Los Angeles River Instream Flow Criteria Technical Study
Progress Report – July 08, 2020
Covering the Period Ending June 30, 2020

Project Overview

The State Water Resources Control Board (State Water Board) and Regional Water Quality Control Boards (collectively Water Boards) have invested heavily in promoting water reuse and recycling. However, reuse leads to potential reduction in stream flow, and the Water Boards are responsible for establishing adequate flows for a variety of beneficial uses. Wastewater Treatment Plant dischargers seeking to reduce discharges associated with reducing flow in a stream for reuse must file a wastewater change petition and obtain approval under Water Code Section 1211 (1211 petition) from the State Water Board prior to reducing discharges. Key considerations of appropriate levels of environmental flows include demonstrating that the reduced discharge will not unreasonably affect fish and wildlife, or other public trust resources.

The Los Angeles River Flow Study has two overarching goals. The first is to develop technical tools that quantify the relationship between various alternative flow regimes (which may include seasonal or annual needs for flow, such as presence and depth of pools, temperature, or flow timing, duration, frequency, or magnitude) and the extent to which beneficial uses are achieved. The second is to engage multiple affected parties in application of these tools to inform and solicit input regarding appropriate flow needs in the Los Angeles River. The ultimate outcome of this project is to provide technically sound recommendations and alternatives to the Water Boards for consideration and implementation of flow objectives.

Major Accomplishments in the Past Quarter

Activity 1: Stakeholder and Technical Advisory Group Coordination

We held our fifth TAC meeting (remote webinar) on May 12, 2020 which focused on the conceptual models developed for Goodding's black willow, Cattails, and Santa Ana sucker, development of species response curves, and preliminary species life history information for additional focal species. Over 65 TAC members and 16 team members attended remotely. We also scheduled in-depth discussions with additional TAC members to discuss topics including groundwater management and additional biological data and reports. The next TAC meeting is tentatively scheduled for late summer 2020 and will focus on preliminary results from the flow management scenarios.

The fourth and final SWG meeting is tentatively scheduled in the fall of 2020, with interim stakeholder webinar(s) planned for the late summer, as needed.

Activity 2: Non-aquatic Life Beneficial Use Assessments.

The final report on the recreational use survey was published in September 2019 and is available on the SCCWRP web site. Prior to its release, the draft report was reviewed by the stakeholder and technical workgroups.

The report found that the most popular uses along the Los Angeles River are walking (walking use were grouped with running, jogging, and dog walking activities), biking, and art/photography. Based on interviews with recreational experts, the activities that occur in channel require sustained, but relatively reduced flow. Experts thought that water quality was an important indicator for all recreational uses and indicated that the volume of water that now flows along the River helps to dilute contaminants. Though recreational experts could not identify a volume that would help in maintaining water quality, they thought there needed to be enough water volume so that smell, excessive algal growth, and bio-accumulating contaminants would not cause nuisance or harm to people or wildlife. Basic flow requirements for kayaking in Reach 3 were also identified. The results of the recreational use assessment were released in July 2019.

Activity 3: Aquatic Life Beneficial Use Assessments

We have made progress on compiling species and habitat information and on developing the hydrologic and hydraulic models.

For species and habitat information, we have compiled all readily available data from surveys and species/habitat databases. Based on input from the TAC, we have refined the following focal habitats, and associated keystone species:

- Cold water habitat – these habitats may not currently occur, but could potentially occur in the future
- Cold water migration habitat – this habitat overlays the entire study area, with an emphasis on the mainstem from the estuary to the confluence with Arroyo Seco.
- Wading shorebird habitat
- Freshwater marsh habitat
- Riparian habitat
- Warm water habitat – as a surrogate of non-native species habitats

We have mapped the habitat locations, compiled data on species that occur in each habitat and identified endmember species that represent the range of tolerances for each habitat. These have been reviewed by our TAC and stakeholders. Project team members have visually surveyed the river to better understand habitat distributions and quantitatively survey bed topography, particularly in soft bottom reaches of Sepulveda Basin and Glendale Narrows. We have designed a conceptual modelling approach that relies on developing response curves (or in some cases thresholds) that can be used to help determine when a species is less likely to occur because a specific life history need cannot be fulfilled. Each species is separated into life stage and the model is built depending on the life stage response to its associated habitat conditions (i.e. substrate, depth, velocity & temperature, or related variables). The probability of occurrence is evaluated for individual life stage.

We have piloted this approach with the Santa Ana Sucker and Goodding's black willow, which represent the cold-water habitat and riparian habitat, respectively, and have demonstrated the mechanistic modeling approach to the TAC. Overall, the TAC agreed that this is a sound approach and have provided valuable feedback and consideration for refining the models. We are currently building the remaining species models, which involves compiling empirical data describing the species relationships with their habitats and will present details on the remaining habitat models in the subsequent TAC webinars.

Goodding's black willow model: This model is made up of four individual components for each important life phase/hydraulic combination. First, germination suitability is evaluated using the hydraulic variable depth. Then, seedling survival is evaluated using the hydraulic variables depth and shear stress (example model shown in Figure 1). Finally, adult survival is evaluated using the hydraulic variable stream power. Each of these component models will be applied to each node within the study region at the left bank, right bank, and thalweg. It is not critical that results are always highly suitable, as willow cohorts tend to recruit every few years in natural areas, therefore setting cutoffs for acceptable streamflow that supports black willow is our next hurtle moving forward.

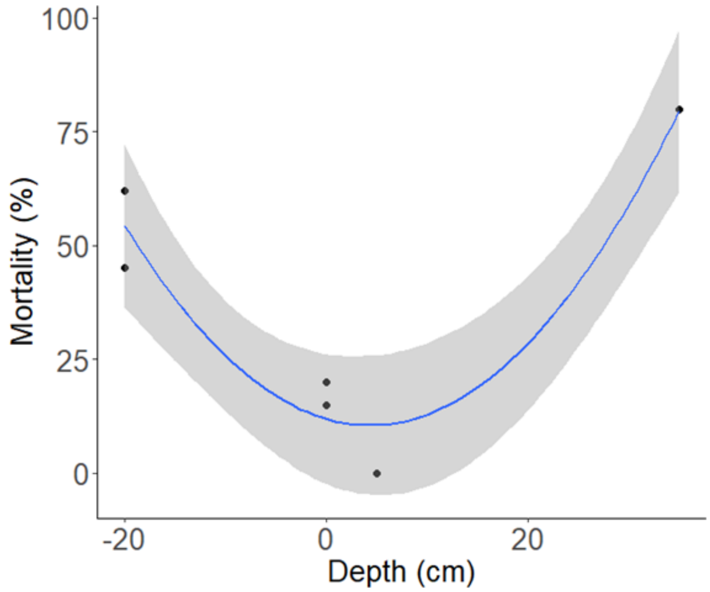

Figure 1. Example species-response curve showing percent Gooding's Black Willow seedling mortality as a function of depth

Santa Ana Sucker model (SAS): the SAS were separated into four life stages (adult, juvenile, spawning and fry) and habitat suitability curves were created for three hydraulic variables (depth, velocity and temperature) for each life stage separately. Example model below (Figure 2) of adult SAS in response to depth. Each life stage is associated with an important time period that corresponds to their life history e.g. spawning takes place mostly between March and July, so emphasis for habitat suitability will focus on these months. As with the Willow model, each life stage will be applied to the hydraulic variables at the right bank, left bank and mid channel of each node within the study area.

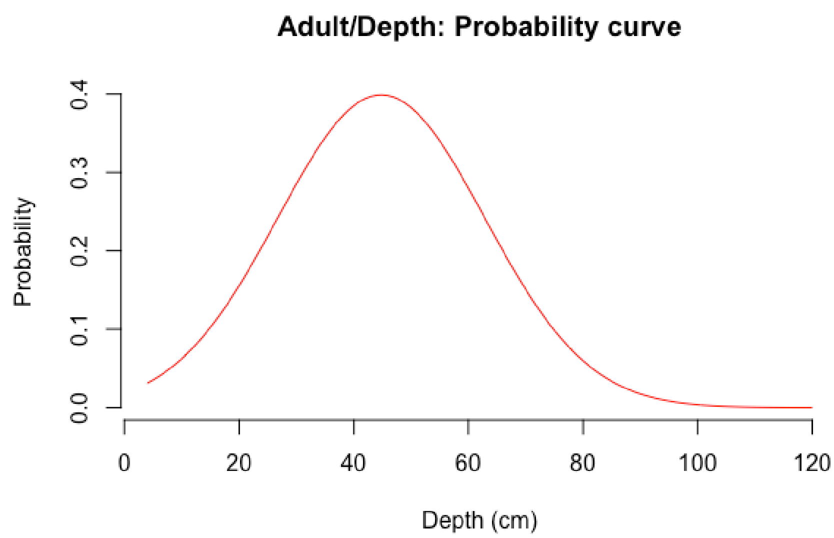

Figure 2. Example probability curve for the Santa Ana Sucker showing probability of fish occurring at different depths

During the next quarter, we will couple the ecological models with the output from the hydrologic, hydraulic, and temperature models (described below) to evaluated suitability, develop preliminary flow recommendations, and evaluate scenarios (see Task 4).

We have created a coupled hydrologic (unsteady state EPA SWMM) and hydraulic model (steady state HEC-RAS) of the system. The model provides hourly data (both discharge and other hydraulic variables) from water year 2011 to 2017. The time frame was selected due to the availability of high-quality continuous data and WRP information. Although this period was slighter drier than "typical", the project's Technical Advisory Committee felt it provided a slightly conservative, but appropriate baseline for comparison of future scenarios. More specifically, we have completed the following:

- **Hydrology model:** A runoff model of the basin using spatially interpreted precipitation data was created with EPA SWMM. A low flow (dry weather) hydrologic model was incorporated into the runoff model based on observed wastewater discharge, groundwater upwelling, and baseflow data. Calibration of flows in the hydrologic model is complete for the upper LA basin through Glendale Narrows as well as for Compton Creek. An autocalibration algorithm is being utilized to select optimal parameters at 11 gage stations. Creation and calibration of the model is ongoing for Rio Hondo and the lower reaches of the main stem of the LA River. **Hydraulic model:** The hydraulic model (HEC-RAS) has been created, and calibrated and validated at five gage locations. Rating curves were developed to relate discharge to stage, velocity, shear and stream power at key model output nodes. The hydraulic model was expanded to include Sepulveda basin. Cross-sectional field data collected in June will be used to validate select soft-bottom reaches in Sepulveda Basin and Glendale Narrows.

- **Water temperature model:** We have updated the temperature model to feed the model time series data of sediment temperatures in place of a constant number for the simulation period. Sediment temperature is a driving factor affecting river temperature during the low flow period (summertime) which is the desired season for ecological modeling purposes. The updated model was applied on 4.2 km of the Compton Creek on steady-state and the results are extracted (see Figure 3). We are considering the arroyo chub or stickleback as the target species for the Compton Creek ecological restoration plans and are working on a manuscript planned for submission by the end of August. We plan to analyze ecological management alternatives in order to suggest optimal plans to maintain habitat suitability on Compton Creek.

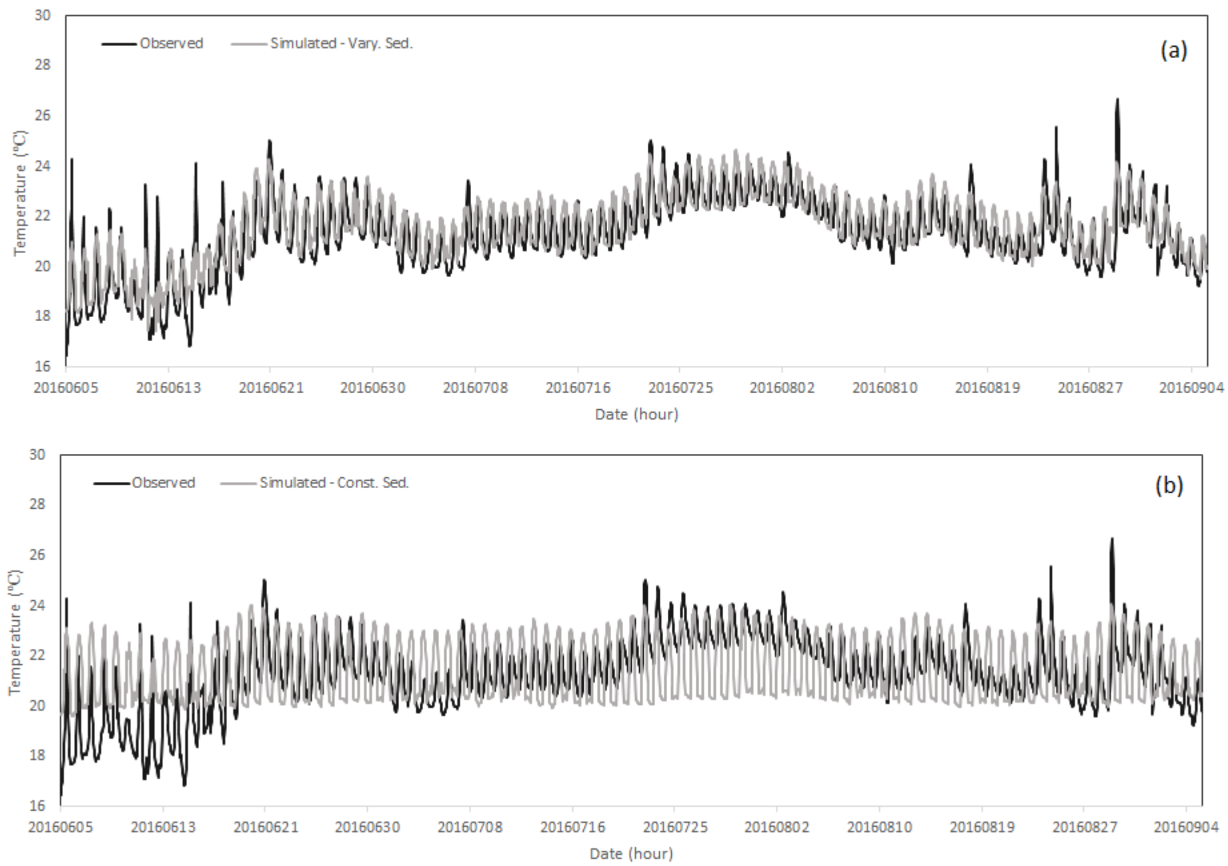

Figure 3. Reach-averaged observed and simulated river temperature for the Compton Creek in low flow condition. The figure shows the simulated river temperatures for the varying (a) and constant (b) sediment temperatures.

We are currently preparing a technical report summarizing the methods, results, and products from Task 3. We expect to distribute a draft of this report for TAC and SWG review early next quarter

<u>Activity 4: Apply Environmental Flows Framework to quantify effects of flow modification on the Los Angeles River and evaluate management scenarios</u>.

Based on discussions with the TAC, we have developed an approach for evaluating management scenarios using sensitivity curves. This approach provides flexibility in terms of management options that can be considered and allows for defining ranges of acceptable flow metrics. We have started with a series of model runs to develop sensitivity curves and are working on creating heat maps of the certain combinations of management actions that meet criteria. We have completed preliminary scenario runs for water reuse with initial hydrologic/hydraulic model outputs, based on a general percent of reuse scenarios. The preliminary results demonstrate how the final data may be displayed through interactive and online plots and will be refined over time in coordination with the TAC and stakeholder groups. During the next quarter, we will expand the sensitivity curves approach to include ranges of future conditions that may also be affected by stormwater capture.

Currently, we are also working on the approach to apply species habitat suitability to the management scenarios by relating the hydraulic variables to the WRP discharge. We aim to produce flow recommendations that consider spatio-temporal aspects of each species life history relative to ranges of potential future changes in WRP discharge.

Activities 5 And 6: Adaptive Monitoring and Management Plan and Summary Project Report.

No progress has been made yet on Activities 5 and 6, which involve developing a monitoring program and drafting the final project report.

Activity 7: Assess Water Quality Effects of Flow Modifications on the LA River.

We have finished compiling a water quality database containing metals, suspended solids, conductivity, and nutrients data dating back to 2005 from a variety of different sources, including Mass Emissions Stations, MS4 discharge data, CEDEN, and the Los Angeles River Watershed Monitoring Program. WRP effluent data was obtained from Discharge Monitoring Reports. A water quality module is being added to the calibrated hydrologic SWMM model and is initially being applied to Compton Creek. Percent land use and event mean concentrations, which are inputs for the model, have been obtained from Southern California Association of Governments and SCCWRP respectively. The aggregated observed data will be used for model validation.