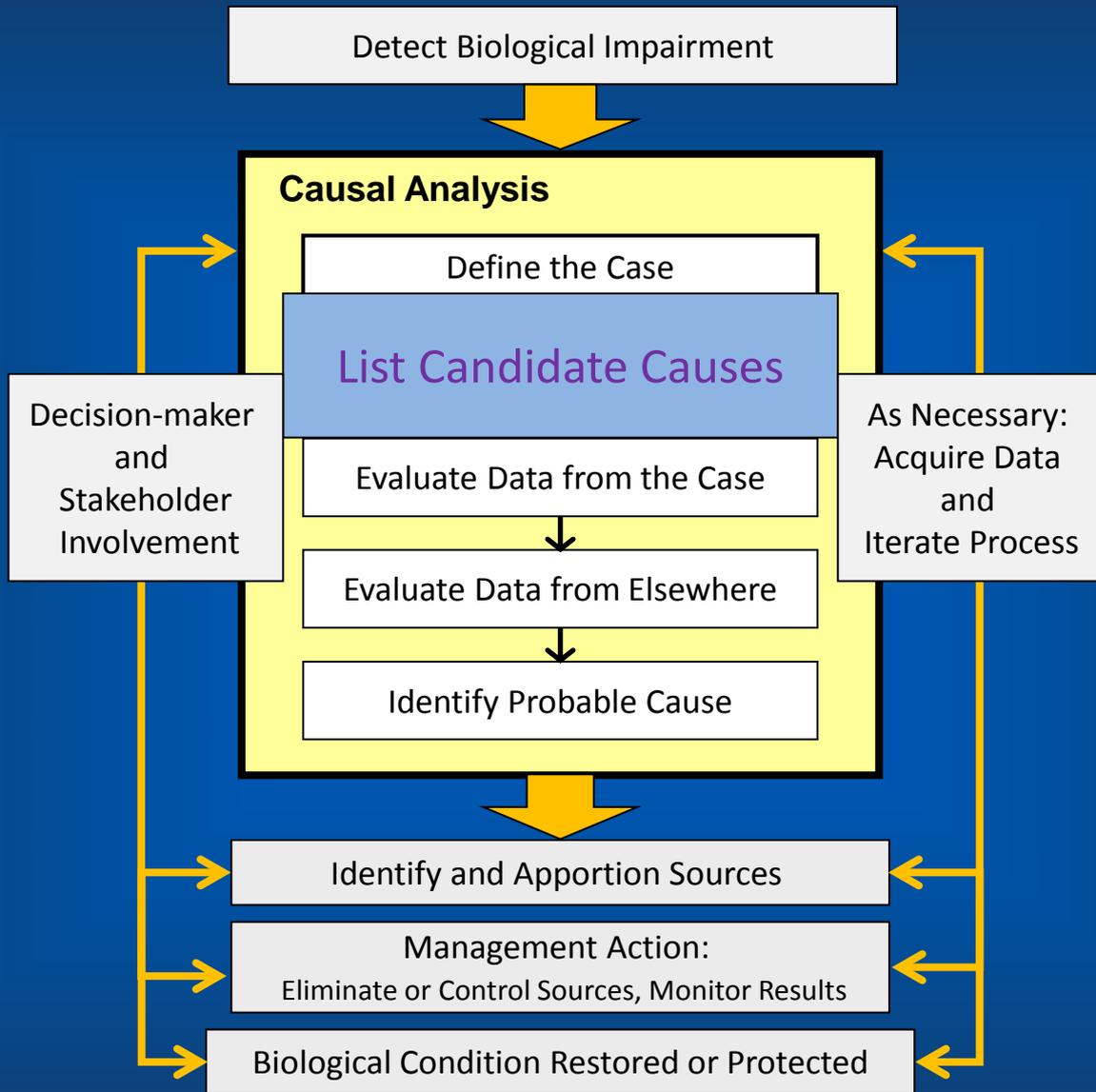


Listing Candidate Causes & Avoiding Confirmation Bias

Step 2

San Diego Creek Causal Assessment Workshop 1
December 17, 2014





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

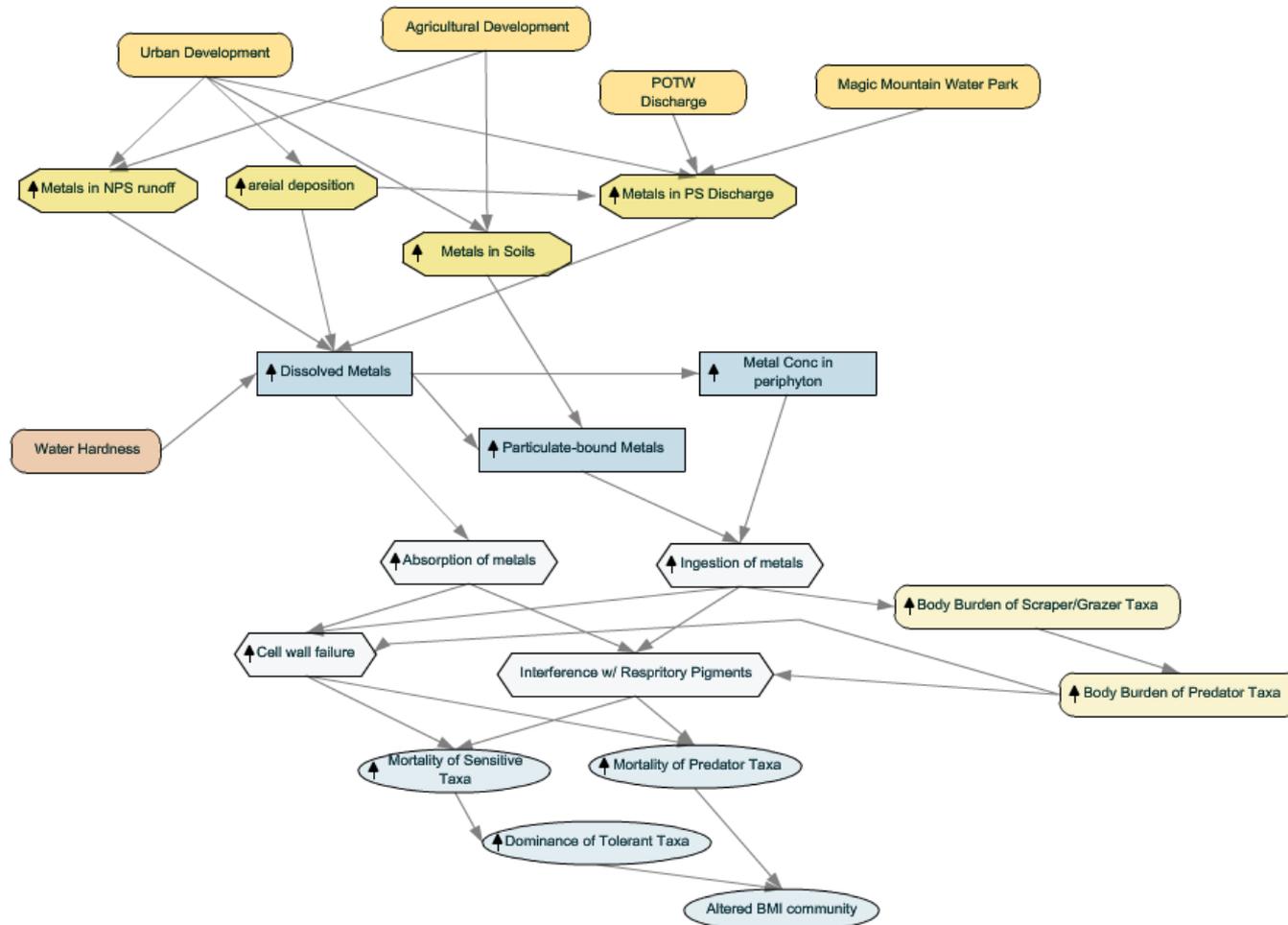
Culling the List

- 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

CADDIS Volume 5: Causal Databases

CADDIS Home

Stressor Identification

Sources, Stressors & Responses

Examples & Applications

Data Analysis

Causal Databases

ICDs

CADLit

You are here: [EPA Home](#) » [CADDIS](#) » [Causal Databases](#) » [ICDs: Introduction](#)

Interactive Conceptual Diagrams (ICDs)

[Introduction](#) | [ICD User Roles & Modes](#) | [Viewing ICDs](#) | [Editing ICDs](#)

In CADDIS, conceptual diagrams are used as visual tools for structuring causal assessments of stream biological impairment (see [Step 2: List Candidate Causes](#)). These conceptual diagrams illustrate hypothesized pathways by which human activities and associated sources and stressors may lead to biotic responses in aquatic systems. The ICD application builds upon this role for these diagrams, linking supporting literature to hypothesized causal pathways and using conceptual diagrams as the front-end for searching an online citation database of this literature-based information.

By organizing literature evidence along the causal pathways laid out in conceptual diagrams, the ICD application helps you visualize where evidence for different pathways is strongest, and where evidence may be weak or lacking. It can help you structure your causal assessment, as well as communicate and defend the results of that assessment, by linking evidence to the causal pathways laid out in your conceptual diagram. Literature evidence already entered into the ICD database can help you gain a better understanding of how sources, stressors, and responses may be operating in your system, and to quickly and efficiently access peer-reviewed scientific literature relevant to specific cause-effect linkages of interest to you, which you can then apply in your own causal assessment.

The ICD application provides:

1. **A set of U.S. EPA-constructed conceptual diagrams** illustrating human activities, associated sources and stressors, and potential biotic responses (collectively referred to as shapes), which can be used to search the ICD literature database for peer-reviewed scientific literature supporting linkages among selected shapes;
2. **An online graphical editor** that allows users to create new (or modify existing) interactive conceptual diagrams and link new or existing references to those diagrams;
3. **A collaborative workspace**, whereby users can grant other users the ability to view and/or revise diagrams they have created.

As you use the ICD application, please keep in mind that it is meant to be a collaborative environment. At any time, the creator of a diagram can allow all registered users to view and comment on any of their diagrams; thus, you should assume that any comments you make on a diagram can be seen by all registered users of the ICD application.

To become a registered user, click

[Contact Us](#)

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Related Links

[Go to ICD application](#)

[About conceptual diagrams](#)

ICD help files

- [Quick Start Instructions](#) (5 pp, 418K, [About PDF](#))
- [ICD User Guide](#) (53 pp, 4.3MB, [About PDF](#))

Example conceptual diagrams

- [Metals](#)
- [Physical habitat](#)
- [Nutrients](#)

Assembling the Data

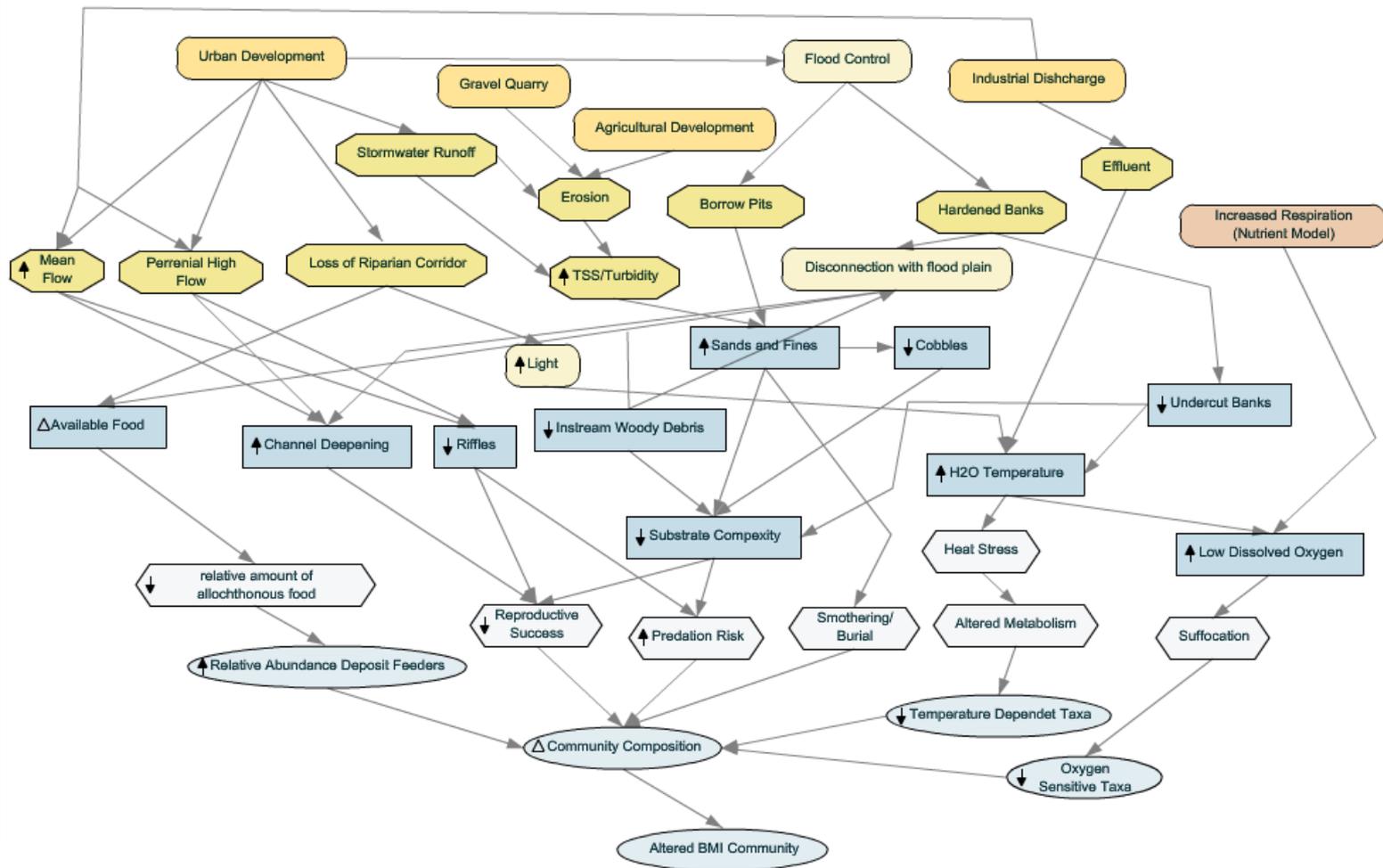
- The models and the proximate stressors provide the needs for the data list
 - Helpful to document sources
- The amounts and types of data will inform the lines of evidence than can be used

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 ($\text{mg CaCO}_3 \text{L}^{-1}$) 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 coarse 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 Algal Mats	Percent of reach with filamentous algae present at time of biological sampling. Mean microalgal mat thickness (cm) 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
	Increase in Toxic Algal Compounds			No data available	No data available	No data available	No data available	No data available

Keep CC Models Simple

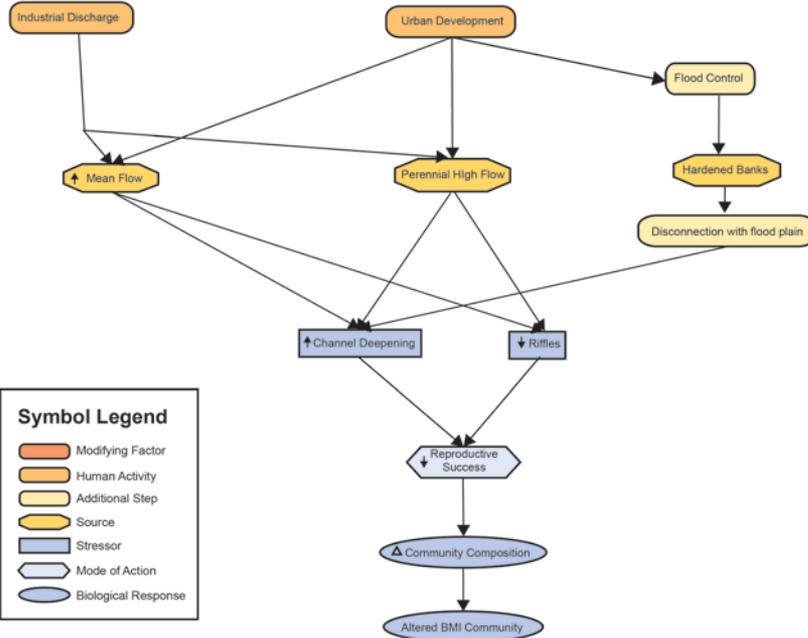
San Diego River Altered Physical Habitat



Keep CC Models Simple

San Diego River Altered Physical Habitat

Loss of Shallow Habitat *San Diego River*



Smothering *San Diego River*

