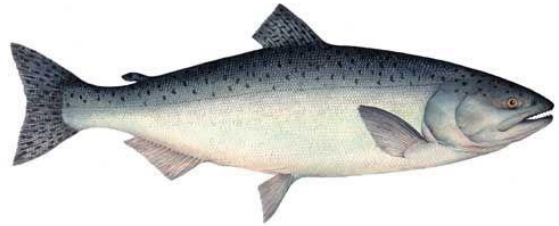
Channel Typology and Salmonids

Dr. Matt Cover



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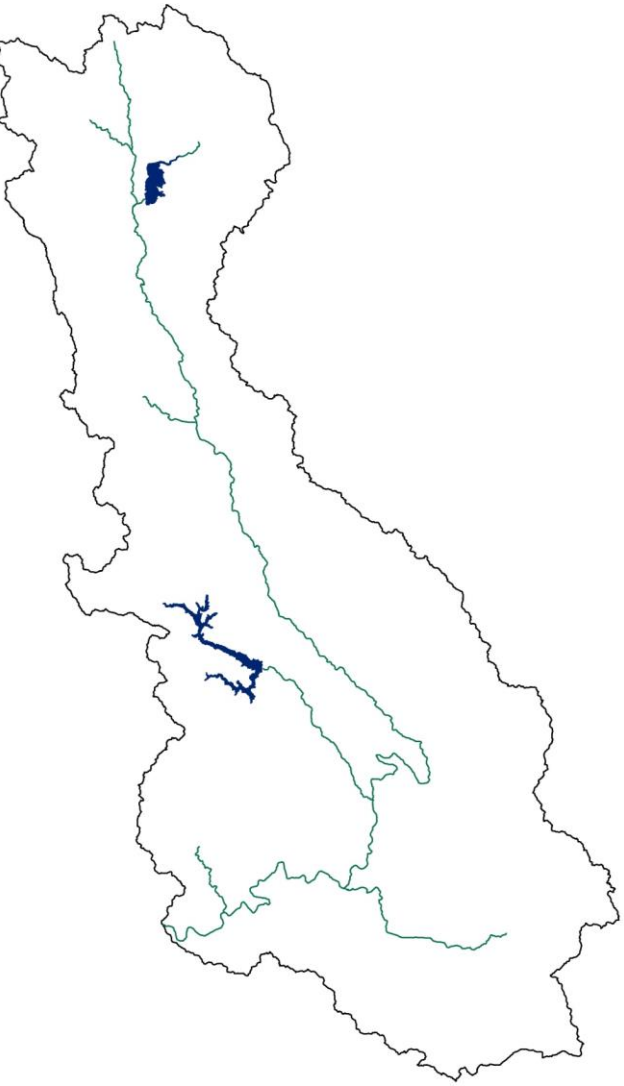
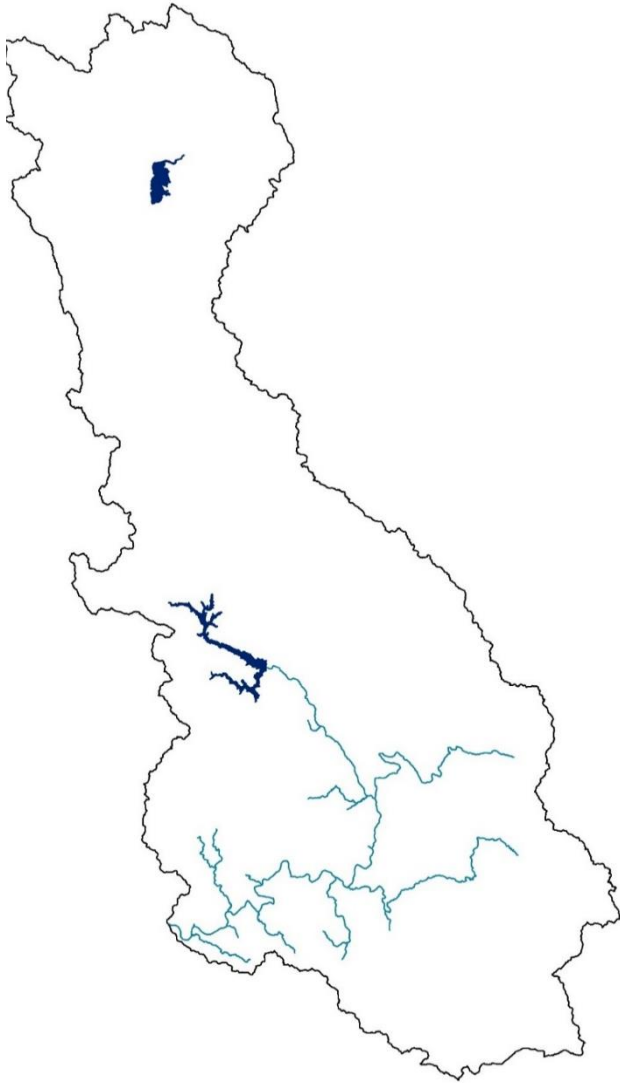
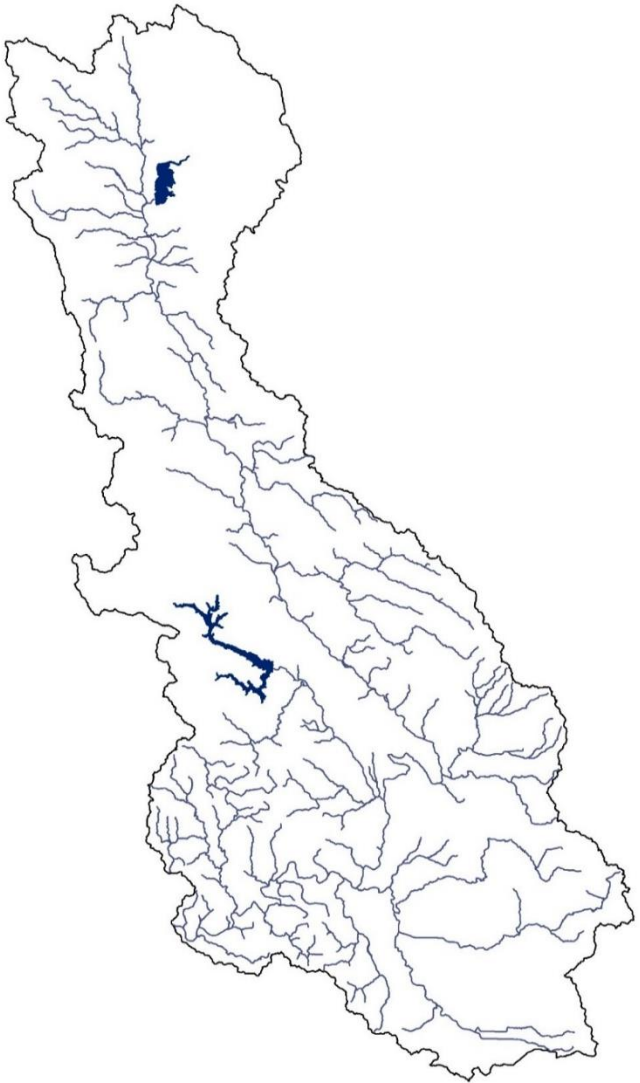
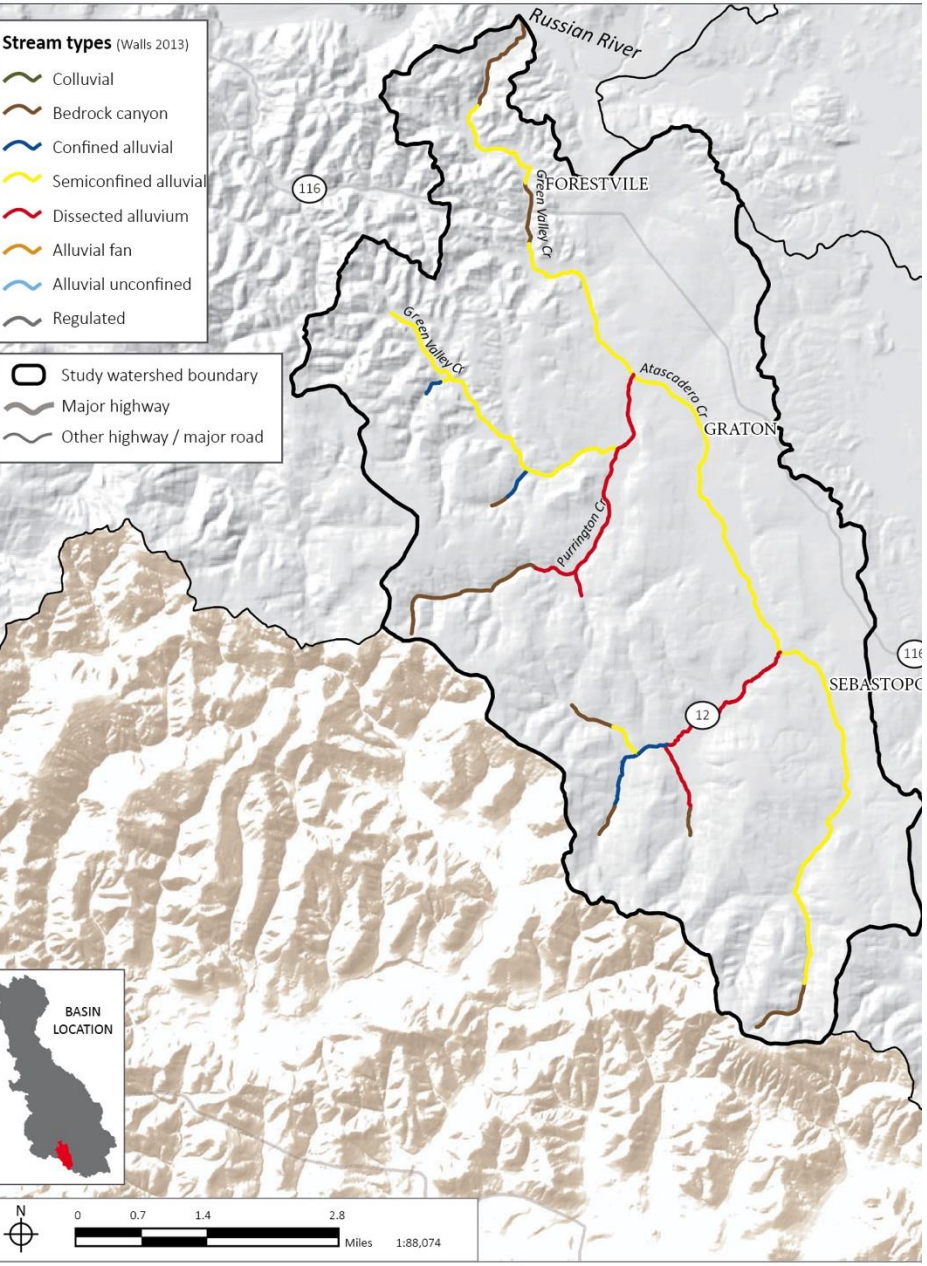




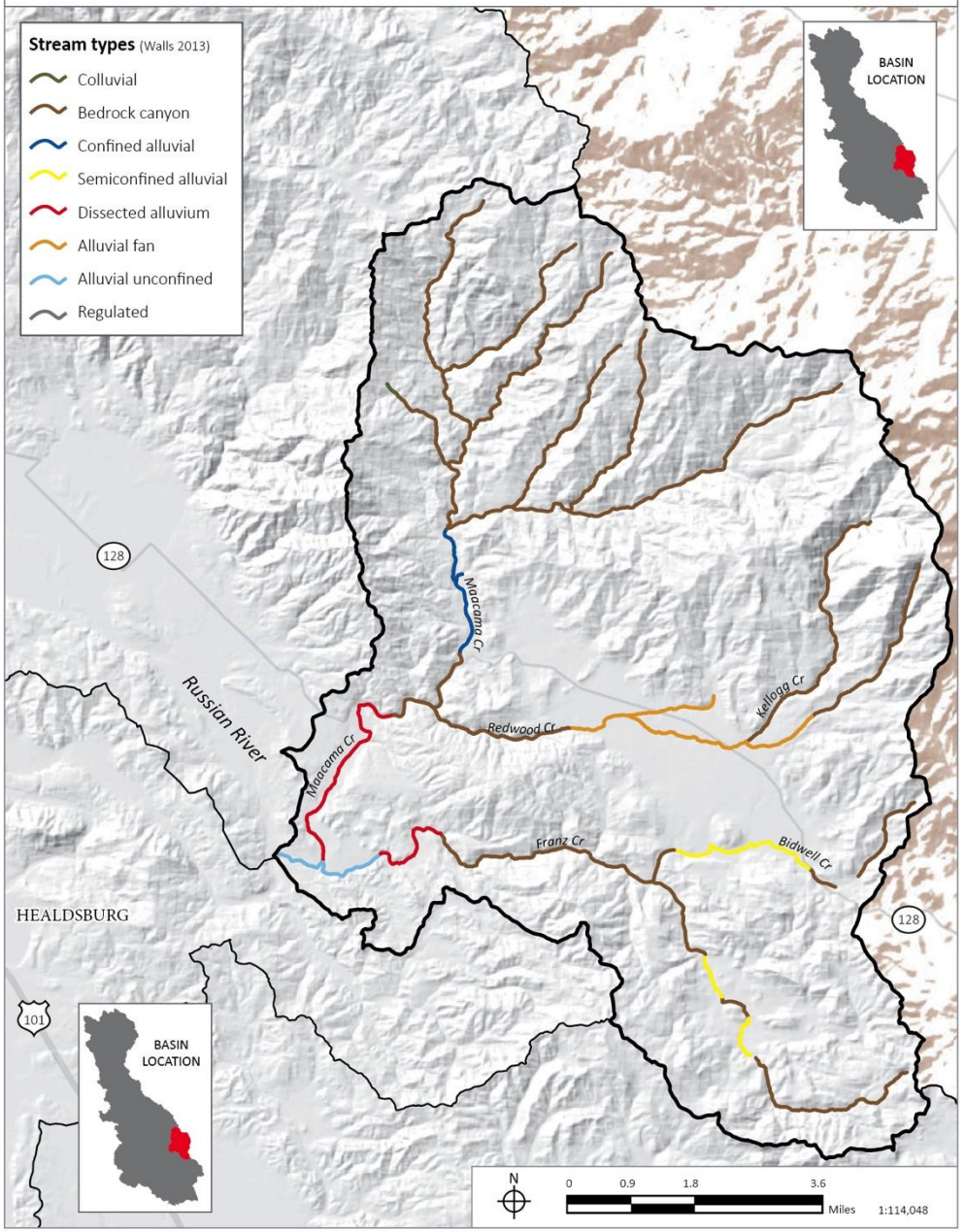


Species	Timing	Habitat Requirements: Channel Slope, Flow Conditions, Complexity of Channel	Colluvial	Bedrock	Confined alluvial	Semiconfined alluvial	Alluvial fan	Dissected alluvium	Unconfined alluvial	Regulated
Adult Migration										
Chinook	Sept-Dec	0-1%; sufficient stream flow and depth								
Coho	Nov-Jan	0-3%; sufficient stream flow and depth								
Steelhead	Jan-Apr	0-4%; sufficient stream flow and depth								
Spawning and Egg Incubation										
Chinook	Oct-Feb	0-1%; PR; intragravel flow; high DO; low fines; little scour								
Coho	Nov-Mar	1-3%; PR, FPR; intragravel flow; high DO; low fines; little scour								
Steelhead	Jan-May	1-4%; FPR, PB, SP; intragravel flow; high DO; low fines; little scour								
Rearing: Spring-Summer-Fall										
Chinook	Dec-May	low velocity margins; floodplain; cover; food supply								
Coho	Feb-Dec	perennial flow; large woody debris; cool temps; cover; food supply								
Steelhead	Mar-Dec	perennial flow or isolated pools; cool temps; cover; food supply								
Rearing: Winter										
Chinook	-	N/A								
Coho	Dec-Mar	large woody debris; flow refugia: floodplains, alcoves, backwater								
Steelhead	Dec-Mar	flow refugia: unembedded substrate, cobble, boulder								
Smolt Outmigration										
Chinook	Mar-Jun	sufficient flow and depth								
Coho	Mar-Jun	sufficient flow and depth								
Steelhead	Apr-July	sufficient flow and depth								

Green Valley : Stream typology



Knights Valley : Stream types



Data Gaps and Recommended Studies - Dr. Matt Cover

Surveying channel cross-sections

Measuring discharge

Monitoring well levels

Seining fish

Sampling macroinvertebrates

The ISRP collected and reviewed sources of information on:

- **Rainfall and air temperature**
- **Geology**
- **Groundwater**
- **Surface water**
- **Geomorphology**
- **Water quality – water temperature**
- **Climate change studies**
- **Water Demand and Use**
- **Aquatic Communities**

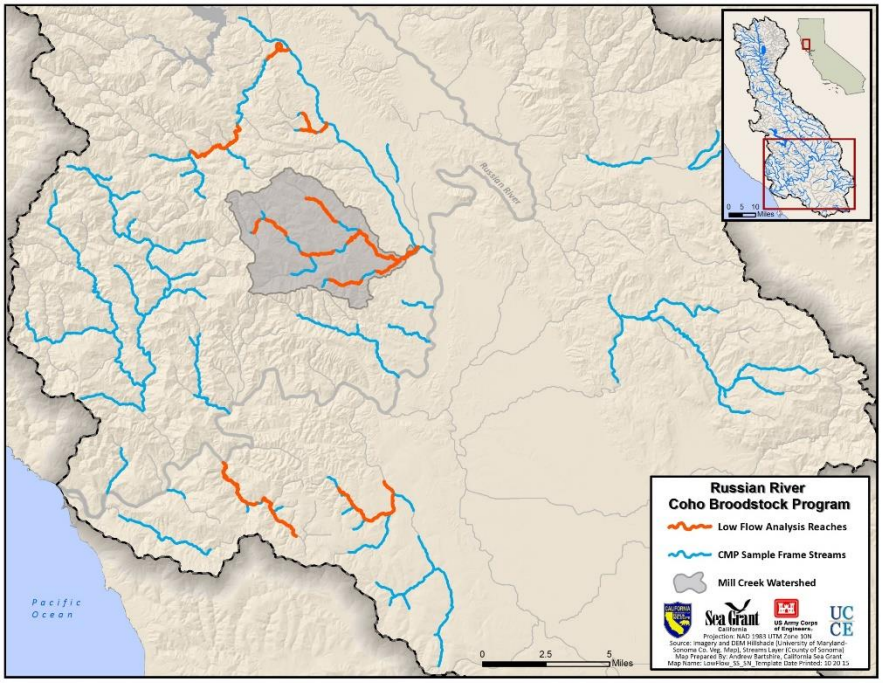
The ISRP is recommending additional data collection in:

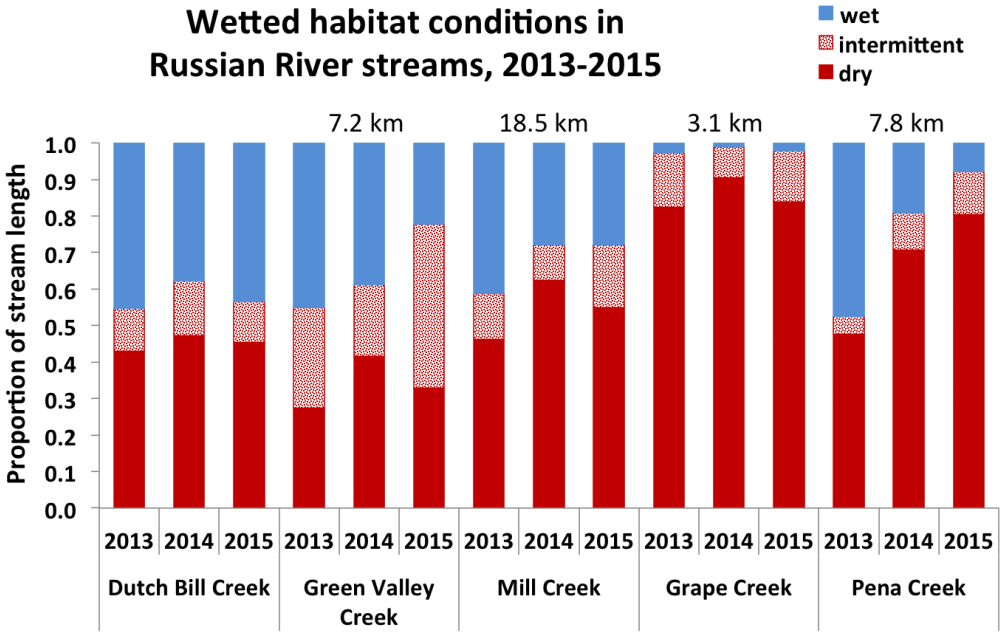
- **Aquatic communities**
- **Groundwater**
- **Surface Water**
- **Water Use**

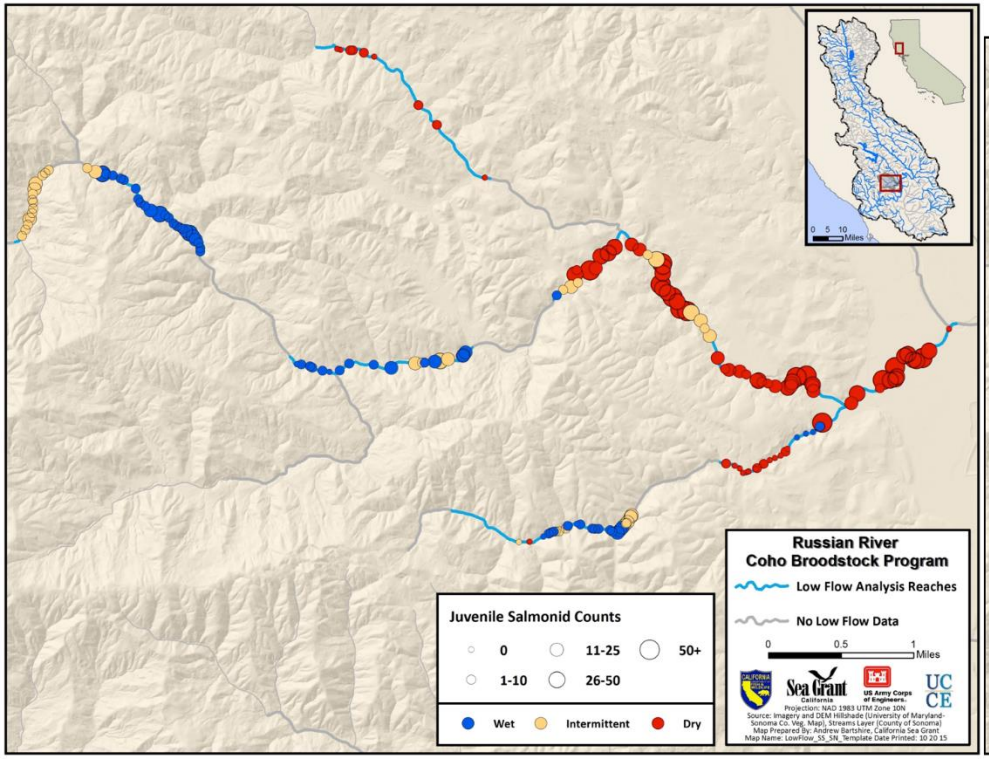
Plus focused studies in geomorphology, climate change

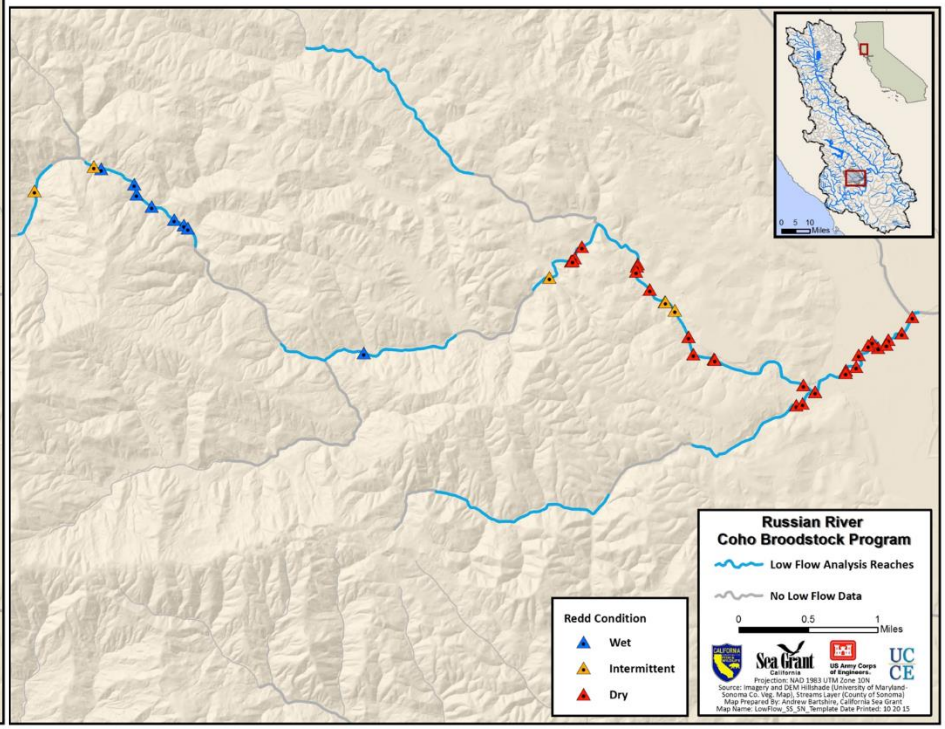
Aquatic Communities Data Gaps

- The watershed lacks a comprehensive monitoring program for aquatic populations and communities
- Very limited information on the occurrence and distribution of aquatic species other than salmonids
- Monitoring of salmonids has not been watershed-wide (but see California Coastal Monitoring Program)
- Species have been studied in isolation, but conservation of anadromous fish populations also requires an understanding of ecological interactions with other species
- Limited research attempting to link hydrologic and biological processes (but see Coho Captive Broodstock Sea Grant/UCCE)


Russian River
Pacific Ocean
Russian River
Coho Broodstock Program
Low Flow Analysis Reaches
CMP Sample Frame Streams
Mill Creek Watershed
0 2.5 5 Miles


Wetted habitat conditions in
Russian River streams, 2013-2015
wet
intermittent
dry
7.2 km
18.5 km
3.1 km
7.8 km
Proportion of stream length
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2013 2014 2015 2013 2014 2015 2013 2014 2015 2013 2014 2015 2013 2014 2015
Dutch Bill Creek
Green Valley Creek
Mill Creek
Grape Creek
Pena Creek


Juvenile Salmonid Counts
0
1-10
11-25
26-50
50+
Wet
Intermittent
Dry
Russian River
Coho Broodstock Program
Low Flow Analysis Reaches
No Low Flow Data
0 0.5 1 Miles


Redd Condition
Wet
Intermittent
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0 0.5 1 Miles

Aquatic Communities Data Gaps

Unknown Biodiversity, Community Dynamics, Invasive Species
Link Biology to Conceptual Model

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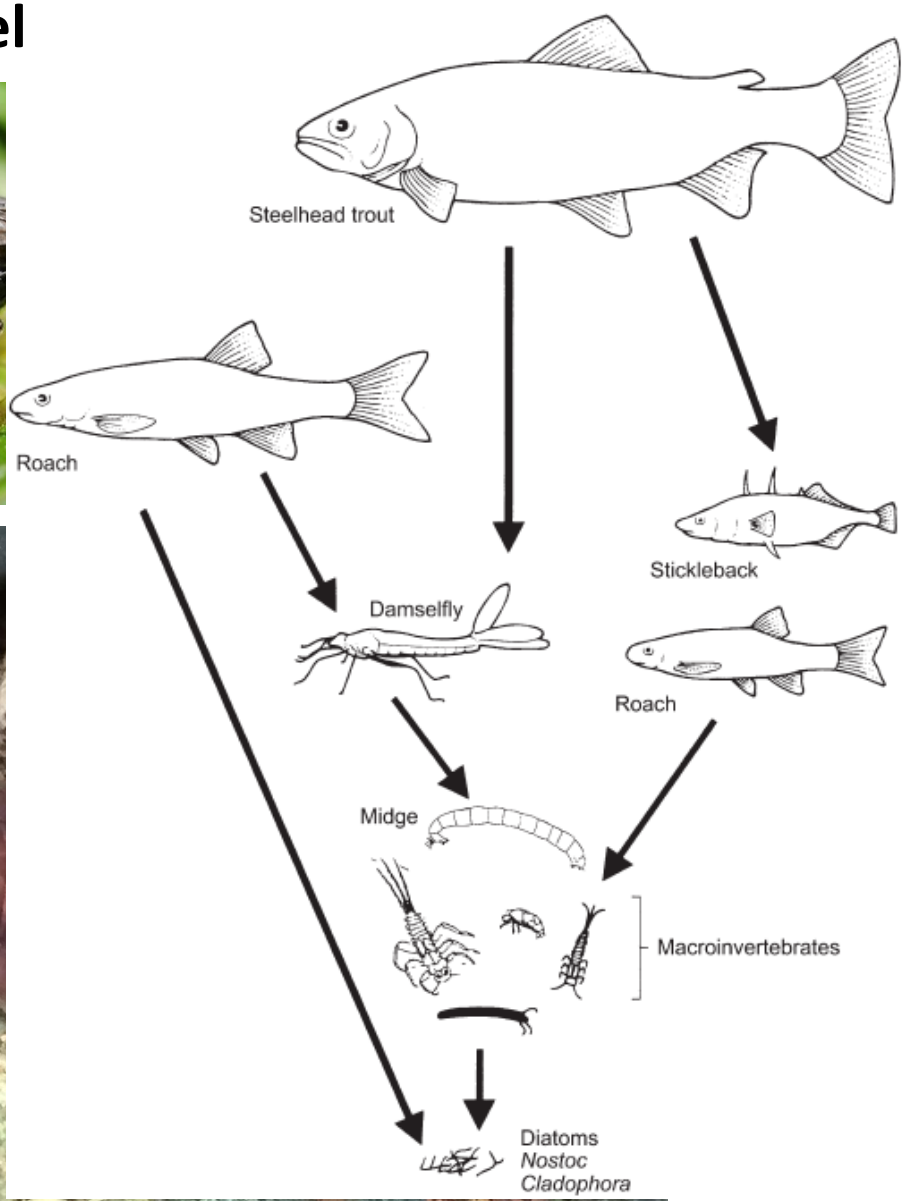

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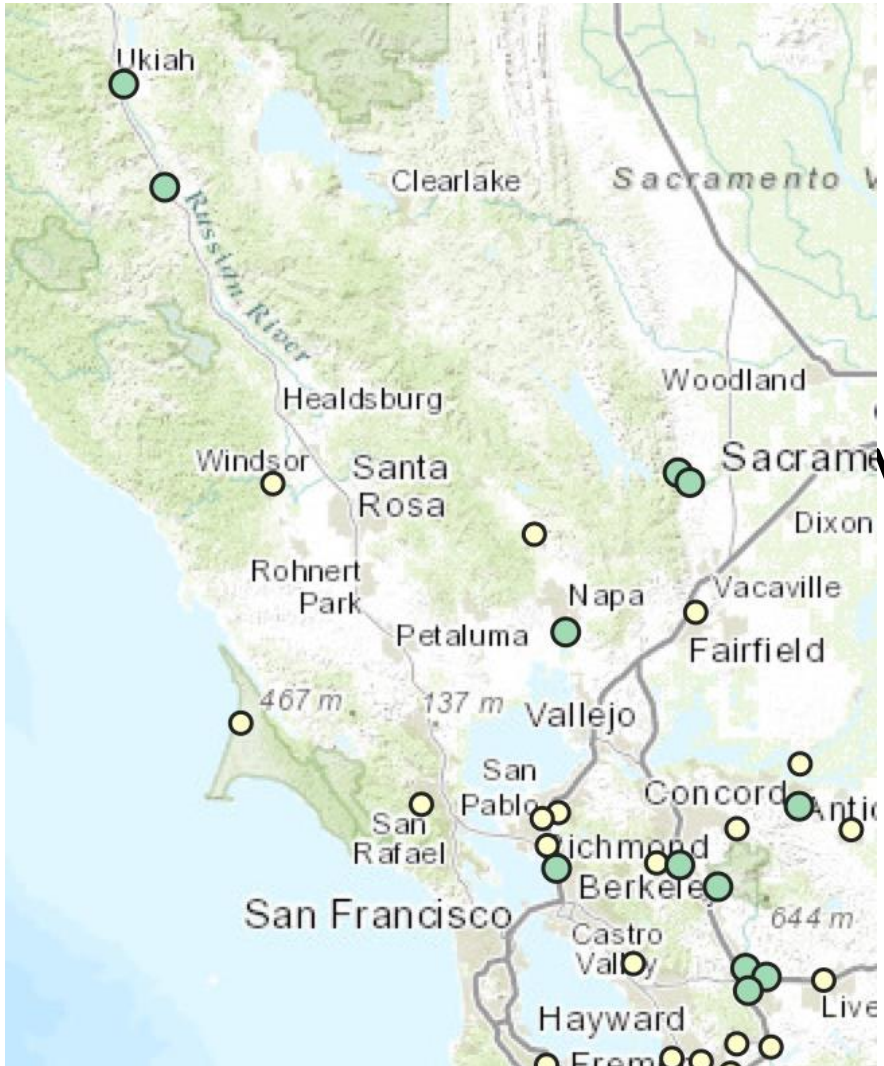

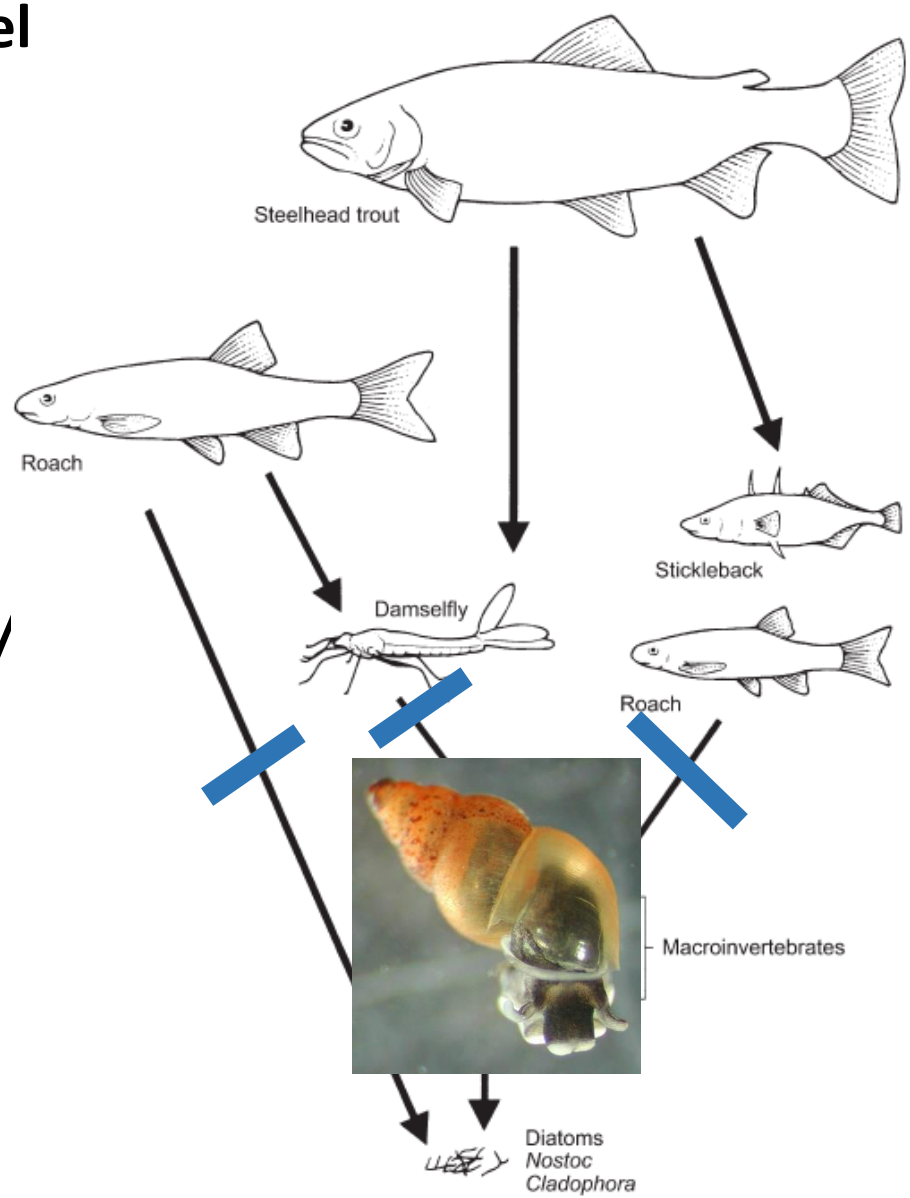

Aquatic Communities: Recommended Data Collection

A coordinated, comprehensive, adaptive, and consistent biological monitoring and research program

- **Coordinated:** should consider the whole watershed, from the headwaters to the estuary
- **Comprehensive:** multiple taxonomic groups and interactions
  - fish, amphibians, reptiles, invertebrates
  - both community and population level interactions
- **Adaptive:** work in phases as knowledge is increased
  - Phase 1: distribution of aquatic biota (~150 sites)
  - Phase 2: long-term monitoring of population and community dynamics; targeted studies
- **Consistent**: established and repeatable methodologies appropriate to this system and the research questions
  - Fish: EPA Rapid Bioassessment Protocol?
  - Invertebrates: SWAMP, or sampling by microhabitats + adult insects

Groundwater Data Gaps

- Continuous groundwater monitoring (elevation, temperature) is lacking in alluvial valleys, confined alluvial, semiconfined alluvial, and dissected alluvium channel types.
- For existing wells, we are lacking an inventory of well features, e.g. elevation of first screen, diversion volume and timing

Questions to answer:

- How do groundwater levels in different alluvial channel types vary seasonally, with changes in surface flow, and with groundwater extraction?
- In the alluvial valleys (Redwood, Ukiah, Hopland and Alexander) how does the groundwater table change with changes in flow in the entrenched Russian River channel? e.g., what is the influence of dry season releases from Lake Mendocino on groundwater levels? how does surface flow in unconfined alluvial tributaries vary with changes in flow in the Russian River channel?
- Effects of pumping, and recovery time to static water levels

Groundwater Recommended Data Collection

A coordinated, continuous groundwater monitoring program

- A series of existing wells in each major valley need to be identified for periodic and a subset for installation of continuous monitoring pressure transducers and temperature.
  - spatially distributed over each valley
  - use existing supply wells, provided pumping records are maintained, or unused wells
  - account for depth and use of the well (drilling logs)
  - locate wells near stream flow gaging stations allow for comparisons between the data from each gage.
- Wels in each major alluvial channel reach in tributaries, coordinated with surface water gaging locations

Surface Water Data Gaps

- Stream flow gages are primarily on the main stem Russian River with only a few on tributary streams
- Due to the high level of variation in the geology and topography of tributary streams, gaging data can not be accurately extrapolated between tributaries

Surface Water- Recommended Monitoring

- Low flow conditions are of primary importance; thus, gage stations should be designed to optimize accuracy at low flow
- Gaging networks in tributaries need to follow established gaging protocols, need to be operated for long-term monitoring (>5 years), and need to be designed to answer water management and fish habitat questions (e.g., nested gages to determine impacts of diversions or pumping)
- Tributary gaging can be coordinated with groundwater monitoring and local gaging efforts under the State Water Board's Frost Regulation

Geomorphology Data Gaps

Uncertainty about dynamics of Russian River mainstem channel changes

- How much has the main stem river channel aggraded (built-up) or degraded (downcut) since the last survey was done?
- Is the incision process continuing and at what rate?
- How are tributary streams in the alluvial valleys adjusting to (potential) incision of the main stem?

Geomorphology – Focused Study

- A topographic survey (aerial LiDAR, conventional surveying of cross sections and longitudinal profile) to directly compare with historic topographic data to evaluate channel changes
  - XS should go from top of bank to top of bank and be tied to benchmarks
  - Include major tributary channels to monitor upstream propagation of incision
- Geomorphic data should be used to develop a hydraulic model of the effects of Coyote Dam operations on channel erosion and geomorphology under different flow scenarios

Climate Change Focused Study

The questions important to answer for future climate change studies include:

- What will future water temperatures be in specific tributary locations under various climate change scenarios?
- Can we prioritize restoration efforts in tributaries where cold water may be more prevalent?
- How will increased future water demands for urban, rural residential and agricultural land use fare under predicted future climate scenarios?
- Will there be adequate flows for human uses and fish and aquatic life?