Establishing Environmental Flows for the Los Angeles River

Stakeholder Workgroup Meeting #4
March 25, 2021

SCCWRP Established 1969

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

Council for Watershed Health

COLORADO SCHOOL OF MINES
EARTH • ENERGY • ENVIRONMENT

LA River's Changing Water Use Practices

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?

LA River Environmental Flows Project Goals

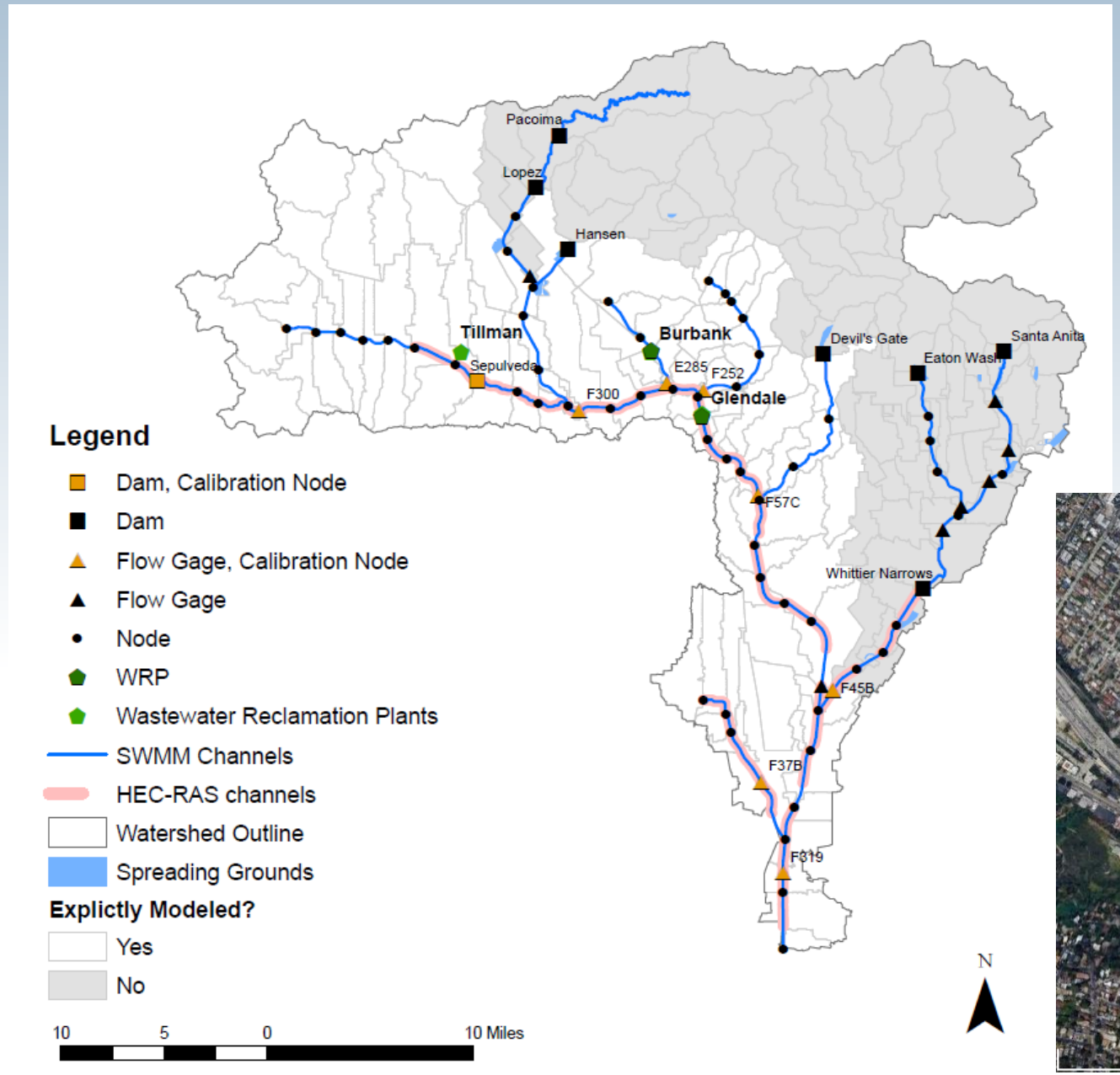
1. Develop technical tools that quantify the relationship between various flow regimes and the extent to which aquatic life and non-aquatic life beneficial uses are achieved

2. Engage affected parties to reach consensus about appropriate flow needs and optimal allocation of flow reduction allowances from multiple wastewater reclamation plants, in consideration of other proposed flow management actions

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

4. Support the State Water Resource Control Board's decision-making under Water Code Section 1211.

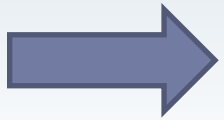
Analysis Domain



Anticipated Products and Outcomes

Products

- Process for establishing flow criteria
- Application of process to develop potential flow criteria for LA River
- Tools to evaluate management scenarios necessary to achieve criteria



Outcomes

- Determination of beneficial use attainment
- Implementation plan/strategy
  - Monitoring
  - Adaptive management
- Roadmap for application to other areas

Key Assumptions

- Goal is to evaluate potential effects of changes in discharge on existing beneficial uses
  - Tools can be used to evaluate restoration of future uses, but that is not the primary objective of this study
- Assume that the physical structure of the channel remains as-is
  - Implications of channel modifications could be explored during a later phase
- “Optimal flow” recommendation are derived based on overlap of flow needs for different beneficial uses
  - “Optimal flows” do NOT constitute a regulatory recommendation
- Resolution of “recommendations” typically limited by model resolution

Where Are We in the Process?

Activity 1: Stakeholder Coordination

↓

Activity 2: Non-aquatic life use assessment

↓

Activity 3: Aquatic life use assessment

↓

Activity 4: Assess effects of flow modification/management

↓

Activity 5: Monitoring and Adaptive Management

Future Work

- Evaluate water quality implications
- Environmental restoration
- Develop user friendly tools

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

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT

Applying next-generation science to aquatic ecosystems management

A PUBLIC AGENCY

Research Areas

Bioassessment Ecohydrology Eutrophication
Climate Change Sediment Quality Emerging Contaminants
Microbial Water Quality Regional Monitoring

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

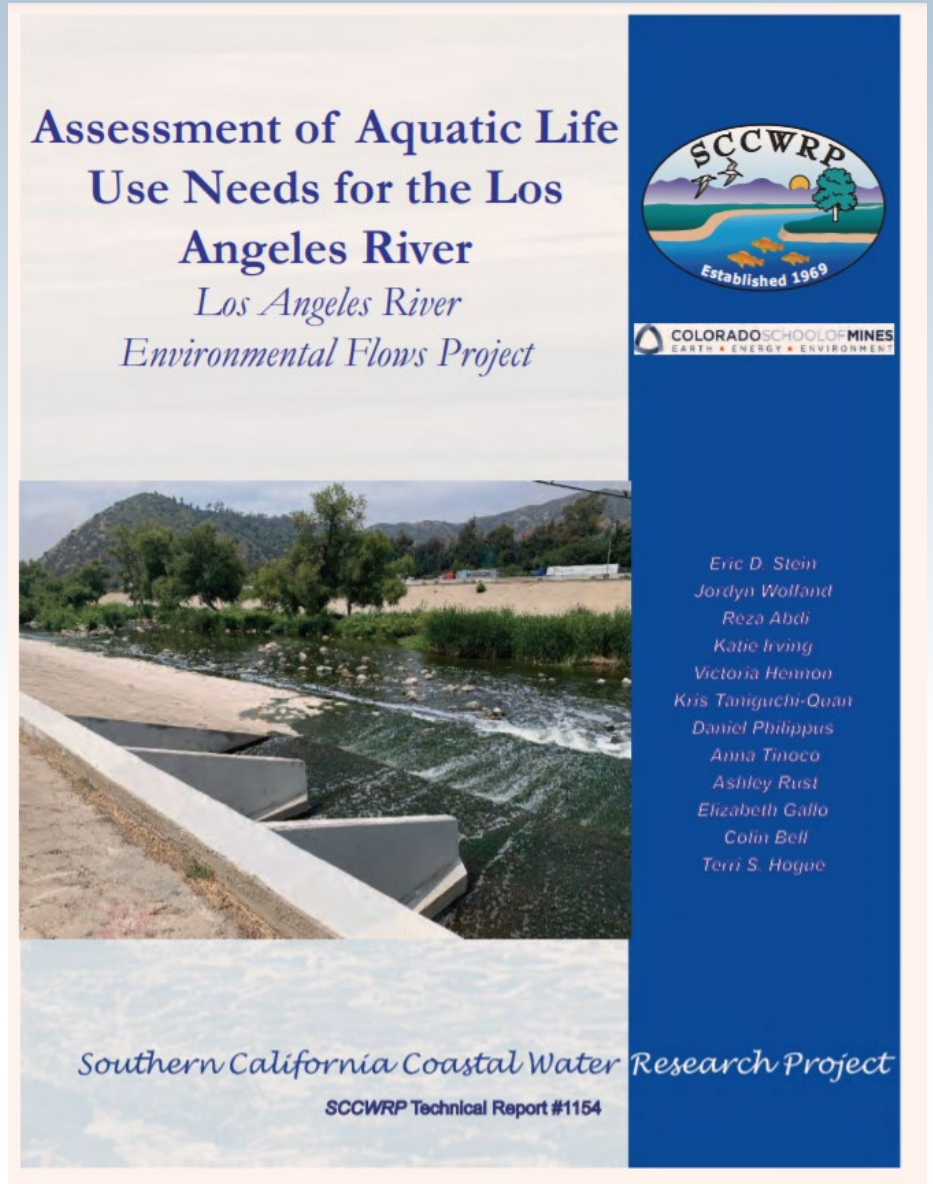
Ecohydrology Research Plan
Ecohydrology

- Progress reports
- Technical reports
- Outreach materials
- TAC meeting materials
- Stakeholder meeting materials

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

Current Conditions Report - Completed

- Hydrologic, hydraulic, and biologic models are complete
- Current conditions report revisions are complete
- Developed preliminary flow recommendations and sensitivity curves
- **Thank you for your input!**



https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1154_LARiverAquaticLifeUses.pdf

Species & Habitats

Habitat	End member species	Description
Cold water habitat	Santa Ana Sucker	Not currently present
	Unarmored threespine stickleback	
Migration habitat	Steelhead/Rainbow trout	Currently, only designated for Reach 1 Overlays with other habitats
Wading shorebird habitat	Cladophora spp	Green algae to support prey of wading birds
Freshwater marsh habitat	Typha	
	Duckweed	
Riparian habitat	Black Willow	
Warm water habitat	African clawed frog	Surrogate for invasive spp. Habitat
	Mosquitofish	

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

Key recreational uses (e.g. kayaking, fishing, wading)

Los Angeles River Watershed

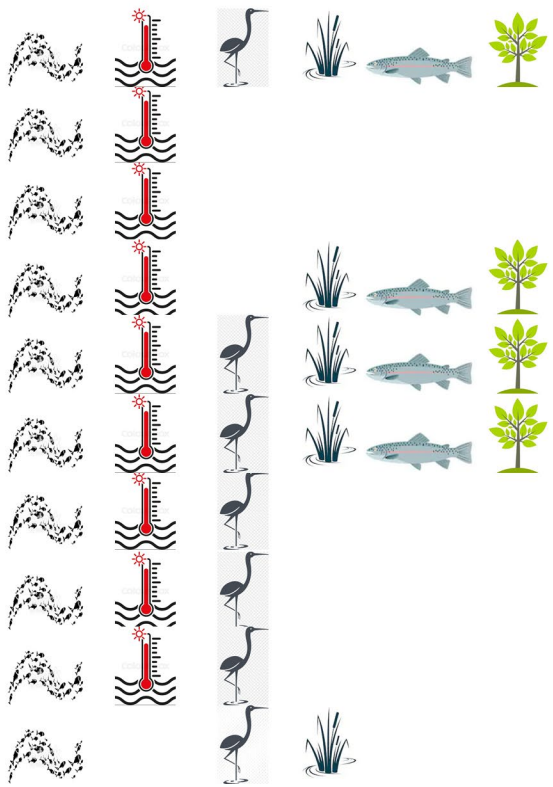
■ Dams ▲ WRP — Tribs Outside Study Area ■ Spreading Grounds (SG)

Habitat

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

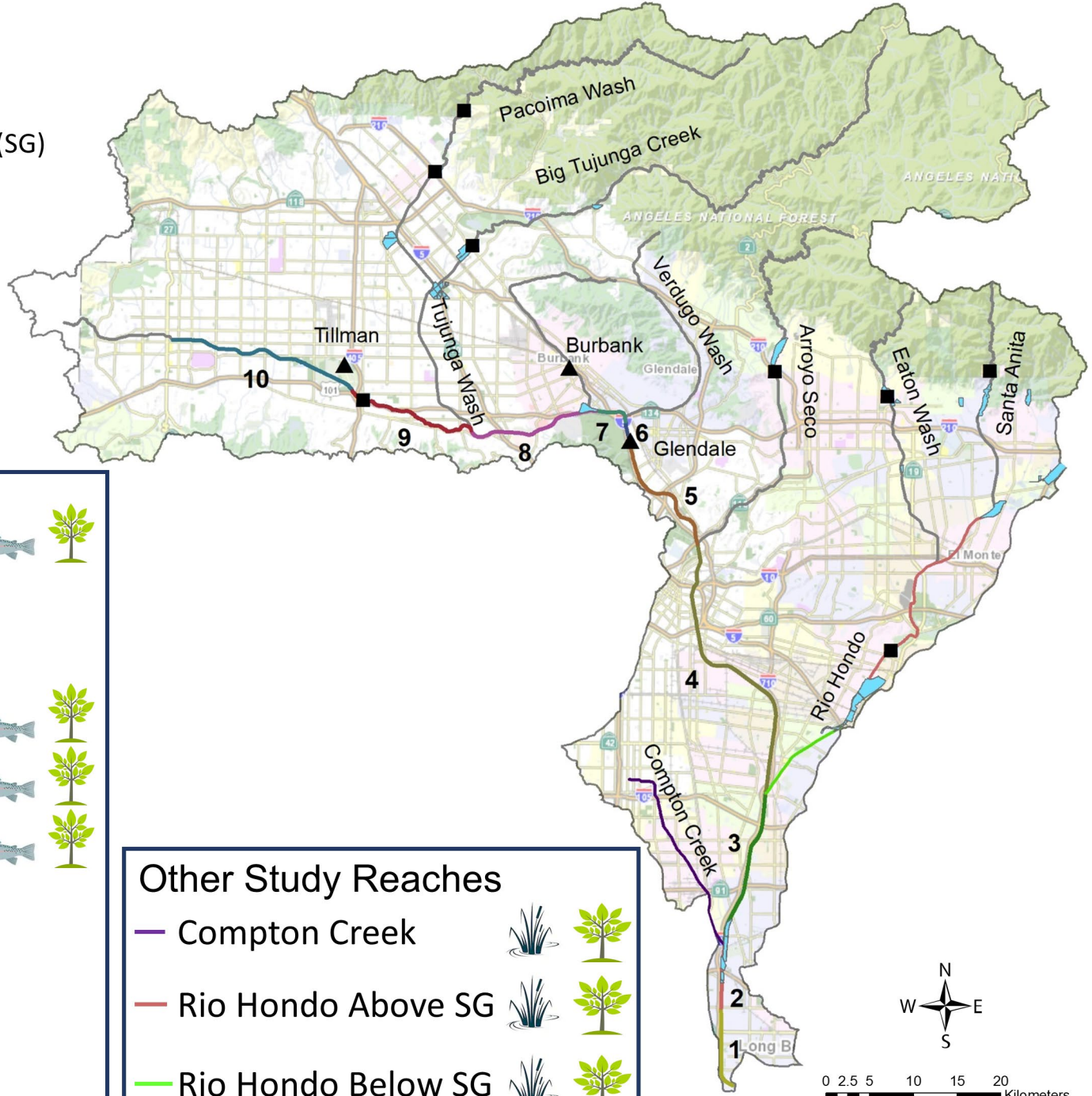
Study Reaches

- 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

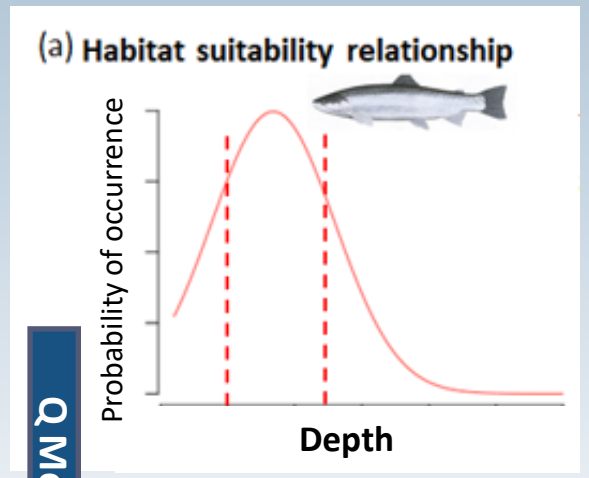


Other Study Reaches

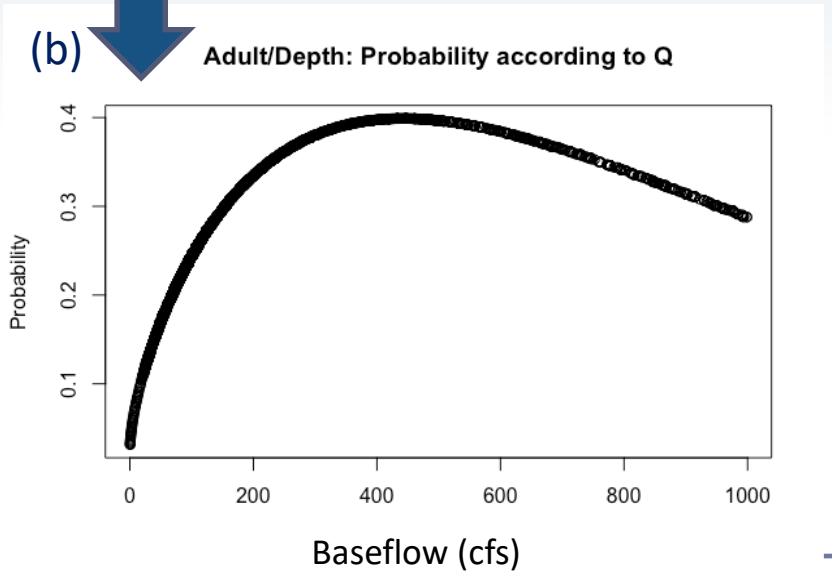
- Compton Creek
- Rio Hondo Above SG
- Rio Hondo Below SG



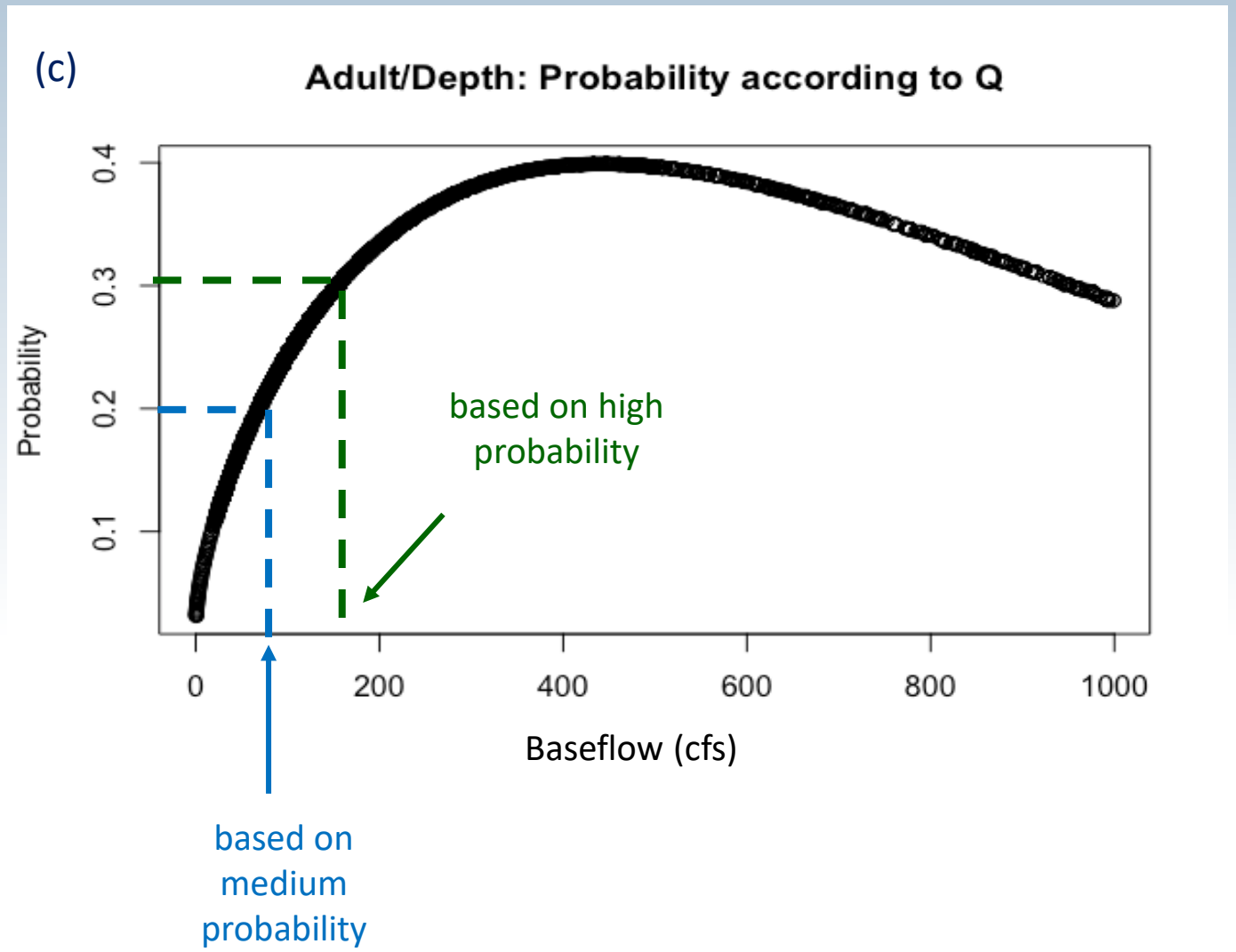
Process for Determining Flow Ranges



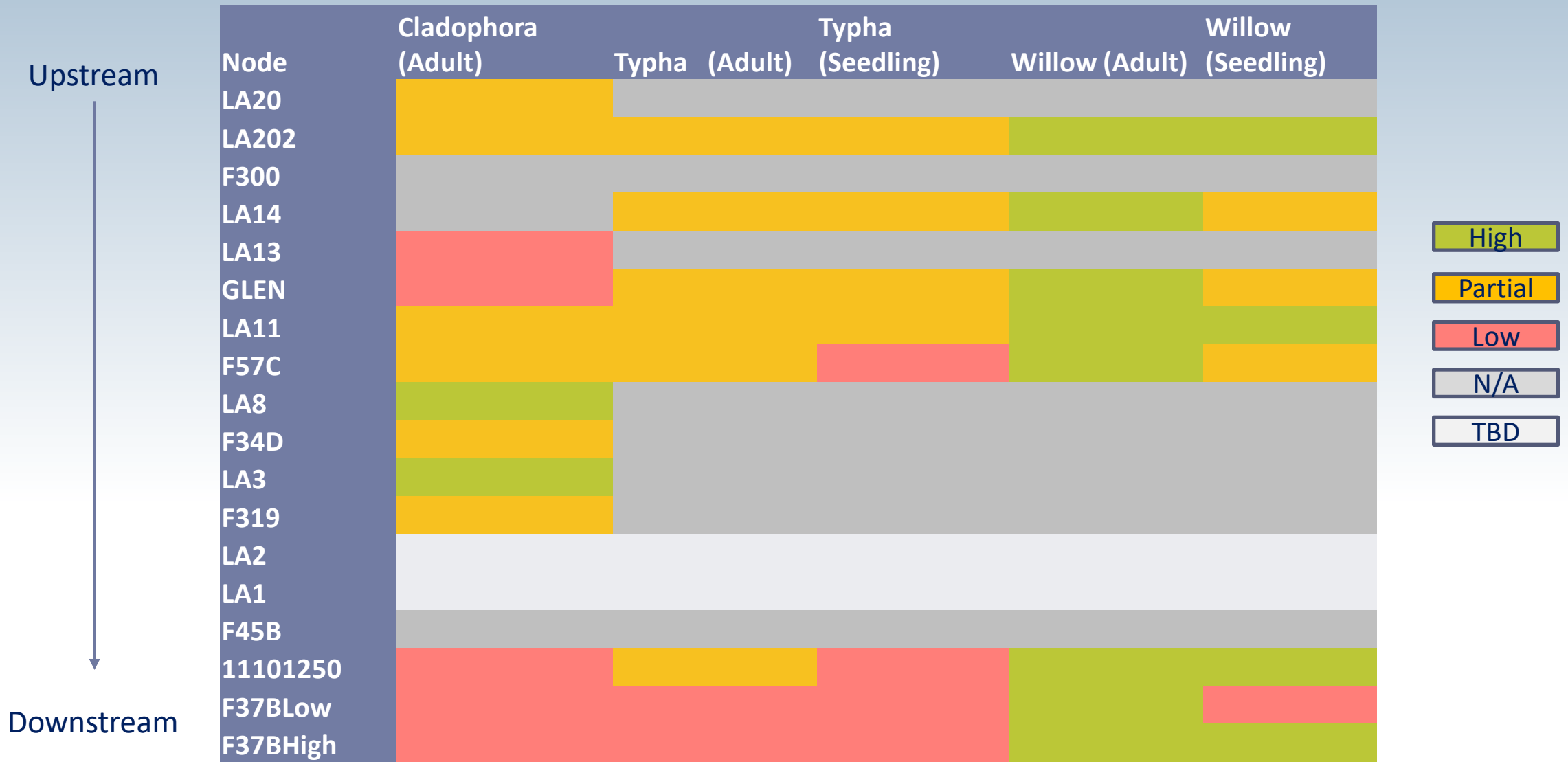
Q Models



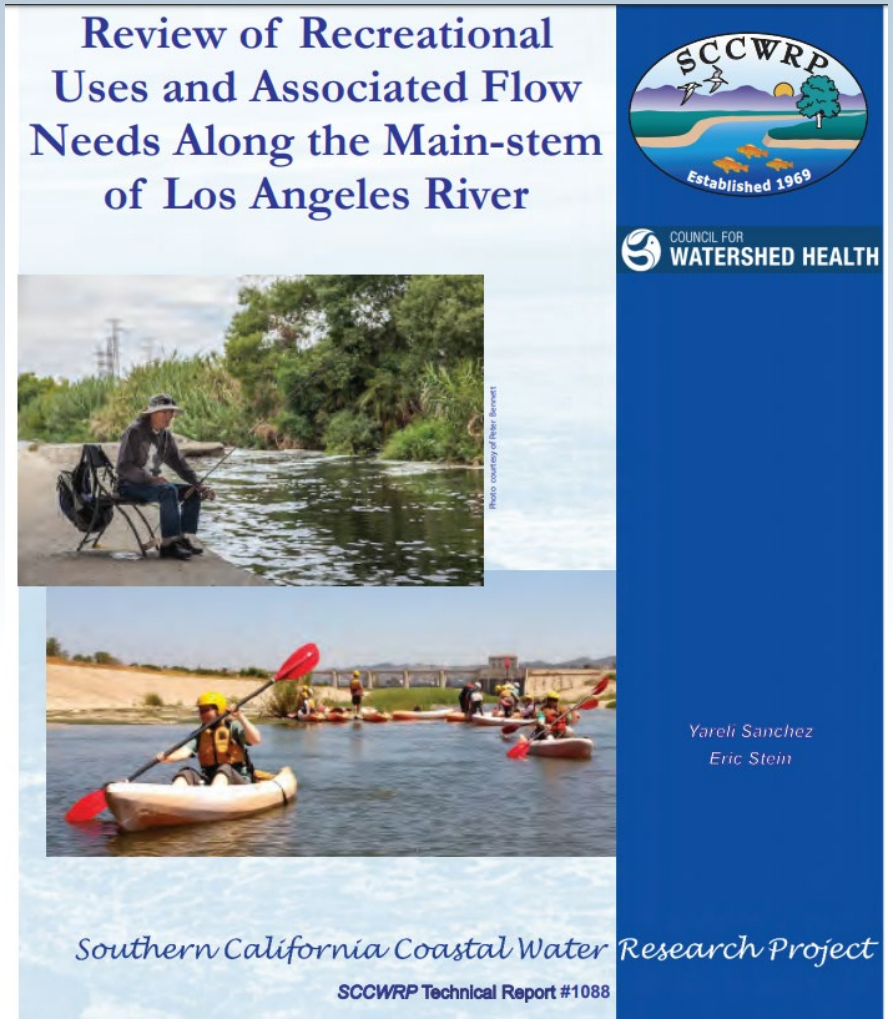
Flow Recommendations



Existing Conditions (Suitability)

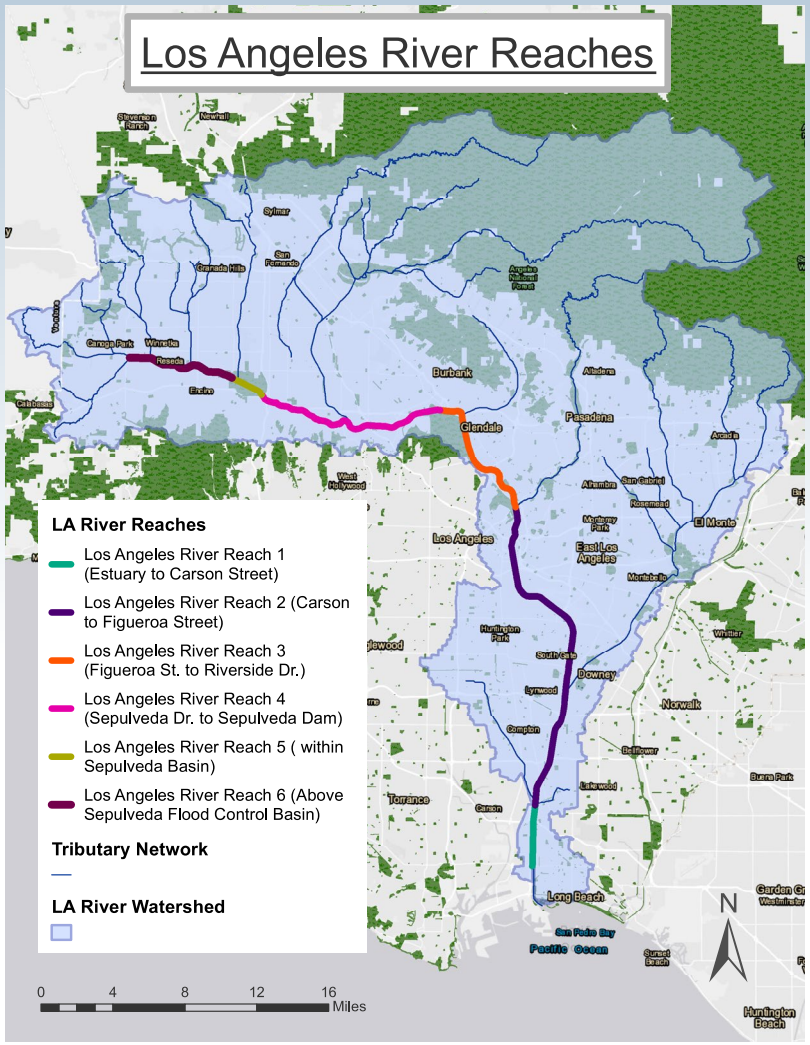


Recreational Use Survey



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



Big Picture

- We have developed a large set of candidate flow recommendations
- The ultimate flow management targets will depend on a series of choices about priority species, habitats, seasons, locations, etc.
- We have developed a process to help select desired flow management targets
- We have also developed tools to help evaluate the potential effects of scenarios of flow reduction on beneficial use indicators
- Managers can use these tools to develop and evaluate proposed changes in discharge to the LAR

Key Questions

1. What are the optimal flow ranges to support beneficial uses?

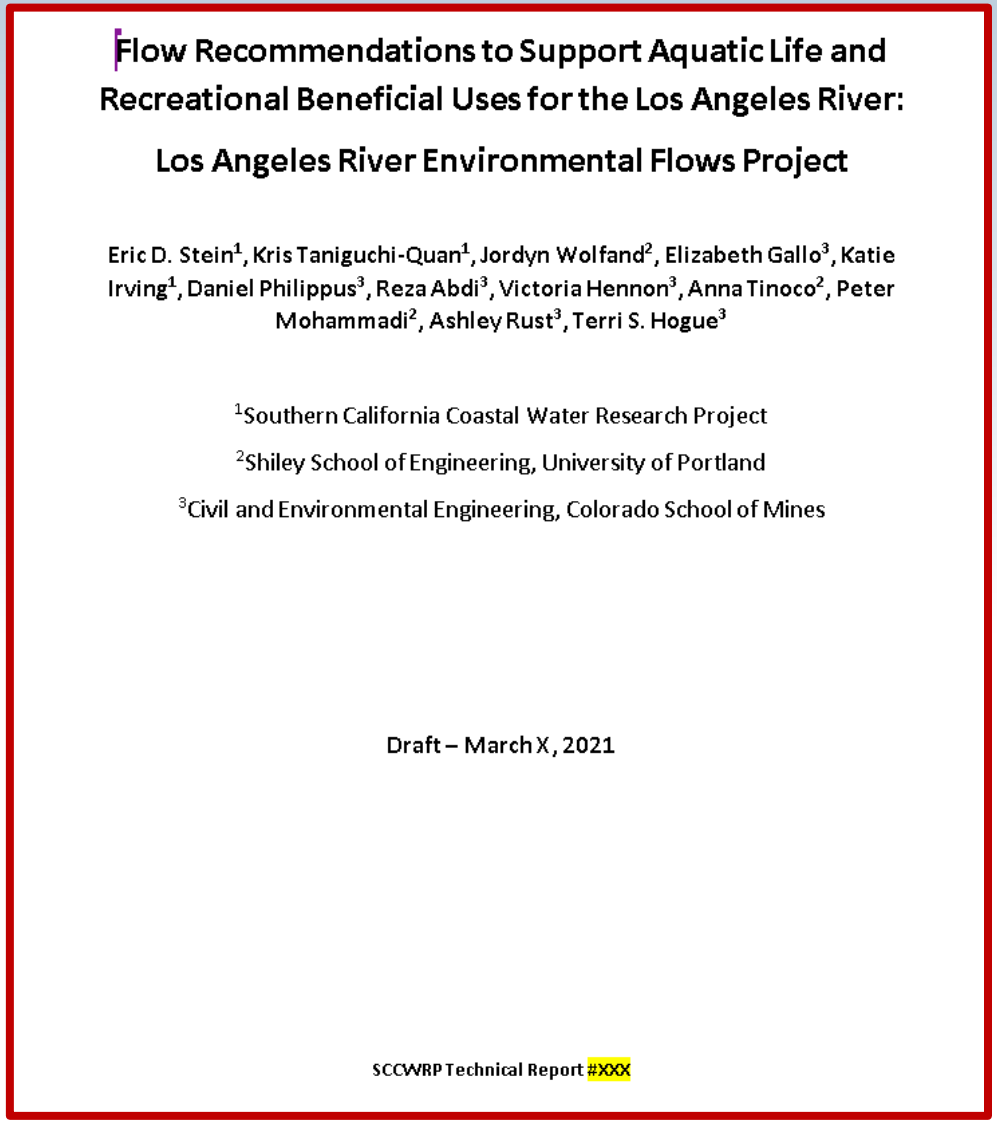
2. How much can WRP discharge or stormdrain discharge be reduced to meet optimal flow ranges?

3. What scenarios can be used to meet optimal flow ranges?

Flow Recommendations Report – Current Status

Comments Requested by April 2nd

- Hydraulic model updates
  - Tidal reach and Sepulveda Basin
- Methods to describe approach to scenario analysis
  - WRP scenarios
  - Stormwater/Stormdrain scenarios
- Recommended flow ranges for focal species and recreational uses
- Effect of reduced discharge on ability to support beneficial uses



Flow Recommendations to Support Aquatic Life and Recreational Beneficial Uses for the Los Angeles River:

Los Angeles River Environmental Flows Project

Eric D. Stein[1], Kris Taniguchi-Quan[1], Jordyn Wolfand[2], Elizabeth Gallo[3], Katie Irving[1], Daniel Philippus[3], Reza Abdi[3], Victoria Hennon[3], Anna Tinoco[2], Peter Mohammadi[2], Ashley Rust[3], Terri S. Hogue[3]

[1]Southern California Coastal Water Research Project

[2]Shiley School of Engineering, University of Portland

[3]Civil and Environmental Engineering, Colorado School of Mines

Draft – March X, 2021

SCCWRP Technical Report #XXX

What is the Intent of Providing Flow Recommendations?

- Identify flow ranges necessary to support different beneficial uses (e.g., recreation, aquatic life use)
  - Providing sufficient flows does not ensure that the use will be supported; there may be other influencing factors
  - There may be tradeoffs between the ability to support different uses
- Provide basis for evaluating potential effects of changes in flow on beneficial uses
  - Support development of proposed management scenarios
  - Support evaluation of proposed management scenarios
  - Support planning for future restoration or enhancement actions
- NOT intended to be used as definitive targets or requirements

Sample Flow Recommendations Table

Species (habitat)	Life Stage	Node	Reaches	Current suitability	Critical Cross section position	Current flow range (cfs)	Summer Baseflow Magnitude (cfs, Medium Probability) Threshold limit	Summer Baseflow Magnitude (cfs, High Probability)	duration	timing
Willow (riparian birds)	growth	LA20 2	LAR 10 - Upstream Reach	High	Overbank	29-37	1-1646	1-1502	April-September	April
Willow (riparian birds)	growth	LA14	LAR 7 - Below Burbank	Partial	Overbank	59-73	8-841	8-655	April-September	April
Willow (riparian birds)	growth	GLEN		Partial	Overbank	72-89	23-595	23-256	April-September	April
Willow (riparian birds)	growth	LA11	LAR 5 - Glendale Narrows	High	Overbank	73-91	25-844	25-666	April-September	April
Willow (riparian birds)	growth	F57C		Partial	Overbank	74-92	26-91	26-42	April-September	April
Willow (riparian birds)	growth	11101250	Rio Hondo 2 - Above Spreading Grounds	High	Overbank	0.4-1.5	1-487	1-269	April-September	April
Willow (riparian birds)	growth	F37B Low	Compton Creek	Low	Overbank	0-0	10-114	10-86	April-September	April
							Threshold limit			
Willow (riparian birds)	adult	LA20_2	LAR 10 - Upstream Reach	High	Overbank	29-37	1-28466		Annual	Annual
Willow (riparian birds)	adult	LA14	LAR 7 - Below Burbank	High	Overbank	59-73	8-39231		Annual	Annual
Willow (riparian birds)	adult	GLEN		High	Overbank	72-89	23-40590		Annual	Annual
Willow (riparian birds)	adult	LA11	LAR 5 - Glendale Narrows	High	Overbank	73-91	25-40888		Annual	Annual
Willow (riparian birds)	adult	F57C		High	Overbank	74-92	26-41750		Annual	Annual
Willow (riparian birds)	adult	11101250	Rio Hondo 2 - Above Spreading Grounds	High	Overbank	0.4-1.5	1-8327		Annual	Annual
Willow (riparian birds)	adult	F37B Low	Compton Creek	High	Overbank	0-0	8-3369		Annual	Annual

Relationship between Focal Species and Beneficial Uses

Focal Species	Beneficial Uses						
	WARM	EST	WILD	RARE	MIGR	SPWN	COLD
Santa Ana Sucker				x		x	x
Unarmored threespine stickleback				x		x	x
Steelhead/Rainbow trout		x		x	x		x
Cladophora spp		x	x				
Typha			x				
Duckweed			x				
Black Willow			x	x			
African clawed frog	x						
Mosquitofish	x						

Process to Determine Optimal Flow Range

Location and Season

- Reach or Node?
- Winter, Spring, Summer, Fall?

Beneficial Use Designation(s)

- Designated or Potential future?
- WARM, EST, WILD, RARE, MIGR, SPWN, COLD, REC1

Focal Species	Beneficial Uses						
	WARM	EST	WILD	RARE	MIGR	SPWN	COLD
Santa Ana Sucker				x		x	x
Unarmored threespine stickleback				x		x	x
Steelhead/Rainbow trout		x		x	x		x
Cladophora spp		x	x				
Typha			x				
Duckweed			x				
Black Willow			x	x			
African clawed frog	x						
Mosquitofish	x						

Probability of Occurrence

- High
- Medium

Species Synthesis

- No → Flow recommendations by individual species life stage
- Yes → Synthesis ruleset applied to get overall recommendations

Each blue box can be a drop-down menu with user-selected options

- User can start from the top-down or bottom-up

Process to Determine Optimal Flow Range

Location and Season

- Reach or Node? → **GLEN**
- Winter, Spring, Summer, Fall?

Beneficial Use Designation(s)

- Designated or Potential future?
- WARM, EST, WILD, RARE, MIGR, SPWN, COLD, REC1 → **Willow Typha Cladophora**

Focal Species	Beneficial Uses						
	WARM	EST	WILD	RARE	MIGR	SPWN	COLD
Santa Ana Sucker				x		x	x
Unarmored threespine stickleback				x		x	x
Steelhead/Rainbow trout		x		x	x		x
Cladophora spp		x	x				
Typha			x				
Duckweed			x				
Black Willow			x	x			
African clawed frog	x						
Mosquitofish	x						

Probability of Occurrence

- High
- Medium

Species Synthesis

- No → Flow recommendations by individual species life stage
- Yes → Synthesis ruleset applied to get overall recommendations

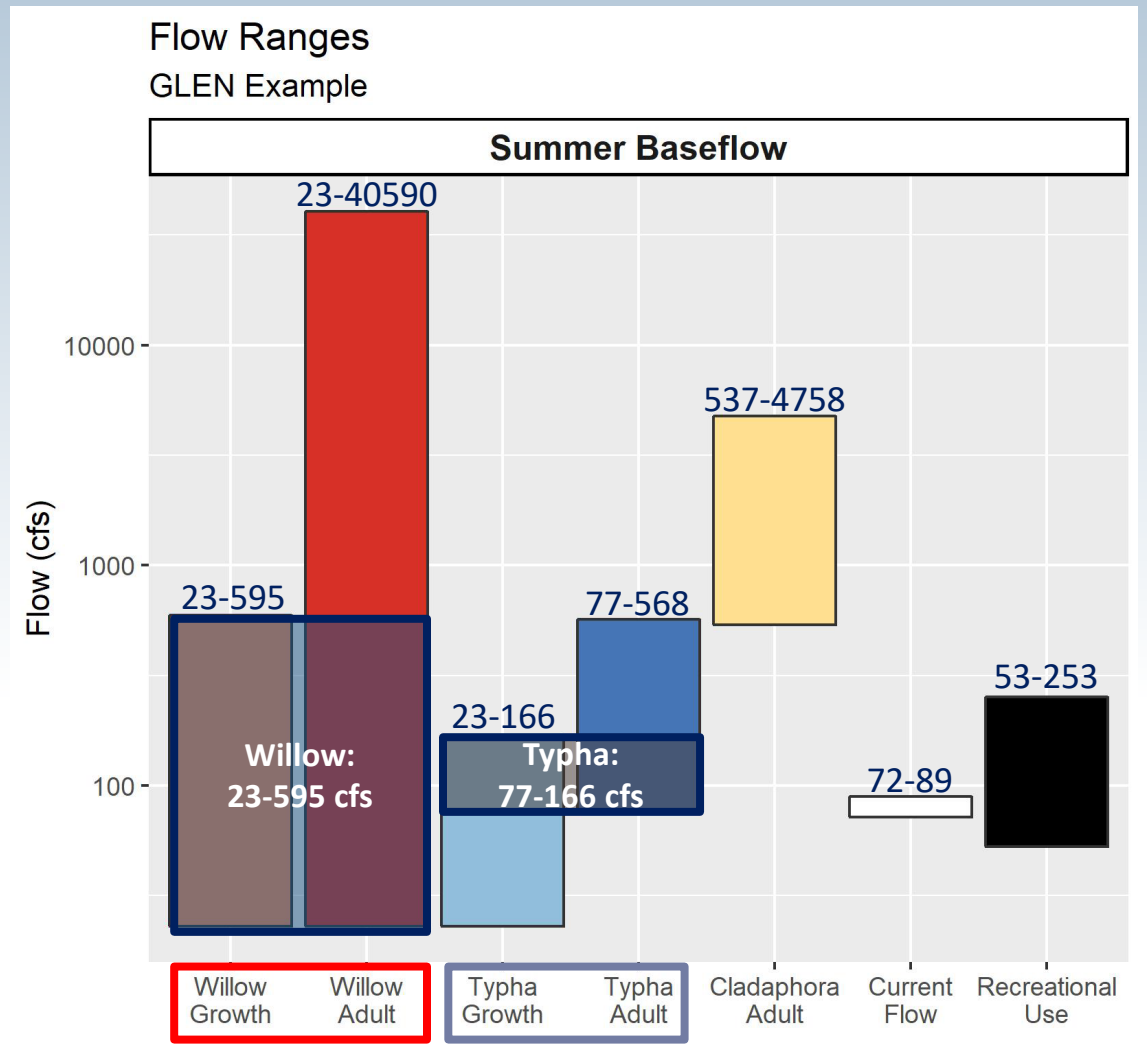
Each blue box can be a drop-down menu with user-selected options

- User can start from the top-down or bottom-up

Proposed Synthesis Ruleset

1. Find the optimal overlap across species or life stages
   - Can synthesize across multiple species or habitats and rec. uses
2. If no overlap, prioritize species/life stage with the highest suitability
   - Based on current flow conditions
3. If none are suitable, select flow range closest to current
4. OR decision based on management priorities
   - i.e., if wading shorebirds are of management concern at LA2, select flow recommendations for Cladophora

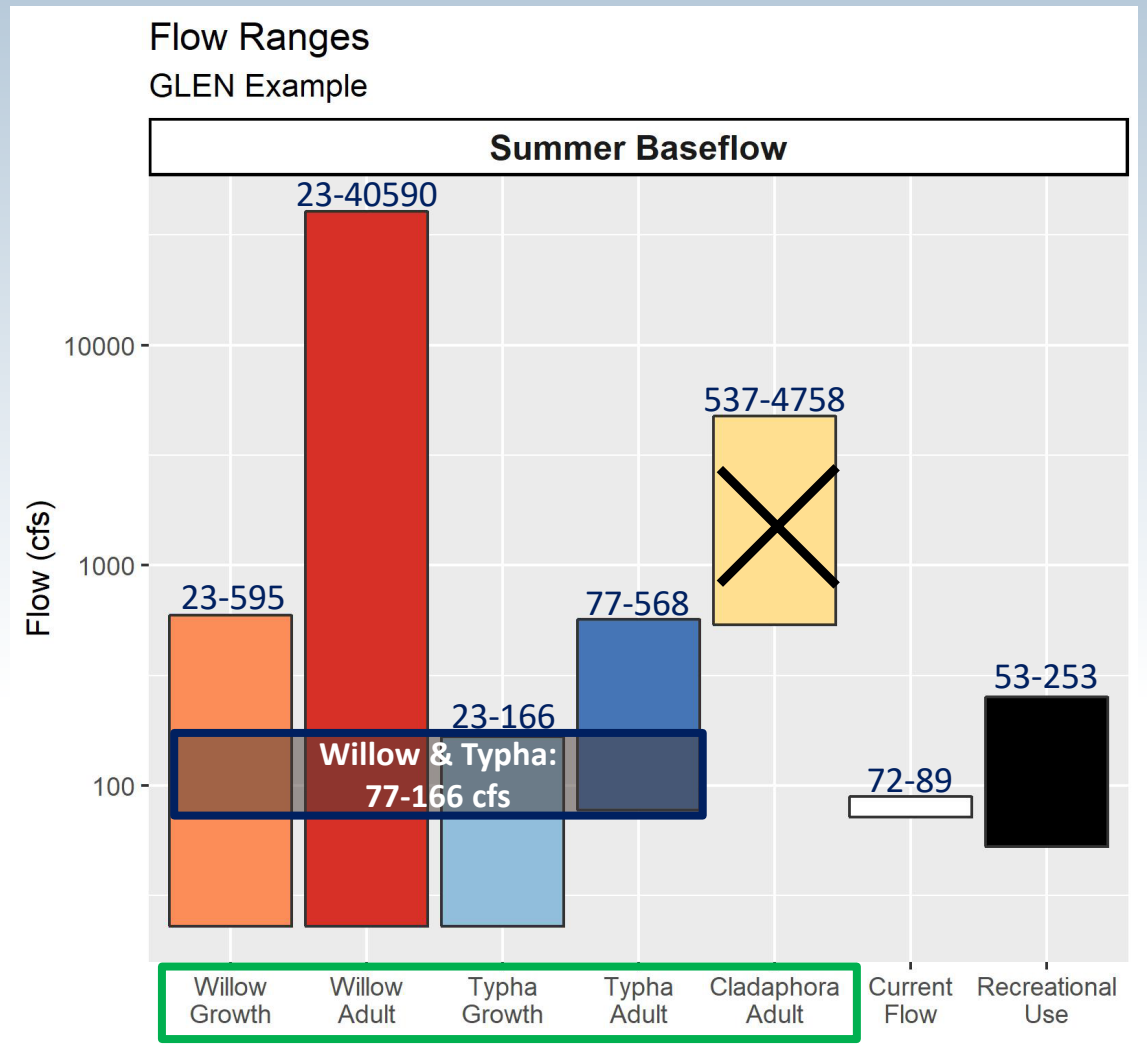
Synthesizing Recommendations: Individual Species



- ✓ Optimal range for Willow
- ✓ Optimal range for Typha

Flow Ranges for Medium Probability

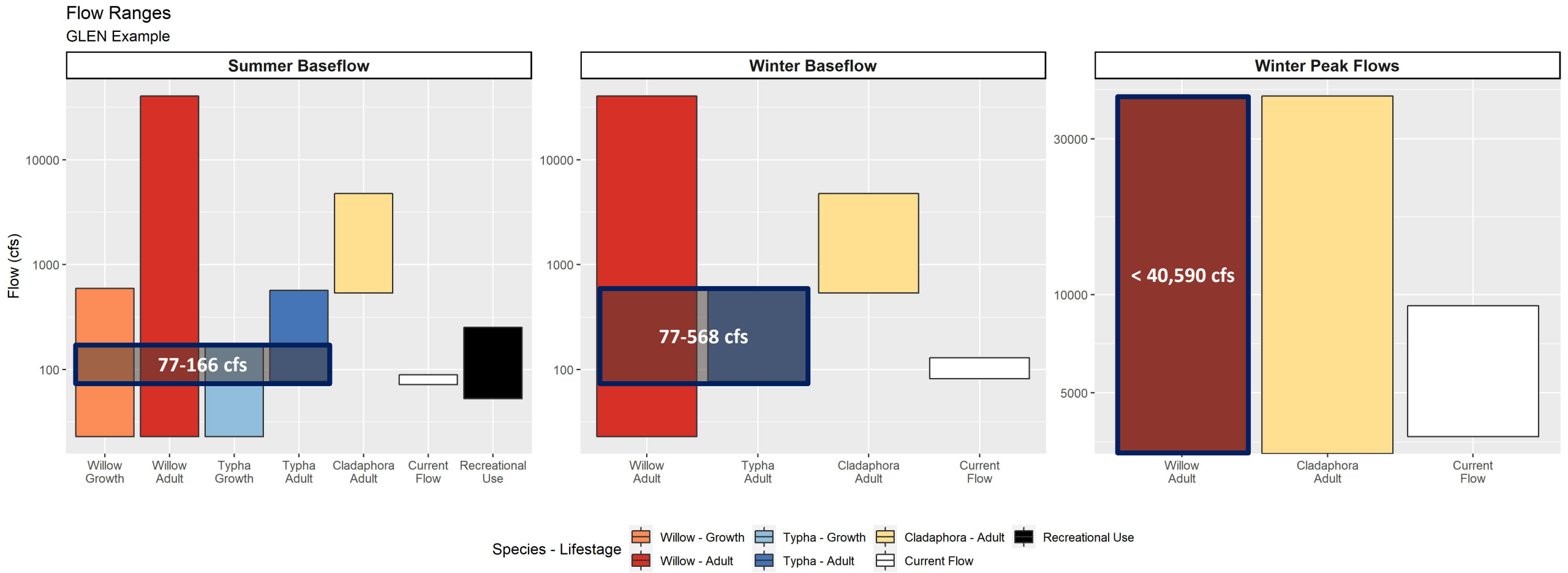
Synthesizing Recommendations: Multiple Species



1. No overlap across all species: Cladophora is too high
2. Prioritize species with highest suitability: Willow and Typha

✓ Optimal range for Willow and Typha

Synthesizing Recommendations for Aquatic Life Use



Output Summary Table

In-River Flow Recommendations

Location: GLEN

Beneficial Use: Existing, WILD

Synthesis: Multiple Species (Willow, Typha)

Probability: Medium

Summer Baseflow				Winter Baseflow				Winter Peak Flow			
Current flow range (cfs)	Optimal Magnitude (cfs)	Duration	Start Timing	Current flow range (cfs)	Optimal Magnitude (cfs)	Duration	Start Timing	Current flow range (cfs, small flood*)	Current flow range (cfs, large flood*)	Optimal Magnitude (cfs)	Frequency
72-89	77-166	April - September	April	82-130	77-568	October - March	October	3675	9249	<40590	-

Example Simplified Summary Table – Multiple Nodes

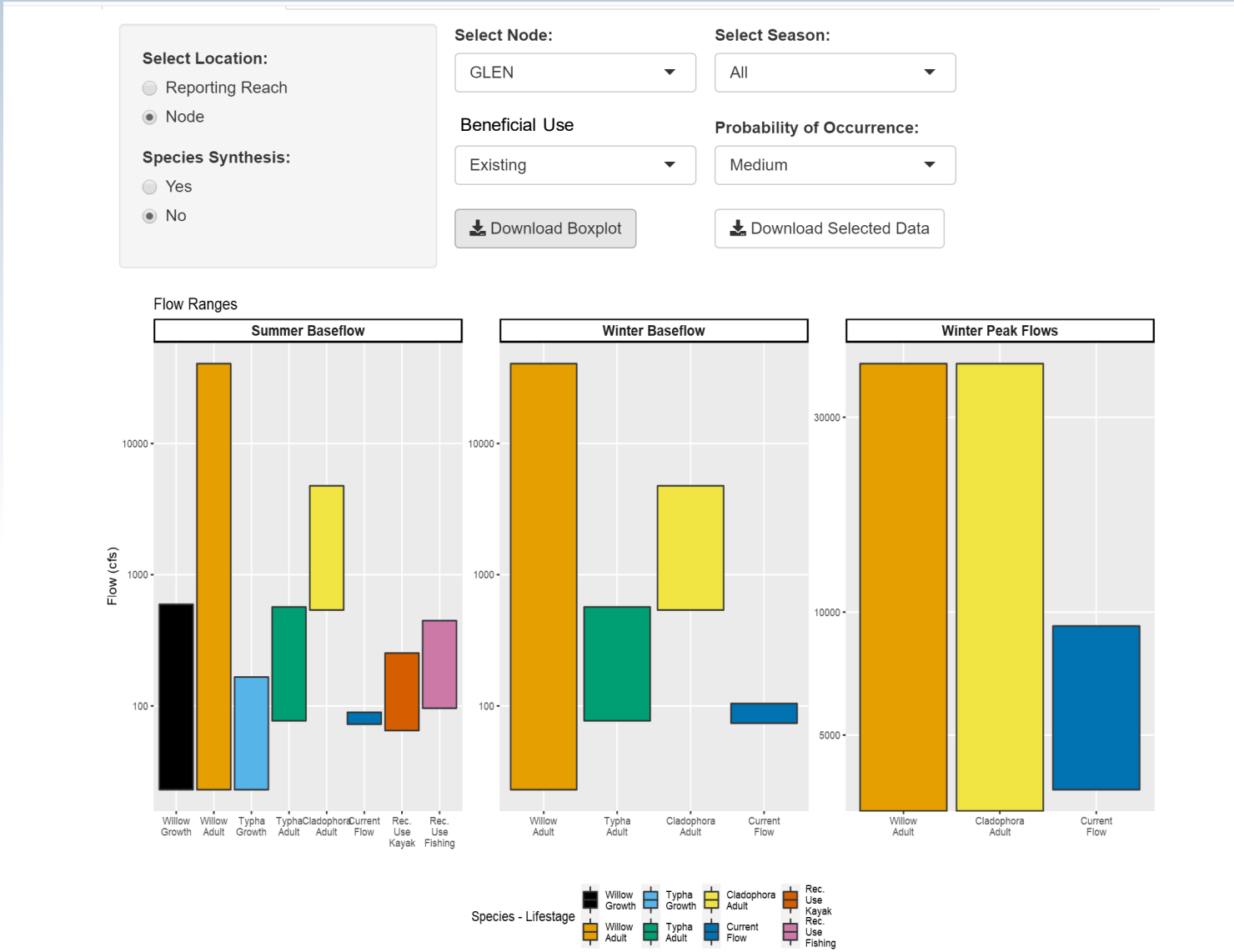
In-River Flow Recommendations
Location: GLEN, LA11, F57C
Beneficial Use: Existing, WILD
Synthesis: Multiple Species (Willow, Typha)
Probability: Medium

Upstream
↓
Downstream

Reach/Node	Summer baseflow	Winter baseflow	Winter peak flow
GLEN	77-166 cfs	77-568 cfs	<40,590 cfs
LA11	25-48 cfs	24-65 cfs	<40,888 cfs
F57C	26-55 cfs	26-586 cfs	<41,750 cfs

Current above range
Current within range
Current below range

R-Shiny App Development



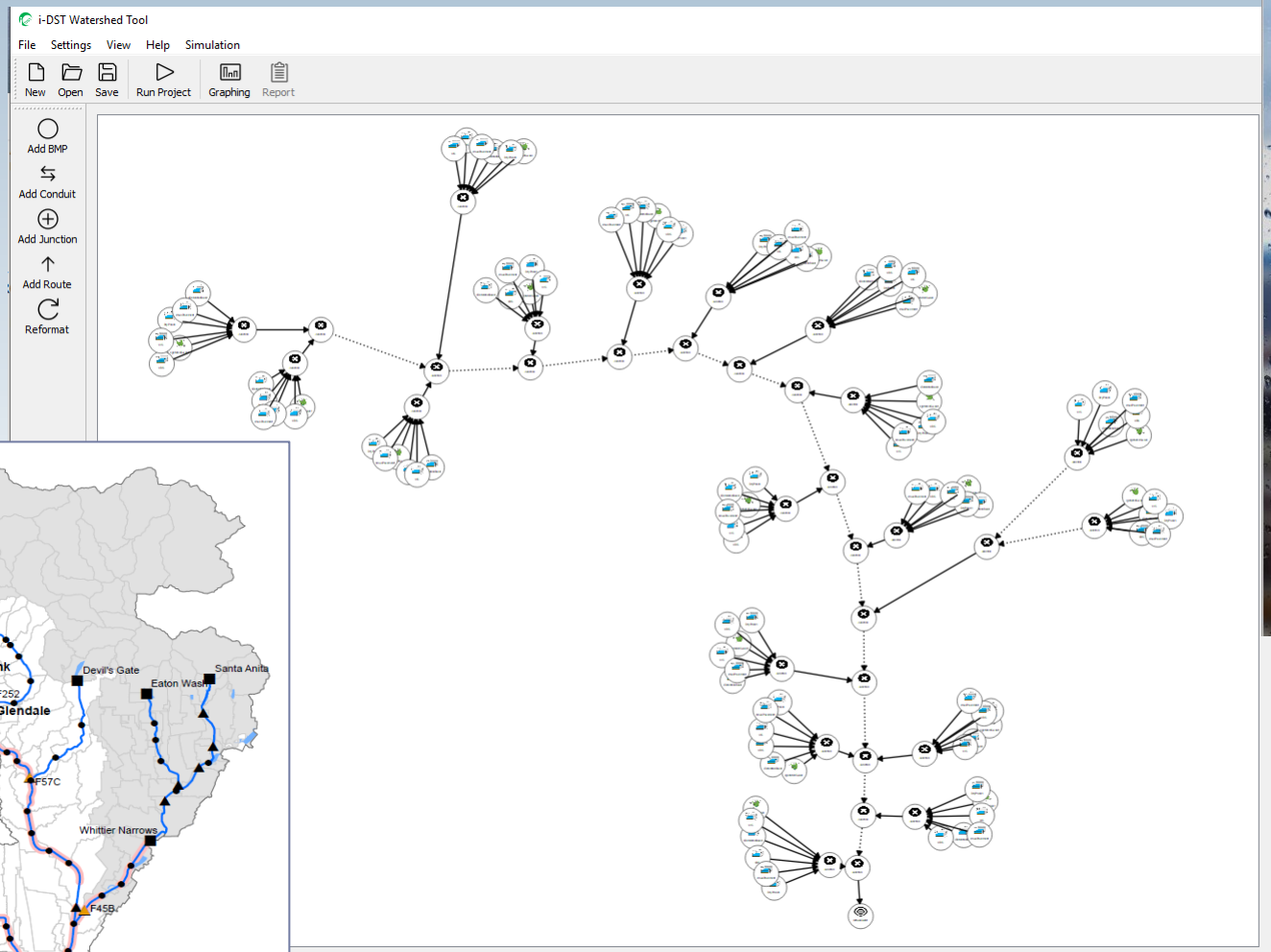
Key Questions

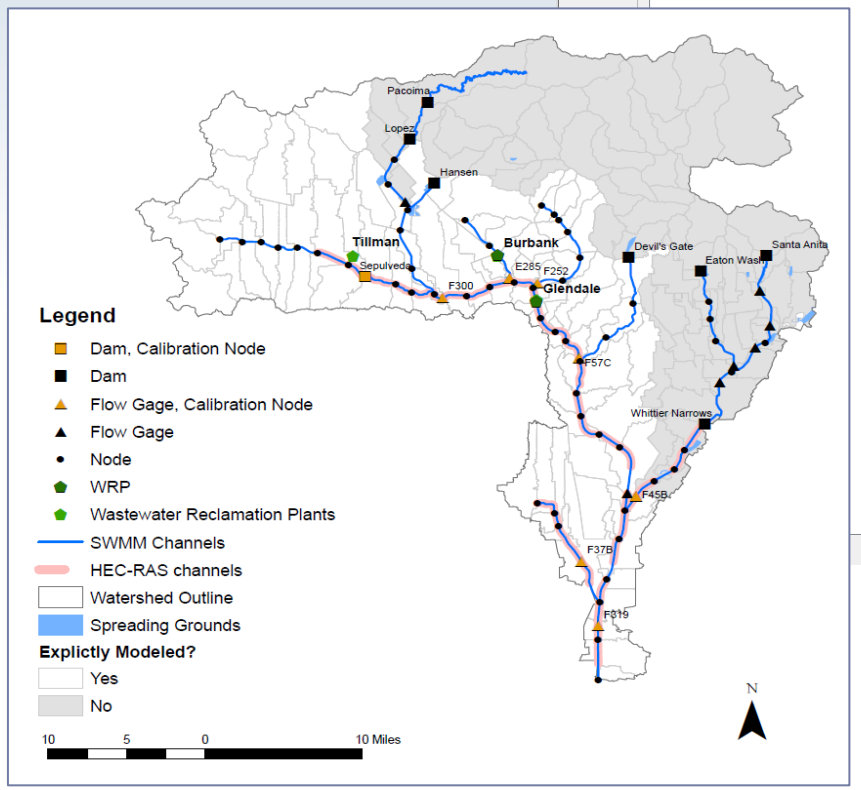
1. What are the optimal flow ranges to support beneficial uses?

2. How much can WRP discharge or stormdrain discharge be reduced to meet optimal flow ranges?

3. What scenarios can be used to meet optimal flow ranges?

Discharge Scenarios

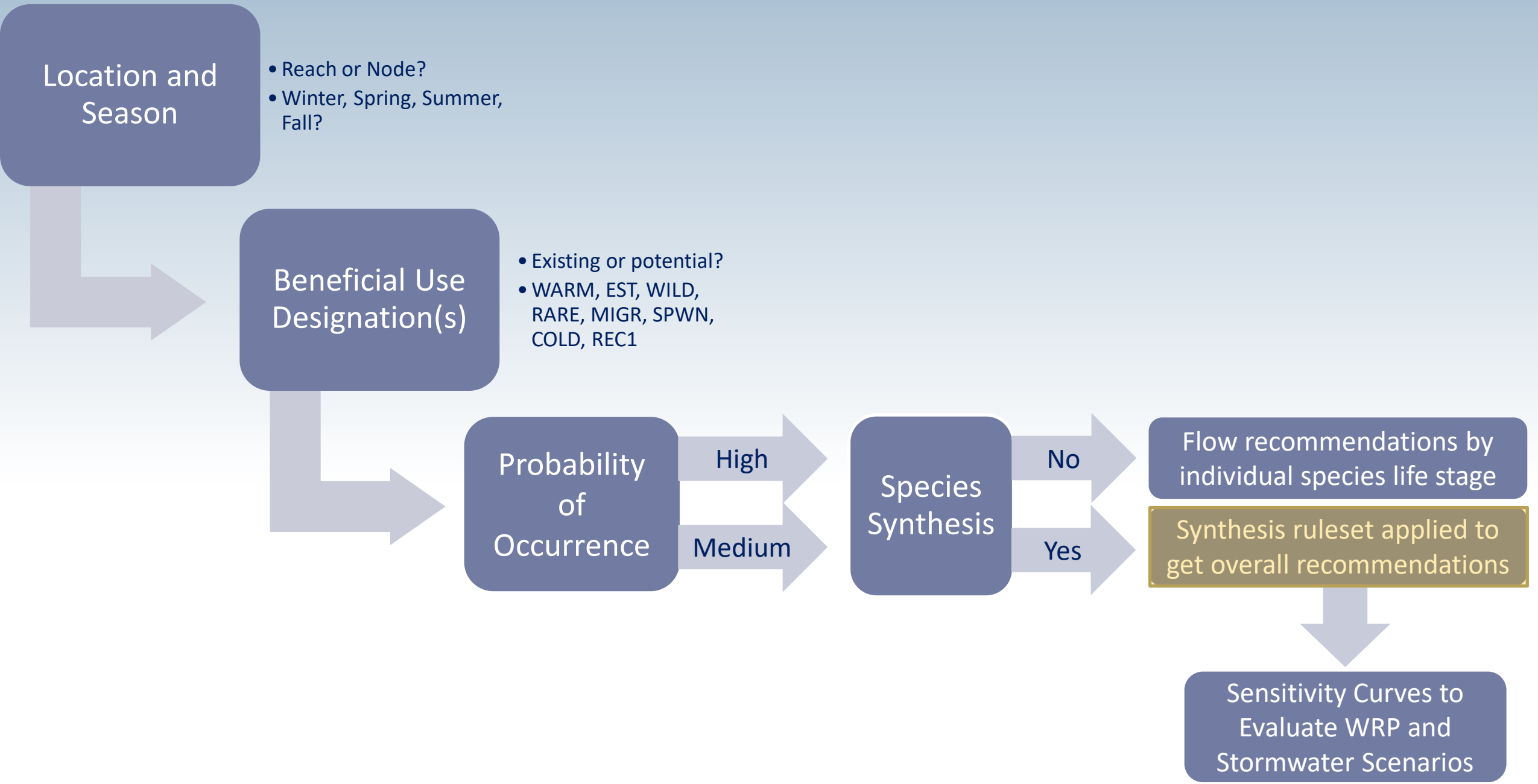




LA13_UrbanDrool	17
LA13_WRP	18
GLEN_Storm	19
GLEN_UrbanDrool	20
GLEN_WRP	21
LA11_Storm	22
LA11_UrbanDrool	23
LA11_WRP	24
F57C_Storm	25

Add

Process to Determine Optimal Flow Range



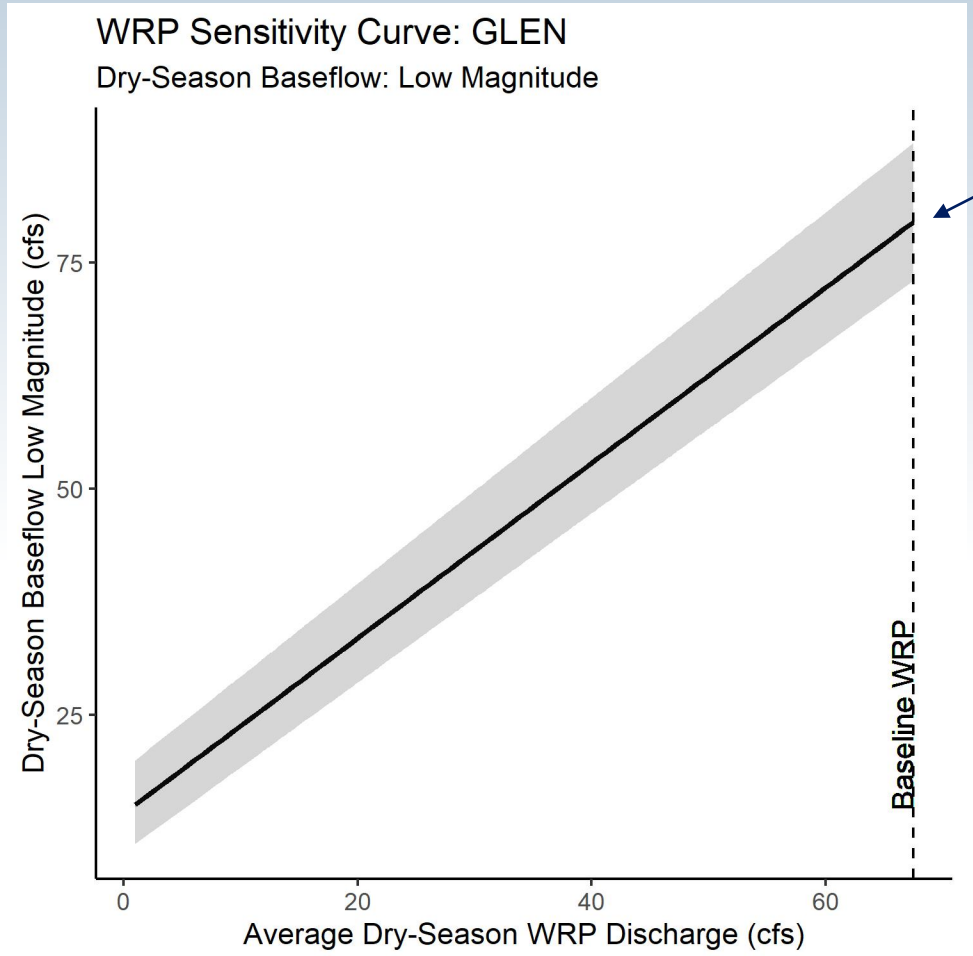
Recap: Development of Sensitivity Curves

- Run models under a wide range of WRP discharge and retention conditions
- Predict changes in instream flow associated with different amounts of WRP discharge and stormwater/stormdrain “capture”
- Plot response of *key variables* to ranges of WRP discharge and stormwater capture
- Curves developed for multiple:
  - Season (i.e., functional flow metrics)
  - Nodes
  - Retention Scenarios
  - Focal Species

Flow Sensitivity Curves

Since rainfall *and* other factors influence baseflow magnitude, we will not use separate curves based on climatic water year type.

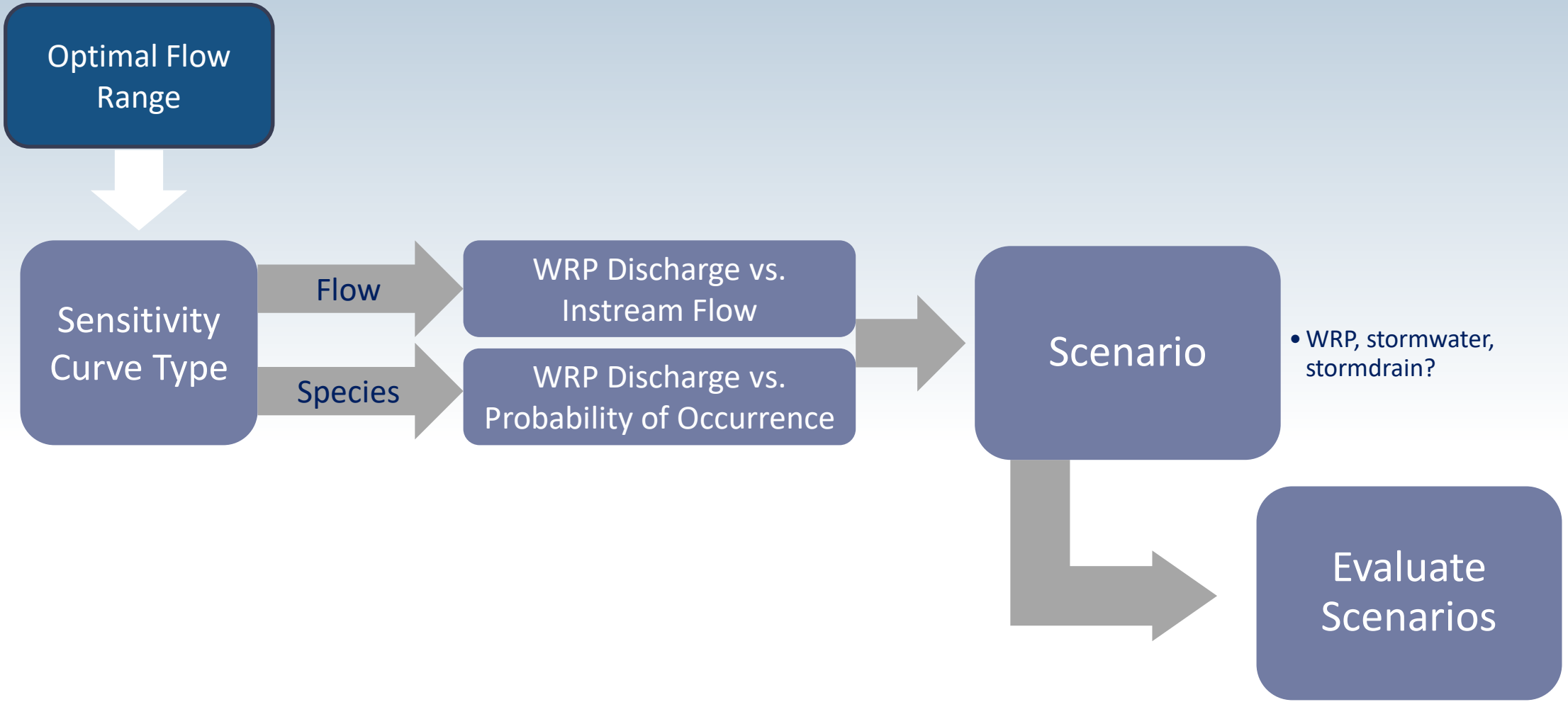
Instead, we used uncertainty bounds to represent the variability in in-stream flows.



Line represents the median dry-season baseflow value calculated across the simulation period

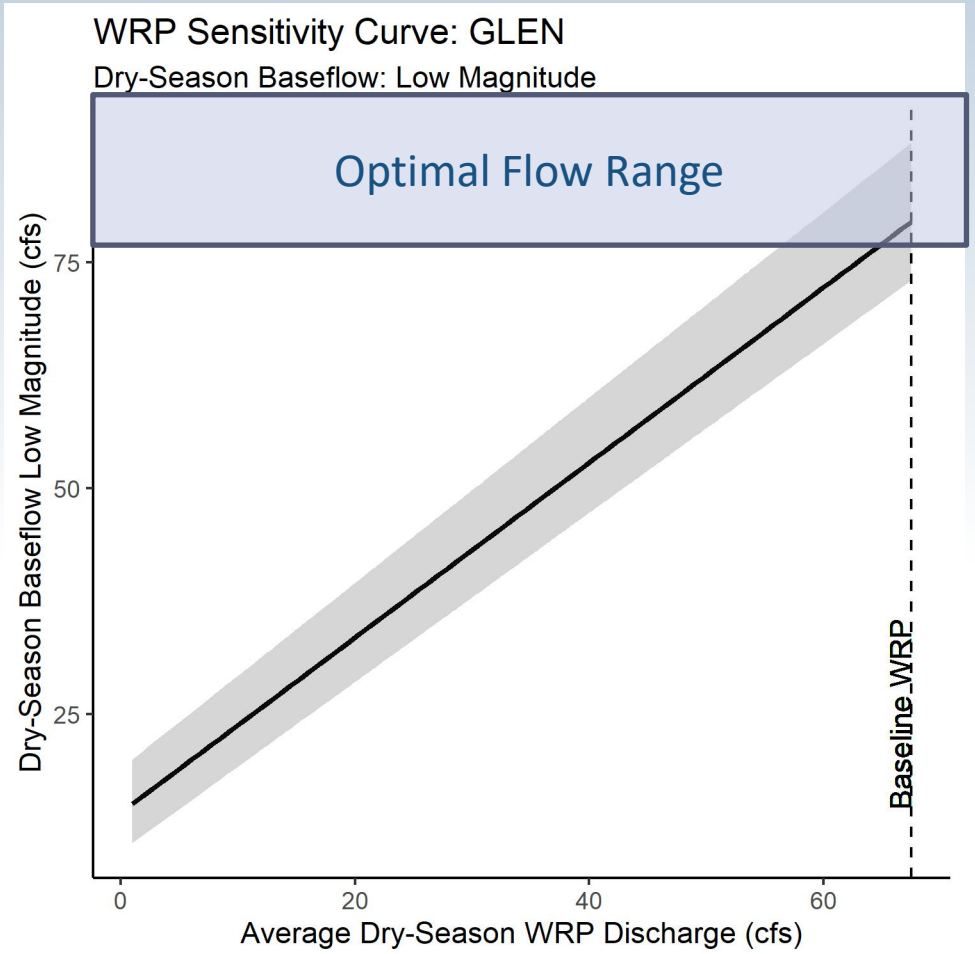
Grey band shows the 90th to 10th percentile of baseflow calculated across the simulation period

Sensitivity Curves Process to Evaluate WRP and Stormwater/Stormdrain Scenarios

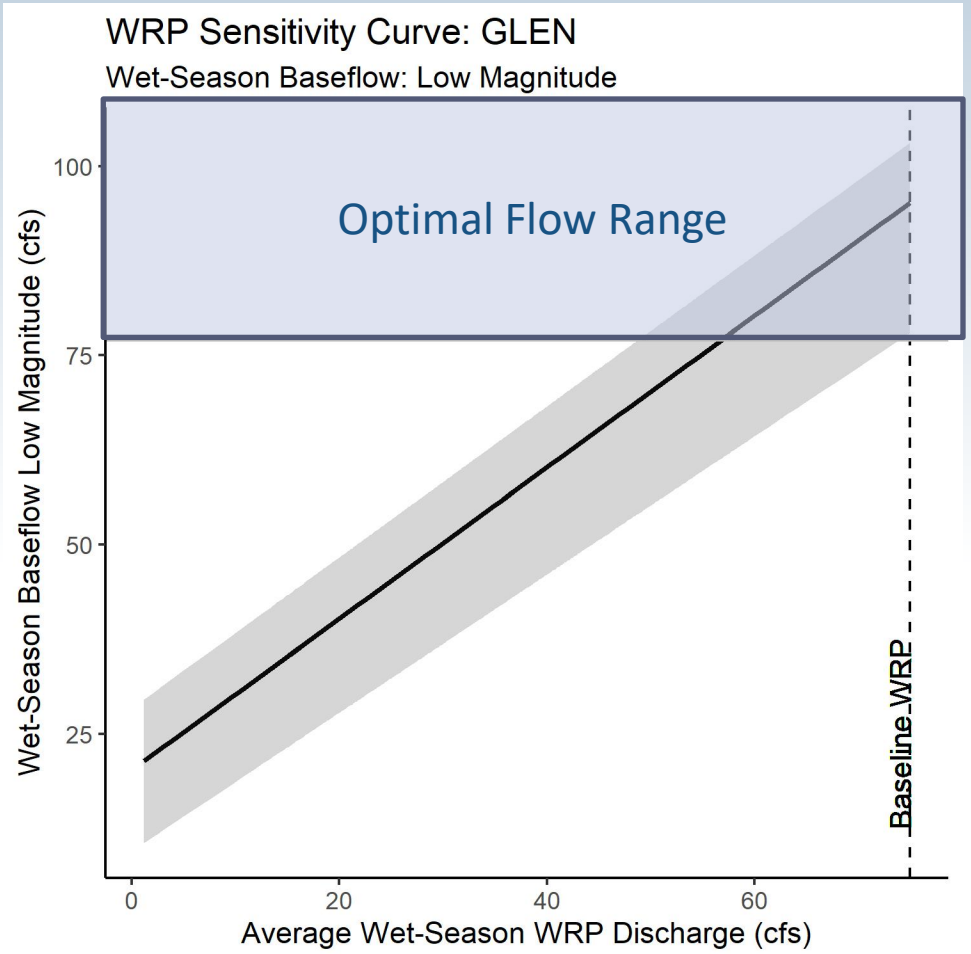


Flow Sensitivity Curves by Season

Summer

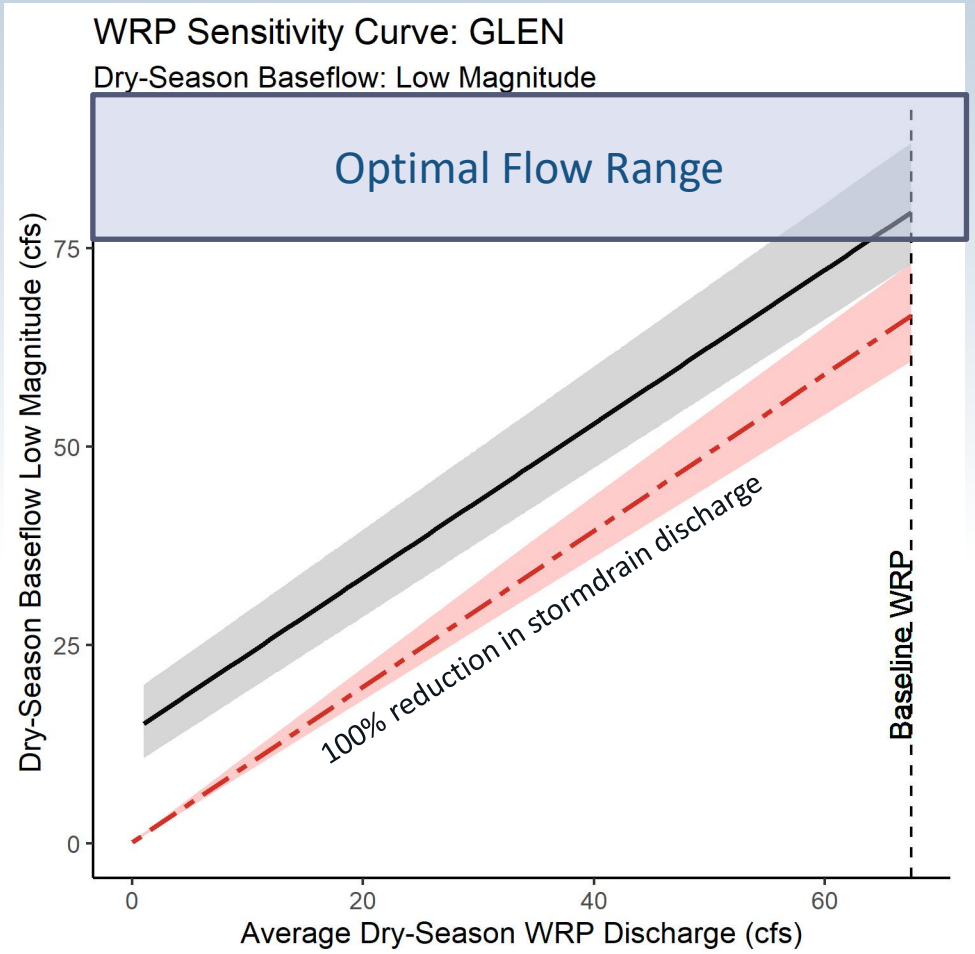


Winter

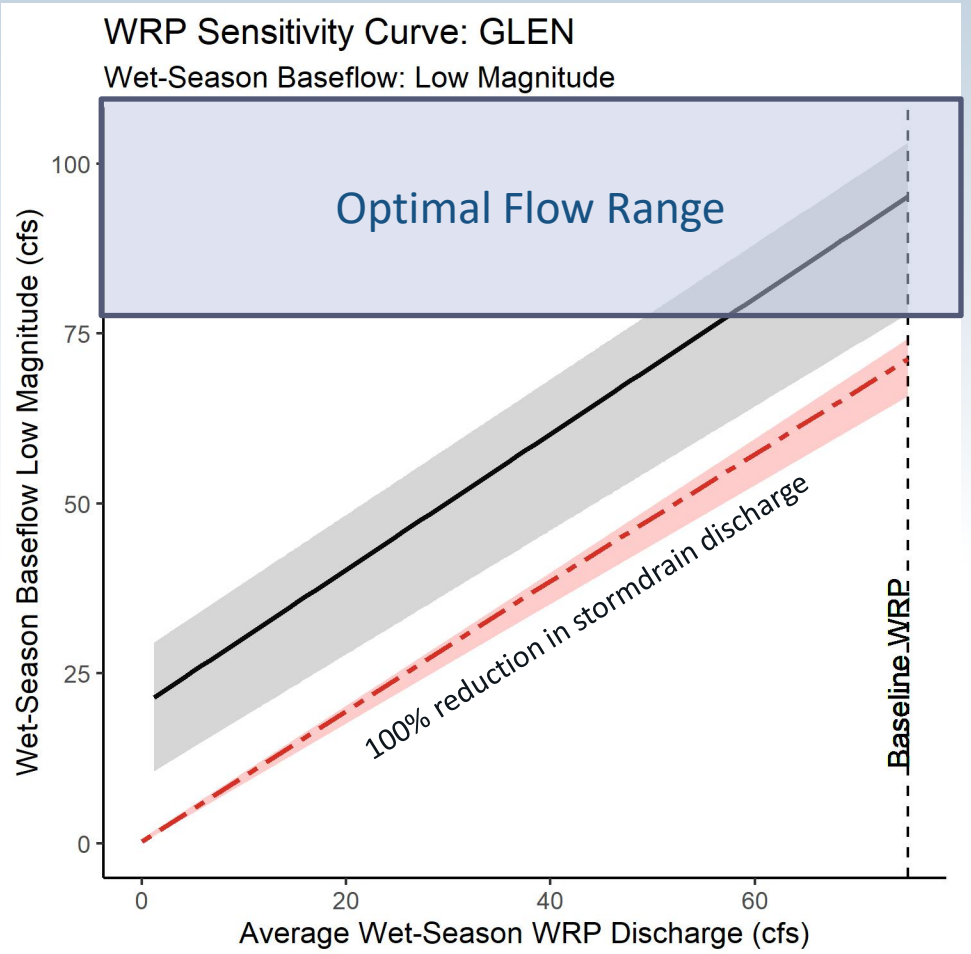


Flow Sensitivity Curves: Stormdrain Scenario, 100% Reduction

Summer

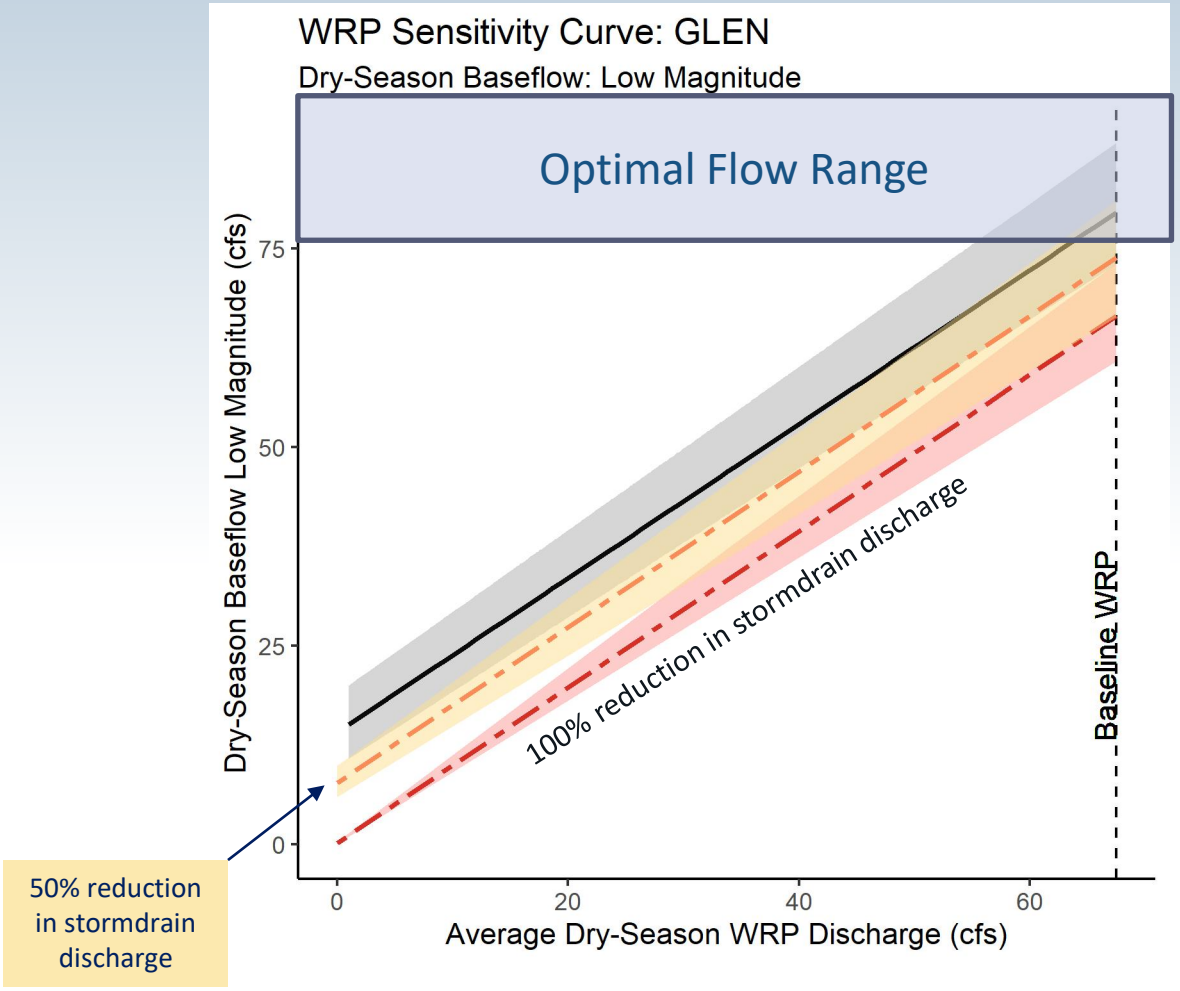


Winter

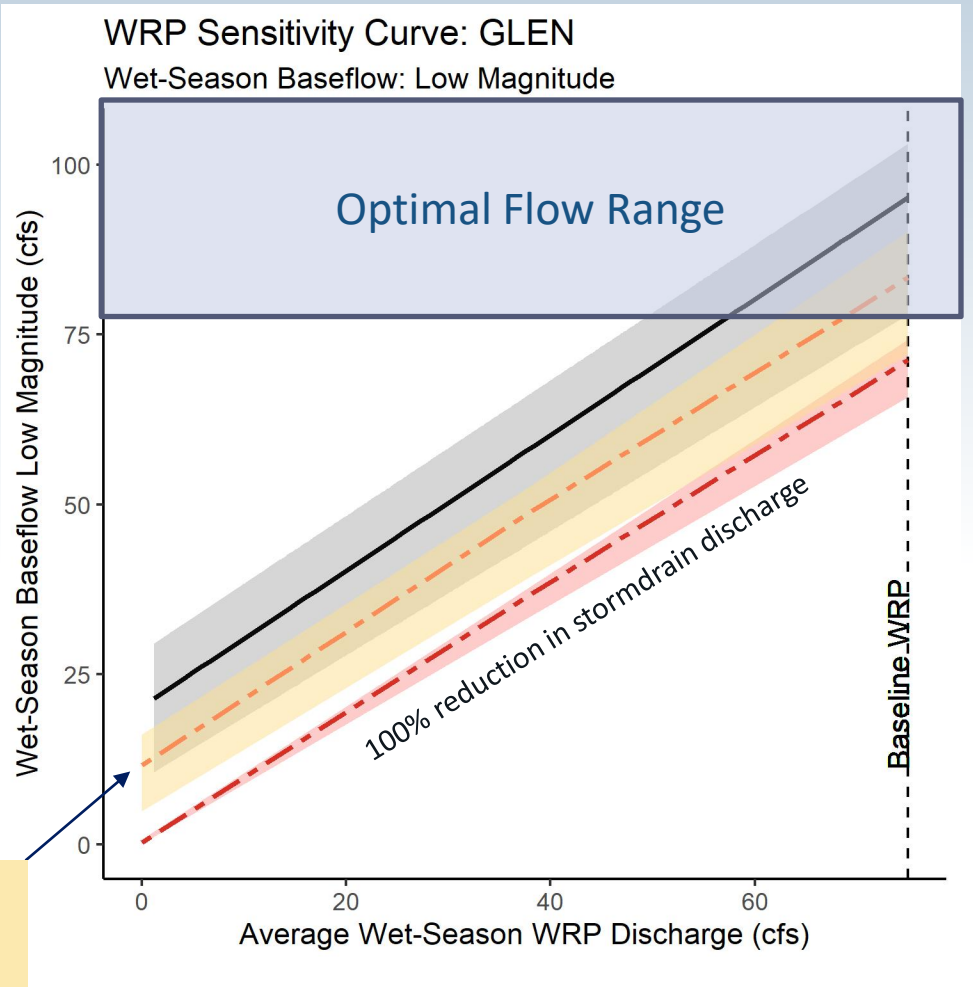


Flow Sensitivity Curves: Stormdrain Scenario, 50% Reduction

Summer



Winter



Key Questions

1. What are the optimal flow ranges to support beneficial uses?

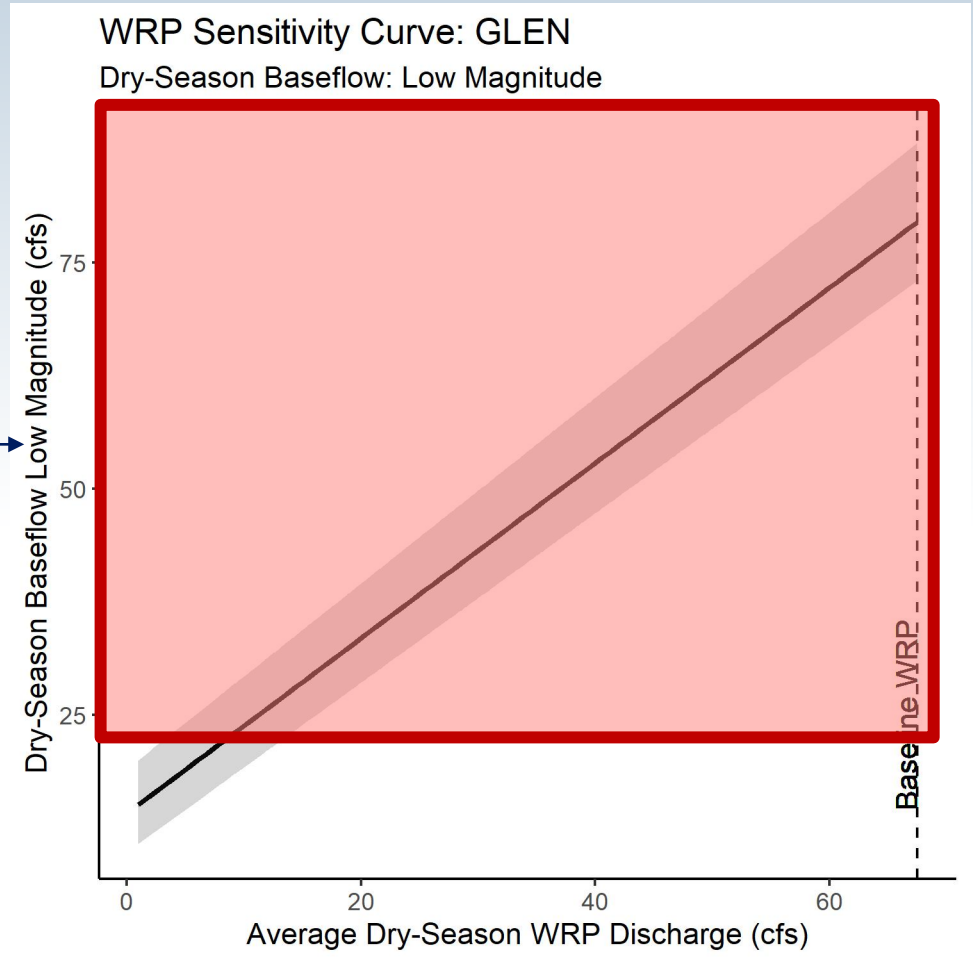
2. How much can WRP discharge or stormdrain discharge be reduced to meet optimal flow ranges?

3. What scenarios can be used to meet optimal flow ranges?

Which Scenarios Satisfy Willow Flow Needs?

Optimal Flows for Willow

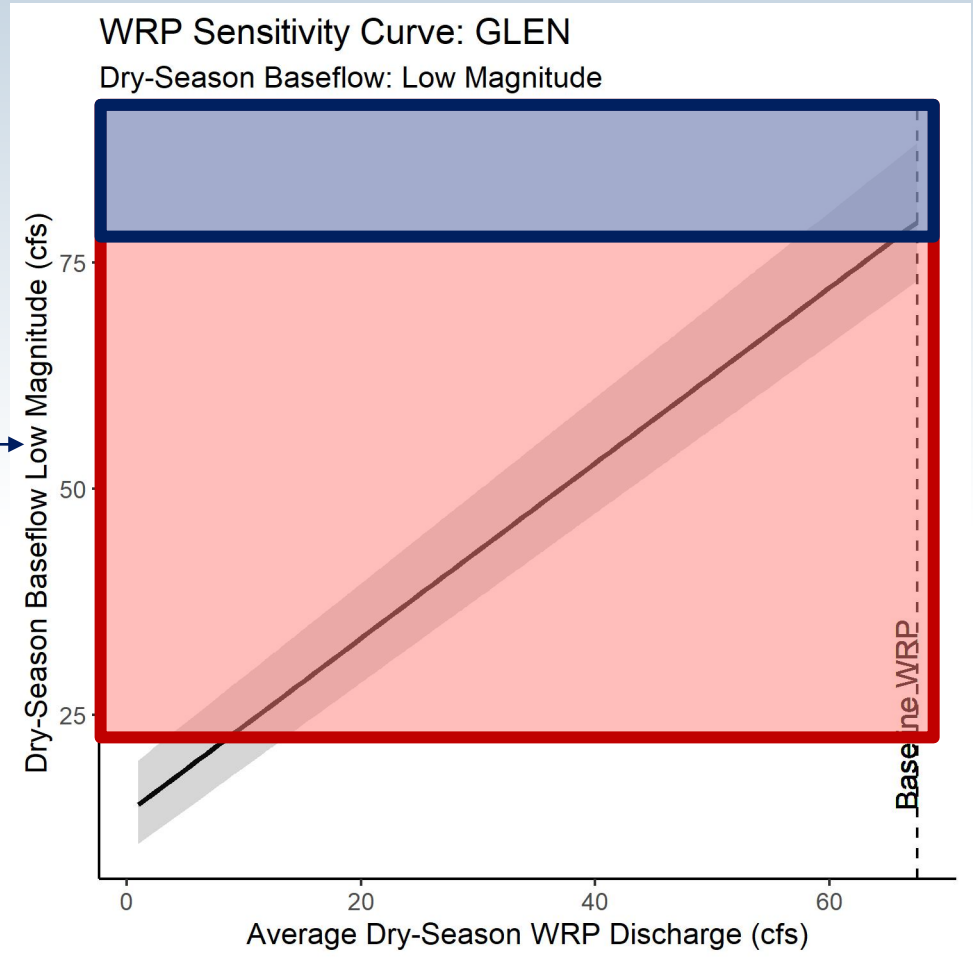
Almost all reuse scenarios satisfy flow needs for Willow



Which Scenarios Satisfy Typha Flow Needs?

Optimal Flows for Willow

Almost all reuse scenarios satisfy flow needs for Willow



Optimal Flows for Typha

Example Optimal WRP Scenarios

Tillman Discharge (cfs)	Burbank Discharge (cfs)	Glendale Discharge (cfs)
90	59	91
99	59	74
98	64	79
98	53	95
92	98	92
98	74	94

Only a few scenarios during years with higher instream flow satisfy optimal flow needs for Typha

Preliminary Scenario Summary:
Glendale Narrows

Scenario	Instream Dry-Season Baseflow Magnitude	Reduction in Dry-Season Baseflow Magnitude		Aquatic Life Use	
	cfs	%	cfs	Willow	Typha
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

Big Picture

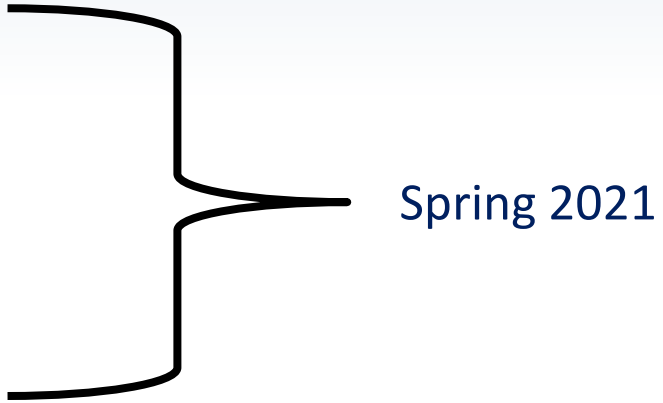
- We have developed a large set of candidate flow recommendations
- The ultimate flow management targets will depend on a series of choices about priority species, habitats, seasons, locations, etc.
- We have developed a process to help select desired flow management targets
- We have also developed tools to help evaluate the potential effects of scenarios of flow reduction on beneficial use indicators
- Managers can use these tools to develop and evaluate proposed changes in discharge to the LAR

General Feedback and Next Steps

- **Technical report on flow recommendations and sensitivity curves**
  - **Draft – March 2021**
  - **Review and comments – April 2021**

- Monitoring and adaptive management recommendations – March 2021

- Water quality modeling
- Temperature analysis
- Restoration opportunities



Questions

Eric Stein
erics@sccwrp.org

Katie Irving
katiel@sccwrp.org

Kris Taniguchi-Quan
kristinetq@sccwrp.org

www.sccwrp.org

Terri Hogue
thogue@mines.edu

Jordy Wolfand
wolfand@up.edu

Liz Gallo
emgallo@mymail.mines.edu

Daniel Philippus
dphilippus@mymail.mines.edu

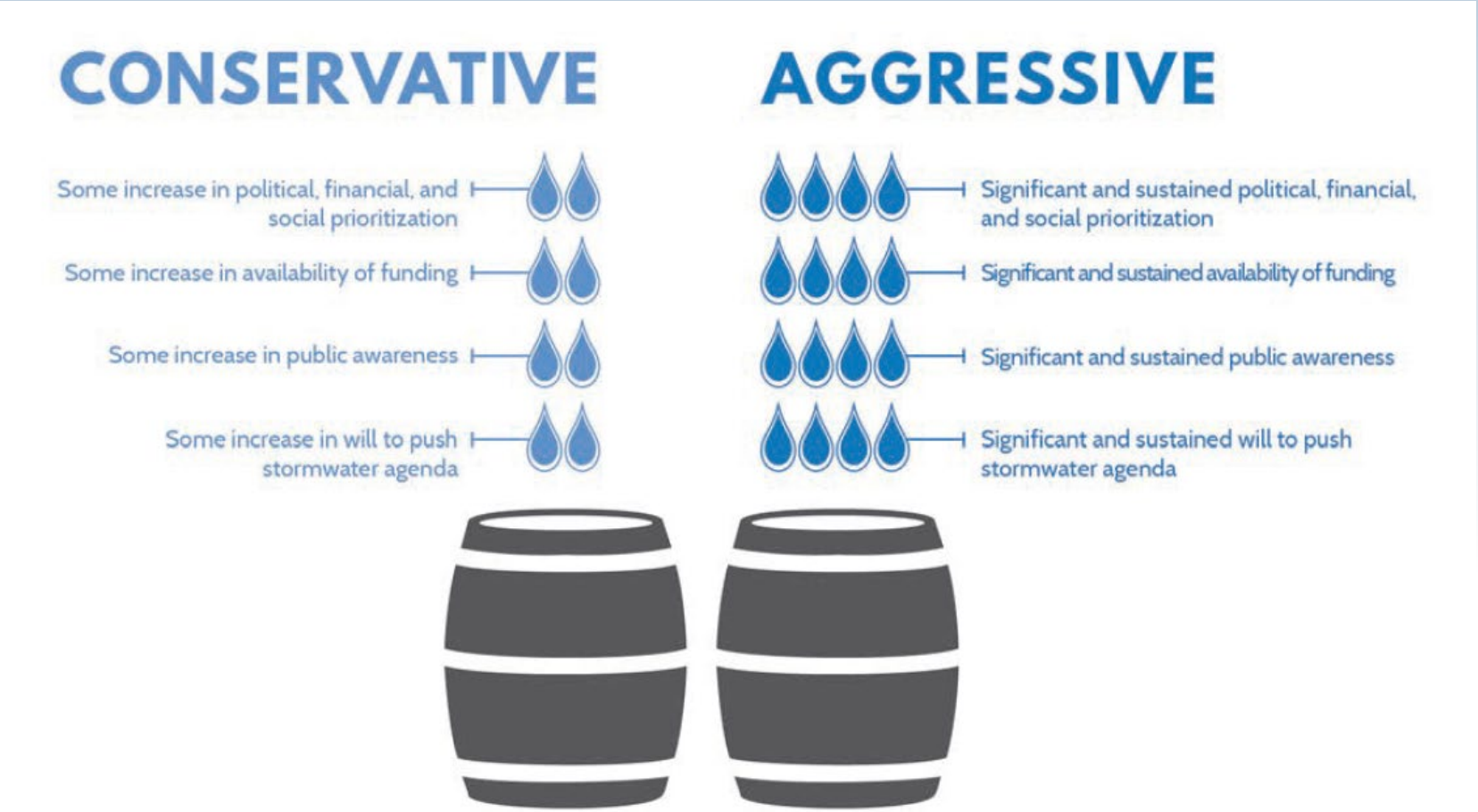
Reza Abdi
rabdi@mines.edu

Victoria Hennon
vhennon@mymail.mines.edu

www.mines.edu

EXTRA SLIDES

Long-term Stormwater Capture Potential



Source: Stormwater Capture Master Plan

BMP Implementation Rate

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

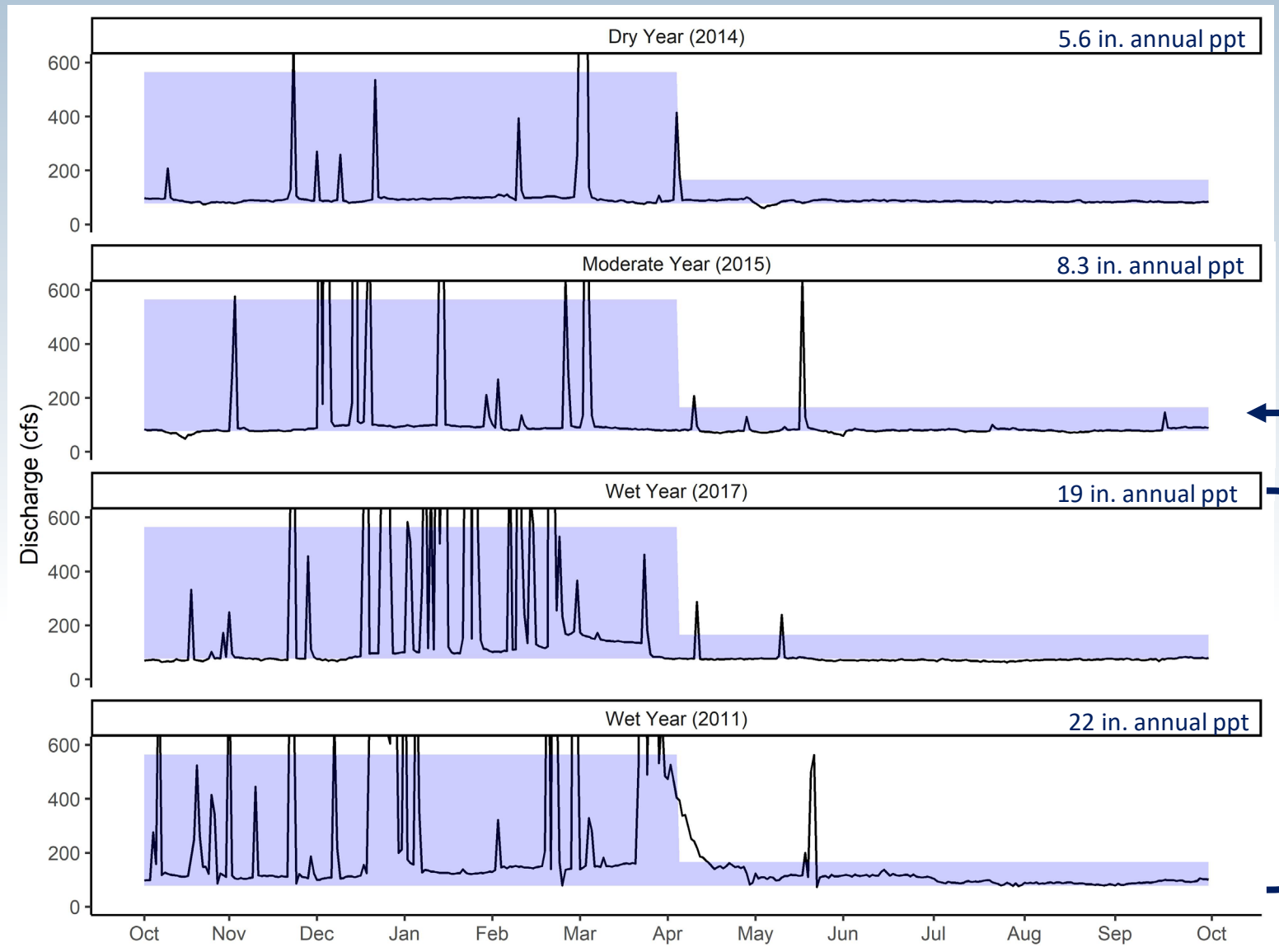
Land use	A	B	C
High Density Single Family Residential	35%	25%	15%
Low Density Single Family Residential with Moderate Slope	30%	20%	10%
Low Density Single Family Residential with Steep Slope	22%	12%	2%
Multi-family Residential	35%	25%	15%
Commercial	37%	27%	17%
Institutional	57%	47%	37%
Industrial	50%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

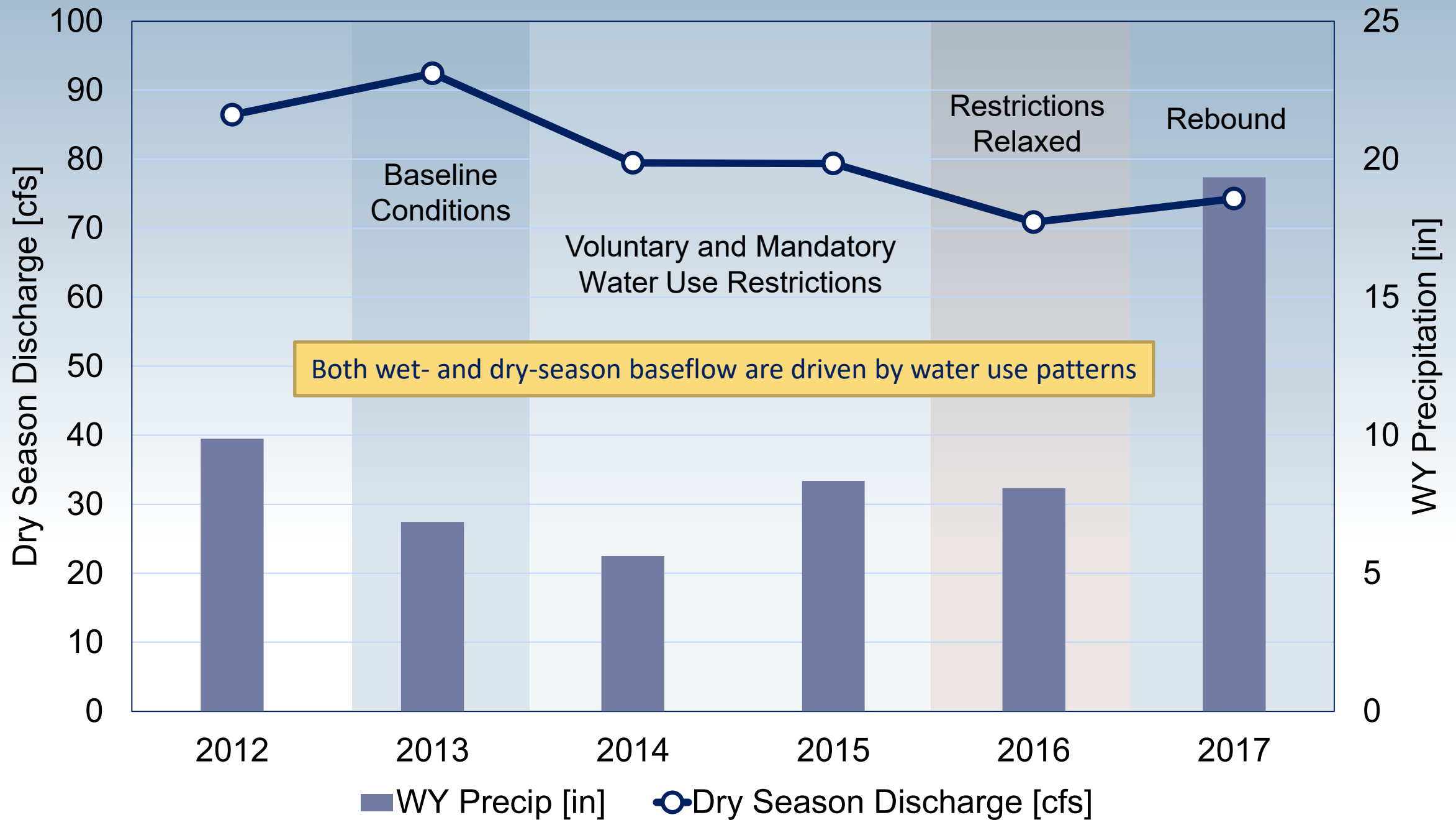
Source: Stormwater Capture Master Plan

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]