Establishing Environmental Flows for the Los Angeles River

Technical Advisory Committee Meeting #2 – May 15, 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:

- Discuss priority species and biological modeling approach
- Provide an overview of hydrologic model set up
- Discuss water quality modeling scope and data availability

AGENDA

1. Introductions
2. Project overview
3. Biological assessment
4. Hydrologic modeling
5. Wrap-up, action items and next steps

PROJECT OVERVIEW

Los Angeles River Environmental Flows Project Goals

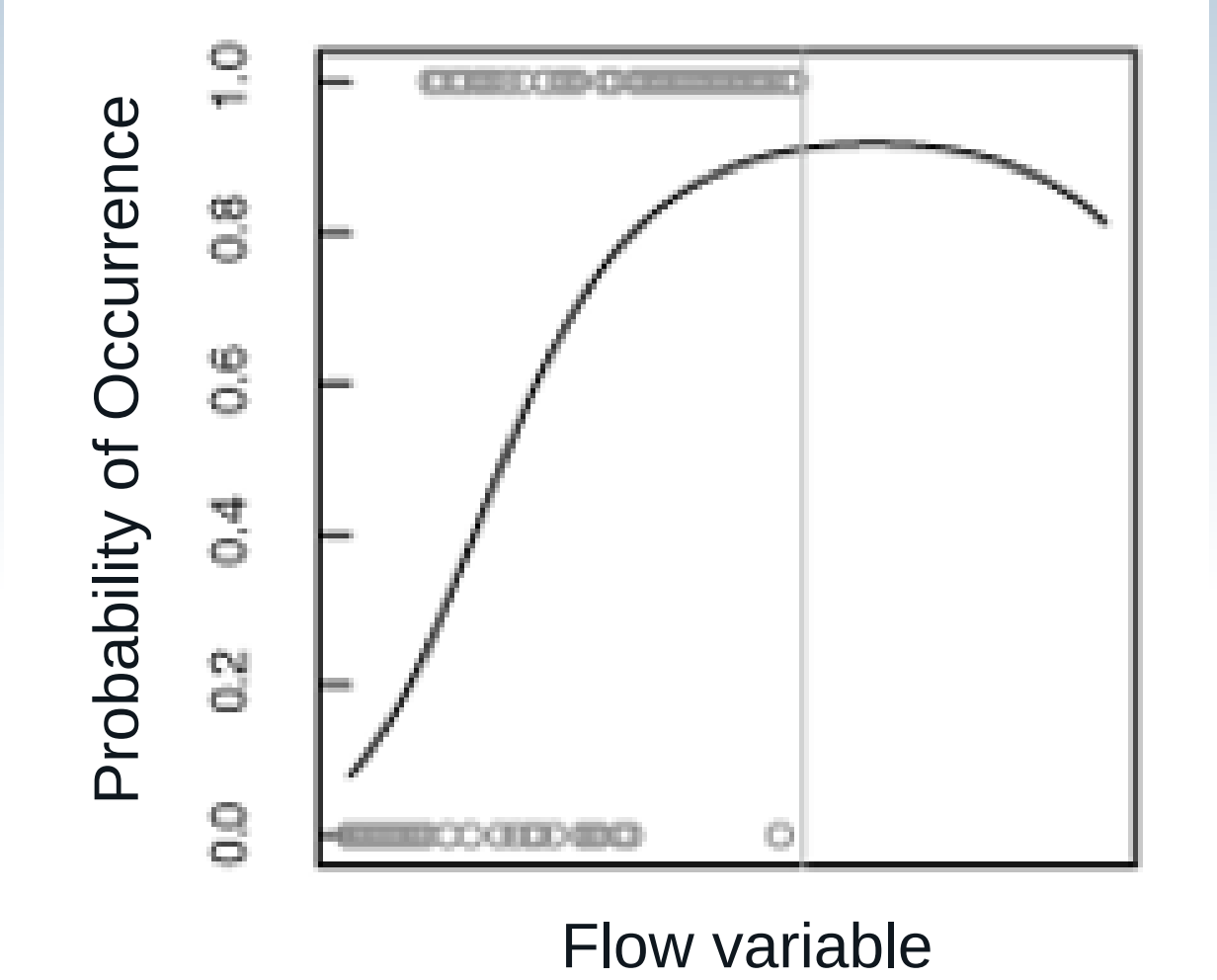
1. Develop technical tools that quantify the relationship between various alternative flow regimes and the extent to which aquatic life and non-aquatic life beneficial uses are achieved

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

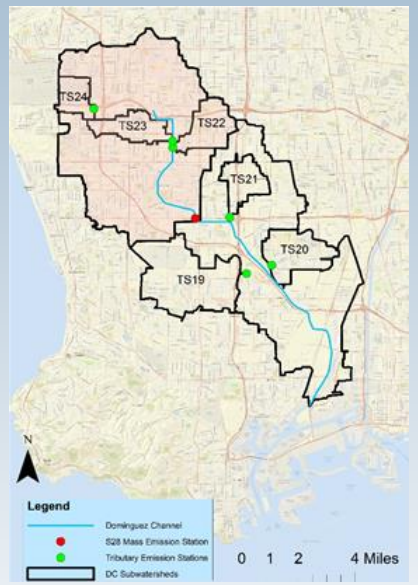
3. Engage multiple affected parties to reach consensus about appropriate flow needs and optimal allocation of flow reduction allowances from multiple WRPs in consideration of other proposed flow management actions

What We Want

- Which species?
- Which habitats?
- What seasons?
- What scenarios?
- What management?



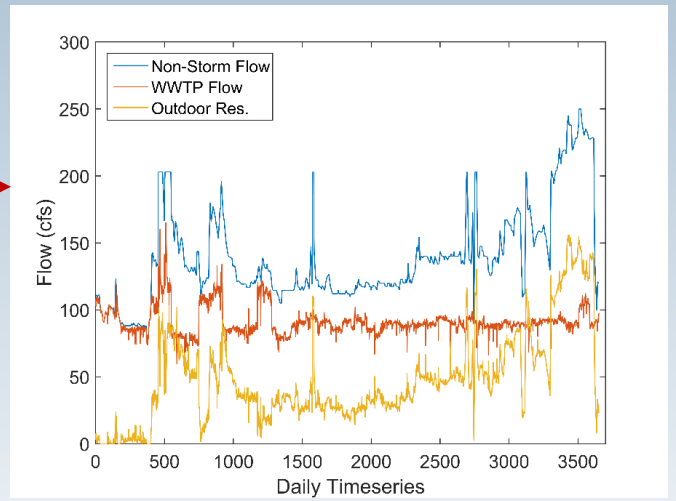
Overall Process for Developing Flow Criteria



Models

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

Scenarios



Time series output

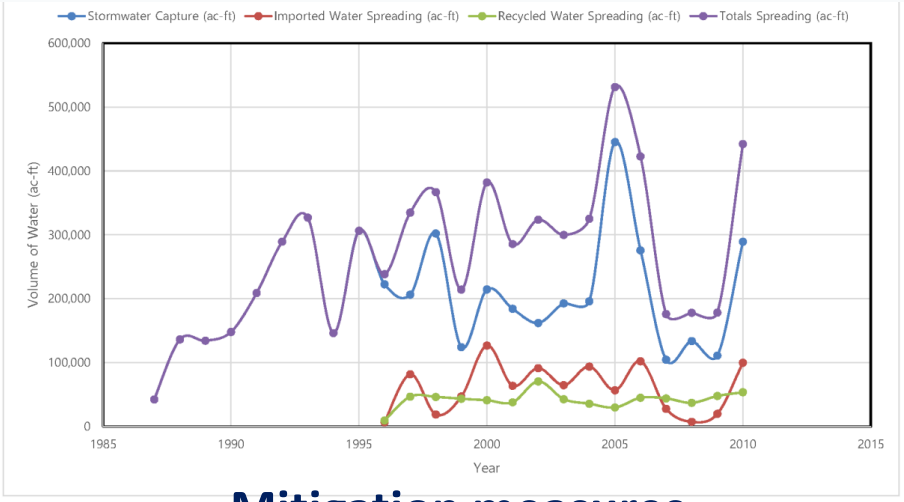
Hydrologic

- 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

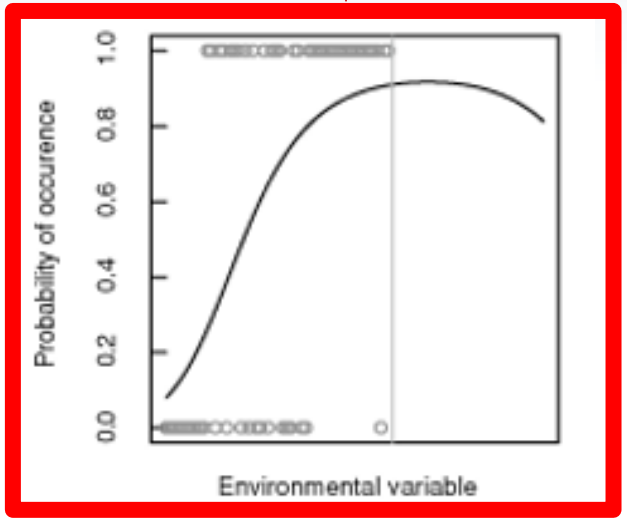
E-flow metrics



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

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

Summary from Last Meeting

- Overview of major project tasks and deliverables
- Roles and expectations of the TAC
- Approach to hydrologic analysis/modeling

Action Items:

- Set up Google Drive information repository
- Compile information on existing modeling efforts
- Key hydrologic data needs
- Key ecological data needs

Work to Date

- ✓ Data compilation (recreational uses, species, habitats, environmental conditions)
- ✓ Mapping of aquatic life and recreational uses by reach
- ✓ Preliminary research to quantify flow-use relationships
- ✓ Initial work to configure the model
- ✓ Held first Technical Advisory Group and Stakeholder Working Group meetings

Today's Meeting

Biology:

- Species/habitat mapping
- Focal species selection
- Modeling approach
  - Mechanistic vs. Statistical

Hydrology:

- Modeling approach
- Model domain and sub-basins/nodes
- Coupling of models
- Water quality model

BIOLOGY

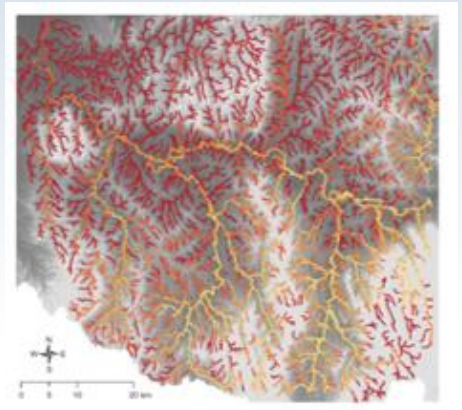
Questions to TAC

- Are we missing any species or habitat data?
- What should be the criteria for selection of the focal species?
- Are there suggestions or comments on the proposed focal species list?
- What is the recommended modeling approach for this study?

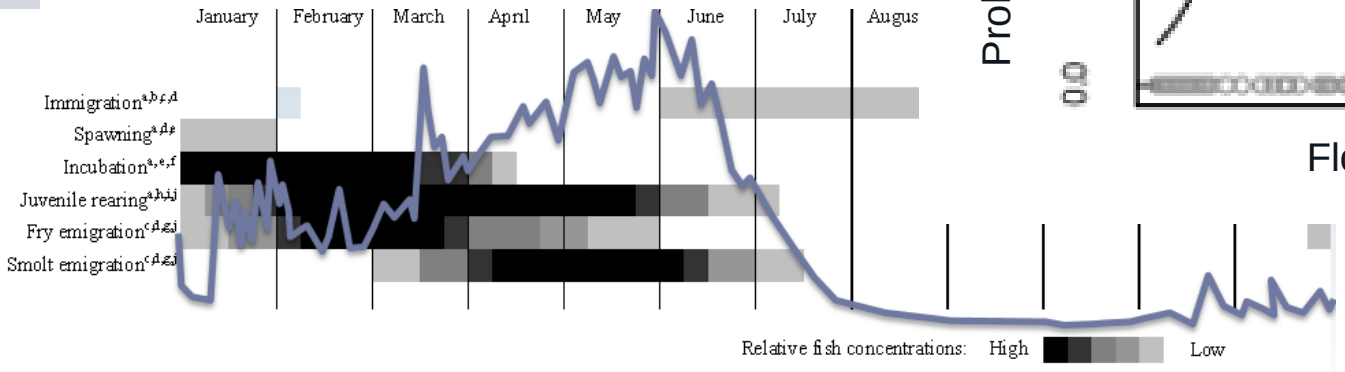
Activity 3 – Aquatic Life Use Assessment:

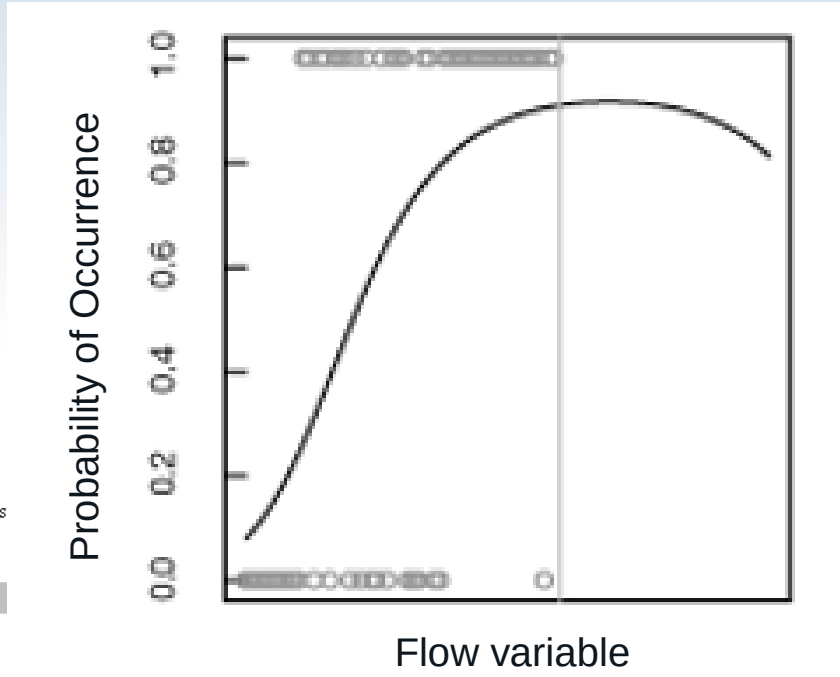
- Choose focal species
- Use existing databases on life history needs
- Augment with additional analysis as needed
- Model relationships between flow needs and probability of occurrence

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

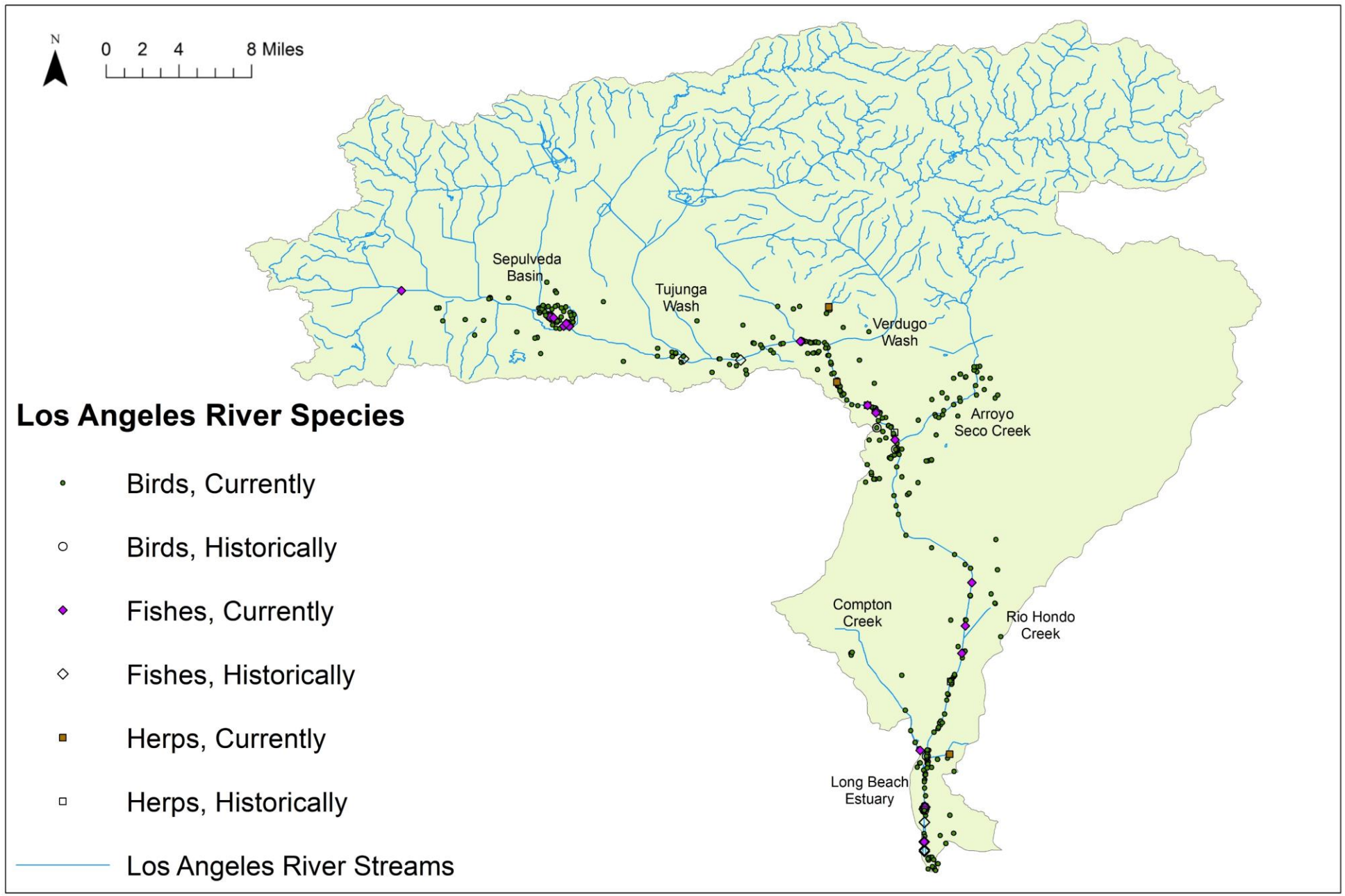


Probability of Occurrence

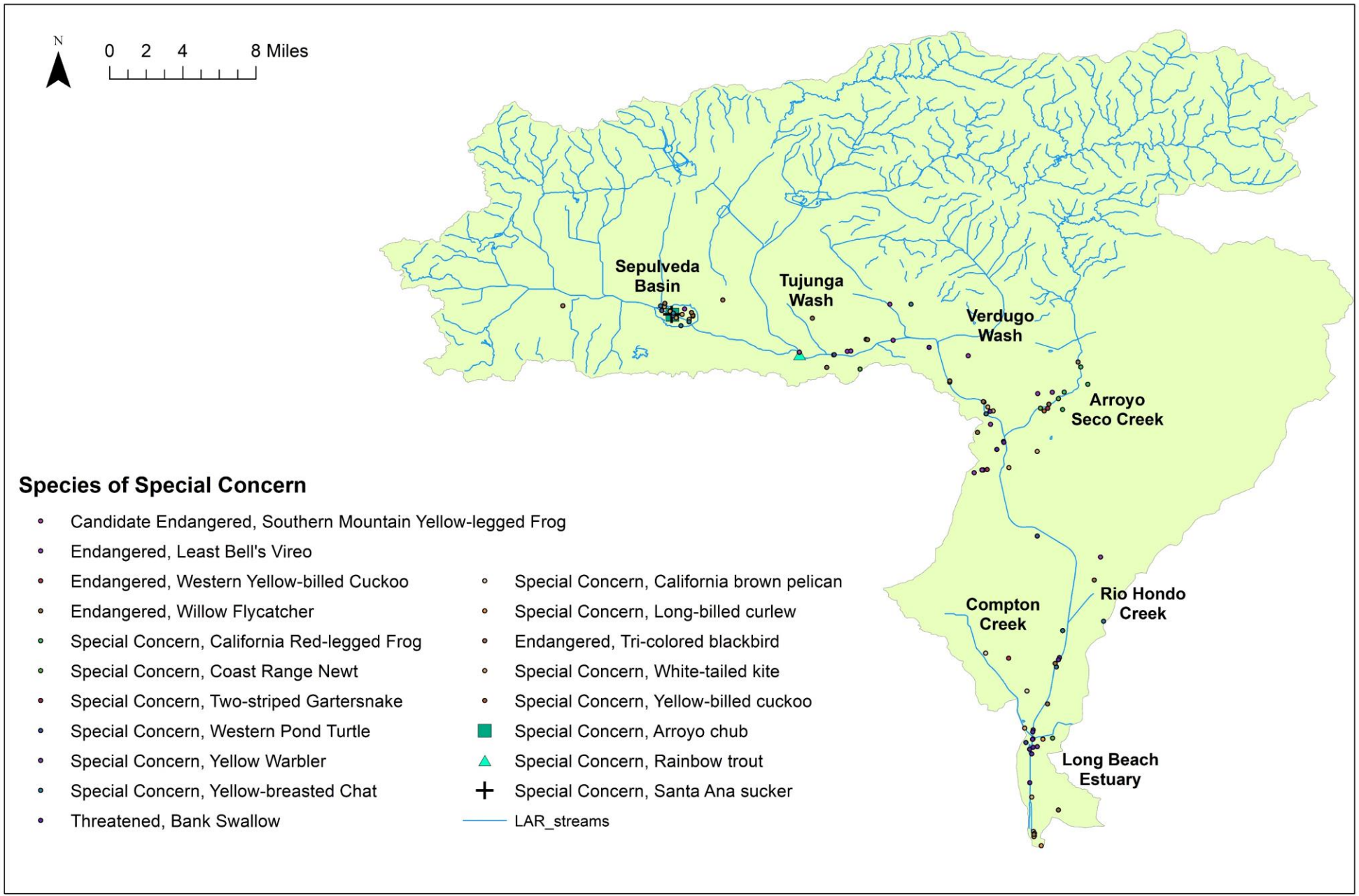




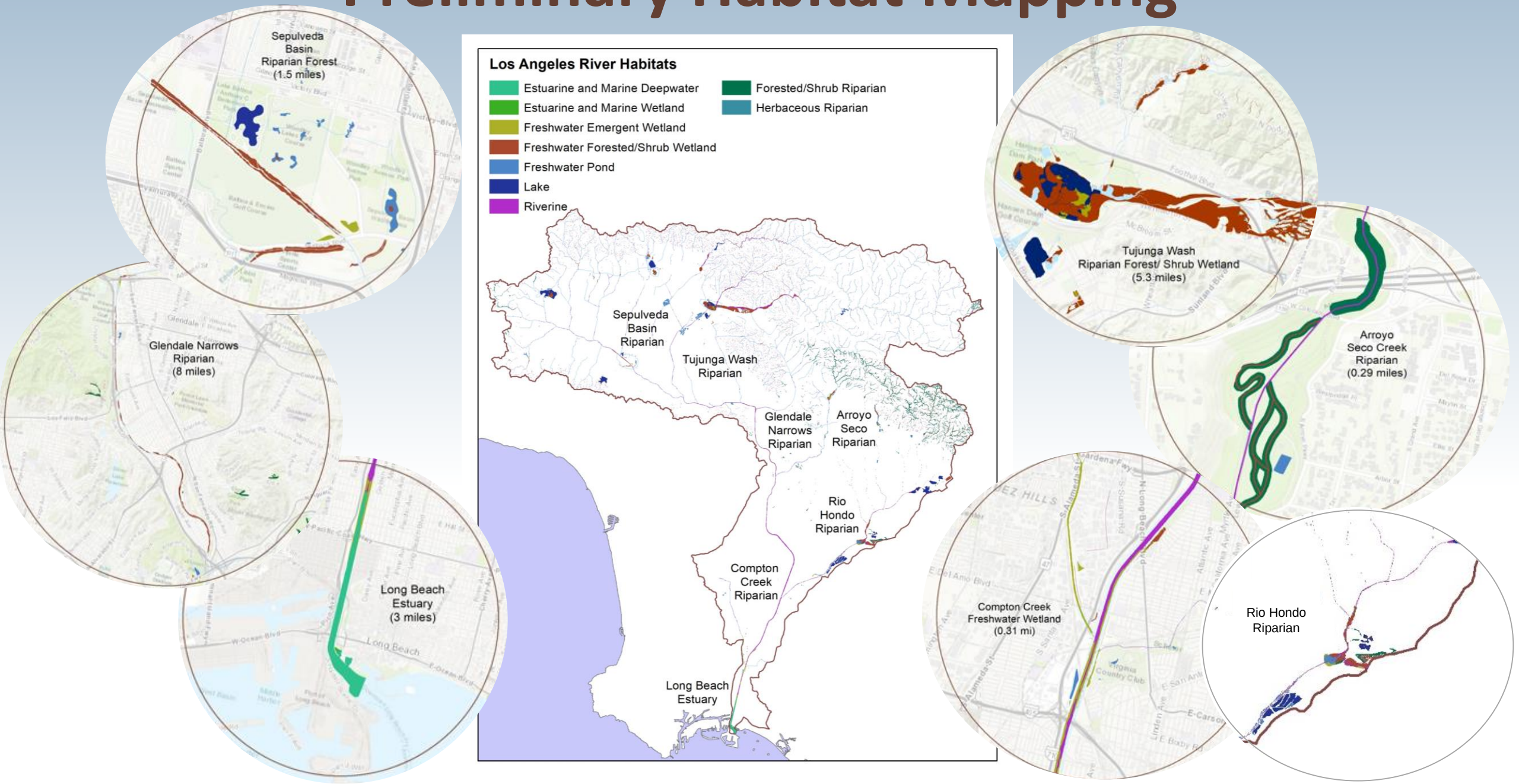
Preliminary Species Mapping



Historic / Current Species Mapping



Preliminary Habitat Mapping



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

POTENTIAL FUTURE SOURCES

- *Study plans & reports from various planning efforts*
- *CDFW fishing records/surveys*
- *Wading shorebird observations & surveys*
- *Others???*

Discussion

Are we missing any species or habitat data?

Selection of Focal Species

- Present or potentially present in the study area
  - Observed within past ten years
- Representative of range of habitat types
- Representative of diversity of species
- Mix of sensitive and more common
- Life history traits fairly well understood
- Dependent on aquatic habitats for key life history stages
- Sensitive to changes in flow, temperature, hydraulics

Goal = select 3-6 focal species

Potential Focal Species

- Arroyo chub
- Tri-colored blackbird
- Least bells' vireo
- Western pond turtle
- Western toad
- Black crowned night heron
- Black necked stilt
- Long-billed dowitcher
- **Other suggestions**

Life History Needs

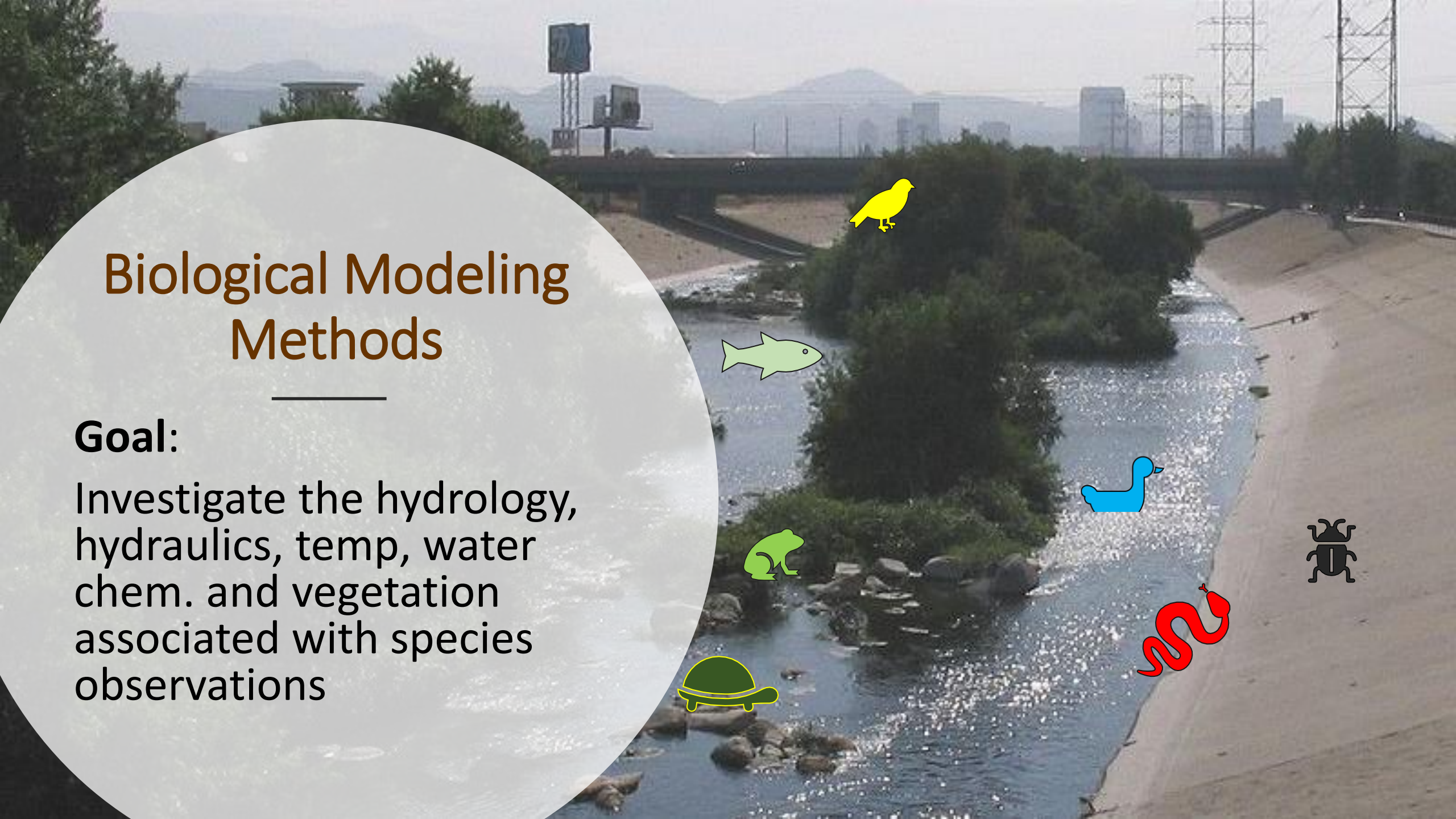
Arroyo chub

Life History	Requirements	Negative Stressor	Reference
Spawning	• Feb-Aug (June-July mostly) • Quiet edge waters or pool • 14-22°C		Tres 1992 cited by Moyle 2002
Fry	• Quiet edge waters with no-slight flow • Aquatic vegetation		Freeney and Swift 2008 Moyle 2002
Juvenile	• Quiet edge waters • Aquatic vegetation • 0.5%-2.5% gradient		Moyle 2002 Freeney and Swift 2008
Adult	• 10-24°C • Slow-moving streams or backwater/ponded sections • 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	• Very high flows • Extended dry periods • (but generally adapted stream flow fluctuations)	Wells and Diana 1975, Bell 1978 cited in Moyle 2002 Freeney and Swift 2008 O'Brien, Hansen & Stephens (2011)

Biological Modeling Methods

Goal:

Investigate the hydrology, hydraulics, temp, water chem. and vegetation associated with species observations



Modeling Approaches

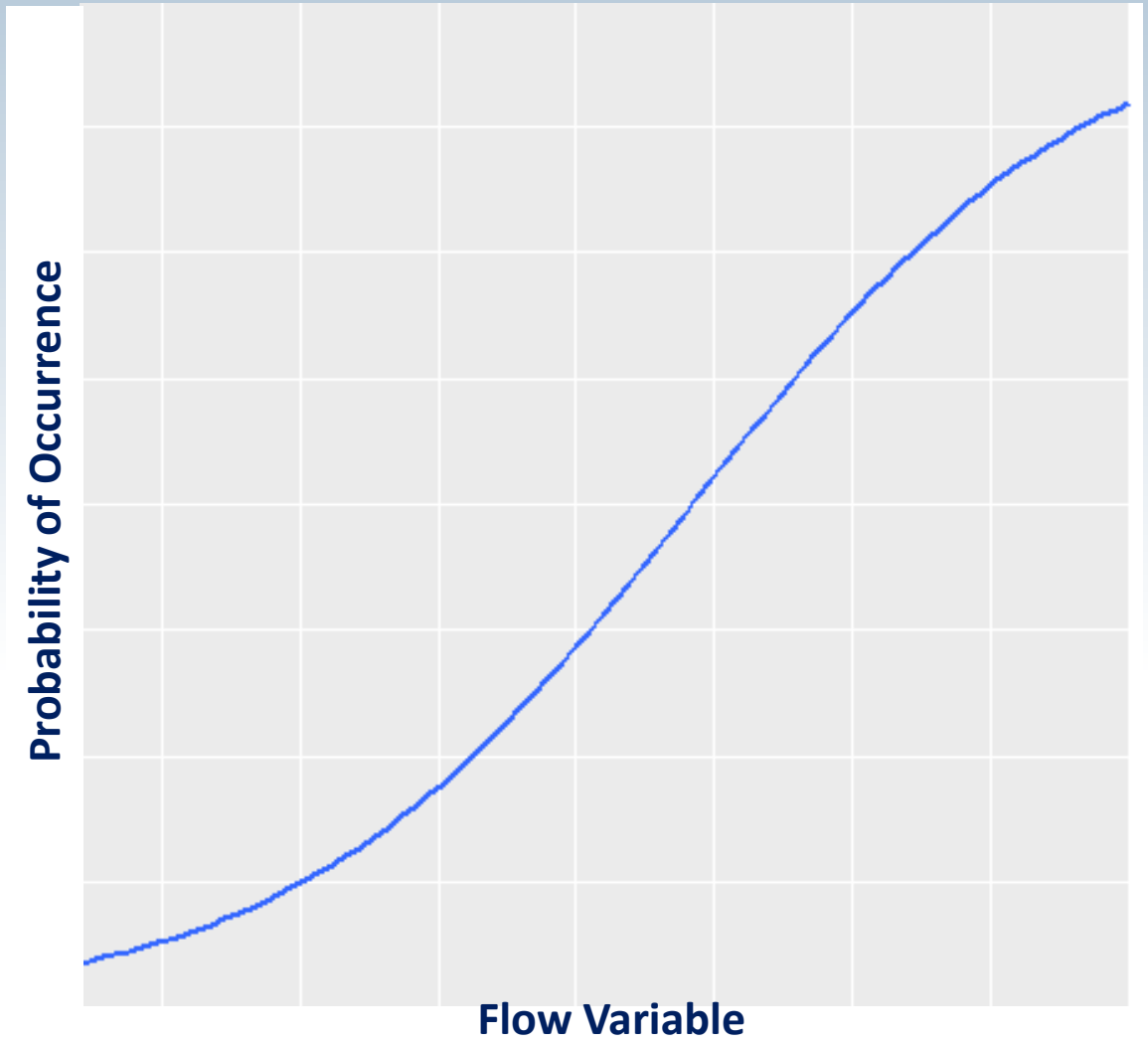
- Statistical methods vs mechanistic methods
- What is the recommended modeling approach?

Statistical Models

Based on correlations between environmental variable and **observed** presences or absence of species

- **Data driven** analysis
- Provides a way to predict probability of occurrence over **large spatial scales**
- Development of the models requires **high data density**
- Limited to the variables used in the statistical analysis
- **Scenario analysis is more constrained** than for mechanistic models

Statistical Models



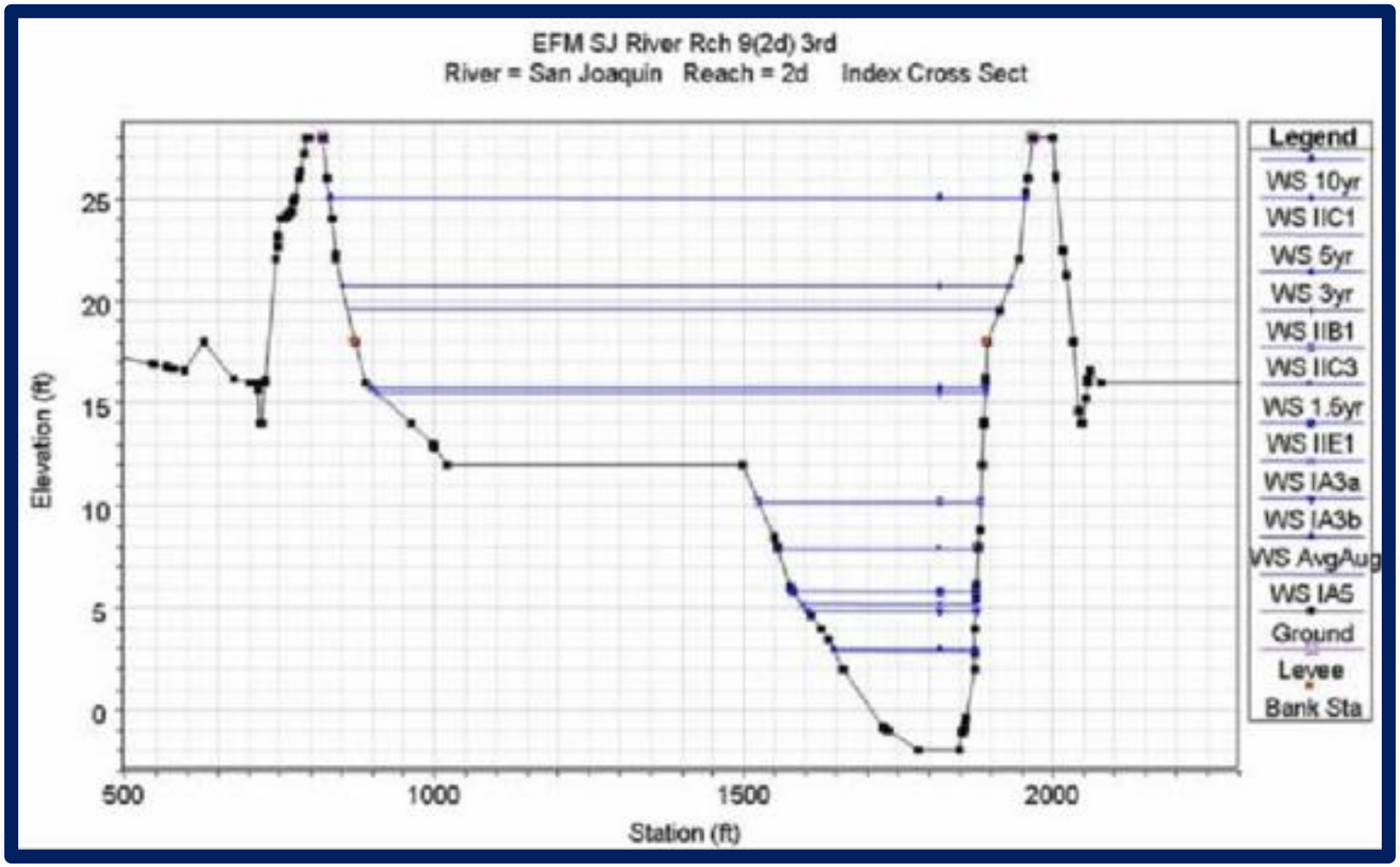
Mechanistic Models

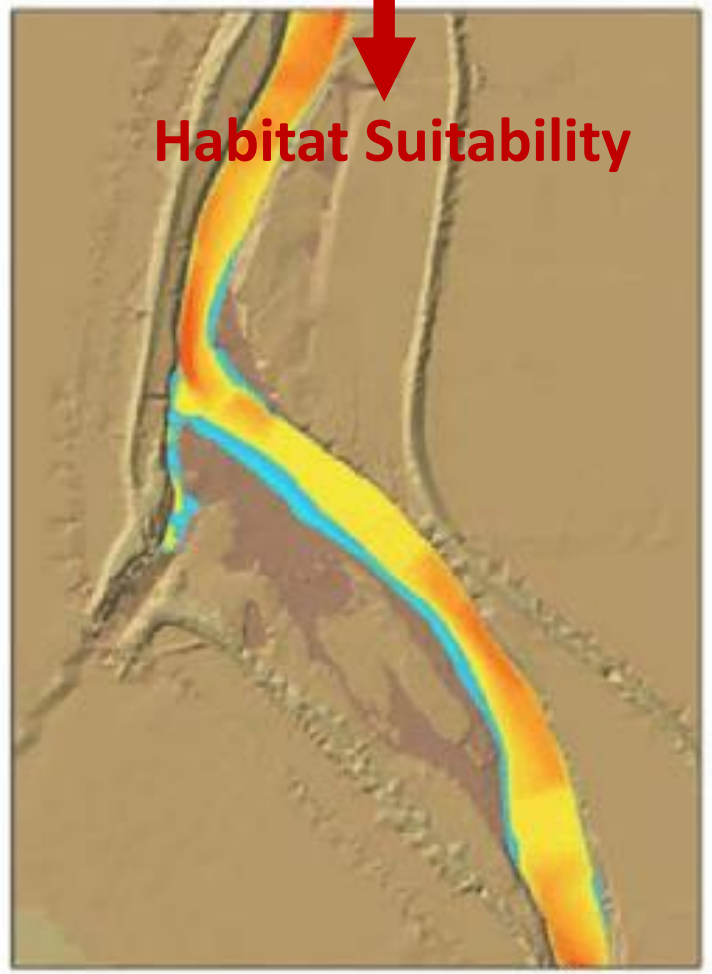
Based on “rules” or “algorithms” that relate physical properties to specific life history requirements/needs

- Allows for consideration of a **broader set of variables** than statistical models, and **interactions between variables**
- Less dependent on high data density of observations
- Responses are more **directly linked to ecology** of the species
- Only as good as the underlying “rules”
  - Often include assumptions that physical-ecological relationships are consistent across locations
- **Scenario analysis is less constrained** than for statistical models

HEC-EFM

HEC-RAS Output → **Biological Rules/Algorithms**





Statistical vs Mechanistic

	Statistical	Mechanistic
Spatial coverage	Regional, broad	Local, site specific
Ability to account for multiple variables?	✘	✓
Data requirements on spp occurrence?	High	Low
Data requirements on life history needs?	Low	High
Easier to validate?	✓	✘
Ability to model scenarios?	✘	✓

What is the recommended modeling approach?

HYDROLOGIC & HYDRAULIC MODELING

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HYDROLOGIC & HYDRAULIC MODELING

Drs. Terri Hogue, Colin Bell, Jordy Wolfand, Nasrin Alamdari
Incoming MS student: Victoria Hennon
Incoming Postdoc: Dr. Reza Abdi

HOGUE HYDROLOGY GROUP

Action Items and Next Steps

- Compile species life history information
  - Existing databases, reports, literature
- Key hydrologic data needs
  - WRP timeseries
  - HEC-RAS model
- Key water quality data needs
  - Temperature, metals, TSS, specific conductance
  - *CECs and DOC?*
- Next TAC meeting – **late Aug/early Sept** – web-based or in-person?

Questions

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Activity / Sub-Task	Products	2018	2019				2020			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Activity 1 - Stakeholder coordination										
Stakeholder Advisory Group (SAG) Meetings	Charter, needs assessment, meeting notes		S1		S2		S3		S4	
Technical Advisory Committee (TAC) Meetings	Meeting notes, feedback		T1	T2	T3	T4	T5	T6	T7	
Activity 2 - Non-aquatic Life Use Assessment										
2A Characterize non-aquatic life uses	Map of NAL uses/indicators by reach									
2B Determine flow use relationships	Flow-use relationships & targets									
Activity 3 - Aquatic Life Beneficial Use Assessment										
3A Asses hydrologic baseline condition	Baseline hydrology/data gaps									
3B Identify priority ecological endpoints	List of priority endpoints, data summary									
3C Determine flow ecology relationships for stream endpoints	Flow eco models/targets by reach for BMI & verts									
3D Determine flow ecology relationships for marsh/estuary	Flow eco models/targets for marsh/est habitats									
Activitiy 4 - Apply Environmental Flows and Evaluate Scenarios										
4A Update hydrologic modeling	Hydro & hydraulic models of LAR									
4B Analyze tolerances to flow modifications	Flow tolerance ranges for riparian hab, BMI, verts									
4C Analyze wastewater reuse scenarios	Map wastewater reuse scenario effects on uses									
4D Evaluate stormwater management scenarios	Map of stormwater/wastewater scenarios effects									
4E Evaluate groundwater interaction scenarios	Map of groundwater/wastewater scenarios effects									
4F Evaluate habitat restoration effects	List of potential hab rest projs and map of uses									
4G Evaluate flow alteration effects on tidal portion of LA River	Map of scenario effects on tidal portion of LAR									
4H Establish recommended flow criteria	Recommended flow criteria by reach & season									
Activity 5 - Monitoring and Adaptive Mangement Plan	Proposed monitoring strategy									
Activity 6 - Summary of results/reporting	Draft and final project report									

Activity 3 – Aquatic Life Use Assessment:

Potential Product of Flow Ecology Assessment

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

		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