**Kris Taniguchi-Quan, Ph.D., *Senior Scientist***
**Southern California Coastal Research Project**

# Los Angeles River Flows Project: Development of Decision Support Tools for Flows in the Los Angeles River

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**Dr. Kris Taniguchi-Quan**
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# LA River's Changing Water Use Practices

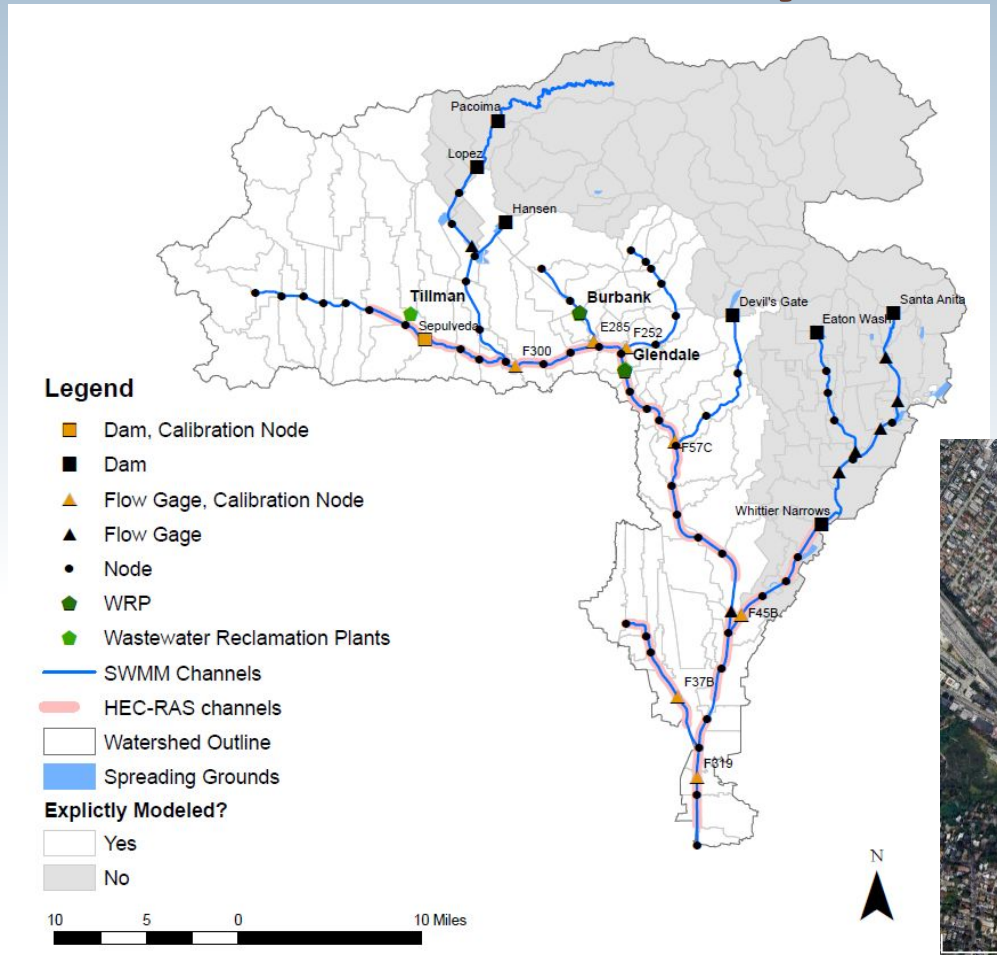

Storm Drain Discharge


Treated Wastewater

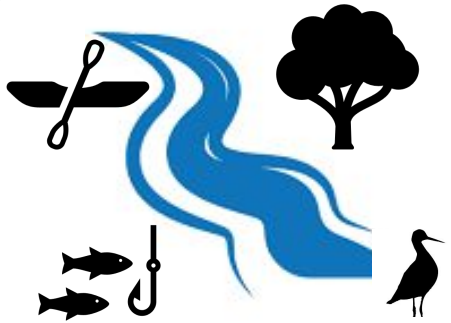
# Overall Question

**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?**

# Analysis Domain

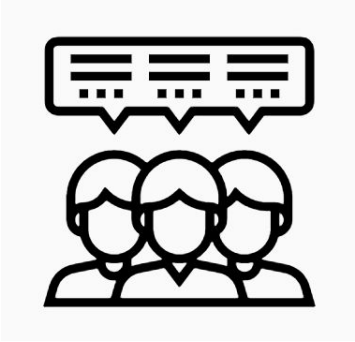



# LA River Environmental Flows Project Goals



Quantify relationship between streamflow and beneficial uses in LA River

Provide toolkit to evaluate effects of stormwater management and 1211 wastewater change petitions



Engage local stakeholders and receive feedback on study and application

# Overall Outcomes

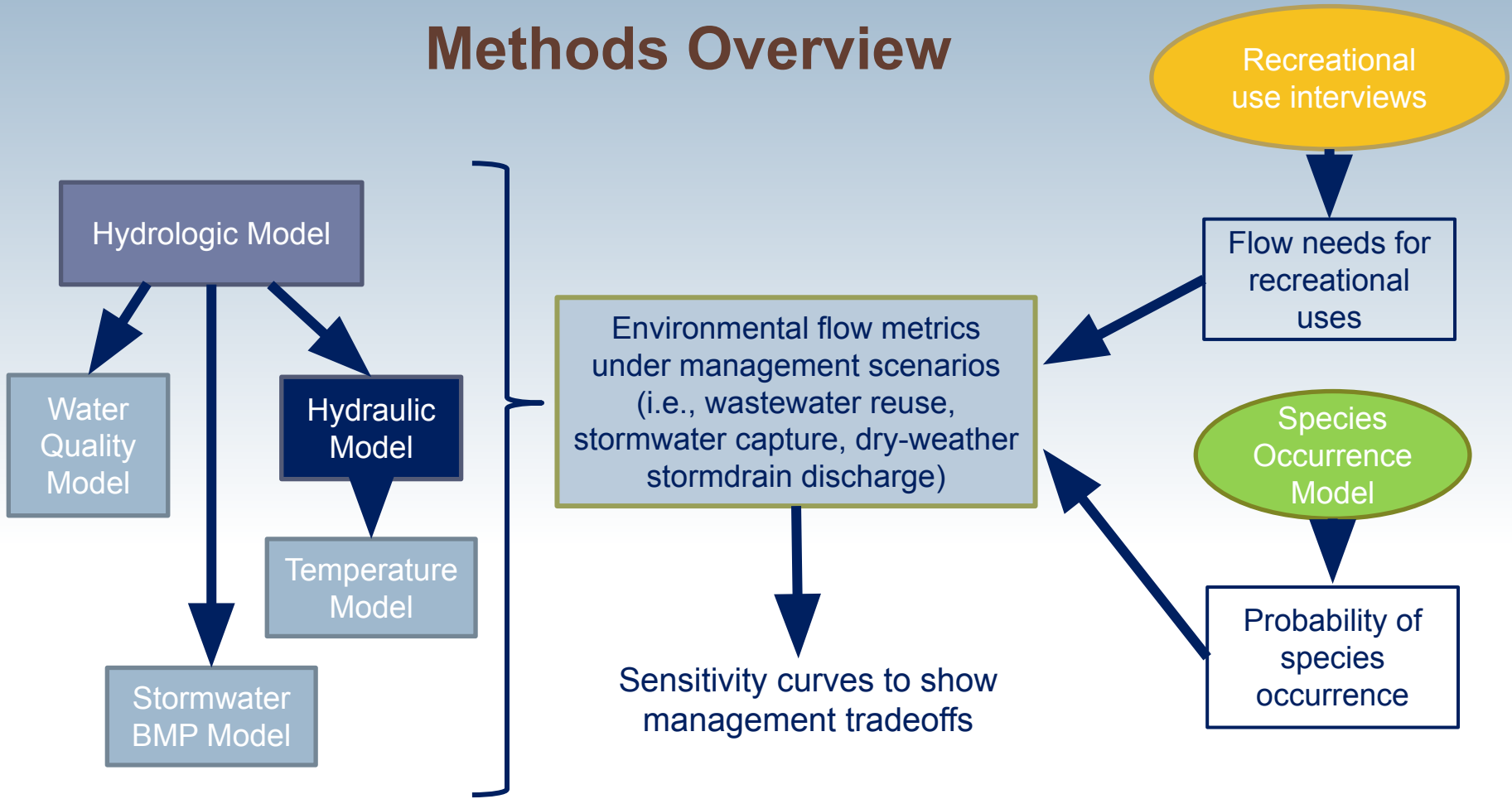
- We have developed a set of tools that can be used to inform decisions about establishing flow management targets

- We have developed tools that can easily be used to evaluate potential effects of a broad range of potential management scenarios on in-river flows

- The tools are highly flexible and transferable
  - https://sccwrp.shinyapps.io/lar_eflows_shinyapp/

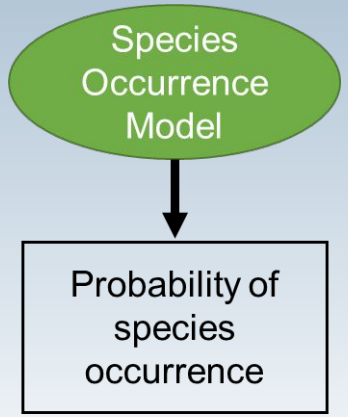
- There is broad agreement among stakeholders on the application and utility of these tools

# Methods Overview

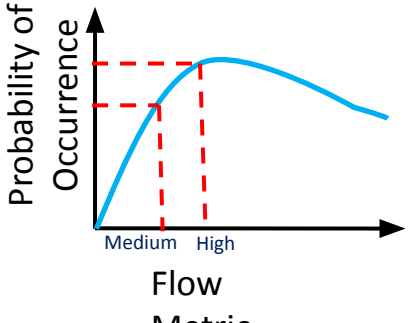


# Species Occurrence Models

- Not associated with currently designated beneficial uses
- Not currently observed in LA River

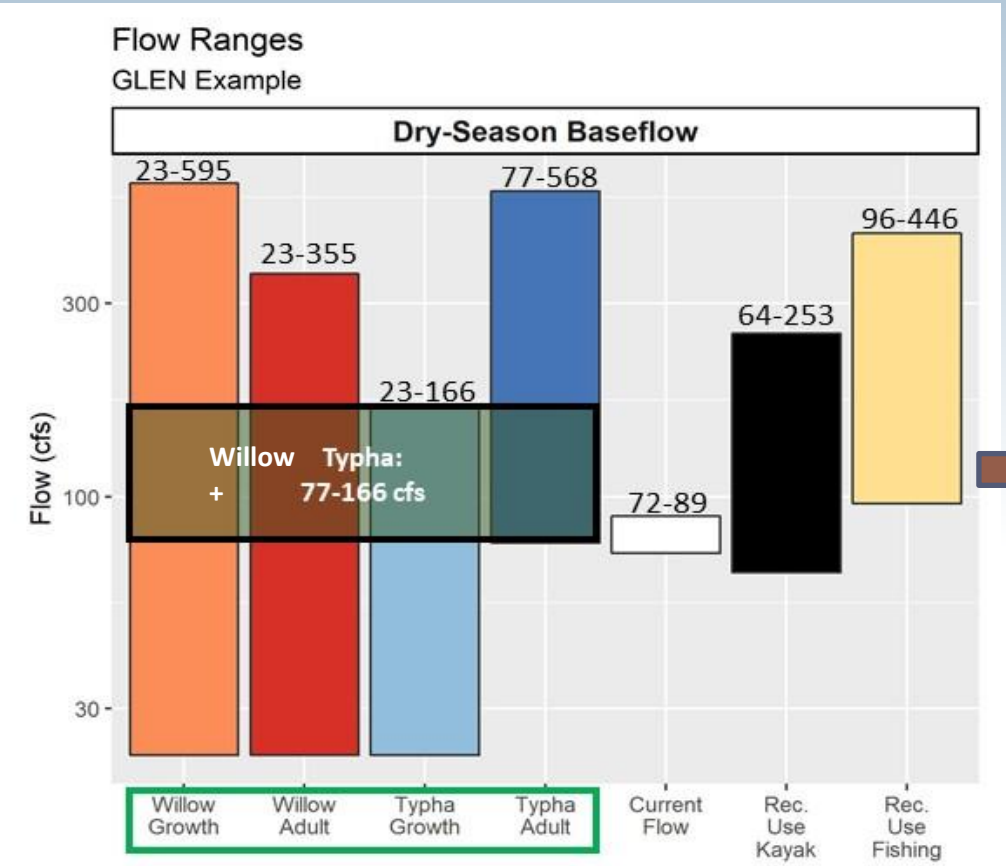



Indicator species and habitats




| Habitat | End member species |
|---|---|
| **Cold water habitat** | Santa Ana Sucker |
| | Unarmored threespine stickleback |
| **Migration habitat** | Steelhead/Rainbow trout |
| **Wading shorebird habitat** | Cladophora spp |
| **Freshwater marsh habitat** | Typha |
| | Duckweed |
| **Riparian habitat** | Black Willow |
| **Warm water habitat** | African clawed frog |
| | Mosquitofish |

# Overall Flow Management Targets



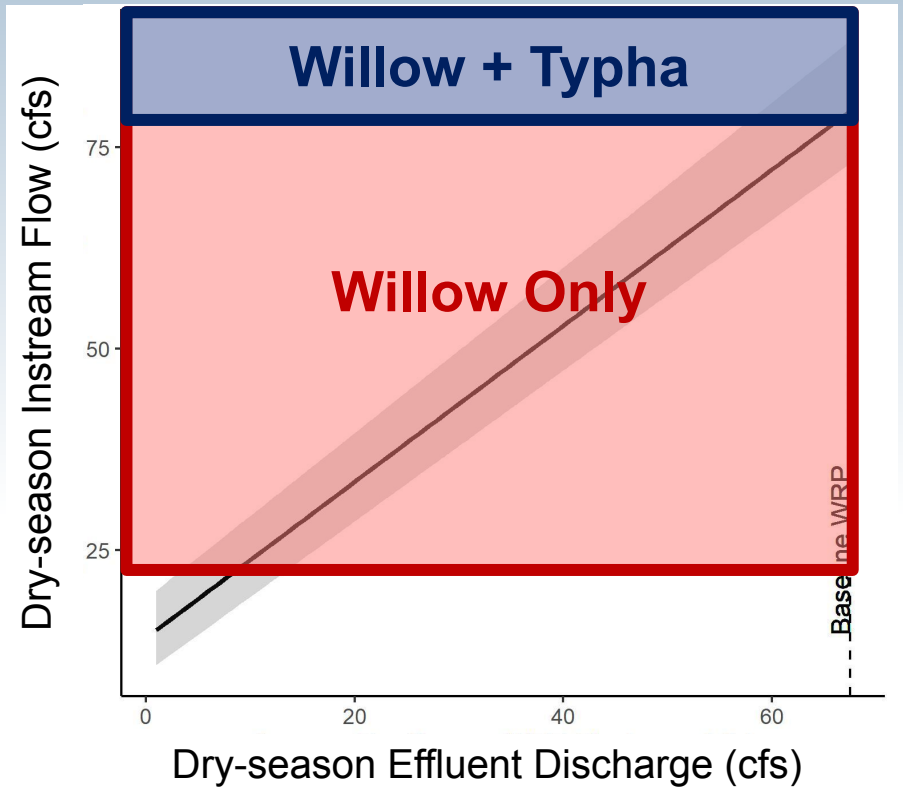

**Example In-River Flow Management Targets**
Location: GLEN
Beneficial Use: Existing, WILD
Synthesis: Multiple Species (Willow, Typha)
Probability: Medium (50%)

| Dry-Season Baseflow | | | Wet-Season Baseflow | | | Wet-Season Peak Flow | |
|---|---|---|---|---|---|---|---|
| Current flow range (cfs) | Optimal flow range (cfs) | Duration | Current flow range (cfs) | Optimal flow range (cfs) | Duration | Current Annual Peak Q range[1] (cfs) | Optimal flow range (cfs) |
| 72-89 | 77-166 | April - September | 82-130 | 77-355 | October - March | 8,188-32,608 | < 568 |

[1] Current annual peak Q range represents the 10th and 90th percentile of annual peak discharge calculated from the hourly f timeseries period of record (WY 2011-2017)

**Targets can be developed for every reach of the river**

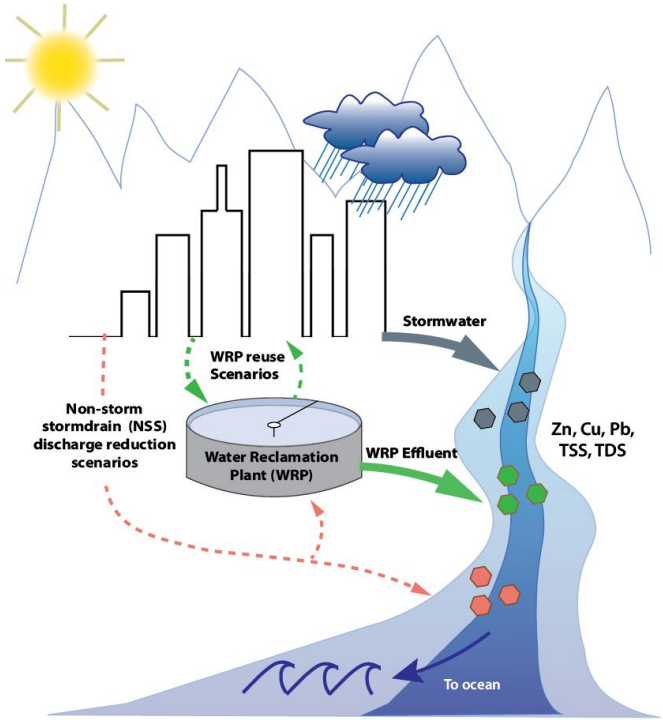
# Sensitivity Curves to Assess Effects of Water Reuse




**Curves allow for consideration of a virtually unlimited number of scenarios**

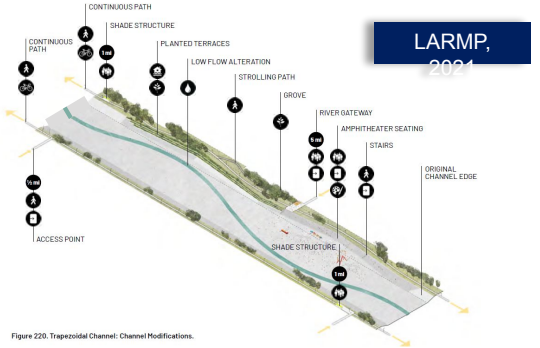
# Water Quality & Restoration Analyses

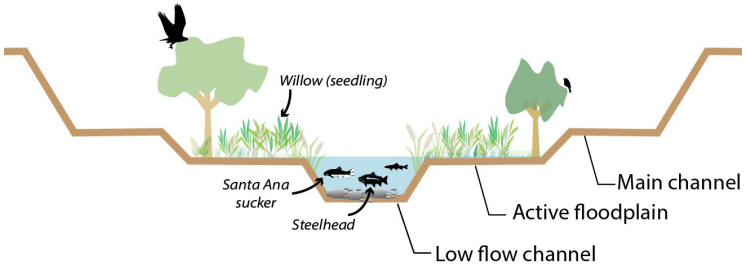
## How might management scenarios affect water quality?




Wolfand et al., 2022, *ACS EST Water*

## What changes to channel design can accommodate altered flows to support ecological beneficial uses?

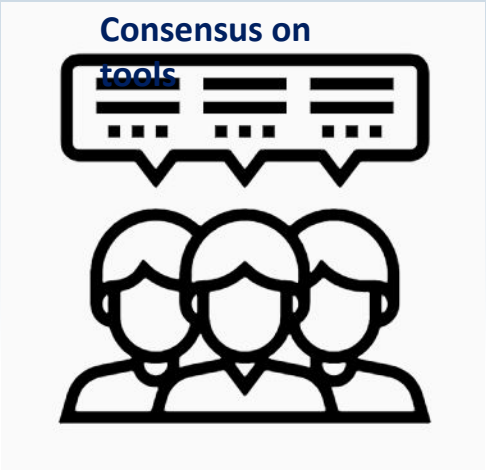



Systema et al., in review

# Summary of Coordination and Outreach

- Year-long scoping process – 4 stakeholder meetings
- Seven TAC meetings since January 2019
- Four stakeholder workgroup meetings
- Two workshops on recreational uses




- Numerous briefings and presentations to community groups and associated LA River programs

https://www.sccwrp.org/about/research-areas/ecohydrology/los-angeles-river-flows-project/

# Questions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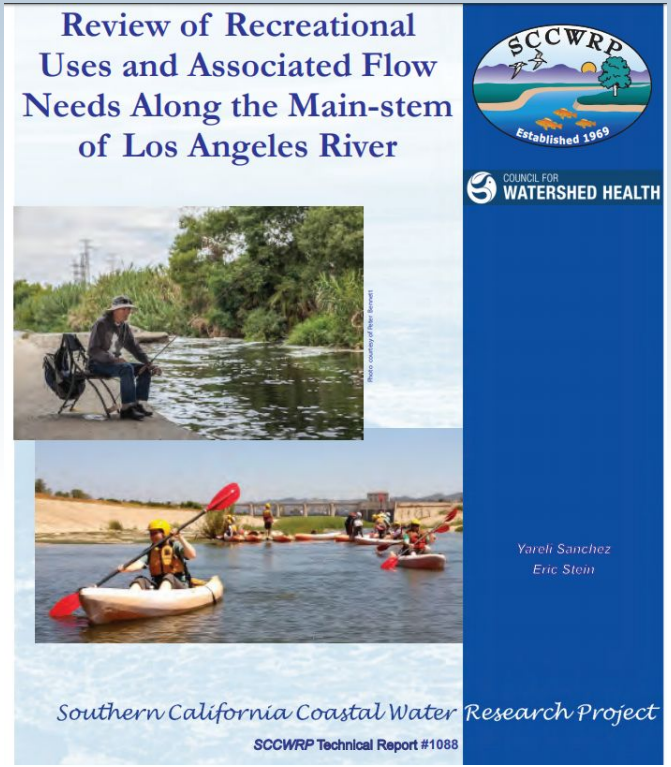
[1]Council for Watershed Health
[2]Colorado School of Mines
[3]University of Portland
[4]Brown and Caldwell
[5]US NCAR

# EXTRA SLIDES

# Flow Needs Associated with Recreational Uses



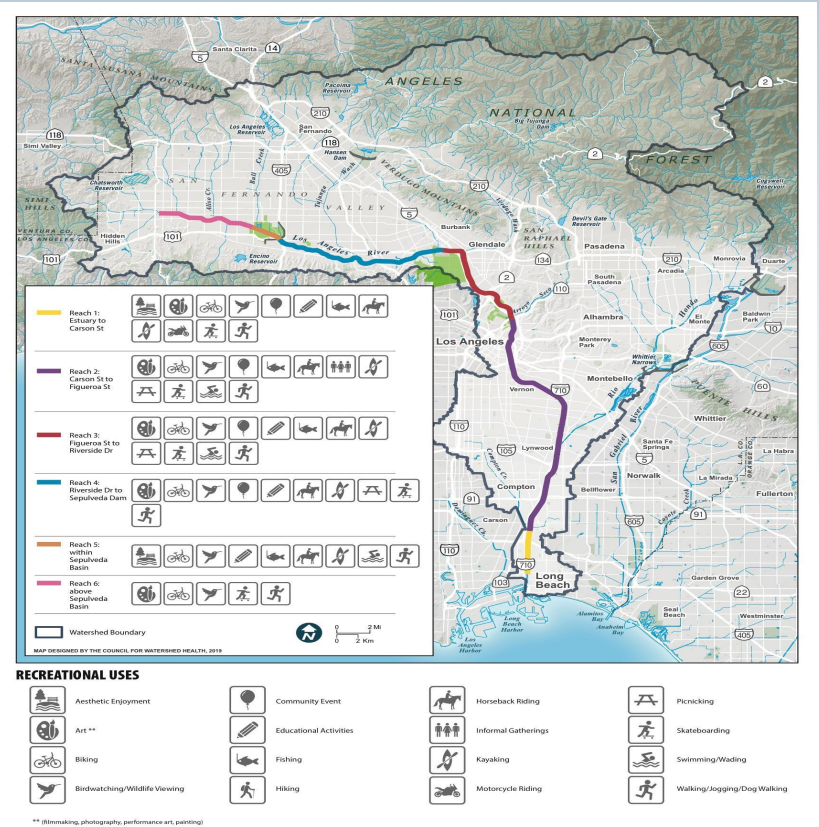

Series of targeted surveys, interviews and workshops

*Understand recreational uses that occur along the main-stem of the Los Angeles River and the associated flow needs*

Recreational use interviews

- Targeted interviews
- Snowball surveys
- Social media outreach
- Workshops with > 40 participants

# Recreational Uses in the LA River




- The Los Angeles River host a rich diversity of recreational uses in both soft bottom and hard bottom reaches
  - ✔ Kayaking
  - ✔ Fishing
  - ✔ Wildlife viewing

- Uses vary seasonally and by location and are influenced by
  - ✔ Duration of flow
  - ✔ Depth of flow
  - ✔ Velocity

# Online Dashboard

## LA River Environmental Flows Dashboard

Overview | **Flow Range Determination** | Sensitivity Curves | Flow Range Heat Map | Flow Depth Visualizer

### Location and Season

**Select Location:**
- (•) Node
- ( ) Reporting Reach
- ( ) LA River Reach-Master Plan

**Specific Location:** GLEN

**Select Season:** All

### Beneficial Use Designation

**Current Designation:**
- (•) Designated
- ( ) Not Designated

**Beneficial Use Name(s):** All

**Designation Type:** All

### Species

**Probability of Occurrence:** Medium

**Species Synthesis:**
- (•) Yes
- ( ) No

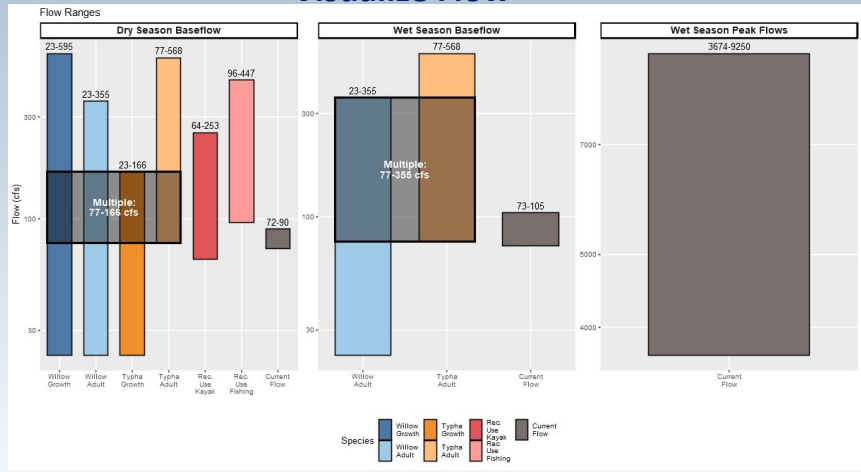
**Type of Species Synthesis:**
- ( ) Single
- (•) Multiple

If Species Synthesis is Yes - synthesis ruleset applied to get overall flow recommendations

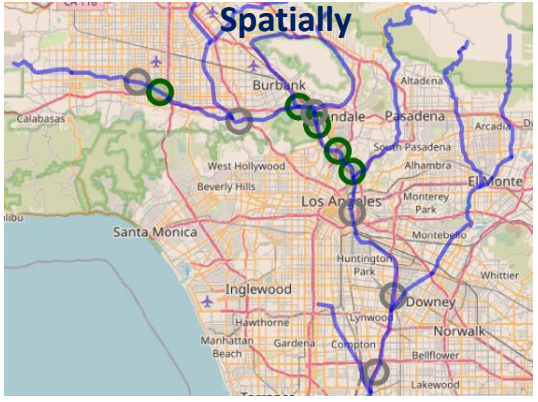
Otherwise, flow recommendations by individual life stages

https://sccwrp.shinyapps.io/lar_eflows_shinyapp/

## Visualize Flow




## Evaluate Scenarios Spatially



# Los Angeles River Environmental Flows Project

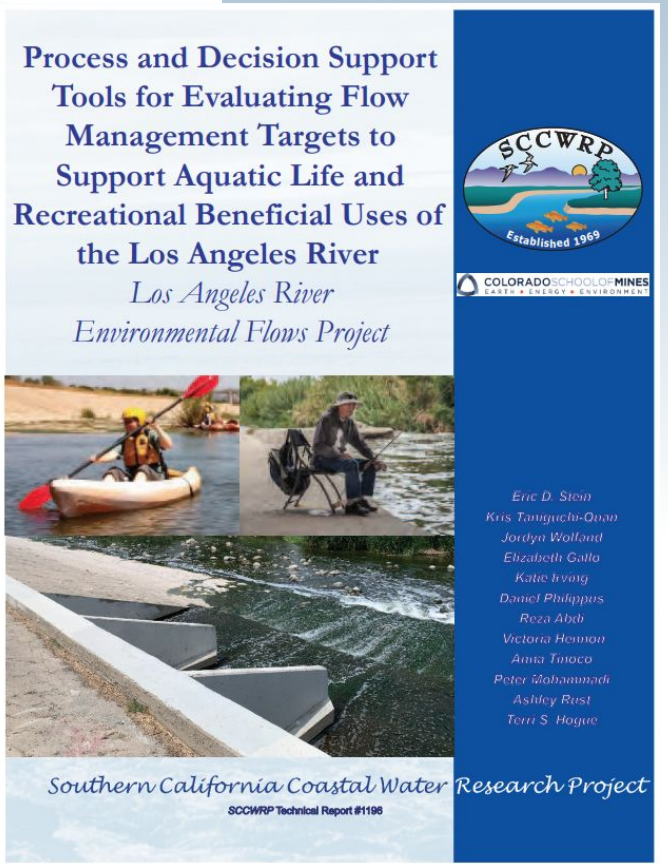
SCCWRP is working with the State Water Resources Control Board and the Los Angeles Regional Water Quality Control Board, in cooperation with local municipalities (including City of LA Bureau of Sanitation, City of LA Department of Water and Power, LA County Department of Public Works, and LA County Sanitation Districts), to conduct the Los Angeles River Environmental Flows Project (Project). The goals of the project are to develop a process for establishing flow criteria, to apply the process to provide recommendations for flow criteria in the LA River, and to produce tools and approaches to evaluate management scenarios necessary to achieve recommended flow criteria. The project also serves as an important pilot application of the California Environmental Flows Framework (CEFF) by demonstrating how CEFF can be applied in a highly urbanized watershed where flow alteration is primarily caused by wastewater and stormwater discharges. The outcomes of this project may also serve as a model for assessing similar situations in other river systems.

For more information about this project, go to the Background and History of the Los Angeles River Flows Project on the State Water Board's website.

**Related Pages**

Ecohydrology Research Plan
Ecohydrology

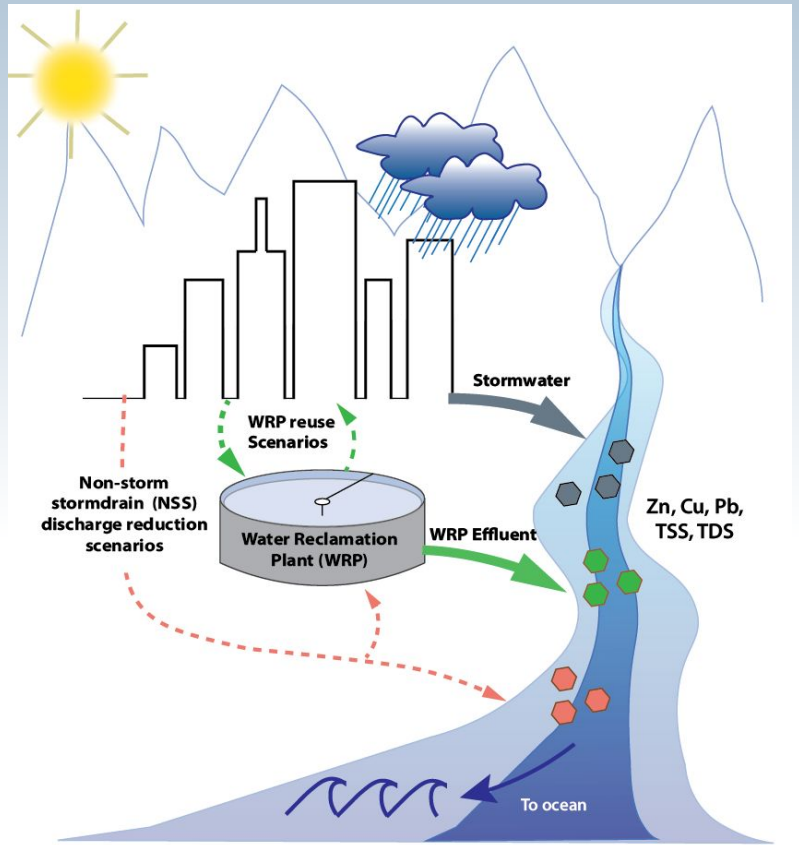
- Progress reports
- Technical reports
- Outreach materials
- TAC meeting materials
- Stakeholder meeting materials
- Data and dashboard




https://www.sccwrp.org/about/research-areas/ecohydrology/los-angeles-river-flows-project/

# Water Quality Assessment

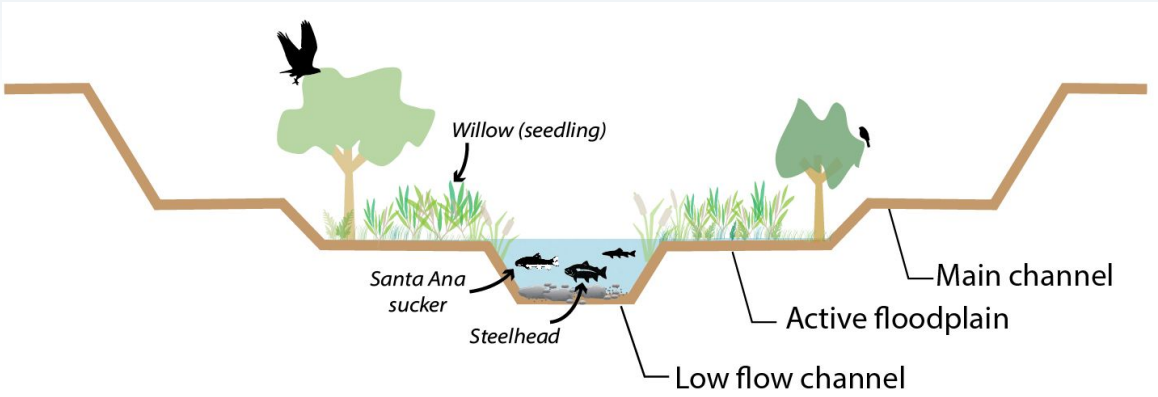
- Reducing WRP discharges may decrease pollutant loads but increase concentrations of TDS, TSS, copper, and lead
- Zinc concentrations increased with reduction in dry-weather stormdrain flows
- Overall, copper, zinc, and TDS WQ objectives were met less frequently with increasing flow reduction




Wolfand et al., 2022, *ACS EST Water*

# LA River Restoration Analysis

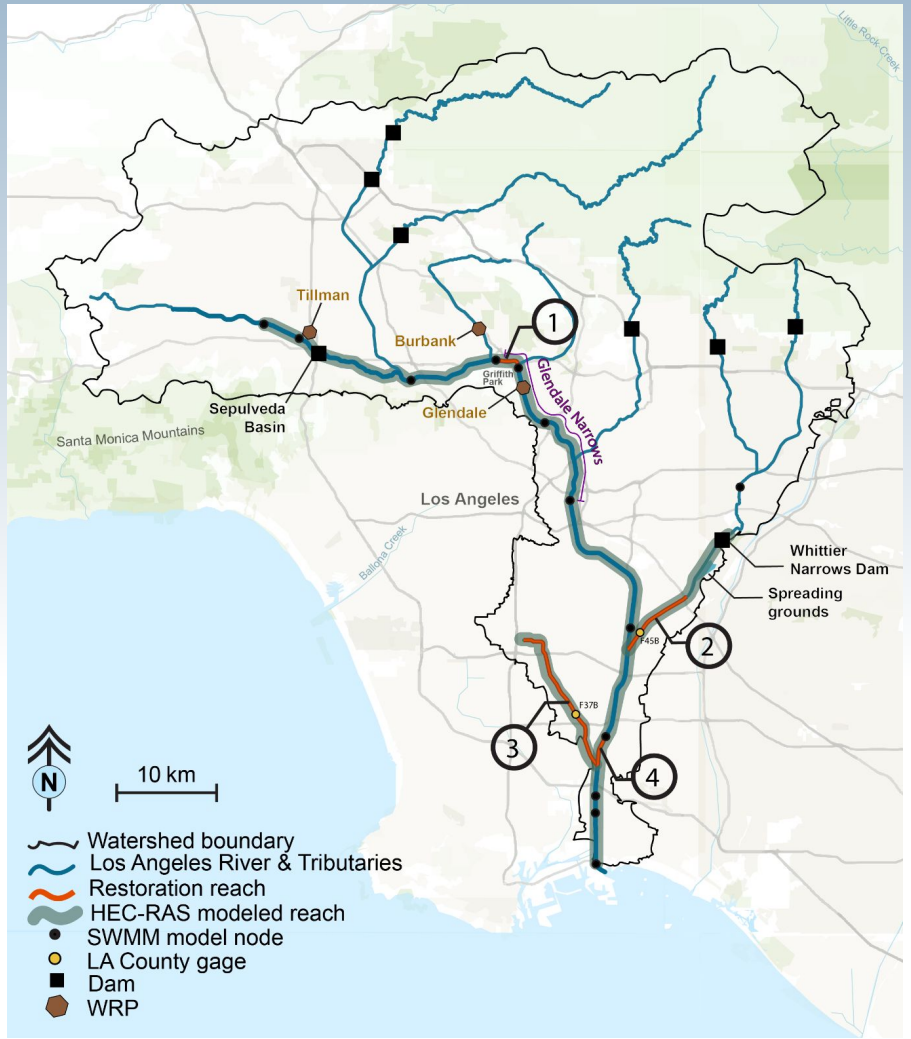
- Evaluated in-channel restoration options
  - What changes to channel design can accommodate altered flows to support ecological beneficial uses?
- Developed approach and illustrated at example study reaches



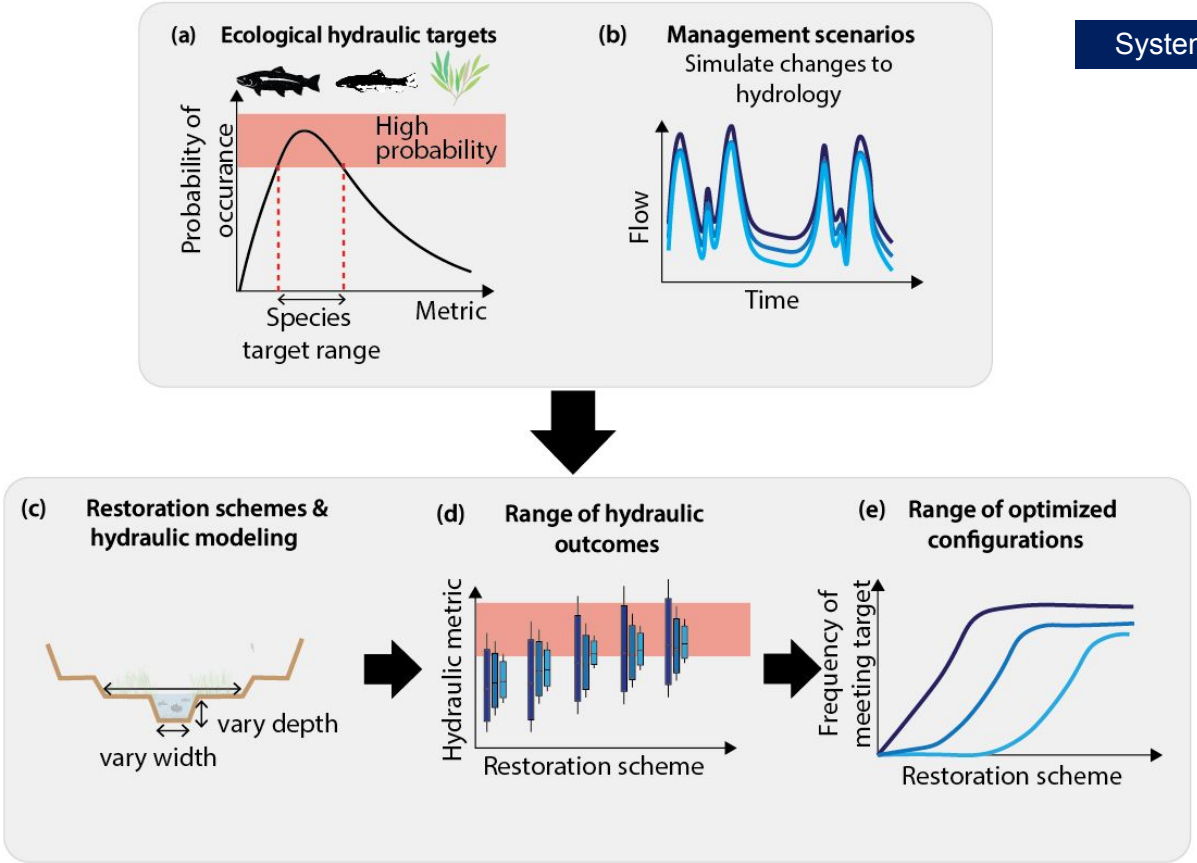

Systema et al., in review

# Study Locations

1. Mainstem below Burbank WRP
2. Rio Hondo
3. Compton Creek (CP2A)
4. Mainstem lower



# General Approach




Systema et al., in
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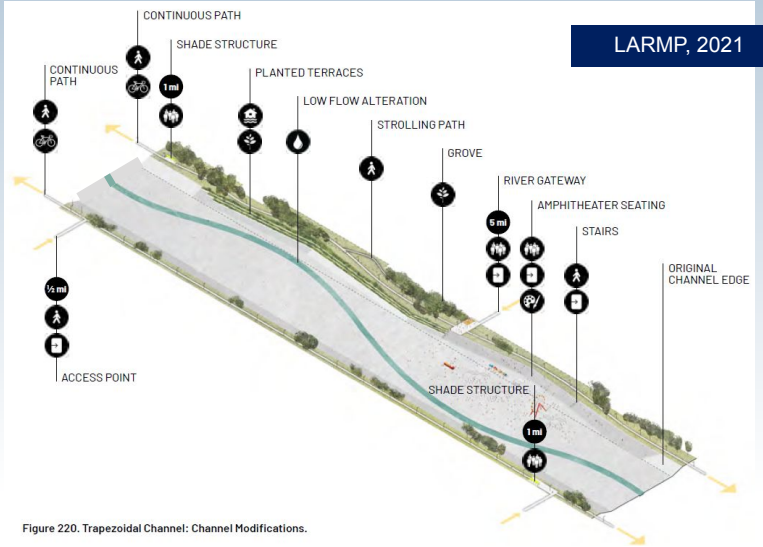
# Restoration Analysis

- Ongoing coordination with:
  - LA River Master Plan efforts
  - LA River Fish Passage Study
  - Stakeholder working group

- Final manuscript in review



# Future Use of Decision Support Tools

- Municipalities to evaluate proposals to regulatory agencies
- Regulatory agencies to evaluate potential flow requirements
- Planning entities to inform restoration and management decisions
- Temperature analysis  climate change + reduced effluent discharge

**Online Dashboard**

https://sccwrp.shinyapps.io/lar_eflows_shinyapp/

**Project Resources**

https://www.sccwrp.org/about/research-areas/ecohydrology/los-angeles-river-flows-project/

# Reporting Milestones

- Review of Recreational Uses and Associated Flow Needs, 2019
- Assessment of Aquatic Life Use Needs, 2021
- Process and Decision Support Tools for Flow Recommendations, 2021
- WQ Assessment, 2022 and Restoration, 2023

# LA River Flows Participating Entities

CALIFORNIA WATER BOARDS
State Water Resources Control Board

Public Works
LOS ANGELES COUNTY

CALIFORNIA WATER BOARDS
Los Angeles - R4

LA DWP Los Angeles Department of Water & Power

CITY OF LOS ANGELES FOUNDED 1781

environment LA SANITATION
CITY OF LOS ANGELES

LOS ANGELES COUNTY SANITATION DISTRICTS
Converting Waste Into Resources

Mountains Recreation & Conservation Authority

RANCHO SIMI RECREATION AND PARK DISTRICT

Watershed Conservation Authority

SCCWRP
Established 1969

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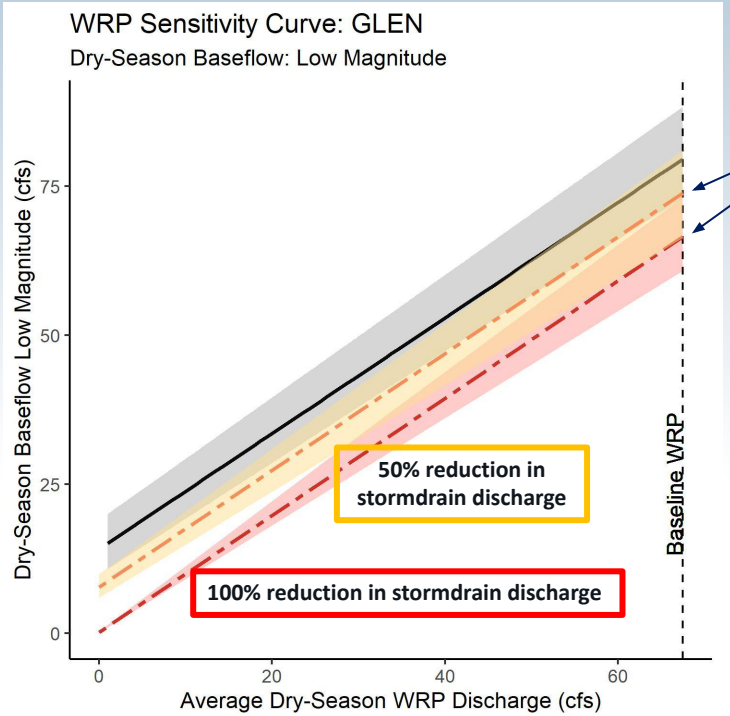
Council for Watershed Health

# Preliminary Scenario Summary: Glendale Narrows

| Scenario | Instream Dry-Season Baseflow Magnitude | Reduction in Dry-Season Baseflow Magnitude | | Aquatic Life Use | |
|---|---|---|---|---|---|
| | cfs | % | cfs | Willow | Cattail |
| Baseline | 80 | 0 | 0 | High | High |
| Baseline + no urban baseflow | 67 | 16 | 13 | High | Medium |
| WRP 50% reduction | 47 | 41 | 33 | High | Medium |
| WRP 50% reduction + no urban baseflow | 37 | 54 | 43 | High | Medium |
| WRP 100% reduction | 13 | 84 | 67 | Low | Medium |
| WRP 100% reduction + no urban baseflow | 3 | 96 | 77 | Low | Medium |

*Example summary table that can be derived from the scenario analysis*

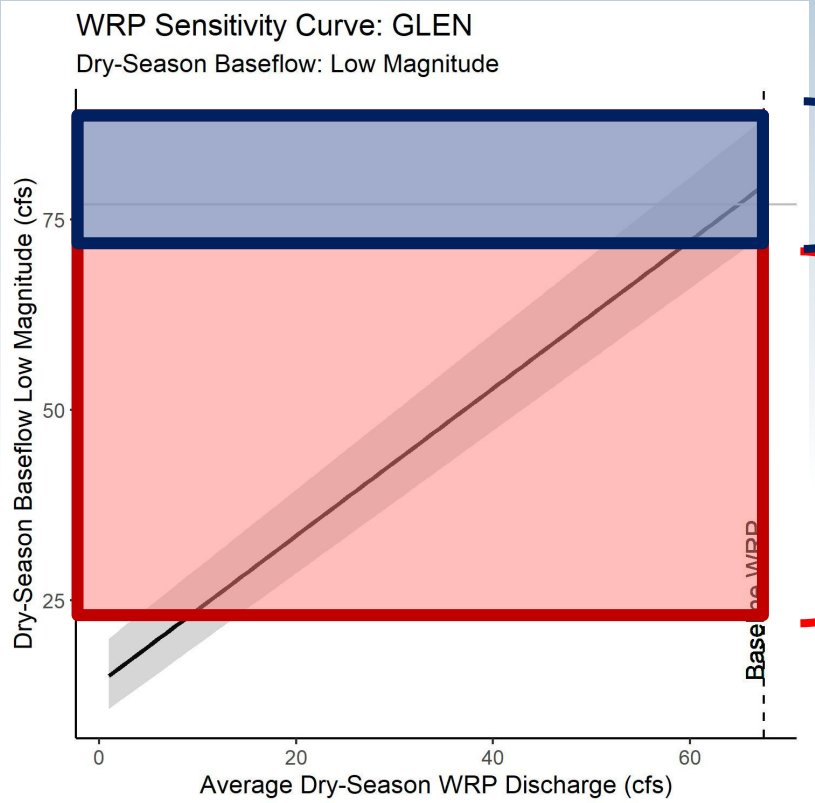
# Sensitivity Curves to Assess Effects of WRP and Stormdrain Reductions




Lines represent the median dry-season baseflow value calculated across the simulation period

**Curves allow for consideration of a virtually unlimited number of scenarios**

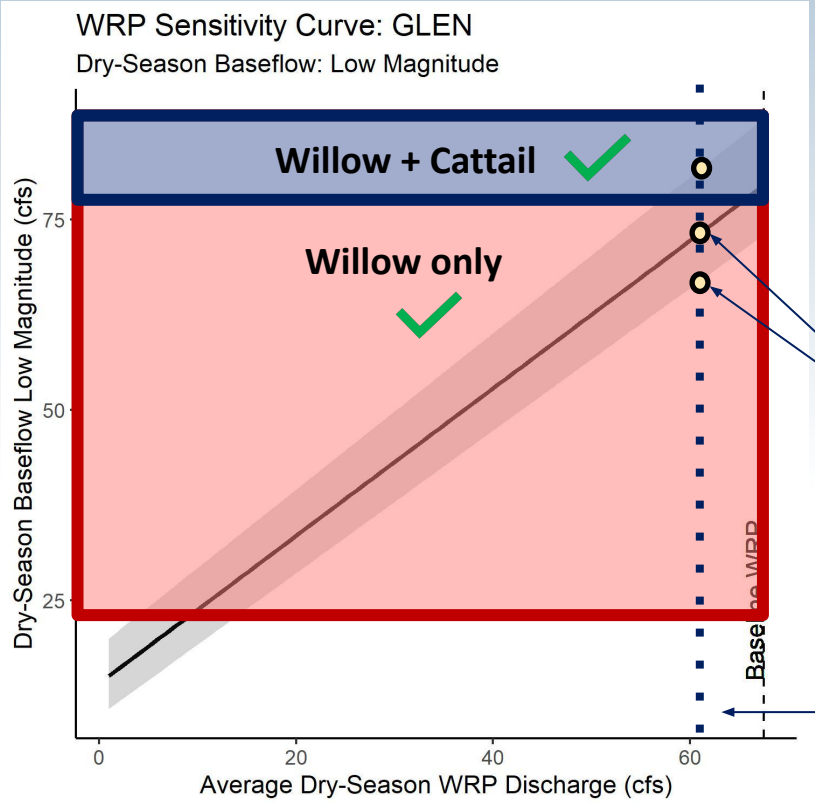
# Use of Sensitivity Curves to Evaluate Scenarios




Flow range necessary to support willow-riparian habitat AND freshwater (cattail) marsh

Flow range necessary to support willow-riparian habitat

# Use of Sensitivity Curves to Evaluate Project Proposals

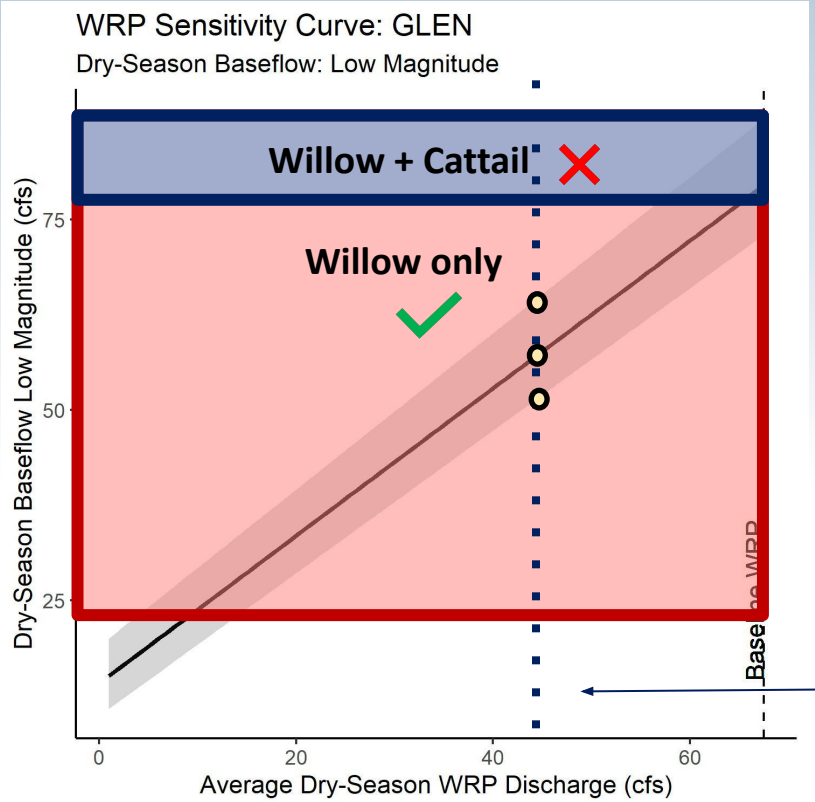



1. Overlay *proposed* reduction on sensitivity curve
2. Determine the intersection points with the curve
3. Overlay the optimal flow ranges

Unsuitable during dry and moderate flow years

6.5 cfs reduction in WRP

# Use of Sensitivity Curves to Evaluate Cumulative Effects




1. Overlay *cumulative* reduction on sensitivity curve
2. Determine the intersection points with the curve
3. Overlay the optimal flow ranges

Cumulative WRP reduction: 19.2 cfs

# Los Angeles River Watershed

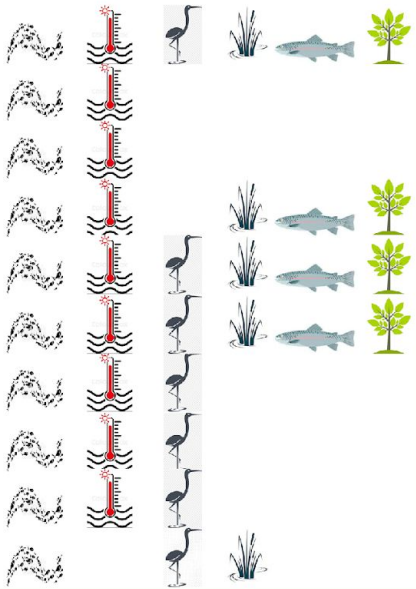
■ Dams ▲ WRP — Tribs Outside Study Area ■ Spreading Grounds (SG)

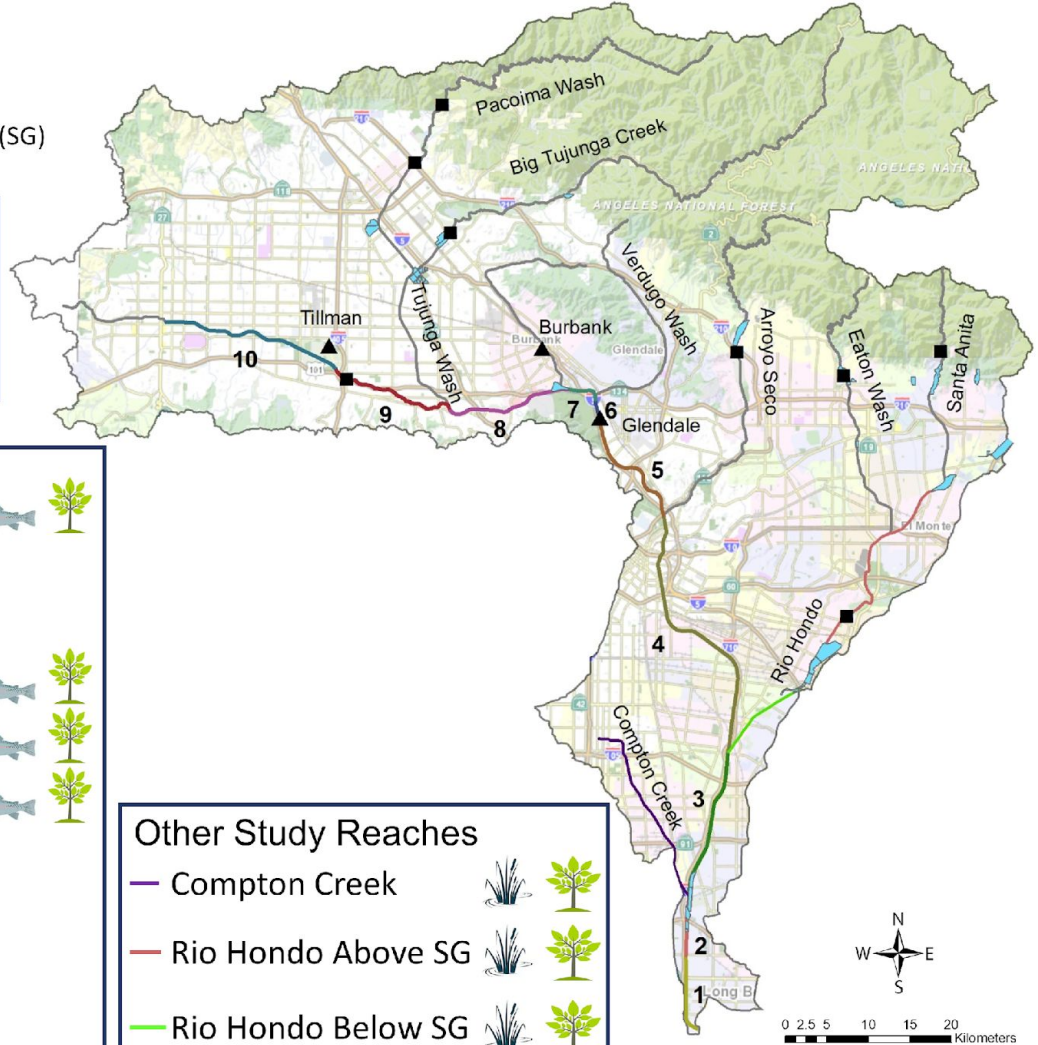
## Habitat

Migration | Warm Water | Wading Shore Bird | Freshwater Marsh | Cold Water | Riparian

## Study Reaches

- 10 - Upstream Reach
- 9 - Above Tujunga Wash
- 8 - Above Burbank
- 7 - Below Burbank
- 6 - Below Glendale WRP
- 5 - Glendale Narrows
- 4 - Above Rio Hondo
- 3 - Below Rio Hondo
- 2 - Below Compton Creek
- 1 - Tidal Reach






## Other Study Reaches

- Compton Creek
- Rio Hondo Above SG
- Rio Hondo Below SG

# Long-term Stormwater Capture Potential


Source: Stormwater Capture Master

# BMP Implementation Rate

*Table 5. BMP Implementation Rates for Geophysical Categorization in the Conservative Scenario*

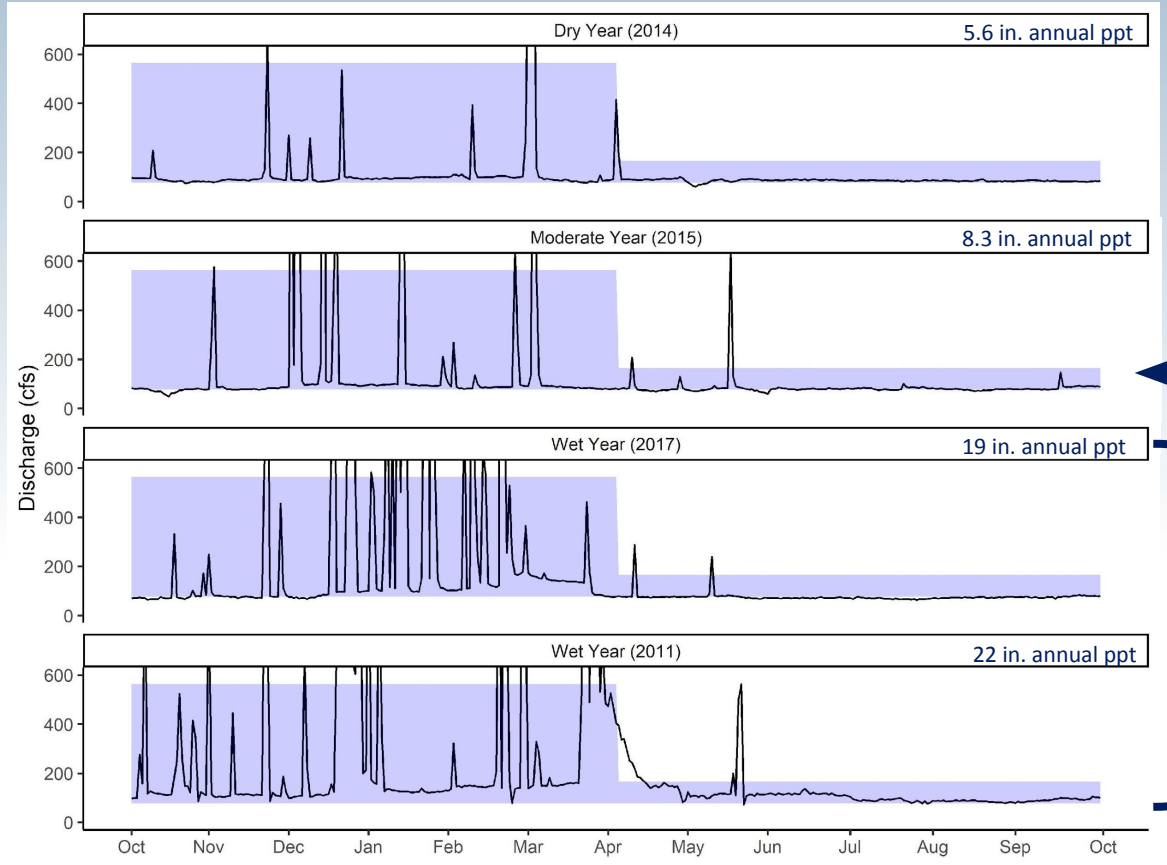
| Land use | A | B | C |
|---|---|---|---|
| High Density Single Family Residential | 35% | 25% | 15% |
| Low Density Single Family Residential with Moderate Slope | 30% | 20% | 10% |
| Low Density Single Family Residential with Steep Slope | 22% | 12% | 2% |
| Multi-family Residential | 35% | 25% | 15% |
| Commercial | 37% | 27% | 17% |
| Institutional | 57% | 47% | 37% |
| Industrial | 50% | 40% | 30% |
| Transportation | 52% | 42% | 32% |
| Secondary Roads | 47% | 37% | 27% |

*Table 6. BMP Implementation Rates for Geophysical Categorization in the Aggressive Scenario*

| Land use | A | B | C |
|---|---|---|---|
| High Density Single Family Residential | 50% | 40% | 30% |
| Low Density Single Family Residential with Moderate Slope | 40% | 30% | 20% |
| Low Density Single Family Residential with Steep Slope | 25% | 15% | 5% |
| Multi-Family Residential | 50% | 40% | 30% |
| Commercial | 55% | 45% | 35% |
| Institutional | 95% | 85% | 75% |
| Industrial | 80% | 70% | 60% |
| Transportation | 85% | 75% | 65% |
| Secondary Roads | 75% | 65% | 55% |

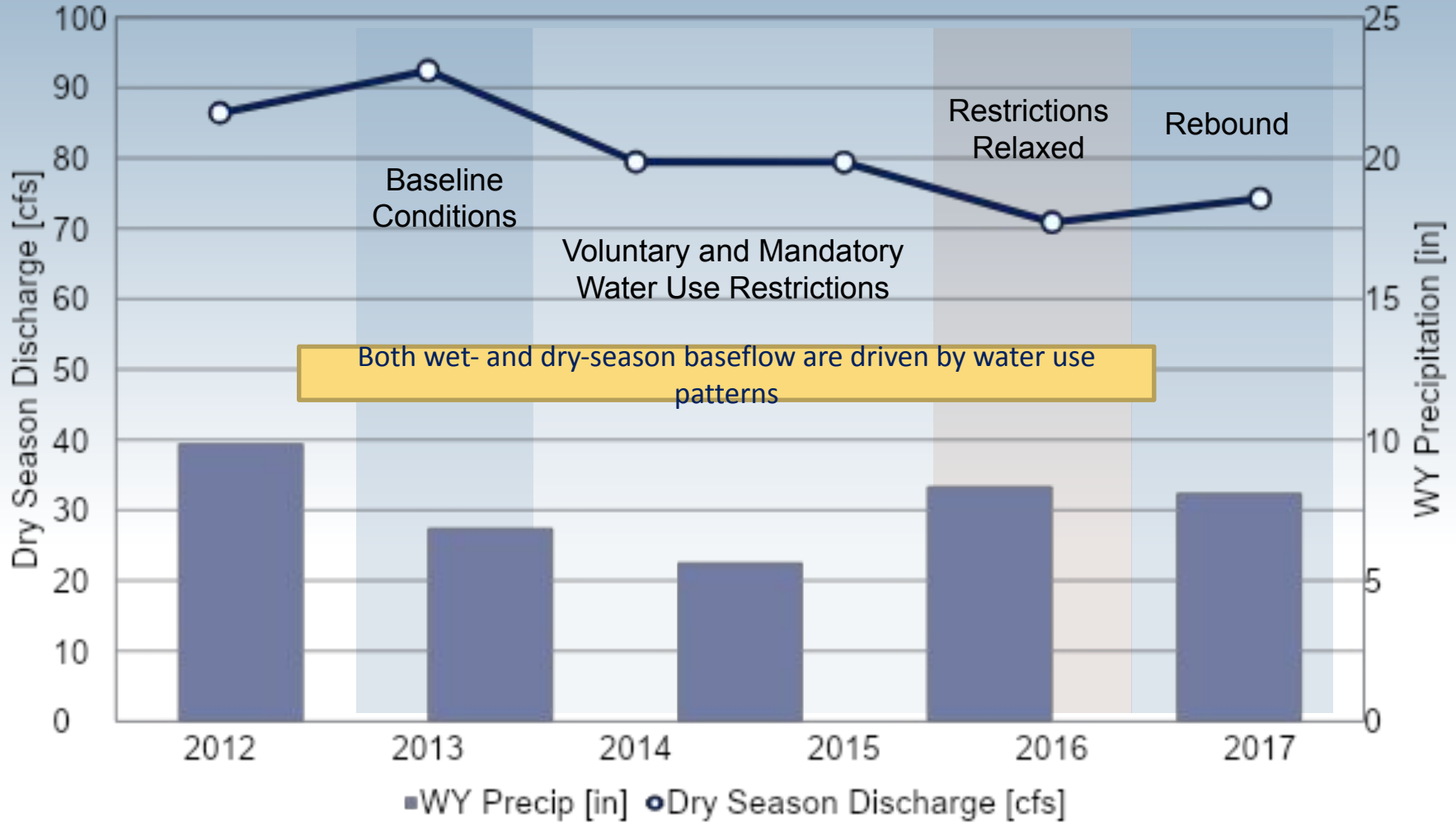
Source: Stormwater Capture Master

# Where are we now relative to optimal flow range?




Optimal flow range for Typha and Willow

Some wet years are within range and some are below. Why?


Dry Season Discharge [cfs]
WY Precipitation [in]
100
90
80
70
60
50
40
30
20
10
0
25
20
15
10
5
0
2012
2013
2014
2015
2016
2017
Baseline Conditions
Voluntary and Mandatory Water Use Restrictions
Restrictions Relaxed
Rebound
Both wet- and dry-season baseflow are driven by water use patterns
WY Precip [in]
Dry Season Discharge [cfs]