On the Ecological Risk Assessment Of Motor Vehicle Tires Containing Zinc

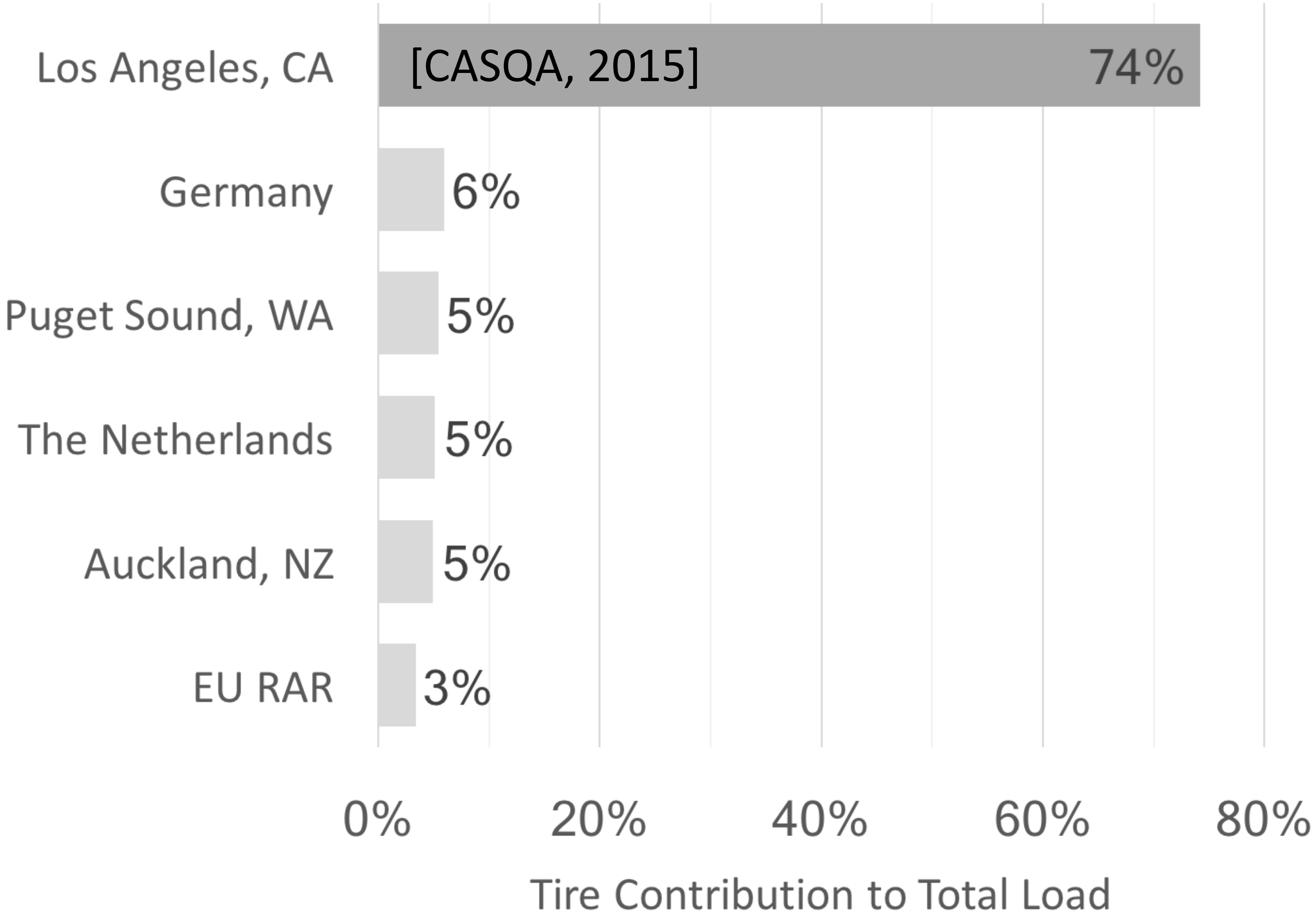
Eric Van Genderen, PhD (evangenderen@zinc.org)
Adam Ryan, PhD, DABT (acryan@zinc.org)
international zinc association

CA DTSC Workshop | 28 July 2021

Resources and Decision Points

CA Water Quality Objective for Zinc (1987 AWQC / 2000 CTR)	?
CASQA Source Apportionment Report (2015)	?
CASQA Petition (2018)	?
DTSC Rationale (2021)	?
Bioavailability-Based CA WQO	?

Relative Loading



Science Supporting the Risk Assessment

Environmental Science & Technology

Article

pubs.acs.org/est

Zinc Leaching from Tire Crumb Rubber

Emily P. Rhodes,[†] Zhiyong Ren, and David C. Mays*

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346 Integrated Environmental Assessment and Management — Volume , Number —pp. 346–357 © 2014 SETAC

Deriving Site-Specific Clean-Up Criteria to Protect Ecological Receptors (… or Metalloi…

Exposure to aged crumb rubber reduces survival time during a stress test in earthworms (Eisenia fetida)

Environmental Science and Pollution Research 25, 11376–11383 (2018)

Science of The Total Environment
Volume 646, 1 January 2019, Pages 1650-1659

…nsitivity

…evels

ELSEVIER
Environmental Pollution
journal homepage: www.elsevier.com/locate/envpol

Chemical fractionation of Cu and Zn in stormwater, roadway dust and stormwater pond sediments

Kimberly M. Camponelli[a], Steven M. Lev[a], Joel W. Snodgrass[a], Edward R. Landa[b], Ryan E. Casey[a,*]

PARTITION COEFFICIENTS FOR METALS IN SURFACE WATER, SOIL, AND WASTE

ELSEVIER
Chemosphere
Volume 173, April 2017, Pages 557-562

ELSEVIER
Scienc…
Volume…

Physical and chem… related particles: … generated using …

Marisa L. Kreider[a], Julie M. Panko…

WATER RESEARCH
…/watres

…view on

…ehrhahn[b],

Open Access | Published: 26 Jul…

Acute aquatic toxi… alga, daphnid, and…

Christopher Marwood, Britt McAtee, Marisa Kreider, R. Scott Ogle, Brent Finley, Len Sweet & Julie Panko

Identification of tire leachate toxicants and a risk assessment of water quality effects u… canals

S. M. Nelson, G. Mueller & D. C. Hemphill

Bulletin of Environmental Contamination and Toxicology 52, 574–…

Environmental Toxicology and Chemistry, Vol 9, pp 1487–1502, 1990 Printed in the USA Pergamon Press plc
0730 7268/90 $3 00 + 00 Copyright © 1990 SETAC

TOXICITY OF CADMIUM IN SEDIMENTS: THE ROLE OF ACID VOLATILE SULFIDE

Dominic M. Di Toro,* John D. Mahony, David J. Hansen, K. John Scott, Michael B. Hicks, Suzanne M. Mayr, and Michele S. Redmond

SETAC PRESS

Environme…

…CTING TOXICITY OF ZIN… …TORY-SPIKED AND FIELD…

…*† Jurgen Buekers,† Ian Oliv…

Sediment Quality Assessment of Road Runoff Detention Systems in Sweden and the Potential Contribution of Tire Wear

Anna Wik · Jenny Lycken · Göran Da…

ELSEVIER
Chemosphere
Volume 77, Issue 7, November 2009, Pages 922-927

Toxicity assessment of sequential leachates of tire powder using a battery of toxicity tests and toxicity identification evaluations

Anna Wik[a], Eva Nilsson[a], Torsten Källqvist[b], August Tobiesen[b], Göran Dave[a]

Chronic toxicity of tire and road wear particles to water and sediment-dwelling organisms

Julie M. Panko, Marisa L. Kreider, Britt L. McAtee & Christopher Marwood

Ecotoxicology 22, 13–21 (2013) | Cite this article

…Road Wear Particle Concentrations in Sediment for Watersheds in France, Japan, and the United States by Quantitative Pyrolysis GC/MS Analysis

Ken M. Unice*, Marisa L. Kreider, and Julie M. Panko

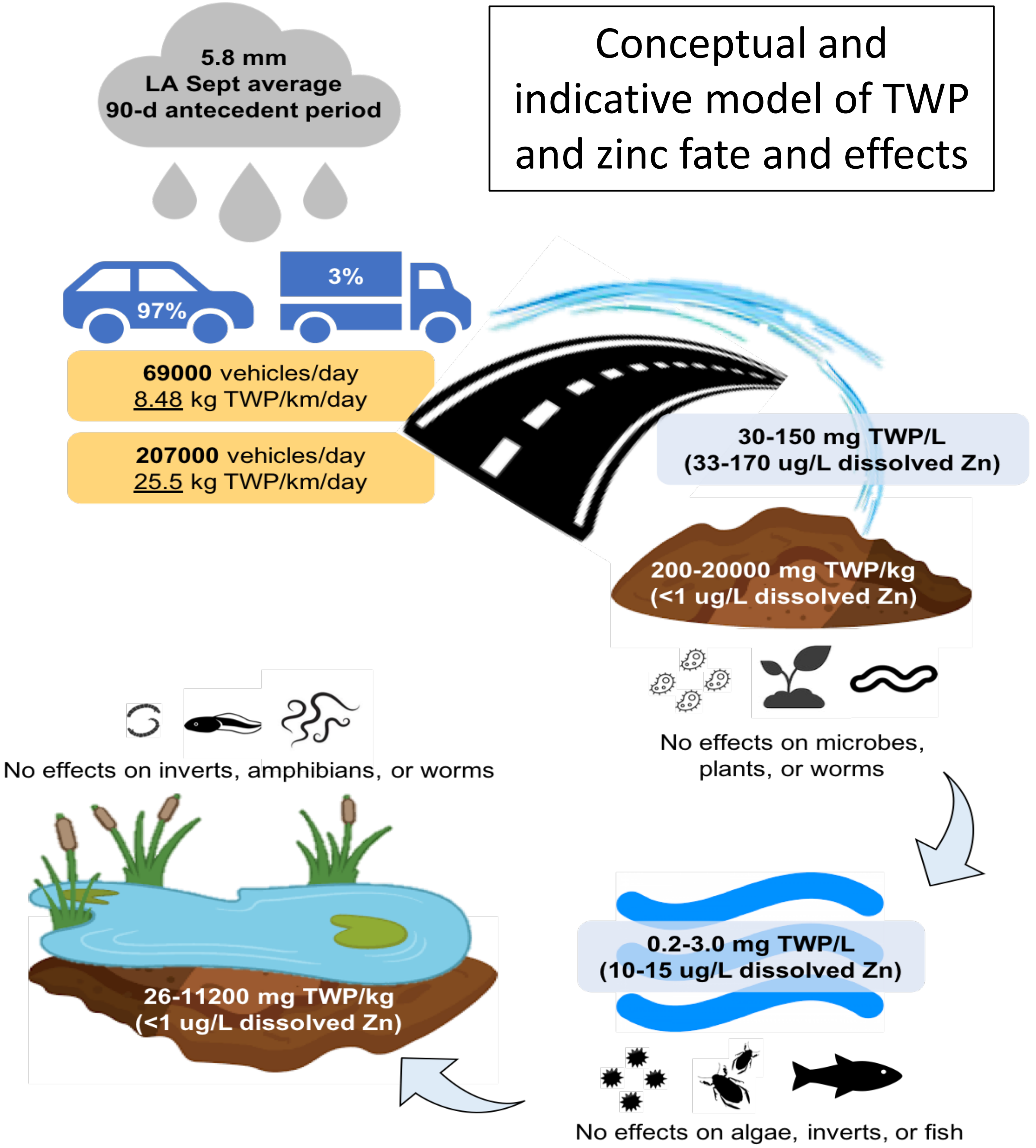
View Author Information

Cite this: Environ. Sci. Technol. 2013, 47, 15, 8138– Article Views Altmetric Citations Share Add to Export

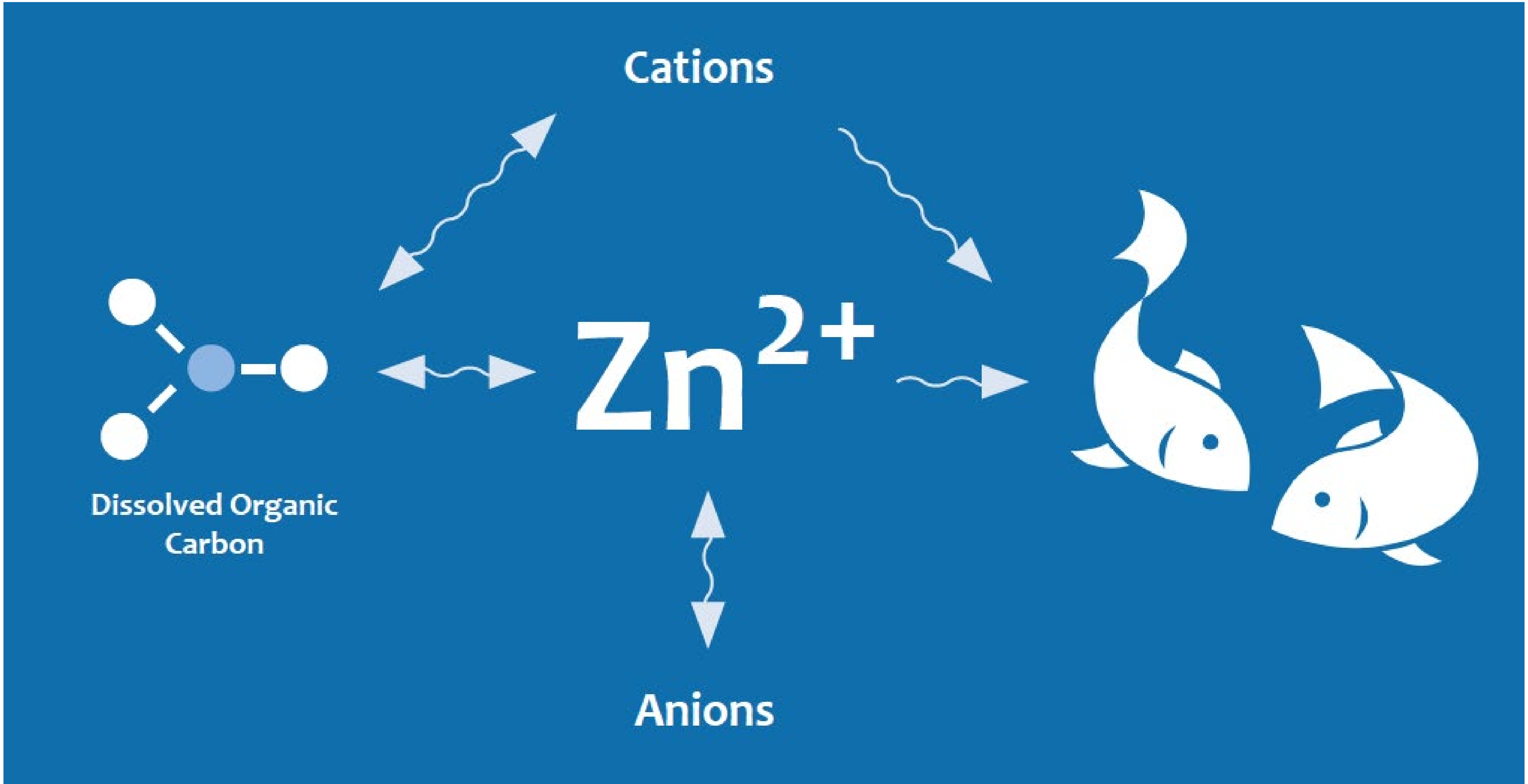
"Zinc in Tires" Risk Assessment

- Tire Wear Particle (TWP) fate pathway is quantifiable and predictable
- **No effects** of relevant direct TWP exposures to diverse ecological receptors
- Dissolved zinc from TWP **does not exceed** environmental quality standards

Conceptual and indicative model of TWP and zinc fate and effects

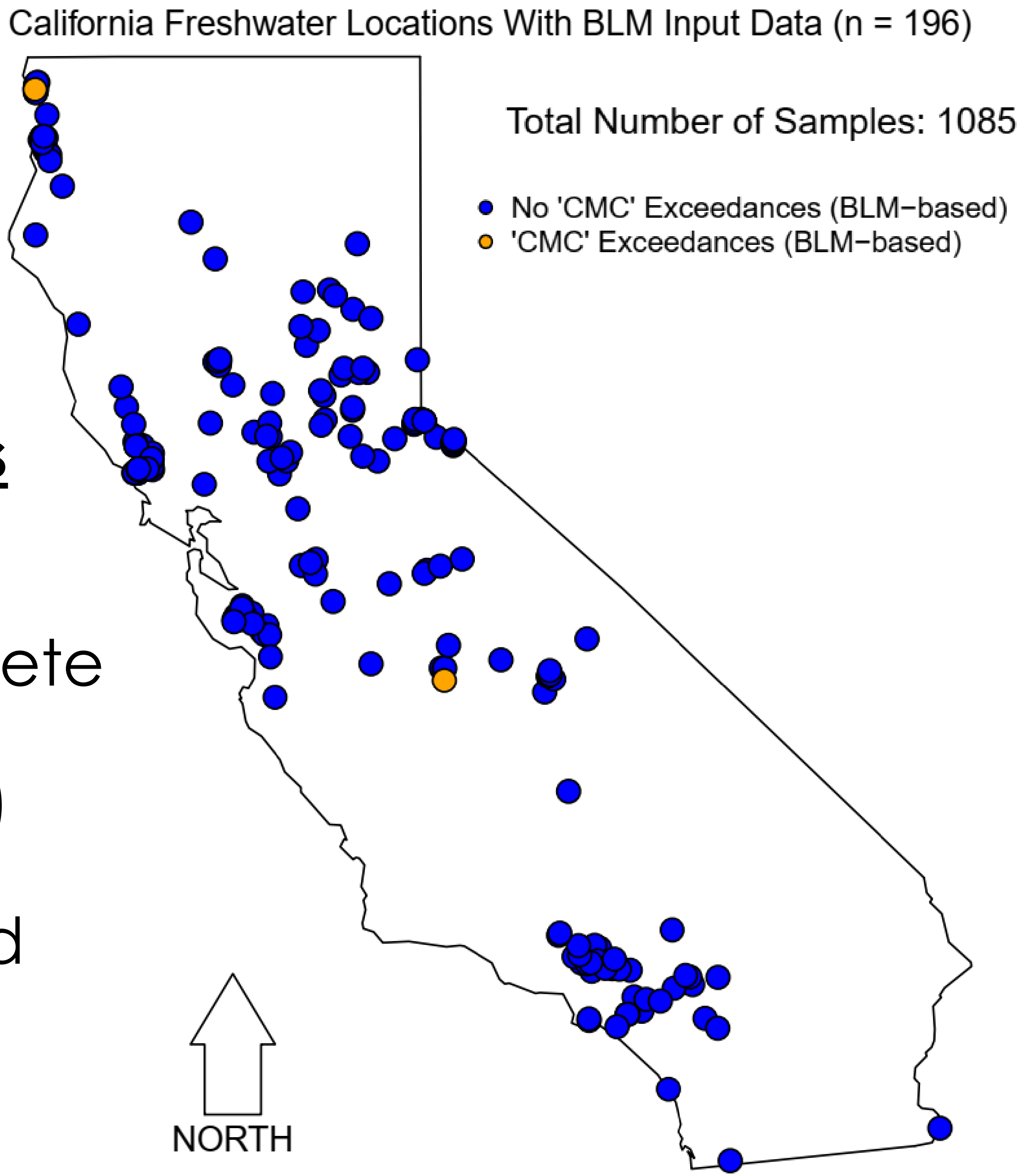


Bioavailability – Conceptual Review



California: Zn BLM Application

- **Zn BLM** (DeForest and Van Genderen 2012) **characterizes bioavailability**
- CTR Hardness approach obsolete
- Data: WQP (NWIS and STORET)
- Compare hardness-based and BLM-based outcomes



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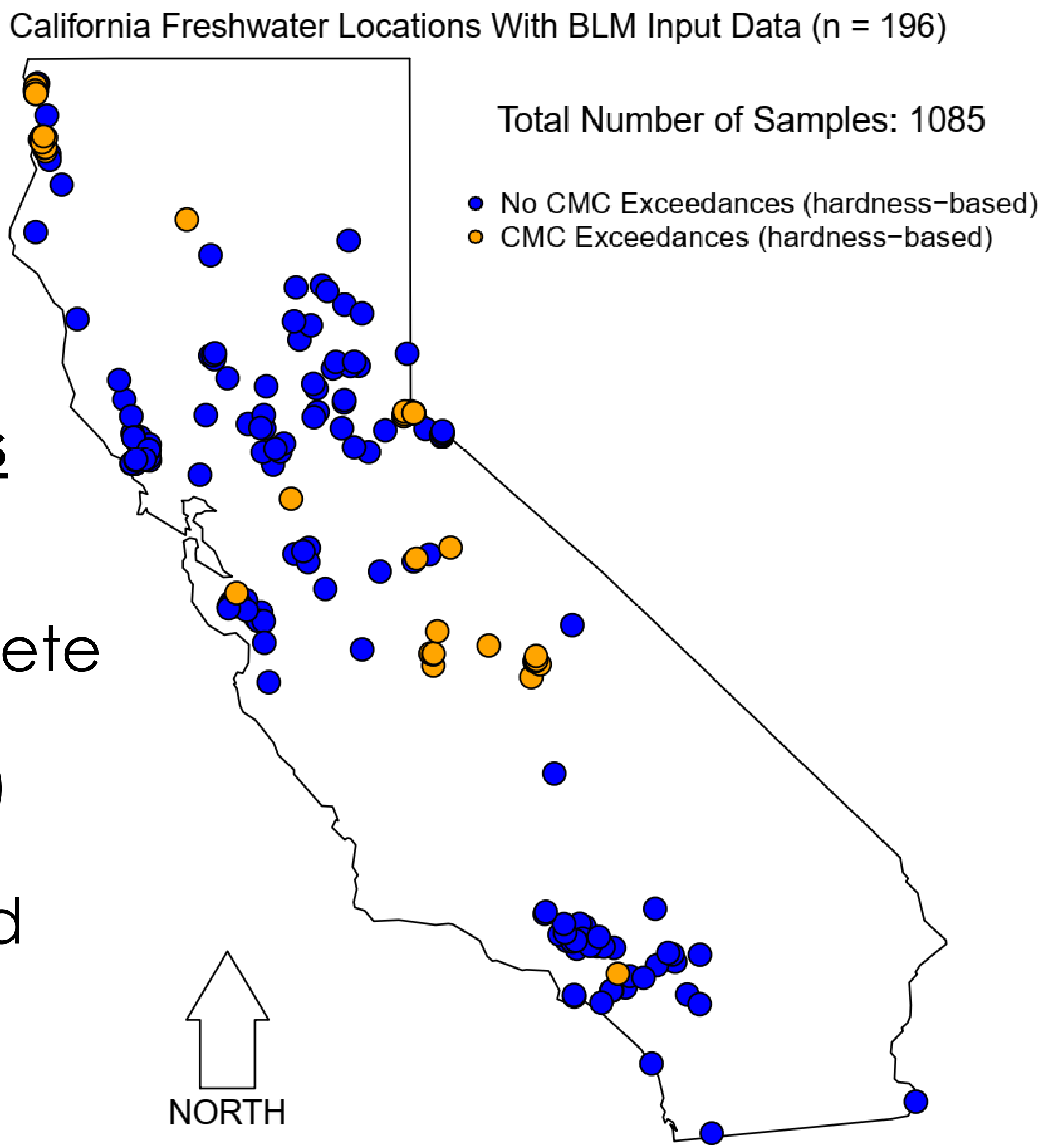
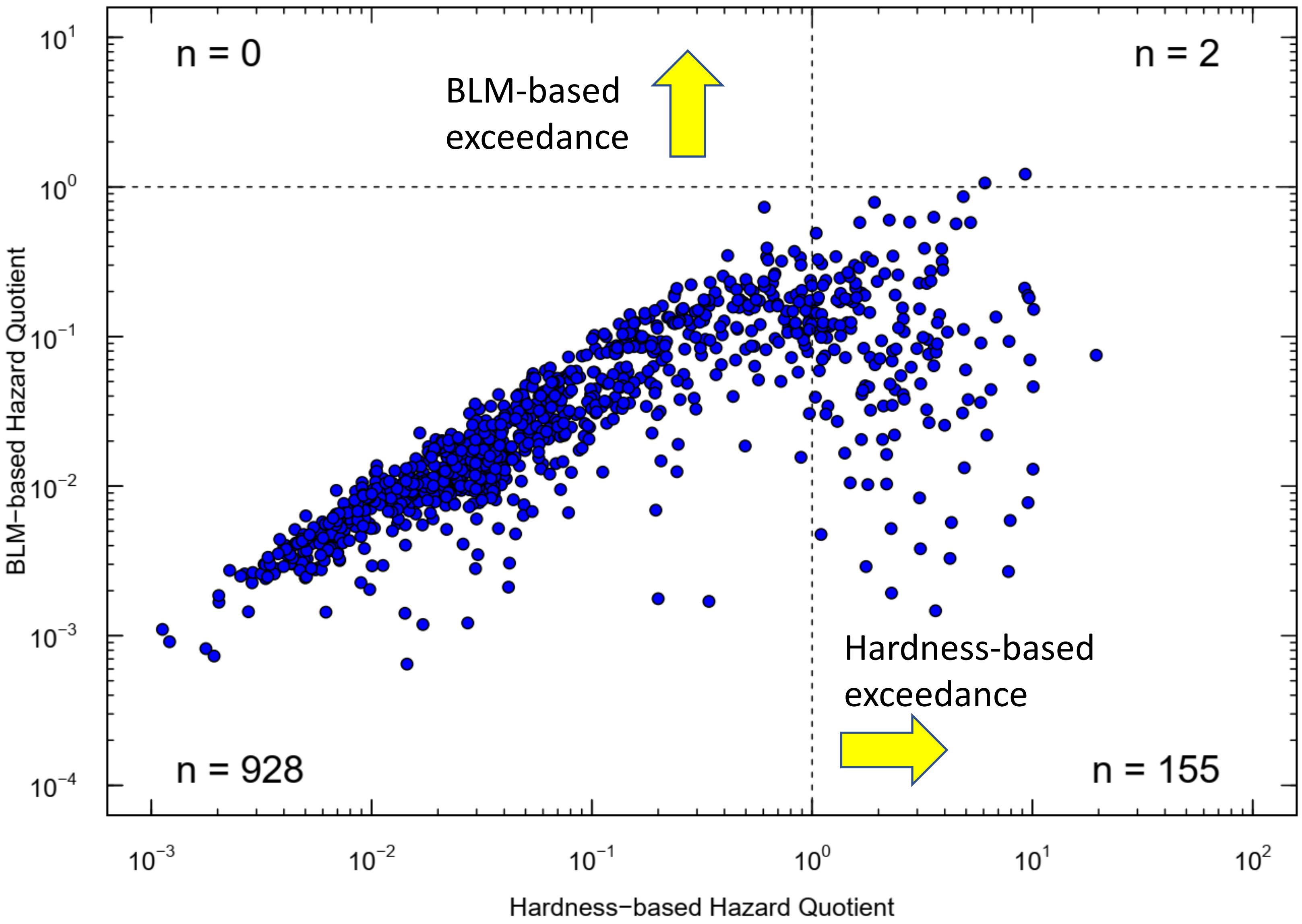


Compare BLM- and Hardness-based Outcomes

$$HQ_i = \frac{Zn_i}{WQO_i}$$

- 157 hardness-based exceedances
- 2 BLM-based exceedances



Science Supporting Zinc Bioavailability

Environmental & Analytical Toxicology

Vardy et al., J Environ Anal Toxicol 2015, 5.2
http://dx.doi.org/10.4172/2161-0525.1000262

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David W

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Received: 11 March 2019 | Revised: 24 April 2019 | Accepted: 17 July 2019 42

ntroduction to the Outcome of a Society of Environmental
Toxicology and Chemistry Technical Workshop

hristian Schlekat,[a,*] William Stubblefield,[b] and Kathryn Gallagher[c]

Oregon, USA

, pp. 2781–2798, 2017
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Printed in the USA

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ANALYZING THE CAPACITY OF THE
SUBCAPITATA BIOAVAILABILITY MOD
HIGH PH AND LOW CALCIUM CONCENTR
BIOAVAILABILIT

Tina Van Regenmortel,* Olivier Berteloot
Faculty of Bioscience Engineering, Laboratory of Environm

(Submitted 24 November 2016; Returned

Application of the biotic ligand
rainbow trout, fathead m

Robert C. Santore[a,*], Rooni Math

Science of the Total Env

SETAC PRESS

Environmental Toxicology and Chemistry, Vol. 31, No. 6, pp. 1264–1272, 2012
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Printed in the USA
DOI: 10.1002/etc.1810

APPLICATION OF U.S. EPA GUIDELINES IN A BIOAVAILABILITY-BASED ASSESSMENT OF AMBIENT WATER QUALITY CRITERIA FOR ZINC IN FRESHWATER

David K. DeForest*† and Eric J. Van Genderen‡
†Windward Environmental, Seattle, Washington, USA
‡International Zinc Association, Durham, North Carolina, USA

(Submitted 5 October 2011; Returned for Revision 29 November 2011; Accepted 9 January 2012)

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gy, J. Plateaustraat 22, B-9000 Ghent, Belgium

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p. 741–753, 2015
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2020

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Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/scitotenv

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Environmental risk assessment of zinc in European freshwaters: A critical appraisal

P.A. Van Sprang[a,*], F.A.M. Verdonck[a], F. Van Assche[b], L. Regoli[b], K.A.C. De Schamphelaere[c]

[a] ARCADIS-EURAS, Kortrijksesteenweg 302, B-9000, Gent, Belgium
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[c] Laboratory of Environmental Toxicology and Aquatic Ecology, Ghent University, J. Plateaustraat 22, B-9000 Gent, Belgium

est Practices for Derivation and Application of Thresholds for Metals Using Bioavailability-Based Approaches

c Van Genderen,[a,*] Jenny L. Stauber,[b] Charles Delos,[c] Diana Eignor,[d] Robert W. Gensemer,[e] James McGeer,[f]
aham Merrington,[g] and Paul Whitehouse[h]

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EI Consultants, Fort Collins, Colorado, USA
ilfred Laurier University, Waterloo, Ontario, Canada
ca environment, Faringdon, Oxfordshire, UK
vironment Agency, Howbery Park, Wallingford, UK

Further Considerations

- **Zinc in tire particles is not bioavailable**

- **21st century state-of-the-science recognized globally**
  - Water Boards, 20+ States, USGS, USEPA, Canada, European Union

- **Current FW WQO exceedances ≠ purple sea urchin toxicity**
  - The Bay Foundation: "The Bay Foundation has initiated, and currently leads, a partnership of researchers, fisherman, and conservationists in the removal of the **overly abundant purple sea urchins**."

    https://www.santamonicabay.org/explore/in-the-ocean/kelp-forest-restoration/

Resources and Decision Points

CA Water Quality Objective for Zinc (1987 AWQC / 2000 CTR)	Outdated
CASQA Source Apportionment Report (2015)	Inconsistent
CASQA Petition (2018)	Incomplete
DTSC Rationale (2021)	Incomplete
Bioavailability-Based CA WQO	Under Development