

DEPARTMENT OF ECOLOGY
ENVIRONMENTAL ASSESSMENT PROGRAM
Quarterly Report

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SUBJECT: White River pH TMDL, Quarterly Report #3: May - July 2013

Project Code: 12-015

Introduction

Several areas of the White River are on Washington State's list of polluted waters (303(d) list) for pH and require a cleanup plan, or total maximum daily load (TMDL). Past studies have documented excursions of the upper pH criteria (8.5) and suggest these conditions are the result of nutrient inputs to the river.

To develop a TMDL for the river, the Washington State Department of Ecology (Ecology) conducted a series of water quality surveys between August and October of 2012. Ecology will use this data to develop and calibrate a numerical water quality model of the river to simulate continuous pH and other water quality parameters.

This quarterly report summarizes the data quality review, analysis, and preliminary model setup activities to date.

Progress to Date

Communications

During this quarter the project team:

- Requested, and received, HEC-RAS model from USGS with cross-section data collected in 2009 (RM 0 to 10).
- Requested, and received, a different HEC-RAS model from King County with cross-section data collected in 2012 (RM 2 to 10).
- Requested, and received, additional information about hatchery operations from Muckleshoot Indian Tribe.

Data Collection

During this quarter the project team:

- Did not collect additional data. Data collection as scheduled has been completed.

Provisional Results

No provisional data is included in this report; however, specific provisional results may be available upon request.

Data Quality Review and Modeling Progress

During this quarter the project team:

- Completed the following tasks related to development of shade inputs to the model:
 - Completed the digitizing and coding of vegetation polygons from 2011 orthophotos.
 - Completed Ttools step 5 to sample vegetation polygons at 10 meter intervals.
 - Divided model period (89 days) into 9 separate periods based on date ranges with similar flows. 9 shade models will be developed, one for each period, with each shade model utilizing the wetted width that corresponds to the median flow for that period.
- Completed groundwater reach assessments and developed a conceptual model of groundwater gains and losses within different reaches of the White River.
 - The conceptual model was developed based on a combination of flow balance residuals, vertical hydraulic gradient measurements, piezometer temperature gradients and patterns, comparison of river and piezometer water quality (gaining reaches only), regional hydrogeology, and the results of previous groundwater studies.
- Compiled, formatted, and entered into the model the following data:
 - Tributary flows and temperatures.
 - Groundwater flows and temperatures

- Combined newer USGS and King County HEC-RAS models into one model for RM 0 to 10.6. Imported and georeferenced cross-sections from each model, set the boundary rating curve, and ran model plan for 10 profiles. Checked the new water surface elevations against elevations at three USGS gages within this reach, agreement was generally very good.
- Used the new HEC-RAS profiles to develop updated rating curves for the QUAL2Kw geometry of the lower river. The updated geometry resulted in a better fit of predicted to observed travel times.
- Calibrated the model geometry to match the predicted to the observed travel times using scaled multipliers on the depth and velocity coefficients. Adjustments were relatively minor, as the initial travel time predictions were within 30 minutes of the observed travel times.
- Created two additional coarser resolution segmentation schemes for the QUAL2Kw model by combining adjacent segments and developing new rating curves.
 - The original segmentation had a minimum travel time of 170 seconds (per segment) at the highest observed flow and a total of 92 segments. The new segmentation schemes have minimum travel times of 340 seconds (56 segments) and 680 seconds (33 segments).
 - The coarser models will likely be used to reduce model run times so that the auto-calibration feature of QUAL2Kw can be used efficiently. The finer resolution model will then be used to run scenarios and develop the TMDL using the auto-calibration results.

Project Schedule and Upcoming Tasks

Based on the project timeline, the project is currently on schedule, with model setup and calibration scheduled to be completed by 12/15/2013. The primary tasks in the upcoming quarter will be:

- Use Ecology's shade model to calculate a continuous diel shade input for the QUAL2Kw model.
- Calibrate the model to observed temperature data.
- Began calibration of model to nutrient, water quality, and periphyton data.

The next quarterly report will be available by 10/31/2013 and will cover progress during the period of 8/1/2013 to 10/31/2013.