.73	3.86	1.20	0.81	0.00	0.12	-0.03	-0.02	-0.23	-0.01	0.02	0.35	-0.02
11/13/99	0.37	0.37	0.37	0.37	0.74	0.74	0.74	0.74	0.06	-0.55	-0.05	0.00	-0.46	-0.08	0.06	-0.09	0.03
12/02/99	0.34	0.34	0.34	0.34	1.07	1.07	1.07	1.07	-0.03	-0.03	-0.03	0.33	0.33	0.33	-0.36	-0.36	-0.36

Appendix I. (Continued)

G99 M_P	Output From Stella Model				Actual Measured Values				Differences: Model Output (Mo)			Differences: Measured Values (Mv)			Diffs of Diffs: Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.96	0.87	1.07	0.92	0.96									
06/10/99	0.63	1.01	0.95	0.87	0.64	1.08	0.98	0.86	-0.24	0.03	-0.09	-0.22	0.06	-0.11	-0.02	-0.03	0.02
06/15/99	0.51	1.01	0.95	0.83	0.52	1.16	0.77	0.77	-0.12	0.00	-0.04	-0.13	-0.21	-0.08	0.01	0.21	0.04
06/21/99	0.54	1.01	0.98	0.79	0.68	1.27	1.02	0.88	0.03	0.03	-0.04	0.16	0.25	0.10	-0.13	-0.22	-0.14
07/01/99	0.45	0.97	0.65	0.72	0.31	1.09	0.78	0.58	-0.09	-0.33	-0.07	-0.37	-0.25	-0.30	0.28	-0.08	0.23
07/07/99	0.45	0.84	0.53	0.69	0.43	1.05	0.51	0.71	0.00	-0.12	-0.03	0.12	-0.27	0.13	-0.12	0.15	-0.16
07/21/99	0.46	0.84	0.76	0.63	0.40	1.19	0.93	0.68	0.01	0.23	-0.06	-0.03	0.41	-0.03	0.04	-0.18	-0.03
08/16/99	0.28	0.84	0.78	0.51	0.57	1.74	1.42	0.88	-0.18	0.02	-0.12	0.16	0.49	0.20	-0.34	-0.47	-0.32
09/02/99	0.25	0.84	0.81	0.43	0.50	1.85	1.56	0.76	-0.03	0.03	-0.08	-0.06	0.14	-0.12	0.03	-0.11	0.04
09/18/99	0.19	0.83	0.65	0.37	0.92	1.98	1.67	1.04	-0.06	-0.16	-0.06	0.41	0.12	0.28	-0.47	-0.28	-0.34
10/07/99	0.19	0.79	0.61	0.31	0.75	2.05	1.43	0.82	0.00	-0.04	-0.06	-0.16	-0.24	-0.22	0.16	0.20	0.16
10/21/99	0.17	0.79	0.69	0.26	0.73	3.86	1.20	0.81	-0.02	0.08	-0.05	-0.02	-0.23	-0.01	0.00	0.31	-0.04
11/13/99	0.19	0.19	0.19	0.19	0.74	0.74	0.74	0.74	0.02	-0.50	-0.07	0.00	-0.46	-0.08	0.02	-0.04	0.01
12/02/99	0.14	0.14	0.14	0.14	1.07	1.07	1.07	1.07	-0.05	-0.05	-0.05	0.33	0.33	0.33	-0.38	-0.38	-0.38

INTENTIONAL SECOND EXPOSURE

Appendix I. (Continued)

G99 M_P									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.96	0.87	1.07	0.92	0.96									
06/10/99	0.63	1.01	0.95	0.87	0.64	1.08	0.98	0.86	-0.24	0.03	-0.09	-0.22	0.06	-0.11	-0.02	-0.03	0.02
06/15/99	0.51	1.01	0.95	0.83	0.52	1.16	0.77	0.77	-0.12	0.00	-0.04	-0.13	-0.21	-0.08	0.01	0.21	0.04
06/21/99	0.54	1.01	0.98	0.79	0.68	1.27	1.02	0.88	0.03	0.03	-0.04	0.16	0.25	0.10	-0.13	-0.22	-0.14
07/01/99	0.45	0.97	0.65	0.72	0.31	1.09	0.78	0.58	-0.09	-0.33	-0.07	-0.37	-0.25	-0.30	0.28	-0.08	0.23
07/07/99	0.45	0.84	0.53	0.69	0.43	1.05	0.51	0.71	0.00	-0.12	-0.03	0.12	-0.27	0.13	-0.12	0.15	-0.16
07/21/99	0.46	0.84	0.76	0.63	0.40	1.19	0.93	0.68	0.01	0.23	-0.06	-0.03	0.41	-0.03	0.04	-0.18	-0.03
08/16/99	0.28	0.84	0.78	0.51	0.57	1.74	1.42	0.88	-0.18	0.02	-0.12	0.16	0.49	0.20	-0.34	-0.47	-0.32
09/02/99	0.25	0.84	0.81	0.43	0.50	1.85	1.56	0.76	-0.03	0.03	-0.08	-0.06	0.14	-0.12	0.03	-0.11	0.04
09/18/99	0.19	0.83	0.65	0.37	0.92	1.98	1.67	1.04	-0.06	-0.16	-0.06	0.41	0.12	0.28	-0.47	-0.28	-0.34
10/07/99	0.19	0.79	0.61	0.31	0.75	2.05	1.43	0.82	0.00	-0.04	-0.06	-0.16	-0.24	-0.22	0.16	0.20	0.16
10/21/99	0.17	0.79	0.69	0.26	0.73	3.86	1.20	0.81	-0.02	0.08	-0.05	-0.02	-0.23	-0.01	0.00	0.31	-0.04
11/13/99	0.19	0.19	0.19	0.19	0.74	0.74	0.74	0.74	0.02	-0.50	-0.07	0.00	-0.46	-0.08	0.02	-0.04	0.01
12/02/99	0.14	0.14	0.14	0.14	1.07	1.07	1.07	1.07	-0.05	-0.05	-0.05	0.33	0.33	0.33	-0.38	-0.38	-0.38

Appendix I. (Continued)

G99_M									Differences							Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.96	0.87	1.07	0.92	0.96									
06/10/99	0.89	1.01	0.95	0.96	0.64	1.08	0.98	0.86	0.02	0.03	0.00	-0.22	0.06	-0.11	0.24	-0.03	0.11
06/15/99	0.89	1.01	0.95	0.96	0.52	1.16	0.77	0.77	0.00	0.00	0.00	-0.13	-0.21	-0.08	0.13	0.21	0.08
06/21/99	0.91	1.01	0.98	0.96	0.68	1.27	1.02	0.88	0.02	0.03	0.00	0.16	0.25	0.10	-0.14	-0.22	-0.10
07/01/99	0.92	0.99	0.94	0.96	0.31	1.09	0.78	0.58	0.01	-0.04	0.00	-0.37	-0.25	-0.30	0.38	0.21	0.30
07/07/99	0.93	0.98	0.94	0.96	0.43	1.05	0.51	0.71	0.01	0.00	0.00	0.12	-0.27	0.13	-0.11	0.27	-0.13
07/21/99	0.95	0.98	0.97	0.96	0.40	1.19	0.93	0.68	0.02	0.03	0.00	-0.03	0.41	-0.03	0.05	-0.38	0.03
08/16/99	0.95	0.98	0.97	0.96	0.57	1.74	1.42	0.88	0.00	0.00	0.00	0.16	0.49	0.20	-0.16	-0.49	-0.20
09/02/99	0.95	0.98	0.97	0.96	0.50	1.85	1.56	0.76	0.00	0.00	0.00	-0.06	0.14	-0.12	0.06	-0.14	0.12
09/18/99	0.95	0.97	0.97	0.96	0.92	1.98	1.67	1.04	0.00	0.00	0.00	0.41	0.12	0.28	-0.41	-0.12	-0.28
10/07/99	0.95	0.97	0.97	0.96	0.75	2.05	1.43	0.82	0.00	0.00	0.00	-0.16	-0.24	-0.22	0.16	0.24	0.22
10/21/99	0.96	0.97	0.97	0.96	0.73	3.86	1.20	0.81	0.01	0.00	0.00	-0.02	-0.23	-0.01	0.03	0.23	0.01
11/13/99	0.96	0.96	0.96	0.96	0.74	0.74	0.74	0.74	0.00	-0.01	0.00	0.00	-0.46	-0.08	0.00	0.45	0.08
12/02/99	0.96	0.96	0.96	0.96	1.07	1.07	1.07	1.07	0.00	0.00	0.00	0.33	0.33	0.33	-0.33	-0.33	-0.33

INTENTIONAL SECOND EXPOSURE

Appendix I. (Continued)

G99_M									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
06/01/99	0.87	1.03	0.92	0.96	0.87	1.07	0.92	0.96									
06/10/99	0.89	1.01	0.95	0.96	0.64	1.08	0.98	0.86	0.02	0.03	0.00	-0.22	0.06	-0.11	0.24	-0.03	0.11
06/15/99	0.89	1.01	0.95	0.96	0.52	1.16	0.77	0.77	0.00	0.00	0.00	-0.13	-0.21	-0.08	0.13	0.21	0.08
06/21/99	0.91	1.01	0.98	0.96	0.68	1.27	1.02	0.88	0.02	0.03	0.00	0.16	0.25	0.10	-0.14	-0.22	-0.10
07/01/99	0.92	0.99	0.94	0.96	0.31	1.09	0.78	0.58	0.01	-0.04	0.00	-0.37	-0.25	-0.30	0.38	0.21	0.30
07/07/99	0.93	0.98	0.94	0.96	0.43	1.05	0.51	0.71	0.01	0.00	0.00	0.12	-0.27	0.13	-0.11	0.27	-0.13
07/21/99	0.95	0.98	0.97	0.96	0.40	1.19	0.93	0.68	0.02	0.03	0.00	-0.03	0.41	-0.03	0.05	-0.38	0.03
08/16/99	0.95	0.98	0.97	0.96	0.57	1.74	1.42	0.88	0.00	0.00	0.00	0.16	0.49	0.20	-0.16	-0.49	-0.20
09/02/99	0.95	0.98	0.97	0.96	0.50	1.85	1.56	0.76	0.00	0.00	0.00	-0.06	0.14	-0.12	0.06	-0.14	0.12
09/18/99	0.95	0.97	0.97	0.96	0.92	1.98	1.67	1.04	0.00	0.00	0.00	0.41	0.12	0.28	-0.41	-0.12	-0.28
10/07/99	0.95	0.97	0.97	0.96	0.75	2.05	1.43	0.82	0.00	0.00	0.00	-0.16	-0.24	-0.22	0.16	0.24	0.22
10/21/99	0.96	0.97	0.97	0.96	0.73	3.86	1.20	0.81	0.01	0.00	0.00	-0.02	-0.23	-0.01	0.03	0.23	0.01
11/13/99	0.96	0.96	0.96	0.96	0.74	0.74	0.74	0.74	0.00	-0.01	0.00	0.00	-0.46	-0.08	0.00	0.45	0.08
12/02/99	0.96	0.96	0.96	0.96	1.07	1.07	1.07	1.07	0.00	0.00	0.00	0.33	0.33	0.33	-0.33	-0.33	-0.33

Appendix J. Data Output and Analysis Table of Lake Giles 1998 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diffs of Diffs was calculated by subtracting the modeled differences by the measured difference. All values are ad_320 values unless otherwise noted.

G Mix PF_seds_rr_bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.79	0.74	0.67	0.73	0.88	0.46	0.41	0.61	0.19	0.01	0.05	0.31	-0.25	-0.06	-0.12	0.26	0.11
06/08/98	0.61	0.75	0.70	0.67	1.20	1.17	1.01	1.15	-0.18	0.03	-0.06	0.32	0.60	0.53	-0.50	-0.57	-0.59
06/15/98	0.65	0.76	0.72	0.70	1.14	1.07	1.01	1.10	0.04	0.02	0.03	-0.06	0.00	-0.05	0.10	0.02	0.08
06/24/98	0.63	0.74	0.74	0.69	0.84	1.02	1.00	0.96	-0.02	0.02	-0.01	-0.30	-0.01	-0.14	0.28	0.03	0.13
07/13/98	0.56	0.89	0.84	0.73	0.66	1.14	1.14	0.86	-0.07	0.10	0.04	-0.18	0.15	-0.09	0.11	-0.05	0.13
07/20/98	0.48	1.08	1.02	0.80	0.58	1.13	1.11	0.81	-0.08	0.18	0.07	-0.08	-0.04	-0.06	0.00	0.22	0.13
08/04/98	0.47	1.48	1.33	0.93	0.56	1.33	1.22	0.85	-0.01	0.31	0.13	-0.02	0.11	0.04	0.01	0.20	0.09
08/12/98	0.39	1.69	1.53	0.99	0.58	1.70	1.57	1.00	-0.08	0.20	0.06	0.02	0.35	0.16	-0.10	-0.15	-0.10
09/02/98	0.40	1.98	1.84	1.05	0.53	1.67	1.37	0.84	0.01	0.31	0.06	-0.05	-0.20	-0.17	0.06	0.51	0.23
09/24/98	0.66	1.86	1.42	0.97	0.59	1.69	1.50	0.81	0.26	-0.42	-0.08	0.06	0.13	-0.03	0.20	-0.55	-0.05
09/30/98	0.62	1.88	1.42	0.95	0.49	1.73	1.69	0.76	-0.04	0.00	-0.02	-0.10	0.19	-0.05	0.06	-0.19	0.03
10/09/98	0.68	1.90	1.64	0.93	0.75	1.77	1.70	0.90	0.06	0.22	-0.02	0.26	0.01	0.13	-0.20	0.21	-0.15
11/03/98	0.73	0.73	0.73	0.73	0.77	0.75	0.75	0.77	0.05	-0.91	-0.20	0.01	-0.95	-0.13	0.04	0.04	-0.07

Appendix J. Data Output and Analysis Table of Lake Giles 1998 data. Differences was calculated as absorbance at date J minus absorbance at date J-1 date. Diffs of Diffs was calculated by subtracting the modeled differences by the measured difference. All values are ad_320 values unless otherwise noted.

G Mix_PF_seds_rr_bio									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.79	0.74	0.67	0.73	0.88	0.46	0.41	0.61	0.19	0.01	0.05	0.31	-0.25	-0.06	-0.12	0.26	0.11
06/08/98	0.61	0.75	0.70	0.67	1.20	1.17	1.01	1.15	-0.18	0.03	-0.06	0.32	0.60	0.53	-0.50	-0.57	-0.59
06/15/98	0.65	0.76	0.72	0.70	1.14	1.07	1.01	1.10	0.04	0.02	0.03	-0.06	0.00	-0.05	0.10	0.02	0.08
06/24/98	0.63	0.74	0.74	0.69	0.84	1.02	1.00	0.96	-0.02	0.02	-0.01	-0.30	-0.01	-0.14	0.28	0.03	0.13
07/13/98	0.56	0.89	0.84	0.73	0.66	1.14	1.14	0.86	-0.07	0.10	0.04	-0.18	0.15	-0.09	0.11	-0.05	0.13
07/20/98	0.48	1.08	1.02	0.80	0.58	1.13	1.11	0.81	-0.08	0.18	0.07	-0.08	-0.04	-0.06	0.00	0.22	0.13
08/04/98	0.47	1.48	1.33	0.93	0.56	1.33	1.22	0.85	-0.01	0.31	0.13	-0.02	0.11	0.04	0.01	0.20	0.09
08/12/98	0.39	1.69	1.53	0.99	0.58	1.70	1.57	1.00	-0.08	0.20	0.06	0.02	0.35	0.16	-0.10	-0.15	-0.10
09/02/98	0.40	1.98	1.84	1.05	0.53	1.67	1.37	0.84	0.01	0.31	0.06	-0.05	-0.20	-0.17	0.06	0.51	0.23
09/24/98	0.66	1.86	1.42	0.97	0.59	1.69	1.50	0.81	0.26	-0.42	-0.08	0.06	0.13	-0.03	0.20	-0.55	-0.05
09/30/98	0.62	1.88	1.42	0.95	0.49	1.73	1.69	0.76	-0.04	0.00	-0.02	-0.10	0.19	-0.05	0.06	-0.19	0.03
10/09/98	0.68	1.90	1.64	0.93	0.75	1.77	1.70	0.90	0.06	0.22	-0.02	0.26	0.01	0.13	-0.20	0.21	-0.15
11/03/98	0.73	0.73	0.73	0.73	0.77	0.75	0.75	0.77	0.05	-0.91	-0.20	0.01	-0.95	-0.13	0.04	0.04	-0.07

Appendix J. (Continued)

G Mix_PF_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.79	0.74	0.67	0.73	0.88	0.46	0.41	0.61	0.19	0.01	0.05	0.31	-0.25	-0.06	-0.12	0.26	0.11
06/08/98	0.61	0.75	0.70	0.67	1.20	1.17	1.01	1.15	-0.18	0.03	-0.06	0.32	0.60	0.53	-0.50	-0.57	-0.59
06/15/98	0.65	0.76	0.72	0.70	1.14	1.07	1.01	1.10	0.04	0.02	0.03	-0.06	0.00	-0.05	0.10	0.02	0.08
06/24/98	0.63	0.74	0.74	0.69	0.84	1.02	1.00	0.96	-0.02	0.02	-0.01	-0.30	-0.01	-0.14	0.28	0.03	0.13
07/13/98	0.55	0.77	0.72	0.66	0.66	1.14	1.14	0.86	-0.08	-0.02	-0.03	-0.18	0.15	-0.09	0.10	-0.17	0.06
07/20/98	0.48	0.78	0.73	0.63	0.58	1.13	1.11	0.81	-0.07	0.01	-0.03	-0.08	-0.04	-0.06	0.01	0.05	0.03
08/04/98	0.37	0.80	0.72	0.56	0.56	1.33	1.22	0.85	-0.11	-0.01	-0.07	-0.02	0.11	0.04	-0.09	-0.12	-0.11
08/12/98	0.29	0.82	0.73	0.53	0.58	1.70	1.57	1.00	-0.08	0.01	-0.03	0.02	0.35	0.16	-0.10	-0.34	-0.19
09/02/98	0.22	0.86	0.77	0.48	0.53	1.67	1.37	0.84	-0.07	0.04	-0.05	-0.05	-0.20	-0.17	-0.02	0.24	0.12
09/24/98	0.25	0.82	0.62	0.40	0.59	1.69	1.50	0.81	0.03	-0.15	-0.08	0.06	0.13	-0.03	-0.03	-0.28	-0.05
09/30/98	0.21	0.84	0.62	0.38	0.49	1.73	1.69	0.76	-0.04	0.00	-0.02	-0.10	0.19	-0.05	0.06	-0.19	0.03
10/09/98	0.23	0.86	0.73	0.36	0.75	1.77	1.70	0.90	0.02	0.11	-0.02	0.26	0.01	0.13	-0.24	0.10	-0.15
11/03/98	0.42	0.42	0.42	0.42	0.77	0.75	0.75	0.77	0.19	-0.31	0.06	0.01	-0.95	-0.13	0.18	0.64	0.19

Appendix J. (Continued)

G Mix_PF_seds_rr									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.79	0.74	0.67	0.73	0.88	0.46	0.41	0.61	0.19	0.01	0.05	0.31	-0.25	-0.06	-0.12	0.26	0.11
06/08/98	0.61	0.75	0.70	0.67	1.20	1.17	1.01	1.15	-0.18	0.03	-0.06	0.32	0.60	0.53	-0.50	-0.57	-0.59
06/15/98	0.65	0.76	0.72	0.70	1.14	1.07	1.01	1.10	0.04	0.02	0.03	-0.06	0.00	-0.05	0.10	0.02	0.08
06/24/98	0.63	0.74	0.74	0.69	0.84	1.02	1.00	0.96	-0.02	0.02	-0.01	-0.30	-0.01	-0.14	0.28	0.03	0.13
07/13/98	0.55	0.77	0.72	0.66	0.66	1.14	1.14	0.86	-0.08	-0.02	-0.03	-0.18	0.15	-0.09	0.10	-0.17	0.06
07/20/98	0.48	0.78	0.73	0.63	0.58	1.13	1.11	0.81	-0.07	0.01	-0.03	-0.08	-0.04	-0.06	0.01	0.05	0.03
08/04/98	0.37	0.80	0.72	0.56	0.56	1.33	1.22	0.85	-0.11	-0.01	-0.07	-0.02	0.11	0.04	-0.09	-0.12	-0.11
08/12/98	0.29	0.82	0.73	0.53	0.58	1.70	1.57	1.00	-0.08	0.01	-0.03	0.02	0.35	0.16	-0.10	-0.34	-0.19
09/02/98	0.22	0.86	0.77	0.48	0.53	1.67	1.37	0.84	-0.07	0.04	-0.05	-0.05	-0.20	-0.17	-0.02	0.24	0.12
09/24/98	0.25	0.82	0.62	0.40	0.59	1.69	1.50	0.81	0.03	-0.15	-0.08	0.06	0.13	-0.03	-0.03	-0.28	-0.05
09/30/98	0.21	0.84	0.62	0.38	0.49	1.73	1.69	0.76	-0.04	0.00	-0.02	-0.10	0.19	-0.05	0.06	-0.19	0.03
10/09/98	0.23	0.86	0.73	0.36	0.75	1.77	1.70	0.90	0.02	0.11	-0.02	0.26	0.01	0.13	-0.24	0.10	-0.15
11/03/98	0.42	0.42	0.42	0.42	0.77	0.75	0.75	0.77	0.19	-0.31	0.06	0.01	-0.95	-0.13	0.18	0.64	0.19

Appendix J. (Continued)

G Mix_PF_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.43	0.74	0.67	0.65	0.88	0.46	0.41	0.61	-0.17	0.01	-0.03	0.31	-0.25	-0.06	-0.48	0.26	0.03
06/08/98	0.30	0.71	0.59	0.50	1.20	1.17	1.01	1.15	-0.13	-0.08	-0.15	0.32	0.60	0.53	-0.45	-0.68	-0.68
06/15/98	0.31	0.72	0.63	0.49	1.14	1.07	1.01	1.10	0.01	0.04	-0.01	-0.06	0.00	-0.05	0.07	0.04	0.04
06/24/98	0.30	0.62	0.62	0.48	0.84	1.02	1.00	0.96	-0.01	-0.01	-0.01	-0.30	-0.01	-0.14	0.29	0.00	0.13
07/13/98	0.24	0.66	0.53	0.44	0.66	1.14	1.14	0.86	-0.06	-0.09	-0.04	-0.18	0.15	-0.09	0.12	-0.24	0.05
07/20/98	0.16	0.67	0.54	0.41	0.58	1.13	1.11	0.81	-0.08	0.01	-0.03	-0.08	-0.04	-0.06	0.00	0.05	0.03
08/04/98	0.07	0.68	0.53	0.34	0.56	1.33	1.22	0.85	-0.09	-0.01	-0.07	-0.02	0.11	0.04	-0.07	-0.12	-0.11
08/12/98	0.00	0.69	0.54	0.30	0.58	1.70	1.57	1.00	-0.07	0.01	-0.04	0.02	0.35	0.16	-0.09	-0.34	-0.20
09/02/98	0.00	0.74	0.60	0.29	0.53	1.67	1.37	0.84	0.00	0.06	-0.01	-0.05	-0.20	-0.17	0.05	0.26	0.16
09/24/98	0.08	0.69	0.47	0.24	0.59	1.69	1.50	0.81	0.08	-0.13	-0.05	0.06	0.13	-0.03	0.02	-0.26	-0.02
09/30/98	0.04	0.70	0.48	0.22	0.49	1.73	1.69	0.76	-0.04	0.01	-0.02	-0.10	0.19	-0.05	0.06	-0.18	0.03
10/09/98	0.05	0.73	0.59	0.19	0.75	1.77	1.70	0.90	0.01	0.11	-0.03	0.26	0.01	0.13	-0.25	0.10	-0.16
11/03/98	0.28	0.28	0.28	0.28	0.77	0.75	0.75	0.77	0.23	-0.31	0.09	0.01	-0.95	-0.13	0.22	0.64	0.22

Appendix J. (Continued)

G Mix_PF_seds									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.43	0.74	0.67	0.65	0.88	0.46	0.41	0.61	-0.17	0.01	-0.03	0.31	-0.25	-0.06	-0.48	0.26	0.03
06/08/98	0.30	0.71	0.59	0.50	1.20	1.17	1.01	1.15	-0.13	-0.08	-0.15	0.32	0.60	0.53	-0.45	-0.68	-0.68
06/15/98	0.31	0.72	0.63	0.49	1.14	1.07	1.01	1.10	0.01	0.04	-0.01	-0.06	0.00	-0.05	0.07	0.04	0.04
06/24/98	0.30	0.62	0.62	0.48	0.84	1.02	1.00	0.96	-0.01	-0.01	-0.01	-0.30	-0.01	-0.14	0.29	0.00	0.13
07/13/98	0.24	0.66	0.53	0.44	0.66	1.14	1.14	0.86	-0.06	-0.09	-0.04	-0.18	0.15	-0.09	0.12	-0.24	0.05
07/20/98	0.16	0.67	0.54	0.41	0.58	1.13	1.11	0.81	-0.08	0.01	-0.03	-0.08	-0.04	-0.06	0.00	0.05	0.03
08/04/98	0.07	0.68	0.53	0.34	0.56	1.33	1.22	0.85	-0.09	-0.01	-0.07	-0.02	0.11	0.04	-0.07	-0.12	-0.11
08/12/98	0.00	0.69	0.54	0.30	0.58	1.70	1.57	1.00	-0.07	0.01	-0.04	0.02	0.35	0.16	-0.09	-0.34	-0.20
09/02/98	0.00	0.74	0.60	0.29	0.53	1.67	1.37	0.84	0.00	0.06	-0.01	-0.05	-0.20	-0.17	0.05	0.26	0.16
09/24/98	0.08	0.69	0.47	0.24	0.59	1.69	1.50	0.81	0.08	-0.13	-0.05	0.06	0.13	-0.03	0.02	-0.26	-0.02
09/30/98	0.04	0.70	0.48	0.22	0.49	1.73	1.69	0.76	-0.04	0.01	-0.02	-0.10	0.19	-0.05	0.06	-0.18	0.03
10/09/98	0.05	0.73	0.59	0.19	0.75	1.77	1.70	0.90	0.01	0.11	-0.03	0.26	0.01	0.13	-0.25	0.10	-0.16
11/03/98	0.28	0.28	0.28	0.28	0.77	0.75	0.75	0.77	0.23	-0.31	0.09	0.01	-0.95	-0.13	0.22	0.64	0.22

Appendix J. (Continued)

G Mix_PF									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.43	0.73	0.66	0.64	0.88	0.46	0.41	0.61	-0.17	0.00	-0.04	0.31	-0.25	-0.06	-0.48	0.25	0.02
06/08/98	0.27	0.65	0.55	0.45	1.20	1.17	1.01	1.15	-0.16	-0.11	-0.19	0.32	0.60	0.53	-0.48	-0.71	-0.72
06/15/98	0.27	0.65	0.57	0.44	1.14	1.07	1.01	1.10	0.00	0.02	-0.01	-0.06	0.00	-0.05	0.06	0.02	0.04
06/24/98	0.25	0.55	0.55	0.42	0.84	1.02	1.00	0.96	-0.02	-0.02	-0.02	-0.30	-0.01	-0.14	0.28	-0.01	0.12
07/13/98	0.18	0.55	0.45	0.36	0.66	1.14	1.14	0.86	-0.07	-0.10	-0.06	-0.18	0.15	-0.09	0.11	-0.25	0.03
07/20/98	0.09	0.55	0.45	0.32	0.58	1.13	1.11	0.81	-0.09	0.00	-0.04	-0.08	-0.04	-0.06	-0.01	0.04	0.02
08/04/98	0.00	0.54	0.42	0.24	0.56	1.33	1.22	0.85	-0.09	-0.03	-0.08	-0.02	0.11	0.04	-0.07	-0.14	-0.12
08/12/98	0.00	0.54	0.42	0.24	0.58	1.70	1.57	1.00	0.00	0.00	0.00	0.02	0.35	0.16	-0.02	-0.35	-0.16
09/02/98	0.00	0.54	0.44	0.21	0.53	1.67	1.37	0.84	0.00	0.02	-0.03	-0.05	-0.20	-0.17	0.05	0.22	0.14
09/24/98	0.03	0.47	0.32	0.15	0.59	1.69	1.50	0.81	0.03	-0.12	-0.06	0.06	0.13	-0.03	-0.03	-0.25	-0.03
09/30/98	0.00	0.47	0.32	0.13	0.49	1.73	1.69	0.76	-0.03	0.00	-0.02	-0.10	0.19	-0.05	0.07	-0.19	0.03
10/09/98	0.01	0.47	0.38	0.11	0.75	1.77	1.70	0.90	0.01	0.06	-0.02	0.26	0.01	0.13	-0.25	0.05	-0.15
11/03/98	0.07	0.07	0.07	0.07	0.77	0.75	0.75	0.77	0.06	-0.31	-0.04	0.01	-0.95	-0.13	0.05	0.64	0.09

INTENTIONAL SECOND EXPOSURE

Appendix J. (Continued)

G Mix_PF									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.43	0.73	0.66	0.64	0.88	0.46	0.41	0.61	-0.17	0.00	-0.04	0.31	-0.25	-0.06	-0.48	0.25	0.02
06/08/98	0.27	0.65	0.55	0.45	1.20	1.17	1.01	1.15	-0.16	-0.11	-0.19	0.32	0.60	0.53	-0.48	-0.71	-0.72
06/15/98	0.27	0.65	0.57	0.44	1.14	1.07	1.01	1.10	0.00	0.02	-0.01	-0.06	0.00	-0.05	0.06	0.02	0.04
06/24/98	0.25	0.55	0.55	0.42	0.84	1.02	1.00	0.96	-0.02	-0.02	-0.02	-0.30	-0.01	-0.14	0.28	-0.01	0.12
07/13/98	0.18	0.55	0.45	0.36	0.66	1.14	1.14	0.86	-0.07	-0.10	-0.06	-0.18	0.15	-0.09	0.11	-0.25	0.03
07/20/98	0.09	0.55	0.45	0.32	0.58	1.13	1.11	0.81	-0.09	0.00	-0.04	-0.08	-0.04	-0.06	-0.01	0.04	0.02
08/04/98	0.00	0.54	0.42	0.24	0.56	1.33	1.22	0.85	-0.09	-0.03	-0.08	-0.02	0.11	0.04	-0.07	-0.14	-0.12
08/12/98	0.00	0.54	0.42	0.24	0.58	1.70	1.57	1.00	0.00	0.00	0.00	0.02	0.35	0.16	-0.02	-0.35	-0.16
09/02/98	0.00	0.54	0.44	0.21	0.53	1.67	1.37	0.84	0.00	0.02	-0.03	-0.05	-0.20	-0.17	0.05	0.22	0.14
09/24/98	0.03	0.47	0.32	0.15	0.59	1.69	1.50	0.81	0.03	-0.12	-0.06	0.06	0.13	-0.03	-0.03	-0.25	-0.03
09/30/98	0.00	0.47	0.32	0.13	0.49	1.73	1.69	0.76	-0.03	0.00	-0.02	-0.10	0.19	-0.05	0.07	-0.19	0.03
10/09/98	0.01	0.47	0.38	0.11	0.75	1.77	1.70	0.90	0.01	0.06	-0.02	0.26	0.01	0.13	-0.25	0.05	-0.15
11/03/98	0.07	0.07	0.07	0.07	0.77	0.75	0.75	0.77	0.06	-0.31	-0.04	0.01	-0.95	-0.13	0.05	0.64	0.09

Appendix J. (Continued)

G_Mix									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.60	0.73	0.66	0.68	0.88	0.46	0.41	0.61	0.00	0.00	0.00	0.31	-0.25	-0.06	-0.31	0.25	0.06
06/08/98	0.66	0.70	0.68	0.68	1.20	1.17	1.01	1.15	0.06	0.02	0.00	0.32	0.60	0.53	-0.26	-0.58	-0.53
06/15/98	0.66	0.70	0.69	0.68	1.14	1.07	1.01	1.10	0.00	0.01	0.00	-0.06	0.00	-0.05	0.06	0.01	0.05
06/24/98	0.66	0.69	0.69	0.68	0.84	1.02	1.00	0.96	0.00	0.00	0.00	-0.30	-0.01	-0.14	0.30	0.01	0.14
07/13/98	0.67	0.69	0.68	0.68	0.66	1.14	1.14	0.86	0.01	-0.01	0.00	-0.18	0.15	-0.09	0.19	-0.16	0.09
07/20/98	0.67	0.69	0.68	0.68	0.58	1.13	1.11	0.81	0.00	0.00	0.00	-0.08	-0.04	-0.06	0.08	0.04	0.06
08/04/98	0.67	0.69	0.68	0.68	0.56	1.33	1.22	0.85	0.00	0.00	0.00	-0.02	0.11	0.04	0.02	-0.11	-0.04
08/12/98	0.67	0.69	0.68	0.68	0.58	1.70	1.57	1.00	0.00	0.00	0.00	0.02	0.35	0.16	-0.02	-0.35	-0.16
09/02/98	0.67	0.69	0.68	0.68	0.53	1.67	1.37	0.84	0.00	0.00	0.00	-0.05	-0.20	-0.17	0.05	0.20	0.17
09/24/98	0.67	0.69	0.68	0.68	0.59	1.69	1.50	0.81	0.00	0.00	0.00	0.06	0.13	-0.03	-0.06	-0.13	0.03
09/30/98	0.67	0.69	0.68	0.68	0.49	1.73	1.69	0.76	0.00	0.00	0.00	-0.10	0.19	-0.05	0.10	-0.19	0.05
10/09/98	0.68	0.69	0.68	0.68	0.75	1.77	1.70	0.90	0.01	0.00	0.00	0.26	0.01	0.13	-0.25	-0.01	-0.13
11/03/98	0.68	0.68	0.68	0.68	0.77	0.75	0.75	0.77	0.00	0.00	0.00	0.01	-0.95	-0.13	-0.01	0.95	0.13

Appendix J. (Continued)

G_Mix									Differences						Diffs of Diffs		
	Output From Stella Model				Actual Measured Values				Model Output (Mo)			Measured Values (Mv)			Mo-Mv		
date	Epi	Meta	Hypo	WC	Epi	Meta	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC	Epi	Hypo	WC
05/01/98	0.60	0.73	0.66	0.68	0.58	0.77	0.66	0.67									
05/11/98	0.60	0.73	0.66	0.68	0.88	0.46	0.41	0.61	0.00	0.00	0.00	0.31	-0.25	-0.06	-0.31	0.25	0.06
06/08/98	0.66	0.70	0.68	0.68	1.20	1.17	1.01	1.15	0.06	0.02	0.00	0.32	0.60	0.53	-0.26	-0.58	-0.53
06/15/98	0.66	0.70	0.69	0.68	1.14	1.07	1.01	1.10	0.00	0.01	0.00	-0.06	0.00	-0.05	0.06	0.01	0.05
06/24/98	0.66	0.69	0.69	0.68	0.84	1.02	1.00	0.96	0.00	0.00	0.00	-0.30	-0.01	-0.14	0.30	0.01	0.14
07/13/98	0.67	0.69	0.68	0.68	0.66	1.14	1.14	0.86	0.01	-0.01	0.00	-0.18	0.15	-0.09	0.19	-0.16	0.09
07/20/98	0.67	0.69	0.68	0.68	0.58	1.13	1.11	0.81	0.00	0.00	0.00	-0.08	-0.04	-0.06	0.08	0.04	0.06
08/04/98	0.67	0.69	0.68	0.68	0.56	1.33	1.22	0.85	0.00	0.00	0.00	-0.02	0.11	0.04	0.02	-0.11	-0.04
08/12/98	0.67	0.69	0.68	0.68	0.58	1.70	1.57	1.00	0.00	0.00	0.00	0.02	0.35	0.16	-0.02	-0.35	-0.16
09/02/98	0.67	0.69	0.68	0.68	0.53	1.67	1.37	0.84	0.00	0.00	0.00	-0.05	-0.20	-0.17	0.05	0.20	0.17
09/24/98	0.67	0.69	0.68	0.68	0.59	1.69	1.50	0.81	0.00	0.00	0.00	0.06	0.13	-0.03	-0.06	-0.13	0.03
09/30/98	0.67	0.69	0.68	0.68	0.49	1.73	1.69	0.76	0.00	0.00	0.00	-0.10	0.19	-0.05	0.10	-0.19	0.05
10/09/98	0.68	0.69	0.68	0.68	0.75	1.77	1.70	0.90	0.01	0.00	0.00	0.26	0.01	0.13	-0.25	-0.01	-0.13
11/03/98	0.68	0.68	0.68	0.68	0.77	0.75	0.75	0.77	0.00	0.00	0.00	0.01	-0.95	-0.13	-0.01	0.95	0.13

Appendix K. L. Lacawac and L. Giles non-bog runoff measurements and L. Giles bog ad_320 measurements m-1 (Take from the work of Elizabeth Blanchet, 1998)

L. Giles runoff 6/18/98 (non-bog)

	Gilesaruno	Gilesbruno
ad_320	0.85	0.70
Average	**0.78**	

L. Lacawac 1998 runoff (non-bog)

	runoff 6/16a	runoff 6/18	runoff 6/18b
ad_320	5.62	-1.21	3.10
Average 6/16a and 6/18b	**4.36**		

L. Giles 1998 bog ad_320 measurements

	G724Bbog	G724Cbog	G724Dbog	G724Ebog	G724Fbog	G724Gbog	G724Hbog	G724Ibog	G724Jbog	G724Kbog
ad_320	100.50	104.32	108.08	104.17	103.90	103.26	105.56	103.04	78.82	87.59
Average	**99.93**									

Kelly O. Maloney

A. VITAE:

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M.S. 2000	Lehigh University
B.S. 1994	The Pennsylvania State University

Professional Employment:

1998 – present	Teaching Assistant, Dept. of Earth and Environmental Sciences, Lehigh University
6/1999 – 8/1999	Summer Internship, Wildlands Conservancy, Emmaus, PA
1996-1998	Environmental, Health, and Safety Manager, Compression Polymers Group, Moosic, PA

Teaching Experience:

Spring 2000	Teaching assistant for Global Environmental Change and Introduction to Arcview
Summer 1999	Teaching assistant for Lake Ecosystems field course
Spring 1999	Teaching assistant for Climate, Geosphere, Biosphere
Fall 1998, 1999	Teaching assistant for Introduction to Environmental and Organismal Biology Falls 1998 and 1999

B. ABSTRACTS, PRESENTATIONS, PUBLICATIONS

Maloney, K.O. and B. R. Hargreaves. 2000. Modeling seasonal variation in dissolved absorbance of Ultra Violet Radiation in two dimictic, mid-latitudinal lakes. Thesis defense. Lehigh University, Bethlehem PA.

Maloney, K. O. and B.R. Hargreaves. 1999. Seasonal Changes in UV Transparency of Lakes: Modeling the Sources and Sinks for UVR Absorbing Substances. Pocono Comparative Lakes Program (PCLP) Annual Meeting, 10/99.

Maloney, K.O. and C. L. Osburn. Effects of filter feeding by the freshwater mussel, *E. Complanata*, on the particulate absorbance and fluorescence in L. Lacawac.1999. Poster at the PCLP Annual Meeting, 10/99.

C. AWARDS, FUNDING

Worthington Scranton Scholarship for Academic Excellence, Penn State University, 1990

Palmer Fund. Lehigh University, 1999.

END OF

TITLE