

# Lower Boise Watershed Phosphorus TMDL Technical Advisory Meeting

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Modeling Status Update  
May 23, 2013

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DRAFT

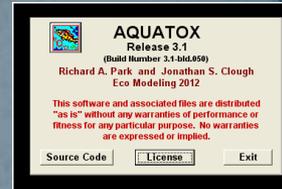
*Disclaimer: Any opinions, findings, statements, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of Lower Boise Watershed stakeholders.*

# Status of Modeling

- USGS efforts for DEQ (Alex Etheridge will present)
- DEQ efforts and support from TAC members
- ★ • DEQ established Modeling Group
  - October 11<sup>th</sup> Council Meeting - “Recommend establishing a working group to look at models to see what will work for our plan. Start sooner than later with this effort. DEQ will send out an email to determine interest. Ben from EPA is available and will help with the modeling.”
  - DEQ posted information and provided updates at TAC and Council meetings
- DEQ held Modeling Workgroup Meetings
  - November 28, 2012
  - January 17, 2013
  - February 21, 2013
  - March 21, 2013

# Modeling Workgroup Meetings

- November 28, 2012
  - Discussed history of Lower Boise River modeling efforts
- January 17, 2013
  - Discussed preliminary results of mass balance model
- February 21, 2013
  - Continued discussion of mass balance model
  - Discussed periphyton dynamics and modeling with AQUATOX and QUAL2Kw
- March 21, 2013
  - Continued discussion of mass balance model
  - ★ • DEQ announces model selection – AQUATOX
    - Publically available model from EPA
    - <http://water.epa.gov/scitech/datait/models/aquatox/index.cfm>



# Modeling Process

- Model development
  - DEQ will own, house, and be responsible for the model
  - DEQ will tap the expertise of the TAC members
  - DEQ plans to build the model from the ground up and use previous work for reference
- DEQ held Weekly Modeling Work Sessions
  - April 2, 2013
  - April 9, 2013
  - April 16, 2013
  - April 23, 2013
  - April 30, 2013
  - May 14, 2013

# Modeling Work Sessions:

April 2, 2013

- Discussed approach for AQUATOX model setup
  - Segmentation (river reaches)
  - Linking (upstream conditions connected to downstream)
  - Time Period (period of simulation)
  - Flow
  - Parameterization (water quality inputs and coefficients)
- AQUATOX use includes translating the instream periphyton Chla target (150 g/m<sup>2</sup>) to a TP concentration
- DEQ will “own” the model but is looking for help building it from the stakeholders
- DEQ will start developing model report/documentation

# Modeling Work Sessions:

## April 9, 2013

- Segmentation

- Discussed segmentation: 4, 13, or other options
- ★ • Selected 13 segments rather than spend effort modifying (April 30<sup>th</sup>)

- Linking

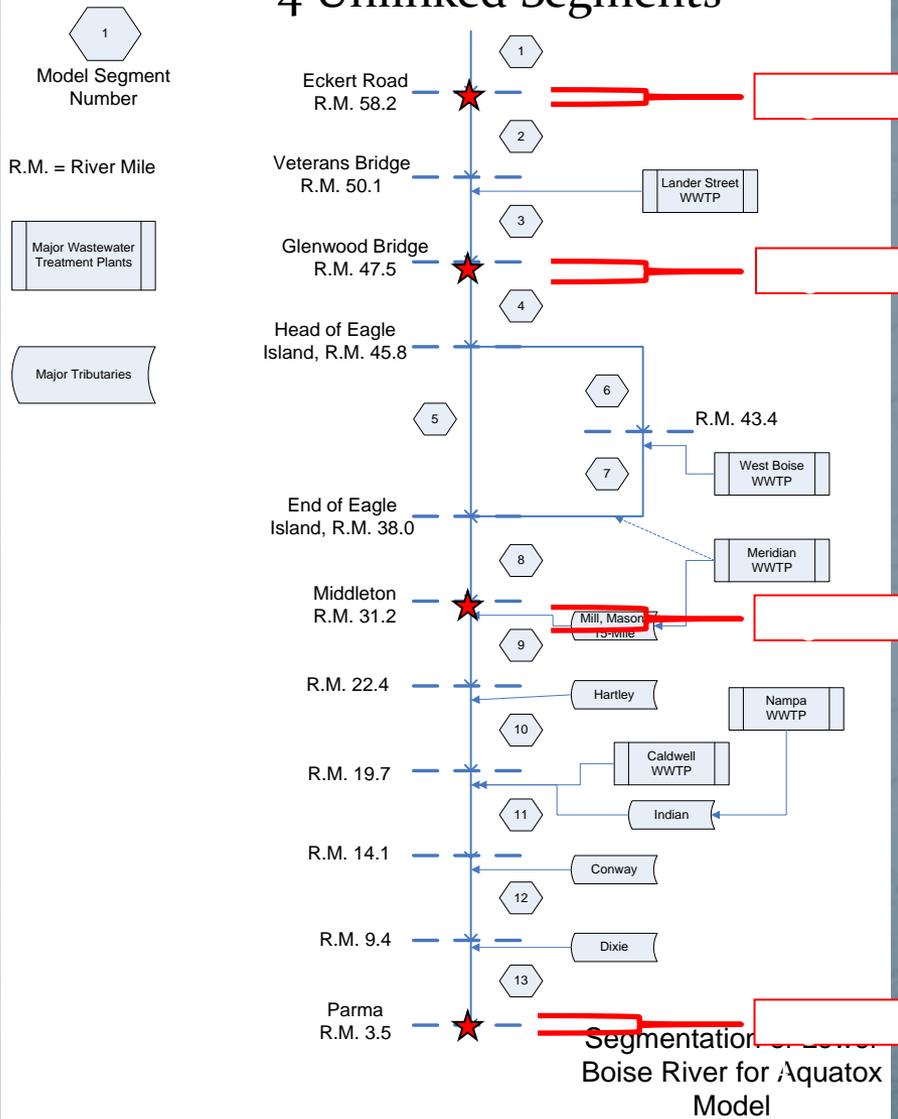
- Discussed unlinked vs. linked model
- ★ • Selected linked model

- Time Period

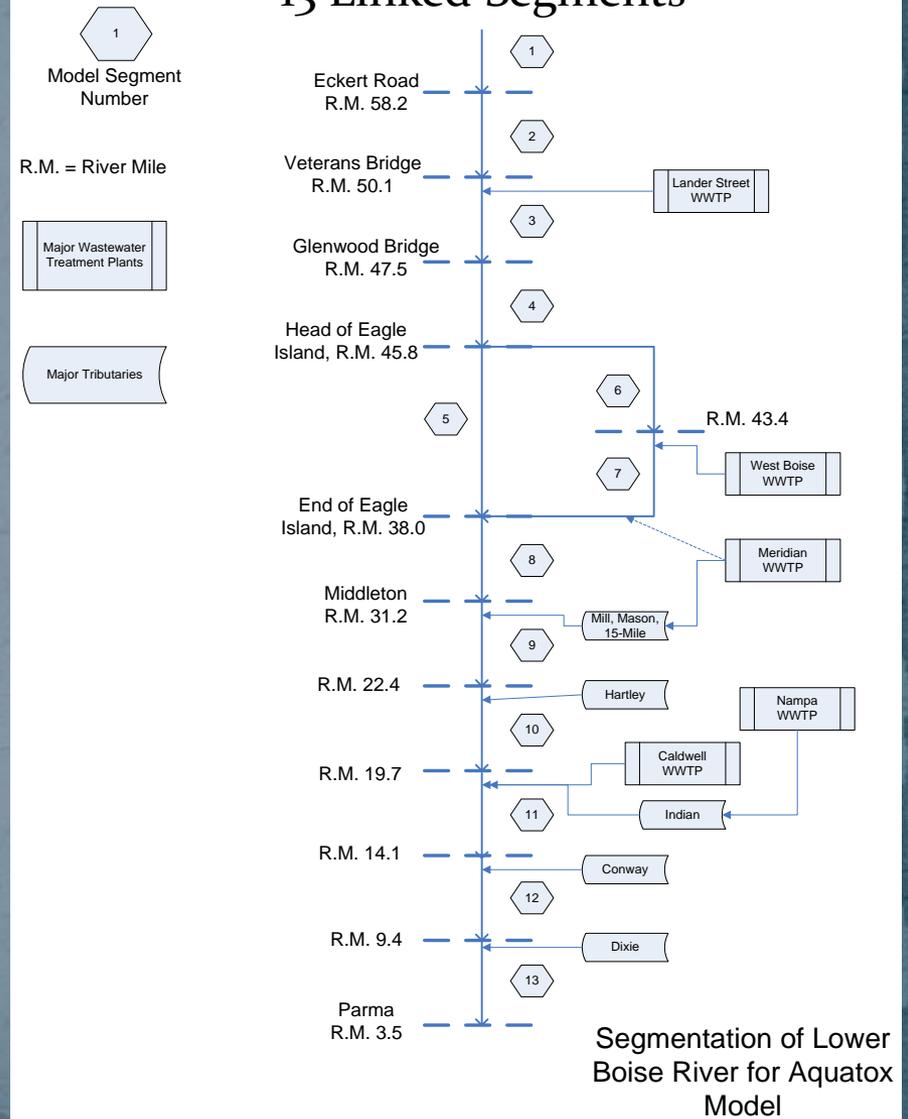
- ★ • Selected January 1, 2012 through April 30, 2013
- “For initial model calibration and runs, we plan to implement a January 1, 2012 through April 30, 2013 time period. This will enable us to capture the entire year and USGS’s synoptic events”

# Segmentation and Linking

## 4 Unlinked Segments



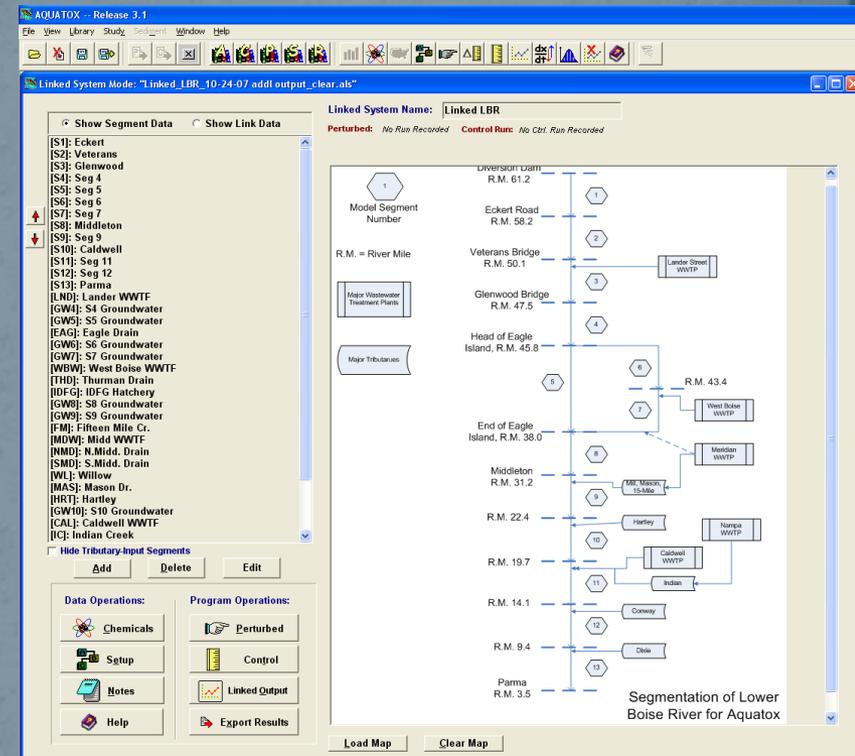
## 13 Linked Segments



# Modeling Work Sessions:

## April 16, 2013

- Continue discussion of model setup, inputs, and calibration
- Parameterization
  - ★ Selected for increased model simplicity and defensibility, animals (grazers) will not be included in the model simulations.
    - Tests with previous model revealed minor differences in results.
  - Use the same periphyton categories as in the previous model and continue to discuss



# Model Input: Flow

AQUATOX

File View Library Study Sediment Window Help

Linked System Mode: "Linked\_LBR\_10-24-07 addl output\_clear.als"

Linked System Name:

Perturbed: No Run Recorded Control Run: 01-21-13 11:58 PM

Show Segment Data  Show Link Data

- S1 to S2: From [S1] to [S2]
- S2 to S3: From [S2] to [S3]
- S3 to S4: From [S3] to [S4]
- S4 to S5: From [S4] to [S5]
- S4 to S6: From [S4] to [S6]
- S5 to S8: From [S5] to [S8]
- S6 to S7: From [S6] to [S7]
- S7 to S8: From [S7] to [S8]
- S8 to S9: From [S8] to [S9]
- S9 to S10: From [S9] to [S10]
- S10 to S11: From [S10] to [S11]
- S11 to S12: From [S11] to [S12]
- S12 to S13: From [S12] to [S13]
- Lander WWTF: From [LND] to [S3]**
- S4 Groundwater: From [GW4] to [S4]
- S5 Groundwater: From [GW5] to [S5]
- Eagle Drain: From [EAG] to [S5]
- S6 Groundwater: From [GW6] to [S6]
- S7 Groundwater: From [GW7] to [S7]
- West Boise WWTF: From [WBW] to [S7]
- Thurman Drain: From [THD] to [S7]
- IDFG Hatchery: From [IDFG] to [S7]
- S8 Groundwater: From [GW8] to [S8]
- S9 Groundwater: From [GW9] to [S9]
- Fifteen Mile Cr.: From [FM] to [S9]
- Midd WWTF: From [MDW] to [S9]
- N.Midd. Drain: From [NMD] to [S9]
- S.Midd. Drain: From [SMD] to [S9]
- Willow: From [WL] to [S9]
- Mason Dr.: From [MAS] to [S9]
- Hartley: From [HRT] to [S9]
- C4R Groundwater: From [C4R] to [S40]

Hide Tributary-Input Segments

**Data Operations:**

- 
- 
- 
- 

**Program Operations:**

- 
- 
- 
- 

**Edit Linkage Between Segments**

Type of Link:  Cascade Link  Feedback Link

Link Name:

Characteristic Length:  m

Link From Segment:  To Segment:

**Water flow data: cu.m/d**

Date	Loading
9/20/2006	5.3374e04
9/21/2006	5.4018e04
9/22/2006	5.3299e04
9/23/2006	5.3450e04
9/24/2006	5.2352e04
9/25/2006	5.2163e04
9/26/2006	5.2617e04
9/27/2006	5.3223e04
9/28/2006	5.3374e04
9/29/2006	5.2314e04
9/30/2006	5.3071e04

**Dispersion coeff.: sq.m/d**

Date	Loading

**XSection of boundary: sq.m**

Date	Loading

(Water flow must be non-negative)

Note: water flows specified here are from one modeled (or tributary) segment to another modeled segment. Additional boundary condition inflows and outflows may be found in the water volume screen within each segment.

R.M. 14.1

R.M. 9.4

Parma

Indian

Conway

Dale

start

Inbox - Microsoft Out... Replicate DEQ\_Meeting\_Draft... COM\_Meeting\_02251... outline ideas.docx - ... AQUATOX Release 3.1

12:57 PM

# Model Input: Concentration

AQUATOX - Main Window

File View Library Study Sediment Window Help

Linked System Mode: "Linked\_LBR\_10-24-07 addl output\_clear.als"

Linked System Name:  **Perturbed:** No Run Recorded **Control Run:** 01-21-13 11:58 PM

Show Segment Data Show Link Data

Segment LND: Linked LBR; Linked\_LBR\_10-24-07 addl output\_clear.als

Single Segment of "Linked LBR"

Seg ID: LND Seg. Name: Lander WWTF EPA Release 3.1

Model Run Status: **Perturbed Run:** No Results Attached **Control Run:** 01-21-13 1:44 PM

Data Operations: Initial Conds. Chemical Site Setup Notes Birds, Mink... Food Web Sed Layer(s)

Program Operations: Go Back Output Export Results Export Control Use Wizard Help

Linked Mode Data: Stratification Morphometry

State and Driving Variables In Study

Total Ammonia as N  
Nitrate as N  
Total Soluble P  
Carbon dioxide  
Oxygen  
Tot. Susp. Solids  
Refrac. sed. detritus  
Labile sed. detritus  
Susp. and dissolved detritus  
Buried refrac. detritus  
Buried labile detritus  
Diatoms1: [Peri Low-Nut Diatom]  
Diatoms2: [Peri High-Nut Diatom]  
Diatoms3: [Phyt High-Nut Diatom]  
Diatoms4: [Phyt Low-Nut Diatom]  
Diatoms5: [Peri, Navicula]  
Diatoms6: [Peri, Nitzschia]  
Greens1: [Cladophora]  
Greens2: [Phyto, Green]  
Cyanobacteria1: [Phyt, Blue-Gree  
Cyanobacteria3: [Peri, Blue-Gree  
OtherAlg1: [Cryptomonas]  
Shredder1: [Crayfish]  
Shredder2: [Rotifer, Brachionus]  
SedFeeder1: [Chironomid]  
SedFeeder2: [Tubifex tubifex]  
SuspFeeder1: [Caddisfly, Trichopt  
SuspFeeder2: [Daphnia]

AQUATOX - Edit State Variable Data

Total Soluble P

Initial Condition: 0.01 mg/L  Value is Total P

Ignore All Loadings  Fraction Available

Use Constant Loading of 0 mg/L  Inflows are TP

Use Dynamic Loadings  Hourly Loadings

Date	Loading	mg/L
6/6/2006	3.082	
6/7/2006	3.862	
6/14/2006	4.437	
6/21/2006	5.09	
6/28/2006	5.81	
7/6/2006	6.709	
7/12/2006	6.92	
7/19/2006	7.72	
7/26/2006	7.72	

Multiply loading by 1

Notes: Patchy data through Nov-1999  
TP from Lander & West Boise Effluent Data 1998-200

Loadings from Point Sources

Use Const. Loading of 0 g/d  Convert  PS Loads are TP

Date	Loading	g/d

Multiply loading by 1

Loadings from Direct Precipitation

Use Const. Loading of 0 g/m2-d  Use Dynamic Loadings

Date	Loading	g/m2-d

Multiply loading by 1

N.P.S.  OK  Cancel

R.M. 9.4  
Parma

Load Map Clear Map

# Model Input: Concentration Options

- Constant
- Time variable
- Reduction factor

AQUATOX- Edit State Variable Data

### Total Soluble P

**Initial Condition:**  
0.01 mg/L  Value is Total P

Ignore All Loadings   
 Use Constant Loading of 0 mg/L  Inflows are TP  
 Use Dynamic Loadings  Hourly Loadings

Date	Loading
6/6/2006	3.082
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mg/L

Multiply loading by 1

Notes: Patchy data through Nov- 1999  
TP from Lander & West Boise Effluent Data 1998-200

### Loadings from Point Sources

Use Const. Loading of 0 g/d   
 Use Dynamic Loadings  PS Loads are TP

Date	Loading
------	---------

g/d

Multiply loading by 1

### Loadings from Direct Precipitation

Use Const. Loading of 0 g/m2 - d  
 Use Dynamic Loadings

Date	Loading
------	---------

g/m2 - d

Multiply loading by 1

# Modeling Work Sessions:

April 23, 2013

- Discuss plant (periphyton) categories
- Dr. Park performed test simulations
- ★ • Recommended using at least four categories
- Discuss pebble counts and translation of periphyton data
  - Concluded should use 1997 data as basis to represent conditions
- DEQ to start compiling point source data

# Modeling Work Sessions:

## April 30, 2013

- Continue discussion of periphyton data
  - May need a translator between field data and model results
    - Field data are from specific riffle locations
    - AQUATOX periphyton results are for a model segment
  - Ben Cope and Dick Park provided presentations
- Data compilation
  - Representatives for point sources compile data
  - Kate Harris compile flow and water quality for 2012-13
  - Michael Kasch use data to update AQUATOX model

# Modeling Work Sessions:

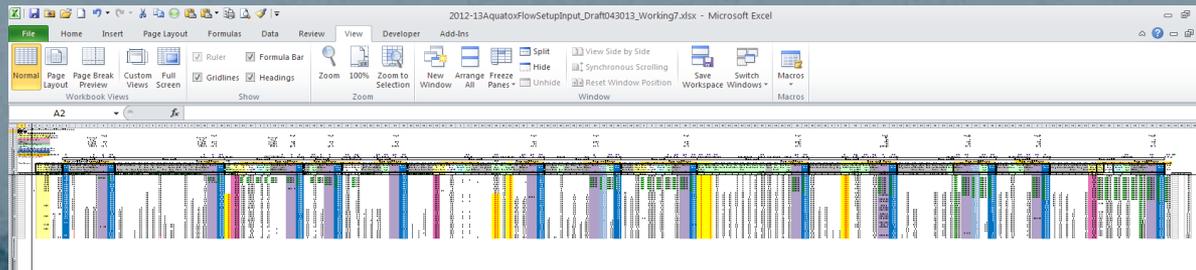
May 14, 2013

- Continue discussions
  - Compiling point source data
  - Periphyton representation and translation
  - Review of physical parameters

# Flows:

## Water Balance

- AQUATOX does not route flows
  - Water balance must be developed external to the model and flows input
- Acquired and reviewed water balance spreadsheets from previous modeling work
  - Used as a template with modifications for 2012-13
- Flow data sources
  - USGS, Reclamation, Water Resources, Point Sources
- Spreadsheet
  - 153 columns, 56 withdrawals, 21 inflows, 6 observation points and 70 calculations



# AQUATOX Import Spreadsheet

- AQUATOX has a feature to import data from a spreadsheet
- Acquired and reviewed import spreadsheet from previous modeling work
  - Updated spreadsheet with 2012-13 flows and water quality data
  - Imported the spreadsheet into the AQUATOX model
  - Reset the simulation period
  - Simulated the model
- Model status
  - ★ • Functional model with majority of 2012-13 data
  - Spreadsheet may be updated and readily re-imported

# Modeling Coordination

- Met with DEQ
- Discussed and provided files
  - Water balance spreadsheet
  - Import spreadsheet
  - AQUATOX model file
- Emailed files to Modeling Work Session attendees list

# Next Steps

- Continue updating the model
  - Point source data
  - Fifteenmile and Indian Creek
  - Confirm water quality data
  - Review physical and mean depth data
  - Compare unaccounted (groundwater) flows between water balance spreadsheet and USGS mass balance model
- Develop plan for continuing to update the model and sharing of updated files
- DEQ review model support efforts and continue to lead model development
- DEQ develop modeling workplan and determine needs for additional assistance