A Leach Rate Cap on Copper Antifouling Paints in California: A Regulatory Case Study

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Outline

- Background
- Monitoring Studies and Results
- CDPR Re-evaluation
- MAM-PEC Modeling
- Leach Rate Regulation

Antifouling Paints

- Prevention of biofouling of marine vessels results in:
  - Increased fuel efficiency
  - Decrease in vessel damage
  - Invasive species prevention

- Copper is the primary biocide in antifouling paints (AFPs)
  - Broad spectrum
  - Leaches out of paints

- Copper in antifouling paints is a biocide
  - Regulatory authority of the California Department of Pesticide Regulation

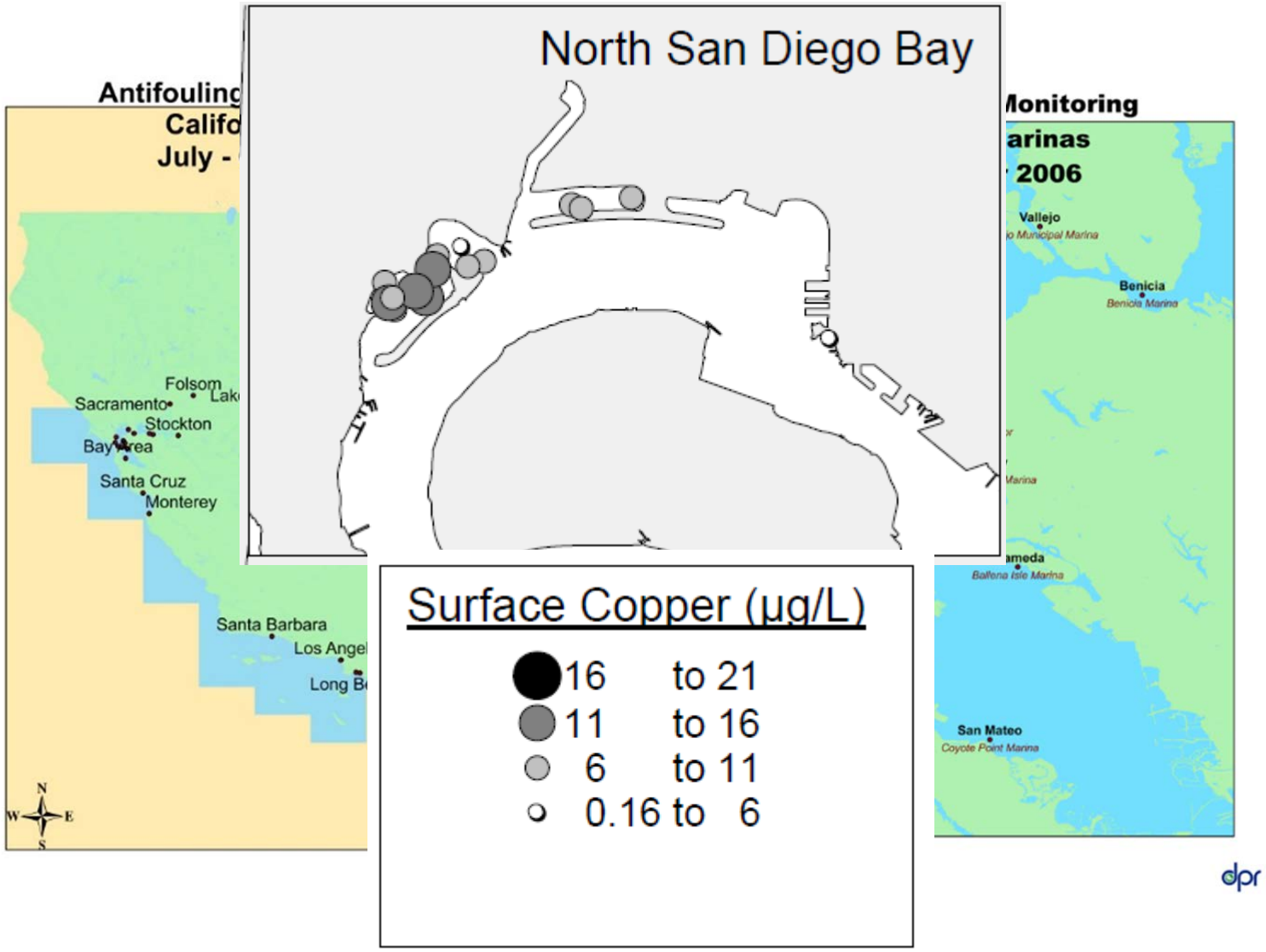
Nall, et al., 2017

Copper and Water Quality

- Copper (Cu^{2+}) is toxic to both target and non-target organisms
  - Only as labile or bioavailable copper
- Species of concern are mussels (blue and Mediterranean)
- California Toxics Rule (CTR) is the enforceable water quality standard
- Dissolved Copper:
  - Acute water quality criterion: 4.8 µg/L
  - Chronic water quality criterion: 3.1 µg/L

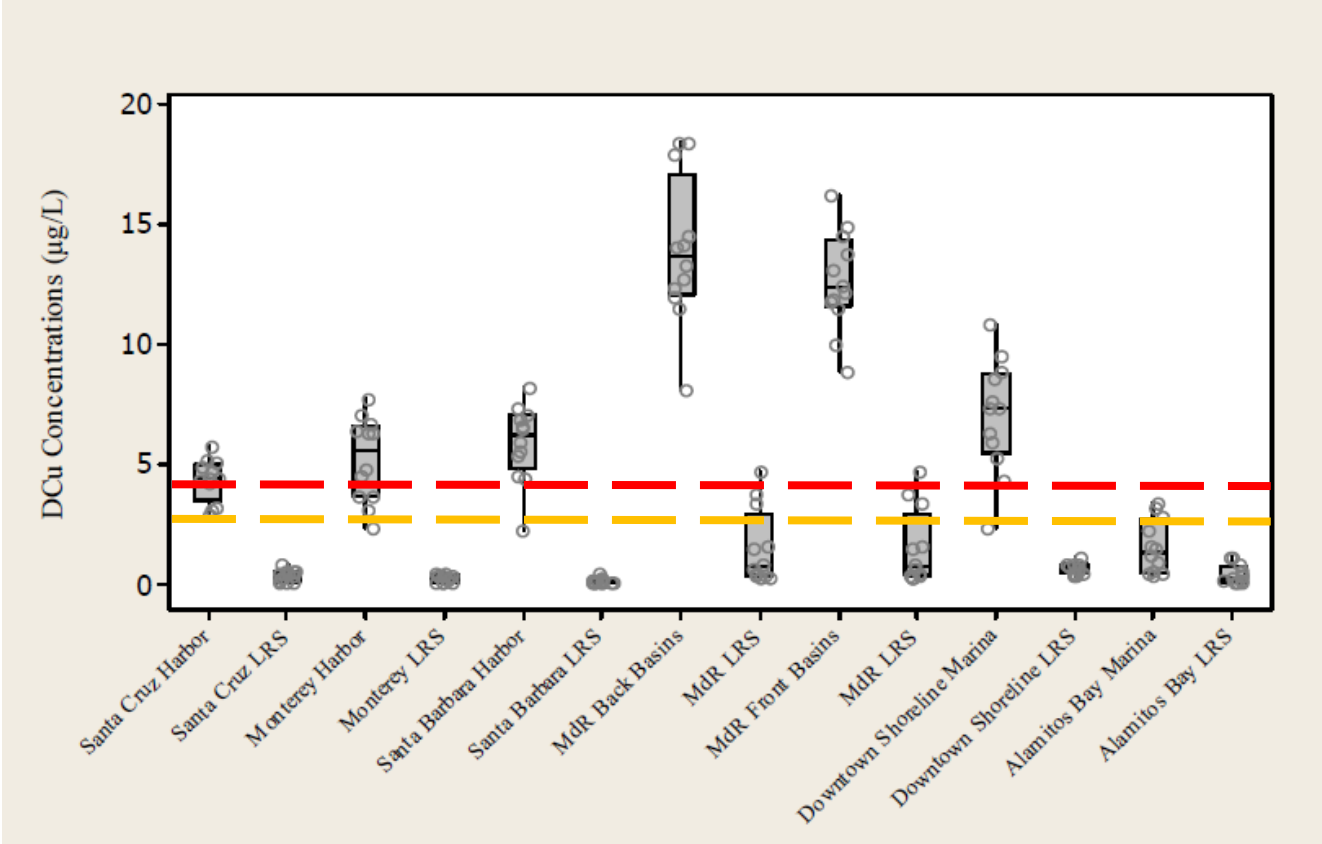
Marinas and Water Quality

- Recreational marinas susceptible to Cu pollution
  - High concentration of boats
  - Long periods of time in marinas
  - Poorly flushed
- 303(d) listing of impaired waters
- DPR Monitoring Study
  - Salinity
  - Region
  - Boat density



Monitoring Results

- DCu and associated toxicity exceeding water quality standards in many California marinas.
- Toxicant Identification Evaluation Tests showed DCu was the likely cause of toxicity.
- Saltwater Marinas
- Region – Southern California
- Boat density



Singhasemanon, et al., 2009

=Acute Water Quality Criterion, 4.8 µg/L

=Chronic Water Quality Criterion, 3.1 µg/L

LRS = Local Reference Site; OUT of the marina

DPR Re-evaluation and Legislative Action

- Occurs when DPR determines there are (or likely are) adverse effects of a pesticide on human health and/or the environment.

Do pesticides meet the standard for continuous registration?

- Leach rate calculations for every Cu-AFP in California

- In 2014, Assembly Bill 425 from the California Legislature passed:
  - Evaluate registration of Cu-AFPs
  - Determine a leach rate cap
  - Make mitigation recommendations

What is the allowable leach rate of copper in AFPs that will be protective of water quality?

MAM-PEC Modeling

- Marine Antifoulant Model to Predict Environmental Concentrations (MAM-PEC)
  - Input parameters: underwater surface areas, Cu speciation, salinity, DOC, suspended solids, marina size, etc.
- CTR chronic criterion of 3.1 µg/L dissolved copper is the goal.
- What leach rate will be sufficient to achieve that concentration or lower in California marinas?

Boatus.com

Total Maximum Daily Loads in place already regulate to this concentration.

Modeling, continued

- Investigated leach rate and loading of copper in 5 marina scenarios:
  - #1: 733 boats
  - #2: 1,270 boats
  - #3: 1,833 boats
  - #4: 2,263 boats
  - #5: 4,754 boats

- Obtained maximum allowable leach rates for AFPs for the five scenarios ranging from 1.12 to 24.60 $\mu g/cm^2/day$

AFPs in California

Regulation

3 CCR § 6190: No copper-based antifouling paint/coating shall be registered over a **leach rate** of 9.5 μg/cm^2/day

- Any currently registered paint above that leach rate will be cancelled.
- For recreational boats only
- Effective July 2018

- The leach rate cap reduces Cu in all marinas but may not be continuously protective of the largest marinas
- Risk management decision: AFPs still need to be efficacious
- Regulation used field work, data assessment, modeling, and outreach to develop a mitigation scenario.

Acknowledgements

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Questions

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