
CAUSAL ASSESSMENT OVERVIEW

October 11, 2012

Why Causal Assessment?

- **Not every stream is going to meet biological objectives**
- **When a stream is non-compliant, site-specific causes need to be determined for remediation**
- **Causal assessment approaches have not been well-vetted in California**

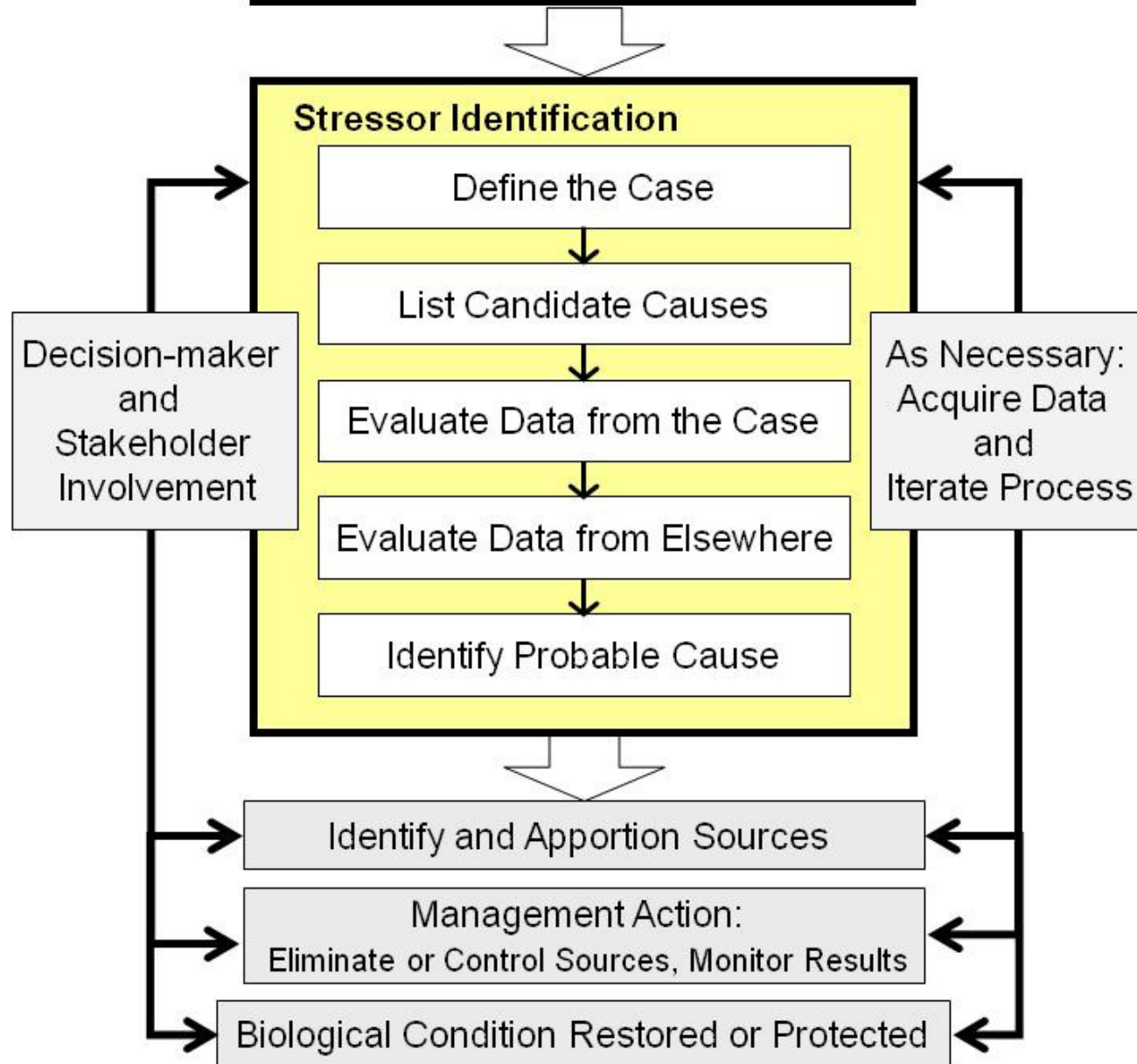
Project Goal

- **Produce a Guidance Document as a resource for stakeholders and regulatory agencies**
- **Provide recommendations for future activities**
 - **Optimize causal assessment designs for California**
 - **Distinguish tools that work (or don't work)**
 - **Identify data gaps or new tools that need to be refined/created**

We're Lucky To Have Partners

- **US EPA has, over the past 15 years, developed a causal assessment framework**
 - www.epa.gov/CADDIS
- **EPA (ORD-National Center for Environmental Assessment) joined our Science Team**
- **Utilized three case studies**
 - **Interactive relationship with local stakeholders**

Detect or suspect biological impairment



The Five Steps

- Define the case
- List candidate causes
- Evaluate data from the case
- Evaluate data from outside the case
- Identify probable causes
 - Refute causes

Our Three Case Studies

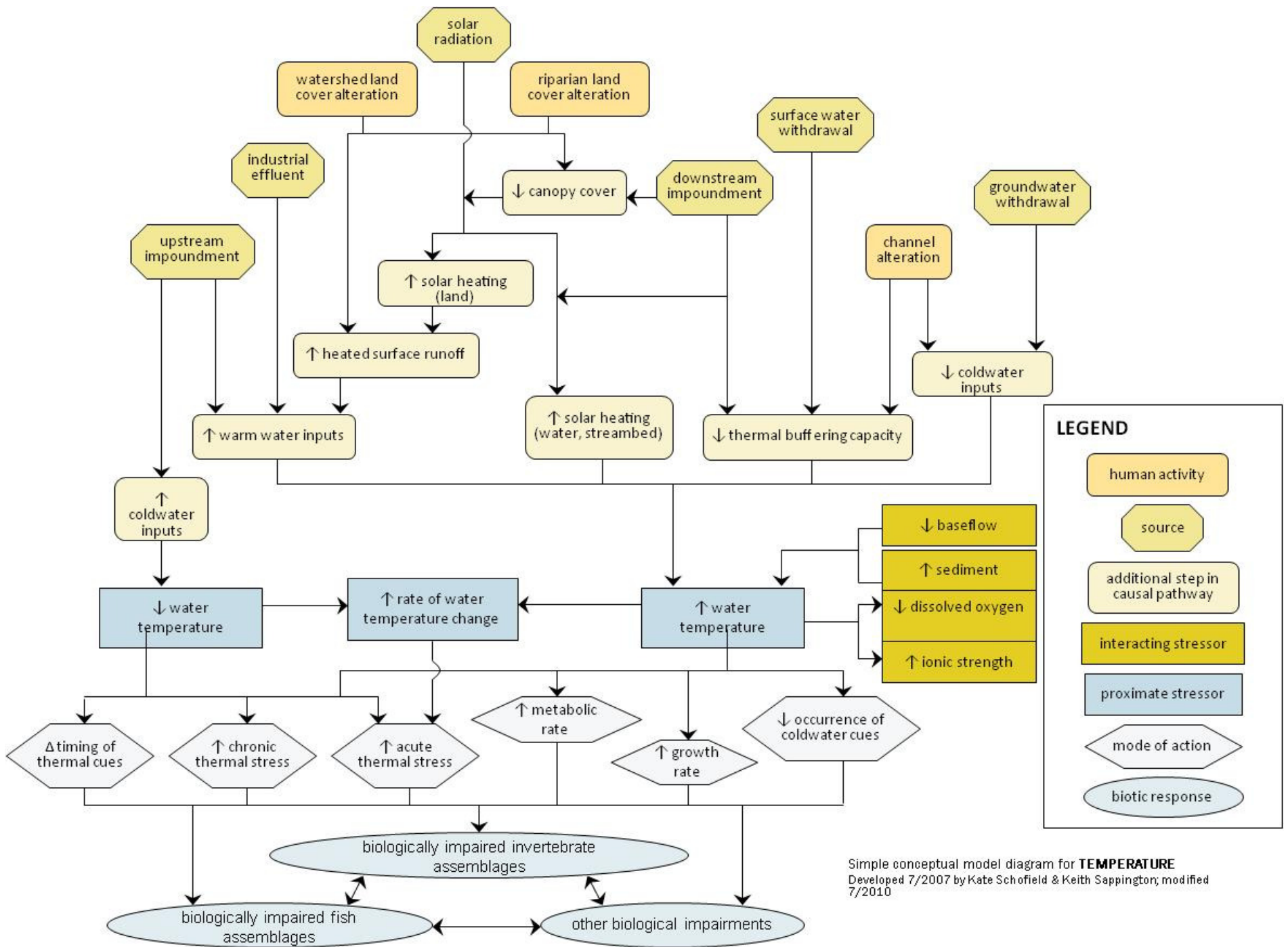
- **Selection criteria**
 - Representativeness, stressor diversity, data availability, willing partners
- **Garcia River in Northern California**
 - RWQCB, Nature Conservancy
- **Salinas River in Central California**
 - RWQCB, Agriculture collaborative
- **Santa Clara and San Diego Rivers in Southern California**
 - RWQCBs, Sewage Treatment Plant, Municipal Stormwater

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CUMULATIVE LIST OF CANDIDATE CAUSES

- Flow alteration
- Physical habitat loss or alteration
- Temperature
- Dissolved oxygen
- Conductivity, TDS
- Sediment
- Nutrients
- Trace metals
- Pesticides
- PAHs
- Invasive species



Simple conceptual model diagram for **TEMPERATURE**
 Developed 7/2007 by Kate Schofield & Keith Sappington; modified 7/2010

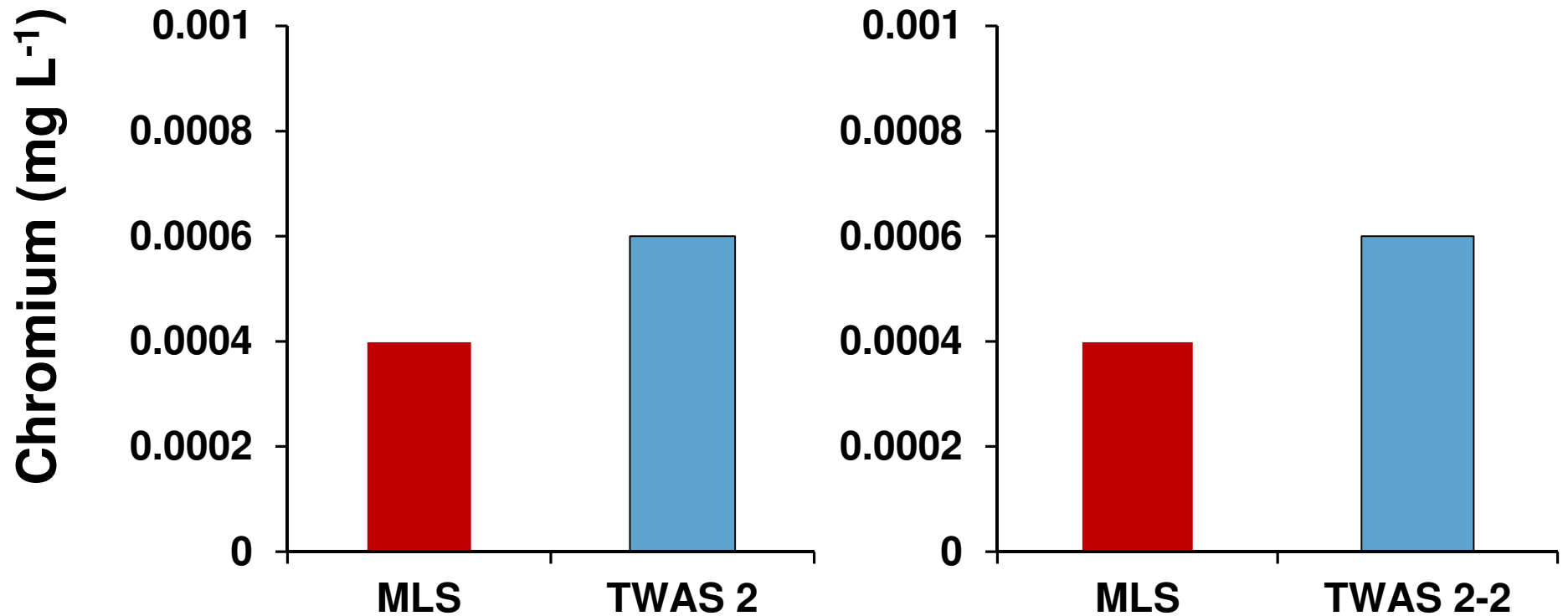
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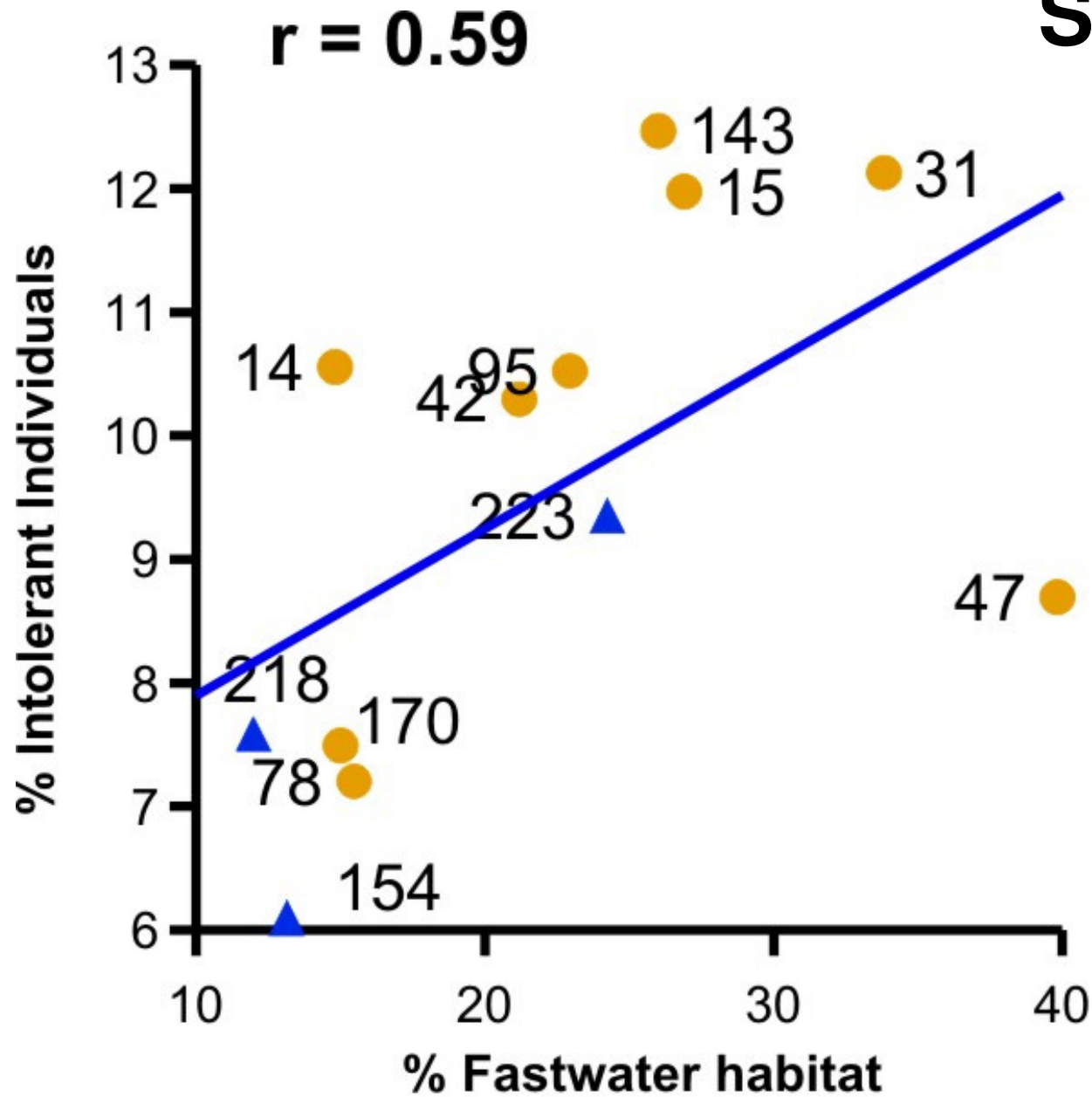
TYPES OF EVIDENCE

- **Spatial/temporal co-occurrence**
- **Exposure**
- **Biological mechanism**
- **Field based stress-response relationship**
- **Casual pathway**
- **Manipulation of exposure**
- **Laboratory tests of site media**
- **Temporal sequence**
- **Verified predictions**
- **Symptoms**

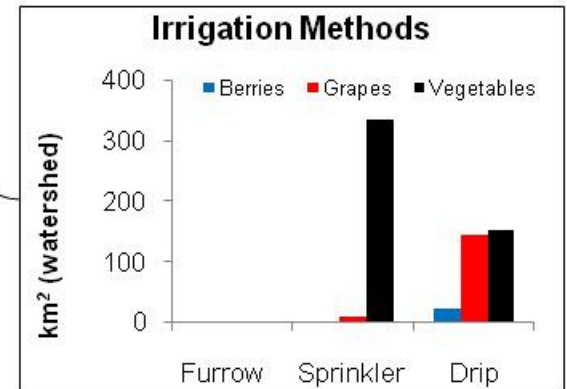
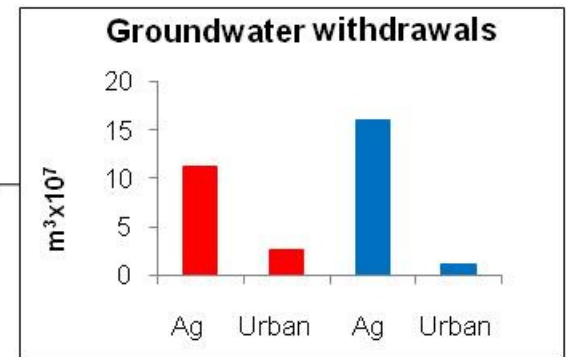
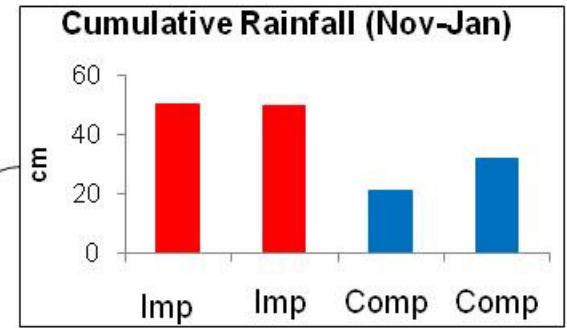
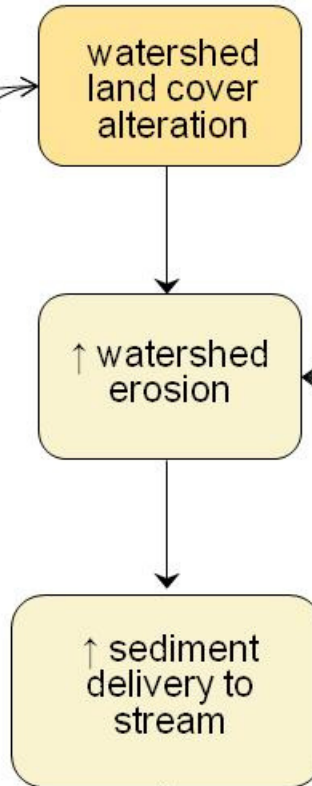
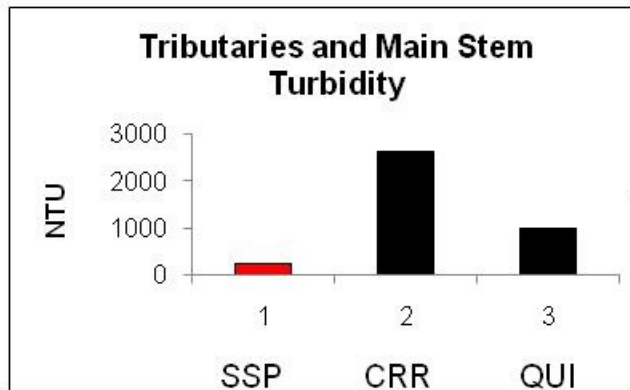
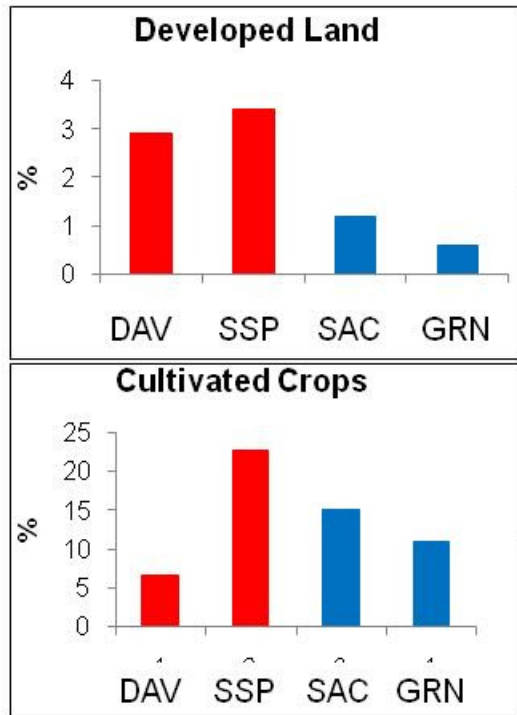
Spatial-Temporal Co-Occurrence From the Field: San Diego River



Stressor-Response From the Field: Garcia River



Causal Pathway: Salinas River

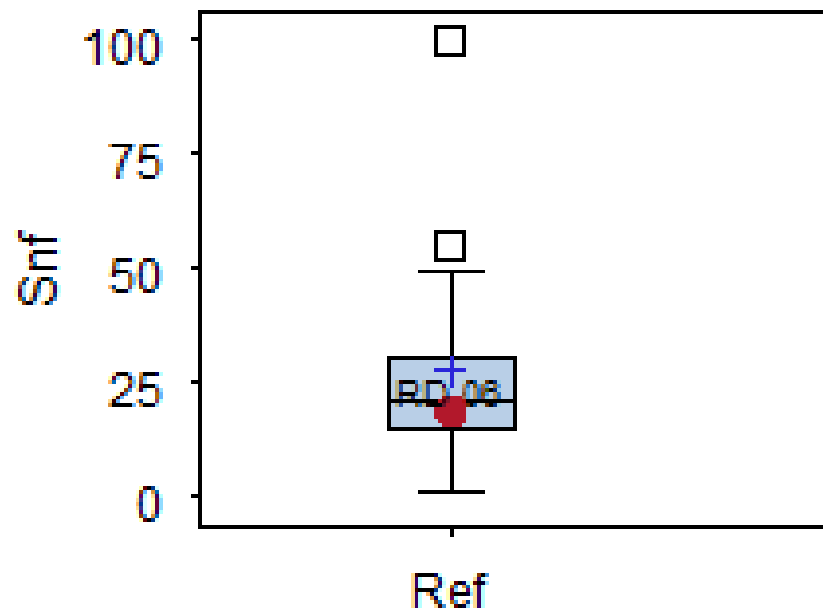


The Five Steps

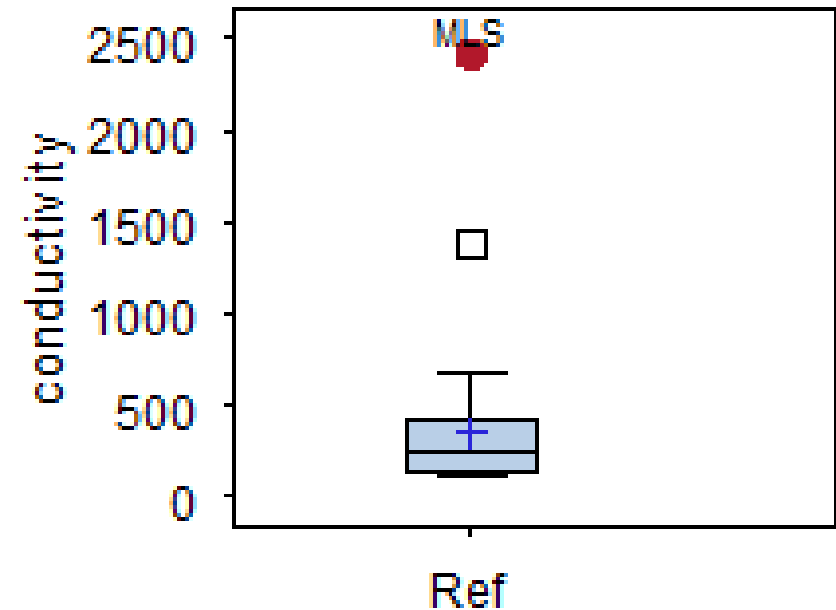
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Co-Occurrence from Outside the Case: San Diego River

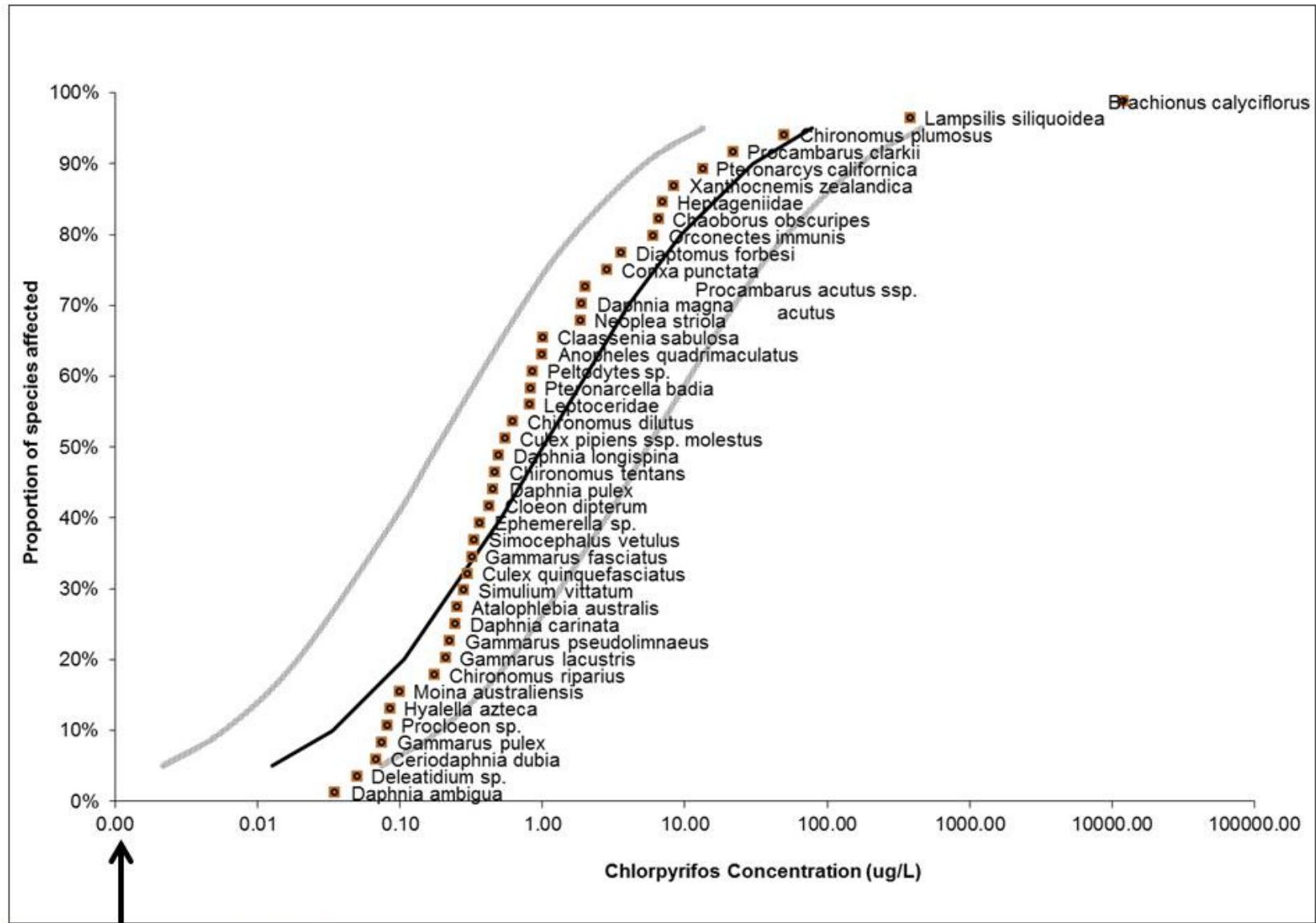
Sands and Fines



Conductivity



Species Sensitivity Distributions



Observed max concentration 2006
(0.001) at 309SAC/309SSP

The Science Team's Evaluation

- **Bioobjectives needs a causal assessment component to be successful**
- **CADDIS is an appropriate framework, but it isn't perfect**
 - Has strengths and weaknesses
- **A guidance manual can be written**
 - Because California has some unique issues, implementing the recommendations will be important

CADDIS Strengths For California

- **Already built and documented**
 - **Creates a solid foundation for regulatory interactions**
- **Adept at ruling out candidate causes**
- **Wonderful communication tool**

CADDIS Weaknesses For California

- **Don't expect to always find the smoking gun**
 - nonpoint, cumulative stressors are difficult to diagnose
- **Challenges finding appropriate comparator sites**
- **Need for additional data analysis tools**

Recommendations

- **Comparator site selection requires additional support**
 - Take advantage of our large statewide data set
- **Data analysis tools need to be built and/or refined**
 - Almost all would be data from outside the case
- **Monitoring recommendations to ensure adequate data collection**

Comparator Site Selection

- **Comparator site attributes**
 - Similar natural setting
 - Different (better) biology
 - Stressor data availability
- **Our vision is a tiered or staged site selection process**
- **Start within your catchment, but could expand to watershed, regional, or statewide scales**

Data Analysis Tools

- **Critical because California mostly suffers from non-point source, cumulative stressors**
 - Need more than spatial/temporal co-occurrence
- **We have some great data sets to learn from**
 - Favors correlative approaches
- **Additional lab studies that examine cause-effect will be crucial**

Non-Technical Considerations We Won't Comment On

- **Who should do the causal assessment?**
- **Should the comparator sites always be reference sites?**
 - **Compliance vs. incremental improvement**
- **When do you have enough certainty to act on the causal assessment?**

The Guidance Manual

- Target audience are Stakeholders and RWQCB staff (“Informed managers”, but not biologists)
- Describe CADDIS (not a cookbook, pointers to SOPs)
- Case Study summaries (utilize as teaching illustrations)
- Important considerations (insights for California users)
- Recommendations (describe needs for future improvements)

Next Steps

- **Present findings to Science Advisory Panel**
- **Draft Guidance Manual**
 - case study results
- **Final Guidance Manual**