



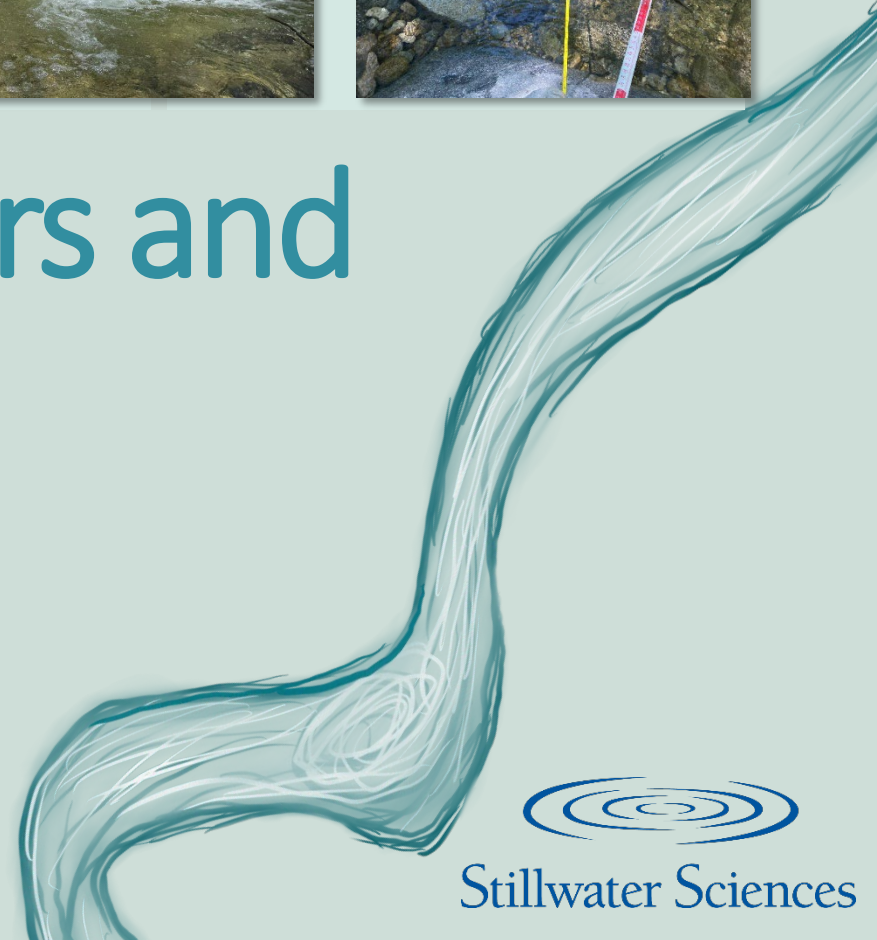
Upper Arroyo Seco Barriers and Habitat Assessment

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Stillwater Sciences

Upper Arroyo Seco and Steelhead

- Upper Arroyo Seco historically supported native steelhead (*Oncorhynchus mykiss*)



Photo credit: Ian Shive, Nature in Focus

Upper Arroyo Seco and Steelhead

- **Steelhead** – anadromous form of *O. mykiss* that migrate to the ocean supported native steelhead (*Oncorhynchus mykiss*)

Resident *O. mykiss* – complete life cycle entirely within freshwater

O. mykiss – Juvenile life history form that is indistinguishable

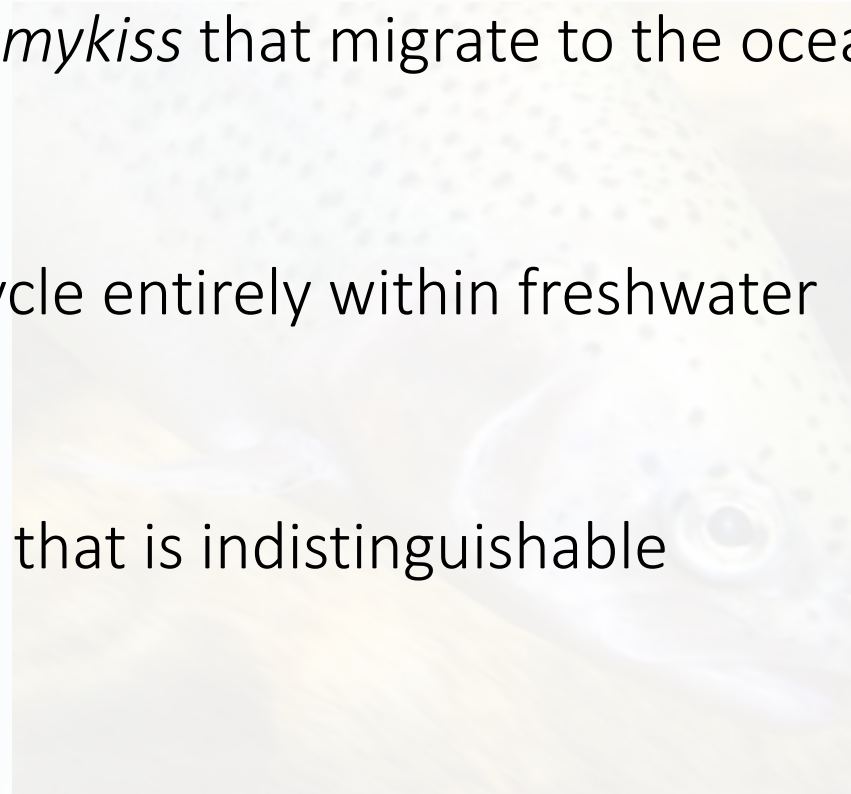


Photo credit: Ian Shive, Nature in Focus

Upper Arroyo Seco and Steelhead

- Upper Arroyo Seco historically supported native steelhead (*Oncorhynchus mykiss*)
- Urbanization and barriers blocked ocean access, but *O. mykiss* persisted
- 2020 Bobcat Fire possibly extirpated *O. mykiss*, but were reintroduced by CDFW



Photo credit: Ian Shive, Nature in Focus

Existing Habitat and Limiting Factors

- High quality habitat - >4,000 individuals in 2024 (J. Stanovich, CDFW, 2024)
- Barriers and water diversions
- Limit natural movement patterns, access to spawning habitat and drought refuge, and can cause mortality



Study Objectives

1. Assess and prioritize barriers for removal within upper Arroyo Seco
2. Evaluate relationships between flow and habitat
3. Evaluate overall habitat conditions

Study Area



Barrier Assessment - Approach

- Identify potential barriers – reports, CDFW PAD
- Survey barriers in the field
 - *Height/length*
 - *Pool depths*
 - *Channel widths*
- Prioritize barriers
 - *Barrier type (physical vs velocity, partial vs total)*
 - *Biological importance*
 - *Access*
 - *Removal effort*

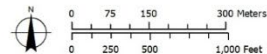


- 12 barriers
- Brown Mountain Dam & Devil's Gate Dam



Survey Results: Downstream

- Barrier
- Habitat feature
- River mile
- Stream channel
- - Intermittent channel



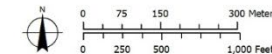
Map Sources:
Roads, cities, parks: ESRI 2016
Rivers: NHD
Imagery: NAIP 2022

Map Location



Survey Results: Upstream

- Barrier
- Habitat feature
- River mile
- Stream channel
- - Intermittent channel



Map Sources:
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Map Location





Natural Barrier
(RM 1.49)



PWP Diversion
(RM 1.81)



USGS Gauge
(RM 3.43)



Arizona Crossing
(RM 5.19)

Barrier Assessment - Recommendations

- Removal of 3, high priority barriers
- Complete removal and restore channel
- Challenges – access, funding, permitting



USGS Gauge
(RM 3.43)




Arizona
Crossing
(RM 4.23)



Arizona
Crossing
(RM 4.91)

Study Objectives

1. Assess and prioritize barriers for removal within upper Arroyo Seco

2. Evaluate relationships between flow and habitat  Habitat Criteria Mapping

3. Evaluate overall habitat conditions  Qualitative Habitat Assessment

Habitat Criteria Mapping

1. Define suitable habitat by life stage

Life Stage	Cover type and/or substrate size criteria	Velocity		Depth	
		Min (ft/s)	Max (ft/s)	Min (ft)	Max (ft)
Age-0+ fry rearing	Within 1.6 ft of large cobble	none	0.5	0.3	none
Age-1+ spring rearing	Within 3.3 ft of large cobble	0.25	2.7	1.0	none
Age-1+ summer rearing	Within 3.3 ft of large cobble	none	2.7	1.0	none
Adult spawning	D ₅₀ : 0.4–1.8 in	1.0	3.0	0.8	none
BMI riffle production	Inundating D50 coarse gravel or cobble (32–256 mm)	1.0	3.5	0.1	none

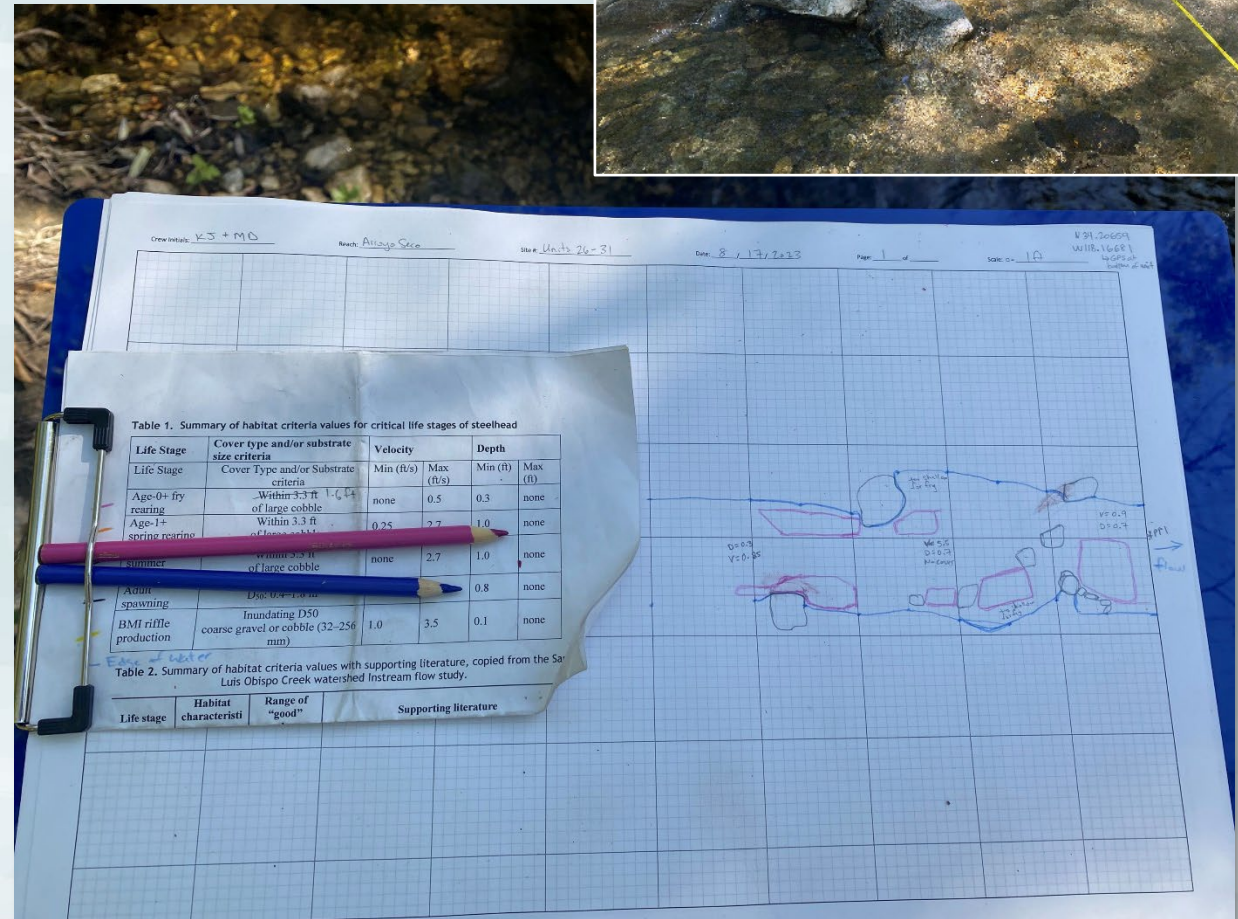
Habitat Criteria Mapping

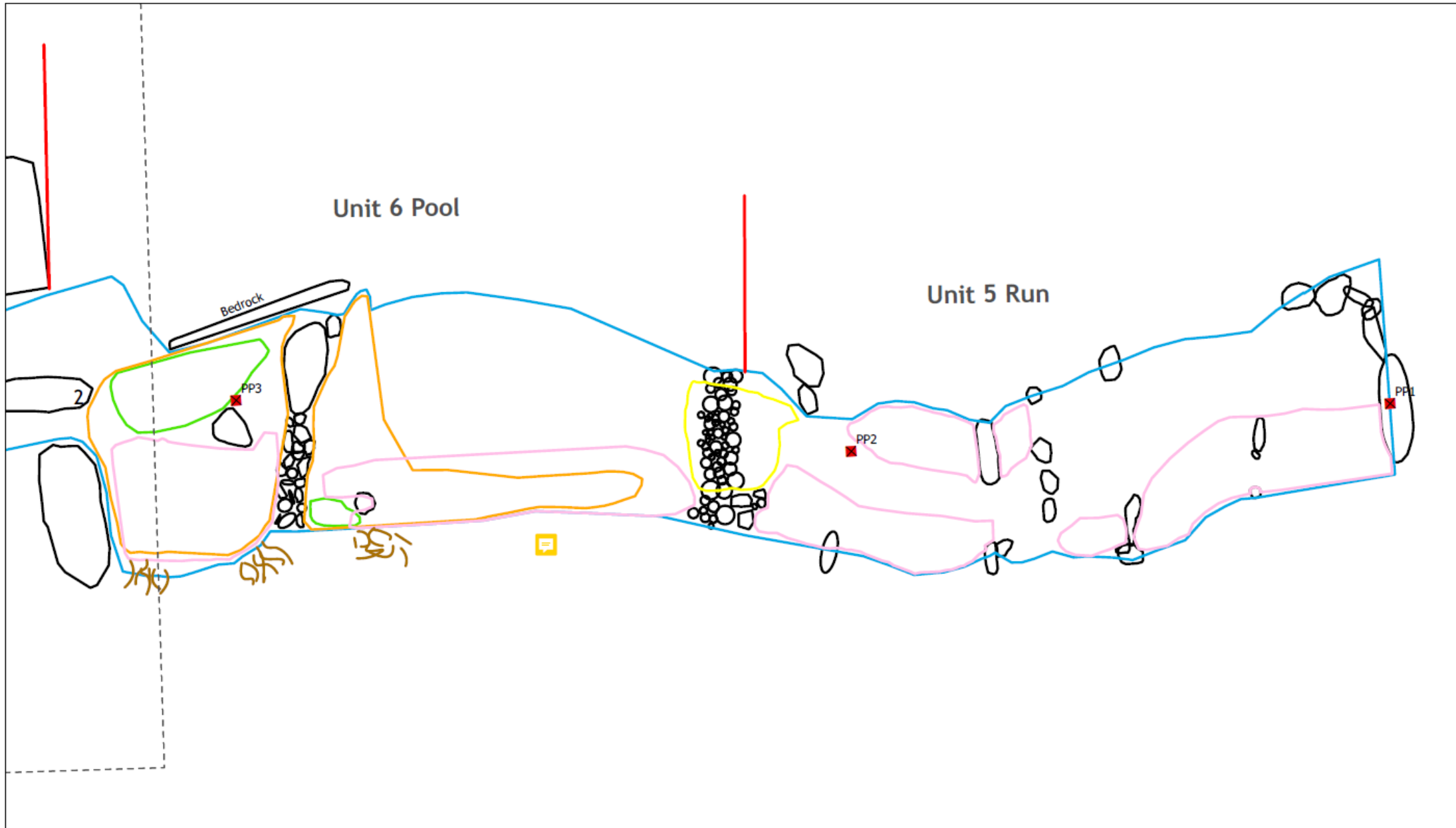
1. Define suitable habitat by life stage
2. Map habitat in survey reach



Habitat Criteria Mapping

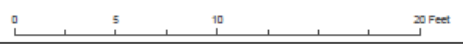
1. Define suitable habitat by life stage
 - Ecologically relevant summer flows (lower, higher)
 - Maps digitized in GIS
2. Map habitat in survey reach
3. Generates estimate of suitable habitat area



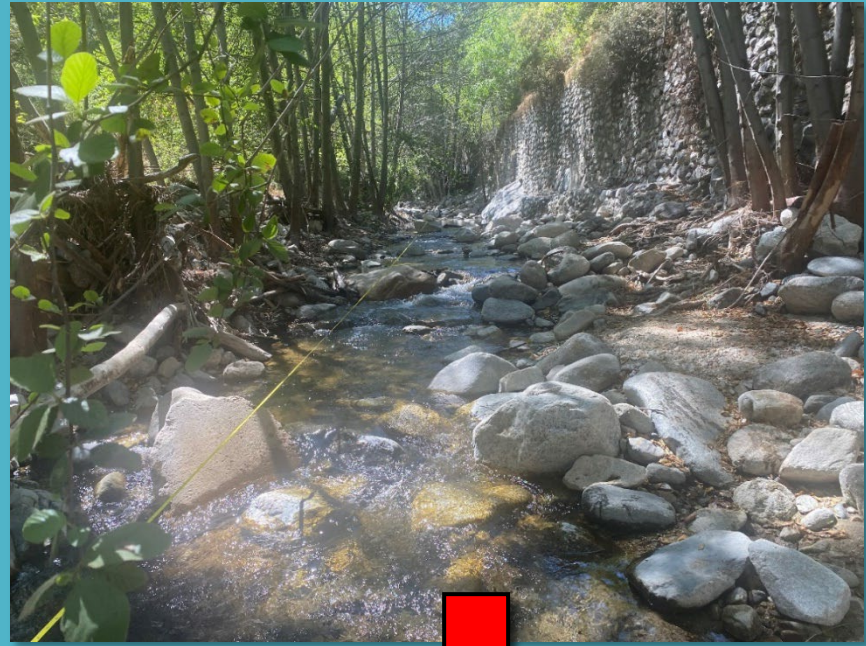


Legend

- | | | |
|--------------|-----------------|---------------|
| Habitat type | Spawn | Unit Break |
| Fry | Stream boundary | Rock |
| BMI | Photo point | Vegetation |
| Spring 1+ | Roots | Adjacent tile |



“Higher flows”

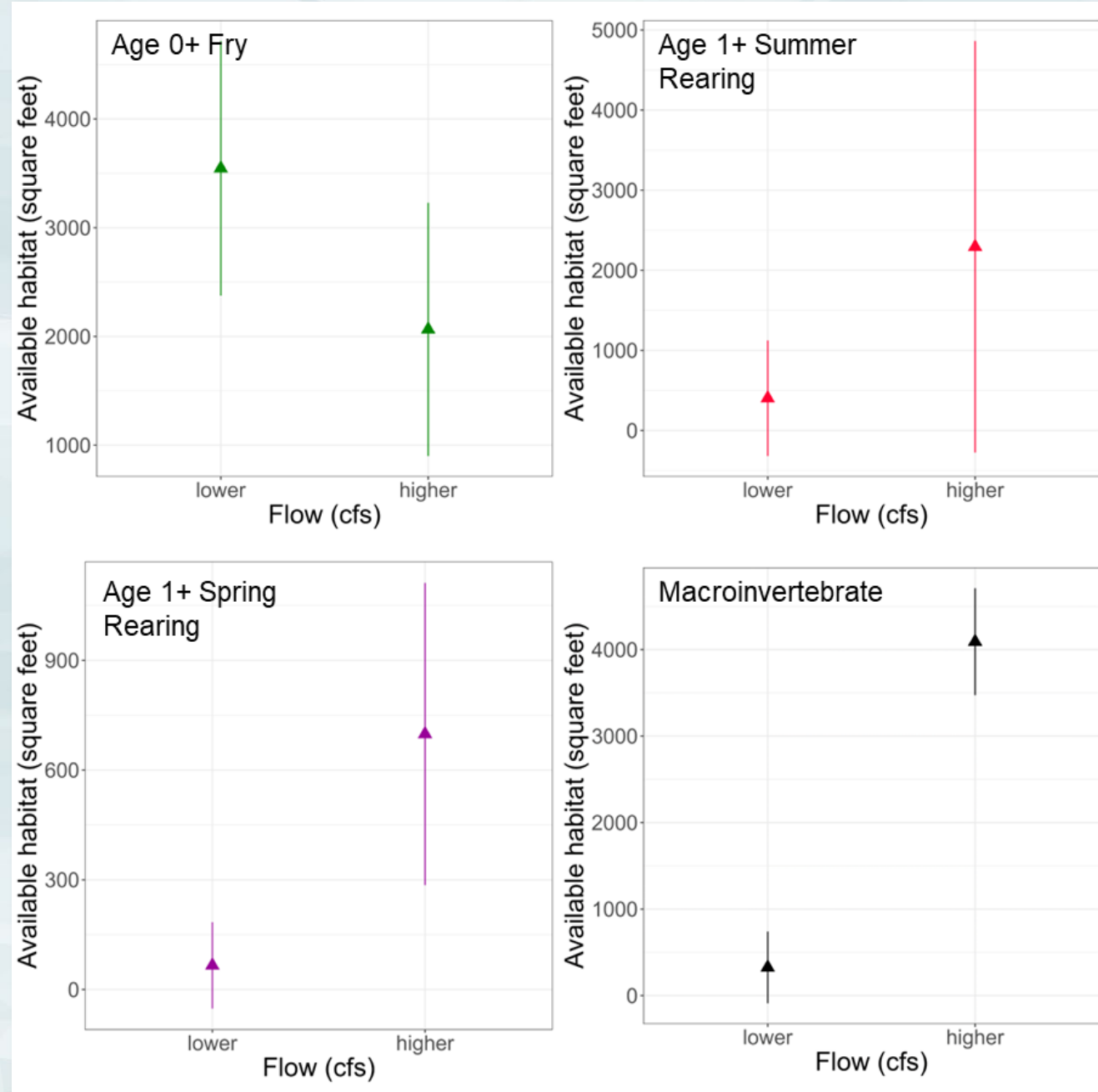


“Lower flows”



Habitat Criteria Mapping - Results

- More fry habitat under lower flows
- All other life stages had less habitat under low flows
- Juveniles need at least 0.35 cfs



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Other Habitat Conditions

Downstream reach (from USGS Gauge)

- Limited spawning habitat (few fry expected)
- Limited summer rearing habitat
- Barriers (high stranding potential)

Upstream reach (from USGS Gauge)

- High-quality, perennial habitat
- Barriers



Conclusions

- Low intrinsic potential for *O. mykiss* downstream of USGS gauge and PWP diversion
- No upstream passage for fish that descend below PWP diversion
- 1 cfs in spring and 0.35 cfs in summer would support *O. mykiss* in the downstream reach
- Once barriers are remediated, minimum flow requirements could be adjusted but flows should follow approved ramp down rates



Next Steps

- Pursue and implement barrier removal (design, permitting, funding)
- Additional flow-habitat mapping to refine minimum flow requirements
- Address fish passage at Brown Mountain Dam and Devil's Gate Dam
- Continued linkages with broader watershed projects



Thank You!

Arroyo Seco Foundation

California Wildlife Conservation Board

California Department of Fish & Wildlife (Joseph Stanovich)

Stillwater Science

Trout Scouts (Angel Pinedo)

Reports available online through Arroyo Seco Foundation website:

<https://www.arroyosecofoundation.org/>

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