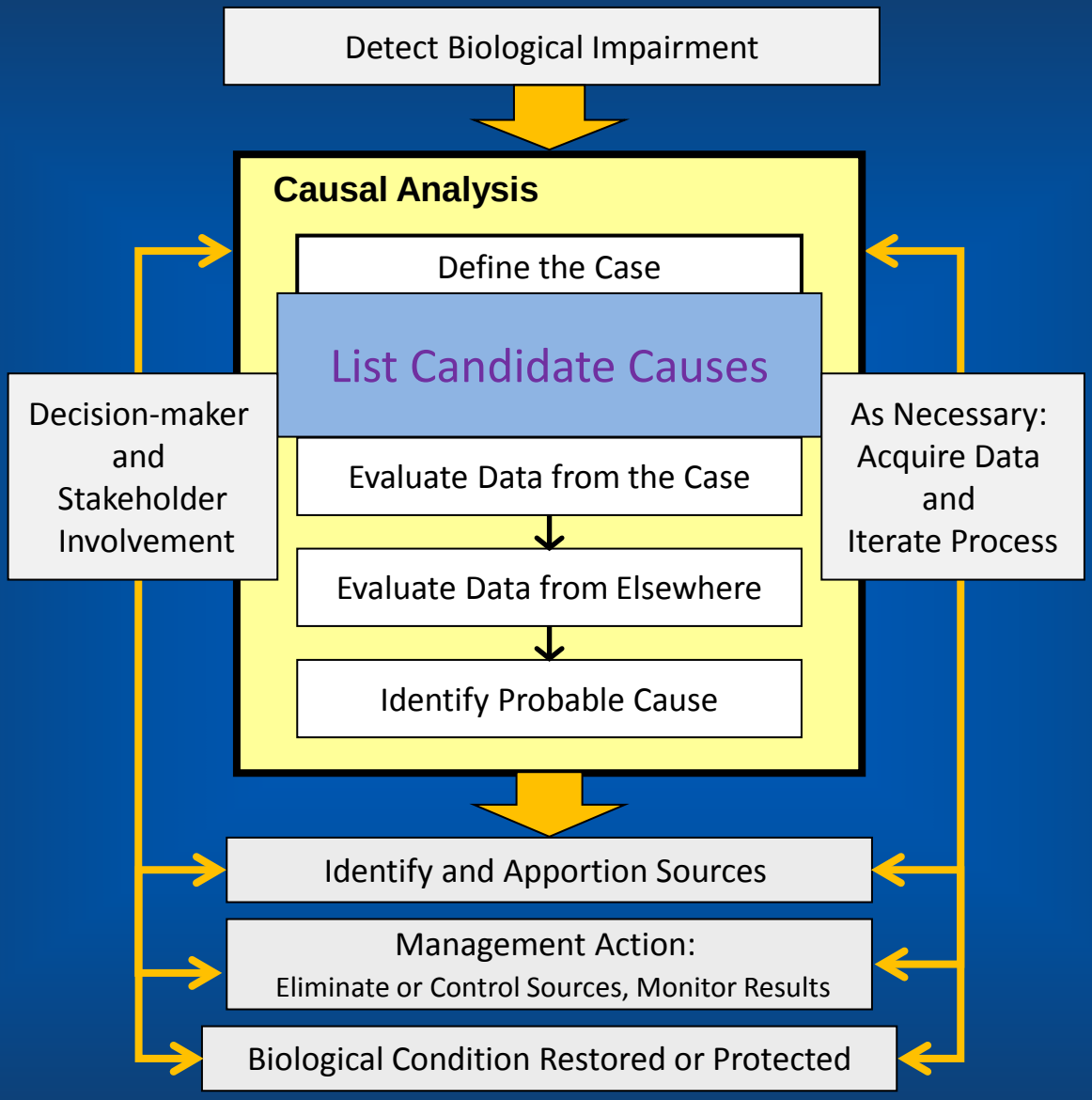
Listing Candidate Causes & Avoiding Confirmation Bias

Step 2

San Diego Creek Causal Assessment Workshop 1
December 17, 2014


Detect Biological Impairment
Causal Analysis
Define the Case
List Candidate Causes
Evaluate Data from the Case
Evaluate Data from Elsewhere
Identify Probable Cause
Decision-maker and Stakeholder Involvement
As Necessary: Acquire Data and Iterate Process
Identify and Apportion Sources
Management Action:
Eliminate or Control Sources, Monitor Results
Biological Condition Restored or Protected

What are Candidate Causes?

- The stressors that could potentially have caused the impaired biology
- These are the basic units of the causal assessment
  - Each cause will be evaluated and scored using the different lines of evidence
- At the end, each will be assigned likely, unlikely, or indeterminate status as a cause of the impairment

Legal Parallel:

The Defendant(s)

CA Case Studies

- San Diego River
  - Elevated Conductivity
  - Heavy Metals
  - Pesticides
  - Increased Nutrients
  - Habitat Alteration
- Santa Clara River
  - Elevated conductivity
  - Heavy metals
  - Pesticides
  - Increased Nutrients
  - Habitat alteration
  - Habitat discontinuity
  - Elevated Temperature
- Garcia River
  - Sedimentation
  - Increased temperature
  - Altered flow regime
  - Physical habitat
  - Marijuana farming
  - Decreased DO
- Salinas River
  - Decreased DO
  - Increased pesticides
  - Increased metals
  - Nutrient enrichment
  - Increased ionic strength
  - Flow alteration
  - Increased sediments
  - Physical habitat alteration

Keeping an Open Mind

- This is the biggest brainstorming part of the assessment process
- You must get beyond your "favorite" stressor or existing regulatory targets
  - These may indeed be a factor, but they may not
  - Keep an open mind
    - Be exhaustive, be thoughtful
    - You're not "wasting your time"
- The list will be pared down
  - Too many CC's can make for a convoluted assessment

Keeping an Open Mind

- Garcia River
  - Sedimentation
  - Increased temperature
- Garcia River participants were only interested in 2 stressors
  - The river has TMDLs and BMPs focused on sediment and temperature

Keeping an Open Mind

- Garcia River
  - Sedimentation
  - Increased temperature
  - Altered flow regime
  - Physical habitat
  - Marijuana farming
  - Decreased DO

- Via discussion and listening to other voices in the room, a more robust case was developed

Proximate Stressors

- Each candidate cause is comprised of a series of proximate stressors
- These are what actually impact the biota
  - Channelization of the stream vs. altered food resources, loss of riffles and pools
- These are the measures that will be evaluated in the analytical steps

San Diego River

- Candidate Causes
  - Elevated Conductivity
  - Heavy Metals
  - Pesticides
  - Increased Nutrients
  - Habitat Alteration

- Increased Nutrients Proximate Stressors
  - Increased algal mats
  - Increased frequency of low DO
  - Altered food sources
  - Ammonia toxicity

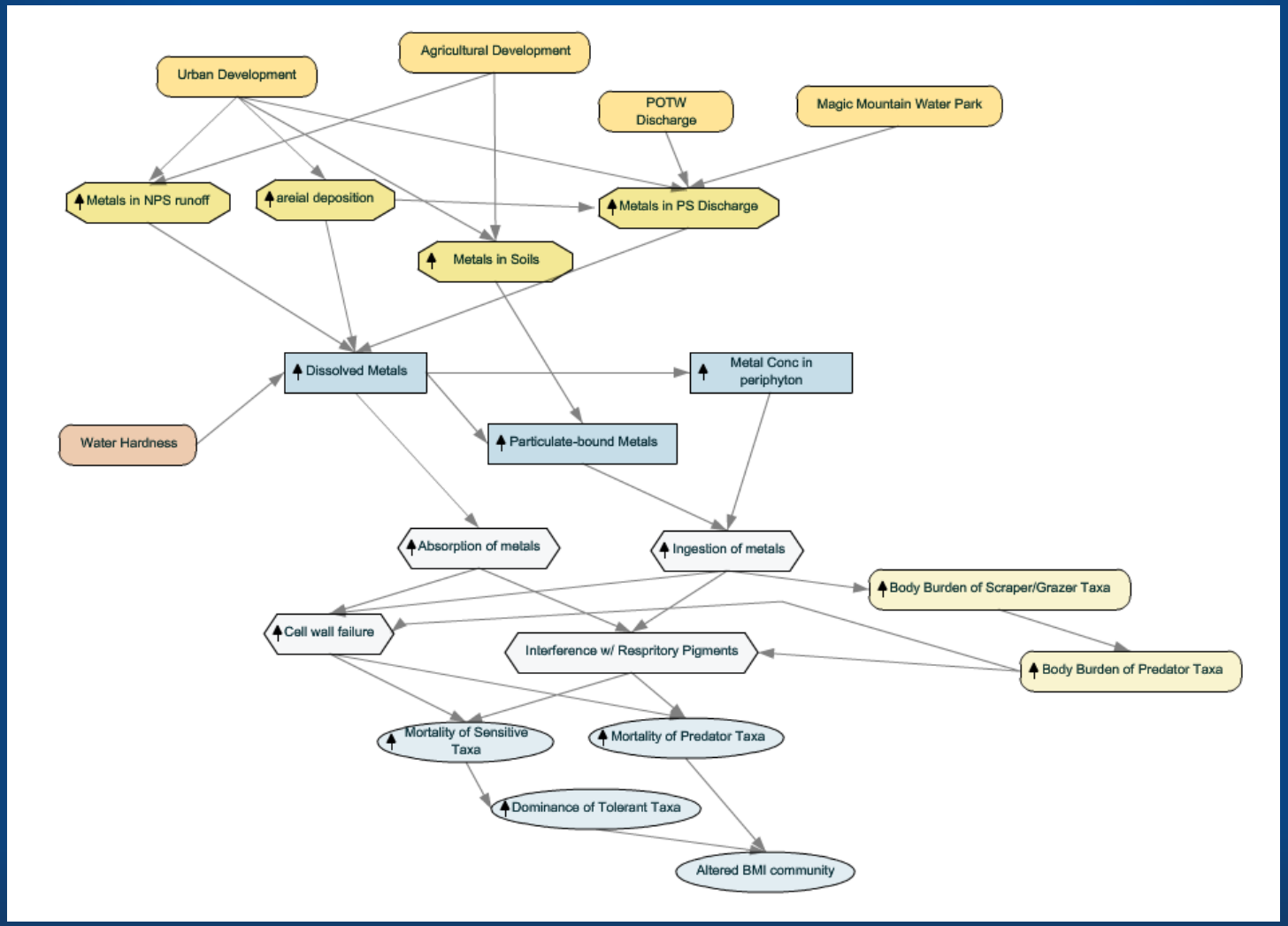
Culling the List

- High likelihood of a long list of candidate causes initially
  - This is good, but too many can make the assessment convoluted
  - Can the list be more constrained?
- Suggested criteria
  - Can proximate stressors and a working conceptual model be developed?
  - Are there any significant data gaps?
    - Can those data be collected?

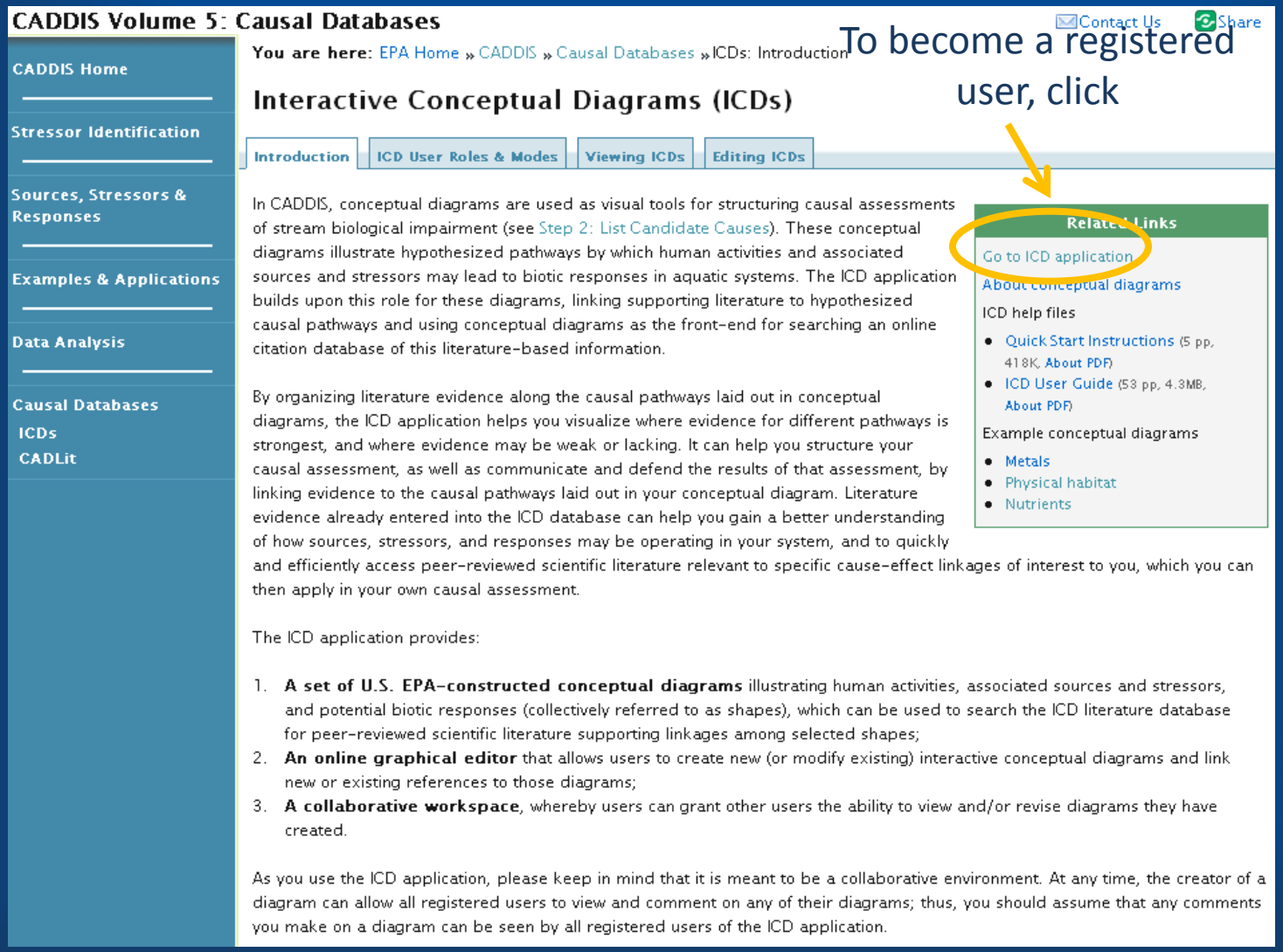
Conceptual Models

- A conceptual model is made for each candidate cause
  - Links the sources to modifying factors to proximate stressor to the mode of action to the altered biology
- A way to visually organize the assessment
  - A good sanity check for each candidate cause
- Can be built from scratch or using the CADDIS library

Santa Clara River – Heavy Metals



CADDIS Library/ICD System



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Assembling the Data

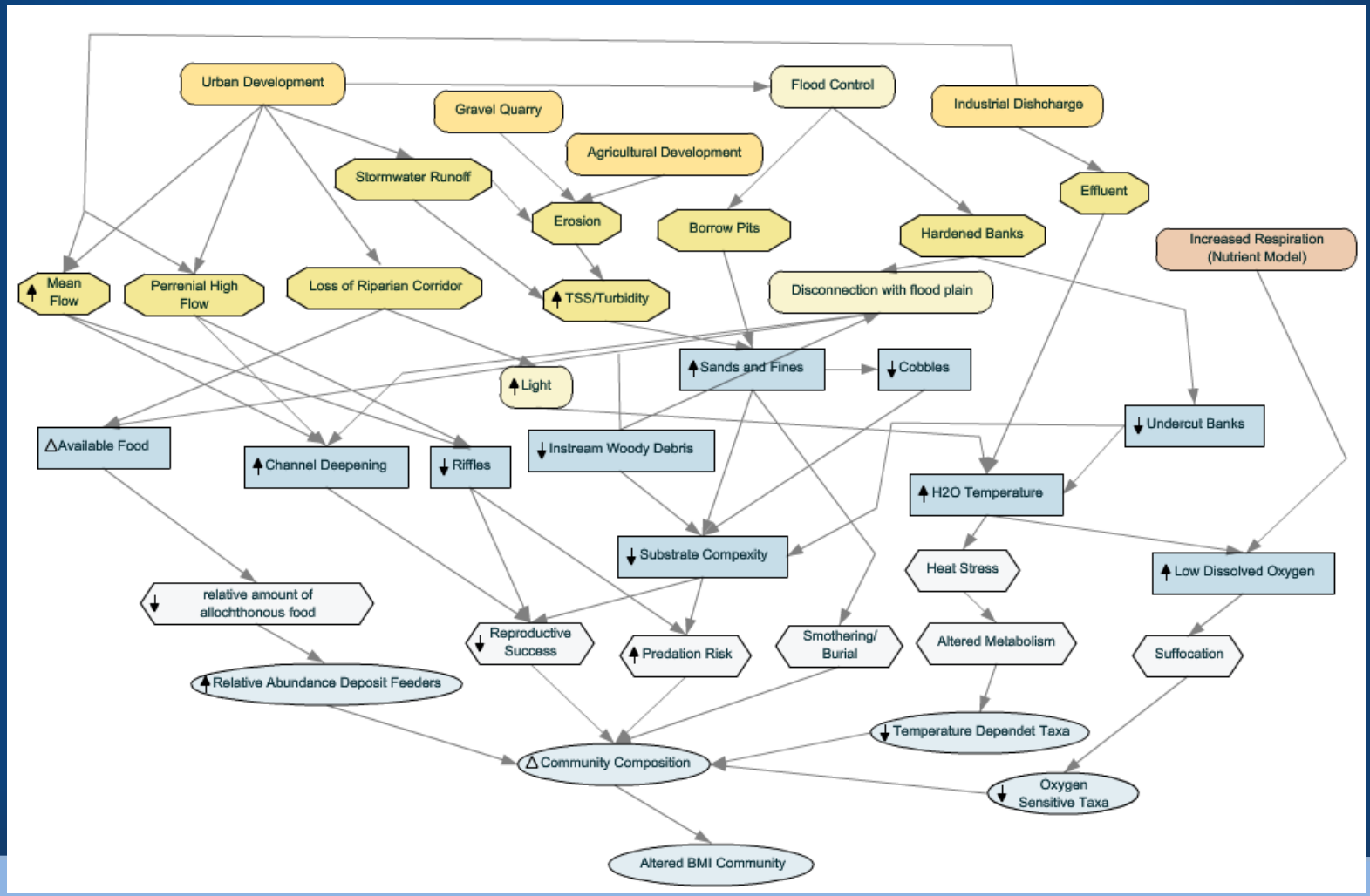
- The models and the proximate stressors provide the needs for the data list
  - Helpful to document sources
- The amounts and types of data will inform the lines of evidence than can be used

Assembling the Data

Candidate Cause/ Conceptual Diagram	Proximate Stressor	Data Available	Data Source	Data Within the Case Lines of Evidence		Data From Outside the Case Lines of Evidence		
				Spatial Co-Occurrence	Stressor-Response From the Field	Reference Condition Comparison	Stressor Response From the Field	Stressor Response From the Lab
Elevated Conductivity	Increased Conductivity	Point Measurement of Conductivity (mmhos cm^{-1}) during biological sampling	NPDES Monitoring	Comparison of MLS to individual comparator sites.	Spearman's rank correlations with percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance among MLS and the comparator sites.	Comparison of MLS to environmentally similar reference sites.	Relative risk calculation at stressor level observed at MLS for percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance using stressor and biological data from environmental similar sites to establish the expectation.	No data available
	Increased TDS	Mean of grab sample measurements of Dissolved Solids (mg L^{-1}) and Hardness (mg $CaCO_3$ L^{-1}) collected January - May	NPDES Monitoring	Comparison of MLS to individual comparator sites.	Spearman's rank correlations with percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance among MLS and the comparator sites.	No data available	No data available	No data available
Increased Nutrients	Change in Food Source	Euclidean distance from MLS location in nMDS comparison of sites based upon the occurrence of course particulate organic matter, macrophyte, filamentous algae, woody debris, and fine sediments. Bray-Curtis similarity to MLS site based upon algal community structure.	NPDES Monitoring and Algal Community Special Study	Comparison of MLS to individual comparator sites in multivariate space	Spearman's rank correlations with percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance among the comparator sites.	No data available	No data available	No data available
	Increase in Toxic Algal Compounds			No data available	No data available	No data available	No data available	No data available
	Increase in Algal Mats	Percent of reach with filamentous algae present at time of biological sampling. Mean microalgal mat thickness (mm) within the reach during	NPDES Monitoring	Comparison of MLS to individual comparator sites.	Spearman's rank correlations with percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance among MLS	No data available	Relative risk calculation at % of filamentous algae observed at MLS for percent non-insect taxa, percent tolerant taxa, percent collector-gatherer abundance, and percent amphipod abundance using stressor and	No data available

Keep CC Models Simple

San Diego River Altered Physical Habitat



Keep CC Models Simple

San Diego River Altered Physical Habitat