A Perspective on Chemicals as Potential Stressors in Watersheds

Paul C. DeLeo, Ph.D.
Senior Director, Environmental Safety
The Soap and Detergent Association

NACWA 2010 National Pretreatment and Pollution Prevention Workshop

Phoenix, Arizona

May 20, 2010

The Home of the Cleaning Products Industry

Overview

- Background
- Watershed-Based Assessments
- Chemicals in Watersheds – Prioritization
- Chemical Source Inventory
- Summary

Background

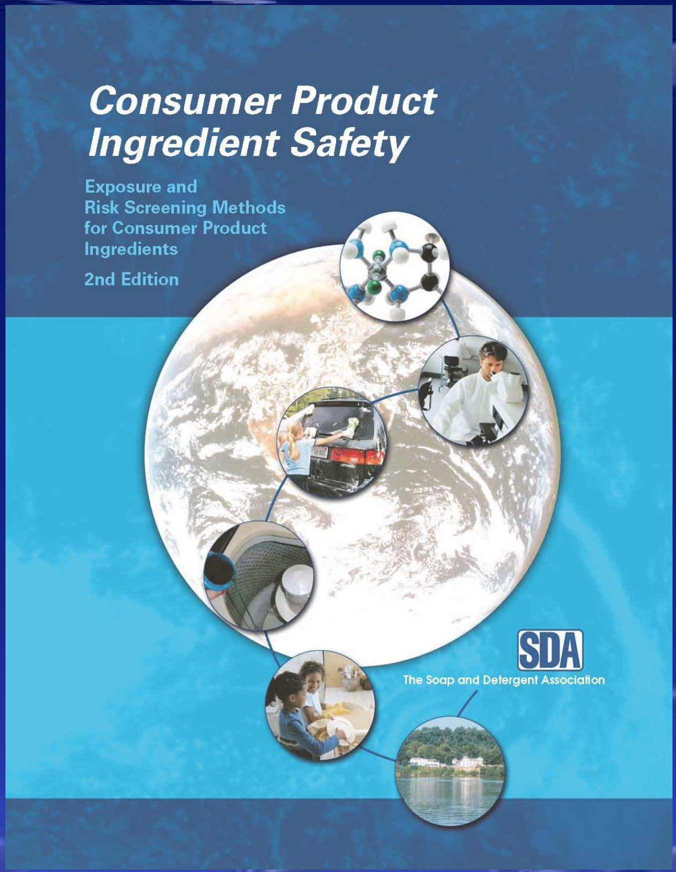
About SDA

- The trade association for the $30 billion US cleaning products industry
- Comprised of 100 companies (often global) including major product formulators and ingredient suppliers
- Engaged in product stewardship research activities for over 50 years (primarily focusing on surfactants)

About SDA Research

Foaming at a wastewater treatment plant in 1954

Consumer Product Ingredient Safety



- Exposure assessment and risk screening principles
  - Hazard profile
  - Use/habits & practices
  - Chemical fate
  - Margin of exposure/PEC-PNEC
- Applied lessons of ingredient safety assessment to develop manual of exposure and risk screening methods
- Available on SDA Science website (http://www.sdascience.org)

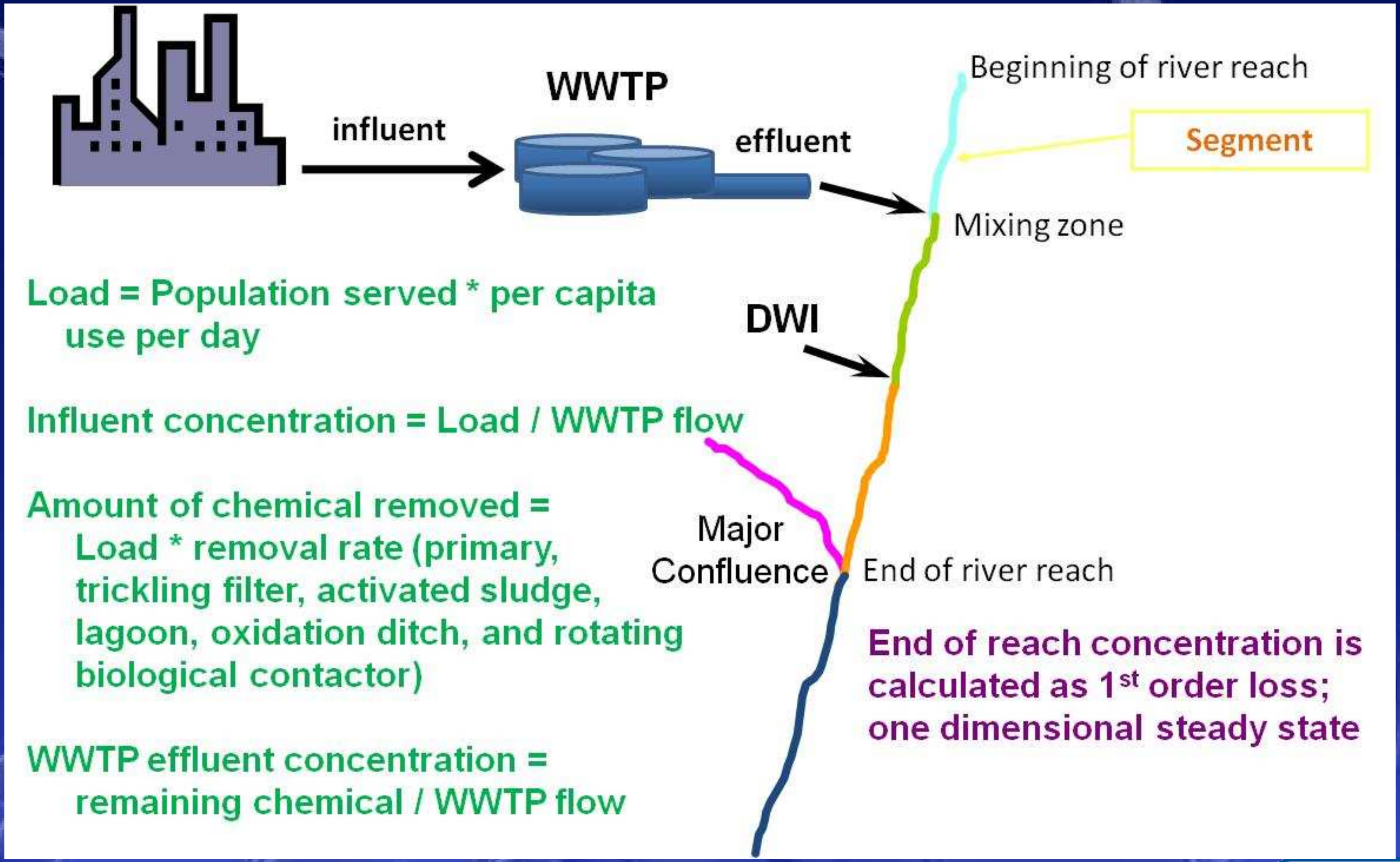
Environmental Exposure Assessment

- For consumer products with down-the-drain disposal, a primary route of environmental release (exposure) is wastewater effluent
- A general screen is volume of chemical in commerce vs. total WWTP effluent
- More sophisticated models can predict concentrations as a watershed level

Watershed-based Exposure Model for Assessment of Down-the-Drain Chemicals

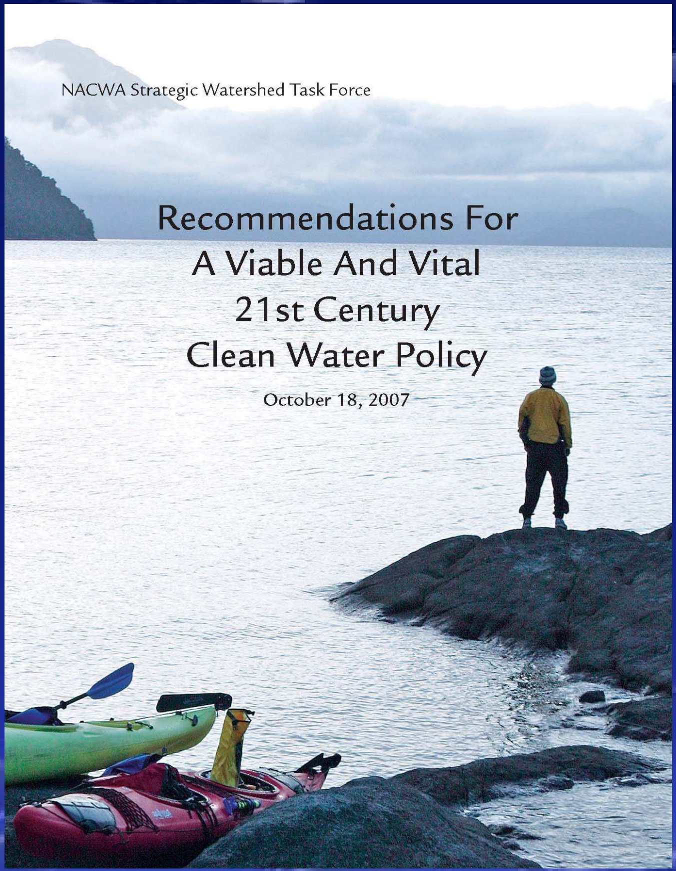
- Predicts concentrations in over 28,000 river reaches across >200,000 river miles receiving WWTP effluent in the continental US (River Reach File 1)
- Incorporates widely dispersed discharges of a chemical ingredient from >10,000 WWTPs across broad geographies (Clean Water Needs Survey)
- Predict the concentration distributions of a chemical at the intake of municipal drinking water treatment facilities across the US (Drinking Water Supply File: SDWIS – 2004)

SDA's Watershed-based Model: iSTREEM



Watershed-Based Assessments

Assessments in Watersheds



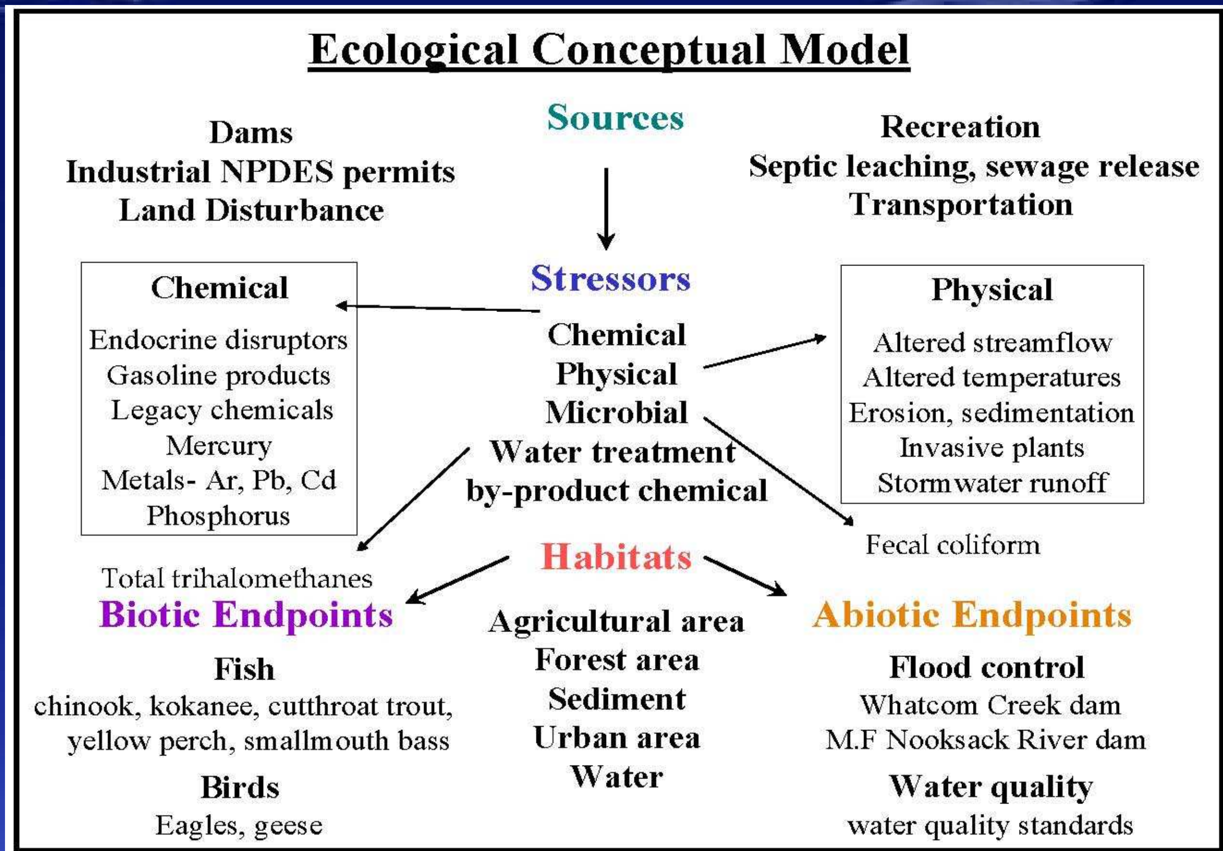
- Integrated watershed approach
- Consider all uses and sources of pollution (stressors) within a watershed
- "Water that is free of chemical or bacteriological pollutants provides little benefit if erosion, lack of habitat, or other negative impacts prevent the water from meeting the goals of the Clean Water Act." (p. 4)

http://www.nacwa.org/images/stories/public/2007-10-18swtfrvv.pdf

SDA

The Home of the Cleaning Products Industry

Regional Scale Ecological Risk Assessment and Relative Risk Modeling



Maginnis, 2006
(http://www.wwu.edu/toxicology/docs/Lakewhatcomthesis.pdf)

WERF Risk-Based Framework for Multiple Stressors in Aquatic Ecosystems

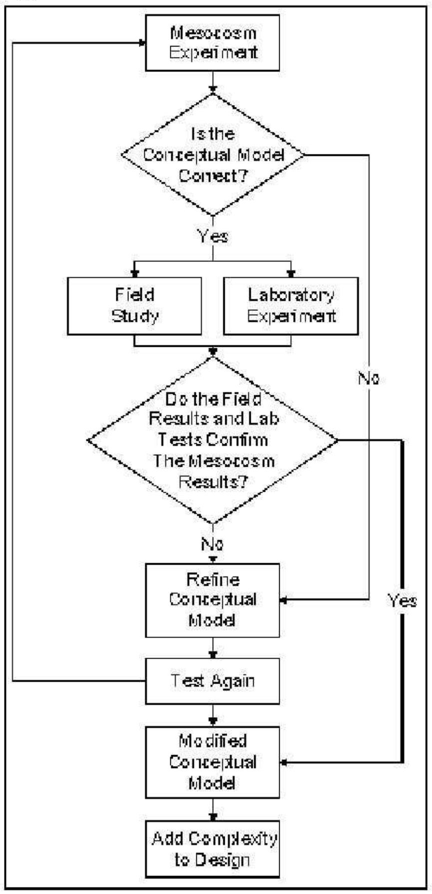


Figure 1: General Testing Scheme for Multiple Stressors.

- Establishing causality
- Defining relative risk
- Assembling the weight of evidence

Available at http://www.werf.org/ under "Research and Knowledge Areas," "Trace Organic Compounds"

SDA

The Home of the Cleaning Products Industry

SDA's Experience in Watersheds

- Watershed-scale risk assessment in river water and sediments
- Recent work:
  - Low dilution streams in Upper Midwest
  - Effluent-dominated Trinity River basin (Texas)

SDA Field Research – Upper Midwest

Available online at www.sciencedirect.com
SCIENCE DIRECT
ELSEVIER
Science of the Total Environment 368 (2006) 695 – 712
Science of the Total Environment
www.elsevier.com/locate/scitotenv

Occurrence and weight-of-evidence risk assessment of alkyl sulfates, alkyl ethoxysulfates, and linear alkylbenzene sulfonates (LAS) in river water and sediments

Hans Sanderson [a,*], Scott D. Dyer [b], Bradford B. Price [b], Allen M. Nielsen [c], Remi van Compernolle [d], Martin Selby [e], Kathleen Stanton [a], Alex Evans [d], Michael Ciarlo [f], Richard Sedlak [a]

[a] The Soap and Detergent Association, Washington, District of Columbia 20005, USA
[b] The Procter and Gamble Company, Cincinnati, Ohio 45253, USA
[c] Sasol North America, Inc., Westlake, Louisiana 70669, USA
[d] Shell Global Solutions (US), Inc., Houston, Texas 77251, USA
[e] Shell Global Solutions, Chester, CH1 3SH, United Kingdom
[f] EA Engineering, Loveton Circle Sparks, Maryland 21152, USA

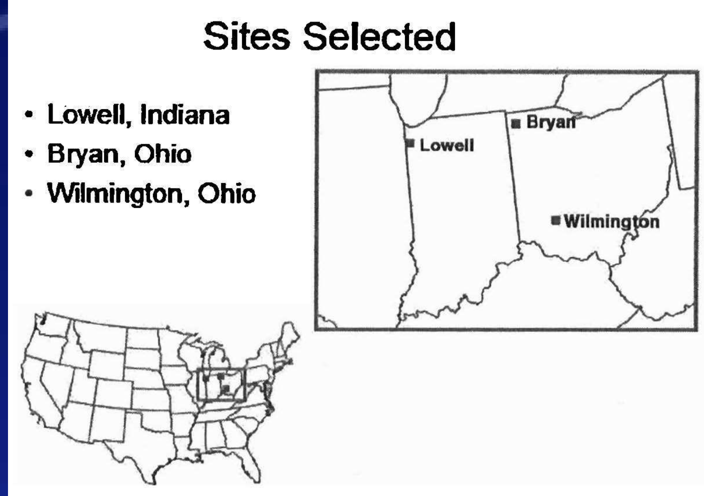


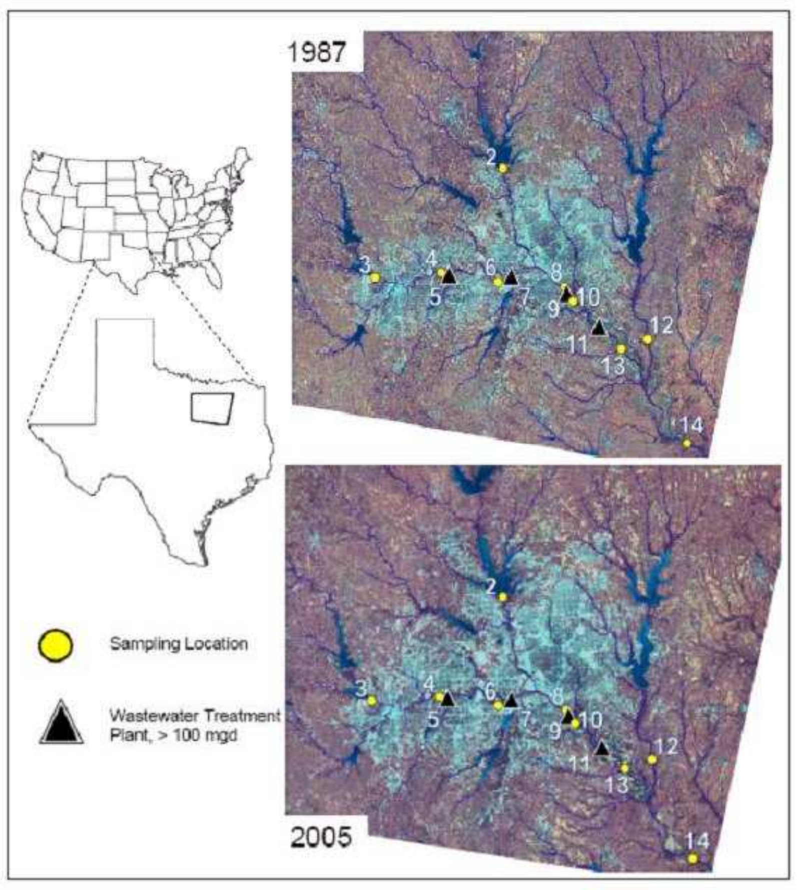
Fig. 1. Sites selected and their location.

- High treatment efficiency/Low dilution factor sites
- Lack of correlation between surfactant concentration and benthos abundance, and perturbation scores
- Low predicted aquatic risk from surfactants

SDA

SDA Field Research – Trinity River

- Observations:
  - Massive hydrological alterations (via urbanization) may have limited biota
  - The ratio of signal (potential chemical stress) to noise (other stressors) was lower in the Trinity River compared to Upper Midwest
  - Effluent-dominated systems may not be "worst-case" (for chemical-focused research) if there are other significant stressors present



SDA

The Home of the Cleaning Products Industry

Chemicals in Watersheds – Prioritization

Focusing on Chemicals in Effluent

- Is your system optimized?
  - What kind of treatment technology?
  - What are the operating parameters?
  - How much industrial effluent?
- Focus on priority chemicals

Chemical Prioritization - Examples

- EPA CCL3 process (screened ~26,000 chemicals)
- NRC workshop on pharmaceuticals in drinking water
  - Potency
  - Presence
  - Persistence
- Oregon Priority Persistent Pollutant List
  - 1,191 chemicals from dozens of lists
  - Focus on analyzable chemicals
- California recycled water (screen for monitoring)
- WERF: three approaches (risk/hazard based)

Chemical Prioritization (cont.)

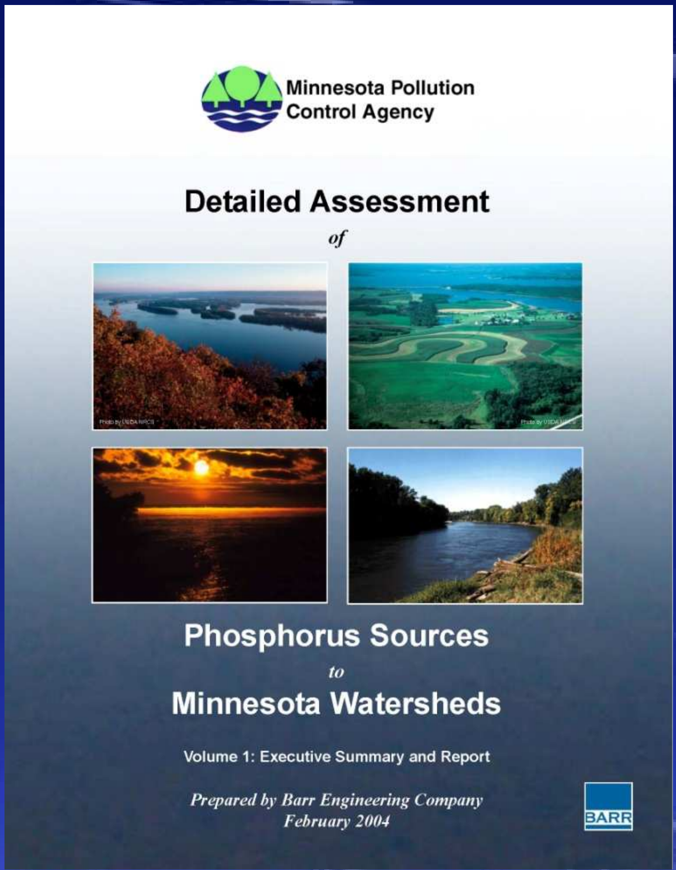
- There is no single best way to prioritize (but there are a number of case studies)
- Focus and purpose of prioritization will drive the outcome
  - Human health
  - Environmental safety
  - Monitoring
  - Long range transport

Chemical Source Inventory

Focusing on A Chemical in Effluent

- Have you established causality?
- *You can't manage it if you don't measure it*
- Identify sources and develop an inventory

Inventory of a Chemical - Phosphorus



- Purpose:
  - Identify sources and amount of P entering POTWs
  - Identify sources and amount of P entering 10 major basins
- Results:
  - 31% of P loadings to surface waters were from point sources
  - 69% of P loadings to surface waters from non-point sources
  - 1.9% of total P to surface water from residential automatic dishwasher detergent

http://www.pca.state.mn.us/hot/legislature/reports/phosphorus-report.html

Inventory of Priority Chemicals: Oregon P^3L & Toxics Reduction Strategy

- Task 1: Identify high priority toxic chemicals and substances
- Task 2: Identify sources and pathways
  - Presence
  - Use
  - Sources
  - Pathways

Summary

- Consider a hierarchical approach when evaluating chemicals as potential stressors in watersheds
  1. Regional-Scale Ecological Risk Assessment – *Getting the most "Bang for the Buck"*
  2. Prioritization – Identifying potential drivers
  3. Source Inventory – *You can't manage it if you don't measure it*
- There are many tools and examples to apply these concepts where you live

Contact Information

Paul C. DeLeo, Ph.D.

Senior Director, Environmental Safety

The Soap and Detergent Association

1331 L Street, N.W., Suite 650

Washington, D.C. 20005

202-662-2516

pdeleo@sdahq.org

http://www.sdascience.org

In June, SDA will become the American Cleaning Institute[SM]

The Home of the Cleaning Products Industry