Establishing Environmental Flows for the Los Angeles River

Stakeholder Working Group Meeting #3 – March 26, 2020

Background

- During dry periods, Los Angeles River instream flows are primarily wastewater treatment plant discharges from facilities managed by the cities of Los Angeles, Glendale and Burbank
- All three have plans to recycle a portion of their wastewater and have petitioned to the State Water Board Division of Water Rights to reduce discharges to river
- Reductions may affect existing beneficial uses such as recreation and aquatic life
- Water Boards support beneficial use protection and recycling
- Study goal is to evaluate impacts on a watershed level

Goals, Approach, and Schedule

OVERVIEW OF STUDY

Central Question

What are the potential impacts (+ or -) to existing and potential future instream beneficial uses in the Los Angeles River caused by reductions of wastewater treatment plant discharges and/or stormwater capture?

Los Angeles River Environmental Flows Project Goals

1. Develop technical tools that quantify the relationship between various alternative flow regimes and the extent to which aquatic life and non-aquatic life beneficial uses are achieved

2. Evaluate various flow management scenarios in terms of their effect on uses in the LA River.

3. Engage multiple affected parties to reach consensus about appropriate flow needs and optimal allocation of flow reduction allowances from multiple WRPs in consideration of other proposed flow management actions

Assessing Environmental Flows for LAR

Activity 1: Stakeholder Coordination

Activity 2: Non-aquatic life use assessment

Activity 3: Aquatic life use assessment

Activity 4: Asses effects of flow modification/management

Activity 5: Monitoring and Adaptive Management

WRP Water Reuse

Options for Other Scenarios

- Stormwater
- Groundwater
- Conservation
- Environmental restoration

Schedule

Activity / Sub-Tasks	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4
Activity 1 - Stakeholder coordination									
Activity 2 - Non-aquatic Life Use Assessment									
Activity 3 - Aquatic Life Beneficial Use Assessment									
Activity 4 - Apply Environmental Flows/Evaluate Scenarios									
Activity 5 - Monitoring and Adaptive Mangement Plan									
Activity 6 - Summary of results/reporting									

Stakeholder Meetings

TAC Meetings

Members, Role, and Relationships

TECHNICAL ADVISORY COMMITTEE (TAC) STAKEHOLDER WORKGROUP (SWG)

Role of the TAC

- Input on hydrologic modeling approach
- Coordination with existing modeling efforts and studies
- Assistance with data sources (hydrology, water quality, biology)
- Input and review on ecological modeling approach
- Input on scenarios and potential mitigation/management approaches
- Review of draft products and findings

TAC Members

Agencies

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

FOREST SERVICE
U S
DEPARTMENT OF AGRICULTURE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

US Army Corps of Engineers®

LOS ANGELES COUNTY
DEPARTMENT of REGIONAL PLANNING

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
100 YEARS 1915–2015

PW
Public Works
LOS ANGELES COUNTY

CITY OF LOS ANGELES
FOUNDED 1781

CITY OF GLENDALE
CALIFORNIA

Long Beach Water Department

LA DWP
Los Angeles Department of Water & Power

CITY OF BURBANK
INCORPORATED 1911

SAWPA

RESOURCE CONSERVATION DISTRICT OF THE SANTA MONICA MOUNTAINS

ULARA
UPPER LOS ANGELES RIVER AREA WATERMASTER

WCB
State of California
Wildlife Conservation Board

TAC Members

NGOs/Private/Universities

Heal the Bay

The Nature Conservancy

ESA 50 YEARS 1969-2019

Stillwater Sciences

mbc AQUATIC SCIENCES

LimnoTech

UCCE University of California Cooperative Extension

UCLA

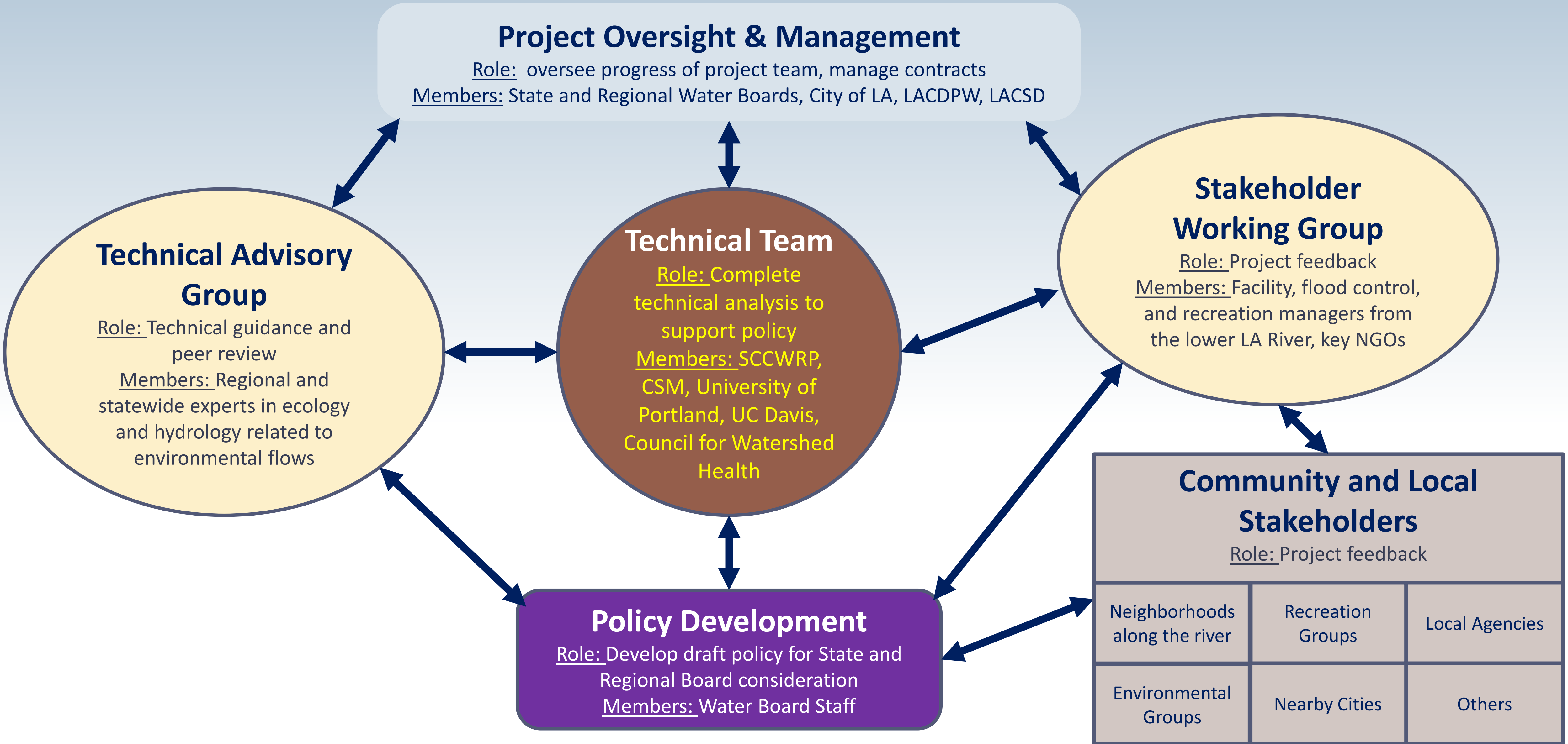
UC DAVIS UNIVERSITY OF CALIFORNIA

UC SANTA BARBARA

Role of the SWG

- Input about community activities along the LA River and associated flow needs
- Review and feedback to project technical team
- Coordination with ongoing community engagement efforts and related projects/studies
- Assistance with interactions with the public and decision makers

Relationship of TAC to Other Groups (e.g. SWG)

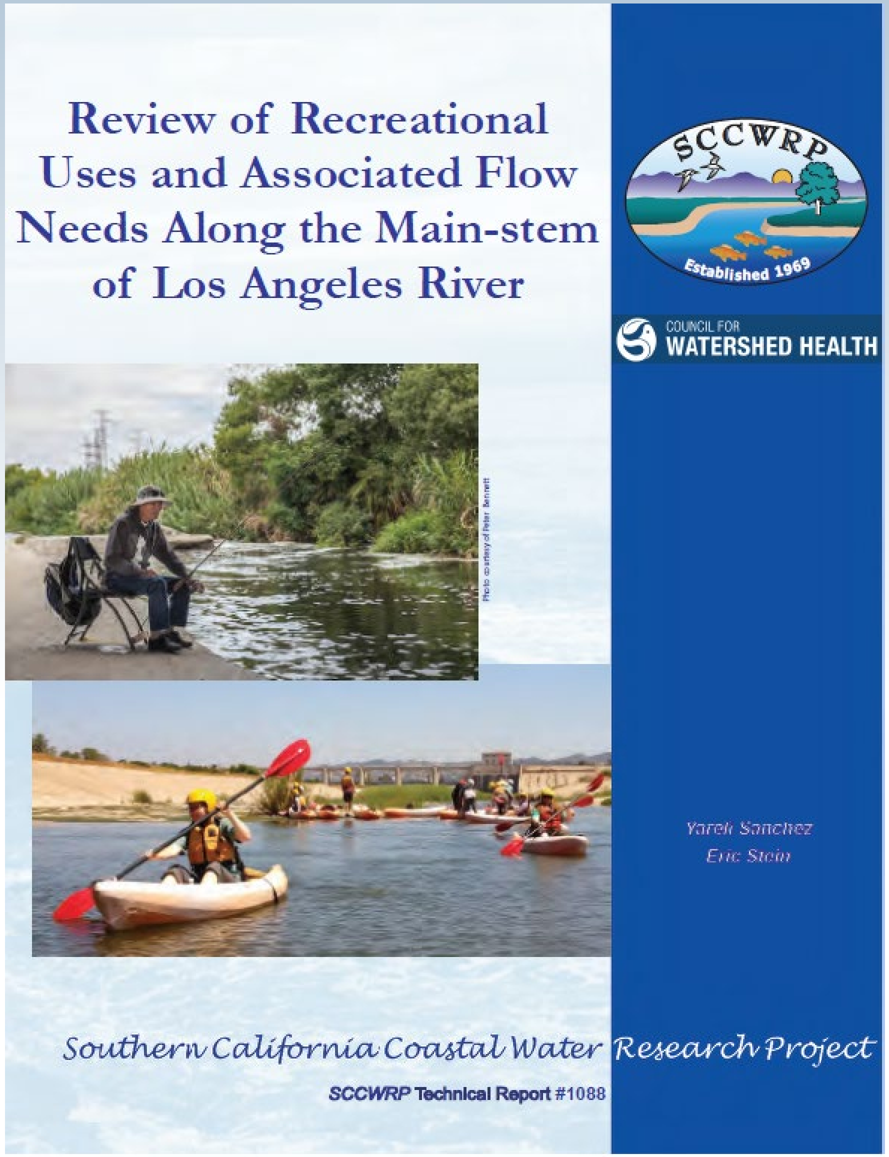


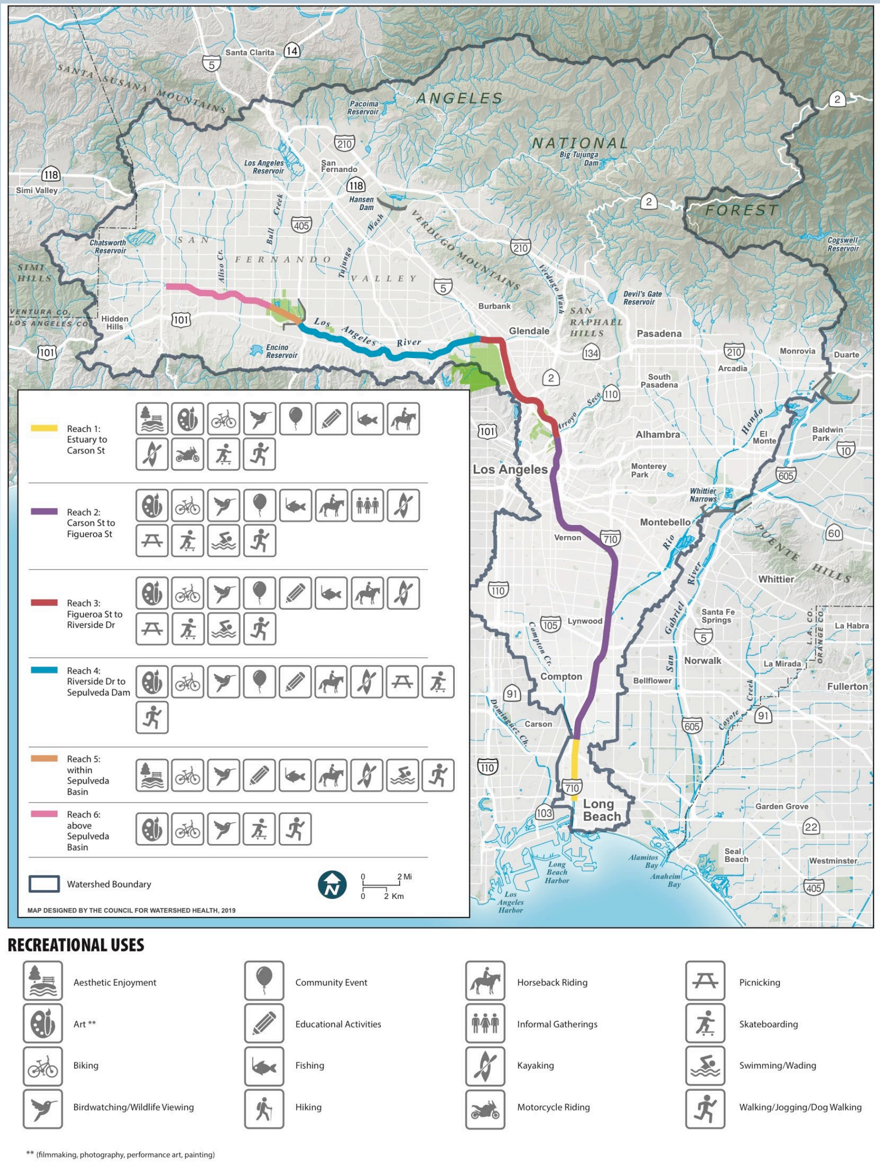
OVERVIEW OF TECHNICAL WORK TO DATE

Summary of Work to Date

- ✓ Data compilation (recreational uses, species, habitats, environmental conditions)
- ✓ Mapping of aquatic life and recreational uses by reach
- ✓ Completed non-aquatic life use assessment
- ✓ Further defined list of focal habitats and key species
- ✓ Characterized habitat needs and tolerance ranges
- ✓ Developed initial habitat modeling approach, conceptual models, and thresholds of response for two habitat types
- ✓ Set up and calibrated hydrologic and hydraulic models
- ✓ Compiled water quality data and identified data gaps
- ✓ Developed initial temperature modeling approach
- ✓ Held four TAC and two Stakeholder Working Group meetings and one TAC webinar

Completed Non-Aquatic Life Use Study

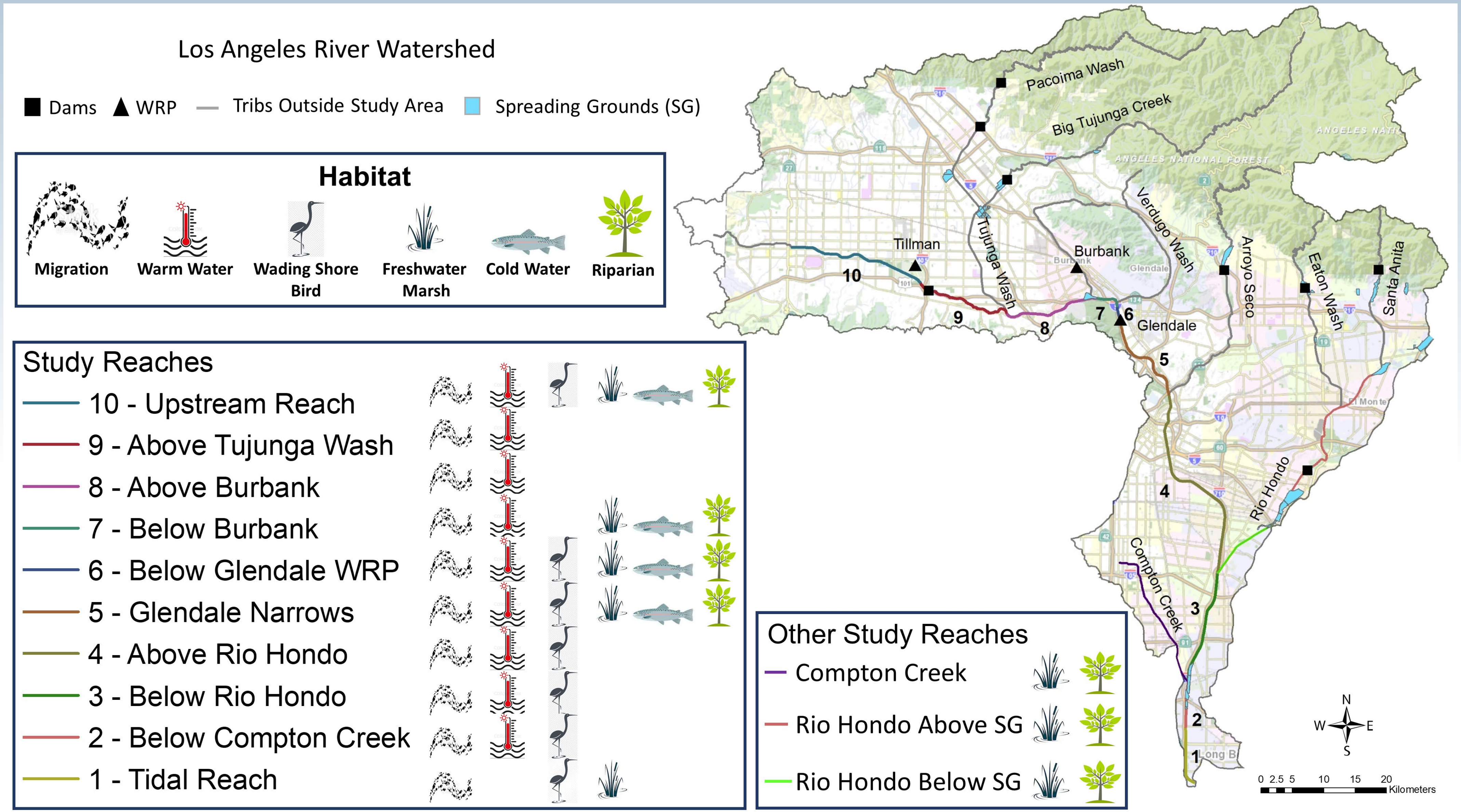




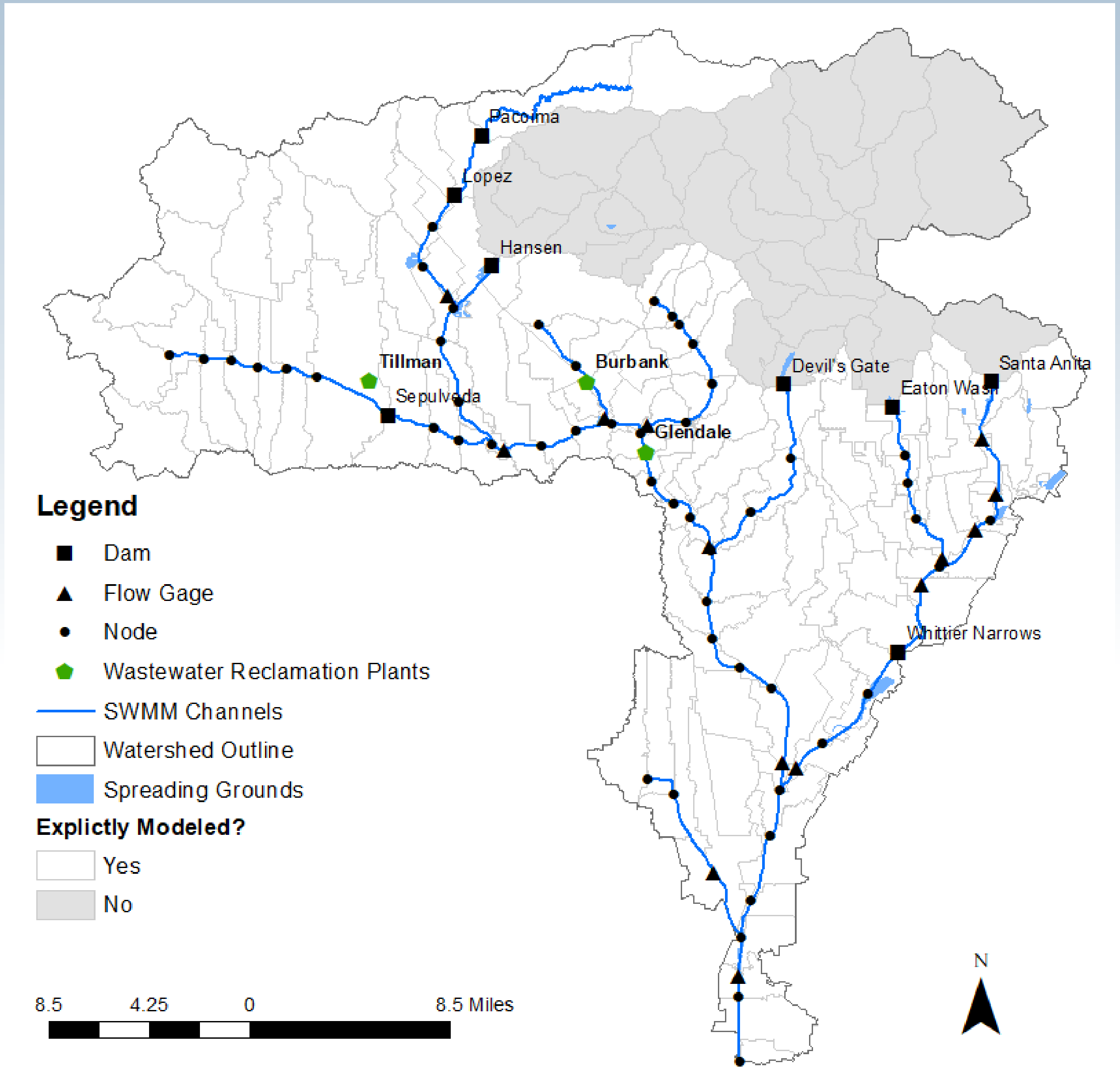
Identified Focal Habitats and Species

- **Cold water habitat -** Unarmored threespine stickleback and Santa Ana sucker
  - *Not currently present, but could potentially be in the future*
- **Migration habitat –** Steelhead/Rainbow trout
  - *Overlays with other habitats*
- **Wading shorebird habitat –** Green algae - *Cladophora* spp.
- **Freshwater marsh habitat –** Cattails and Duckweed
- **Riparian habitat –** Sandbar willow and black willow
- **Warm water habitat –** African clawed frog and Mosquitofish
  - *Surrogate for invasive spp. habitat*

Mapped Potential Locations of Habitats



Developed Physical Models



Model calibration is nearly complete:

- ☑ Hydraulics (HEC-RAS)
- ☐ Hydrology (SWMM)

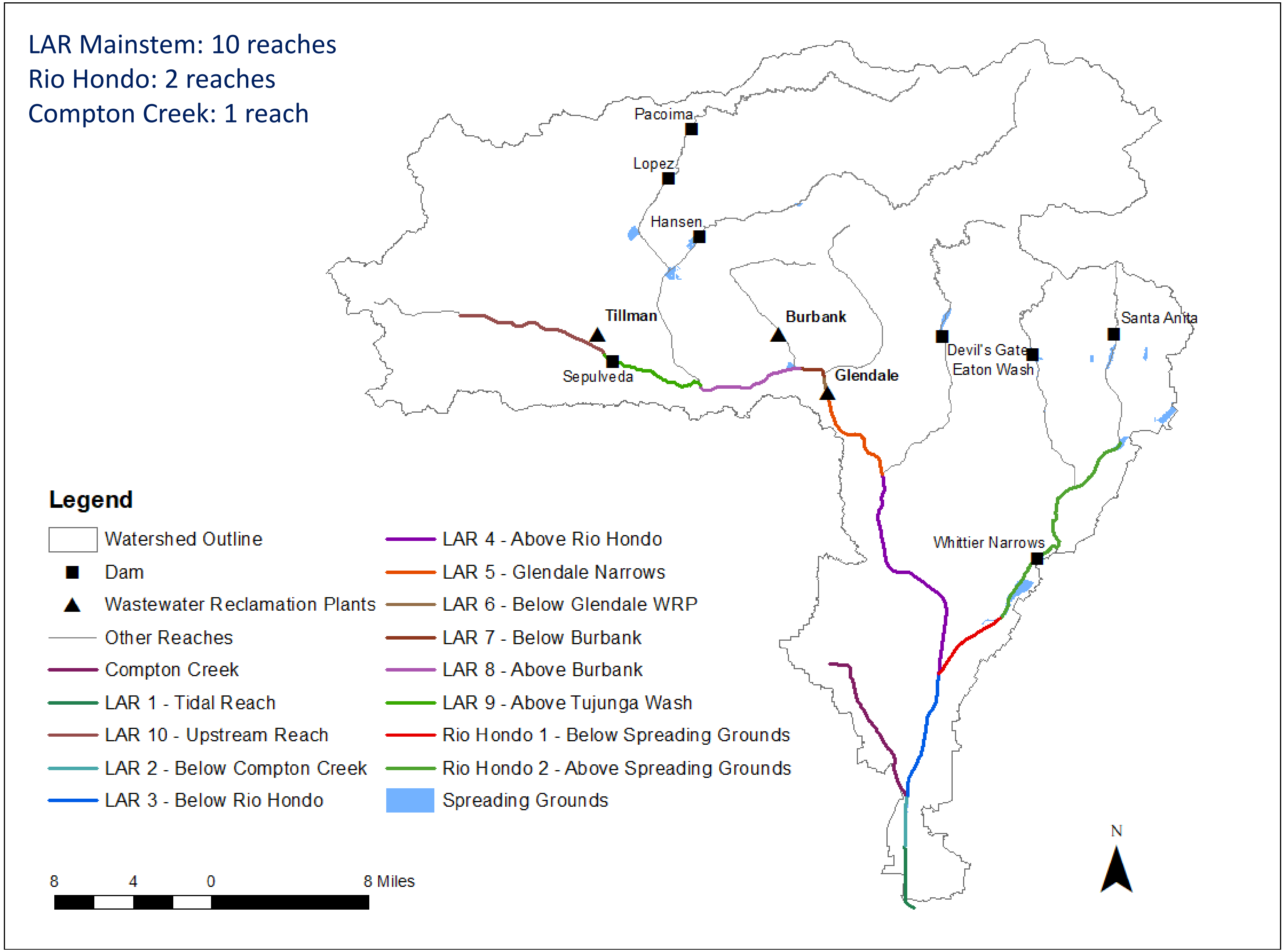
In development:

- Stream temperature
- Water quality

Filling key data gaps

Analysis Reaches

LAR Mainstem: 10 reaches
Rio Hondo: 2 reaches
Compton Creek: 1 reach



Study Focus

Cypress Park
Within the banks of the LA River mainstem
N
800 m
Google Earth
© 2018 Google

Summary from Last Meeting

- Project overview/recap
- Recreational use study
- Key habitats and representative species
- Update on modeling
- Proposed approach to evaluate management scenarios
- Outreach reports

Today's Meeting

- ✓ Review of Charter
- ✓ Group Feedback on Outreach Activities
- ✓ Overview of Technical Work to Date
- Habitat Modeling
- Scenario Analysis
- Outreach Support

Kris Taniguchi-Quan, SCCWRP

HABITAT MODELING

Why build habitat models?

- Evaluate if stream conditions will likely support focal habitats and species

- Assess if future scenarios (i.e. WRP reductions or stormwater capture) will likely alter stream conditions and affect aquatic life

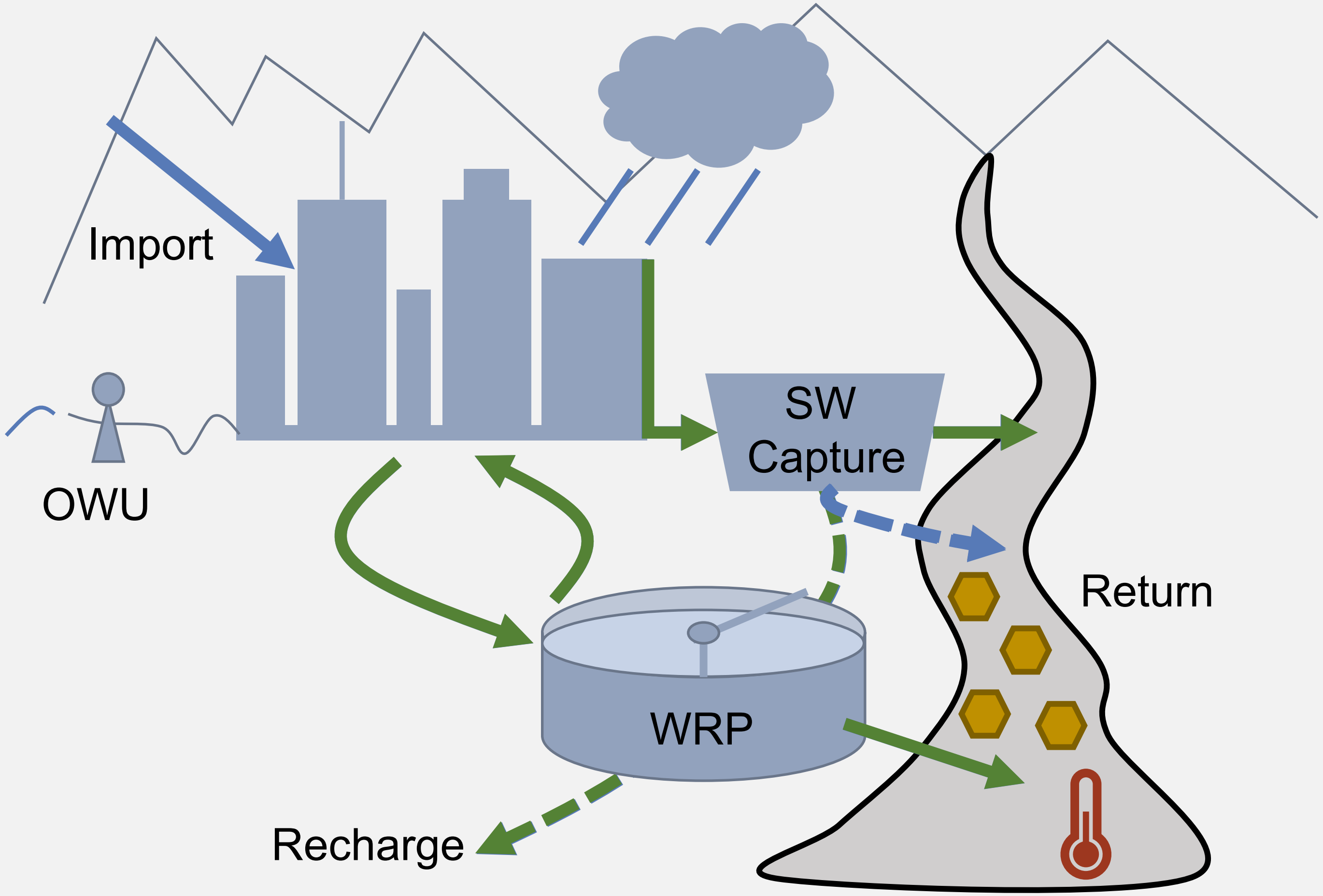
Stream Conditions are Modeled:

HYDROLOGY (Runoff / Point Sources / Diversions)

HYDRAULICS (Channel Flow / Depth / Velocity / Shear / Power)

STREAM TEMPERATURE

WATER QUALITY (Metals / TSS / Specific Conductance)



Status of Physical Models

COLORADOSCHOOLOFMINES
EARTH • ENERGY • ENVIRONMENT

Hydrology

- Calibration on mainstem almost complete
- Address model issues within Rio Hondo → add spreading basins

Hydraulics

- Calibration at 5 gages complete
- Expand HEC-RAS model above Sepulveda dam (need cross sectional data)
- Create rating curves for additional outputs: shear stress and stream power
- Add tidal influence near outlet

Status of Physical Models

COLORADOSCHOOLOFMINES
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Stream Temperature

- Developed modeling approach and compiled data
- Set up initial model and ran simulations in Compton Creek
- Need additional observed data for calibration/validation in urban areas

Water Quality

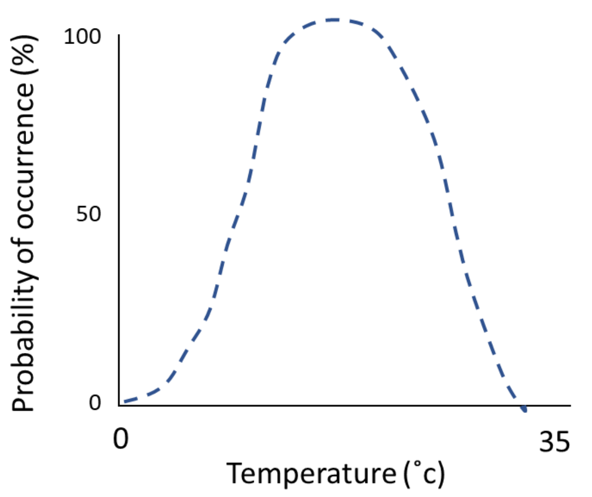
- Developed modeling approach and compiled data
- Identified key data needs:
  - WRP discharges
  - Mass emissions data at Wardlow pre-2006
  - MS4 pre-2015

Habitat Modeling - Overall Approach

- Determine what **conditions** the species need to **survive** at different life stages
  - Based on previous studies and expert solicitation from TAC

- Build **models** depending on each **life stage response** to its associated **habitat condition** (i.e. substrate, depth, velocity, & temperature)

Piloted this approach on two focal species: Santa Ana sucker and black willow



*Hypothetical Response Curve

Conceptual Habitat Model

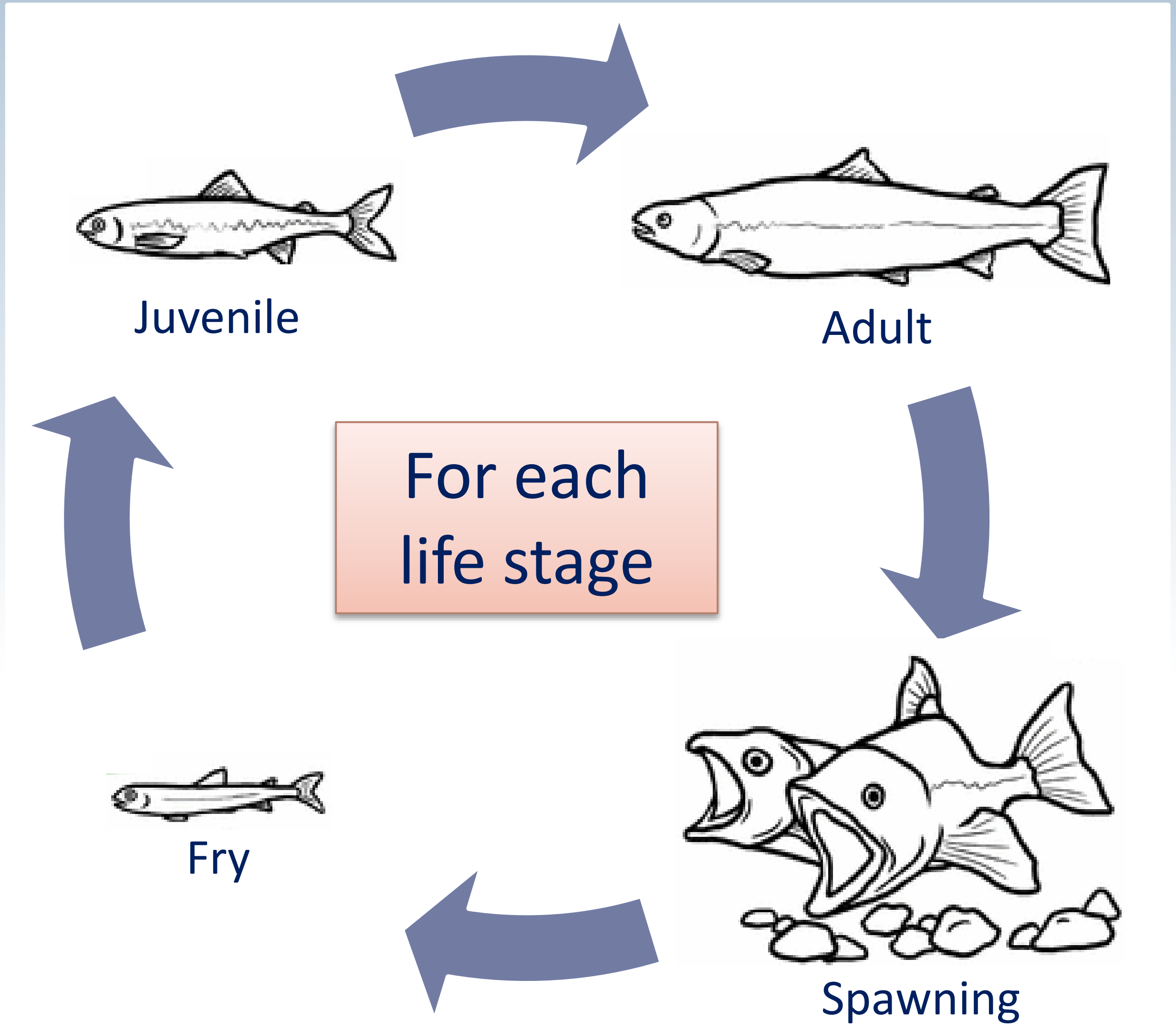
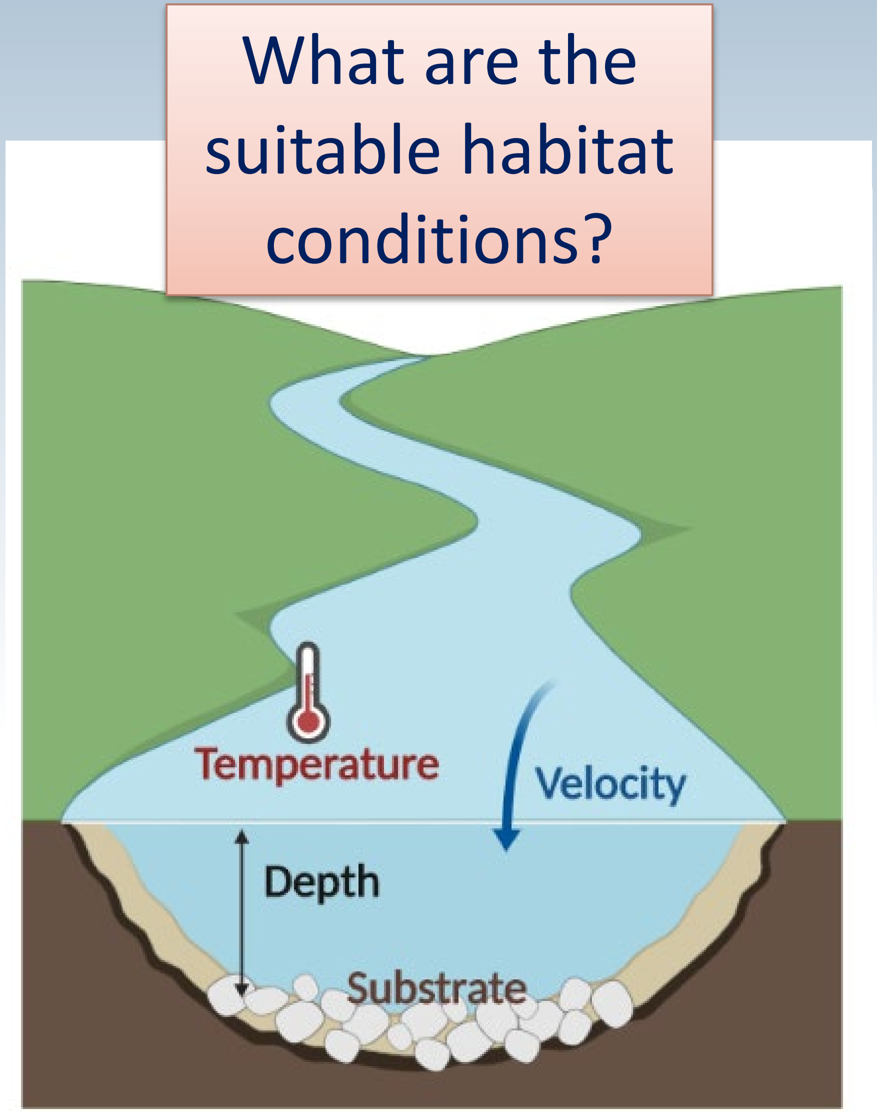


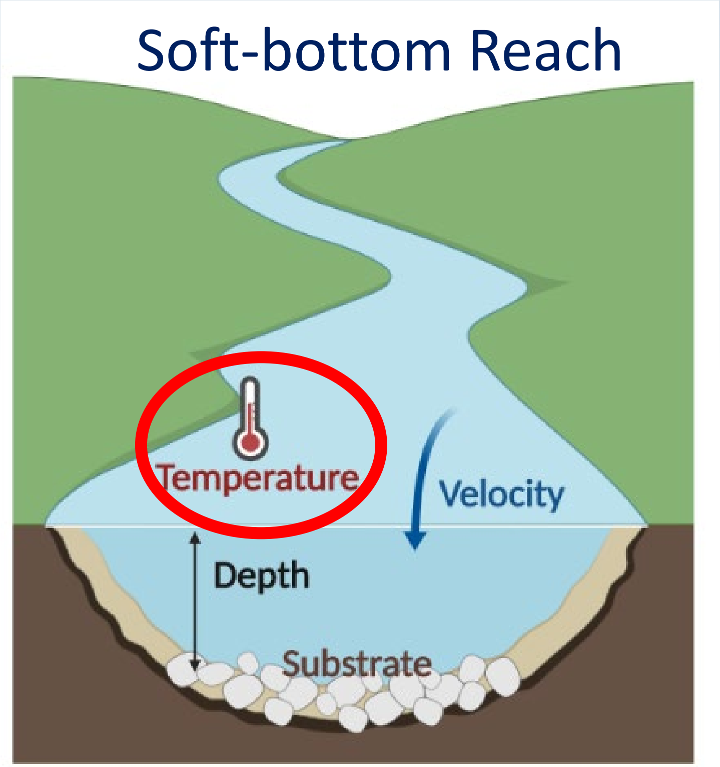
Illustration: education.com



KTQ via biorender.com

Overall Conceptual Understanding

- For every reach, which species and which factors are the most important?



Using Relationships to Build Willow Model

- For each life stage (i.e. pre-germination, germination, seedling/sapling, adult), what are the stream conditions (depth, velocity, shear, power) needed for survival?

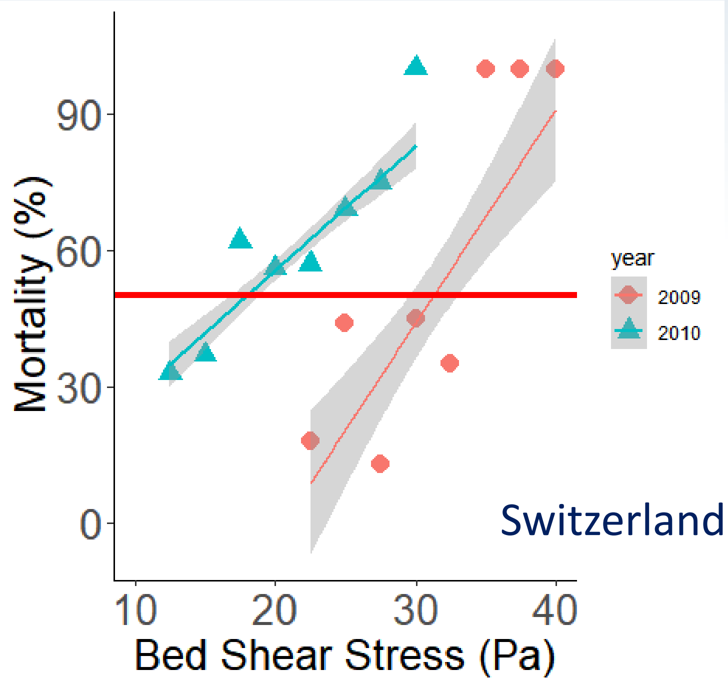
- Seedling example:
  - Critical time period: Oct 1 – Sept 30
  - Use observed relationships to build model

Depth

Inundation (cm)	105 day Mortality (%)
35 (flooded)	82.5
0 (saturated)	10
-20 (dry)	50

Nevada

Shear Stress



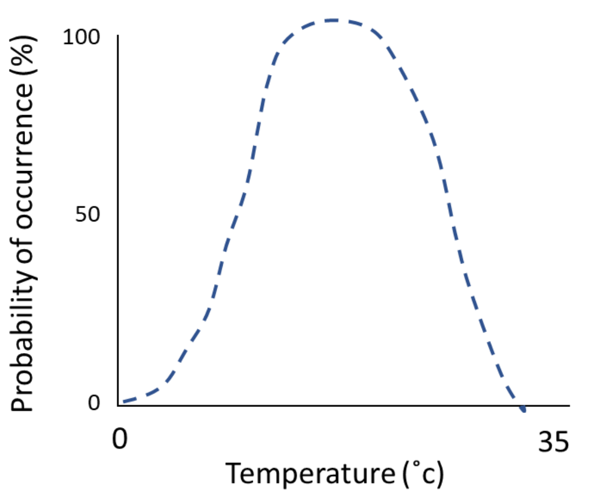
Key Recommendations from the TAC

- Develop overall conceptual model that contextualizes the study reaches
  - Which species and which factors are most important in what areas?
  - Describe limiting factors by channel setting and life stage

Key Recommendations from the TAC

- Explore use of continuous functions (i.e. response curves) vs. binned thresholds (i.e. suitable or unsuitable) for habitat modeling

Response Curve



*Hypothetical Response Curve

Categorical Bins

Temperature (°C)	Unsuitable	Intermediate (Uncertain)	Suitable
Fry[1]	< 10 & >29	10-17 & 25-28	18-24
Juvenile[1]	<10 & >29	10-14 & 23-28	15-22
Spawning[2]	<10 & >26	10-21, >26	22-25
Adult[2,3,4,5]	>28	22-28	<22

Key Recommendations from the TAC

- Develop overall conceptual model that contextualizes the study reaches
  - Which species and which factors are most important in what areas?
  - Describe limiting factors by channel setting and life stage
- Explore use of continuous functions (i.e. response curves) vs. binned thresholds (i.e. suitable or unsuitable) for habitat modeling
- Set up web-based calls for remaining focal species and habitat models

Questions for the SWG

- General feedback or questions on the overall approach?
- Any additional data on species or habitats that we should consider?

11:05 – 11:20

BREAK

Eric Stein, SCCWRP

SCENARIO ANALYSIS

Consideration of Management Scenarios

- Varying amounts of **reduced discharge** from three water reclamation plants

- **Stormwater capture** along Rio Hondo and Compton Creeks
  - Other areas of stormwater capture associated with LA County Master Plan

- **Restoration** along Compton, Rio Hondo, Arroyo Seco
  - Implications for water consumption
  - Constraints on restoration goals

Sensitivity Curves Approach

- Develop curves based on sensitivity of response of specific reaches
  - Based on different flow (or hydraulic metrics)
  - Based on different seasonal flow conditions
- Evaluate effects of changes in key hydrologic, hydraulic, or temperature properties vs. specific management scenarios
- Can be used to accommodate many different scenarios or combinations of scenarios
  - Flexible and adaptable

Development of Sensitivity Curves

- Run models under a wide range of discharge and retention conditions
- Predict changes in flow, velocity, depth, and temperature associated with different amounts of discharge and “capture”
- Plot response of key variables to ranges of discharge and capture

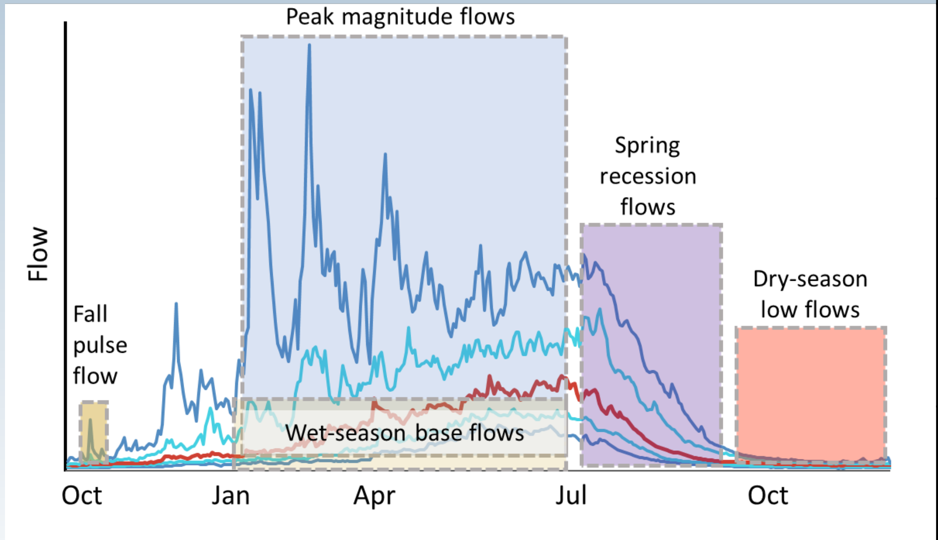
Development of Sensitivity Curves - Example

- EXAMPLE from LA County flow gage 57C (LAR above Arroyo Seco)

- Reuse is defined as percent reduction from historic discharge (WY 2011 to WY 2017) from each of the three WRPs
  - Current historic discharge is 73 cfs

- Results are based on a Monte Carlo simulation of 500 reuse scenarios

Functional Flow Metrics



Metrics not related to any specific organism.

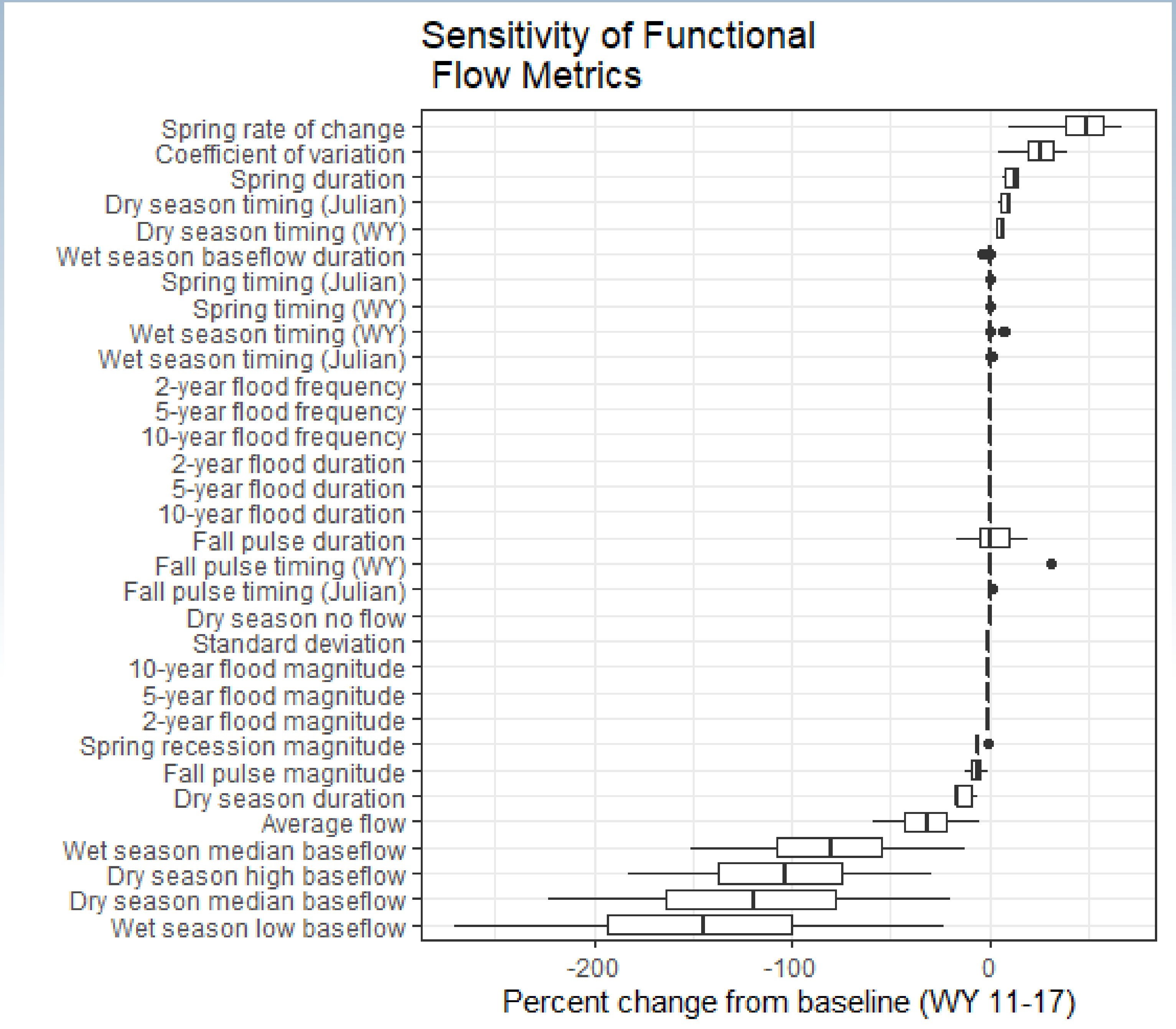
Metrics relate to general health based on *reference conditions*

Yarnell et al., 2019

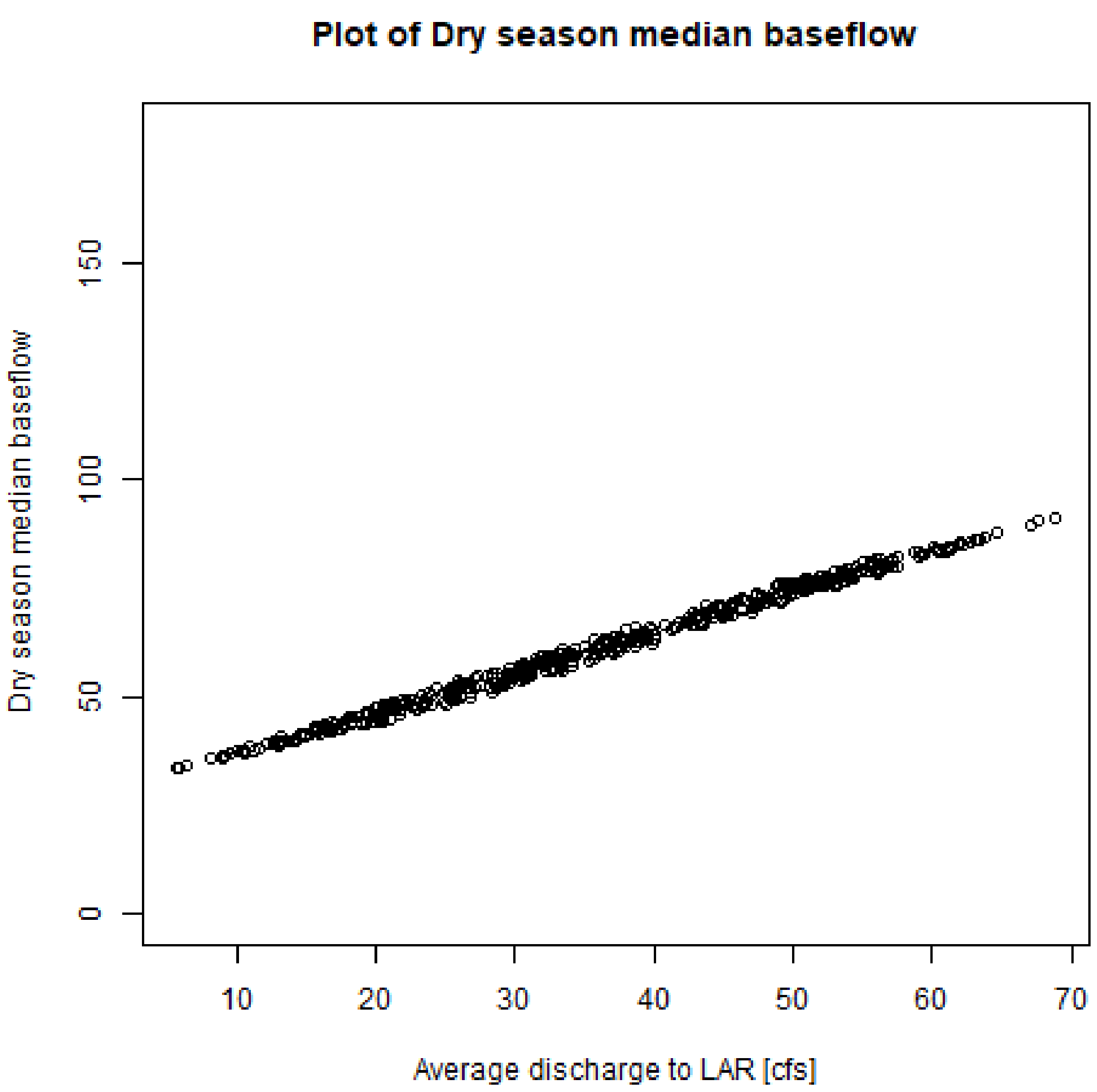
Flow Component	Flow Characteristic	Flow Metric
Fall pulse flow	Magnitude (cfs)	Peak magnitude of fall season pulse event (maximum daily peak flow during event)
	Timing (date)	Start date of fall pulse event
	Duration (days)	Duration of fall pulse event (# of days start-end)
Wet-season base flows	Magnitude (cfs)	Magnitude of wet season baseflows (10th and 50th percentile of daily flows within that season, including peak flow events)
	Timing (date)	Start date of wet season
	Duration (days)	Wet season baseflow duration (# of days from start of wet season to start of spring season)
Peak flow	Magnitude (cfs)	Peak-flow magnitude (50%, 20%, 10% exceedance values of annual peak flow --> 2, 5, and 10 year recurrence intervals)
	Duration (days)	Duration of peak flows over wet season (cumulative number of days in which a given peak-flow recurrence interval is exceeded in a year).
	Frequency	Frequency of peak flow events over wet season (number of times in which a given peak-flow recurrence interval is exceeded in a year).
Spring recession flows	Magnitude (cfs)	Spring peak magnitude (daily flow on start date of spring-flow period)
	Timing (date)	Start date of spring (date)
	Duration (days)	Spring flow recession duration (# of days from start of spring to start of summer base flow period)
	Rate of change (%)	Spring flow recession rate (Percent decrease per day over spring recession period)
Dry-season base flows	Magnitude (cfs)	Base flow magnitude (50th and 90th percentile of daily flow within summer season, calculated on an annual basis)
	Timing (date)	Summer timing (start date of summer)
	Duration (days)	Summer flow duration (# of days from start of summer to start of wet season)

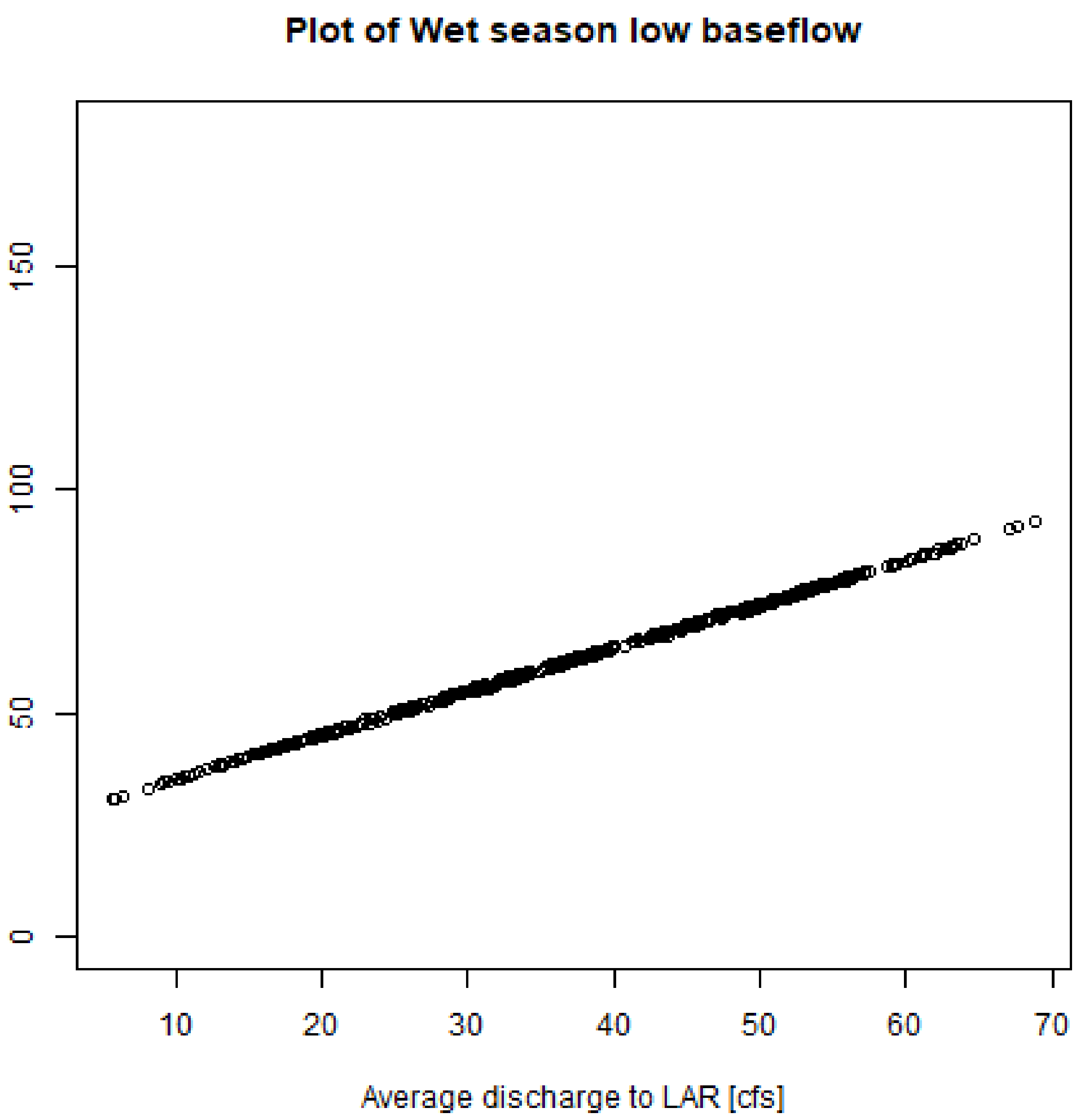
- **Baseflow**, **spring rate of change**, and **dry season days with no flow** are *most* sensitive to changes in reuse

- **Peak flows**, **spring timing**, and **wet season timing** are *least* sensitive

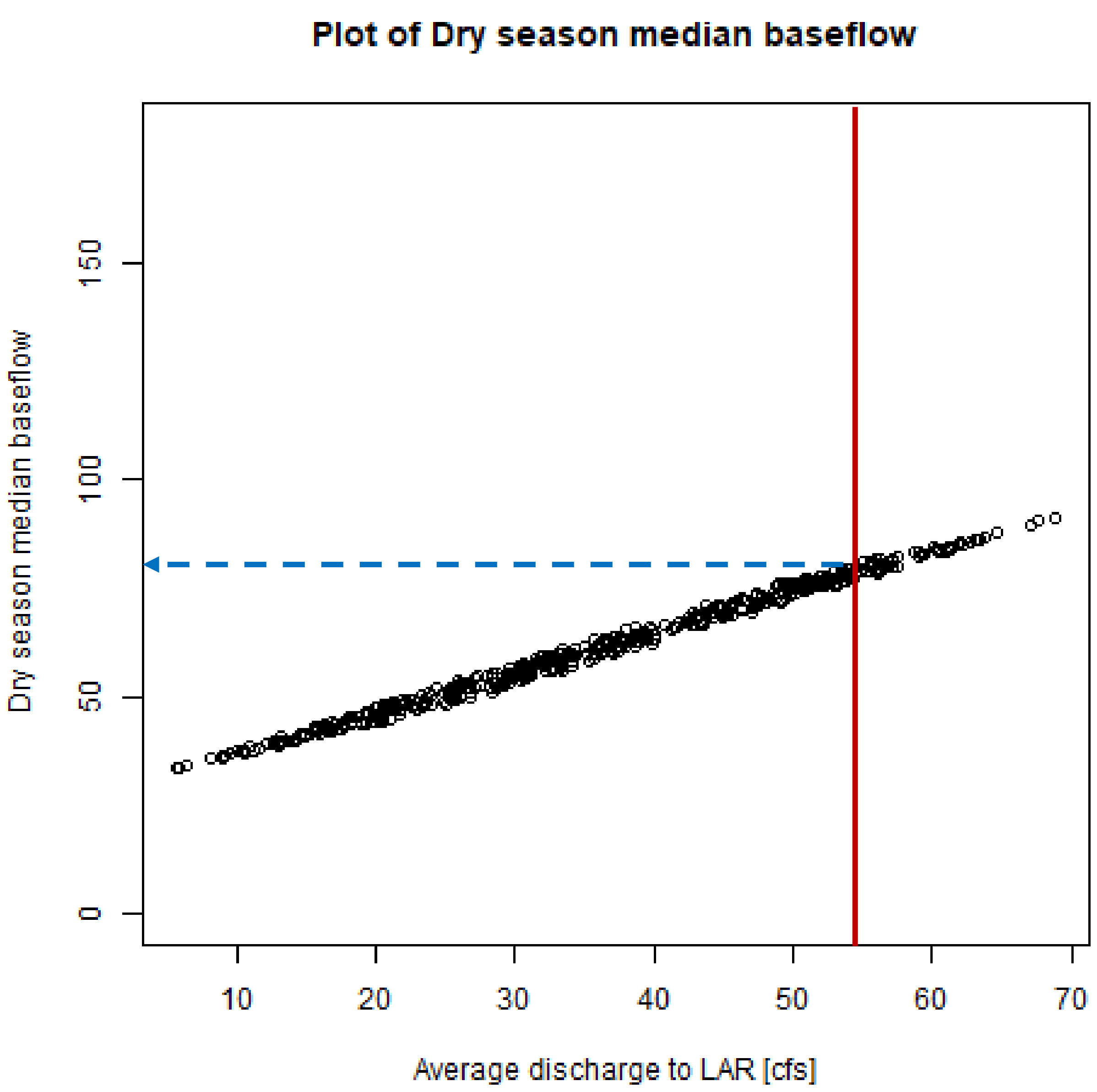


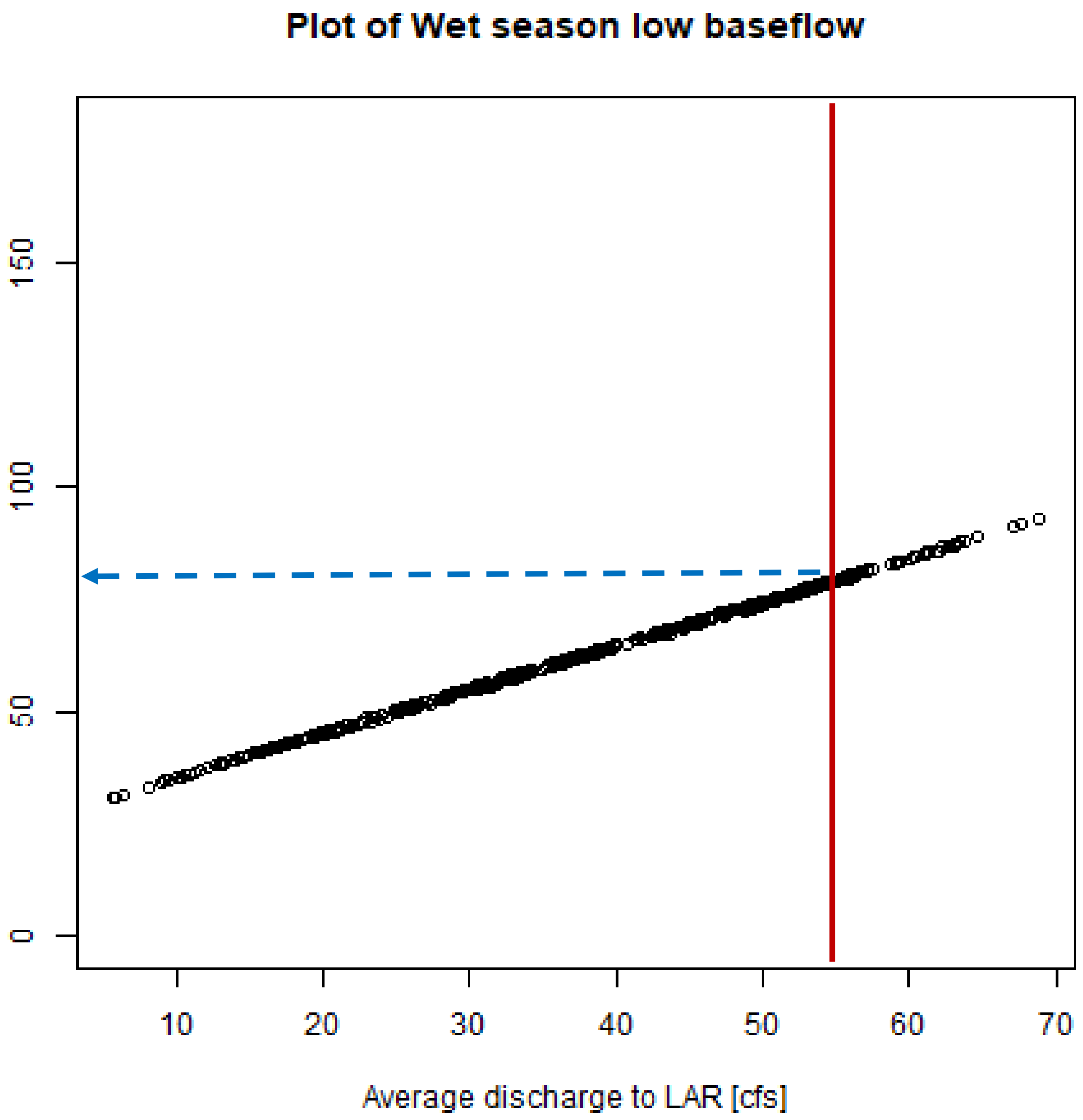
Sensitivity Curves – Most Sensitive Metrics



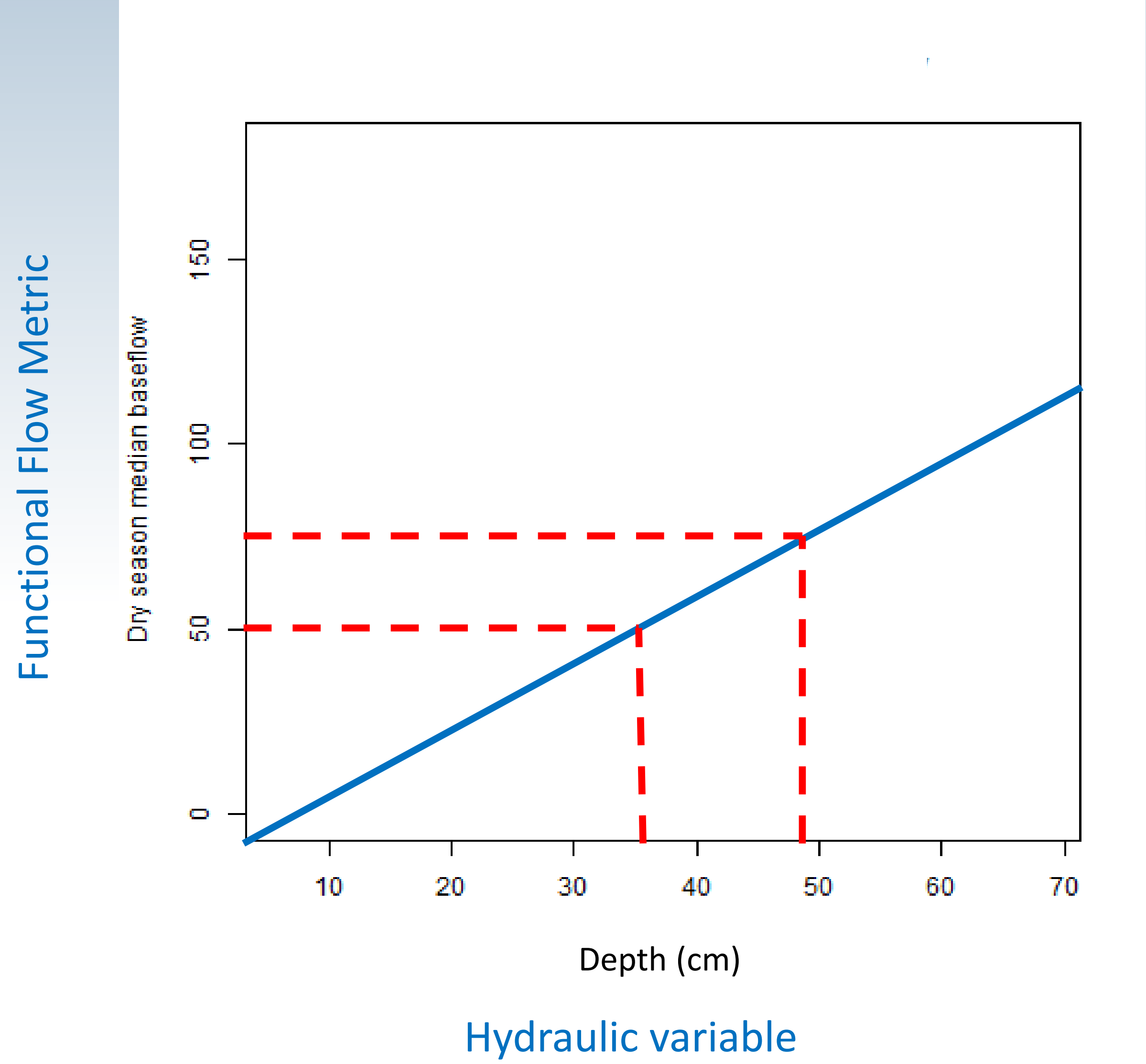


Example – 25% Reduction in Avg. WRP Discharge





Example: Relating hydraulic variables to flow metrics



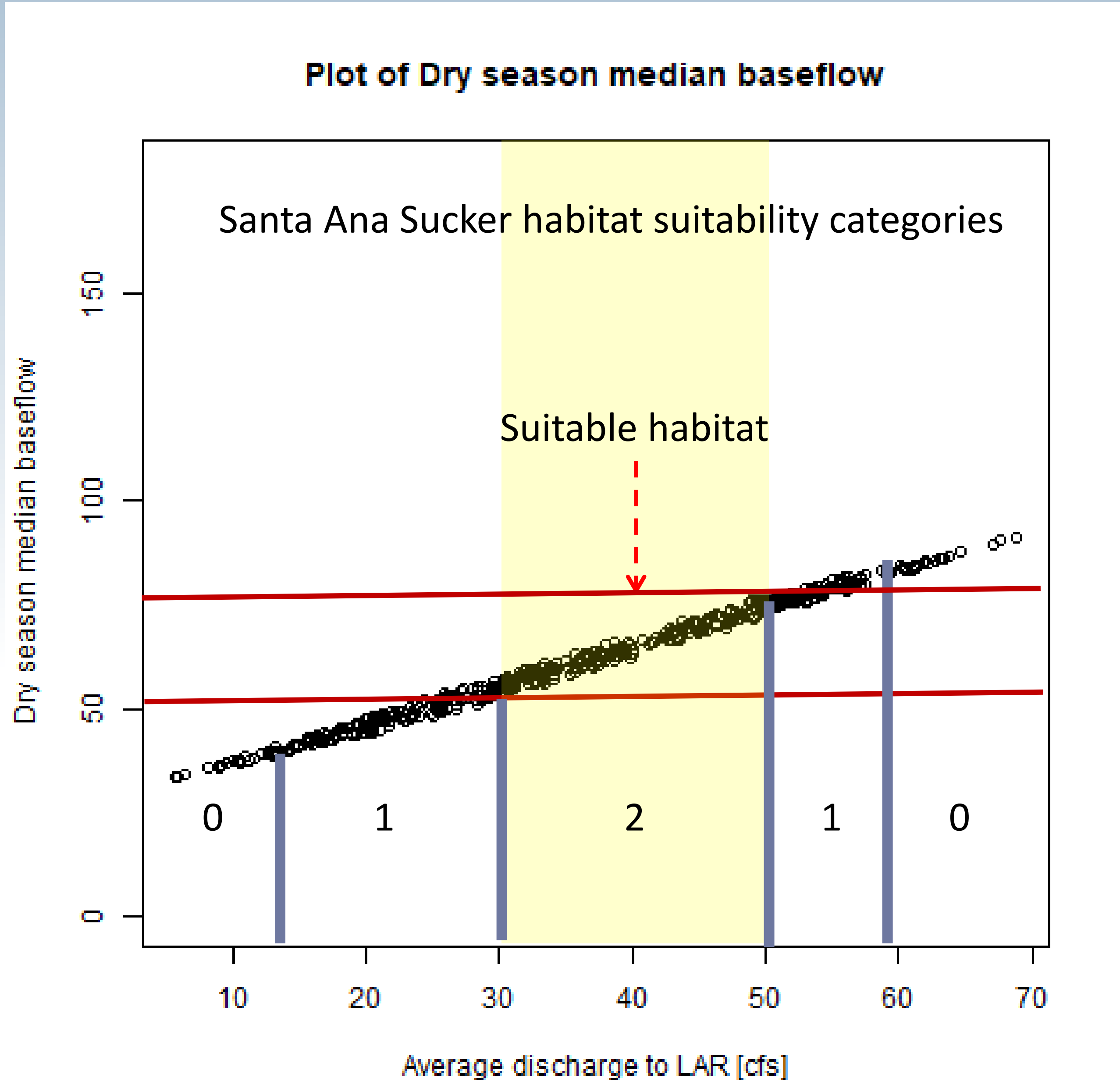
Hydraulic variables, e.g. depth, from HEC-RAS can all be related to functional flow metrics

We can then relate the habitat requirements of the species to the functional flow metrics

We then use the functional flow metrics to find the appropriate discharge values from WRP

Hypothetical Example

Example – Ecological Effects



Code	Suitability
0	Unsuitable
1	Uncertain
2	Suitable

Hypothetical Example

Key Recommendations from the TAC

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

Next Steps

- Implement **stormwater capture scenarios** based on SCMP
- Create curves for **other variables**, such as temperature, depth.
- Create similar curves **at key locations** on the mainstem, Rio Hondo, and Compton Creek
- Test **sensitivity of metrics to stormwater capture** scenarios – likely affect peak flow metrics

  → Use to inform how we measure species response

What About Recreational Uses

- Recreational use study was not able to quantify specific flow requirements associated with recreational uses
  - General, qualitative needs only
- Plan to circle back with recreational use experts once initial scenario analysis is complete to determine if flow changes being considered may adversely affect recreational uses
  - E.g. “if depth is reduced to a specific level during the spring, what would be the implications for kayaking?”

Questions for the SWG

- General feedback or questions on the sensitivity curve approach?

- Any information on management scenarios that we need to account for in the analysis?

Next Steps

- Develop overall conceptual model and identify limiting factors
- Build remaining habitat models and set up Zoom meeting to discuss
  - TAC input on conceptual models and thresholds
- Refine flow management scenarios
  - TAC and Stakeholder input
- Fill data gaps:
  - Water quality and temperature data
- Next TAC meeting – **early July** – web-based?
  - Flow management scenarios and water quality modeling

Questions

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