



Sustainable  
Water Resources  
*Florida Challenges, Global Solutions*

# Monitoring for Microcontaminants in an Advanced Wastewater Treatment Facility

## Authors

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# Project Objectives

- Model Fate and Transport of Microcontaminants in AWT Effluent
- Evaluate Advanced Wastewater Treatment through Pilot Testing
- Determine AWT Effluent Toxicity
  - ◆ Chronic
  - ◆ Acute

# Reuse Also Means Environmental Stewardship

Project Addresses Microcontaminant Concerns Related to Human Health and Environmental Impact



Ethynyl estradiol



Triclosan



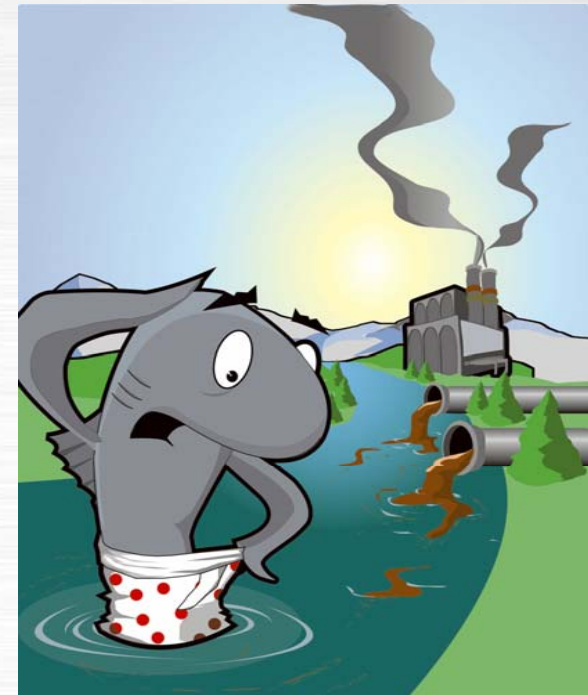
DEET



Bisphenol-a

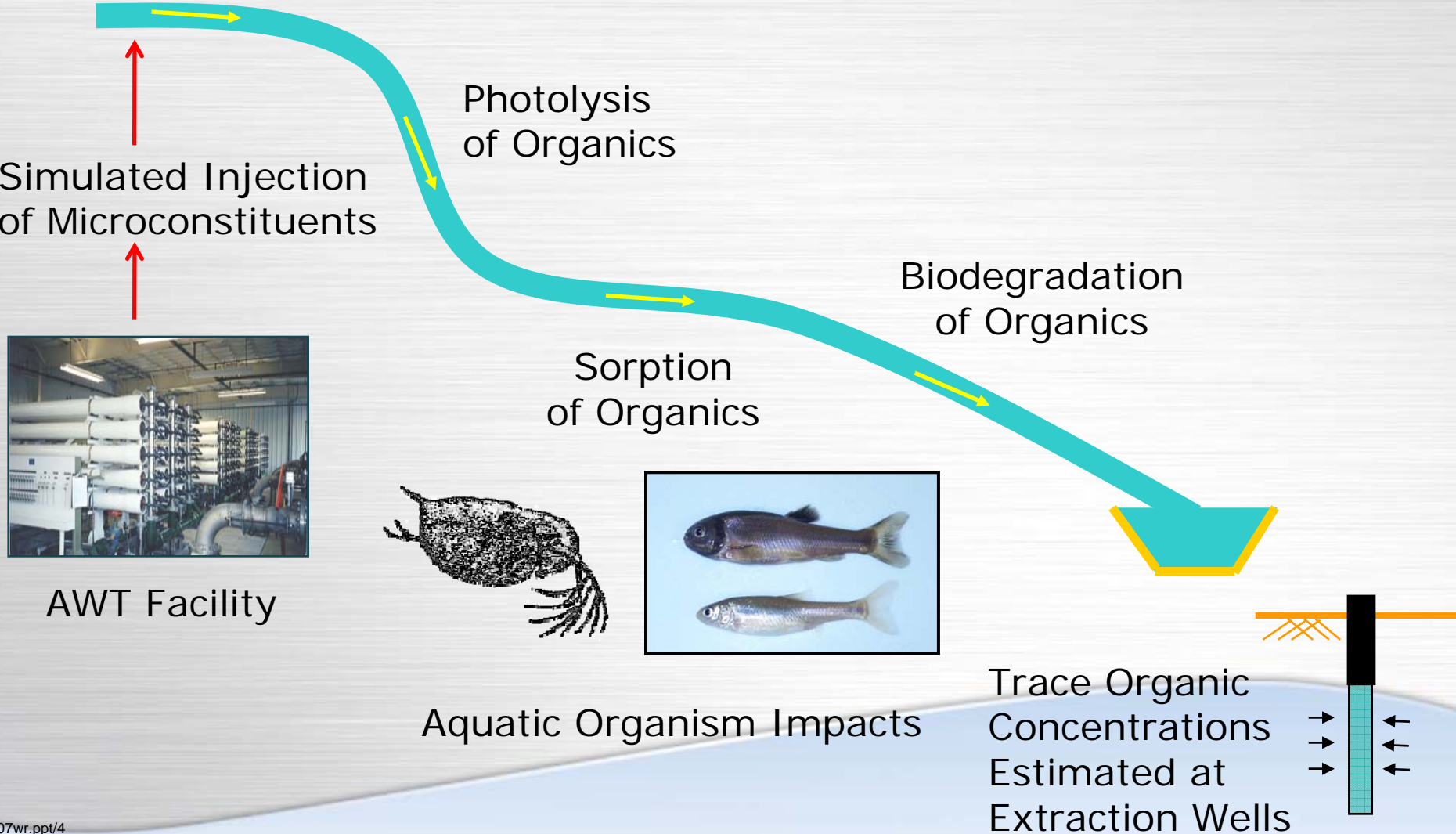


surfactants

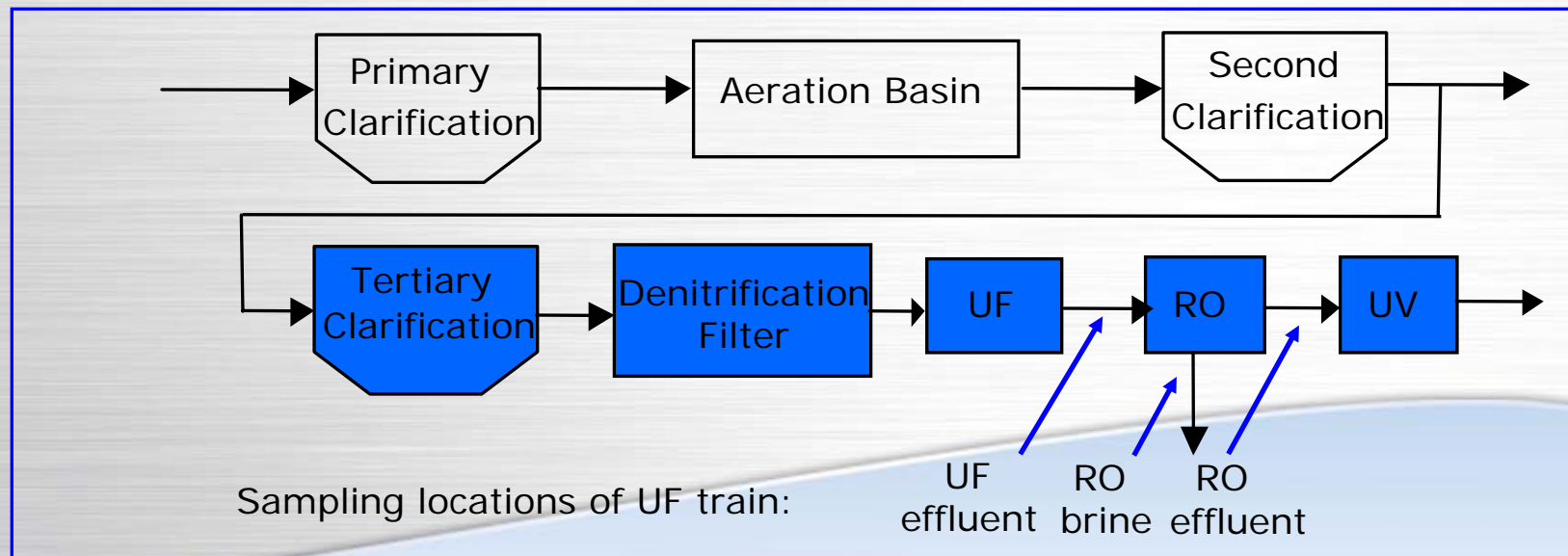
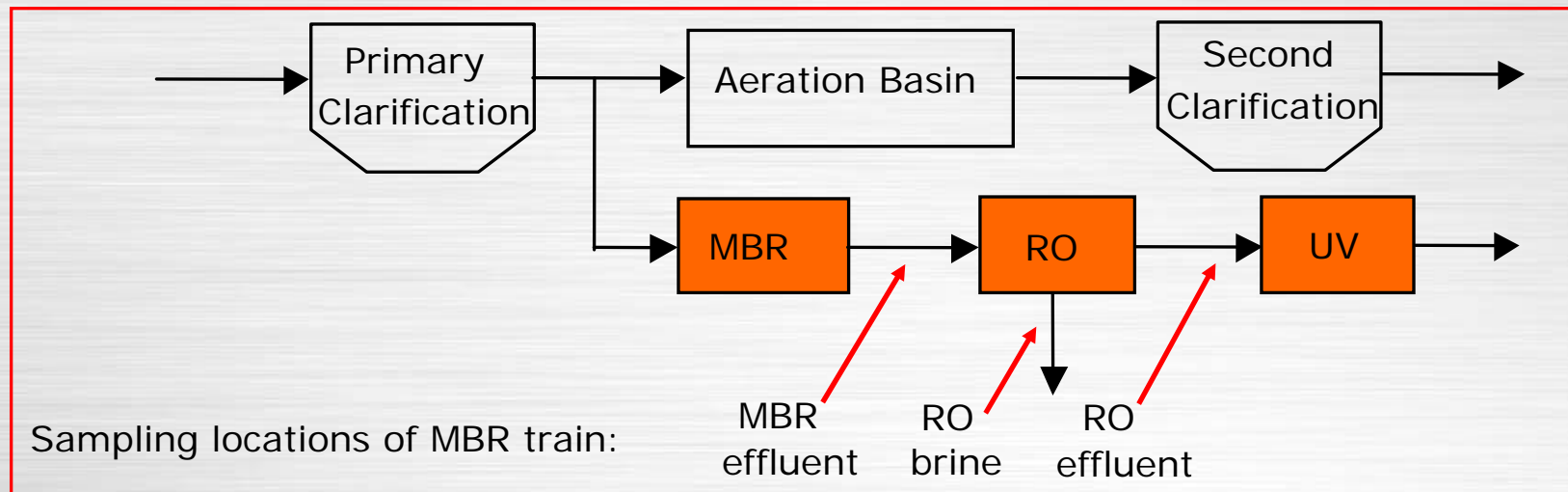


“They're in the Water... They Make Fish Change Sex... Endocrine Disruptors-What are they doing to you?”

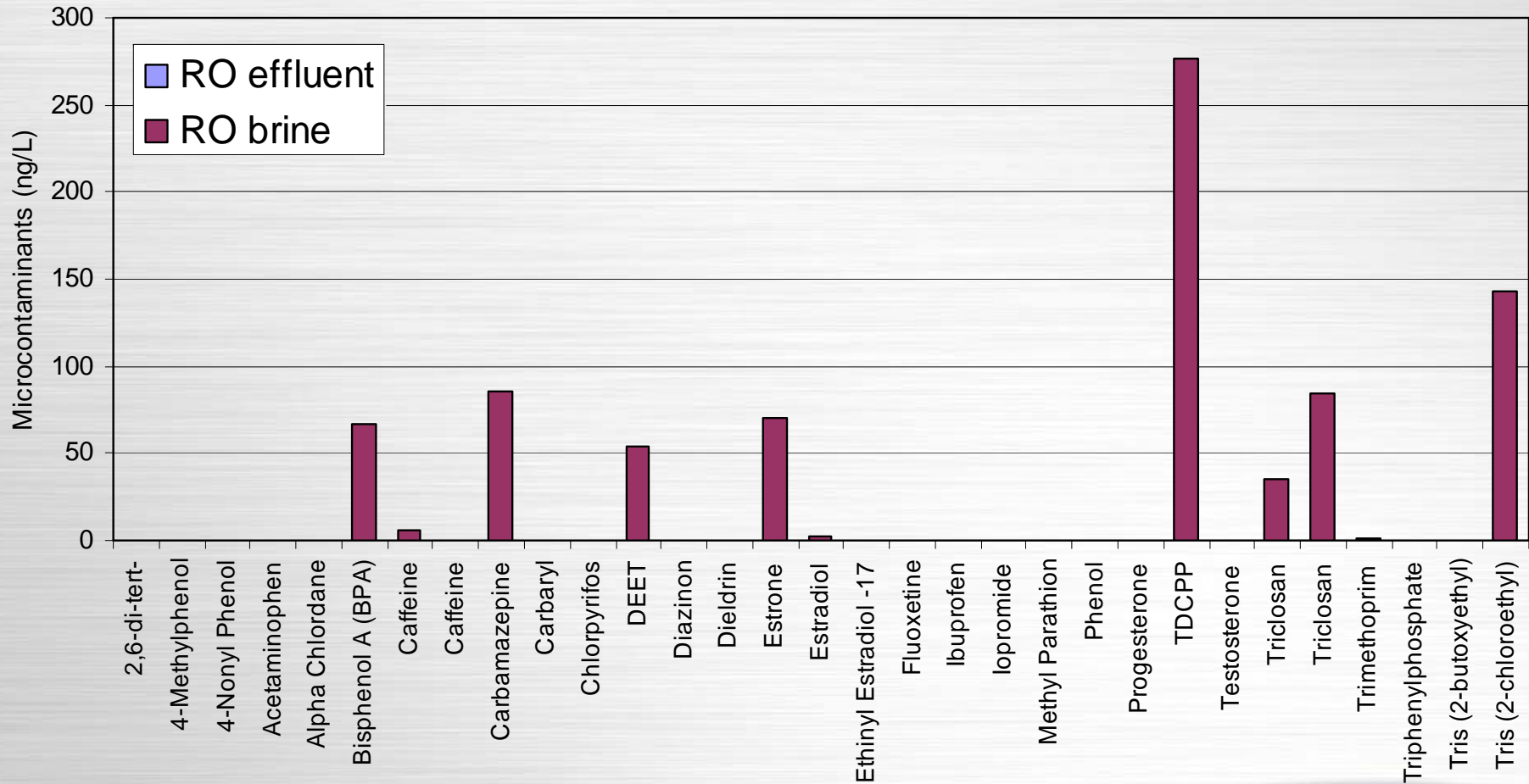
# Fate and Transport of Microcontaminants is Being Modeled



# Microcontaminants are Being Tracked Through Two AWT Configurations



# Preliminary Results for AWT Removal of Microcontaminants Show Promise

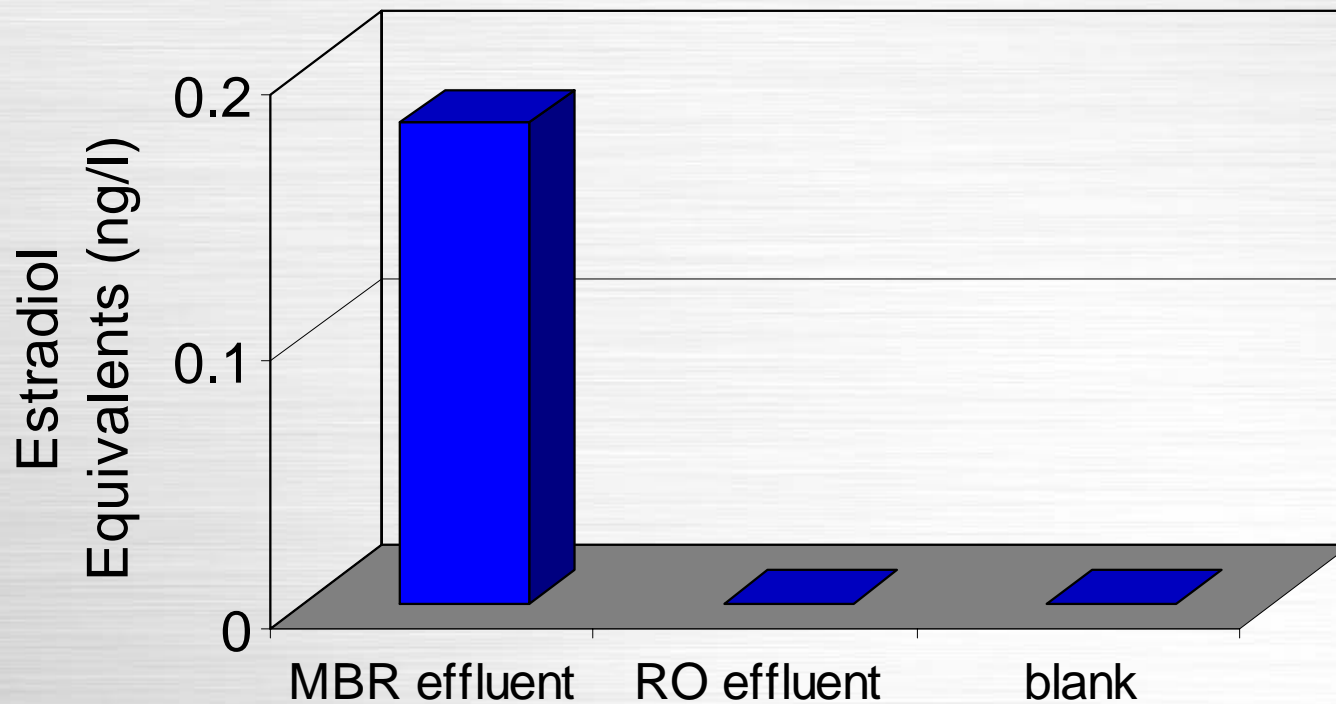


Microcontaminants in RO effluent are below detection limits!

# Microcontaminant Concentrations and Effluent Toxicity are Being Correlated to Aquatic Organism Impact

- Hormonal Response Through Tissue Bioassays
- Acute Fish Toxicity
- Acute Water Flea Toxicity

# Results of Hormonal Response Through Tissue Bioassays (E-Screen)

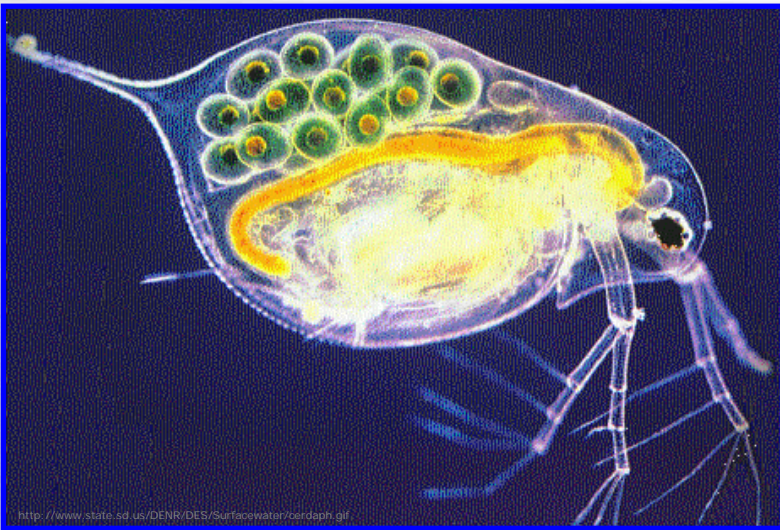


RO effluent didn't produce a significant response in MCF-7 cells, a breast cancer cell line that proliferates in response to estrogenic activity.



# Results of Pilot AWT Effluent Toxicity Tests - test organisms

waterflea,  
*Ceriodaphnia dubia*



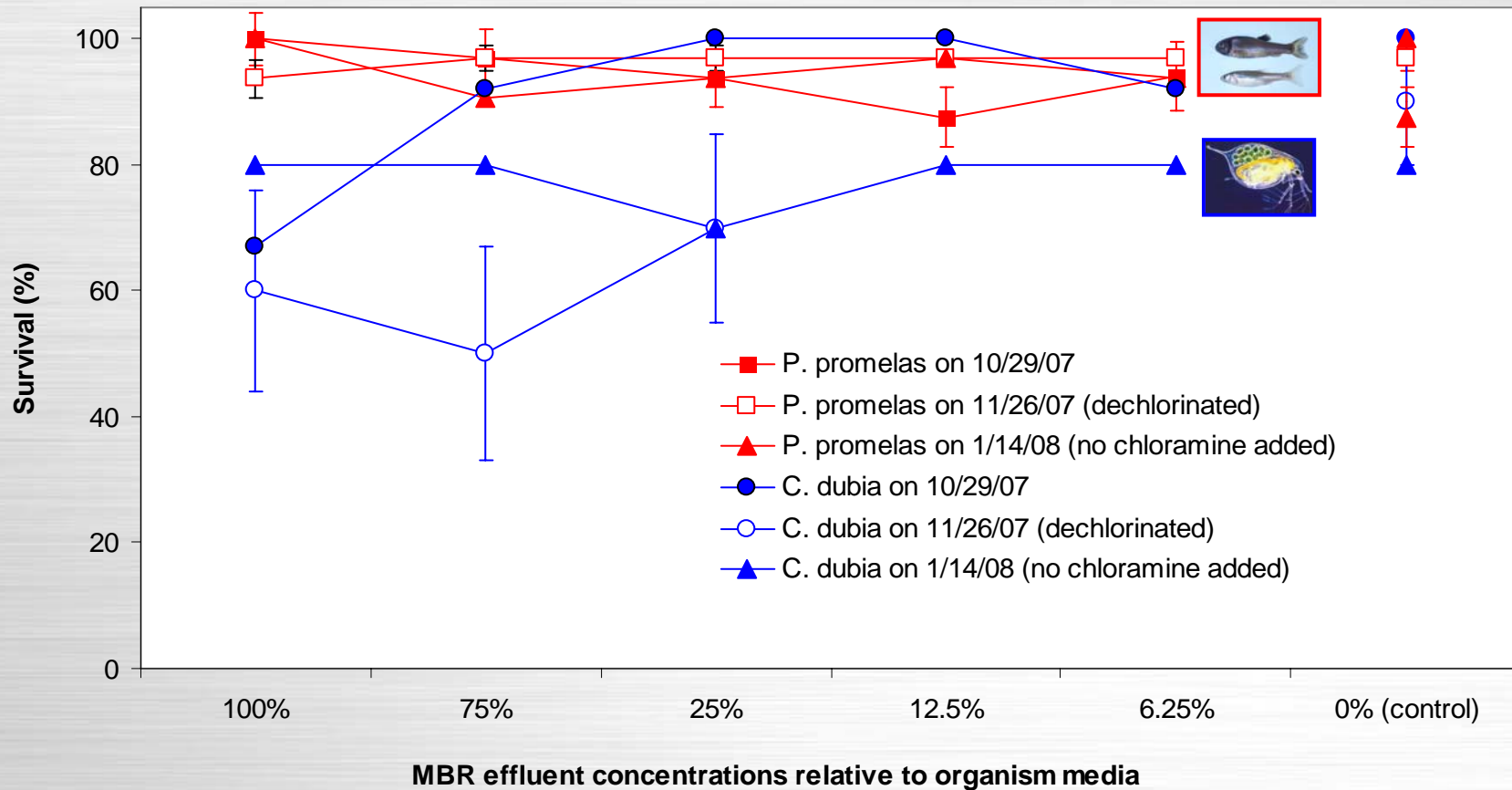
EPA 821-R-02-013  
Test Method 1002.0

fathead minnow,  
*Pimephales promelas*



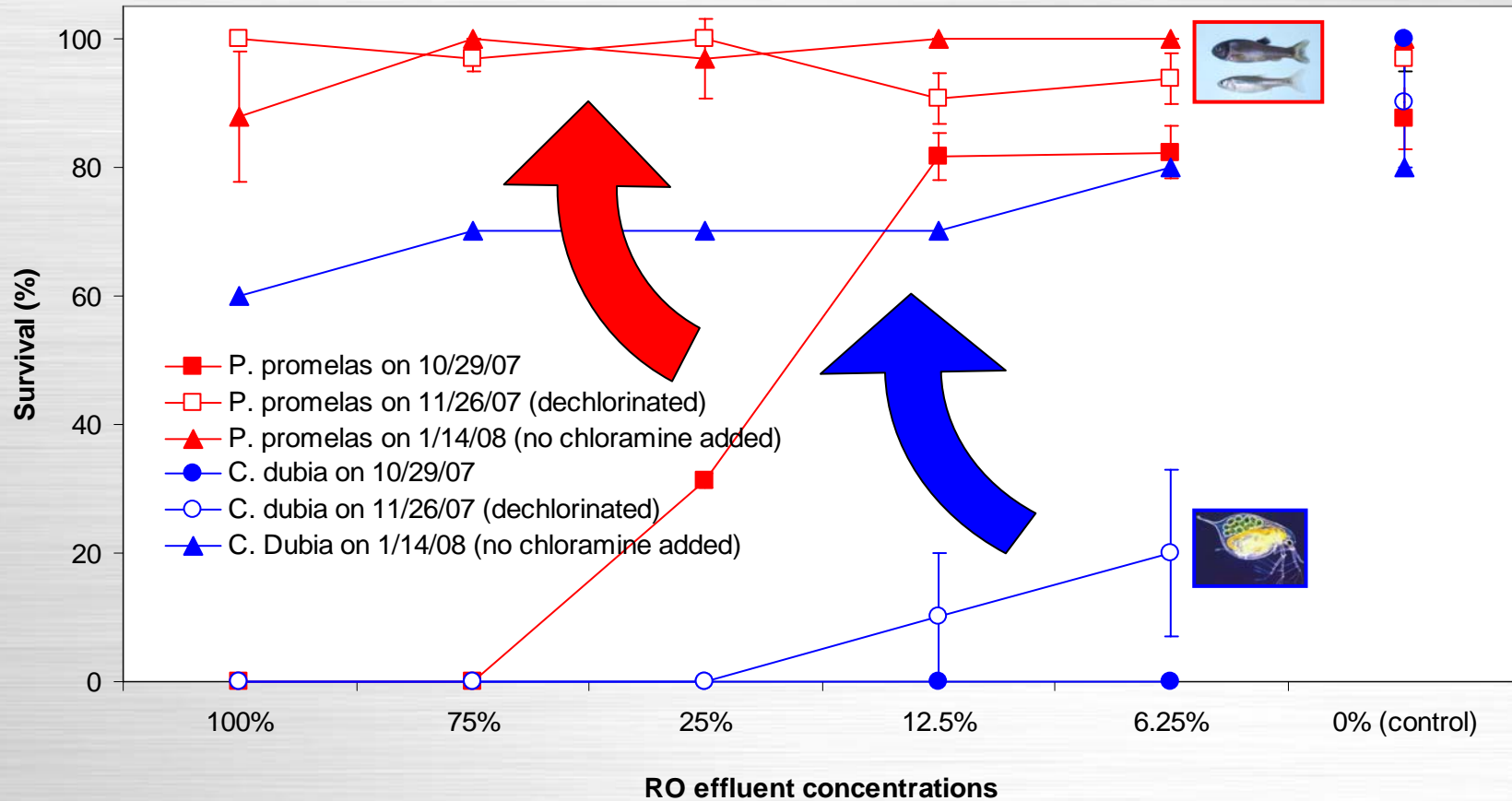
EPA 821-R-02-013  
Test Method 1000.0

# MBR effluent shows minimal acute toxicity



No significant survival differences were observed on all test days, except for *C. Dubia* in 100% MBR effluent without de-chlorination on 10/29/07.

# RO effluent increases organism sensitivity to chlorine



De-chlorination on 11/27/07 significantly increased the survival of *P. Promelas* and *C. Dubia*. No significant survival differences were observed in *P. Promelas* or *C. Dubia* after complete removal of chloramine on 1/14/08.

# Summary

- The developed fate and transport model may be a valuable tool to track microcontaminants in wastewater effluents
- Reverse osmosis treatment shows promise for microcontaminant removal
- Chlorine residual plays significant role in AWT effluent acute toxicity to indicator organisms.
- Non-chlorinated AWT effluents show no signs of acute toxicity.

# Project Team

Microcontaminant Research and Project Management -

South Florida Water Management District and Carollo Engineers

Pilot Plant Design, Operation, and Sampling -  
City of Plantation and Hazen and Sawyer

Laboratory Work -

Univ. of Florida at Gainesville (hormonal bioassays and toxicity), University of Wisconsin (hormonal bioassays), Montgomery-Watson Harza (trace organics), Golder (toxicity), Carollo (particle analysis)

# Project Team

Microcontaminant Fate and Transport Modeling -  
DHI Water and Environment

Expert Advisory Panel -

Dr. Jorg Drewes, Membrane Treatment Processes

Dr. Shane Snyder, Water Quality and Toxicology

Dr. Erin Snyder, Toxicology

**End of Presentation**