## Los Angeles River Instream Flow Criteria: Technical Study

### Technical Advisory Committee Meeting #4 Notes

### March 11, 2020

**Meeting Objectives:**

- Discuss habitat modeling approach and thresholds of response
- Modelling update
    - Hydrologic modeling
    - Hydraulics modeling
    - Temperature modeling
- Review water quality data compilation
- Discuss approach for flow management scenarios and management scenario analysis

**Participants**

**In-person:**

- Alexander Prescott: LARWQB
- Chris Medak: USFWS
- Derek Booth: Stillwater Sciences, UCSB
- Doug McPherson: USBR
- Hassan Rad: LA City
- Jane Tsong: WCA
- Manuel Aguilar: LA DWP
- Steven Webb: LARWQB
- TJ Moon: LACDPW
- Wendy Katagi: Stillwater
- Yao Kauwouou: LA County Flood District

**Remote:**

- Geremew Amenu: LA County Public Works
- Ginachi Amah: LARWQB
- Andy Collison: ESA Consultants
- Rosi Dagit: RCD Santa Monica Mountains
- Anthony Hicke: ULARA Watermasters Office
- Antoine Kunsch: UCLA
- Kelly Schmoker: CDFW
- Rafael Villegas: LA DWP
- Sarah Yarnell: UC Davis

Project Team:

- Eric Stein: SCCWRP
- Jenny Rogers: SCCWRP
- Katie Irving: SCCWRP
- Kris Taniguchi-Quan: SSCWRP
- Liesl Tiefenthaler: SCCWRP
- Jordyn Wolfand: University of Portland
- Reza Abdi: Colorado School of Mines (Remote)
- Victoria Hennon: Colorado School of Mines (Remote)
- Daniel Philippus: Colorado School of Mines (Remote)
- Ashely Rust: Colorado School of Mines (Remote)
- Terri Hogue: Colorado School of Mines (Remote)
- Tatyana Isupov: SWRCB
- Lori Webber: SWRCB (Remote)

**Agenda**

1. Introductions and meeting goals – 10:00-10:15
2. Recap from last TAC meeting – 10:15-10:30
    a. Update on action items
3. Discuss habitat modeling – 10:30 – 12:00
    a. General approach
    b. Review of data sources and key variables
    c. Examples with two initial species and threshold values
4. LUNCH – 12:00 – 1:00
5. Update on hydrologic and hydraulic modeling – 1:00 – 1:30
    a. Calibration results
    b. HEC-RAS outputs
6. Update on temperature modeling – 1:30 – 2:00
    a. Temperature modelling approach
    b. Data needs and calibration
7. Water quality data compilation – 2:00 – 2:15
8. Scenario evaluation 2:15 – 3:15
    a. Example scenario evaluation curves
    b. Relating physical properties to biological response
9. Wrap-up, action items and next steps – 3:15 – 3:30

**<u>Key Action Items and Recommendations:</u>**

**Data Needs:**

- Stream temperature - 2016 continuous data (Mongolo et al., 2017)
- WRP discharge data - Burbank
- Water quality: MS4 (particularly pre 2015), mass emissions
- Depth to groundwater data
- Scenario capture:
    - Planned dry weather diversion locations
- Existing cross-sectional data for Sepulveda Basin from One Water City of LA study
- Sucker spawning and depth studies

**Habitat Modeling:**

- Develop an overall conceptual model that contextualizes the study reaches and physical habitats that may be supported at each reach - which species and limiting factors are important in what areas?
    - Set up a follow-up discussion on limiting factors and conceptual understanding with Stillwater Sciences
- Describe the limiting factors by channel setting
    - By life stage
    - Articulate synthesis
- Explore use of continuous functions vs. thresholds for habitat modeling
- For the sucker temperature thresholds, look at temperature thresholds for southern CA trout as they co-occur with sucker in Tujunga
- Set-up web-based calls for remaining focal species

- Follow-up with CDFW on willow germination information

**Physical Modeling:**

- SWMM:
    - Run the validated model on a wet year to see how well the prediction is
- HEC-RAS:
    - Additional cross-sectional data for soft bottom area of Sepulveda Basin
    - For all softbottom cross sections, manually designate left and right banks to get additional hydraulic outputs (i.e., velocity, shear stress, etc.) for left, center, and right side of channel
- Consider shading for temperature modeling – at appropriate reaches

**Model Scenarios:**

- Develop WRP model scenarios that consider diurnal variability and capture scenarios that consider the dry weather diversions
- Set up follow-up webinar on the flow management scenarios for continued discussion with TAC

**Detailed Meeting Notes:**

**Habitat Modeling:**

***Conceptual model****: discussed overall habitat model approach and conceptual model*

- Chris Medak: what do you mean by aggregate?
    - Katie Irving: this means that we need to combine the various suitability curves/relationships together to get an overall habitat suitability for a given location. We haven't figured that out yet but would like suggestions from the TAC on this.
- Rosi Dagit: will each life history phase be modeled for each habitat?
    - Katie Irving: Yes, we will consider each life history phase for each species that we are modeling
- Andy Collison: for what flows do we do this for? How are you going to select which discharge rates to focus on?
    - Eric Stein: we will have a whole discussion on that this afternoon when we talk about the scenario analysis.

***Thresholds:*** *Discussion of the types of physical parameters we will consider (substrate, depth, velocity, and temperature) and specific thresholds for the Santa Ana sucker model*

- Rosi Dagit: regarding the 3 habitat suitability categories (unsuitable, intermediate, suitable), is it necessary to have an intermediate category or would it be better to have just suitable or not? It's hard to tell what the advantage of the intermediate category is.
    - **Point of discussion:** we could do a binary suitable or have more categories: probability of flow conditions being suitable or unsuitable (binary) or we could add a middle category to allow for a grey area of uncertainty
        - The intermediate category really was chosen to capture our level of confidence in the thresholds: if it's in a grey zone, we really aren't sure if it's suitable or not. We could rename the intermediate category to "uncertain"
        - Chris Medak: Key component to all of this is time. It's not just about is it suitable or unsuitable but how long is the habitat suitable or unsuitable. This has to be time based. Historically, a tributary could be full of fish one year and

none the next depending on the amount of rainfall. We need to think about how rainfall and habitat suitability varies over time.

- Eric Stein: We can take advantage of the time series of climate data to look at the number of years (or sequences of years) when certain conditions are being met. We will need some assistance from the TAC to determine how to define "suitable" (i.e. how many consecutive years of optimal conditions are necessary). We can also use the models to assess sensitivity over time (i.e. how do certain flow patterns change the period of time when suitable conditions occur).

- Derek Booth: I like the intermediate or uncertain category, but we can't answer questions regarding the spatial and population basis in between reaches. Some of the life stages may be irrelevant to population because they are limiting. Need to capture the year to year variation in the model - just because one year we can't support fry in one year it doesn't mean the population can't survive
- Eric Stein: if we can provide a timeseries of years of suitable habitat, can we reach a conclusion from management perspective? Is the change in the discharge going to create a shift in the ability to support beneficial use?
- John Bishop: we are not going to be considering the entire flow regime but the time of the year when changes in WRP discharge will have an effect on discharge in the mainstem of the LA River
  - Eric Stein: To clarify this statement, we need to consider the entire year because the previous rainfall year may be important and have implications to the subsequent spring and dry season. We don't want to ignore the wet season in relation to the impact of that on the dry season
  - John Bishop: want to make sure that we are not focusing on certain flows that are not important to changes in wastewater discharge

- Jennifer Pareti: will you consider some of the peak flows necessary to prepare habitat?
  - Katie Irving: Yes, we will be looking at shear and velocity as a surrogate. We will discuss this later on when we talk about the willows
- Ashley Rust: will you consider the egg stage or is that included in the spawning phase?
  - Katie Irving: No, as of now, we are not considering the egg stage as its own individual life stage.
  - Chris Medak: The sucker is a protracted spawner so it could react to the natural triggers depending on rainfall, it can spawn after the first rain and all eggs get washed out and spawn based on next rain. I would suggest that the time period is not limited in the critical time period. Wouldn't recommend the whole year but a wider range. Looking at climate change and changing/shifting seasons so using an absolute narrow window is a mistake (May-June time period) **[time period recommendation: at least March-July]**

- **Thresholds: Depth**
  - Chris: Spawning 100-150 depth is too deep -->
    - Feeney and Swift was the only paper with an actual value for spawning stage
    - Recommends using Santa Ana river because it has a shallower gradient and prioritizing studies that are. Gradient is controlling factor for a lot of these variables --> we won't find boulders in the flat LA River so we have to look at areas in similar gradient. In contrast to the upper San Gabriel River
    - Rosi: In Santa Ana we may see more similar temp gradients, as well

        - Chris Medak: There are few studies on spawning depth, but there are some that are shallower
            - **Action item: follow up on Sucker spawning and depth studies**

    - Eric: maybe most important threshold here is the unsuitable measure, make sure that we are not using a number that's not true.
    - Chris: Depth that shallow is almost immeasurable if you have cobble in there. This is a hard measurement to take. Need to think about interstitial spaces that the fish can swim even with a very shallow depth. Depth <20 cm could be in depth greater as long as velocity isn't large (fry, unsuitable threshold). Velocity vs depth that's an excluding factor
    - Teri CSM: think about the sensitivity of the model --> keep in mind that we won't be able to get down to 1cm accuracy so there's going to be uncertainty around this.
- **Thresholds: Temp**
    - Are there other species that have experimental studies?
        - Arroyo Chub are more tolerant than suckers. You can look at temp thresholds for southern CA trout because they co-occur. In Tujunga you have sucker and trout co-occurring. If DO is too low, that may be limited factors there
        - Eric: keep in mind that we will also have some limitations based on the resolution of the temperature model output
        - **Recommendation: for sucker temperature thresholds, look at temperature thresholds for southern CA trout as they co-occur with sucker in Tujunga**
    - Do we use combo of temp data and extrapolation from trout or is there so much uncertainty for this species that we don't use it?
    - Know that they live in Santa Ana river and it's hot. So even if we don't have formal temp tolerance studies that show upper limit, those temperatures will be appropriate for putting the upper limits in.
    - Make sure that we're not trying to aim high but low and that the wastewater utilities may have the ability to control temp.
    - We also want to account for the fact that if we reduce the wastewater discharge we could potentially cause a reduction in temperature
- **Thresholds: velocity**
    - Options for velocity:
        - Apply model with uniform velocity
    - Juvenile trout velocity: in study relied on whatever juvenile trout that could be comparable.
    - AJ from Stillwater Science: lacking anything better, suitable spawning velocities should be fairly comparable of adult velocities. Kai balanscar, Kerwin Russell could be people to consult with
    - Chris Medak: can share us with data on juveniles. Haglan and Baskin in Santa Ana River and San Gabriel
    - Feedback:
        - Chris Medak: velocity is not a limiting factor. If concrete channel with no surface complexity that suckers couldn't live there under any conditions. If you have any shelter at all, they can find a way to get between cobbles and that alone
        - Andy: Concrete channel velocities will be close to the model output. In more vegetated sections there could be refugia where they can hang out

        - **Recommendation: for different reaches, there may be different limiting factors. Start with substrate (if in concrete would apply velocity as next limiting factor but if in sandy refugia may be possible so we may look at things like temperature)**
        - AJ: limiting factors may be different to life stages
        - Andy: has algorithm to discretize the edge slower and centers. It's empirical and clunky but an avenue that could be worth exploring.
    - **Thresholds: substrate**
        - Excessive silt can be a limiting factor for spawning <- adults might be there but if cobbles covered by silt
        - >50% would be too much, we know it should be a mixture of cobble, sand, and gravel. Knowing how sand moves, we can say that they couldn't lay in sand and they can't stay
        - Adults can tolerate the highest velocities they can use anything from boulders down to sand because they can tolerate the highest velocities (they aren't limited in their movements) --> adults can move to where they want to be in deeper pools. Need larger substrate down the stream
        - Categorizing different sections of the river (hard bottom, soft bottom, highly vegetated) and define limiting factors based on the settings, vary by species and have offline calls for when we get to the other species
    - Is the general approach of looking at different life stages, critical variables, thresholds, and id limiting factors for the different settings a good approach?
        - Chris Medak: are there minor changes that can be done to help support possibility of having them there?
        - Eric: we can consider this, but generally we will assume that the physical configuration of the channel remains the same and we just focus on changes due to flow

***Black Willow Model:*** *discussion of the black will model set-up and thresholds*

- **Life history of *Salix gooddingii* – Goodding's black willow**
    - Chris Medak: few willows in the understory is probably a function of bulldozing of the river
        - Eric Stein: Paul Alva (LACFCD) made a point at the previous stakeholder meeting that this is a flood control channel and it will continue to be a flood control channel
    - Derek Booth: if conditions were such that these willows will never recruit, then it seems like you would want to know and consider that. You wouldn't want to tweak the wastewater regime to achieve successful germination if the floods already wiped them out. Want to know that before coming up with management interventions. If conditions are never conducive, let's move on
    - **Recommendation: consider limiting factors for each reach**
- **Pre-germination:**
    - Rosi Dagit: if there is too much flow, then seeds will wash away. Germination requires that the ground is damp, how will you consider this?
        - Jenny Rogers: because we won't be explicitly modeling soil moisture, one option is to use depth as a proxy for soil moisture. For example, we can set a depth requirement during early spring (April 1- April 30)
    - Chris Medak: Regarding the depth of 3cm threshold, is that from what part of the cross section?

        - Jenny: We will be considering this depth threshold from multiple points across a cross section (considering 10 points). For each point, was it wet during the time period?
    - **Discussion: For the variables, we have options of using threshold ranges, bins, or probability functions**
        - Derek Booth: argues against bright lines and argues for acknowledging the uncertainties
        - **Recommendation: create probability curves for some of the various factors when we have that information available, there is no bright line. From the management perspective, need to decide what is desired: 50% or 80% probability (for example)**
        - Chris Medak: Can we consider the variable conditions across a cross section, not just at one point? Can you have suitable conditions for all portions across the cross section? It's not a binary decision
            - Andy Collison: For velocity and shear, HEC-RAS can give you 3 outputs for one cross section (for left, main channel, and right). Set the LOB, ROB, and in channel values manually for the soft-bottom reaches --> this can allow for a more spatially explicit average hydraulic representation for one cross section
            - **HEC-RAS Recommendation: break up the cross-section designation to get 3 shear and velocity values from the "bankfull" channel**
- **Germination:**
    - Chris Medak: it is odd that we are focusing on flows that would be detrimental during that period (April 30 – Aug 31)
        - Jenny Rogers: this would be a good time to reduce wastewater discharge during this time period. Our main thought was that we will focus on low velocity discharges that could scour smaller plants
        - Chris Medak: Wouldn't it make more sense to focus on mortality due to being waterlogged?
    - **Action item: circle back with CDFW about how to address flow needs during germination phase of willow model**
- **Water Table:** Current assumption is that the soft bottom areas are upwelling areas, we will assume that groundwater is in "root reach" of both seedlings and adults
    - Jenny Rogers: Depth to groundwater data available for the LA basin? Are there times when groundwater is less than 3 m below the surface?
    - Rafael Villegas: Generally speaking, groundwater level rises to the surface the closer you get to the LAR from the valley. Sometimes we observe upwelling and infiltration, sometimes this varies. From LA's perspective, how do we efficiently capture some of that water? There is concern that contaminated groundwater is upwelling into that reach because of the legacy contamination from aerospace.
    - Unknown (phone): in most cases, depth to groundwater table is not >3m.
    - John Bishop: Assumption that no matter what management scenario we will choose we will never dry softbottom area. If the groundwater is lower, we will have infiltration. There will always be water table water available.
    - **Action item: need to circle back and check on the depth to groundwater data**
    - Anthony Hicke: Along that stretch of the river in the narrows, there are areas where water moves out of the ground, and areas where it moves back in. The issue with the groundwater data in that reach with respect to this groups efforts is that the ULARA

Watermaster calculates rising water volumes on an annual basis. Those volumes are reported in the Annual ULARA Watermaster report. Therefore, it is not a monthly dataset but an annual look at what is leaving and entering the river.

- Unknown (Phone): In Glendale Narrows, most of the time the assumption that groundwater is in "root reach" of both seedlings and adults would probably be a safe assumption
- Anthony Hicke: Also noteworthy that in the ULARA Judgment documents, mention is made that a wellfield in the area of Pollock should be operated to prevent loss of any groundwater from ULARA through the LA River past gage F-57.

**Hydrologic and Hydraulic Modeling Update:**

- Updated precip data and redelineating model outputs around Sepulveda basin
- HEC-RAS calibration finished based of 5 gages
- SWMM model calibration almost complete
  - Next step is to disaggregate the Qurban_baseflow (which lumps Qupwelling, industrial and urban drool)
- Working on improve calibration of Rio Hondo, Compton Creek, and Pacoima diversion --> account for things like Lopez Dam and spreading grounds

**HEC-RAS:**

- TJ Moon: For cross sectional data for soft bottom area within Sepulveda Basin, you could extract topographic cross-sections from the LiDAR data
  - Jordy Wolfand: We tried to use the LiDAR data, however there are too many trees to discriminate the ground surface.
  - Kris Taniguchi-Quan: We could check the SMC/SWAMP physical habitat survey data to see if cross sections in this area have been surveyed previously
- **Recommendations:**
  - City of LA, One Water study did have cross sections, reach out to Mark Hanna from Geosyntec
  - Check SMC/SWAMP physical habitat surveys surveys
  - Determine if we need to survey cross sections but be careful for very deep areas near the golf course, may need a kayak
- Chris Medak: why was the 2011-2017 period chosen?
  - Jordy Wolfand: Mainly due to data limitations. It was hard to find a consistent time period where we had overlap of all observed data. During this seven-year period, it did capture wet, dry, and moderate rainfall years. The WRP discharge signal is constant up until 2017, following that recycling and WRP discharge patterns changed.
- Derek Booth: Since the focus of this project is on wastewater recycling which has the greatest influence during dry years, I think that this calibration period, which airs on the drier side, is appropriate. We will never get a great calibration so if we skew calibration to match the wet years, then we probably will screw up the low water or drier model performance. For this application, it is critical to get the drier period right - it should be more skewed towards drier years where WRPs would be of greater importance.
- Chris Medak: From a species perspective, will this calibration produce accurate high flow events?
  - Eric: if we had to make a tradeoff in flows, we would lean towards certainty of lower flows and less certainty in higher flows.
  - **Recommendation: run the validated model on a wet year to see how well the prediction is**

- Kelly Schmoker: HEC-RAS doesn't do well with the low flows so this would be best to make sure flow calibration towards lower flow is more accurate
- Teri Hogue: Keep in mind that the graphs shown is for average annual flow and we will have a wide range of storm events that we are calibrating for. We aren't calibrating on annual flow, so we could have captured some big storms events even within some of those years
- Rafael Villegas: How does the average annual discharge relate back to the daily? Ultimately, we will impact the low flows.
    - Eric Stein: we will get back to that during out scenario discussion. These plots are just a summary but the more granular variability within a year will be seen on different parts of the annual hydrograph

To do:

- Figure out cross-section data in Sepulveda Basin
- Finish hydrologic calibration
- Work on updates to HEC-RAS model to derive more discretized outputs from the shear variables LOB, in bank, ROB

**Water Quality Modeling Discussion:**

- Discussed water quality data required and key data needs
- LA county flood: could get the metals data
- Missing water quality effluent data

To do:

- Will work with WRP to get the WRP effluent data and LA county for metals data

**Water temperature modeling update:**

- Any key temperature datasets from the TAC?
    - Antoine Kunsch: We have 2016 continuous data from numerous loggers throughout the mainstem (Mongolo et al. 2017)
        - Reza Abdi: We couldn't get a hold of the raw dataset, need to follow up with Jennifer Mongolo and other to get data used in that report
        - Rosie Dagit has that data and will share it
- Options:
    - Obs data from areas (not in urban areas)
    - Deploy ibuttons to collect data for calibration/validation
    - Other data sources we don't have?
- Data needs: Still need effluent temp data from Burbank WRP
- Rosie Dagit: Are there variables in iTree River that account for canopy cover and shading? Maybe that's why the simulated temperature is underpredicted
    - Reza Abdi: Yes, but for initial calibration we didn't account for shading. For the future calibration, we will account for that.
    - Rosie Dagit: If one of our metrics for success is %cover, it would be great to know where we are now vs where we are in the future
- **Recommendation**: **For reaches where there is shading, we should include shading factors in the temperature model. When we start to think about management scenarios, there may be opportunities for promoting or allowing tree cover to control for temp (if temp is a critical factor for habitat suitability)**
- Chris Medak: is it a % cover or what is the variable to enter to accommodate for shade?
    - Reza Abdi: You put in a value from 0 to 1 that indicates %shading or cover at each cross section

- Geremew Amenu: What is the spatial scale of temperature model: is it at a cross section or continuous length of the river?
    - We will have one average temperature value predicted at each cross section. However, we can get additional information by including multiple cross sections in a reach.

**Flow Management Scenarios:**

- Rather than a defined set of scenarios, the TAC has previously recommended that we use a more flexible approach – sensitivity curve analysis. Feedback on approach or potential changes to the approach?
    - Derek Booth: We need some sort of overarching conceptual framework of what these species need and the different parts of LA River system that links to the life history stages. This is a tool, so you will need some kind of conceptual framework that narrows it down so it's a useful tool
    - Eric Stein: We can build off the habitat maps we already produced that indicates that for a given reach, what habitats have the potential to be supported. For each reach, we can contextualize this understanding:
        1. For a given reach is it soft bottom or concrete?
        2. What are limiting variables?
        3. Come up with probabilistic relationship that relates depth (or other variables) to prob of supporting life stage. This will give us a range of depth to aim for
    - Derek Booth: You should also have ecologists tell you the key locations where we should be concerned about the various habitats. Before you integrate those 7 suitability curves x 6 species x 11 reaches, for example, the framework for which habitats and variables matter based on which locations based on all of the messy things that don't fit on the graph
    - Wendy Katagi: Useful information to inform this framework is determining the limiting factors for each reach
    - Derek Booth: Everything will come down to what do you think is important and in what areas
    - Eric Stein: Now that we have that habitat map we can extend on that map and ask the biologists to see if we are focusing on the right things in the right locations. One piece that we didn't mention yet is the potential to test our models in outside locations.
        1. If we start to develop series of sequential curves, are there locations outside of here (i.e., Santa Ana river) were we can test/validate the models? We can apply these models in a reach of the Santa Ana river where we do have observed data and determine if we are in the right ballpark.
- **Recommendation: develop an overall conceptual model and contextualize the study reaches and physical habitats that may be supported at each reach. Describe the limiting factors for each reach**
- Chris Medak: Having a hard time envisioning aggregating all of this information and curves and to figure out what it means. How will the all of the data be integrated into an answer?
    - Eric Stein: For some of the variables can we identify the limiting factors (life stages or factors for those life stages) and focus on those limiting factors. Another way would be for every reach, we could give concern for adults and adults during some parts of the year (focus on limiting life history stage). This could mean we would end up with a series of targets per each reach. First pass is to lay out critical limitations for each reach and see how messy it is and next is to see if we can pair that down.
- Derek Booth: in the end of the day, we may have a fuzzy set of alternative outcomes but if you can get to that point, you can declare success

- Eric Stein: Also remember that we will circle back to the recreational use study and considering flow/hydraulic needs to support those uses in addition to aquatic life uses
- Timing of the next suite of species:
    - Eric Stein: We will take the next couple of weeks to organize and refine our overall process and then from there, share with the group. After that point, we will move forward with the other species. Once we have the thresholds ready for the next set of species, we would like to have web-based discussions with the TAC
    - Goal on timing is to get through all this work by the summer and to start getting conclusions by the fall
- **To do: Set up more focused working sessions with Stillwater Sciences on limiting factors and conceptual understanding**

- Hassan Rad: What set of flow variables will you be looking at?
    - Will have a finite set of variables that are important to biology and are sensitive to changes in wastewater discharge.
- Hassan Rad: What is the lowest common denominator that you will be looking at?
    - Lowest common denominator will be overall reduction in wastewater discharge (combined from the 3 WRPS) and how will it affect these critical variables and this is what it means to the biology
- Derek Booth: Regarding the stormwater capture scenarios - LA DWP SW Master plan: even on the conservative side, these are highly aggressive goals to aim for in terms of possible stormwater capture. Would suggest using a more realistic set of scenarios. Need to think about what is actually possible in terms of a decade time stamp. Definitely in support of these aspirational goals and in support of all of the projects and initiatives going on.
    - Raphael Villegas: In some areas we want to make these values more aggressive, but in totality, given MS4 requirements want to choose something that fits within these requirements. They may not be way out of line. Over the last 5 years are generally in line for what governor is aiming for. Over last decade have pushed over $100million out the door to push a lot of these initiatives
    - TJ Moon: There is a new program with safe clean water: in LA River watershed 30 projects that will come into fruition in the LA River alone. So this may not be so unrealistic.
- TJ Moon: What about other areas outside of the DWP master plan?
    - There are plans that are in place with stated goals, question is how much do those plans contribute to that goal?
- TJ Moon: The LA River dry weather bacterial TMDL will construct a series of low flow diversions that will be put in place that will definitely impact low flows in the mainstem
    - Eric Stein: We can estimate percent capture due to projects and implementation of other regulatory programs and then account for them in the model

**Action item: follow up with where the low flow diversions will occur to make sure that we account for those in our analysis**

- Jane Tsong: For Compton Creek and Rio Hondo, has it been discussed yet what those scenarios will be?
    - Eric Stein: We used those two creeks as an example, but we want to be inclusive of other things that may be in the que. One reason why we are looking at these sensitivity

curves is so we can use it to provide a set of tools for the stormwater and wastewater scenarios

- Geremew Amenu: Need to evaluate dry weather and wet weather separately. Urban dry weather runoff is prohibited, should assume zero discharge from storm drains during dry weather. Eventually those flows will be addressed in the long term. Need to assume zero dry weather runoff for this modeling exercise. For wet weather, go with the 85 percentile or the 1-inch storm (from tmdl)
    - Eric Stein: Dry weather discharge provides exemptions if it is proven to support certain beneficial uses
    - Yes, exemptions for potable discharge.
- **Recommendation: Set up a follow-up webinar on the flow management scenarios to continue discussion with TAC**
    - Follow up with watershed protection division who are working on the dry weather issues

- Rafael Villegas: Are you considering the diurnal flows because discharge mimics the water use --> are we looking at that diurnal signal on the impact of the aquatic life? What does that curve look like in the LA River, will we consider that? If the data suggests that we'd be limited amount of water that additional opportunities may present themselves in the middle of the night.
    - Jordy Wolfand: Right now, we are modeling hourly data and for reuse scenarios, we are simply multiplying a scalar (i.e, 0.75) to the historic discharge. If that is not the use pattern, recycling 20cfs constantly or only during the nighttime hours this is all flexible in the model but it's a matter of how to display that data.
    - The City of LA is looking at baseline reduction in flow and want to get a handle on what the study shows and then take a look at seasonal and additionally skimming on the diurnal: what is required for beneficial uses? Maybe opportunities and to be flexible of where and when water can be diverted while producing not only on seasonal but also diurnal timescale.

- Chris Medak: The river is cleared which could add space for seeding and for suckers, sediment transport in the reach and turnover of gravel is important for spawning preparation. But we have absolute values for current substrate - is there a certain flow during a certain time frame? The environmental scouring flows have direct effect on both willows and sucker. Since these are periodic how will that value get added in the analysis?
    - Eric Stein: If we had critical shear value that will remove vegetation and we want that to occur every 10 years, we can look at how changes in stormwater management effect the frequency of hitting those shear values. We can also use critical shear stress to mobilize a certain grain size on the bed in a similar fashion. Currently, we are considering this for the willows but we are not accounting for the flushing flows for the sucker. If we can think of a high flow variable that is important that we aren't considering we can add those in – like the critical flows to mobilize specific grain size of the bed.

**Key Action Items and Recommendations:**

**Data Needs:**

- Stream temperature - 2016 continuous data (Mongolo et al., 2017)
- WRP discharge data - Burbank
- Water quality: MS4 (particularly pre 2015), mass emissions
- Depth to groundwater data
- Scenario capture:
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- Sucker spawning and depth studies

**Habitat Modeling:**

- Develop an overall conceptual model that contextualizes the study reaches and physical habitats that may be supported at each reach - which species and limiting factors are important in what areas?
    - Set up a follow-up discussion on limiting factors and conceptual understanding with Stillwater Sciences
- Describe the limiting factors by channel setting
    - By life stage
    - Articulate synthesis
- Explore use of continuous functions vs. thresholds for habitat modeling
- For the sucker temperature thresholds, look at temperature thresholds for southern CA trout as they co-occur with sucker in Tujunga
- Set-up web-based calls for remaining focal species
- Follow-up with CDFW on willow germination information

**Physical Modeling:**

- SWMM:
    - Run the validated model on a wet year to see how well the prediction is
- HEC-RAS:
    - Additional cross-sectional data for soft bottom area of Sepulveda Basin
    - For all softbottom cross sections, manually designate left and right banks to get additional hydraulic outputs (i.e., velocity, shear stress, etc.) for left, center, and right side of channel
- Consider shading for temperature modeling – at appropriate reaches

**Model Scenarios:**

- Develop WRP model scenarios that consider diurnal variability and capture scenarios that consider the dry weather diversions
- Set up follow-up webinar on the flow management scenarios for continued discussion with TAC

Stakeholder meeting on March 26th to provide updates and solicit feedback from the larger stakeholder community. An agenda will be sent out from the State Water Board next week.