Temperature Modeling of River and Lakes

Course Project - Laurance Lake Reservoir

Due: March 13, 2008

Introduction

Laurance Lake is a reservoir located in Hood River County, Oregon (Figure 1). It is located at the base on Mt. Hood in Oregon (see Figure 2 and Figure 3) and discharges into the Middle Fork of the Hood River. The reservoir was constructed in 1968 for irrigation storage and has a capacity 3564 acre-feet at full pool. Since the river violates temperature standards, a hydrodynamic and temperature model of Laurance reservoir was constructed in order to assess strategies for improving temperatures in the Middle Fork River.

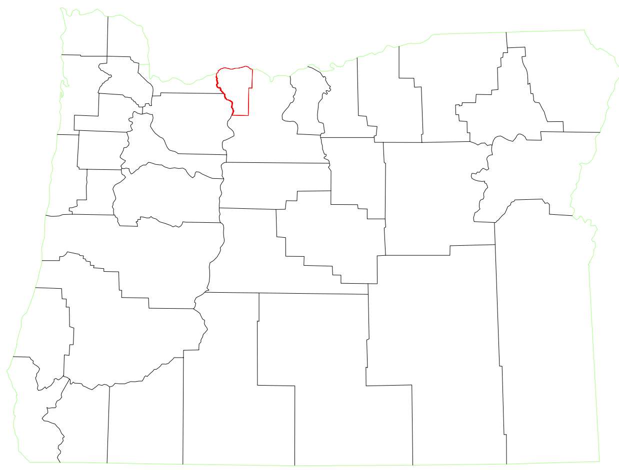

Figure 1. Hood River County, Oregon.

The model applied to Laurance Lake is CE-QUAL-W2 Version 3.5 (Cole and Wells, 2006). This is a two-dimensional unsteady hydrodynamic, temperature and water quality model that includes typical eutrophication parameters (algae, nutrients, temperature, organic matter, dissolved oxygen, pH).

In order to model the system, the following data are required:

- Laurance Lake outflow, water level and temperature data at the upstream system boundary (Clear Creek)

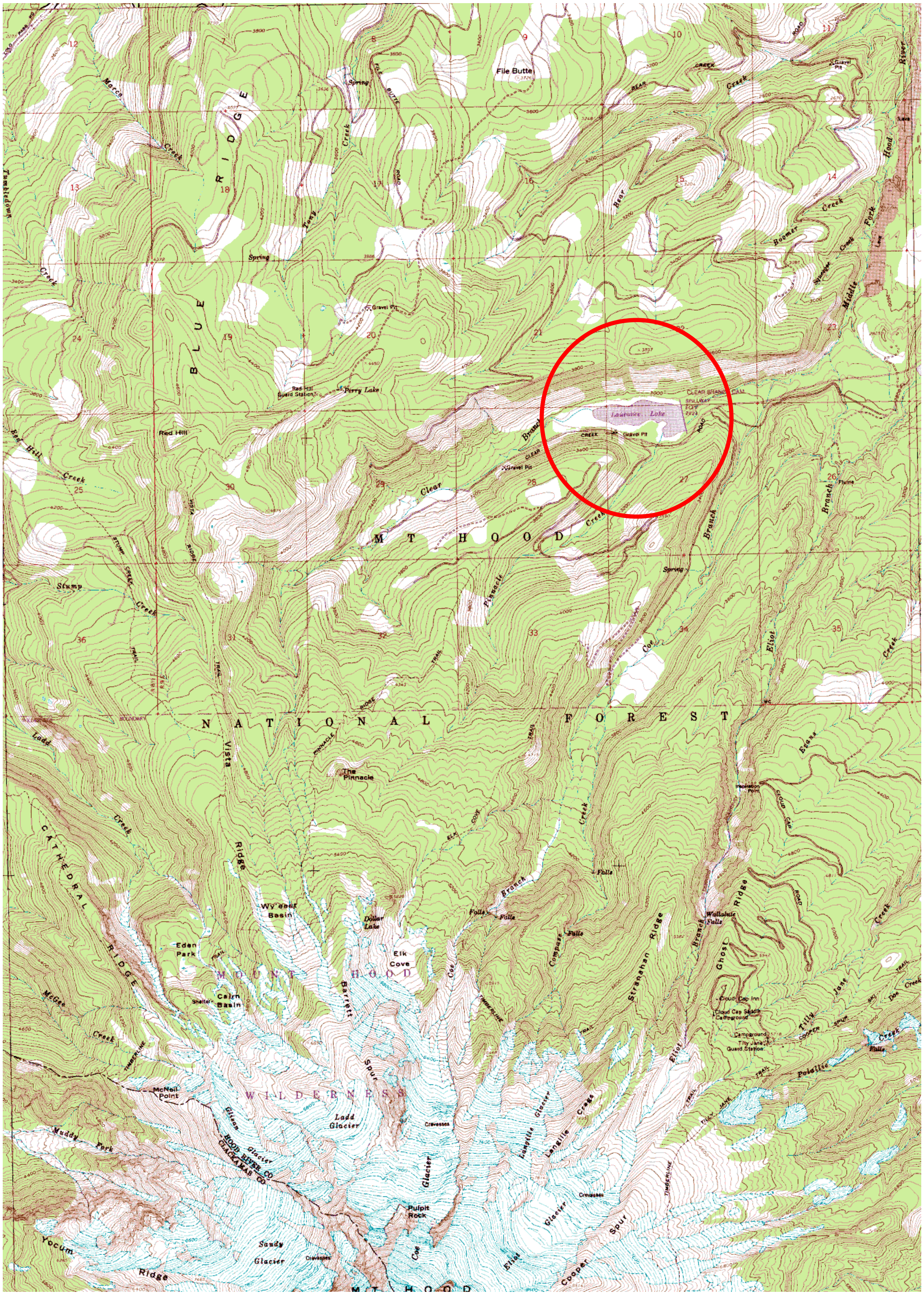

Figure 2. Laurance Lake, Oregon.

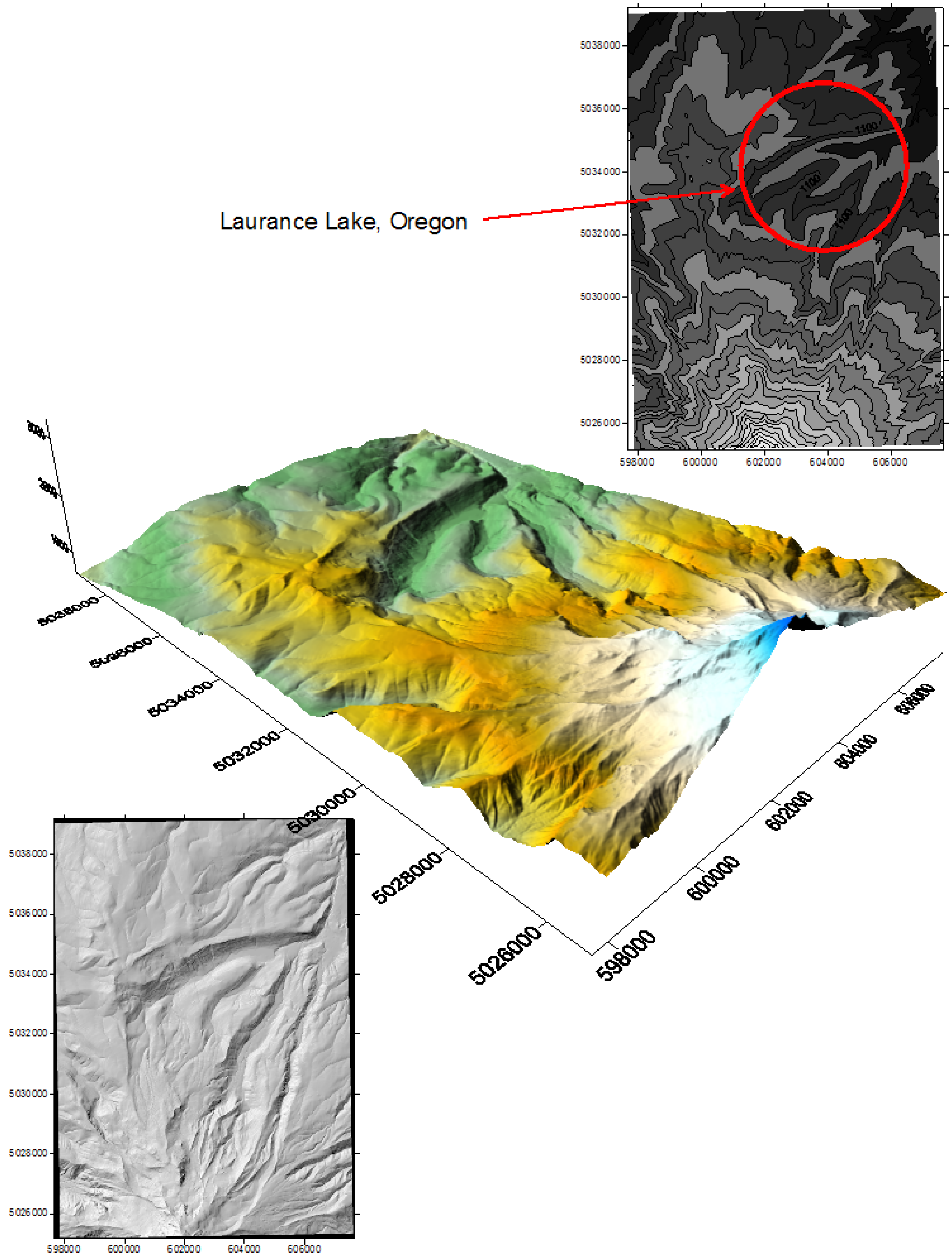

Figure 3. Topography around Laurance Lake.

- Tributary inflows and temperatures
- Meteorological conditions
- Bathymetry of Laurance Lake

Calibration will focus on model predictions of hydrodynamics (flow and water level) and temperature. The model calibration period is from May 1, 2003 to December 3, 2003.

Background Information

The following information from Oregon DEQ and Middle Fork Irrigation District documents temperature issues in the Laurance Lake system (ODEQ and MFID, 2002):

> "The waters in Clear Branch and the Middle Fork Hood River below Clear Branch Dam have been identified as water quality limited for temperature and placed on the 303(d) list as required by the Federal Clean Water Act. Clear Branch and the Middle Fork Hood River are included on the 303 (d) list for exceeding the State of Oregon's Bull trout (*Salvelinus confluentus*) criterion of 10º C. Bull trout inhabit Clear Branch and the Middle Fork Hood River and were listed as a threatened species under the Endangered Species Act in 1998. Clear Branch Dam was constructed under P.L. 566 with the help of the NRCS and is operated and maintained by Middle Fork Irrigation District (MFID). Clear Branch and Coe Branch join together about 0.5 miles below the Clear Branch Dam to form the Middle Fork Hood River."
>
> "The Western Hood Subbasin Total Maximum Daily Load (TMDL) was approved by EPA in January 2002 and lists the "critical period" for Clear Branch below Laurance Lake as year round. Suggested solutions to this temperature problem have included diverting colder Pinnacle Creek water to the base of the dam or a selective withdrawal system in the Lake. MFID is required to develop and implement a "Surface Water Temperature Management Plan" for the operation of the Clear Branch Dam by Oregon Department of Environmental Quality (DEQ). Temperature data has been collected above and below Laurance Lake since 1997. That data is not complete. Flow data for Pinnacle and Clear Branch Creeks feeding Laurance Lake is not available. Anecdotal evidence indicates there is a groundwater influence in Laurance Lake. There are springs at the base of the dam, one has been monitored for temperature and frequently exceeds the 10º C standard. Before a "Surface Water Temperature Management Plan" can be created and a computer model run to examine temperature and flow dynamics, cooling/warming effects of Pinnacle and Clear Branch creeks and ground water influence, more data must be acquired."

Model Forcing Data

The model forcing data consists of the system bathymetry developed into the model grid; the boundary condition flow and temperature; the tributary and flow and temperature; and the system meteorology.

Water quality monitoring sites from which data were used for model development and calibration were identified in Figure 4 and were described in Table 1.

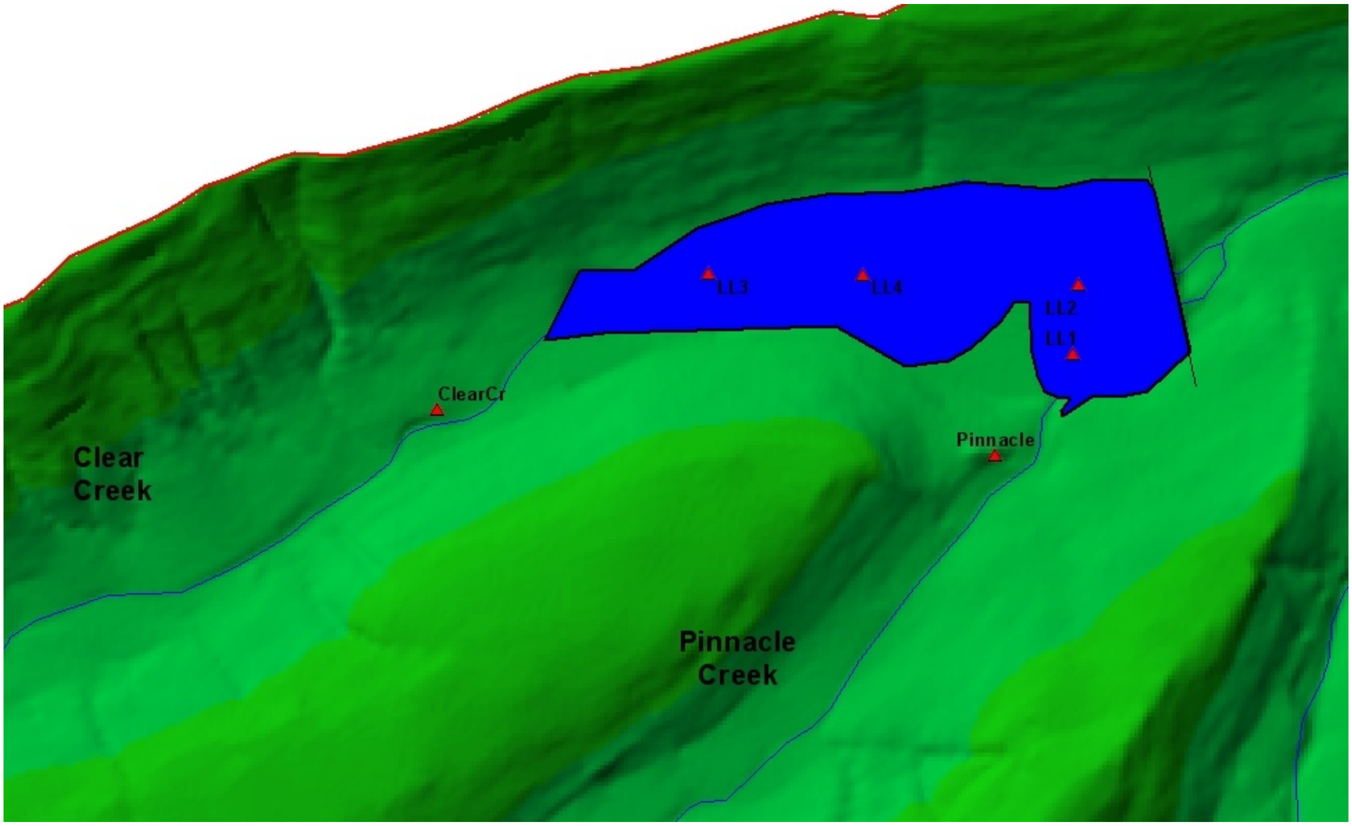

Figure 4. Monitoring sites at Laurance Lake

Table 1. Monitoring sites

Site ID	Description
CC	Clear Creek above Reservoir
PC	Pinnacle Creek above Reservoir
LL1	Laurance Lake at Pinnacle Creek Branch
LL2	Laurance Lake near dam
LL3	Laurance Lake, middle
LL4	Laurance Lake near upstream end

Model Geometry

Laurance Lake Bathymetry

The Long Lake bathymetry was developed using depth soundings, a USGS digital elevation map (DEM), and a bathymetric contour map provided by Middle Fork Irrigation district. The data points used to develop the bathymetry were shown in Figure 5. Model bathymetry was created up to an elevation of 925 meters, 17 meters above the current full pool elevation, to allow the simulation of management scenarios that included raising the dam. In general, data from depth soundings were used to describe bathymetry below current full pool elevations, the bathymetric contour map was used for areas near the bank, and the USGS DEM data were used for elevations well above the full pool elevation.

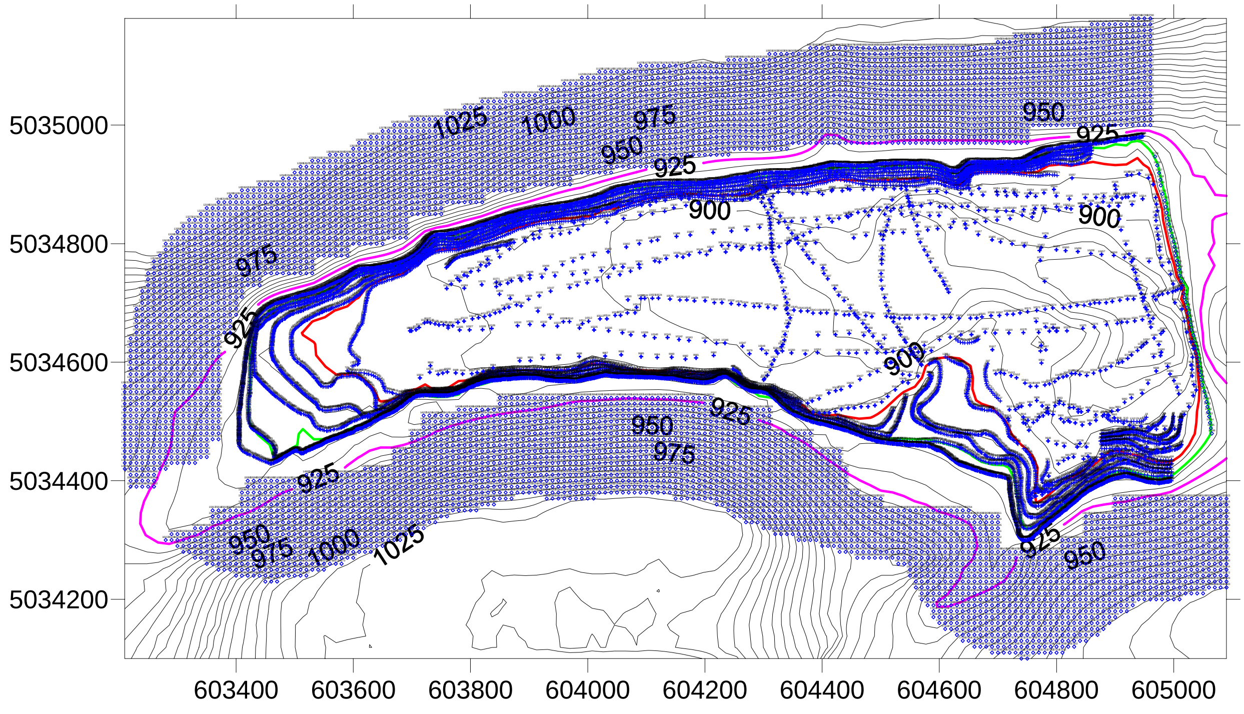

Figure 5. Location of data points used to develop bathymetry

Grid Layout

Figure 6 shows the plan view of the grid layout for the Laurance Lake.

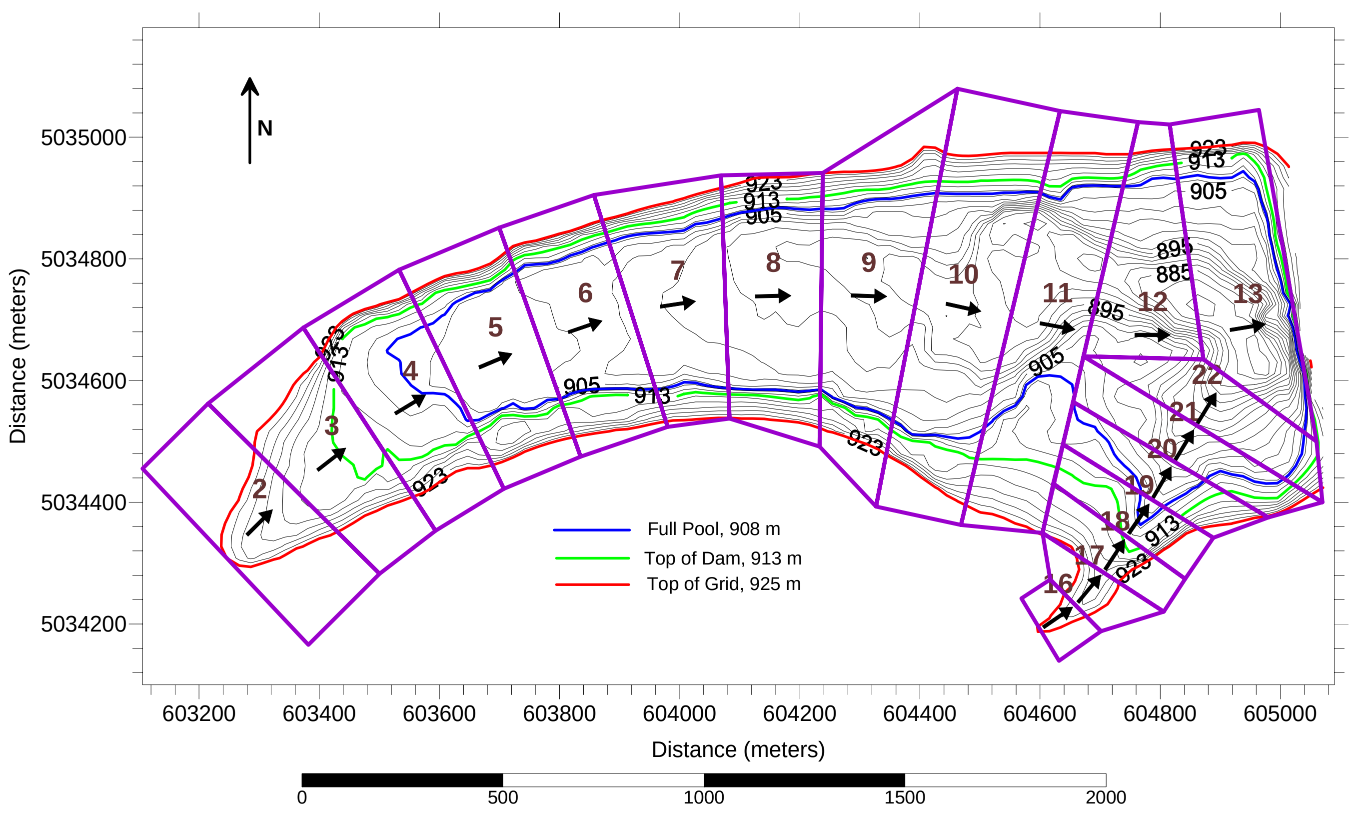

Figure 6. Plan view of the Laurance Lake grid. The arrows show the segment orientation.

The model is divided into two branches, the first representing Clear Creek and the second Pinnacle Creek. Branch 1 has 12 active segments and branch 2 contained 7 active segments. The model segments in branch 1 have a length of 159.6 meters whereas those in branch 2 are 71.3 meters long. There are a total of 90 active model layers each having a thickness of 0.5 meters.

In the CE-QUAL-W2 model, the model user must specify the characteristics and connectivity of the model grid. The following parameters are used in the Laurance Lake model (see Cole and Wells, 2006, for detailed explanation of model grid characteristics):

IMP (# of segments): 23
KMP (# of vertical layers): 92
NWB (# of water-bodies): 1
NBR (# of branches): 2

The branch layout is specified by these parameters for each branch (as specified in the w2_con.npt control file – see Cole and Wells, 2006).

Boundary Conditions

The upstream boundary condition for the Laurance Lake model is Clear Creek. Clear Creek inflows are based on gaging station data and a regression equation developed from a correlation between Clear Creek and Pinnacle Creek flow rates. The regression equation is only used when Clear Creek gaging data were not available. Figure 7 shows the flow rates used for Clear Creek.

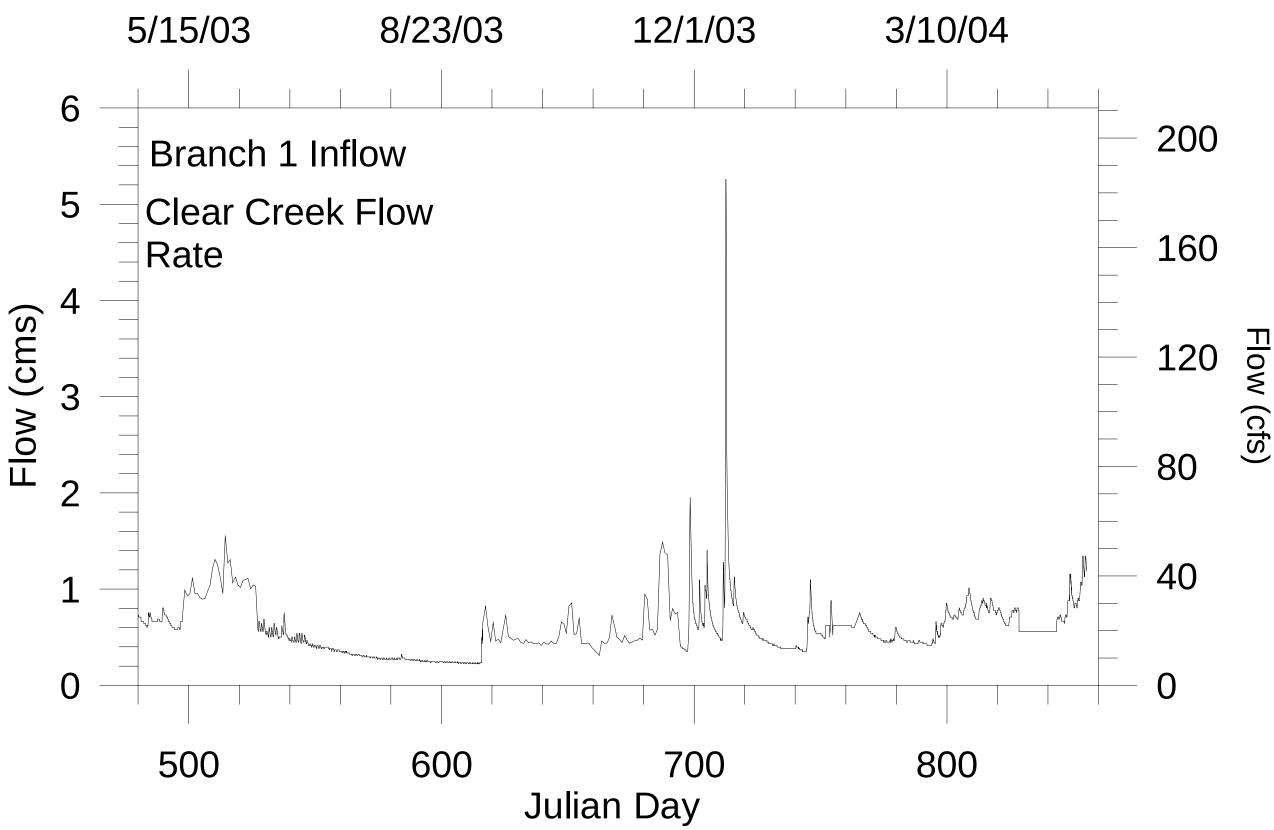

Figure 7. Clear Creek flow rates.

Clear Creek inflow temperatures were based on measured data obtained from a sampling site near the reservoir. Figure 8 shows a plot of inflow temperatures versus time.

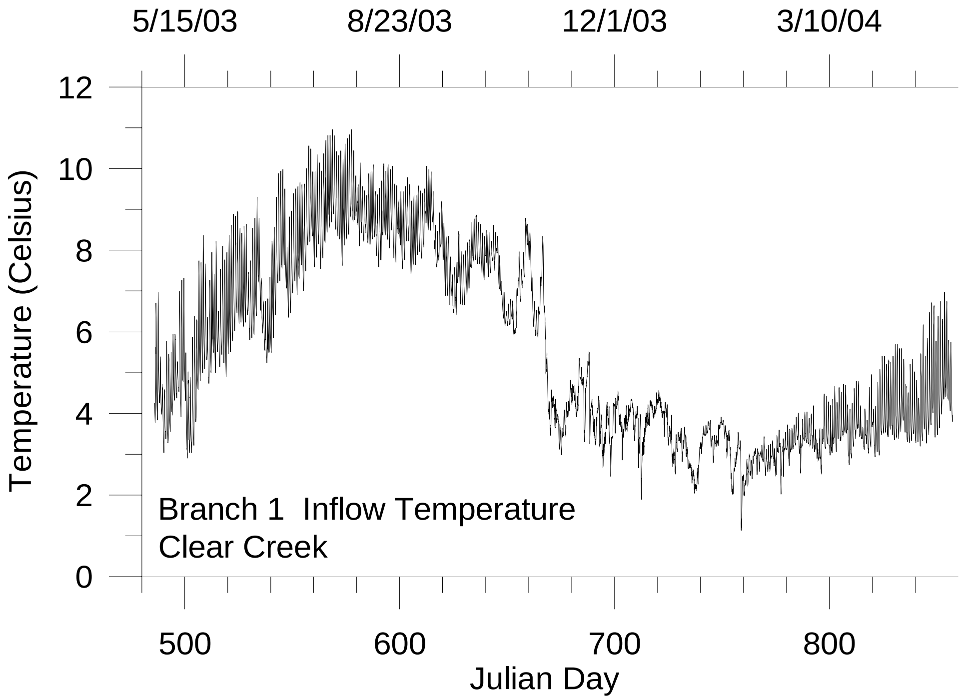

Figure 8. Clear Creek inflow temperatures.

<u>Laurance Lake outflow</u>

The downstream boundary condition is the outflow from Laurance Lake. An outflow record was developed for the model as shown in Figure 9. The outflow file was developed from data provided by Middle Fork Irrigation District (MFID). The outlet pipe is at the bottom of the reservoir adjacent to the dam and was modeled as a point sink.

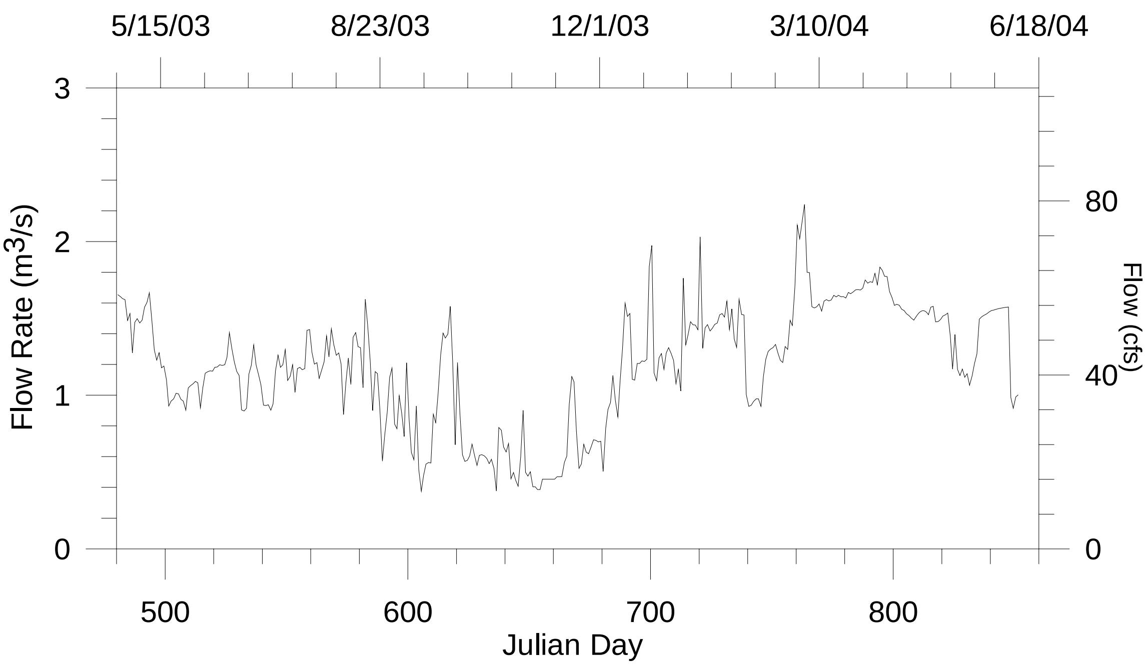

Figure 9. Laurance Lake Outflow

Tributaries

Pinnacle Creek

Pinnacle Creek inflows are shown in Figure 10. Flow rates are developed from gaging station data and a regression equation for time periods when gaging station data did not exist. A regression between Pinnacle Creek and Clear Creek is used during these periods. Water temperatures used to represent Pinnacle Creek were measured data and were plotted in Figure 11.

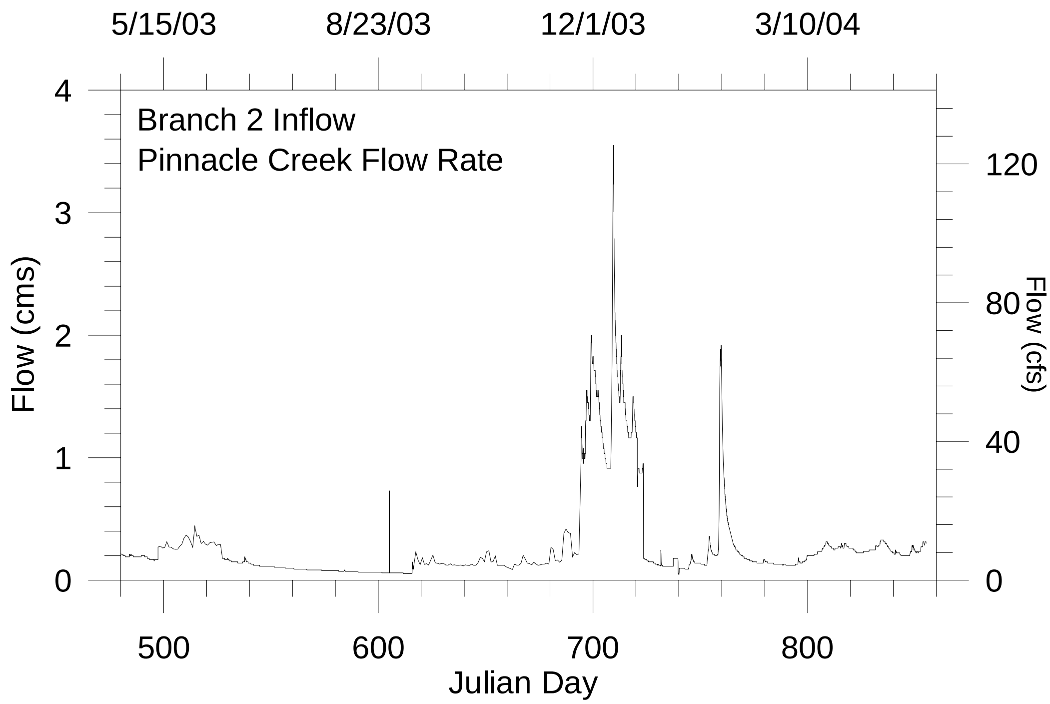

Figure 10. Pinnacle Creek Flow

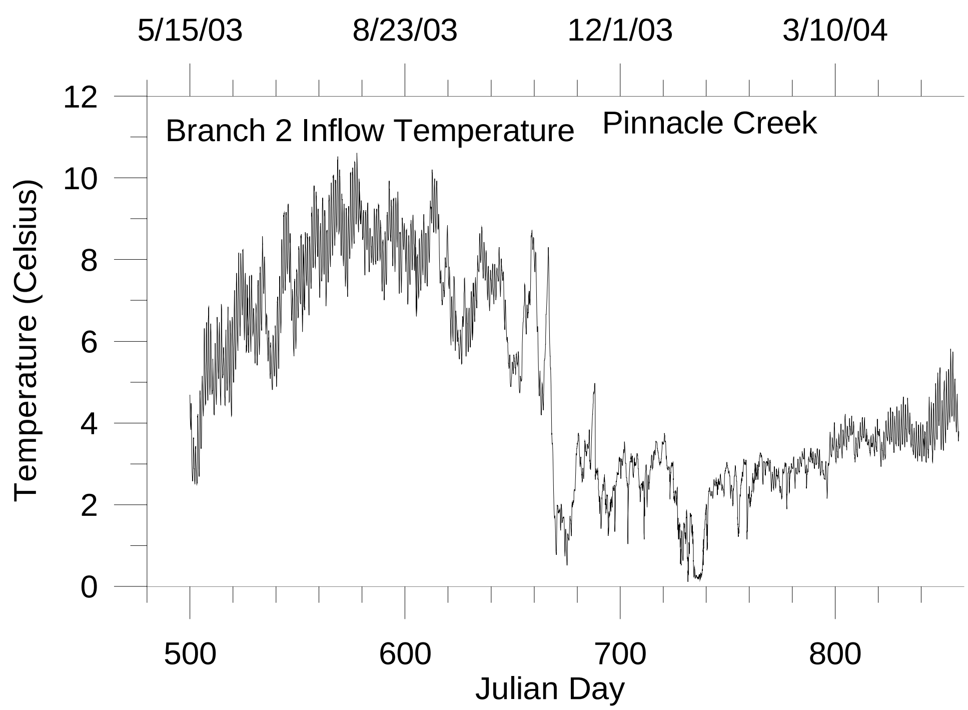

Figure 11. Pinnacle Creek water temperatures

Meteorological Data

Meteorological data for the CE-QUAL-W2 model were measured at the dam and at an agrimet station located at Parkdale. The model utilizes air and dew point temperature, wind speed and direction, and cloud cover or solar radiation. Wind data measured at the dam were accurate only until 8/3/03 (Julian Day 583). Afterwards Parkdale wind speed data were used and wind direction was set to an angle parallel to the axis of the reservoir. Parkdale wind direction data were not used because a comparison between Laurance Lake and Parkdale wind direction showed significant differences. Wind at the dam was directed primarily along the axis of the reservoir (see Figure 12 showing the wind rose at the dam superimposed on the lake) whereas the predominant wind directions at Parkdale were from the south and the southwest. Since wind direction data measured at Parkdale were not applicable to Laurance Lake, wind directions for the period when data at the dam did not exist were set to a value of 4.55 radians, which was parallel to the axis of the reservoir. The meteorological station at the dam failed completely on 9/9/03, and afterwards only air temperature, dew point temperature, cloud cover, and short wave radiation data from Parkdale were used. After 11/6/03 (Julian Day 675) air and dew point temperatures regression equations correlating data measured at Laurance Lake and Parkdale were applied.

Air and dew point temperatures were shown in Figure 13 and Figure 14, respectively. Figure 15 shows wind speed and Figure 16 shows wind direction relative to time. Cloud cover was plotted in Figure 17.

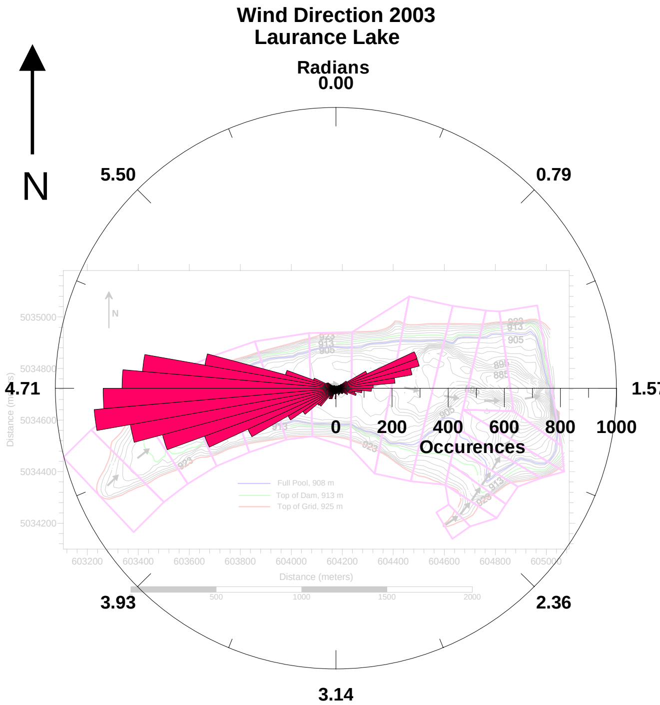

Figure 12. Laurance Lake wind direction at the dam superimposed over the lake axis.

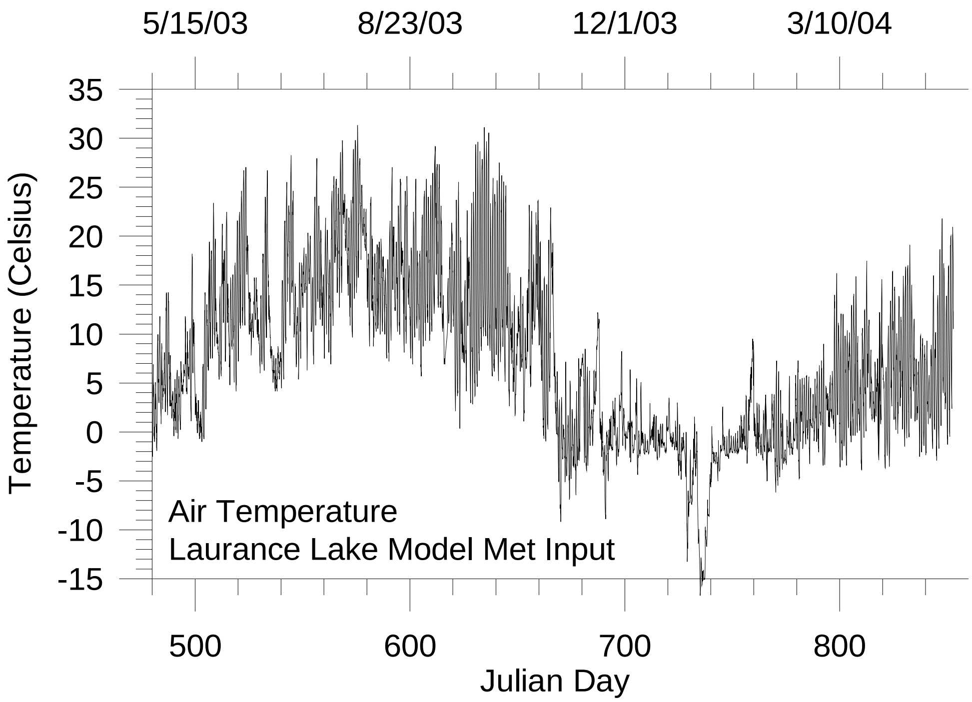

Figure 13. Air temperature, °C

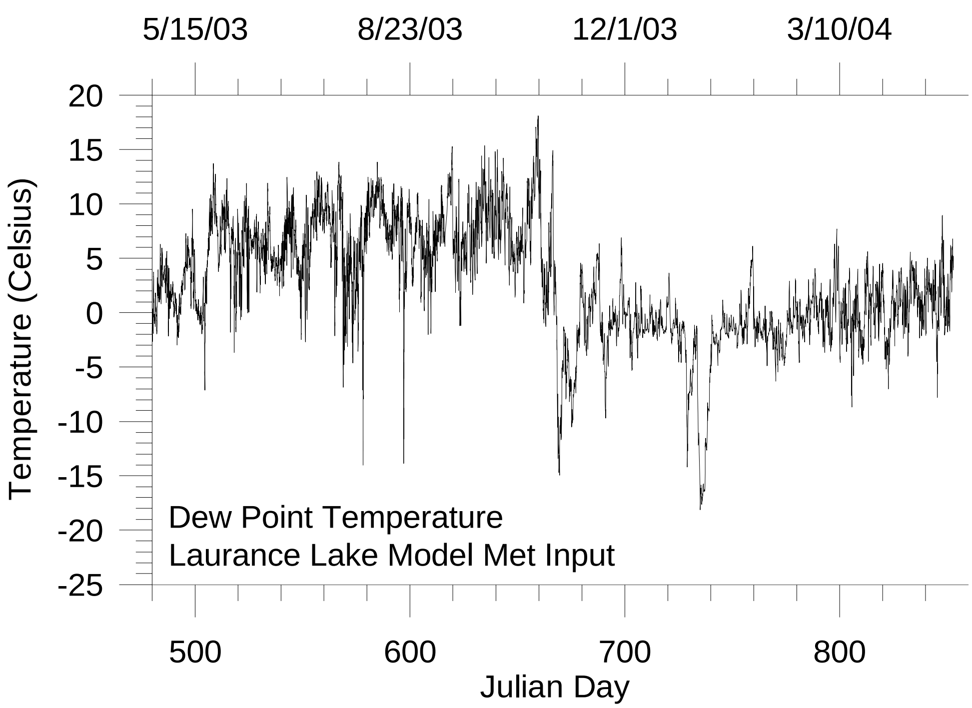

Figure 14. Dew point temperature, °C

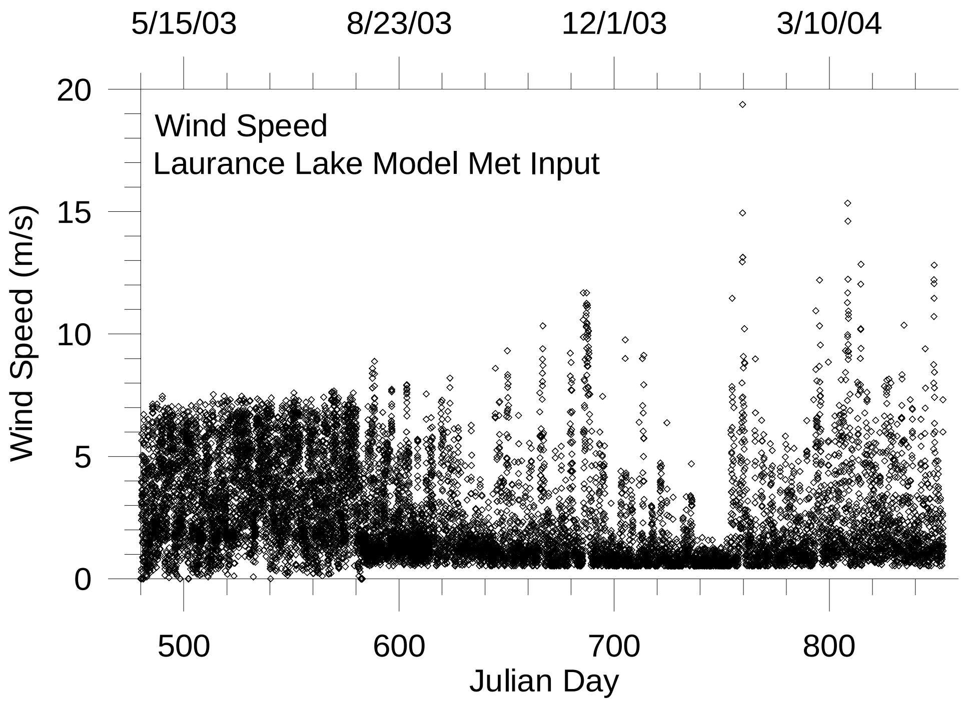

Figure 15. Wind Speed, m/s

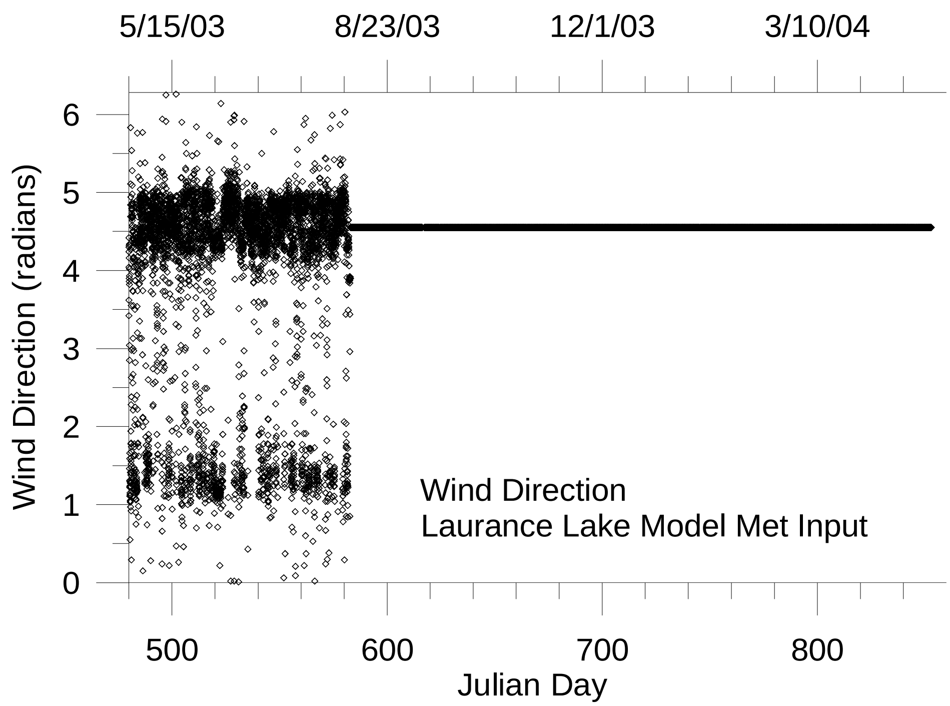

Figure 16. Wind direction used for model input. After Julian Day 583 (8/6/03) wind data measured at the dam did not exist and was set to a value of 4.55 radians, roughly parallel to the axis of the reservoir.

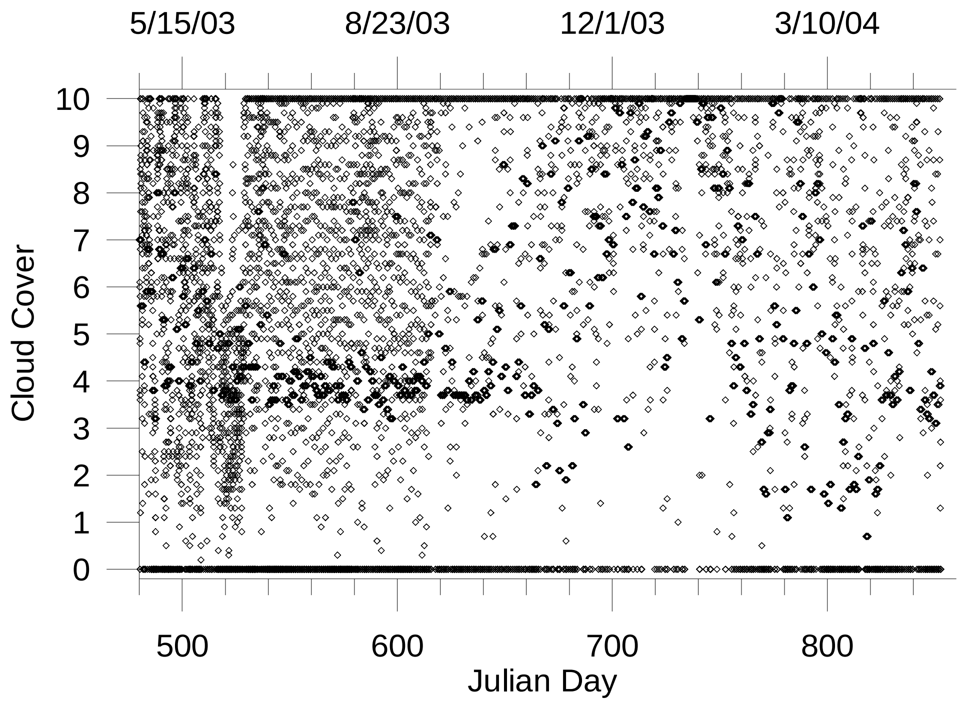

Figure 17. Cloud Cover

Detention Time

Figure 18 shows the detention time plotted versus flow rate for different water levels. At a full pool water surface elevation with combined inflows of 20 cfs, the detention time would be approximately 80 days.

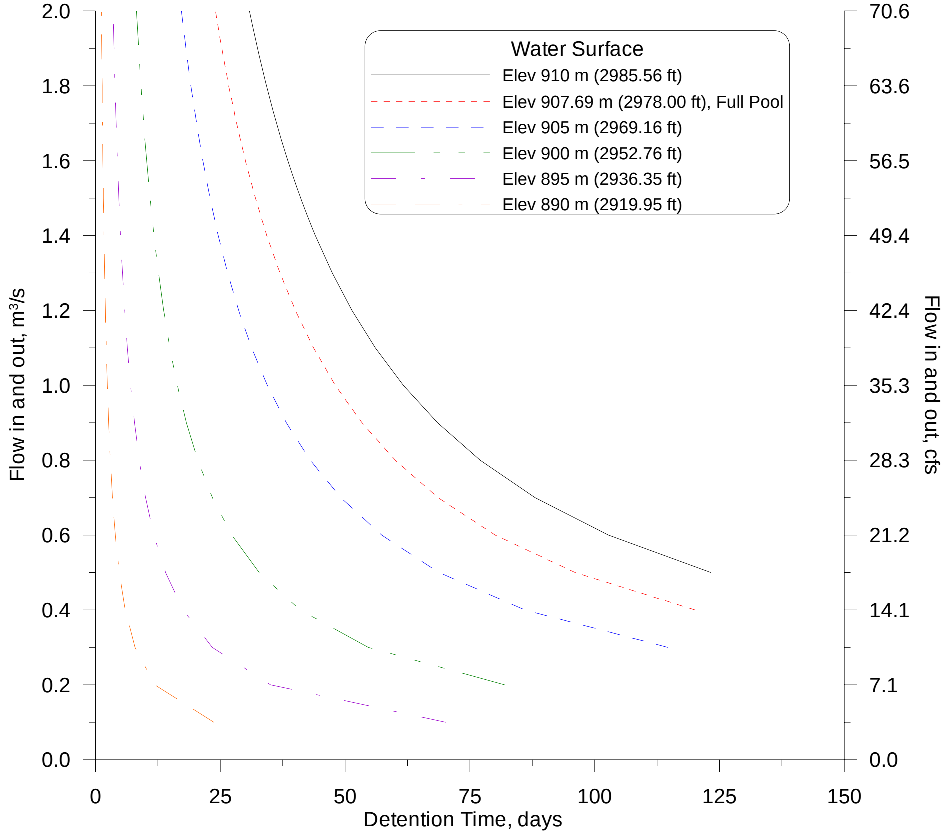

Figure 18. Plot of flow versus detention time for different water level elevations.

Project Objectives

1. Model Calibration
    a. Calibrate the model for water level
    b. Calibrate the model for temperature
2. Develop and analyze multiple management strategies for reducing temperature outflows from Laurance Lake

1a. Water Level Calibration

The initial model predictions of water levels at the dam compared to field data are poor (Figure 19). In fact, the model could not run to the end of the simulation period because the reservoir dried up. CE-QUAL-W2 Version 3.5 has a utility program outside the **w2_cvf.exe**, called **waterbalance.exe** that can generate an approximate water balance if water level data are known. Table 2 lists the files used in the model post processing and conducting the reservoir water balance.

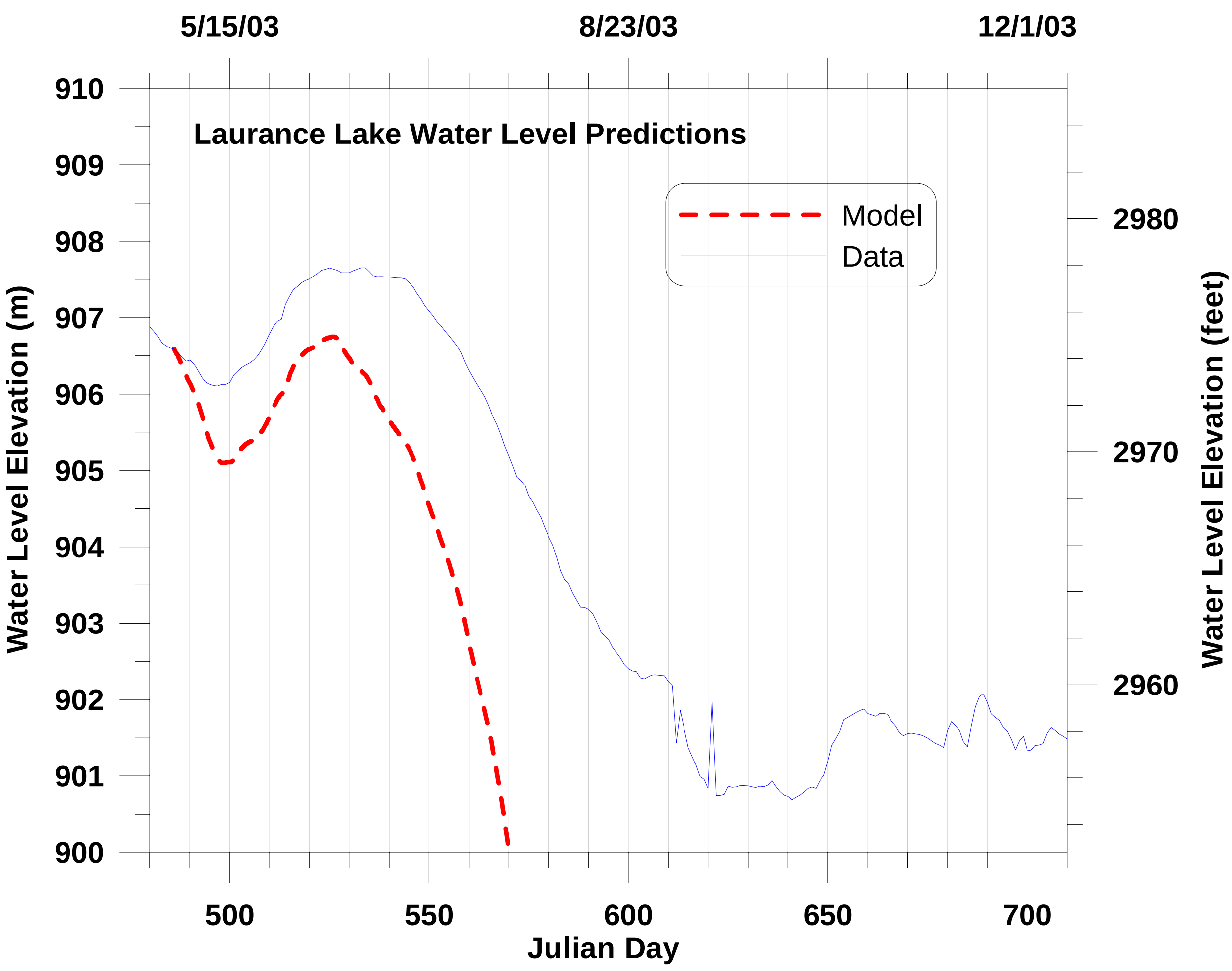

Figure 19. Initial water level predictions compared with data.

Table 2: Water balance processing files

File Type	File Name	Description
Program executable	waterbalance.exe	Program application for calculating the water balance flows to correct the model water surface elevation
Water balance output file	el_stats.opt	Water level model-data error statistics

File Type	File Name	Description
Water balance output file	qwb.opt	Water balance flow file, may be used for model input

The utility program asks the user for pertinent information (i.e., which water body is being asked to compare water levels, whether there was a previous water balance conducted, what is the name of the water level data used for comparison etc. The water level data file is called **el_obs.npt.** The utility program will generate a file with the name **qwb.opt.** Change the name of this file to **qwb1.npt** since we will be using it as an input. A positive value is an inflow and a negative value is an outflow. Now add that water back to the model as a DISTRIBUTED INFLOW to the reservoir. If one is editing the text file **w2_con.npt** directly:

- Go into the file **w2_con.npt** and go to the card DST TRIB and turn it ON for branch 1.
- Go to the card QDT FILE and input the name of the inflow file (**qwb1.npt**)
- Now you must also input temperature and concentration data to this. What will you use? Note that you must specify these in the TDT FILE and CDT FILE.

For this exercise, create new temperature files by copying the files for the inflow into Branch 1. You will then need to rename the files and enter the names in **w2_con.npt**.

Now, be sure to re-run the preprocessor (**pre.exe**) and then the model (**w2_cvf.exe**). Run the post-processing and compare the water balance.

This can be continued again to refine the water balance by using the water balance utility to add successive water balance flows to previous developed flows after each model run. When using the water balance utility for a second time be sure to check the box indicating the new balance flows are to be added to the previous water balance flows. When water balance flows are added to the previous water balance flow file the previous file is simply updated, no new flow file is created. At some point one may have to alter flows by hand

Step by Step instructions for this assignment are provided below.

1. Run the preprocessor (double click on **pre.exe**)
2. Execute the W2 model (double click on **w2_cvf.exe**)
3. Compare model predicted water levels (contained within time series output file **tsr_wb1_1.opt**) with data **(el_obs.npt)** .
4. Use the water balance utility (**waterbalance.exe**) to calibrate the water level.
    - Double click on **waterbalance.exe**
    - Enter the name of the water level data file, **el_obs.npt**
    - Enter the name of the model time series output file, **tsr_wb1_1.opt**
    - The utility provides a check box if there was a previous water balance file. The first time through using the utility do NOT check the box. After the second model run use the check box and enter the name of the previous water balance flow file. When the box is checked the previous water balance flow file is updated.
    - Enter the desired skip number, **1**
    - Enter the water body number, **1**
    - Rename the water balance generated flow file from **qwb.opt** to **qwb1.npt** and use it as a new distributed tributary inflow file for water body 1.

To add a distributed tributary to water body 1 (note: instructions are given for editing the control file manually, you can also use the GUI editor):

- Open the control file (**w2_con.npt**) in a text editor.
- Go to the line for distributed tributaries: DST TRIB
- Change the variable DTRC from "OFF" to "ON" for the branch listed (water body 1).
- Go to the input file locations: QDT FILE, TDT FILE, and CDT FILE. You must specify Q, T, and C files for the distributed tributary that you just turned on. QDT FILE should be **qwb1.npt**. Copy the temperature and concentration files from the Branch 1 inflow files and rename them. Use these names in the control file under TDT FILE and CDT FILE.

Other options for adding the water balance flow back into the model are:

A. Add another structure outflow (downstream withdrawal)
- Open the control file (**w2_con.npt**) in a text editor.
- Add another Structure by 1st increasing NST by 1 (from 1 to 2)
- Go to the line for structures: N STRUC and for this branch increase the number by 1
- Then define the structure by filling in information for STR INT, STR TOP, STR BOT, STR SINK, STR ELEV, and STR WIDTH.
- Go to the input file for the outflow – look for QOUT under filenames. You will need to edit this file by adding another column for the outflow. See Appendix C in the manual on the QOUT file.

B. Add a tributary with negative flows for outflow
- Open the control file (**w2_con.npt**) in a text editor.
- Add another tributary by 1st increasing NTR by 1
- Go to the line for tributaries: TRIB PLA(CE) is the first tributary line.
- Then define the tributary by filling in information for TRIB PLA, TRIB INT, TRIB SEG, TRIB TOP, and TRIB BOT.
- Go to the input file for the tributaries, look for QTR FILE. You can use the water balance file for the flow but you will need to create new files for the temperature and water quality (if water quality is ON).

6. Run the preprocessor (double click on **pre.exe**)
7. Run the W2 model (double click on **w2_cvf.exe**) and allow it to run to completion
8. Compare model predictions with data
9. Repeat the water balance procedure as necessary. To view the water level error statistics run the water balance utility (**waterbalance.exe**) and open the output file **el_stats.opt**.

1b. Temperature Calibration

Model parameters affecting temperature calibration include light extinction, wind sheltering coefficients, groundwater inflow temperature, and the accurate representation of reservoir inflows and outflows. The spreadsheet file **temperature_profiles_data.xlsx** contains vertical profile data of temperature measured at site L2 (segment 13) in the reservoir. Try to calibrate the model so that temperature predictions match data. Plot model predicted vertical profiles of temperature with measured data. Also included in the spreadsheet file **secchi depth data.xlsx** are secchi disk depth data that can be used to estimate light extinction. Plot dam outflow temperature and compare with the State of Oregon temperature standard for Bull Trout of 10 degrees Celsius.

2. Management of Alternatives

The temperature standard for Bull Trout is 10 degrees Celsius. Development management alternatives designed to reduce dam outflow temperatures. Model predicted outflow temperatures are located in the outflow file **two_13.opt**. Alternatives may include, but are not restricted to, the following:
- Moving or adding outflow structures
- Altering the height of the dam
- Adjusting the timing of the outflows
- Diverting creek flows directly to the dam outflow

Document the alternatives that you have investigated by plotting outflow temperatures and water levels and discuss the results.

Model Files and Data Files

Laurance Lake model and data files are listed in Table 3.

Table 3. Laurance Lake model files and data files

File Type	File Name	Description
Model Executable and Tools	w2_cvf.exe	Model executable
	pre.exe	Pre-processor tool
	W2Control35.exe	Model graphical user interface (GUI)

File Type	File Name	Description
	waterbalance.exe	Water balance tool
Model Input files	w2_con.npt	Control file
	graph.npt	Hydrodynamic, constituent, and derived constituent names, formats, multipliers, and array viewer controls
	bth.npt	Segment lengths, initial water surface elevation, segment orientation, layer thickness and cell widths
	met.npt	Time series file containing temperature, dew point temperature, wind speed, wind direction, cloud cover, and short wave radiation data
	wsc.npt	Wind sheltering coefficient for each segment and variable over time
	shd.npt	Shade file for characterizing vegetative and topographic shade or static shade values
	vpr.npt	Initial Conditions temperature profile, temperatures for each active layer at start of simulation
	qin_br1.npt	Clear Creek flow input file
	qin_br2.npt	Pinnacle Creek flow input file
	tin_br1.npt	Clear Creek temperature input file
	tin_br2.npt	Pinnacle Creek temperature input file
	qout.npt	Dam outflows
Model Output Files	pre.opt	Pre-processor (pre.opt) output file
	spr_wb1.opt	Spread sheet formatted output file of model predicted temperatures
	tsr_wb1_1.opt	Time series output file for model segment adjacent to dam
	snp_wb1.opt	Snapshot output information for specific model segments. One file is output for each water body and includes model time parameters, meteorological parameters, inflow and outflow parameters, balances, geometry, water surface temperature and water quality information
	qwo_13.opt	Laurance Lake outflow file time series
	two_13.opt	Laurance Lake outflow temperature time series
Data Files	el_obs.npt	Laurance Lake water level data
	temperature_profiles_data.xlsx	Temperature Profile data
	secchi depth data.xlsx	Secchi disk depth data

This model has been under development for many years and is a public-domain code maintained by the Corps of Engineers, Waterways Experiments Station (WES), located in Vicksburg, Mississippi. Version 3.5 has and is undergoing rigorous testing and has been successfully applied to many river basin systems. Further information about CE-QUAL-W2 Version 3 is shown at http://www.ce.pdx.edu/w2.

References

Cole, T.M., and S.A. Wells (2006) "CE-QUAL-W2: A two-dimensional, laterally averaged, Hydrodynamic and Water Quality Model, Version 3.5," Instruction Report EL-2006-, US Army Engineering and Research Development Center, Vicksburg, MS.

Edinger, J. E. and Buchak, E. M. (1978). “Numerical hydrodynamics of estuaries.” *Estuarine and Wetland Processes with Special Emphasis on Modeling*, edited by P. Hamilton and K. B. MacDonald, Plenum Press, NY, 115-146

Wells, S. A. (1997) "Theoretical Basis for the CE-QUAL-W2 River Basin Model," Dept. of Civil Engr., Tech. Rpt. EWR-6-97, Portland St. Univ., Portland, OR, 1997.

Model Control File (Input File ‘w2_con.npt’)

```
W2 Model Version 3.5

TITLE C ..............................TITLE...................................
        Laurance Lake Model  Version 3.5
        Portland State University


        Temperature simulation

        Julian day 1.0 = 1/1/2002 12 am




GRID          NWB     NBR     IMX     KMX
                1       2      23      92

IN/OUTFL      NTR     NST     NIW     NWD     NGT     NSP     NPI     NPU
                0       1       0       0       0       0       0       0

CONSTITU      NGC     NSS     NAL     NEP    NBOD     NMC     NZP
                3       1       1       1       0       0       1

MISCELL      NDAY
              100

TIME CON  TMSTRT   TMEND730 YEAR
         486.000 702.000    2002

DLT CON       NDT  DLTMIN
                1 1.00000

DLT DATE     DLTD    DLTD    DLTD    DLTD    DLTD    DLTD    DLTD    DLTD    DLTD
         63.5000

DLT MAX   DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX  DLTMAX
         3600.00

DLT FRN      DLTF    DLTF    DLTF    DLTF    DLTF    DLTF    DLTF    DLTF    DLTF
         0.90000

DLT LIMI     VISC    CELC
WB 1           ON      ON

BRANCH G       US      DS     UHS     DHS     UQB     DQB   NLMIN   SLOPE
BR1             2      13       0       0       0       0       1 0.00000
BR2            16      22       0      13       0       0       1 0.00000

LOCATION      LAT    LONG    EBOT      BS      BE    JBDN
WB 1      45.5000 122.000 880.000       1       2       1

INIT CND      T2I    ICEI  WTYPEC
WB 1     -1.00000 0.00000   FRESH

CALCULAT      VBC     EBC     MBC     PQC     EVC     PRC
WB 1           ON      ON      ON     OFF      ON     OFF

DEAD SEA    WINDC    QINC   QOUTC   HEATC
WB 1           ON      ON      ON      ON

INTERPOL    QINIC   DTRIC    HDIC
BR1            ON      ON     OFF
BR2            ON      ON     OFF

HEAT EXCH   SLHTC    SROC  RHEVAP   METIC  FETCHC     AFW     BFW     CFW   WINDH
WB 1         TERM      ON     OFF      ON     OFF 9.20000 0.46000 2.00000  5.0000

ICE COVE     ICEC  SLICEC  ALBEDO   HWICE    BICE    GICE  ICEMIN   ICET2
WB 1           ON  DETAIL 0.25000 10.0000 0.60000 0.07000 0.05000 3.00000
```

```
TRANSPOR   SLTRC   THETA
WB 1    ULTIMATE 0.55000

HYD COEF      AX      DX    CBHE    TSED      FI   TSEDF   FRICC
WB 1     1.00000 1.00000     0.3   8.000 0.00000 1.00000    MANN

EDDY VISC    AZC   AZSLC   AZMAX  PHISET
WB 1          W2     IMP 0.00100     0.0

N STRUC     NSTR
BR1            1
BR2            0

STR INT    STRIC   STRIC   STRIC   STRIC   STRIC   STRIC   STRIC   STRIC   STRIC
BR 1          ON
BR 2

STR TOP    KTSTR   KTSTR   KTSTR   KTSTR   KTSTR   KTSTR   KTSTR   KTSTR   KTSTR
BR1            2
BR2

STR BOT    KBSTR   KBSTR   KBSTR   KBSTR   KBSTR   KBSTR   KBSTR   KBSTR   KBSTR
BR1           91
BR2

STR SINK   SINKC   SINKC   SINKC   SINKC   SINKC   SINKC   SINKC   SINKC   SINKC
BR1        POINT
BR2

STR ELEV    ESTR    ESTR    ESTR    ESTR    ESTR    ESTR    ESTR    ESTR    ESTR
BR1      880.000
BR2

STR WIDT    WSTR    WSTR    WSTR    WSTR    WSTR    WSTR    WSTR    WSTR    WSTR
BR1      0.00000
BR2

PIPES       IUPI    IDPI    EUPI    EDPI     WPI   DLXPI     FPI  FMINPI   WTHLC


PIPE UP    PUPIC   ETUPI   EBUPI   KTUPI   KBUPI


PIPE DOWN  PDPIC   ETDPI   EBDPI   KTDPI   KBDPI


SPILLWAY    IUSP    IDSP     ESP    A1SP    B1SP    A2SP    B2SP   WTHLC


SPILL UP   PUSPC   ETUSP   EBUSP   KTUSP   KBUSP


SPILL DOWN PDSPC   ETUSP   EBUSP   KTDSP   KBDSP


SPILL GAS GASSPC    EQSP  AGASSP  BGASSP  CGASSP


GATES       IUGT    IDGT     EGT    A1GT    B1GT    G1GT    A2GT    B2GT    G2GT   WTHLC


GATE WEIR   GTA1    GTB1    GTA2    GTB2  DYNVAR


GATE UP    PUGTC   ETUGT   EBUGT   KTUGT   KBUGT


GATE DOWN  PDGTC   ETDGT   EBDGT   KTDGT   KBDGT


GATE GAS  GASGTC    EQGT  AGASGT  BGASGT  CGASGT


PUMPS 1     IUPU    IDPU     EPU  STRTPU   ENDPU   EONPU  EOFFPU     QPU   WTHLC
```

```
PUMPS 2     PPUC    ETPU    EBPU    KTPU    KBPU

WEIR SEG     IWR     IWR     IWR     IWR     IWR     IWR     IWR     IWR     IWR

WEIR TOP    KTWR    KTWR    KTWR    KTWR    KTWR    KTWR    KTWR    KTWR    KTWR

WEIR BOT    KBWR    KBWR    KBWR    KBWR    KBWR    KBWR    KBWR    KBWR    KBWR

WD INT      WDIC    WDIC    WDIC    WDIC    WDIC    WDIC    WDIC    WDIC    WDIC

WD SEG       IWD     IWD     IWD     IWD     IWD     IWD     IWD     IWD     IWD

WD ELEV      EWD     EWD     EWD     EWD     EWD     EWD     EWD     EWD     EWD

WD TOP      KTWD    KTWD    KTWD    KTWD    KTWD    KTWD    KTWD    KTWD    KTWD

WD BOT      KBWD    KBWD    KBWD    KBWD    KBWD    KBWD    KBWD    KBWD    KBWD

TRIB PLA    PTRC    PTRC    PTRC    PTRC    PTRC    PTRC    PTRC    PTRC    PTRC

TRIB INT    TRIC    TRIC    TRIC    TRIC    TRIC    TRIC    TRIC    TRIC    TRIC

TRIB SEG     ITR     ITR     ITR     ITR     ITR     ITR     ITR     ITR     ITR

TRIB TOP   ELTRT   ELTRT   ELTRT   ELTRT   ELTRT   ELTRT   ELTRT   ELTRT   ELTRT

TRIB BOT   ELTRB   ELTRB   ELTRB   ELTRB   ELTRB   ELTRB   ELTRB   ELTRB   ELTRB

DST TRIB    DTRC    DTRC    DTRC    DTRC    DTRC    DTRC    DTRC    DTRC    DTRC
BR 1         OFF
BR 2         OFF

HYD PRIN  HPRWBC  HPRWBC  HPRWBC  HPRWBC  HPRWBC  HPRWBC  HPRWBC  HPRWBC  HPRWBC
NVIOL         ON
U             ON
W             ON
T             ON
RHO          OFF
AZ           OFF
SHEAR        OFF
ST           OFF
SB           OFF
ADMX         OFF
DM           OFF
HDG          OFF
ADMZ         OFF
HPG          OFF
GRAV         OFF

SNP PRINT   SNPC    NSNP   NISNP
WB 1          ON       1      19

SNP DATE    SNPD    SNPD    SNPD    SNPD    SNPD    SNPD    SNPD    SNPD    SNPD
WB 1     63.5000

SNP FREQ    SNPF    SNPF    SNPF    SNPF    SNPF    SNPF    SNPF    SNPF    SNPF
WB 1     1.00000
```

```
SNP SEG      ISNP    ISNP    ISNP    ISNP    ISNP    ISNP    ISNP    ISNP    ISNP
WB 1            2       3       4       5       6       7       8       9      10
               11      12      13      16      17      18      19      20      21
               22

SCR PRINT    SCRC    NSCR
WB 1           ON       1

SCR DATE     SCRD    SCRD    SCRD    SCRD    SCRD    SCRD    SCRD    SCRD    SCRD
WB 1      63.5000

SCR FREQ     SCRF    SCRF    SCRF    SCRF    SCRF    SCRF    SCRF    SCRF    SCRF
WB 1      0.50000

PRF PLOT     PRFC    NPRF   NIPRF
WB 1          OFF       0       0

PRF DATE     PRFD    PRFD    PRFD    PRFD    PRFD    PRFD    PRFD    PRFD    PRFD
WB 1

PRF FREQ     PRFF    PRFF    PRFF    PRFF    PRFF    PRFF    PRFF    PRFF    PRFF
WB 1

PRF SEG      IPRF    IPRF    IPRF    IPRF    IPRF    IPRF    IPRF    IPRF    IPRF
WB 1

SPR PLOT     SPRC    NSPR   NISPR
WB 1           ON      21       4

SPR DATE     SPRD    SPRD    SPRD    SPRD    SPRD    SPRD    SPRD    SPRD    SPRD
WB 1        519.4   526.4   533.4   540.4   547.4   561.4   568.4   575.4   582.4
            597.4   603.4   612.4   617.4   631.4   638.4   645.4   652.4   659.4
            666.4   673.4   701.4

SPR FREQ     SPRF    SPRF    SPRF    SPRF    SPRF    SPRF    SPRF    SPRF    SPRF
WB 1        900.0   900.0   900.0   900.0   900.0   900.0   900.0   900.0   900.0
            900.0   900.0   900.0   900.0   900.0   900.0   900.0   900.0   900.0
            900.0   900.0   900.0

SPR SEG      ISPR    ISPR    ISPR    ISPR    ISPR    ISPR    ISPR    ISPR    ISPR
WB 1            6       9      13      20

VPL PLOT     VPLC    NVPL
WB 1          OFF       1

VPL DATE     VPLD    VPLD    VPLD    VPLD    VPLD    VPLD    VPLD    VPLD    VPLD
WB 1      63.5000

VPL FREQ     VPLF    VPLF    VPLF    VPLF    VPLF    VPLF    VPLF    VPLF    VPLF
WB 1      1.00000

CPL PLOT     CPLC    NCPL
WB 1          OFF       1

CPL DATE     CPLD    CPLD    CPLD    CPLD    CPLD    CPLD    CPLD    CPLD    CPLD
WB 1      486.400

CPL FREQ     CPLF    CPLF    CPLF    CPLF    CPLF    CPLF    CPLF    CPLF    CPLF
WB 1          1.0

FLUXES       FLXC    NFLX
WB 1          OFF       0

FLX DATE     FLXD    FLXD    FLXD    FLXD    FLXD    FLXD    FLXD    FLXD    FLXD
WB 1

FLX FREQ     FLXF    FLXF    FLXF    FLXF    FLXF    FLXF    FLXF    FLXF    FLXF
WB 1

TSR PLOT     TSRC    NTSR   NITSR
               ON       1       1

TSR DATE     TSRD    TSRD    TSRD    TSRD    TSRD    TSRD    TSRD    TSRD    TSRD
          63.5000
```

```
TSR FREQ    TSRF    TSRF    TSRF    TSRF    TSRF    TSRF    TSRF    TSRF    TSRF
         0.10000

TSR SEG     ITSR    ITSR    ITSR    ITSR    ITSR    ITSR    ITSR    ITSR    ITSR
              13

TSR LAYE    ETSR    ETSR    ETSR    ETSR    ETSR    ETSR    ETSR    ETSR    ETSR
         0.00000

WITH OUT    WDOC    NWDO   NIWDO
              ON       1       1

WITH DAT    WDOD    WDOD    WDOD    WDOD    WDOD    WDOD    WDOD    WDOD    WDOD
         1.00000

WITH FRE    WDOF    WDOF    WDOF    WDOF    WDOF    WDOF    WDOF    WDOF    WDOF
         0.00100

WITH SEG    IWDO    IWDO    IWDO    IWDO    IWDO    IWDO    IWDO    IWDO    IWDO
              13

RESTART     RSOC    NRSO    RSIC
             OFF       0     OFF

RSO DATE    RSOD    RSOD    RSOD    RSOD    RSOD    RSOD    RSOD    RSOD    RSOD


RSO FREQ    RSOF    RSOF    RSOF    RSOF    RSOF    RSOF    RSOF    RSOF    RSOF


CST COMP     CCC    LIMC     CUF
             OFF     OFF       1

CST ACTIVE   CAC
TDS          OFF
Gen1         OFF
Gen2         OFF
Gen3         OFF
ISS1         OFF
PO4          OFF
NH4          OFF
NO3          OFF
DSI          OFF
PSI          OFF
FE           OFF
LDOM         OFF
RDOM         OFF
LPOM         OFF
RPOM         OFF
ALG1         OFF
DO           OFF
TIC          OFF
ALK          OFF
ZOO1         OFF
LDOM_P       OFF
RDOM_P       OFF
LPOM_P       OFF
RPOM_P       OFF
LDOM_N       OFF
RDOM_N       OFF
LPOM_N       OFF
RPOM_N       OFF

CST DERI   CDWBC   CDWBC   CDWBC   CDWBC   CDWBC   CDWBC   CDWBC   CDWBC   CDWBC
DOC          OFF
POC          OFF
TOC          OFF
DON          OFF
PON          OFF
TON          OFF
TKN          OFF
TN           OFF
DOP          OFF
```

```
POP          OFF
TOP          OFF
TP           OFF
APR          OFF
CHLA         OFF
ATOT         OFF
%DO          OFF
TSS          OFF
TISS         OFF
CBOD         OFF
pH           OFF
CO2          OFF
HCO3         OFF
CO3          OFF

CST FLUX   CFWBC   CFWBC   CFWBC   CFWBC   CFWBC   CFWBC   CFWBC   CFWBC   CFWBC
TISSIN       OFF
TISSOUT      OFF
PO4AR        OFF
PO4AG        OFF
PO4AP        OFF
PO4ER        OFF
PO4EG        OFF
PO4EP        OFF
PO4POM       OFF
PO4DOM       OFF
PO4OM        OFF
PO4SED       OFF
PO4SOD       OFF
PO4SET       OFF
NH4NITR      OFF
NH4AR        OFF
NH4AG        OFF
NH4AP        OFF
NH4ER        OFF
NH4EG        OFF
NH4EP        OFF
NH4POM       OFF
NH4DOM       OFF
NH4OM        OFF
NH4SED       OFF
NH4SOD       OFF
NO3DEN       OFF
NO3AG        OFF
NO3EG        OFF
NO3SED       OFF
DSIAG        OFF
DSIEG        OFF
DSIPIS       OFF
DSISED       OFF
DSISOD       OFF
DSISET       OFF
PSIAM        OFF
PSINET       OFF
PSIDK        OFF
FESET        OFF
FESED        OFF
LDOMDK       OFF
LRDOM        OFF
RDOMDK       OFF
LDOMAP       OFF
LDOMEP       OFF
LPOMDK       OFF
LRPOM        OFF
RPOMDK       OFF
LPOMAP       OFF
LPOMEP       OFF
LPOMSET      OFF
RPOMSET      OFF
CBODDK       OFF
DOAP         OFF
DOAR         OFF
DOEP         OFF
DOER         OFF
```

```
DOPOM         OFF
DODOM         OFF
DOOM          OFF
DONITR        OFF
DOCBOD        OFF
DOREAR        OFF
DOSED         OFF
DOSOD         OFF
TICAG         OFF
TICEG         OFF
SEDDK         OFF
SEDAS         OFF
SEDLPOM       OFF
SEDSET        OFF
SODDK         OFF

CST ICON   C2IWB   C2IWB   C2IWB   C2IWB   C2IWB   C2IWB   C2IWB   C2IWB   C2IWB
TDS      51.0000
Gen1     100.000
Gen2     0.00000
Gen3     10.0000
ISS1     2.00000
PO4      0.00000
NH4      0.00000
NO3      0.14000
DSI      0.00000
PSI      0.00000
FE       0.10000
LDOM     0.70000
RDOM     2.02000
LPOM     0.10000
RPOM     0.00000
ALG1     1.00000
DO       1.00000
TIC      11.9100
ALK      31.0000
ZOO1      0.1000
LDOM_P    0.0005
RDOM_P    0.0005
LPOM_P    0.0005
RPOM_P    0.0005
LDOM_N    0.0080
RDOM_N    0.0080
LPOM_N    0.0080
RPOM_N    0.0080

CST PRIN  CPRWBC  CPRWBC  CPRWBC  CPRWBC  CPRWBC  CPRWBC  CPRWBC  CPRWBC  CPRWBC
TDS           OFF
Gen1          OFF
Gen2          OFF
Gen3          OFF
ISS1          OFF
PO4           OFF
NH4           OFF
NO3           OFF
DSI           OFF
PSI           OFF
FE            OFF
LDOM          OFF
RDOM          OFF
LPOM          OFF
RPOM          OFF
ALG1          OFF
DO            OFF
TIC           OFF
ALK           OFF
ZOO1          OFF
LDOM_P        OFF
RDOM_P        OFF
LPOM_P        OFF
RPOM_P        OFF
LDOM_N        OFF
RDOM_N        OFF
LPOM_N        OFF
```

RPOM_N	OFF

CIN CON	CINBRC	CINBRC	CINBRC	CINBRC	CINBRC	CINBRC	CINBRC	CINBRC	CINBRC
TDS	OFF	OFF							
Gen1	OFF	OFF							
Gen2	OFF	OFF							
Gen3	OFF	OFF							
ISS1	OFF	OFF							
PO4	OFF	OFF							
NH4	OFF	OFF							
NO3	OFF	OFF							
DSI	OFF	OFF							
PSI	OFF	OFF							
FE	OFF	OFF							
LDOM	OFF	OFF							
RDOM	OFF	OFF							
LPOM	OFF	OFF							
RPOM	OFF	OFF							
ALG1	OFF	OFF							
DO	OFF	OFF							
TIC	OFF	OFF							
ALK	OFF	OFF							
ZOO1	OFF	OFF							
LDOM_P	OFF	OFF							
RDOM_P	OFF	OFF							
LPOM_P	OFF	OFF							
RPOM_P	OFF	OFF							
LDOM_N	OFF	OFF							
RDOM_N	OFF	OFF							
LPOM_N	OFF	OFF							
RPOM_N	OFF	OFF							

CTR CON	CTRTRC	CTRTRC	CTRTRC	CTRTRC	CTRTRC	CTRTRC	CTRTRC	CTRTRC	CTRTRC
TDS	OFF								
Gen1	OFF								
Gen2	OFF								
Gen3	OFF								
ISS1	OFF								
PO4	OFF								
NH4	OFF								
NO3	OFF								
DSI	OFF								
PSI	OFF								
FE	OFF								
LDOM	OFF								
RDOM	OFF								
LPOM	OFF								
RPOM	OFF								
ALG1	OFF								
DO	OFF								
TIC	OFF								
ALK	OFF								
ZOO1	OFF								
LDOM_P	OFF								
RDOM_P	OFF								
LPOM_P	OFF								
RPOM_P	OFF								
LDOM_N	OFF								
RDOM_N	OFF								
LPOM_N	OFF								
RPOM_N	OFF								

CDT CON	CDTBRC	CDTBRC	CDTBRC	CDTBRC	CDTBRC	CDTBRC	CDTBRC	CDTBRC	CDTBRC
TDS	OFF	OFF							
Gen1	OFF	OFF							
Gen2	OFF	OFF							
Gen3	OFF	OFF							
ISS1	OFF	OFF							
PO4	OFF	OFF							
NH4	OFF	OFF							
NO3	OFF	OFF							
DSI	OFF	OFF							
PSI	OFF	OFF							
FE	OFF	OFF							

```
LDOM          OFF     OFF
RDOM          OFF     OFF
LPOM          OFF     OFF
RPOM          OFF     OFF
ALG1          OFF     OFF
DO            OFF     OFF
TIC           OFF     OFF
ALK           OFF     OFF
ZOO1          OFF     OFF
LDOM_P        OFF     OFF
RDOM_P        OFF     OFF
LPOM_P        OFF     OFF
RPOM_P        OFF     OFF
LDOM_N        OFF     OFF
RDOM_N        OFF     OFF
LPOM_N        OFF     OFF
RPOM_N        OFF     OFF

CPR CON   CPRBRC  CPRBRC  CPRBRC  CPRBRC  CPRBRC  CPRBRC  CPRBRC  CPRBRC  CPRBRC
TDS           OFF     OFF
Gen1          OFF     OFF
Gen2          OFF     OFF
Gen3          OFF     OFF
ISS1          OFF     OFF
PO4           OFF     OFF
NH4           OFF     OFF
NO3           OFF     OFF
DSI           OFF     OFF
PSI           OFF     OFF
FE            OFF     OFF
LDOM          OFF     OFF
RDOM          OFF     OFF
LPOM          OFF     OFF
RPOM          OFF     OFF
ALG1          OFF     OFF
DO            OFF     OFF
TIC           OFF     OFF
ALK           OFF     OFF
ZOO1          OFF     OFF
LDOM_P        OFF     OFF
RDOM_P        OFF     OFF
LPOM_P        OFF     OFF
RPOM_P        OFF     OFF
LDOM_N        OFF     OFF
RDOM_N        OFF     OFF
LPOM_N        OFF     OFF
RPOM_N        OFF     OFF

EX COEF    EXH2O    EXSS    EXOM    BETA     EXC    EXIC
WB 1     0.25000 0.01000 0.20000 0.45000     OFF     OFF

ALG EX       EXA     EXA     EXA     EXA     EXA     EXA
         0.20000

ZOO EX       EXZ     EXZ     EXZ     EXZ     EXZ     EXZ
             0.2     0.2     0.2

MACRO EX     EXM     EXM     EXM     EXM     EXM     EXM
          0.0100

GENERIC    CGQ10   CG0DK   CG1DK     CGS
CG 1     0.00000 0.00000 0.00000 0.00000
CG 2     0.00000 -1.0000 0.00000 0.00000
CG 3     1.04000 0.00000 1.40000 0.00000

S SOLIDS     SSS   SEDRC   TAUCR
SS# 1    1.00000     OFF .15E-04

ALGAL RATE    AG      AR      AE      AM      AS    AHSP    AHSN   AHSSI    ASAT
ALG1     2.00000 0.04000 0.04000 0.10000 0.10000 0.00300 0.01400 0.00000 100.000

ALGAL TEMP   AT1     AT2     AT3     AT4     AK1     AK2     AK3     AK4
ALG1     5.00000 30.0000 35.0000 40.0000 0.10000 0.99000 0.99000 0.10000
```

```
ALG STOI    ALGP    ALGN    ALGC   ALGSI   ACHLA   ALPOM   ANEQN    ANPR
ALG1     0.00500 0.08000 0.45000 0.00000 65.0000 0.80000       1 0.00000

EPIPHYTE    EPIC    EPIC    EPIC    EPIC    EPIC    EPIC    EPIC    EPIC    EPIC
EPI1         OFF

EPI PRIN    EPRC    EPRC    EPRC    EPRC    EPRC    EPRC    EPRC    EPRC    EPRC
EPI1         OFF

EPI INIT   EPICI   EPICI   EPICI   EPICI   EPICI   EPICI   EPICI   EPICI   EPICI
EPI1     0.00000

EPI RATE      EG      ER      EE      EM      EB    EHSP    EHSN   EHSSI
EPI1     2.00000 0.04000 0.04000 0.10000 0.00100 0.00300 0.01400 0.00000

EPI HALF    ESAT     EHS   ENEQN    ENPR
EPI1     125.000 1.00000       1 0.00000

EPI TEMP     ET1     ET2     ET3     ET4     EK1     EK2     EK3     EK4
EPI1     5.00000 25.0000 35.0000 40.0000 0.10000 0.99000 0.99000 0.10000

EPI STOI      EP      EN      EC     ESI   ECHLA    EPOM
EPI1     0.00500 0.08000 0.45000 0.00000 65.0000 0.80000

ZOOP RATE     ZG      ZR      ZM    ZEFF   PREFP  ZOOMIN    ZS2P
Zoo1        1.50    0.10   0.010    0.50    0.50  0.0100    0.30

ZOOP ALGP  PREFA   PREFA   PREFA   PREFA   PREFA   PREFA   PREFA   PREFA   PREFA
Zoo1        1.00    0.50    0.50

ZOOP ZOOP  PREFZ   PREFZ   PREFZ   PREFZ   PREFZ   PREFZ   PREFZ   PREFZ   PREFZ
Zoo1        0.00    0.00    0.00

ZOOP TEMP    ZT1     ZT2     ZT3     ZT4     ZK1     ZK2     ZK3     ZK4
             0.0    15.0    20.0    36.0     0.1     0.9    0.98   0.100

ZOOP STOI     ZP      ZN      ZC
         0.01500 0.08000 0.45000

MACROPHYT MACWBC  MACWBC  MACWBC  MACWBC  MACWBC  MACWBC  MACWBC  MACWBC  MACWBC
Mac1          ON     OFF     OFF

MAC PRINT MPRWBC  MPRWBC  MPRWBC  MPRWBC  MPRWBC  MPRWBC  MPRWBC  MPRWBC  MPRWBC
Mac1          ON     OFF     OFF

MAC INI  MACWBCI MACWBCI MACWBCI MACWBCI MACWBCI MACWBCI MACWBCI MACWBCI MACWBCI
Mac1     0.00000       0.1     0.5

MAC RATE      MG      MR      MM    MSAT    MHSP    MHSN    MHSC    MPOM  LRPMAC
Mac 1       0.30    0.05    0.05    30.0     0.0     0.0     0.0     0.9     0.2

MAC SED     PSED    NSED
MAC 1        0.5     0.5

MAC DIST    MBMP    MMAX
Mac 1       40.0   500.0

MAC DRAG  CDDRAG     DWV    DWSA   ANORM
Mac 1        3.0 7.0E+04     8.0     0.3

MAC TEMP     MT1     MT2     MT3     MT4     MK1     MK2     MK3     MK4
Mac 1        7.0    15.0    24.0    34.0     0.1    0.99    0.99    0.01

MAC STOICH    MP      MN      MC
Mac 1      0.005    0.08    0.45

DOM       LDOMDK  RDOMDK   LRDDK
WB 1     0.30000 0.00100 0.01000

POM       LPOMDK  RPOMDK   LRPDK    POMS
WB 1     0.08000 0.01000 0.00100 0.50000

OM STOIC    ORGP    ORGN    ORGC   ORGSI
WB 1     0.00500 0.08000 0.45000 0.18000
```

```
OM RATE      OMT1    OMT2    OMK1    OMK2
WB 1     4.00000 30.0000 0.10000 0.99000

CBOD        KBOD    TBOD    RBOD    CBODS
BOD 1    0.25000 1.01500 1.85000      0.0

CBOD STOIC  BODP    BODN    BODC
BOD 1    0.00500 0.08000 0.45000

PHOSPHOR    PO4R   PARTP
WB 1     0.01500 1.20000

AMMONIUM    NH4R   NH4DK
WB 1     0.15000 0.05000

NH4 RATE   NH4T1   NH4T2   NH4K1   NH4K2
WB 1     5.00000 25.0000 0.10000 0.99000

NITRATE    NO3DK    NO3S
WB 1     0.05000 0.00000

NO3 RATE   NO3T1   NO3T2   NO3K1   NO3K2
WB 1     5.00000 25.0000 0.10000 0.99000

SILICA      DSIR    PSIS   PSIDK  PARTSI
WB 1     0.10000 0.10000 0.30000 0.20000

IRON         FER     FES
WB 1     0.50000 2.00000

SED CO2     CO2R
WB 1     0.10000

STOICH 1   O2NH4    O2OM
WB 1     4.57000 1.40000

STOICH 2    O2AR    O2AG
ALG1     1.10000 1.40000

STOICH 3    O2ER    O2EG
EPI1     1.10000 1.40000

STOICH 4    O2ZR
ZOO1     1.10000

STOICH 5    O2MR    O2MG
MAC1         1.1     1.4

O2 LIMIT   O2LIM
         0.10000

SEDIMENT    SEDC  SEDPRC   SEDCI    SEDK    SEDS    FSOD    FSED    SEDB
WB 1         OFF      ON 0.00000 0.08000     0.1 1.00000 1.00000   0.000

SOD RATE   SODT1   SODT2   SODK1   SODK2
WB 1     4.00000 30.0000 0.10000 0.99000

S DEMAND     SOD     SOD     SOD     SOD     SOD     SOD     SOD     SOD     SOD
         0.30000 0.30000 0.30000 0.30000 0.30000 0.40000 0.50000 0.50000 0.50000
         0.70000 0.90000 1.10000 1.30000 1.50000 1.70000 1.90000 1.90000 1.90000
         1.70000 1.50000 1.40000 1.30000 0.00000

REAERATION  TYPE    EQN#   COEF1   COEF2   COEF3   COEF4
WB 1        LAKE       2 0.00000 0.00000 0.00000 0.00000

RSI FILE.................................RSIFN................................
        rsi.npt

QWD FILE.................................QWDFN................................
        qwd.npt

QGT FILE.................................QGTFN................................
        qgt.npt
```

```
WSC FILE.................................WSCFN................................
        wsc.npt

SHD FILE.................................SHDFN................................
        shd.npt

BTH FILE.................................BTHFN................................
WB 1    bth.npt

MET FILE.................................METFN................................
WB 1    met.npt

EXT FILE.................................EXTFN................................
WB 1    ext.npt

VPR FILE.................................VPRFN................................
WB 1    vpr.npt

LPR FILE.................................LPRFN................................
WB 1    lpr.npt - not used

QIN FILE.................................QINFN................................
BR1     qin_br1.npt
BR2     qin_br2.npt

TIN FILE.................................TINFN................................
BR1     tin_br1.npt
BR2     tin_br2.npt

CIN FILE.................................CINFN................................
BR1     cin_br1.npt
BR2     cin_br2.npt

QOT FILE.................................QOTFN................................
BR1     qout.npt
BR2     qot_br2.npt

QTR FILE.................................QTRFN................................
TR1     qtr_tr1.npt - not used

TTR FILE.................................TTRFN................................
TR1     ttr_tr1.npt - not used

CTR FILE.................................CTRFN................................
TR1     ctr_tr1.npt - not used

QDT FILE.................................QDTFN................................
BR1     qwb.npt
BR2     qdt_br2.npt - not used

TDT FILE.................................TDTFN................................
BR1     tdt_br1.npt
BR2     tdt_br2.npt - not used

CDT FILE.................................CDTFN................................
BR1     cdt_br1.npt - not used
BR2     cdt_br2.npt - not used

PRE FILE.................................PREFN................................
BR1     pre_br1.npt - not used
BR2     pre_br2.npt

TPR FILE.................................TPRFN................................
BR1     tpr_br1.npt - not used
BR2     tpr_br2.npt

CPR FILE.................................CPRFN................................
BR1     cpr_br1.npt - not used
BR2     cpr_br2.npt

EUH FILE.................................EUHFN................................
BR1     euh_br1.npt - not used
BR2     euh_br2.npt
```

```
TUH FILE.................................TUHFN................................
BR1     tuh_br1.npt - not used
BR2     tuh_br2.npt

CUH FILE.................................CUHFN................................
BR1     cuh_br1.npt - not used
BR2     cuh_br2.npt

EDH FILE.................................EDHFN................................
BR1     edh_br1.npt - not used
BR2     edh_br2.npt

TDH FILE.................................TDHFN................................
BR1     tdh_br1.npt - not used
BR2     tdh_br2.npt

CDH FILE.................................CDHFN................................
BR1     cdh_br1.npt - not used
BR2     cdh_br2.npt

SNP FILE.................................SNPFN................................
WB 1    snp_wb1.opt

PRF FILE.................................PRFFN................................
WB 1    prf_wb1.opt - not used

VPL FILE.................................VPLFN................................
WB 1    vpl_wb1.opt - not used

CPL FILE.................................CPLFN................................
WB 1    cpl_wb1.opt

SPR FILE.................................SPRFN................................
WB 1    spr_wb1.opt

FLX FILE.................................FLXFN................................
WB 1    flx_wb1.opt - not used

TSR FILE.................................TSRFN................................
        tsr_wb1.opt

WDO FILE.................................WDOFN................................
        wdo_wb1.opt
```