Establishing Environmental Flows for the Los Angeles River

Technical Advisory Committee Meeting #1 – January 28, 2019

SCCWRP Established 1969

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

Council for Watershed Health

COLORADO SCHOOL OF MINES
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Meeting Objectives and Agenda

Meeting Objectives:

- Provide overview of major project tasks and deliverables
- Discussed roles and expectations of the TAC

AGENDA

1. Introductions
2. Project overview
3. Role and expectations of the TAC
4. Introduction to hydrologic modeling
5. Wrap-up, action items and next steps

PROJECT OVERVIEW

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

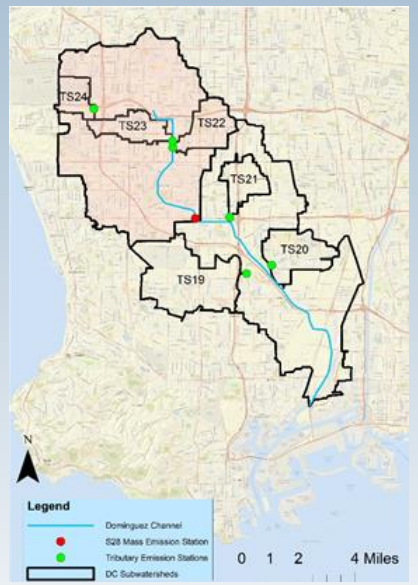
2. Evaluate various flow management scenarios in terms of their effect on uses in the LA River.

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

LAR Case Study Benefits

- Develop tools and approaches for assessing effects and optimizing water use management scenarios
- Support decision making under water code section 1211 –wastewater change petitions
- Prototype for consideration of establishing environmental flows in urban (effluent dominated) systems
- Case study for implementation of Tier 2 of statewide environmental flows framework

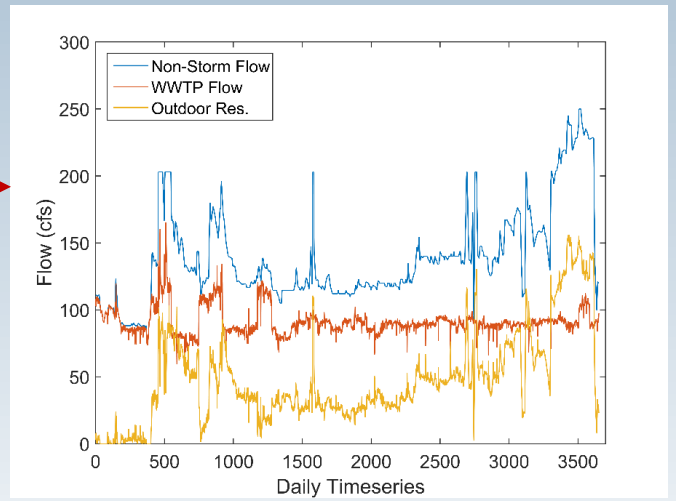
Overall Process for Developing Flow Criteria



models

Scenario	Description
1	WRP
2	WRP + stormwater
3	WRP + conservation
4	WRP + stormwater + conservation

scenarios



Time series output

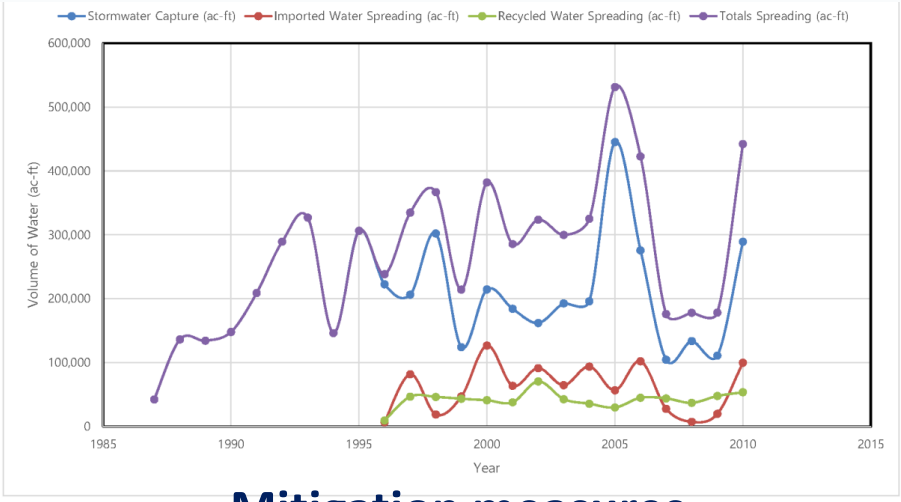
Hydrologic

- Minimum annual flow
- Duration of consecutive minimum annual flow
- Frequency of high winter flows Oct-March
- Frequency of Spring flush flows march-June
- Date of latest flood during the winter
- Decrease in flow per day in Spring following last Winter flood
- Magnitude of summer base flow

Hydraulic

- Presence of riffle (moderate depth, swift current, course substrate) habitat in Spring for spawning
- Percent of habitat as edgewater, riffle, and pools in the Spring and Summer
- Minimum and maximum bottom velocity in the Spring and summer
- Minimum depth of water in Spring, Summer, and Fall

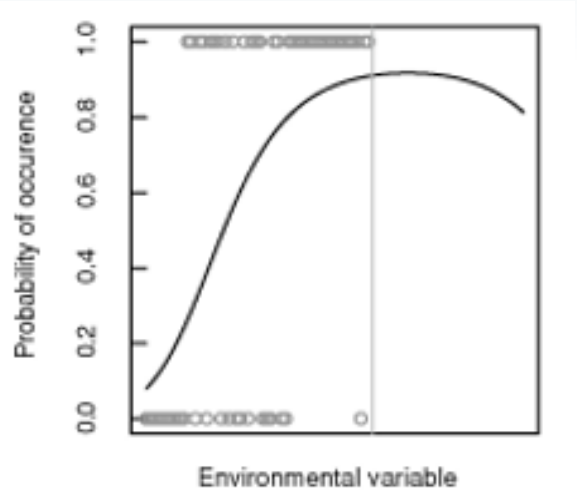
E-flow metrics



Mitigation measures

- **Flow Criteria**
  - ✓ **by reach and season**
- **Management/mitigation recommendations**

Agreed upon criteria



Flow-ecology relationships

Assessing Environmental Flows for LAR

Activity 1: Stakeholder Coordination

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Activity 2: Non-aquatic life use assessment

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Activity 3: Aquatic life use assessment

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Activity 4: Asses effects of flow modification/management

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Activity 5: Monitoring and Adaptive Management

→ **WRP Water Reuse**

→ **Options for Other Scenarios**

- Stormwater
- Groundwater
- Conservation
- Environmental restoration

Activity 1

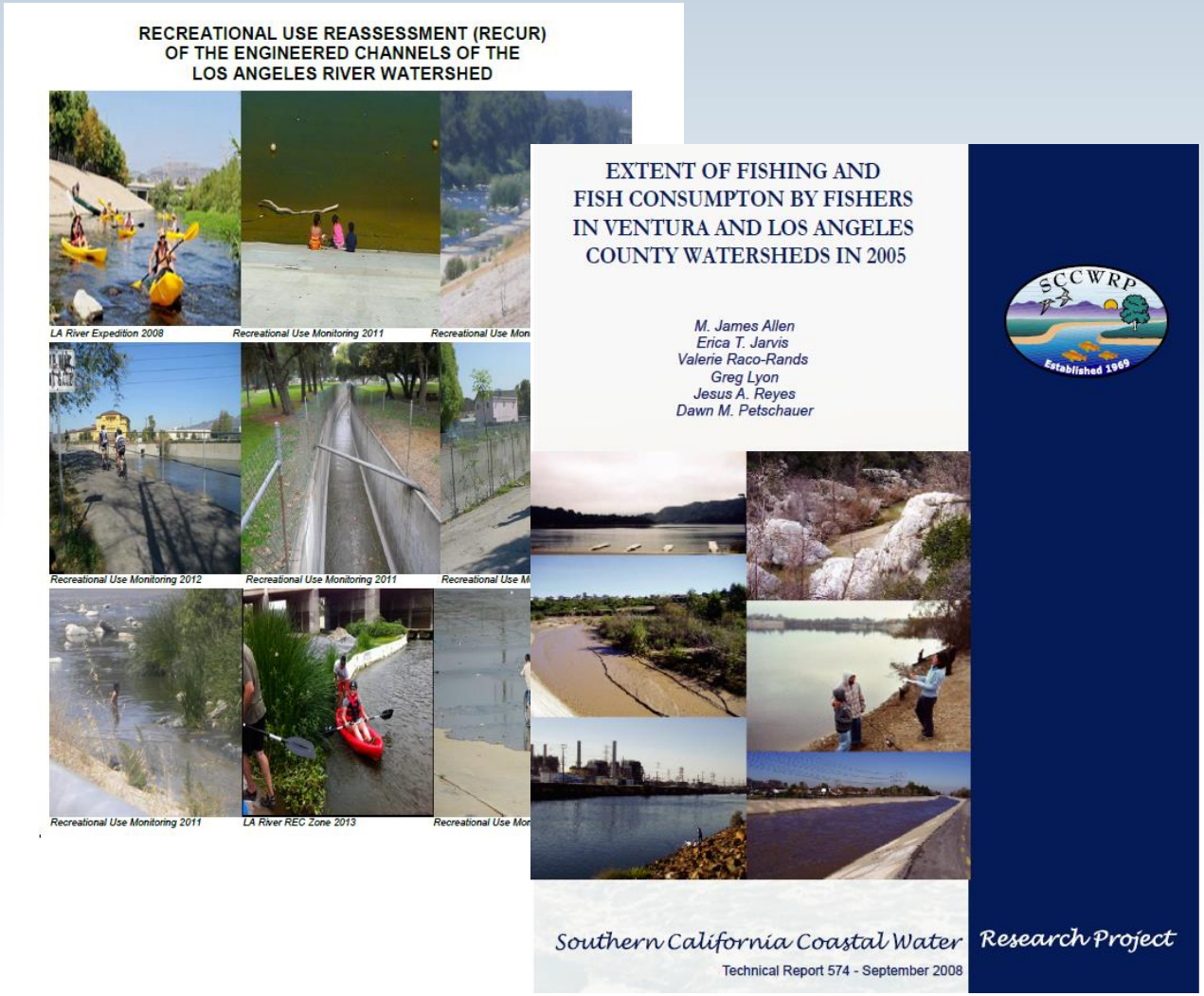
Community outreach and stakeholder coordination

- Coordinate with stakeholders on technical approach and desired outcomes
- State Water Board to take the lead on this effort
- Partner with existing efforts to avoid duplication and stakeholder fatique
  - LA River Master Plan
  - MRCA/RMC planning efforts

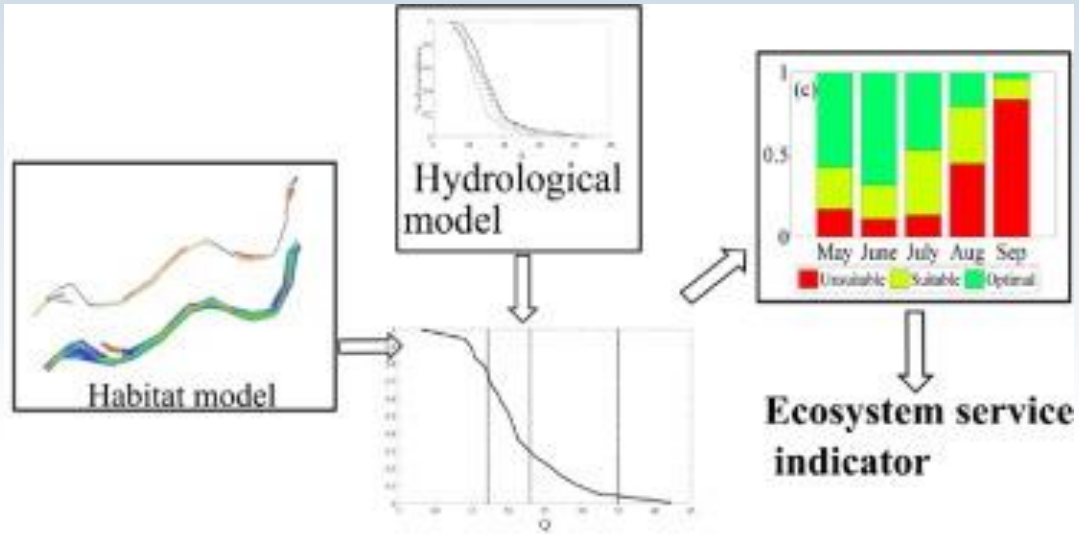
Activity 2 – Assessing Non-aquatic Life Uses

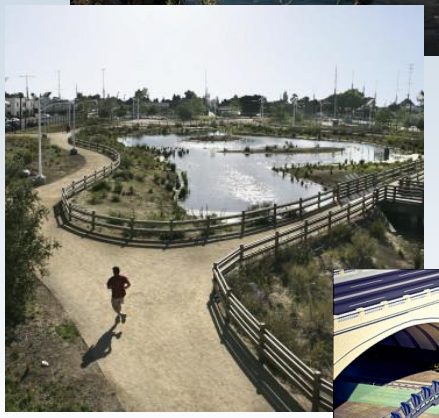
Goal: Identify key non-aquatic life uses and determine hydrologic needs for those uses

- Survey existing reports
- Interview key individuals
- Produce list of uses by reach
- Establish flow needs for each use
  - Past reports
  - Interviews/BPJ



Relate Flow Patterns to Uses





Social Choice Voting: Indicators and Flow Management Scenarios

Plurality- largest number of 1st place rankings

Boarda count- point system (higher for best alternative), highest sum is preferred

Pairwise comparisons – preference score (total or average) weighted by intensity of preference, confidence in management scenario, or stakeholder group

Activity 2 – Assessing Non-aquatic Life Uses

Potential Product/Outcome

Reach	Uses	Flow Needs
a. 1	a. Fishing b. Bird watching	a. Depth and flow during all seasons b. Minimum depth to provide foraging area during non-storm periods
2	a. Community education b. Recreation/kayaking	a. No substantive flow restrictions b. Min flow and depth during spring and summer
3	a. Fishing b. Recreation/wading	a. Depth and extent of inundation during spring and summer b. Min flow and velocity during spring and summer
4	TBD	
5	TBD	
6	TBD	

- Flow, depth and velocity needs to be quantified to the extent possible
- Season considerations to be included

Activity 3 – Aquatic Life Use Assessment

- **Goal:** Develop flow-ecology relationships for key aquatic species or habitats in the LA River

- **Approach:**
  - Task 3A – Assess hydrologic baseline
  - Task 3B – Identify and categorize ecological endpoints of management concern
  - Task 3C – Determine flow-ecology relationships for stream endpoint
  - Task 3D – Determine flow-ecology relationships for marsh and estuary habitats

Activity 3 – Aquatic Life Use Assessment:

Task 3A: Assess Hydrologic Baseline

- Survey existing models and report
- Determine trends and patterns
  - Wet vs. dry years
  - Trends due to conservation practices
- Coordinate with technical and stakeholder workgroups

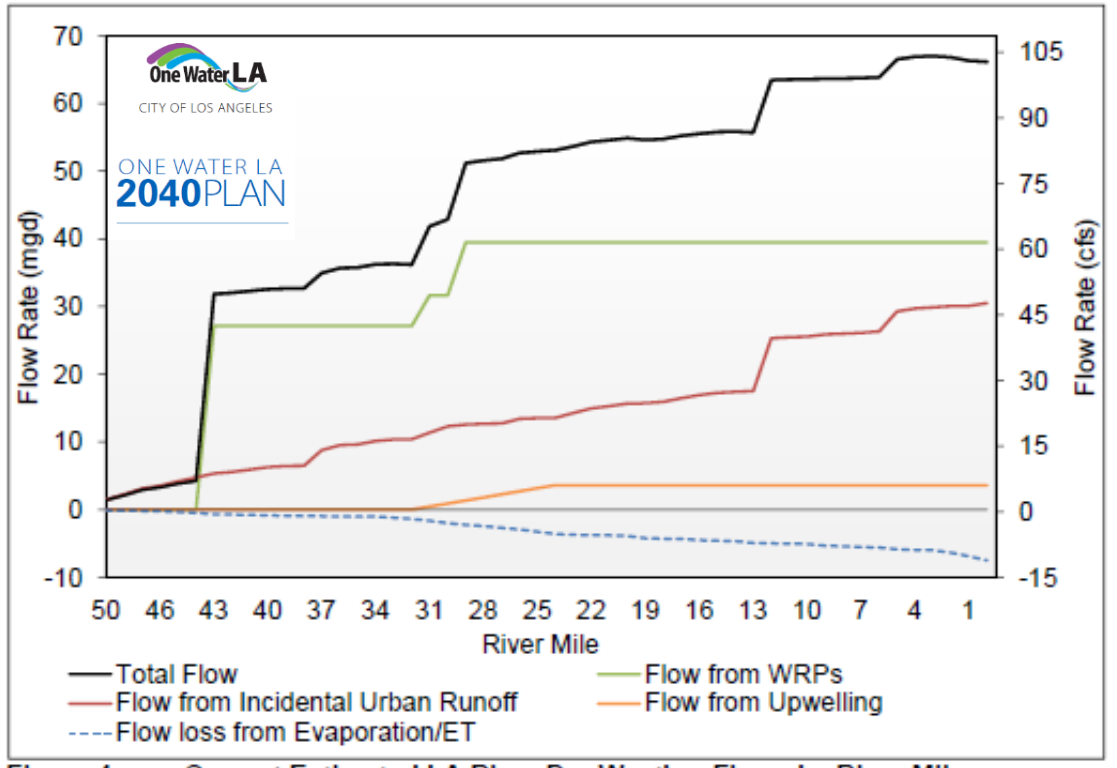


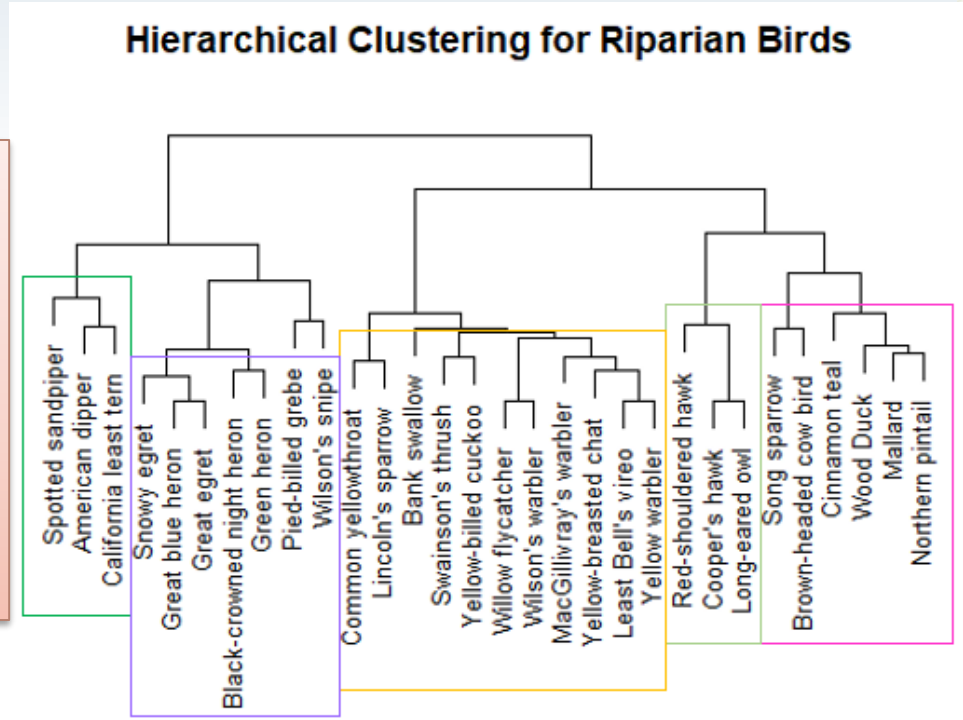
Figure 4 Current Estimated LA River Dry Weather Flows by River Mile

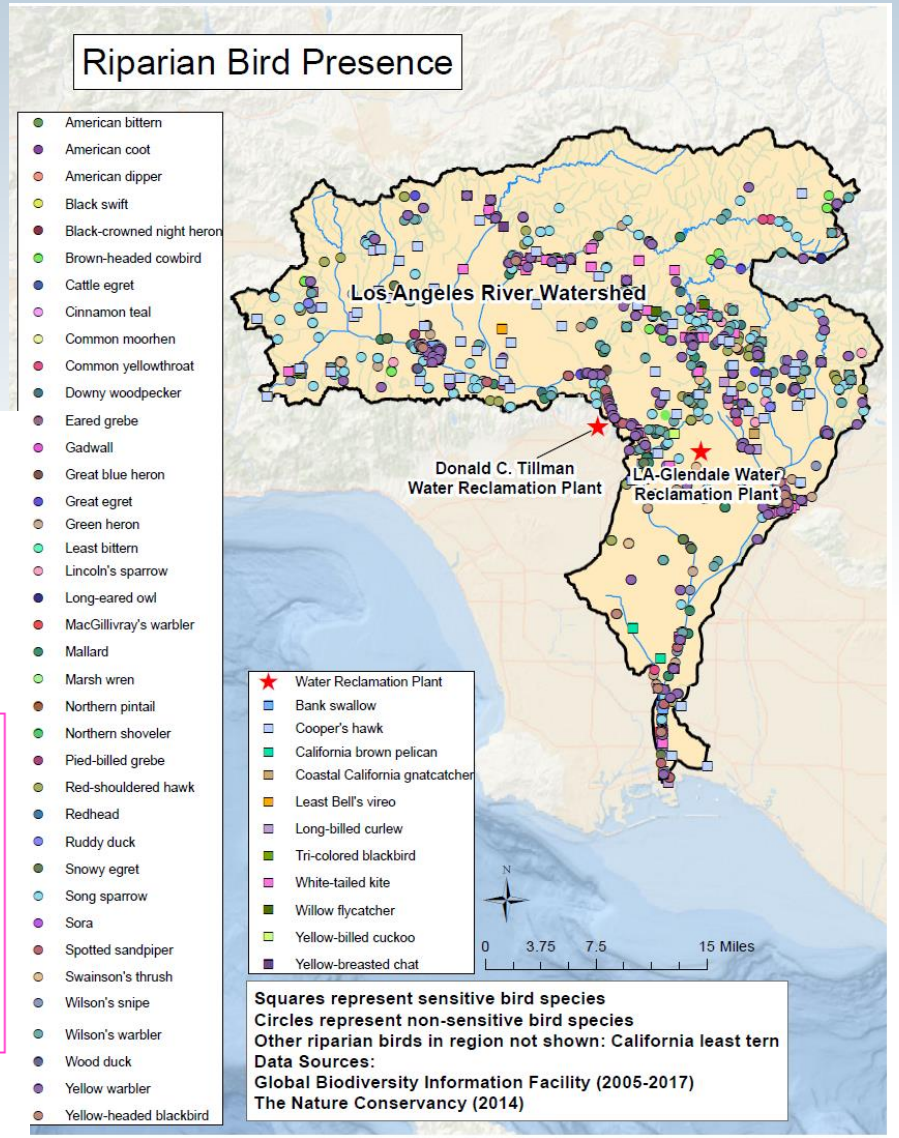
Activity 3 – Aquatic Life Use Assessment:

Task 3B: Identify and Characterize Ecological Endpoints

- Use existing data compilations of species/habitats
- Group based on similar flow needs
- Agree on priority species/habitat groups for each reach of study area

- Southern steelhead
- Santa Ana sucker
- Arroyo chub
- Southwestern pond turtle
- Arroyo toad
- Yellow warbler
- Great blue heron





Biological Data Sources

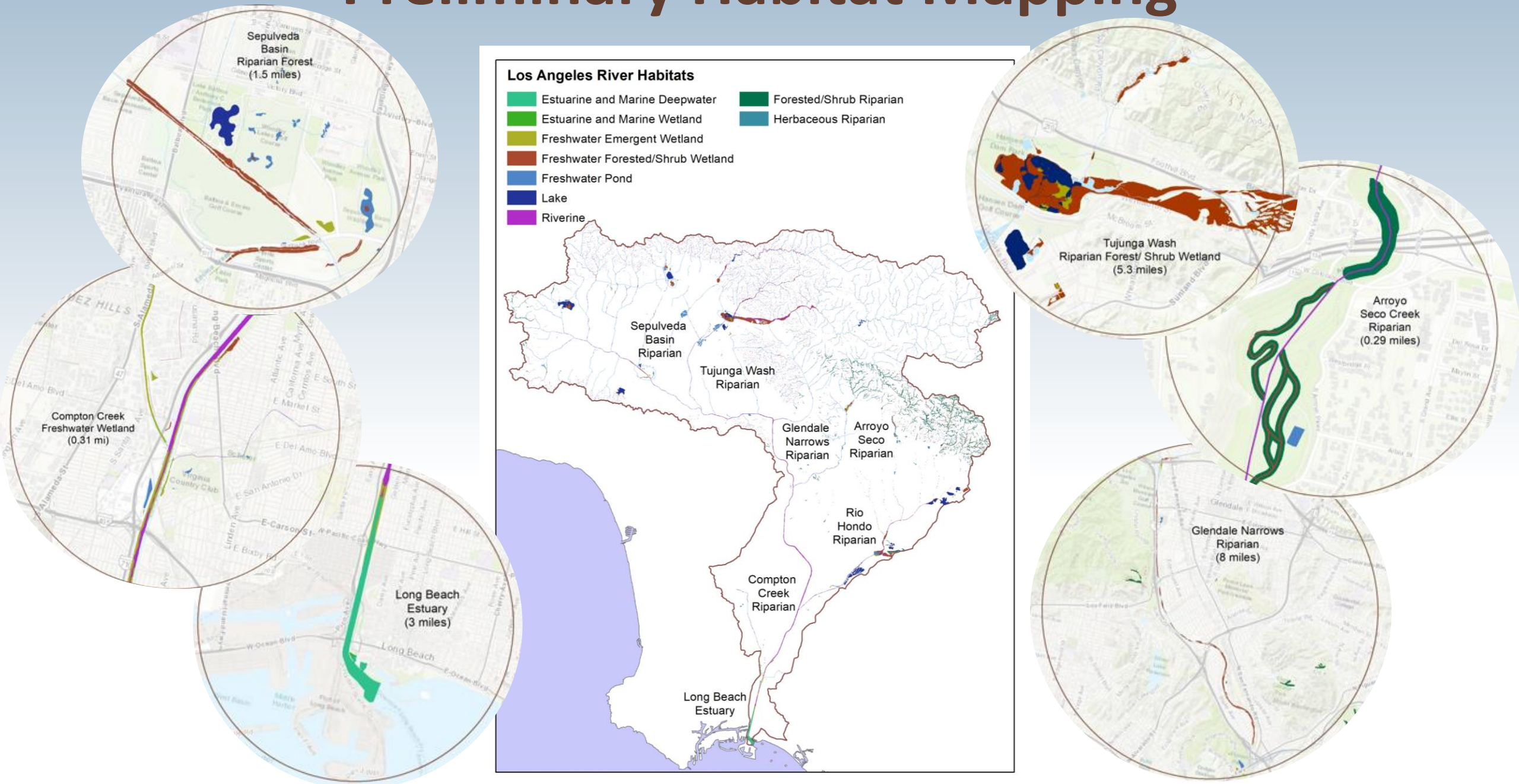
SPECIES

- Center for Biological Diversity
- California Natural Diversity Database (CNDDB)
- Nature Conservancy/Aquarius/Nature Serve
- USFWS – threatened and endangered species
- eBird
- Global Diversity Information Facility (GBIF)
- HerpNET – Natural History Museums
- iNaturalist
- CDFW Wildlife Action Plan
- *Various species survey reports*

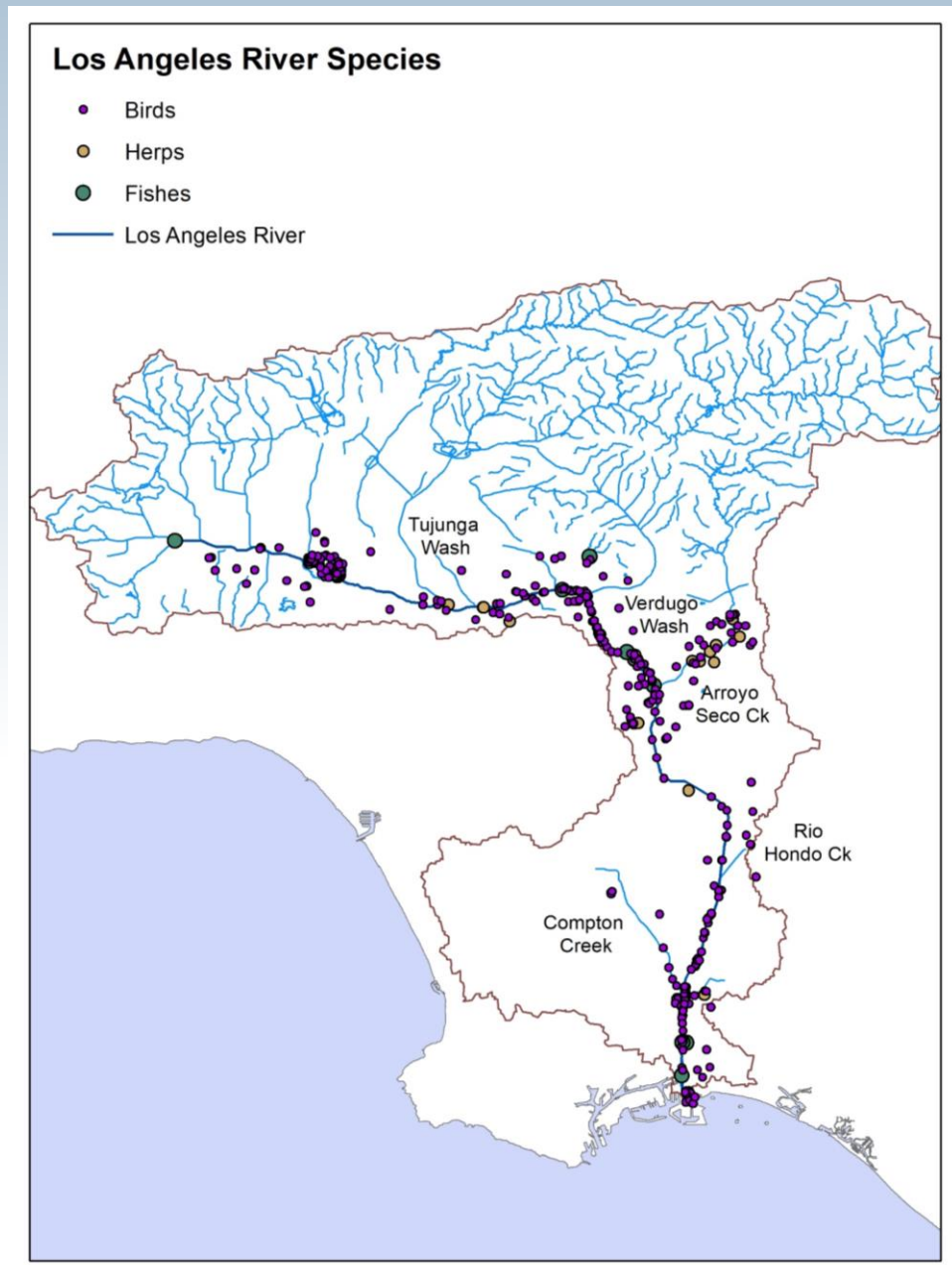
HABITATS

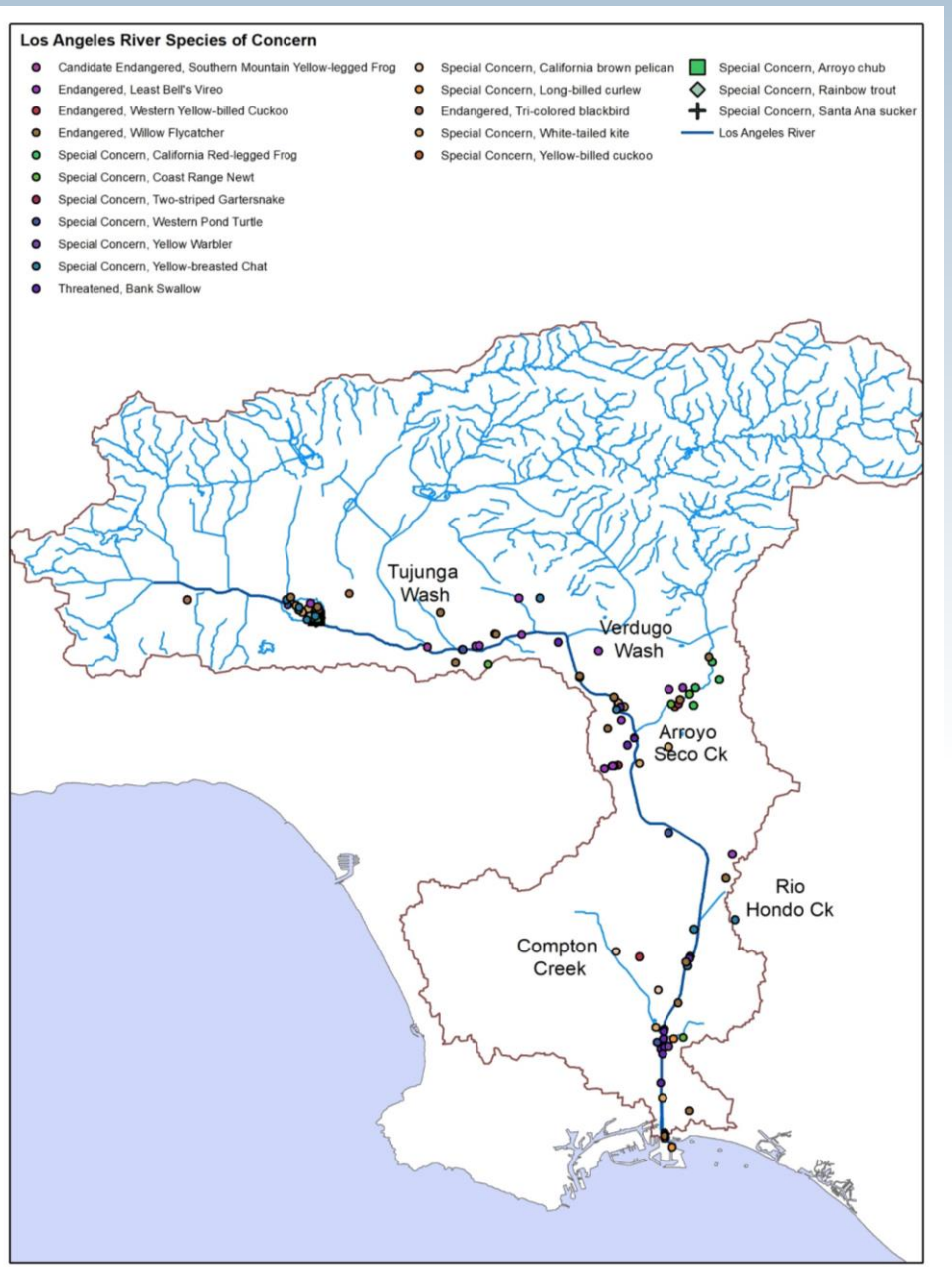
- Significant ecological areas
- National wetlands inventory
- California Native Plant Society
- CalVeg
- *Numerous study plan reports from various planning efforts*

Preliminary Habitat Mapping



Preliminary Species Mapping



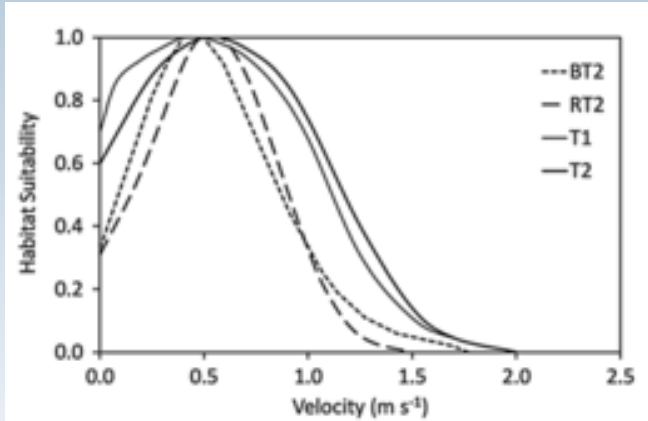


Activity 3 – Aquatic Life Use Assessment:

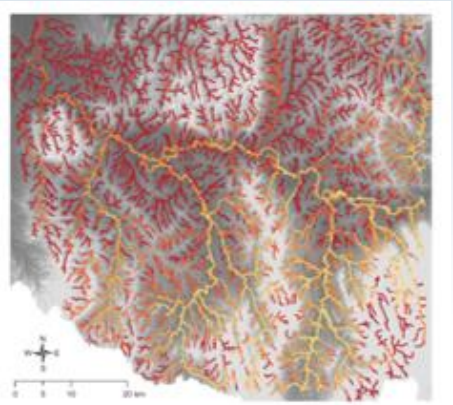
Task 3C: Determine Flow Ecology Needs

- Use existing databases on life history needs
- Augment with additional analysis as needed
- Model relationships between flow needs and probability of occurrence

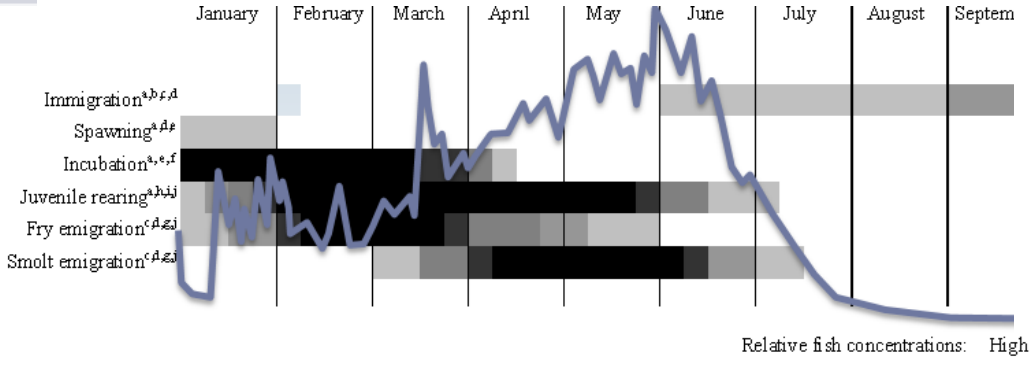
Life History	Requirements
Spawning	• Feb-Aug (June-July mostly) • Quiet edge waters or pool • 14-22°C
Fry	• Quiet edge waters with no-slight flow • Aquatic vegetation
Juvenile	• Quiet edge waters • Aquatic vegetation • 0.5%-2.5% gradient
Adult	• 10-24°C • Slow-moving streams or backwater/ponded sec • Sand, gravel, cobble, boulder • Adapted to fast 0.8m/s streams • Depth>40cm • 0.5%-2.5% gradient, <2% in upper San Gabriel • Pools and glides • Emergent vegetation

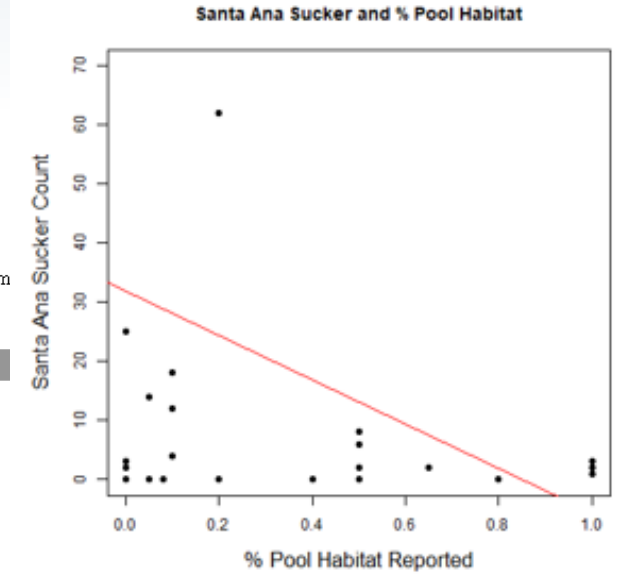


Habitat suitability curve



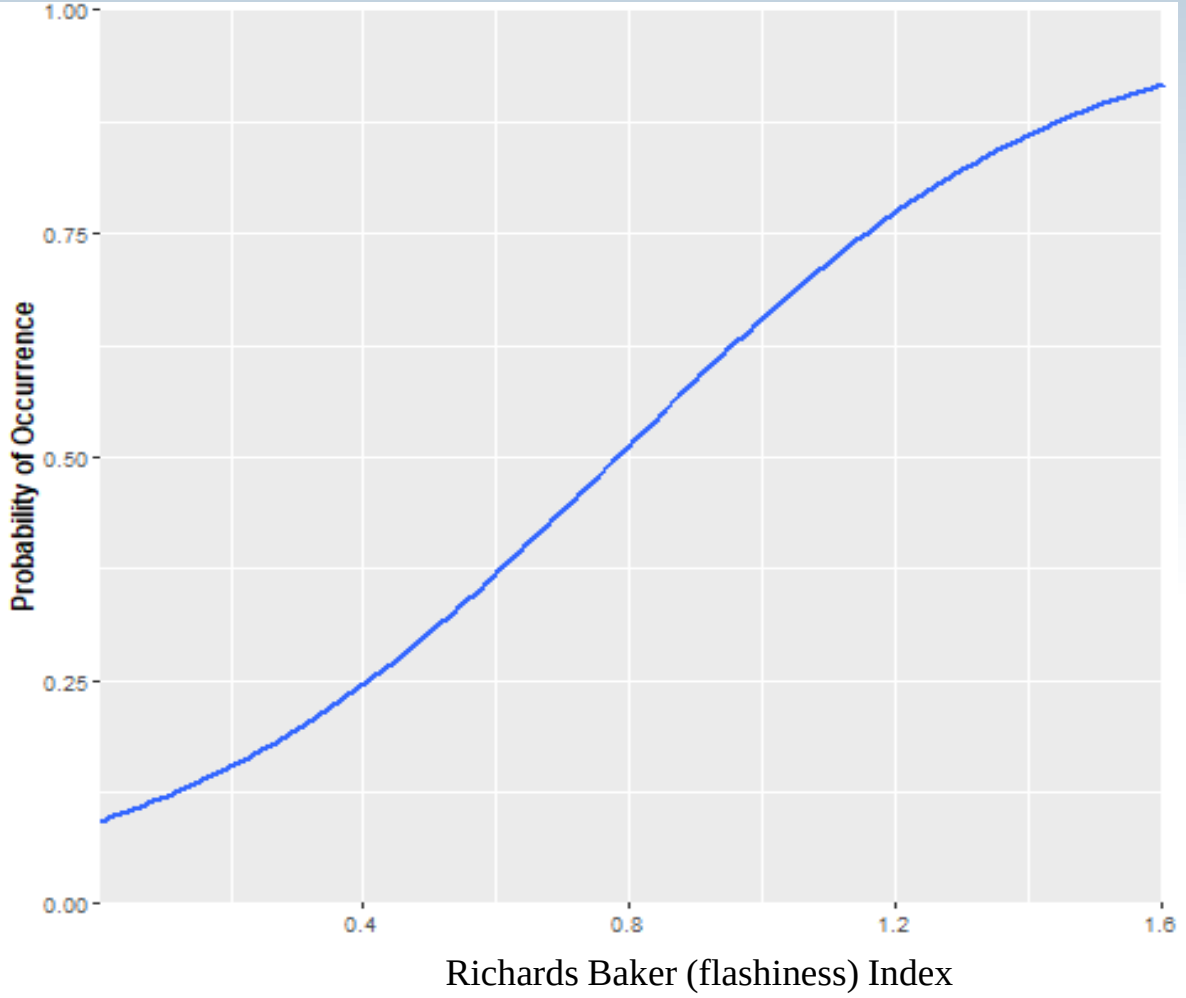
Probability of Occurrence





Example Flow Criteria: Arroyo Chub

- Two year storm magnitude
- Richards Baker (flashiness) Index
- Duration of high flow (average)
- Median number of zero flow days
- Average annual minimum flow



Activity 3 – Aquatic Life Use Assessment:

Potential Product of Flow Ecology Assessment

		Flow Needs			
Endpoint	**Reaches**	**Fall**	**Winter**	**Spring**	**Summer**
Great blue heron	1-3		• Peak flow > X • High flow cfs duration between x and y days		• Depth of water between x and y meters
Riparian habitat/vireo	3-5		• Peak flows > X at least every Y years • Sustained high flow > x days	• Recession rates over 3 weeks to promote seed establishment	• Baseflow duration of 3 weeks
SW pond turtle	2, 4, 6	• Flushing flows > X days and Y cfs			• Baseflow > x cfs • Baseflow duration through Aug
Benthic Invertebrates	2-6		• Frequency of high flow events > x • Peak flows between x and y	• Recession rates through June • No scouring flows after X date	• Flow > ponding through Aug

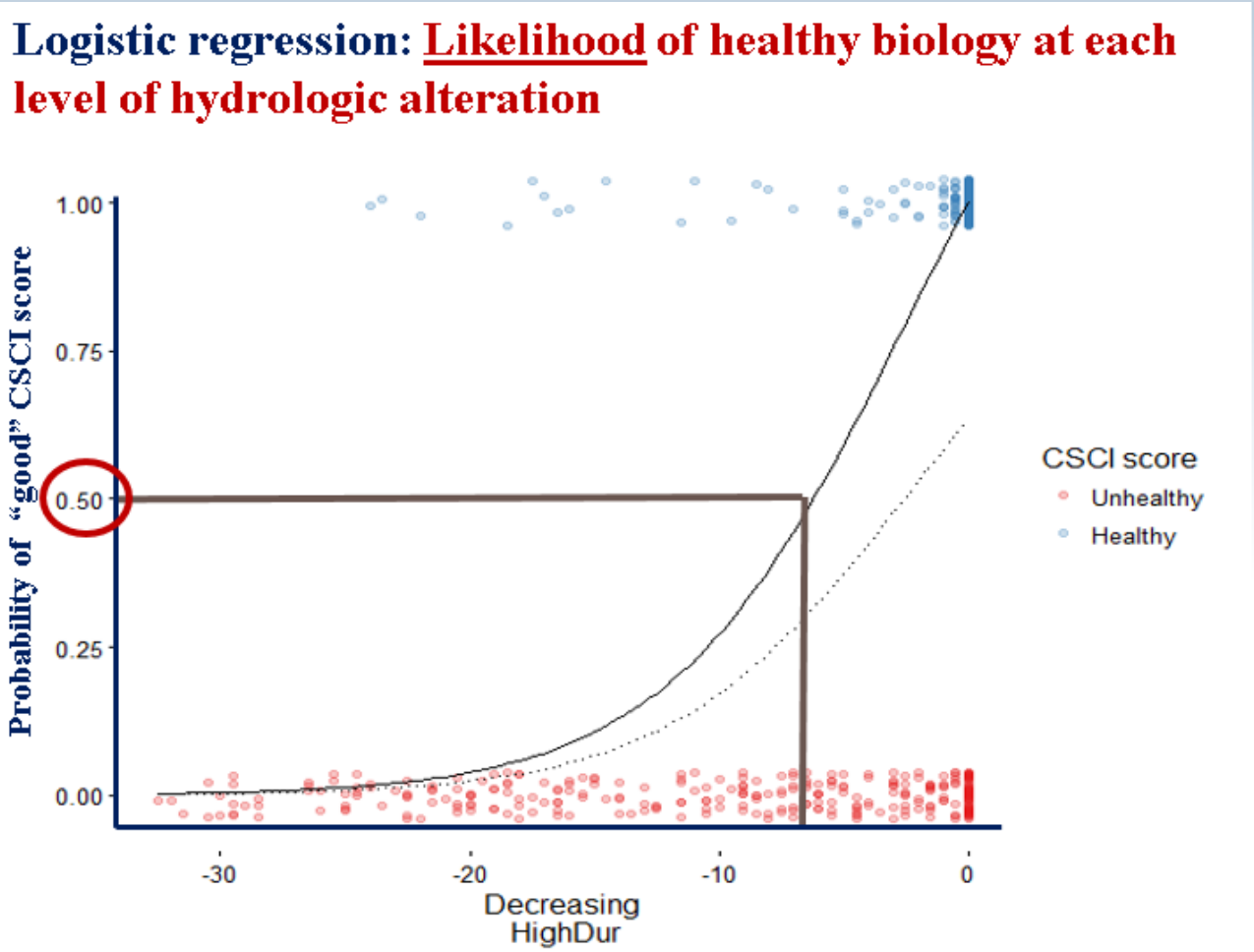
Activity 4 – Quantify Effects of Flow Management:

- **Goal:** Evaluate effect of flow management/alteration on both aquatic life and non-aquatic life uses in the LA River

- **Approach:**
  - Task 4A – Determine appropriate hydrologic tools and update modeling analysis
  - Task 4B – Analyze tolerances of system to flow modification
  - Task 4C – Analyze water use scenarios
  - Task 4D – Evaluate stormwater capture scenarios
  - Task 4E – Evaluate groundwater interactions
  - Task 4F – Evaluate habitat management offsets for flow reductions
  - Task 4G – Evaluate effects of flow alteration on tidal portions of the river
  - Task 4H – Establish recommended flow targets w/stakeholder coordination

Activity 4 – Quantify Effects of Flow Management:

Determine Flow Targets



Hydrograph Component	Metric Definition	Critical precipitation condition	Threshold
Duration (days)	longest number of consecutive days that flow is between the low and high flow threshold	Average	64
	longest number of consecutive days that flow was greater than the high flow threshold	Wet	3
Magnitude (cms)	Maximum mean monthly streamflow	Wet	1.5
	streamflow exceeded 99% of the time	Wet	32
Variability (unitless)	Richards-Baker index of stream flashiness	Dry	.25
Frequency (# of events)	number of events that flow was greater than high flow threshold	Dry	3

Activity 4 – Quantify Effects of Flow Management: *Potential Product of Flow Target Determination*

Reach	Season	Flow Target	Species or Habitat	General Relationship to Non-aquatic Life Use
1	Fall	Target 1	Wading shorebirds	Promotes fishing
	Winter	Target 2	Shorebirds, riparian habitat (scour)	No winter uses
	Spring	Target 3	Benthic invertebrates, pond turtle	Potential conflict with recreational uses
	Summer	Target 4	Pond turtle	Consistent with recreation
2	Fall			
	Winter			
	Spring			
	Summer			

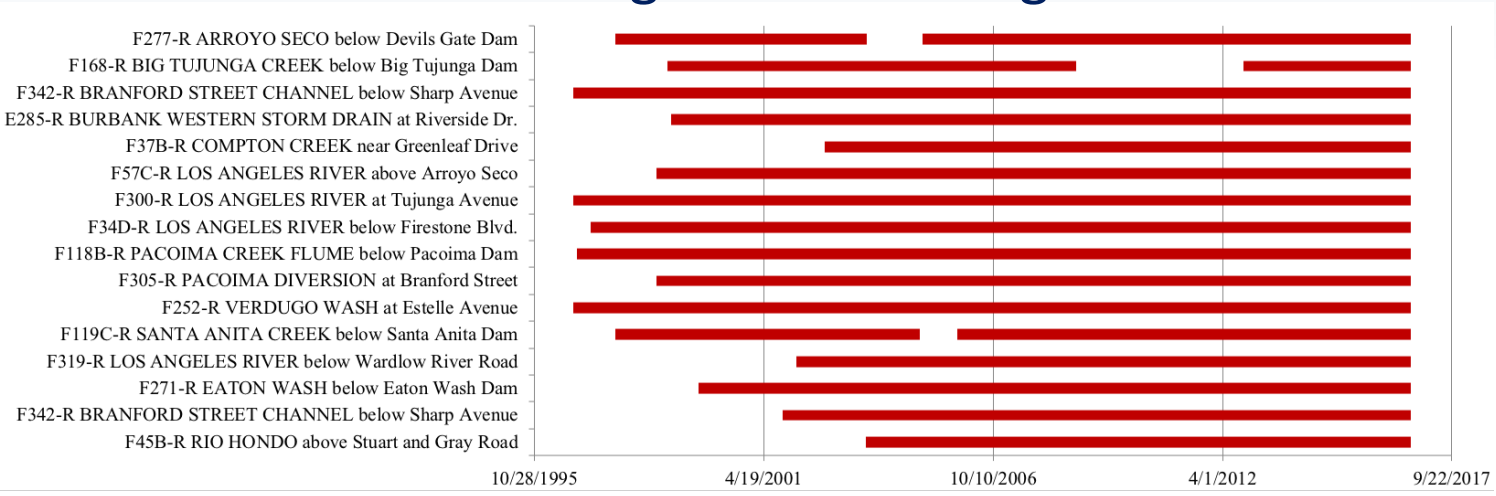
- Number of endpoints and targets based on input from workgroups
- Relationship to non-aquatic life uses will help inform scenario analysis

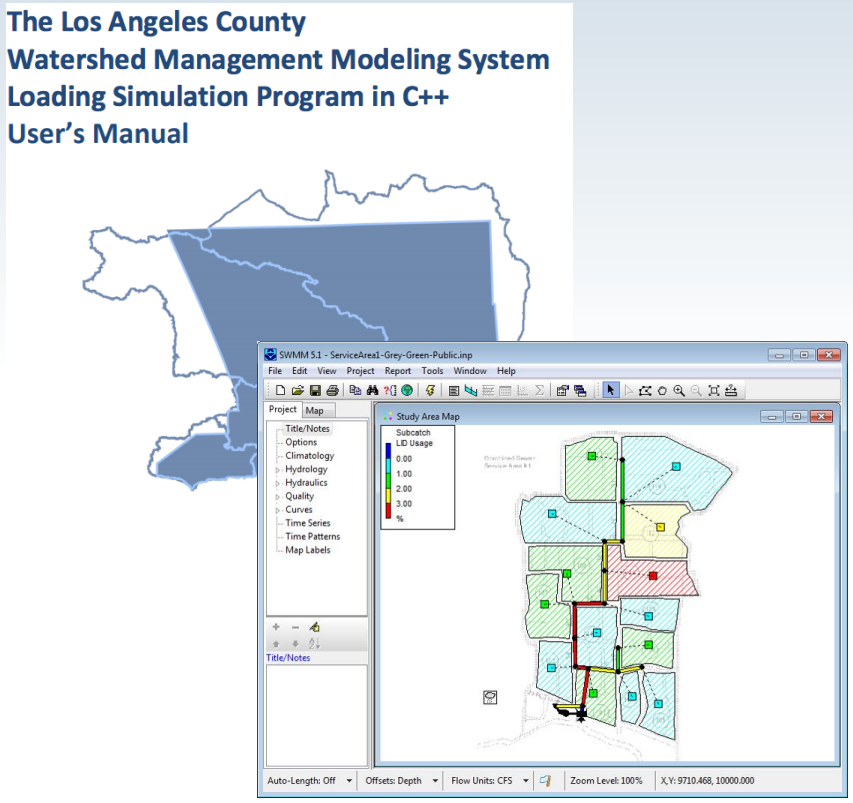
Activity 4 – Quantify Effects of Flow Management:

Task 4A: Determine Appropriate Tools; Update Models

- Review past studies of LAR
- Coordinate with TAC for best modeling strategies
- Update model input data

LAR Flow Gage Data Coverage



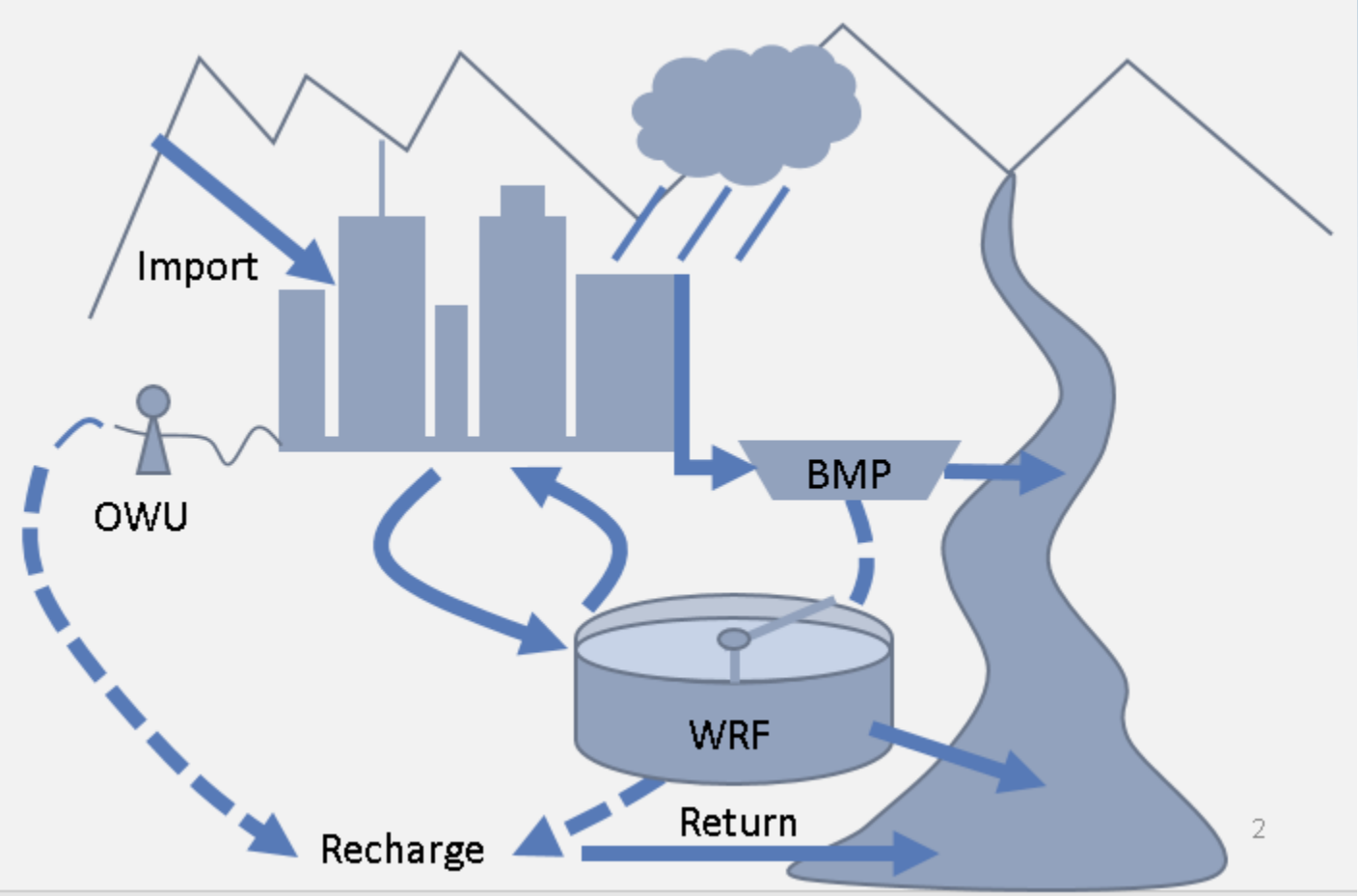


Activity 4 – Quantify Effects of Flow Management

Modeling Analysis

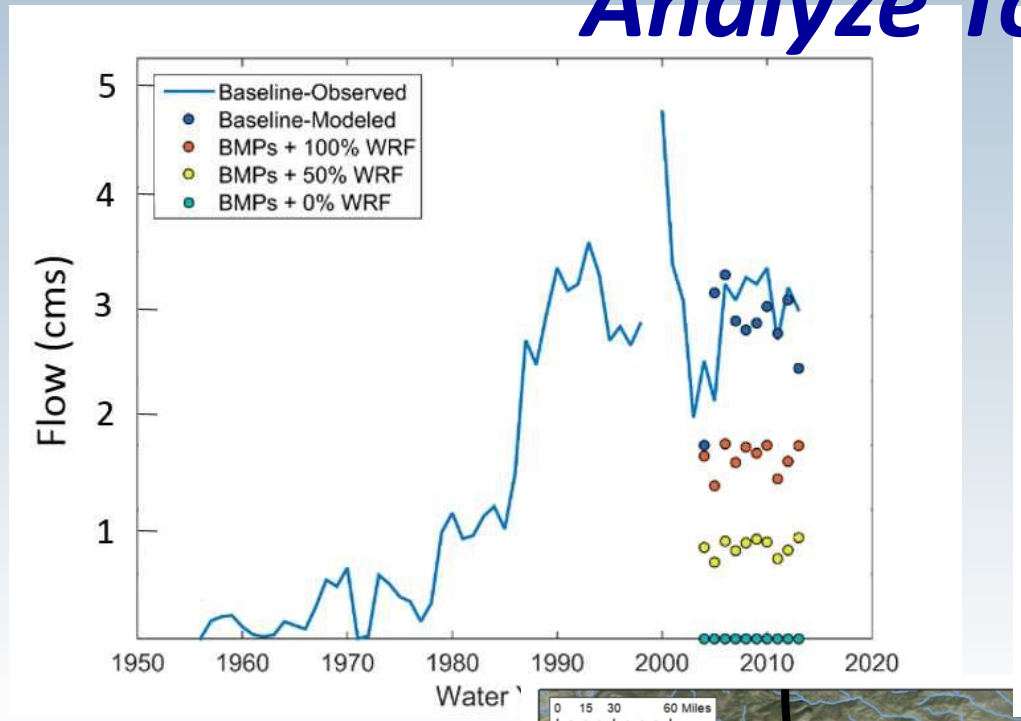
More details to come in presentation by Colin Bell and Terri Hogue: Colorado School of Mines

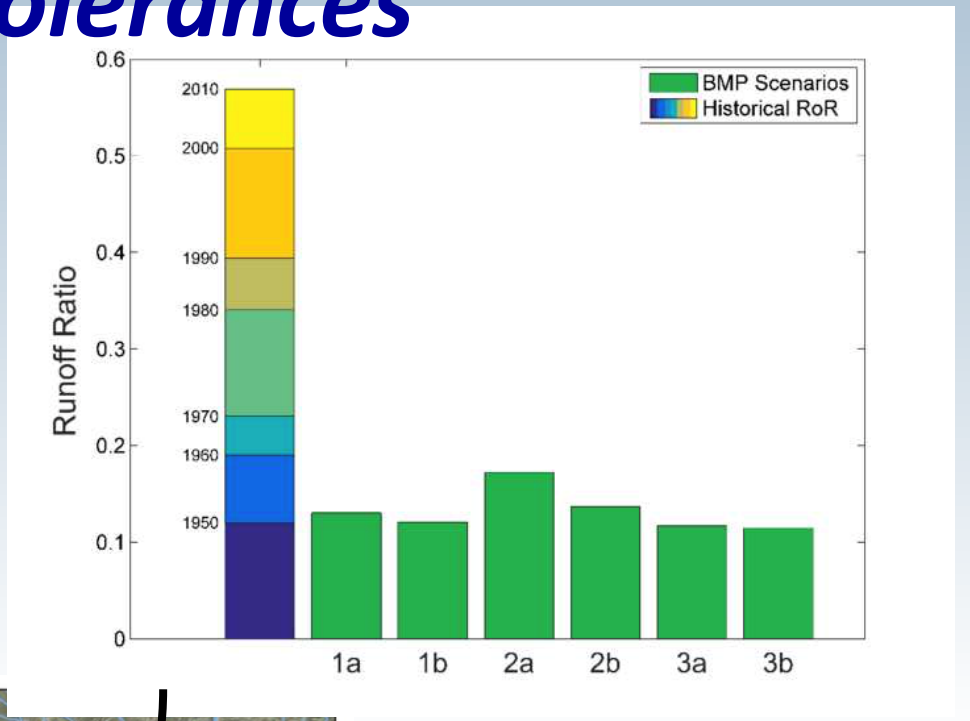
- Model baseline hydrologic conditions
- Model scenarios based on choices made by project Executive Committee

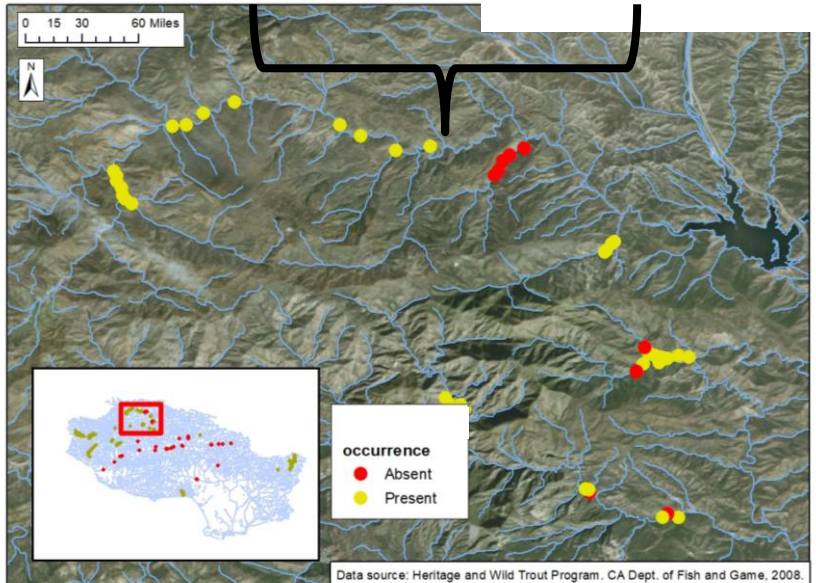


Activity 4 – Quantify Effects of Flow Management

Analyze Tolerances







Activity 4 – Quantify Effects of Flow Management

Analyze Water Use Scenarios

- Evaluate effects of various water use and flow management scenarios on ecological and human use endpoints

- **Core scenario**
  - Reduced WRP discharges

- **Additional scenarios**
  - Stormwater capture
  - Changes to groundwater upwelling
  - Conservation practices
  - Habitat restoration (offsets)

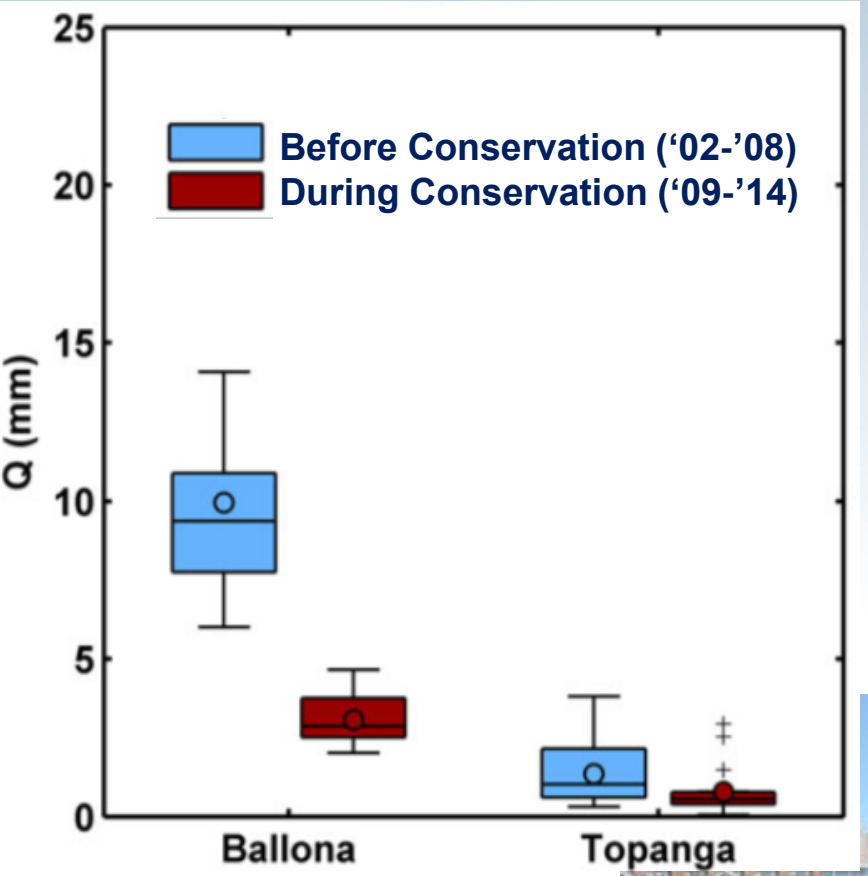
Activity 4 – Quantify Effects of Flow Management

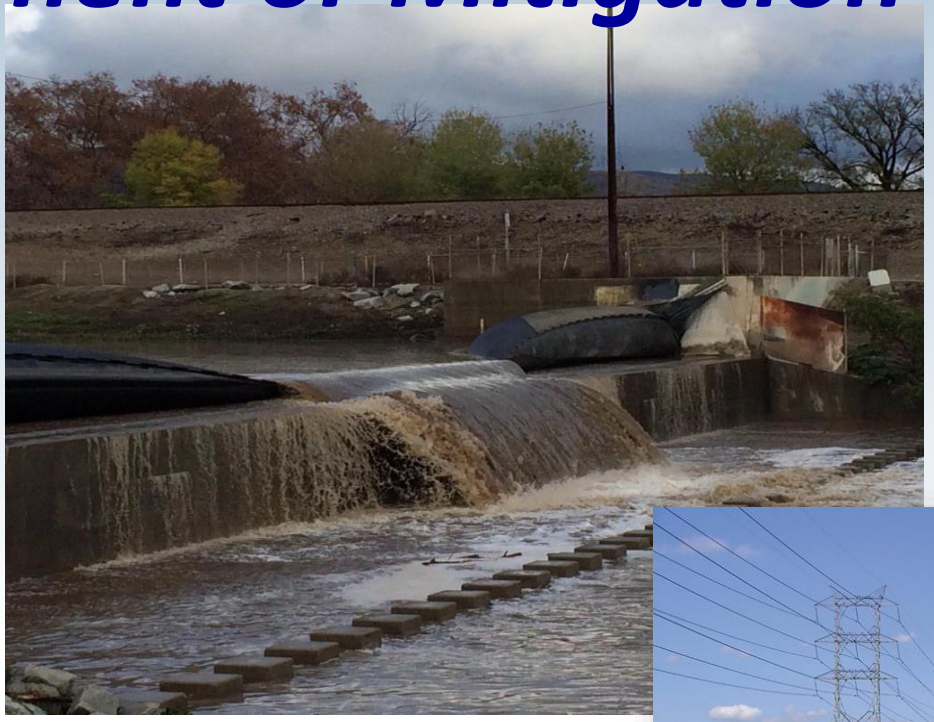
Establish Recommended Flow Criteria

- Determine recommended flow criteria that balance need to support multiple uses / management objectives
  - Specific reaches
  - Specific seasons or climatic conditions
- Optimization based on prioritization or weighting developed in coordination with stakeholder and technical workgroups
- Explore the effects of mitigation measures on reduced flows
  - Habitat restorations / invasive plant removal
  - Supplemental discharges
  - Seasonal management actions (based on critical conditions)
- Develop recommended flow management strategies based on agreed upon criteria

Activity 4 – Quantify Effects of Flow Management

Example Management or Mitigation Measures





Activity 4 – Quantify Effects of Flow Management:
Potential Products of Flow Criteria Analysis

Scenario	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5-6
50% WRP diversion	• **Potential habitat/species impacts** • **Effects on non-aquatic uses** • **Recommended targets** • **Potential mitigation measures**				
100% WRP diversion					
WRP diversion + stormwater capture					
WRP diversion + additional recharge					
WRP diversion + conservation +BMP					

- Criteria may vary by reach, by season, or by climatic condition
- Management and mitigation measures determined in coordination with workgroups

Activity 5 – Monitoring and Adaptive Management

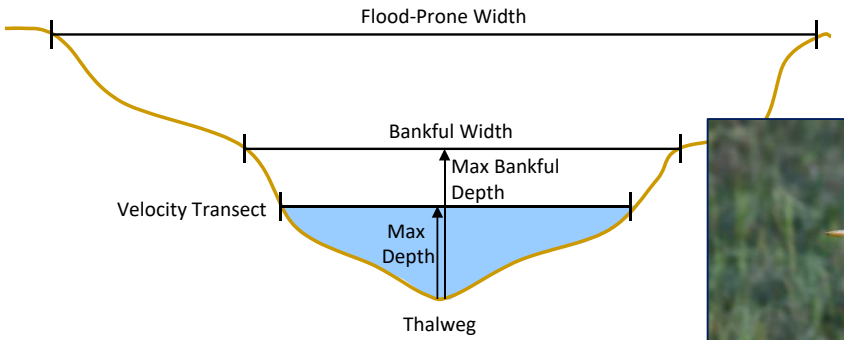
- **Goal:** Develop a recommended monitoring strategy with potential triggers for adaptive management

- **Approach:** work with stakeholders and technical team to develop monitoring strategies
  - Leverage existing monitoring and assessment programs (e.g. SMC)
  - Provide data to improve model performance
  - Evaluate efficacy of criteria and management actions

Activity 5 – Monitoring and Adaptive Management

Components of a monitoring strategy:

- Permanent flow monitoring stations
- Flow or physical habitat following critical storm events or specific times of year
- Biological responses



Major Products

- List of current and potential uses by reach
- Map of key species and habitats
- Flow needs and tolerances associated with aquatic and non-aquatic uses
- Evaluation of potential effects associated with various water use/reuse scenarios
- Suggested mitigation/management measures that could offset potential effects
- Proposed monitoring approach/strategies

ROLE OF THE TAC

Role of the TAC

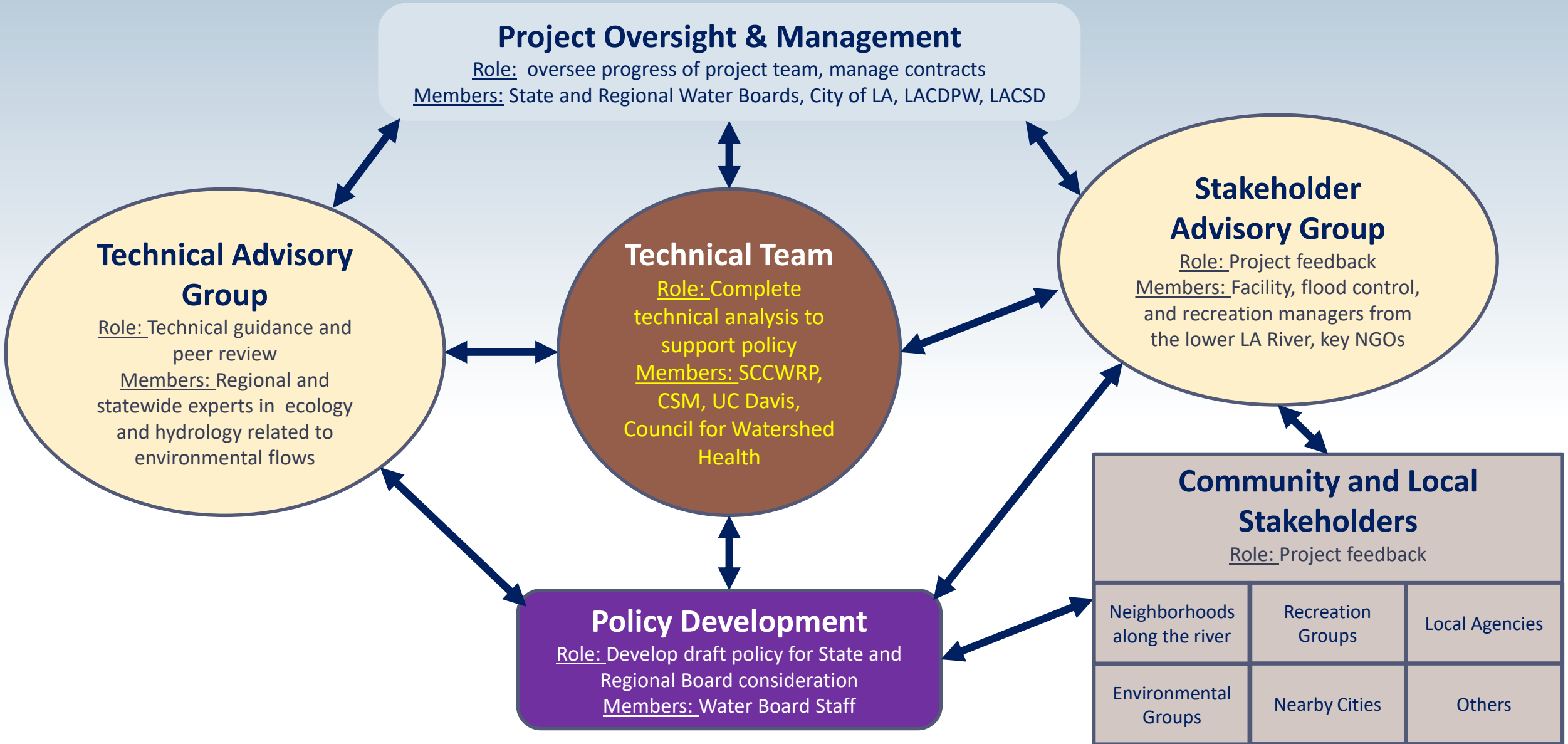
- Provide input on hydrologic modeling approach
  - Coordination with existing modeling efforts
  - Assistance with data sources
- Input and review on ecological modeling approach
  - Review of assumptions about species/habitat uses and groupings
  - Review of habitat-flow relationships
  - Review of conclusions about potential effects
- Input on scenarios and potential mitigation/management approaches
- Review of draft products

Process for TAC Interaction

- Seven quarterly meetings
- Most meetings will be via webinar
  - Is there value/willingness for approximately 2 in-person meetings?
- Email review of interim products
- Review of draft project report
- Potential for summary memo of TAC findings and recommendations??

Is there a need for additional expertise or key individuals on the TAC?

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



HYDROLOGIC MODELING DETAILS

COLORADO SCHOOL OF MINES
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HYDROLOGY & HYDRAULIC MODELING: OVERVIEW, RELEVANT WORK & DATA GAPS

Drs. Terri Hogue, Colin Bell, Nasrin Alamdari, Jordy Wolfand

HOGUE HYDROLOGY GROUP

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									

TAC meetings to occur quarterly

Stakeholder coordination meeting

Action Items and Next Steps

- Compile information on existing modeling efforts
  - Potential follow up survey on modeling directions
- Key hydrologic data needs
  - LIDAR
  - Flow
- Key ecological data needs
  - Habitat mapping
  - Species occurrence data
- Next TAC meeting – APRIL – web-based or in-person?

Questions

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