

APPROACHES TO SETTING SITE-SPECIFIC OBJECTIVES FOR TRACE METALS

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BACKGROUND

- National and California water quality criteria allow the use of site-specific objectives
 - Adjust for differences in water constituents
- Approaches for establishing a SSO vary
- Commission requested briefing on SSO development approaches

EPA RECOGNIZED NEED TO MODIFY WATER QUALITY OBJECTIVES

- Objectives intended to be protective of aquatic life under diverse environmental conditions
 - Based on standardized laboratory tests with purified water
- Objectives may not account for site-specific factors
 - Water chemistry differs among sites/habitats
 - New data may become available
 - Special status species may be present
- Toxicity of metals especially sensitive to water characteristics
 - Criteria may be under- or overprotective
 - Development of a site-specific objective (SSO) allowed to address site-specific issues

METAL SSO DERIVATION APPROACHES

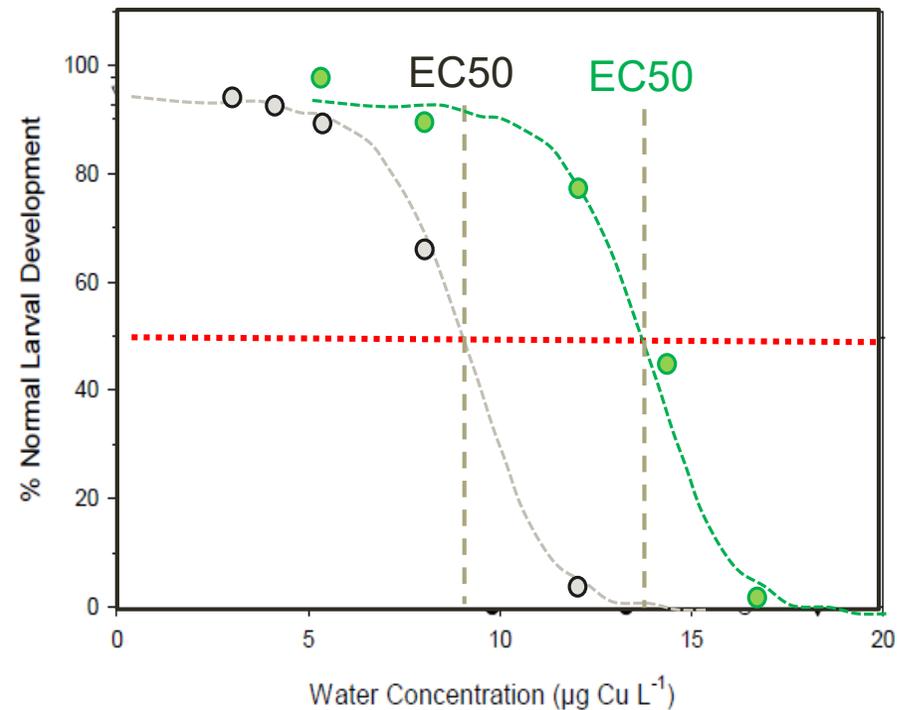
- Evaluate the change in toxicity expected due to local conditions
- Water effect ratio (WER)
 - Measure differences in metals toxicity between site water and reference water
- Bioavailability modeling
 - Biotic Ligand Model
 - Predicts toxicity threshold based on water constituents

WATER EFFECT RATIO (WER)

- EPA-recommended method to develop site-specific aquatic life criteria
 - Compares toxicity of contaminant in site water to lab control water

$$\text{WER} = \frac{\text{Site Water EC50}}{\text{Lab Water EC50}}$$

EC50 = Toxicant concentration causing 50% effect



WER INTERPRETATION

- $WER = 1$
 - Water quality objective accurate with respect to site conditions
- $WER > 1$
 - Site conditions reduce toxic potency
- $WER < 1$
 - Site conditions increase toxic potency
- Magnitude and consistency of WER used as part of basis to develop a SSO
 - Adjustment to restore level of aquatic life protection to that intended by EPA

CALIFORNIA TOXICS RULE (CTR)

- CTR is based on US EPA's National Water Quality Criteria
 - Numeric targets for priority toxics to protect environmental and human health
 - Freshwater and marine
- Site specific adjustments for metals included
 - Water hardness
 - WER; assumed to be 1 unless determined for site
- WER determined by special study
 - Involved process involving regional water board and permittees

EPA WER STUDY GUIDANCE

- 1994 Interim Guidance is primary reference for WER study design and interpretation
 - *“Each design has to be formulated individually to fit the specific site. The design should try to take into account the times, locations, and depths at which the extremes of the physical, chemical, and biological conditions occur within the site, which will require detailed information concerning the site.”*
 - 2001 Streamlined guidance for copper
 - Continuous point source discharges

PREVIOUS CU WER STUDIES IN CALIFORNIA

- Site water composition shown to affect copper toxicity in multiple studies
 - Los Angeles River and tributaries
 - Calleguas Creek and Malibu Lagoon
 - San Francisco Bay
 - San Diego Bay and Chollas Creek
- TMDLs and Basin Plans modified in several cases
 - Often contentious during approval or implementation phase

MAJOR CHALLENGES AND CONCERNS WITH WERS

- Insufficient data to make a decision
 - Too few stations or limited study duration
- Results fail to capture important variability in site conditions
 - Stormwater impacts, seasonal trends
- Lab data quality concerns
- Final data analysis doesn't properly address uncertainty

BIOTIC LIGAND MODEL TO PREDICT METAL TOXICITY

- Predicts toxicity based on interactions with ions and organic material
 - Improved ability to address hardness-related effects
- Incorporated into EPA freshwater Cu criteria
 - Marine Cu BLM-based criteria under review
- Not yet formally used for SSO development in CA

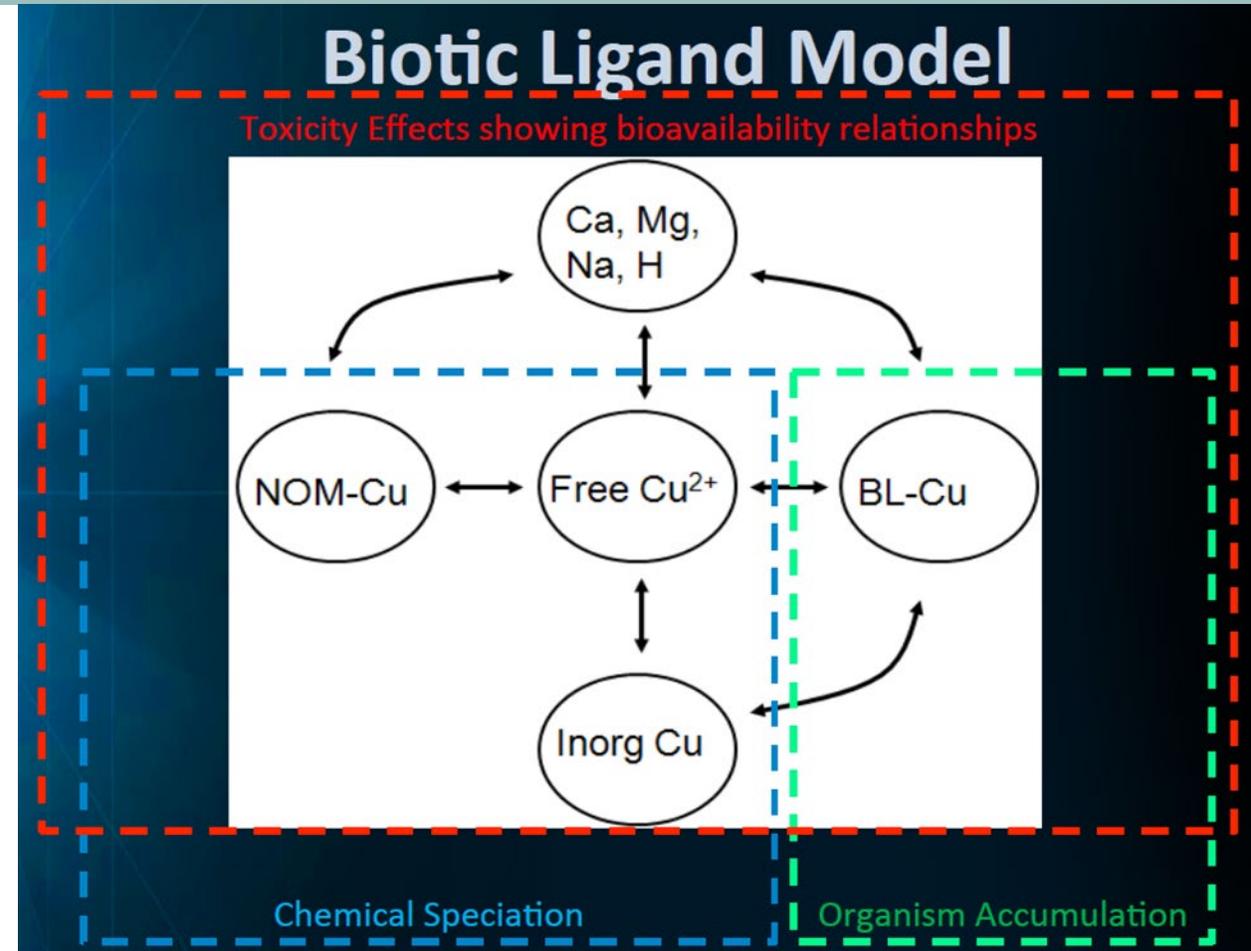


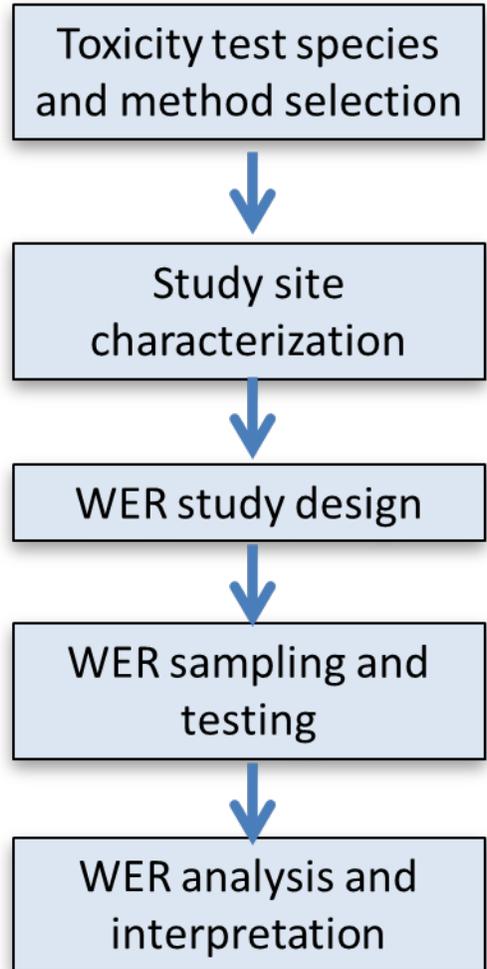
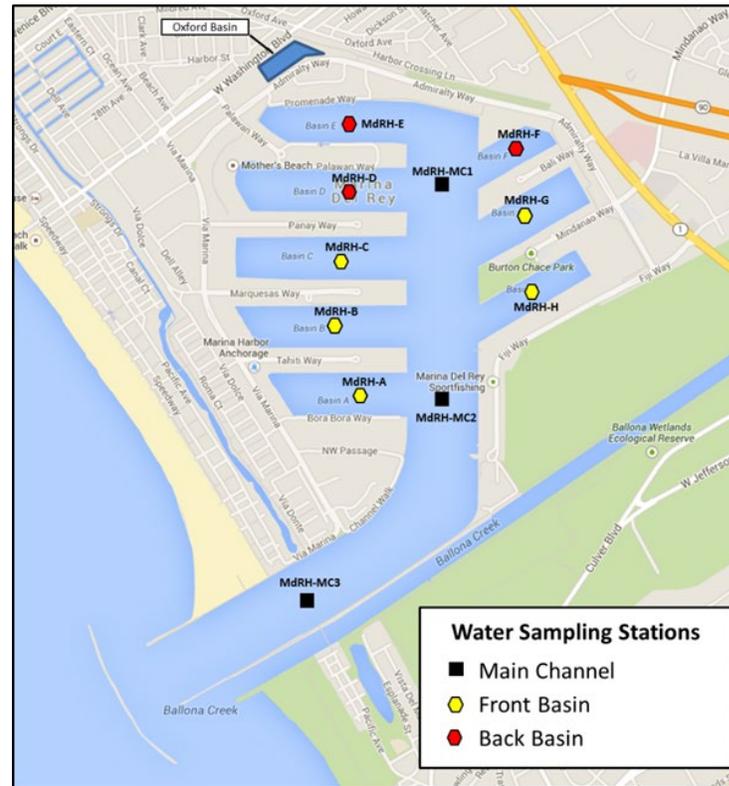
Figure from Bob Santore

SCCWRP METAL SSO RESEARCH

- Marina del Rey Harbor SSO study
 - WER study to inform implementation of Cu TMDL
- Watershed monitoring data evaluation
 - Assess feasibility for BLM application

MARINA DEL REY HARBOR: COPPER WER SSO STUDY

- Toxicity-based WER to assess basis for SSO
- Site characterization to evaluate seasonal and spatial factors
- Technical Advisory Committee established to aid study design & interpretation



LA WATERSHED BLM DATA EVALUATION

- Compilation and evaluation of monitoring data for potential use of BLM
 - Data types and coverage for sites of interest
- Develop monitoring guidance for BLM analyses
- Demonstration monitoring at selected sites

NEED FOR SSO STUDY GUIDANCE?

- Guidance for developing WERs is out of date
 - *WER studies take years for design and approval*
- Little consistency among studies
 - *Methods and study design differ due to TAC and stakeholder concerns*
 - Similar concerns often raised for each study
- Stakeholder uncertainty regarding process
 - *Little supporting guidance for reference*
- BLM provides additional options and uncertainties