Date	Source	Topic	Comment	DEQ Response
9/24/2013	Ben Cope	P-half saturation	Need to take a close look at these parameters for calibration.	DEQ received input from various sources, including USGS, Brown and Caldwell, HDR, EPA, Dick Park, Jonathan Clough, and others and has strived to utilize appropriate and meaningful values. Documentation is available in the model and the model report.
10/15/2013	Kate Harris	Embeddedness	How is embeddedness used in the model via DEQ visual assessment?	Embeddedness is not applicable for this modeling effort because % embeddedness is used only for salmonid spawning and this model set-up is not using the sediment diagenesis.
10/15/2013	Kate Harris	Cladophora	Cladophora dropped immediately after initial conditions and never recovered.	As we continue striving to fix these model calibration issues, Dick Park also recognized that *Cladophora* is occurring in segments such as S2, and he suggested fine tuning nutrient parameters reflect that. Algal parameters were adjusted for the final model and documented in the model report.
10/15/2013	Kate Harris	Blue Greens	Blue greens did not show up at all in the model.	As we continue striving to fix these model calibration issues, Dick Park also recognized that Cyanobacteria initial conditions had been set to 0; they were reset to a nominal value of 0.01 g/m2, and oce it was recognized that cyanobacteria were occurring in the early spring, *Oscillatoria* was parameterized as a cold-tolerant genus.Algal parameters were adjusted for the final model and documented in the model report.
10/15/2013	Kate Harris	DO	DO in segment 5 dropped below water quality standards.	Subsequent model calibration changes strived to improve this value, but it still exists in the final.
10/15/2013	Model Group	Groundwater	Need to clarify how groundwater volumes/concentrations are utilized in model for segments 1-8?	There is no groundwater volume for segments 1-3. Segments 4 through 13 have groundwater volume allcoations based on the mass balance work conducted by Alex Etheridge (USGS) and the water balance work conducted by Michael Kasch (HDR).
10/15/2013	Clifton Bell	Velocity	What collection methods were used to collect observed velocity data and how to extrapolate to other segments without observed data?	USGS collection methods were used. We have velocity data for 12 USGS stations so limited extrapolation was required. Currently, segments 1 & 2, segments 5 and 6, and segments 12 and 13 are using the same velocity dataset.

10/15/2013	Clifton Bell	Alga Accuracy	Careful not to overparameterize data - what algae taxa occur longitudinally and seasonally?	DEQ utilized data collected on the LBR (Rushforth 2007) and best professional judgment to determine and limit to most appropriate taxa and associated parameters and coefficients. In addition, Dick Park asserted that in order to make the calibration more defensible, most periphyton parameters were previously set equal to those used in the published Minnesota calibration, which extended across three diverse wadeable rivers, including low-nutrient, high-nutrient, clear, and turbid sites. DEQ built upon this information and comments from the model workgroup to identify appropriate algal taxa. and associated paramters and coefficients.
10/15/2013	Clifton Bell	Cladophora	Need to check cladophora temperature and growth rate in the model.	Dick Park also recognized that *Cladophora* is occurring in segments such as S2, and he suggested fine tuning nutrient parameters reflect that. Algal parameters were adjusted for the final model and documented in the model report.
10/15/2013	Clifton Bell	P-half saturation	Need to evaluate P-half sat values…LBR value for Blue Greens is 0.01 (MN default is 0.1) and LBR P-half sat for Cladophora is 0.01 (MN default is 0.04).	These values have been further adjusted based on model sensitivity analyses, literature and best prof. judg., including reviews and input by various members of the model workgroup. Documentation available in the model report.
10/15/2013	Clifton Bell	Calibration & Validation	Recommends undergoing a model validation exercise.	DEQ agrees with this suggestion, and is utlizing multiple lines of evidence to help calibrate the model. This approach is also consistent with Dick Park's recommendation, "...Because of the complexity of the model, there will almost never be sufficient data at all levels. Therefore, we usually apply a weight-of-evidence approach with a hierarchy of tests emphasizing discernment of similar simulated and observed patterns."
10/15/2013	Clifton Bell	Phytoplankton	Phytoplankton Chl a may be oversimulated – through sloughing or other mechanisms.	The model had inadvertantly been set-up with with duplicate phytoplankton loadings in the tributaries, which have since been corrected.

10/15/2013	Jack Harrison	Calibration/Validation	We need to utilize all of the available data to "optimize" the model.	DEQ agrees with this suggestion, and is utlizing multiple lines of evidence to help calibrate the model. This approach is also consistent with Dick Park's recommendation, "...Because of the complexity of the model, there will almost never be sufficient data at all levels. Therefore, we usually apply a weight-of-evidence approach with a hierarchy of tests emphasizing discernment of similar simulated and observed patterns."
10/22/2013	Darcy Sharp	Accuracy Goals	What is resonable accuracy goal for TSS in model?	General modeling group suggestion was that within 10-25% (similar to other parameters) is probably suitable. 25% accuracy is now applied to the model calibration.
10/22/2013	Jack Harrison	Velocity	Unsure how velocity is calculated in the model?	Velocity calculations are clearly identified in the AQUATOX technical documentation, and further velocity calibration steps are identified in the model report.
10/25/2013	Ben Cope	Questions for Jonathan & Dick	What are our assumptions about how the Boise River changes in terms of growth/die-off/succession of periphyton species over the year? Is there a common succession pattern in western streams?	Dick Park replied, "I have made no assumptions specific to LBR. I have tried to calibrate given the very limited periphyton observations (3 data points across several diverse reaches), supplemented by the data on periphyton composition from the earlier investigation. I believe the LBR is typical of many Western streams that are heavily managed for water use, resulting in an inversion of hydrology. The LBR team is in a better position to compare the simulated uccessional pattern with that seen in Western streams."
10/25/2013	Ben Cope	Questions for Jonathan & Dick	As the calibration stands now, it looks like we have two periphyton species that comprise almost all the predicted biomass (greens and high nutrient diatoms). Do we need 4 species as in our current setup?	Dick Park replied, "My calibration has completely changed the simulated composition. A diverse periphyton community is now represented; I believe this is in line with the available data on composition, for example in March 2007(Rushforth and Rushforth 2007). In the current simulation the only periphyton group not represented is that of greens other than Cladophora. With regard to calibration, one cannot determine goodness of fit with only three data points in any given segment. I strongly suggest that the team consider running the model from an earlier period to take advantage of the long sequence of periphyton observations under varying conditions."

10/25/2013	Ben Cope	Questions for Jonathan & Dick	What is the research support for assumptions on requirements/effects of high nutrient and low nutrient diatoms? Since the current condition (calibration state) is very high nutrients but the TMDL will move to a lower nutrient condition, do you anticipate that we will assume via model parameters the emergence/dominance of low nutrients diatoms? What would that mean for management of phosphorus to keep the periphyton biomass down? Simply put, will that assumption tend to favor the allowance of higher instream phosphorus, or the opposite?	Dick Park replied, "The concept of modeling both high- and low-nutrient diatoms simultaneously developed from an EPA-funded calibration of the model with Minnesota rivers across nutrient and turbidity gradients. Specifically, an assumption was that the pairing of low- and high-nutrient rivers could represent the equivalent of the change over time that would be experienced as an impacted river is subject to nutrient reduction. This assumption has been published several times and I am not aware that anyone has questioned it. I would expect the low-nutrient diatoms to dominate the diatom community in the LBR as P is reduced. This can be verified by examining the simulation of Segments 1 and 2, which are low in nutrients at present.Ben then asks “will that assumption tend to favor the allowance of higher instream phosphorus, or the opposite? “ I believe the answer is a counterintuitive one: the periphyton biomass may account for most of the P in a segment, but that has little effect on the down-stream transport of P. One of the powerful suites of analytical tools in AQUATOX is the ability to examine mass balances. We can examine the mass associated with each major compartment (Figure 3), and we can examine the rates (kg/d) over time (Figure 4). Most P is carried downstream, no matter what the biomass of periphyton. If the water balance is correct, then retention times are very short for the LBR; on the average, transit time is less than 1.5 days; maximum transit time is approximately 2 days for the period simulated."
10/25/2013	Ben Cope	Questions for Jonathan & Dick	Based on the current parameter setup, what is the most reasonable set of parameter changes to get the model to simulate higher periphyton biomass observed in March? The species that is dominant in the spring currently (high nutrient diatoms) just isn’t growing early or fast enough. There is also a prediction that the greens, which dominate the summer, crash to near zero in winter as currently simulated.	Dick Park replied, "This is answered by the abundant output from the present calibration (numerous figures accompanied the response)."
11/5/2013	Jack Harrison	Terminology	Careful with terminology (e.g. calibration vs. accuracy checks, etc)	In order to avoid confusion, or inadvertant misrepresentation, the previously identified "calibrations goals" will be called "accuracy goals" and the previously named "Model Calibration Report" will be named "Model Report."

11/5/2013	Ben Cope	Alga Accuracy	Evaluate potential model underprediction of periphyton in summer and spring	DEQ has made appropriate and defensible model parameter adjustments to try and improve model fit. The model report documents the strengths and limitations of the model results relative to the observed data for both areas of overprediction and underprediction of algae and other parameters.
11/5/2013	Ben Cope	Rate Constants	Should speak with Chris Mebane regarding rate constants used in the model	DEQ spoke with Chris Mebane on 12/2/2013 - literature sources and professional judgment may be best avenues. Chris subsequently provided information to the model workgroup during the 12/19/2014 meeting.
11/5/2013	Ben Cope	MOS & Critical Flows	Account/identify implicit/explicit MOS and critical low flows…preferred approach is to see how the calibration begins to look to help guide those decisions.	DEQ agrees that these issues need to be discussed and refined for the TMDL; however, the purpose of the model report is to demonstrate the process and end results of the model set-up and calibration for current conditions. The application of the model for the development of the nutrient allocations in the TMDL (via critical flows, MOS, etc.) will be addressed in the TMDL.
11/5/2013	Kate Harris	Model Spin-up	How to identify model spin-up period and associated criteria/rationale	The potential 4-month spin-up period was selected because it would allow sufficient time for the model to spin-up, while still maintaining a full year of model simulation. However, for the final model calibration, DEQ has determined that the necessary model spin-up period is two months, and that the use of modeled simulations for use in the TMDL begin March 1, 2012. This is based on sensitivity analyses which help identify better initial loads for nutrients and algal groups that eliminated the need for a full 4-month spin-up period.
11/5/2013	Matt Gregg	Documentation	Have spreadsheet identifying calibration questions and responses	For the modeling group, DEQ is tracking the model questions and concerns in this spreadsheet. All of the formal written comments received on the ftp for review by the public.
11/6/2013	Jack Harrison	Model Report	I do not believe… that “tracking” each change from an earlier very preliminary version is that critical. But sounds like other may want this….	This is a practice DEQ is implementing so we can clearly track model changes from one version to the next until a final version is identified.
11/6/2013	Jack Harrison	Parameter Adjustments	What are the changes from “defaults” and the previous model, and how are they supported?	Sections 2 and 3 of the model report provide detail about how the algal parameters in the final calibration differ from earlier model iterations, which parameters were most important for the final prediction of periphyton chlorophyll a (mg/m2), and how model error and bias differs for each parameter set.

11/6/2013	Jack Harrison	Alga Accuracy	How does periphyton compare to measured data?	New information has been added to Section 3.3.3 of the Model Report to address these comments and recommendations..
11/6/2013	Jack Harrison	Mass Balance TP	What is the mass balance for TP (hopefully were track the “change in storage (in biomass, detritus, etc) = in – out” at various locations and time steps?). This will be critical	Jonathan Clough has responded that the MB is working appropriately in the model. From the AQUATOX Technical Documentation, "Mass balance test= total Mass + Loss – Load" and should stay constant. This is further addressed in the model report.
11/6/2013	Jack Harrison	Sensitivity Analysis	What are the key parameters that control periphyton production and how do adjustments to these parameters affect production (this is a typical sensitivity analysis)	Boundary conditions of nutrients and chlorophyll and half-saturation values for algal groups have the largest effect on periphyton production. These and other calibration issues are documented in Section 3 of the model report.
11/6/2013	Jack Harrison	Conceptual Model	How well does the model represent our conceptual understanding of the complex processes involved (i.e., what’s included and what’s missing).	The conceptual model is identified and discussed in the model report, and was developed with input from numerous individuals of the model workgroup.
11/26/2013	Jack Harrison	Spurious Data	Be sure to check for spurious data in the model (e.g. temperature) and adjust/document as appropriate.	Removal of spurious data points, interpolation, data averaging and using long-term data were utilized to ensure appropriate and representative data values were used in the model. All of these changes are documented in the model report.
11/26/2013	Kate Harris	Curve Fitting	Clarification on how the curve fitting process is used during the sensitivity analysis for revising initial conditions.	Each sensitivity run altered given parameters by only 10%. Newly output initial condition loads were then used as new inputs for the model and another control run was made with the new initial conditions. This iterative process was used until the initial loads were not changed by more than 0.1 mg/L for nutrients and detritus.
11/26/2013	Kate Harris	Nutrient Modeling	How is the accuracy of modeled nitrate relative to observed data (e.g. discussion about NO2, NO3, NH4, Nox reported and used in model)?	The accuracy of model results to observed data are within the accuracy goals and are identified in the model report. Further, Dick Park confirmed that the appropriate input data types (e.g. Nitrates and Ammonia as N) are used in the model. Also, the comparison of observed data at or near segment breaks to the immediate upstream modeled output appears to be providing a more reasonable and meaningful relationship.

11/26/2013	Jack Harrison	Periphyton	Further investigate periphyton growth limiting factors (e.g. periphyton growth rates may be short relative to the growing season, etc.)	DEQ utilized data collected on the LBR (Rushforth 2007) and best professional judgment to determine and limit to most appropriate taxa and associated parameters and coefficients. In addition, Dick Park asserted that in order to make the calibration more defensible, most periphyton parameters were previously set equal to those used in the published Minnesota calibration, which extended across three diverse wadeable rivers, including low-nutrient, high-nutrient, clear, and turbid sites. DEQ built upon this information and comments from the model workgroup to identify appropriate algal taxa. and associated paramters and coefficients.
12/3/2013	Tom Dupuis	Periphyton & Phytoplankton	Concerned that modeled periphyton may be overinflated in the lower reaches of the river, which also seems to correspond with phytoplankton values that appear rather higher in the lower reaches than observed data would suggest.	DEQ has made appropriate and defensible model parameter adjustments to try and improve model fit. The model report will clearly document the strengths and limitations of the model fit to the observed data for both areas of overprediction and underprediction of algae and other parameters.
12/3/2013	Robbin Finch	Periphyton & Phytoplankton	Periphyton prediction appears closer in the upper half of the river but overpredicting in the lower segments: is it possible/appropriate to have two sets of biological rates (one for upper end, and one for lower end)?	Dick Park recommended against this dual approach in in his email response to the December 3rd questions from the Modeling Group.
12/3/2013	Ben Cope	Periphyton & Phytoplankton	What is driving the “spikiness” of the high nutrient diatoms (e.g. light limitation, etc)?	Sloughing and f-crit values appear to drive the model spikiness. DEQ has made appropriate and defensible model parameter adjustments toward improving model fit, relative to our understanding of the system function.
12/3/2013	Ben Cope	Periphyton& Phytoplankton	What is the annual pattern for periphyton?	Darcy addressed referencing the 2007 data and Dick Park’s 11/3/2013 report to the modeling group. Historical data is available for comparison to the model results, although the quantity of available data is highly variable among locations and seasons.

12/3/2013	Ben Cope	Nutrient Modeling	How to improve nutrient predictions in the upper reaches of the model?	DEQ has made appropriate and defensible model parameter adjustments to try and improve model fit. The model report will clearly document the strengths and limitations of the model fit to the observed data for both areas of overprediction and underprediction of algae and other parameters. A primary changed that improved nutrient calibration was that observed plant and nutrient data measured at/near segment breaks are compared modeled output from the segment just upstream, as a more appropriate comparison. Conversely, driver variables TSS, pH, Temp, and physical parameters such as DO and Velocity remaind with the measured segment.
12/3/2013	Ben Cope	Periphyton & Phytoplankton	Periphyton blue-green light limitation and other variables?	This issue has been addressed and corrected corrected in the 12/04 and subsequent model version.
12/3/2013	Michael Kasch	Nutrient Modeling	Do we need to double check groundwater (function of nitrate overprediction)?	This issue has been addressed and corrected corrected in the 12/04 and subsequent model version.
12/11/2013	HDR	Model 2013_1204 and 1209	DEQ and EPA have expressed a desire to somewhat over-predict typical conditions to provide for a margin of safety while providing an appropriate representation of the river. At the modeling work session there also was agreement that the model should not significantly over-predict periphyton especially given the targets that the model should appropriately represent the river and provide reasonable responses to scenarios of potential future conditions. The implications of a model with significant over-prediction could result in delay and dispute for continued development of the total maximum daily load (TMDL).	Although this was discussed during model work sessions, it is DEQ's intent to develop the best predictive model calibration for current conditions given the data, time, resources, etc. that are available. DEQ will not intentionally calibrate the model to overprict periphyton or other parameters for MOS purposes. Those issues will be addressed outside of the model calibraiton process.
12/11/2013	HDR	Model 2013_1204 and 1209	Given that the TMDL is based on the relationship between phosphorus and periphyton, the degree of over-prediction of periphyton throughout the listed reach of the lower Boise River from Middleton to Parma indicates that further calibration and refinement of the Aquatox model is appropriate. HDR recommends DEQ address these issues.	DEQ agrees that the further model calibration is warranted to help improve the relationship between model predictions. However, DEQ would also like to emphasize that it is equally important to focus on over- and under-prediction issues in order to improve the model.

12/11/2013	HDR	Model 2013_1204 and 1209	Potential modifications to the model to reduce the amount of over-prediction include revisions to three key parameters. These parameters are the phosphorus half saturation for phytoplankton and periphyton, critical force (FCrit), and percent lost in sloughing events for periphyton. HDR modified each of these parameters individually initially and confirmed that each simulation generally reduced the over prediction to some extent as would be expected. HDR then did a simulation with all three parameters adjusted. The values in the *RAP.als and the modified values are shown in Table 1. These simulations were done to test the sensitivity of the model to these adjustments and to see if there was a useful reduction in the degree of over-prediction. The simulations show that the overall area of over-prediction is reduced with these adjustments.	DEQ appreciates HDR providing concrete suggestions of how to potentially improve the model, and we will evaluate these recommendations along with other feedback from the modeling workgroup and DEQ modeling expertise.
12/11/2013	HDR	Model 2013_1204 and 1209	Is the propensity of the *RAP.als version to over-predict periphyton also adversely affecting the responsiveness of the model to substantial reductions in phosphorus?	DEQ, in consultation with the model workgroup, is working to calibrate the model to current conditions and within the context of historical data by utilizing the best available information and best professional judgment from experts in the model workgroup. DEQ will evaluate the *RAP parameter recommendations from Richard Park along with continued input from others in the model workgroup.
12/11/2013	HDR	Model 2013_1204 and 1209	Has something in the setup and calibration changed the phosphorus to periphyton relationship?	Extensive model calibration has since taken place, and new information has been added to the model report to address these comments.
12/11/2013	HDR	Model 2013_1204 and 1209	For the expected phosphorus and periphyton reductions, do the data and conceptual model match with model?	DEQ is focused on calibrating the model to current conditions and within the context of historical data. Through the use of the best available data and best professional judgment from experts in the model workgroup and the AQUATOX model developers, DEQ anticipates the will correspond with observed data and with our conceptual understanding of the river system.

12/13/2013	Ben Cope	Model 2013_1204 and 1209	The model continues to under-predict periphyton biomass and over-predict nutrients observed at Glenwood Bridge in the spring of 2013. This is a location of high measured biomass, and it may be a critical location/time for setting of allocations, so I would recommend additional work to achieve greater agreement of the model and measurements. The alternative is to mitigate this problem with a substantial margin of safety in the TMDL.	The model does continue to underpredict biomass at Glenwood Bridge. However, recent model adjustments (comparing observed nutrient and biomass data to incoming segment model results) are yielding better and more appropriate nutrient fit.Language in the model report will be changed to reflect the 303d listings. As such, although one can assert that Glenwood appears impaired, it is not officially identified as such. The current TP TMDL is addressing all TP sources in the LBR to meet the 0.07 mg/L May-Sept target at Parma, and the periphyton target in the two 303d listed Assessment Units. DEQ will address any additional potential 303d listings through the Integrated Report process based on multiple lines of evidence.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	In general, the periphyton biomass is highly variable throughout the simulation, particularly the mass of high nutrient diatoms. It appears that a high maximum rate of periphyton growth (over 2/day for high nutrient diatoms) and assumptions causing frequent and large sloughing events are a cause of the “spikiness” of simulated periphyton. What is the empirical or literature basis to support this simulated variability? Are year-round, frequent, large sloughing events seen in this river (from anecdotal info)? It appears that high maximum rates of periphyton growth and a “low bar” for sloughing cause the variability. If there is no empirical information to support the degree of sloughing assumed in this river, I would propose reducing the max growth rates of the periphyton and reducing the sloughing. It would be reasonable to set model parameters such that sloughing would occur only at high velocity (consistent with scouring flows and low periphyton observed in the spring) and/or low temperature (consistent with temperature-caused mortality and low periphyton observed in December/January).	DEQ agrees that the current rate of growth and/or sloughing may be exaggerated in the model simulations relative to what actually occurs in the system. DEQ appreciates EPA providing suggestions of how to potentially improve the model, and we will evaluate these recommendations along with other feedback from the modeling workgroup and DEQ modeling expertise. Sloughing and washout are functions of light, nutrient, and temperature limitations along with biomass, water velocity, and critical force.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	The predicted phytoplankton is also too high, and since sloughed periphyton becomes phytoplankton, this may be linked to excessive sloughing.	The model currently exhibits highly variable sloughing, which may result from a number of factors, including representation of the system function, lack of grazers in the model, periphyton abundance, growth, and sloughing rates, etc.D EQ appreciates the observations, as we continue striving to address these model calibration issues. The final model calibration changes have improved these values and they are documented in the model report..

12/13/2013	Ben Cope	Model 2013_1204 and 1209	It may be possible to look at hourly DO data for the river to see if the pattern of diel DO variation changes significantly in a particular month or season. If frequent and large sloughing events are actually happening in the river, there should be variability in the pattern of diel DO variation, i.e., after a sloughing event the diel variation would drop substantially. If the DO swing is relatively steady over a month or two, the frequent and large sloughing in the model would be called into question. Hourly DO data and simulations may also provide insight into general biomass levels.	Because the model accuracy for DO was within the stated objective, and due to limited diel DO data, evaluating these relationships was not pursued because it is unlikely to result in improved model accuracy.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	Segment 3 shows Veteran's Br. data. Should this data instead should be shown for segment 2, where nutrients are low above the Lander WWTP?	DEQ has since determined that observed nutrient and plant data are more appropriately compared with model results from the incoming (upstream) segments, while driver variables (TSS, Temp, pH) and other physically-based variables (DO, velocity) are compared within the actual model segment.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	The Glenwood Bridge (segment 4) simulated condition is too low in periphyton and too high in nutrients in March 2013. There are many overlapping periphyton groups in the model, which can create a myriad of non-linear dynamics, but it would build more confidence if the pattern of spring growth in blue-green periphyton in 2012 was repeated in 2013. The measured data shows a large biomass in March 2013. The model shows a spike in March 2012 but not March 2013.	Nutrients – see comment previous comment. Biomass – given input and advice from other professionals in the modeling workgroup, matching the spring 2013 value continues to be elusive. DEQ believes that oserved periphyton values may not accurately represent segment average values in many cases. That is, we believe the sample data are accurate, but are taken at specific locations at specific times; whereas the model is predicting average periphyton values for each segment. Therefore, even under a "perfect" calibration, we would not expect the model to match the observed periphyton data perfectly. Further, as described in the model report, there is, at times, wide ranging variability among periphyton samples collected from the same site on the same day.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	Similarly, Segment 5 simulation is too high in nutrients in spring 2013, in parallel to dissolved oxygen that is too low, suggesting that biomass growth and uptake is too low.	Nutrients – see previous comment. DO - simulations have improved with subsequent calibration.

12/13/2013	Ben Cope	Model 2013_1204 and 1209	What is the cause of the large spike in NH3 at segment 7? Was there a plant upset at West Boise or Lander that kicked out high NH3?Segment 10 is looking better than upstream segments in March 2013 for the full complex of nutrients, DO, and periphyton. The blue greens at this location have risen in the spring, unlike the late and weak increase upstream at Segment 4. Does this suggest that a change would be warranted in the temperature optimum/preference assumptions for this group of periphyton, so Segment 4 acts more like Segment 10?	DEQ has strived to fix these model calibration issues. However, the final model calibration continues to show a NH3 spike in segment 7. Subsequent adjustments have been made in the final model calibration for algal parameters, which are addressed in detail in the model report.
12/13/2013	Ben Cope	Model 2013_1204 and 1209	We have not identified conceptual assumptions and goals for the calibration process, but such assumptions are surely imbedded in the current model setup. That setup has two periphyton groups dominating – blue greens in spring, high nutrient diatoms in summer/fall. I would offer a goal of periphyton succession that is roughly symmetrical.	DEQ, through the modeling workgroup, has discussed and proposed conceptual framework and model calibration/accuracy goals during model workgroup meetings and the 2013_1024 TAC meeting. These assumptions and goals will continue to be adjusted and refined, as appropriate, as the calibration process continues.
12/11/2013	Kate Harris	Model 2013_1204 and 1209	We seem to be having trouble getting the portion of the river above Middleton and the portion below Middleton to calibrate equally. If the upper section is close to measured values, the lower section is highly over predicted. On the flip side, if the lower section is nearing predicted values, the upper section is under predicting. While I think it is important to have a model that is functioning to the best of its ability, I would recommend that the calibration targets be a higher prioirty for the impaired (lower) section of the river.	It is DEQ's intent to develop the best predictive model calibration for current conditions given the data, time, resources, etc. that are available. Although calibrating the lower segments of the river are important for helping to identify nutrient-periphyton relationships, appropriately calibrating the the system as a whole is also important for identifying sources and potential management implications on the lower river segments as they become more similar to upper segments under scenarios of reduced TSS and nutrients.
12/11/2013	Kate Harris	Model 2013_1204 and 1209	While the model is specifically geared toward periphyton, I would recommend that we think carefully about the other parameters that are being over predicted. For example, phytoplankton. If the Snake River - Hells Canyon TMDL were ever reopened, they would have a field day with the chlorophyll that is coming out of the Boise River (according to the model developed by DEQ with approval from the WAG). Hopefully Dr. Park's tweaks fixed this problem.	DEQ agrees that is important to appropriately calibrate the suite of parameters to the extent practicable (e.g. velocity, nutrients, periphyton, phytoplankton, etc). Subsequent model calibration changes have improved these algal parameter values.

12/11/2013	Kate Harris	Model 2013_1204 and 1209	I realized that the two comments somewhat contradict each other - tradeoffs allowed or not - but just some things that we need to discuss and perhaps clearly document our decision. For example - note in model report that nitrate is over predicted and values should not be used to determine N loads in Boise River, etc.	DEQ has made appropriate and defensible model parameter adjustments to try and improve model fit. The model report will clearly document the strengths and limitations of the model fit to the observed data for both areas of overprediction and underprediction of algae and other parameters. A primary change that improved nutrient calibration was that observed plant and nutrient data measured at/near segment breaks are compared modeled output from the segment just upstream, as a more appropriate comparison. Conversely, driver variables TSS, pH, Temp, and physical parameters such as DO and Velocity remaind with the measured segment.
1//16/2014	Dick Park	Model Report 2014_0107	I am concerned that the goodness of fit of simulated results to observed data is not calculated properly. The more serious objection is that the AME statistic is being applied to segments where there are only three data points. Therefore, the "statistic" is misleading.	AME was utilized because it is a straightforward method to compare model results to observed data. Averaged model results are compared to observed data in order to reduce differences due to slight shifts in timing, etc. It is not a perfect methodology, but is one line of evidence used to help determine the goodness of fit.
1//16/2014	Dick Park	Model Report 2014_0107	The best we can do with the available data would be to run uncertainty analyses and plot the point observations to see if they fall within 1 std dev error bands.	DEQ has also utilized this methodology as an additional line of evidence to help determine the model goodness of fit and estimate error rates between model results and observed data.
1//16/2014	Dick Park	Model Report 2014_0107	I have stated before and I still think that you should be considering the fit to historic data, perhaps running the model for the period that was used in the prior application by CH2MHill.	Dick Park and Jonathan Clough have subsequently helped to run these analyses and are available as part of the comments package for the model version dated 2014_0103
1//16/2014	Dick Park	Model Report 2014_0107 Fig. 29. Page 53	I hope you can utilize these data by presenting model algal composition results	The algal community composition and its role in the modeling effort are now documented in Section 3 of the model report.
1//16/2014	Dick Park	Model Report 2014_0107 Page 54	You probably should give credit to Chris Mebane as well, although I have to accept much of the blame for any shortcomings of the calibration. I am disappointed that the visual fits are not better.	We have expanded the model report text to include Chris Mebane et al. for their help on with the parameterization.

1//16/2014	Dick Park	Model Report 2014_0107	I do believe that the observed March outlier in the Glenwood segment does not represent average conditions for that site; therefore, I do not feel compelled to pass the simulation through that point.	DEQ believes that observed periphyton values may not accurately represent segment average values in many cases. That is, we believe the sample data are accurate, but are taken at specific locations at specific times; whereas the model is predicting average periphyton values for each segment. Therefore, even under a "perfect" calibration, we would not expect the model to match the observed periphyton data perfectly. Further, as described in the model report, there is, at times, wide ranging variability among periphyton samples collected from the same site on the same day.
1//16/2014	Dick Park	Model Report 2014_0107 Page 55	The simulations consistently miss the low summer biomass observations. In my opinion those low values can be obtained only by having a biomass-dependent loss term. Sloughing is one such process, although it should be reflected by higher sestonic algal (phytoplankton) biomass, which is not seen. The other process is grazing by invertebrates and fish; this process was removed from implementation by general agreement of the LBR modeling team.	DEQ has worked extensively to try and closely match the model results to the observed data, by scrutinizing numerous parameters, including sloughing, f-crit, half saturation. Including grazers was considered early on in the process, but were removed in order to minimize the model parameterization.
1/16/2014	Alex Etheridge	Model Report 2014_0107 Model Diagram	Some return flows are missing including Mason Creek, Eagle Drain, Dry Creek, Hartley Drain, Mason Slough, Thurman Drain – Mason Creek seems important if the others aren't.	Additional important tributaries have since been added to the model diagram to improve the representation of the actual system.
1/16/2014	Alex Etheridge	Model Report 2014_0107 Model Accuracy	I am seeing this a lot and just had a question. Is this 25% relative percent difference?	Model accuracy for these parameters was considered sufficient when modeled concentrations/loads were within 25% of the range of observed field data.
1/16/2014	Alex Etheridge	Model Report 2014_0107 Oxygen	Single-reading DO values could be quite far from the daily average depending on when they were taken. It may be too much given the 2 mg/L quality check described below, but I wonder if someone could look at time of day of DO readings and pick some closer to morning at 8 or 9 am when we are in the middle of the diurnal swing.	Because the model accuracy for DO was within the stated objective, and due to limited diel DO data, evaluating these relationships was not pursued because it is unlikely to result in improved model accuracy and would require a significant time investment.

1/16/2014	Ben Cope	Model Report 2014_0107 Introduction	These are the “303d listed segments”, not the “impaired units”. Impaired units include impairment at Glenwood Bridge as documented in USGS data. How and when does IDEQ plan to address impairment of the nuisance target at Glenwood Bridge?	Language in the model report will be changed to reflect the 303d listings. As such, although one can assert that Glenwood appears impaired, it is not officially identified as such. The current TP TMDL is addressing all TP sources in the LBR to meet the 0.07 mg/L May-Sept target at Parma, and the periphyton target in the two 303d listed Assessment Units. DEQ will address any additional potential 303d listings through the Integrated Report process based on multiple lines of evidence.
1/16/2014	Ben Cope	Model Report 2014_0107 Introduction	Has the QAPP never been finalized?	The QAPP is nearly completed. It was not possible to complete until the calibration was nearly complete because of the potential use of additional unforeseen data, and other sources of information, etc. Additionally, because this model exclusively utilizes existing data, the primary purpose of the QAPP is to document the use, strengths, and limitations of the data and other information used to set-up and calibrate the model.
1/16/2014	Ben Cope	Model Report 2014_0107 Background	The model should not be affecting the target…the model is used to predict the nutrient concentrations necessary to meet the target.	Due to the paucity of periphyton data in many parts of the year (e.g. spring, summer, winter), the model will help to identify when and where potentially high periphyton biomass may be occuring and the relationship with nutrients and other environmental factors. This will also help to inform when and where the target should be applied, and the associated TP reductions needed to meet that target.
1/16/2014	Ben Cope	Model Report 2014_0107 Background	This edit is because there is a difference between “supporting software development” and determining that a specific application of that software (e.g., Boise AQUATOX model) is acceptable for use in a TMDL.	The language in the model report will be changed to reflect the correct application.
1/16/2014	Ben Cope	Model Report 2014_0107 Background	Provide perhaps two examples/cites to nutrient examples (use of AQUATOX).	AQUATOX has been used to evaluate water quality and identify relationships among algal growth, nutrients and other environmental factors for Alabama's Cahaba River Phosphorus TMDL, three rivers in Minnesota, and previously for the lower Boise River (however, the modeling results were not translated into a TMDL).

1/16/2014	Ben Cope	Model Report 2014_0107 Background	Based on what observation specifically (absence of impacts from grazers)?	Anecdotally, based on DEQ's visual assessment of the river in June and August of 2013, there appeared to be virtually no influence from grazers. DEQ acknowledges the existence of grazers in the river, but felt the tradeoff was better to minimize the number of model parameters to the extent possible, given the very limited data and knowledge about grazer populations, biomass, grazing activities, and other river impacts that would need to be adjusted in the model.
1/16/2014	Ben Cope	Model Report 2014_0107 Data Sources and Conditions	One doesn't "populate state variables". Driving variables (boundary conditions), yes. The model provides the state variable estimates.	The language in the model report will be changed to reflect the correct application.
1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - Model Spin-up	How was 4 months determined? Is that much time needed, and if so, how was that determined? Is IDEQ going to disregard simulated periphyton spikes in spring 2012 because it is in the spin-up period? What if spring 2012 shows higher biomass than spring 2013?	The potential 4-month spin-up period was selected because it would allow sufficient time for model to spin-up to occur, while still maintaining a full year of model simulation. However, for the final model calibration, DEQ has determined that the sufficient model spin-up period is two months, and that the use of modeled simulations for use in the TMDL can begin March 1, 2012. This is based on sensitivity analyses which help identify better initial loads for nutrients and algal groups that eliminated the need for a full 4-month spin-up period.
1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - Model Spin-up	In response to language from the draft AQUATOX technical report, stating a spin-up period can occur fairly rapidly, Ben states that, "4 months does not seem 'fairly rapidly'. This seems to contradict the 4 month spin up."	"Fairly rapidly" is a relative term depending on the given modeling situation. The potential 4-month spin-up period was selected because it would allow sufficient time for model to spin-up to occur, while still maintaining a full year of model simulation. However, for the final model calibration, DEQ has determined that the sufficient model spin-up period is two months, and that the use of modeled simulations for use in the TMDL can begin March 1, 2012. This is based on sensitivity analyses which help identify better initial loads for nutrients and algal groups that eliminated the need for a full 4-month spin-up period.

1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - Oxygen	Note also my previous question asking if there was diel DO data that could be checked against simulated DO, as indirect check on biomass accuracy.	Because the model accuracy for DO was within the stated objective, and due to limited diel DO data, evaluating these relationships was not pursued because it is unlikely to result in improved model accuracy and would require a significant time investment.
1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - Ground water	What is basis for these numbers (Ground Water values for 2008 TP Implementation Plan)?	Ground water values were based on data collected by USGS monitoring wells along the mainstem of the lower Boise River in 2001 (MacCoy 2004) as summarized in the LBR Implementation Plan TP (DEQ 2008).
1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - Temperature	The model does not simulate temperature, so “model accuracy for temperature” does not make sense to me.	The language in the model report will be changed to reflect the correct application.
1/16/2014	Ben Cope	Model Report 2014_0107 Initial Conditions - DO	Note also my previous question asking if there was diel DO data that could be checked against simulated DO, as indirect check on biomass accuracy.	Because the model accuracy for DO was within the stated objective, and due to limited diel DO data, evaluating these relationships was not pursued because it is unlikely to result in improved model accuracy.
1/16/2014	Ben Cope	Model Report 2014_0107 Nutrient Mass Balance	Need an example of this kind of variable.	Jonathan Clough responded – When running with "tributary-input" loadings these "tributary inputs" are not added to the total nutrient load (accounting variable) in KG. When this was fixed, mass balance was maintained as shown in the figure referenced.
1/16/2014	Ben Cope	Model Report 2014_0107 Optimization of nutrient predictions	Table of values you arrived at? Also, need table with nutrient-affecting parameters, such as nitrification, organic phosphorus hydrolysis, and any others. And need to show nitrate plots, especially upstream where it may be limiting, and ammonia unless they are all non-detect.	New set of figures have been added to Appendix A of the Model Report to address these comments and recommendations.
1/16/2014	Ben Cope	Model Report 2014_0107 Organic Constituents	Decisions were discussed among the modeling group, but decisions were made by DEQ.	The language in the model report will be changed to reflect the correct application.

1/16/2014	Ben Cope	Model Report 2014_0107 Algal groups	Since there is so much emphasis on initial conditions, the actual initial concentrations determined by this process should be listed in a table somewhere (same for nutrients).	New information has been added to Section 2.2.1 of the Model Report to address these comments and recommendations..
1/16/2014	Ben Cope	Model Report 2014_0107 Algal groups	And March at Glenwood is very underpredicted, and segment 9 is underpredicted for 2 out of 3 datapoints. If you are going to comment like this, do it consistently. I think overall, over and under-prediction is a wash, but the under-prediction has to be addressed with the MOS in the TMDL.	DEQ has since strived to use consistent language and approaches throughout the report.
1/16/2014	Ben Cope	Model Report 2014_0107 Algal groups	I don't understand what it means to "use" this. Suggest deleting and deferring this MOS piece until the TMDL, where it can be given more discussion and tied to allocation scenarios.	DEQ agrees with the stated approach and will remove or revise the MOS statement, as appropriate, and address it in the TMDL.
1/16/2014	Ben Cope	Model Report 2014_0107 Sensitivity of parameters to calibration	Need more here. What about other algal parameters (e.g., max growth rate, sloughing, temperature preference parameters, death rates, etc.)?	New information has been added to Section 3.3.3 of the Model Report to address these comments and recommendations.
1/16/2014	Ben Cope	Model Report 2014_0107 Sensitivity of parameters to calibration	General comment: I expected to see the info below somewhere in the document:- limitations plots (light, nutrients, temperature)- Specific algal group plots showing dominance/succession over time - Periphyton plots showing all data (including historic) for the month/day along with the time series simulation for 2012-2013, since we have so few periphyton data points.- Temperature plots When in doubt, include the plots for everything of relevance in an appendix.	This information has been included in the Model Report and Appendices.
1/20/2014	Jack Harrison	Model Report 2014_0107	An explanation of how and why final parameters differ from "default" & Boise/CH2 (previous model)	Tables comparing the algal default, 2008 model, and the current 2012-2013 model version are provided in the model report. Additional description of how the current model parameters were developed are identified through the model report.

1/20/2014	Jack Harrison	Model Report 2014_0107	...“Dracy’s” that over-predicted periphyton on lower reach (per comments by Boise and Meridian/ HDR) and Dick’s” that under-predicted periphyton on upper reach (per comments EPA).	DEQ believes that some over- and under-predictions are quite likely and reasonable to some extent, given all of the observed periphyton data are likely accurate, but are taken at specific locations at specific times; whereas the model is predicting average periphyton values for each segment. Therefore, even under a "perfect" calibration, we would not expect the model to match the observed periphyton data perfectly. Conversely, it is also possible that given the wide variability in observed periphyton data, historically, that the model is actually not over- or under-predicting periphyton at those locations. Even further, it is possible that some model parameters could be more "optimally" parameterized, or that the model is unable to more accurately simulate the complexity of the LBR system.
1/20/2014	Jack Harrison	Model Report 2014_0107	In December, two “parameter set” (i.e., b and c) were being reviewed and produced very different results. Is the final calibrations parameter set a comprise between these? Please explain how this conflict was resolved for selection of the “final” calibration parameter set.	Tables comparing the algal default, 2008 model, and the current 2012-2013 model version are provided in the model report. Additional description of how the current model parameters were developed are identified through the model report. In short, the current model calibration utilized best available data, sensitivity analyses, and best professional judgment by DEQ personnel through consultation and coordination with the LBWC model workroup.
1/20/2014	Jack Harrison	Model Report 2014_0107	Do the various “parameter set” produce similar AME?? In the report you show the AME for each reach for the “parameter set”. Could you provide and compare the AME for other “parameter sets” listed above (Darcy’s and Dick’s). This would provide support for selection of final parameters	The model report identifies AMEs for 5 different potential model calibrations, including the 2001 algal parameter set, Dick Park's earlier parameter adjustments, 2 DEQ draft calibrations, and the final calibration (2014_0203_DDS). The final model calibration has the lowest overall AME and has the lowest AME in 21 of 25 (84%) model-segment combinations.
1/17/2014	Jonathan Clough	Model Report 2014_0107	The new periphyton calibration predicts more biomass across the whole river given the same boundary conditions. However, a different normalization was used for observed data between the two simulations. It looks like the new calibration over-predicts up-stream quite badly no matter which observed-data method is used, however.	DEQ believes this issue has largely been resolved and analyses are reported throughout Section 3 of the Model Report.

1/21/2014	Dick Park	Model Report 2014_0107	Looking at the algal composition across sites, the model predicts more high-nutrient diatoms than nuisance blue-greens (cyanobacteria) and Cladophora. In fact, if I were calibrating with these compositional data, I would try to obtain a better representation of Cladophora given that it is a nuisance alga.	New information has been added to the Model Report to reflect additional calibration adjustments.
1/21/2014	Dick Park	Model Report 2014_0107	When seen in the context of the long-term record, the simulation is perhaps more acceptable. An even more rigorous test would be to run the model for 10 or more years and determine if there is concordance in observed and predicted values based on relative bias (central tendency) and F test (dispersion)	New information has been added to Section 3 of the Model Report to address these comments and recommendations. Additional analyses and/or the use of new data could also help to better identify model fit and bias, and should be considered in the future.
1/21/2014	Matt Gregg	Model Report 2014_0107	It was difficult to tell from the report how well the model simulated light extinction through the water column, which is also a critical variable.	The light-limitation function in AQUATOX represents both limitation for suboptimal light intensity and photo-inhibition at high light intensities, and the AQUATOX Technical Documentation describes the function and related equations (Park and Clough 2012b). The light limitation graphs and statistics are available for each species and each segment, and thus were not included in the Model Report.
1/21/2014	Matt Gregg	Model Report 2014_0107	The periphytic chlorophyll-a, the target value for the TMDL, plots show mixed results. It appears that the model achieves only a 30-60% level of agreement with observations at many points in space or time. The use of a more appropriate calibration metric (as discussed below) would be needed to quantify this. At a critical segment such as 13, the model appears to be biased high. Given the complexities of periphyton growth and variability of the data, it may not be practical to achieve a tight periphyton calibration with the data in hand. Without a high level of confidence in the periphyton calibration, this model would best be use as a sensitivity analysis tool in conjunction with adaptive management, rather than for the direct calculation of waste load allocations.	DEQ intends to identify the model error in order to better understand the calibration strengths and limitations. Further, DEQ agrees with the concept of utilizing AQUATOX to be a tool for helping to develop appropriate and meaningful allocations, along with other appropriate methodologies.

1/21/2014	Matt Gregg	Model Report 2014_0107	The calibration report makes the statement that “Even though periphyton respond to changes in temperature, water chemistry, and light availability, the relationship between nutrients and periphyton is the most direct and responsive.” (p. 36). This is not necessarily true in all hydrologic systems, and no information is presented in the report to justify this statement. It is recommended to perform and present a thorough analysis of the sensitivity of periphyton predictions to major environmental and management variables, including phosphorus, nitrogen, water clarity, temperature, etc. This will provide a broader perspective on the degree to which periphyton can be controlled given the characteristics of the system.	The model report language has been changed to reflect the uncertainty and focus of the modeling effort: "Periphyton can respond to changes in temperature, water chemistry, and light availability, and other environmental factors. The current modeling effort will account for these complex relationships, while the relationships between nutrients and periphyton will be a primary focus of this modeling effort."
1/21/2014	Matt Gregg	Model Report 2014_0107	The report states that “In order to have a margin of safety, the entire AME of 71 mg/m2 can be used as the total error of the periphyton chlorophyll a prediction.” (p. 57). Few TMDLs use an explicit margin of safety that exceeds 10% and the direct use of this value as a MOS may make an already-challenging TMDL impractical to attain. The use of 71 mg/m2 as a margin of safety would seem to have the potential of effectively cutting the periphyton target (150 mg/m2) almost in half. It would be recommended to remove statements regarding the MOS from the calibration report, and revisit the MOS issue when the team is closer to developing the TMDL.	DEQ agrees with the stated approach and will remove or revise the MOS statement, as appropriate, and address it in the TMDL.

1/21/2014	Matt Gregg	Model Report 2014_0107	The modeling report expresses the calibration objective as a percentage (agreement within 25%), but primarily relies on a calibration metric (the AME) that has the unit of whatever state variable is being examined. To make the conversion between state variable units and a percentage, the authors compare the AME to 25% of the observed data range. [For example, if the AME of constituent x was 25 mg/L, and the data range was from 100 to 200 mg/L, the AME would be considered to just meet the calibration objection of 25%.] This method will tend to overstate the accuracy of the model. Rather than just a measure of % agreement between observations and model predictions, it is strongly affected by the overall variability of the each constituent. The model will look better for highly variable state constituents, and a single outlying datum could balloon the observed data range and thus make the model look even more accurate. If the calibration objective is expressed as a percentage, it would be more appropriate use a calibration metric that is also expressed as a percentage and is based only on model-observation agreement, such as the mean absolute percentage error (MAPE). Alternatively, the AME could be retained, but with calibration goals expressed in original units and based on something other than a percentage of the entire data range.	The AME is utilized as one line of evidence to evaluate the model performance and goodness of fit. The model report also utilizes correlation analyses (R^2), differences is monthly biomass values among simulated, measured, and historical data, as well as visual assessments. Additionally, although the AME was used, calibration goals were expressed as percentages and in original units .
1/21/2014	Matt Gregg	Model Report 2014_0107	It is also recommended to tabulate calibration metrics for individual stations, not just the overall simulation. This is especially important for critical stations that are most likely to control regulatory applications of the model. Finally, in addition to absolute measure of model error, it is also recommended to examine model bias.	New information has been added to Section 3.3.3.4 of the Model Report to address these comments and recommendations.
1/21/2014	Matt Gregg	Model Report 2014_0107	Table 7 presents the algal parameters used in the final calibration. Obviously, the periphyton simulation is highly dependent upon these values. For this reason, it would be helpful if the report presented more information on the calibration strategy for these parameters. Which values were adjusted from default values and what was the technical basis? If these values were based on professional judgment with a high degree of uncertainty, it might lead to a different conclusion regarding the proper use of the model than if the adjustments were based on more direct measurements.	New information has been added to Section 3.3.3 of the Model Report to address these comments and recommendations.

1/21/2014	Matt Gregg	Model Report 2014_0107	The calibration report presents something of a conceptual model in the form of Figure 29, based on Rushforth (2007). However, there is no indication (from the report, at least) that it was directly used for model calibration or corroboration. Rather, the model focuses on total periphytic chlorophyll-a, without regard to whether the model is predicting the correct taxonomic successions.	The Rushforth 2007 reports are utilized as the best available inforamtion regarding periphyton and phytoplankton community compositions. However, DEQ also acknowledges that the Rushforth data represents a limited snapshot of the river and should be viewed as a helpful guide, but not necessarily as a community composition template against which the model results should be quantified. Therefore, the final taxa and parameter selection utilized multiple sources including the best available data, literature sources, and best professional judgment from members of the model workgroup, etc.
1/21/2014	Matt Gregg	Model Report 2014_0107	It is recommended to use the conceptual model to identify specific calibration goals (e.g., dominance of groups x and y in spring, groups x and z in summer in segment 13), and then discuss the degree to which the model reproduces the expected patterns. This exercise could be very useful for interpreting how the biomass calibration can be improved, whether model is getting the right biomass for the wrong reasons, or whether the inclusion of certain algal functional groups is hurting rather than helping the simulation. Moreover, it helps inform the level of confidence and proper regulatory application of the model.	The Rushforth 2007 reports are utilized as the best available inforamtion regarding periphyton and phytoplankton community compositions. However, DEQ also acknowledges that the Rushforth data represents a limited snapshot of the river and should be viewed as a helpful guide, but not necessarily as a community composition template against which the model results should be quantified. Therefore, the final taxa and parameter selection utilized multiple sources including the best available data, literature sources, and best professional judgment from members of the model workgroup, etc.
1/20/2014	HDR	Model Report 2014_0107	The model *.als and the import spreadsheet once loaded into the Aquatox model and simulated, do not appear to provide the same results. Therefore, DEQ appears to have released two versions of the model. DEQ should clarify which model is to be reviewed and is considered the most current model.	DEQ appreciates identifying the discrepancy between the model and import spreadsheet. This issue will be rectified in the subsequet release.
1/20/2014	HDR	Model Report 2014_0107	Therefore, the comments provided in our December 11, 2013 Technical Memo Comments on DEQ Draft RAP Aquatox Model Setup and Calibration remain a concern. The modeling work group and DEQ should continue to work on these issues.	Noted - Please see DEQ's response to the 2013_1211 Technical Memo Comments, above.

1/20/2014	HDR	Model Report 2014_0107	Changing the Fcrit and Percent Slough for the high nutrient diatoms could be one change to improve the model. For example, the Fcrit could be changed to 0.002 to match the previous modeling and the Percent Slough could be changed to 90% to match the value for low nutrient, greens, and blue-greens. The periphyton data and model results with this modest change are shown in Figure 1 through Figure 4 for lower Boise River locations. While this change does not resolve the over-prediction issues, in general the periphyton levels are lower from May through August and the predictions are closer to the measured August data point, without substantially reducing the model's closeness of fit for the fall and spring seasons. This suggests that further improvement of model predictive capability in the summer may not require excessive re-calibration effort.	New information has been added to Section 3.3.3 of the Model Report to address these comments and recommendations.
1/20/2014	HDR	Model Report 2014_0107	The degree to which these issues must be resolved is partially dependent on examining the objectives of the model, the post-processing of the output (weekly averaging or daily), and recognition of the model capabilities and limitations. Pending the discussions at the upcoming modeling work session and TAC meetings, currently it appears that additional time may be necessary to further examine and refine the model.	DEQ agrees and additional model calibration discussions and efforts are ongoing and will include a subsequent "final" model calibration.
2/14/2014	Ben Cope	Model Rerport 2014_0203	On the one hand, these plots bolster the model as generally providing reasonable (middle of the road) predictions of biomass. But the plots also make clear that the model year, while representative of low flows historically, may not be representative of the critical conditions for periphyton growth at particular locations and times. Could some data analysis shed light on what factors lead to the highest biomass values, particularly those that are much higher than observed in our model year? Is it possible that high flow, rather than low flow, is actually the critical condition for growth? Or different weather? Or particularly stable flow years? Or is it a jumble?	DEQ agrees that the model calibration for current conditions does not necessarily address other critical conditions or peak biomass growth. The model calibration will be utlized as one of multiple lines of evidence as needed/appropriate. Although interrelated, these questions are somewhat beyond the scope of the current model calibration, and will be daylighted further during the application of the model along with additional lines of evidence in helping to develop allocations.

2/14/2014	Ben Cope	Model Rerport 2014_0203	On a more detailed note, I think one area of the report that is still lacking is the documentation of the importance of periphyton sloughing assumptions. I'm attaching plots on this point. I'd recommend adding some plots like these, language that describes how sloughing works in the model (e.g., it is not just activated by velocity shear), and the importance of these assumptions in the prediction of peak biomass. I continue to view the high sloughing values as questionable (i.e., causing extreme loss of biomass over short periods of time), but this is based on personal observations around streams rather than data or literature. So that other reviewers have an opportunity to weigh in on this question with more expertise than mine, I think the report should point to it.	A new subsection, 2.4.2.1 Slough and Loss, has been added to the model report under the Phytoplankton and Periphyton Chlorophyll a heading. This section discusses how AQUATOX calculates sloughing and that it is based on a number of factors. An additional brief description and figures are provided in in section 3.3.3.1 as a general illustration of the relationships.