

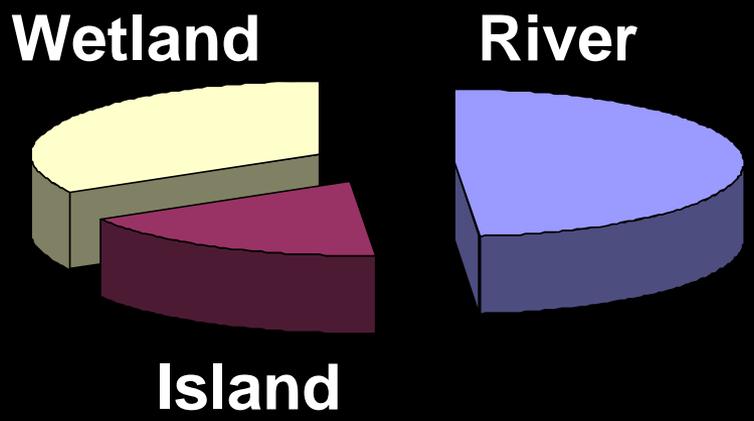


# DOC Dynamics and Reactivity in the Agricultural Willow Slough Watershed

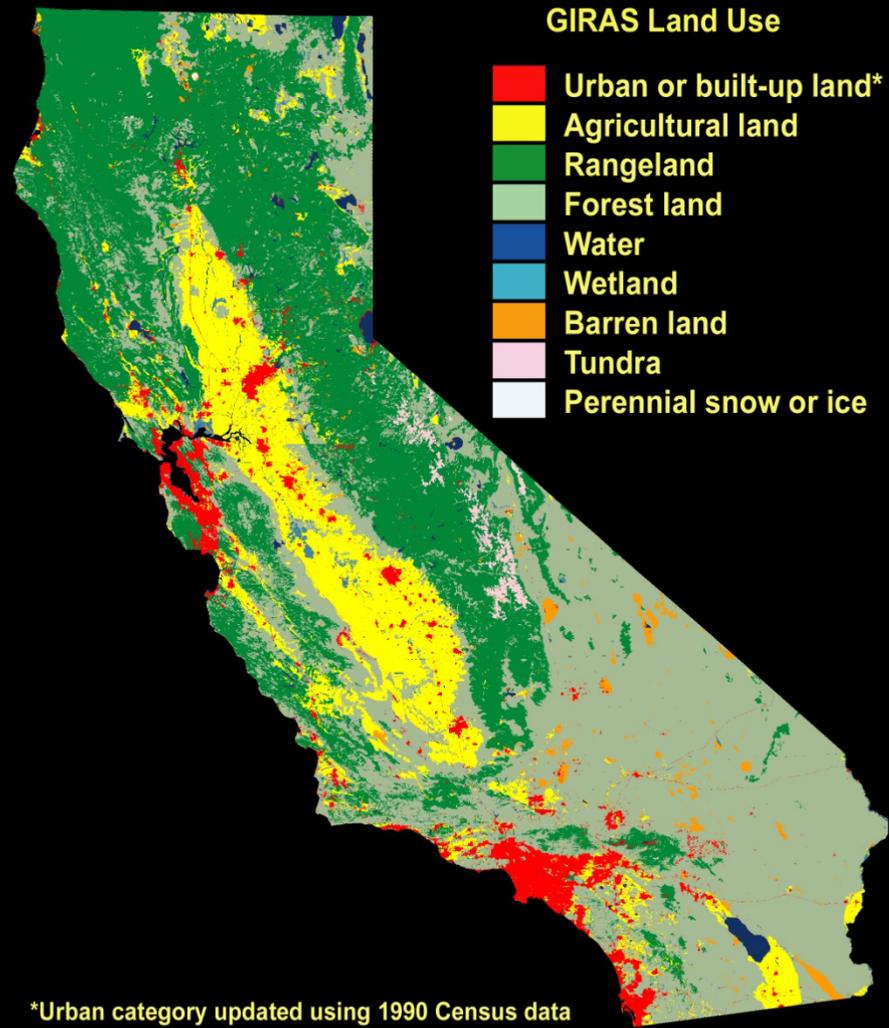
**B.A. Pellerin and B.A. Bergamaschi**

Collaborators: UC-Davis, Hydrofocus,  
Bachand and Associates, Yolo County RCD

# Relative contribution of DOC to drinking water intake (Clifton)

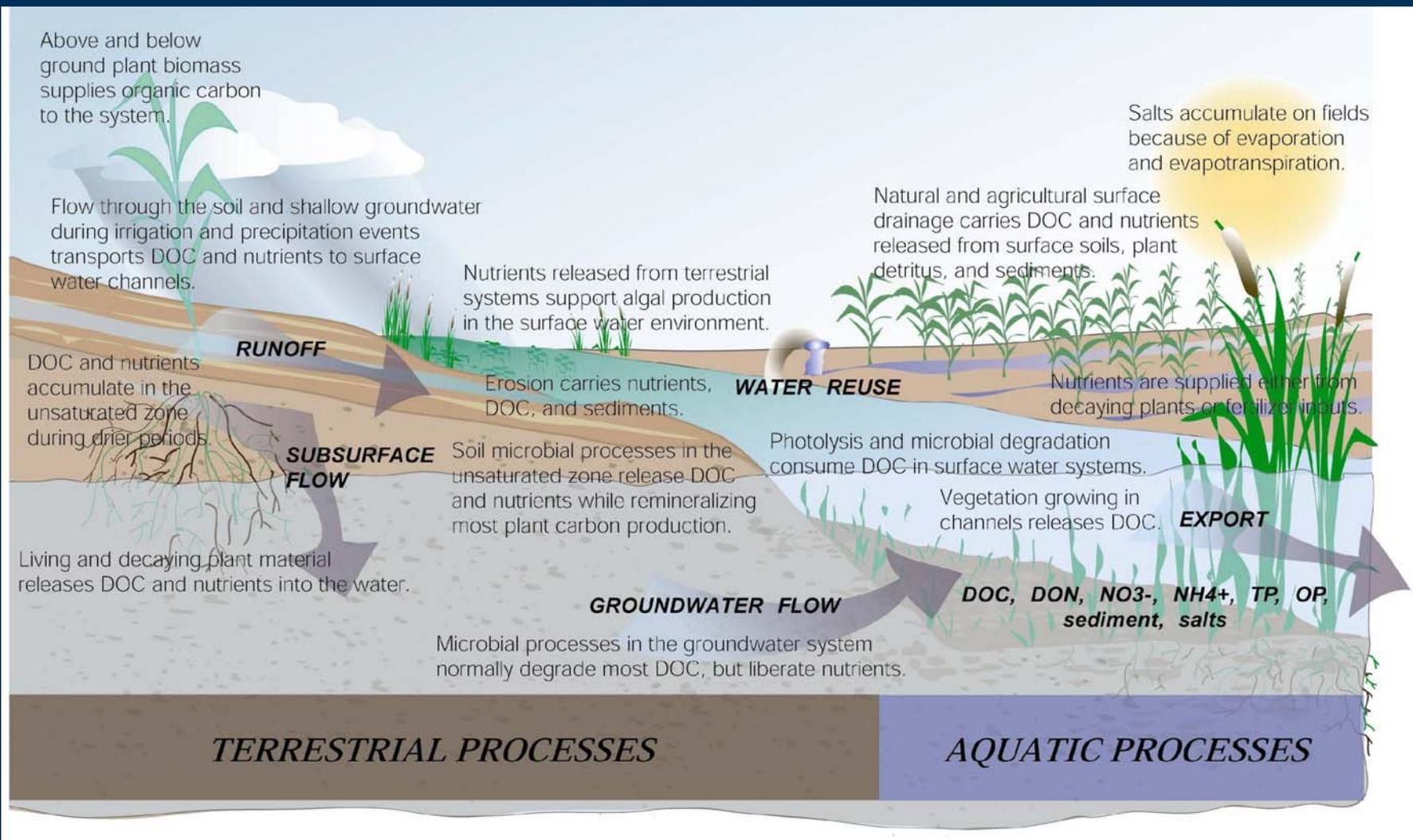


Kraus et al., *in press*



\*Urban category updated using 1990 Census data

# Agricultural DOC Conceptual Model



# Willow Slough Watershed Study

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Develop a quantitative understanding of the impact of agricultural land uses and management on watershed exports of DOC, sediment, nutrients and salts.

Funded by CALFED Bay Delta Program (Drinking Water Program, Prop 50)

Project Timeline: Jan 2006 – March 2009

## Approach:

- Linked studies at different scales
- Variety of analytical tools, models
- Applied elements (outreach, BMP development)
- Watershed comparison (urban, forested)

***What we really want to know...***

**What is the role of agricultural vs. natural landscapes as sources of DOC and constituents of concern?**



## ***What we really want to know...***

**How important are aquatic systems vs. processes on land in producing or retaining DOC and other constituents?**



## ***What we really want to know...***

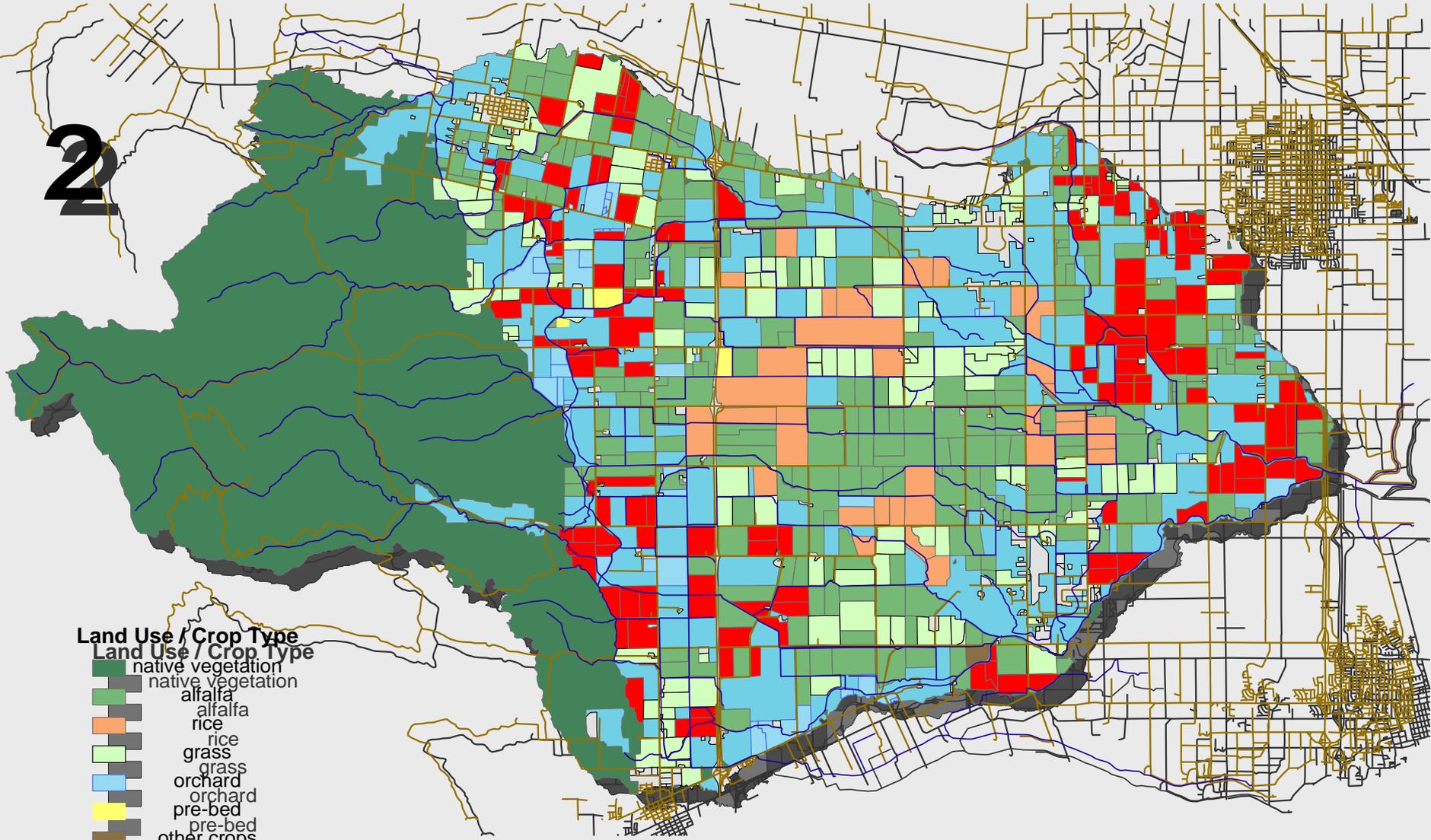
What are the types, persistence and reactivity of DOC in soils, surface water and ground water environments?

A tractor is plowing a field, creating a long, straight furrow of dark, rich soil mixed with straw. The tractor is visible in the distance, moving away from the viewer. The background shows a line of trees and a clear sky with some clouds.

## ***What we really want to know...***

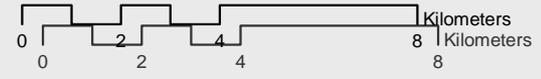
Are there *practical* management strategies to reduce the export of DOC and constituent of concern from fields and sloughs?

2

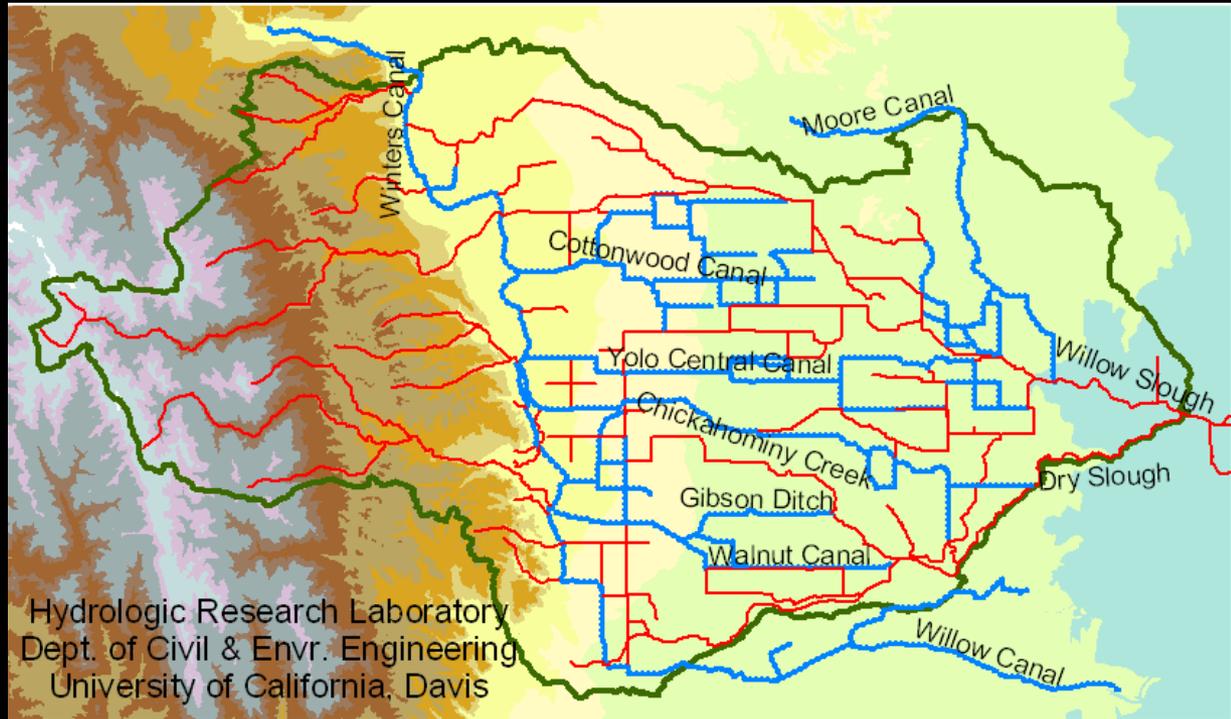
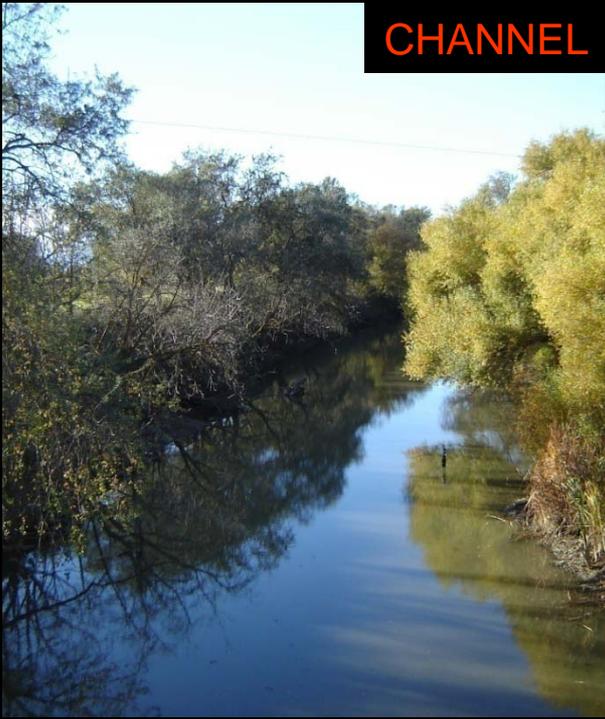


**Land Use / Crop Type**

- native vegetation
- native vegetation
- alfalfa
- alfalfa
- rice
- rice
- grass
- grass
- orchard
- orchard
- pre-bed
- pre-bed
- other crops
- other crops
- tomato
- tomato
- urban
- urban



# CHANNEL



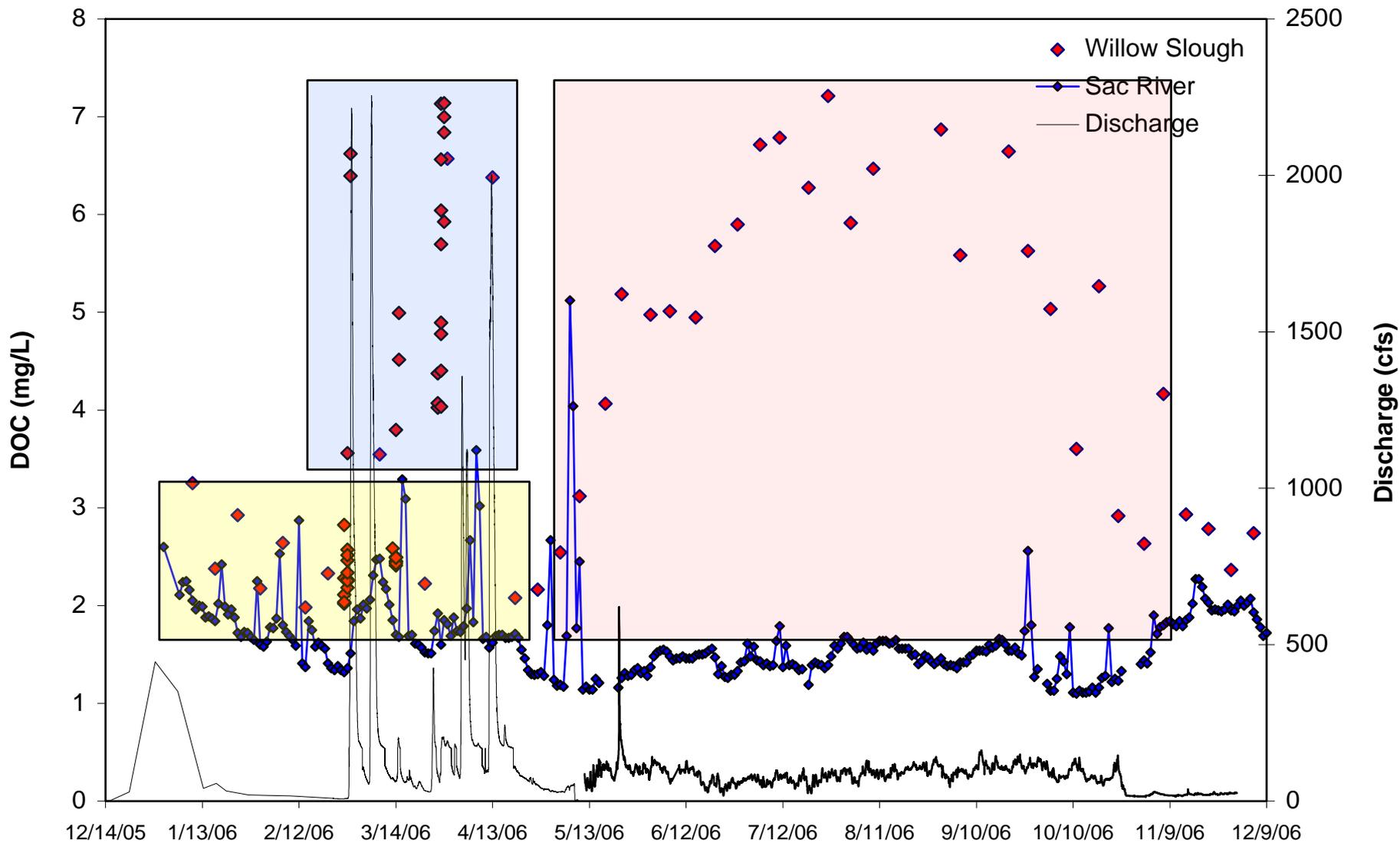
# DRAINS



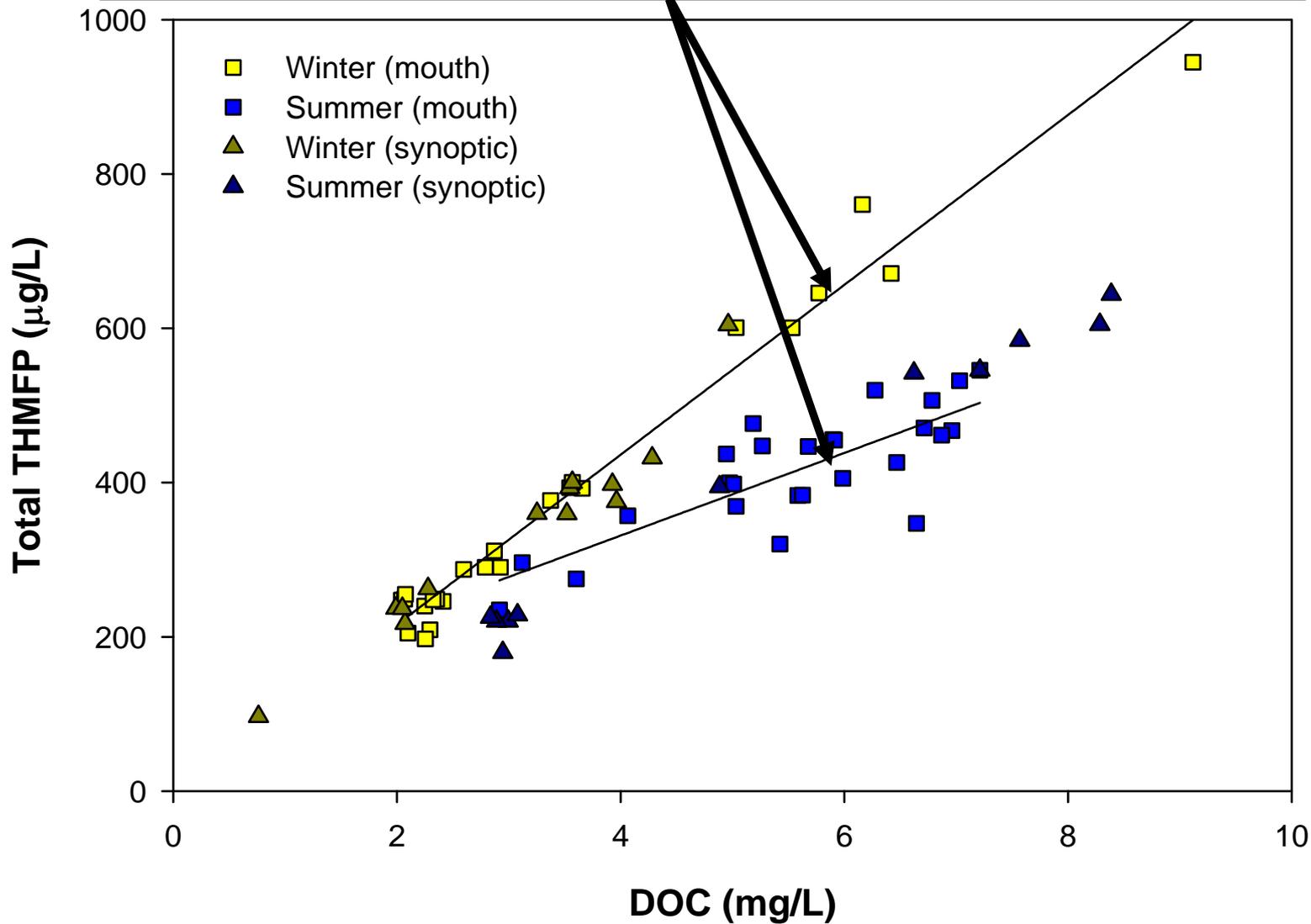
# SEASONAL DAMS



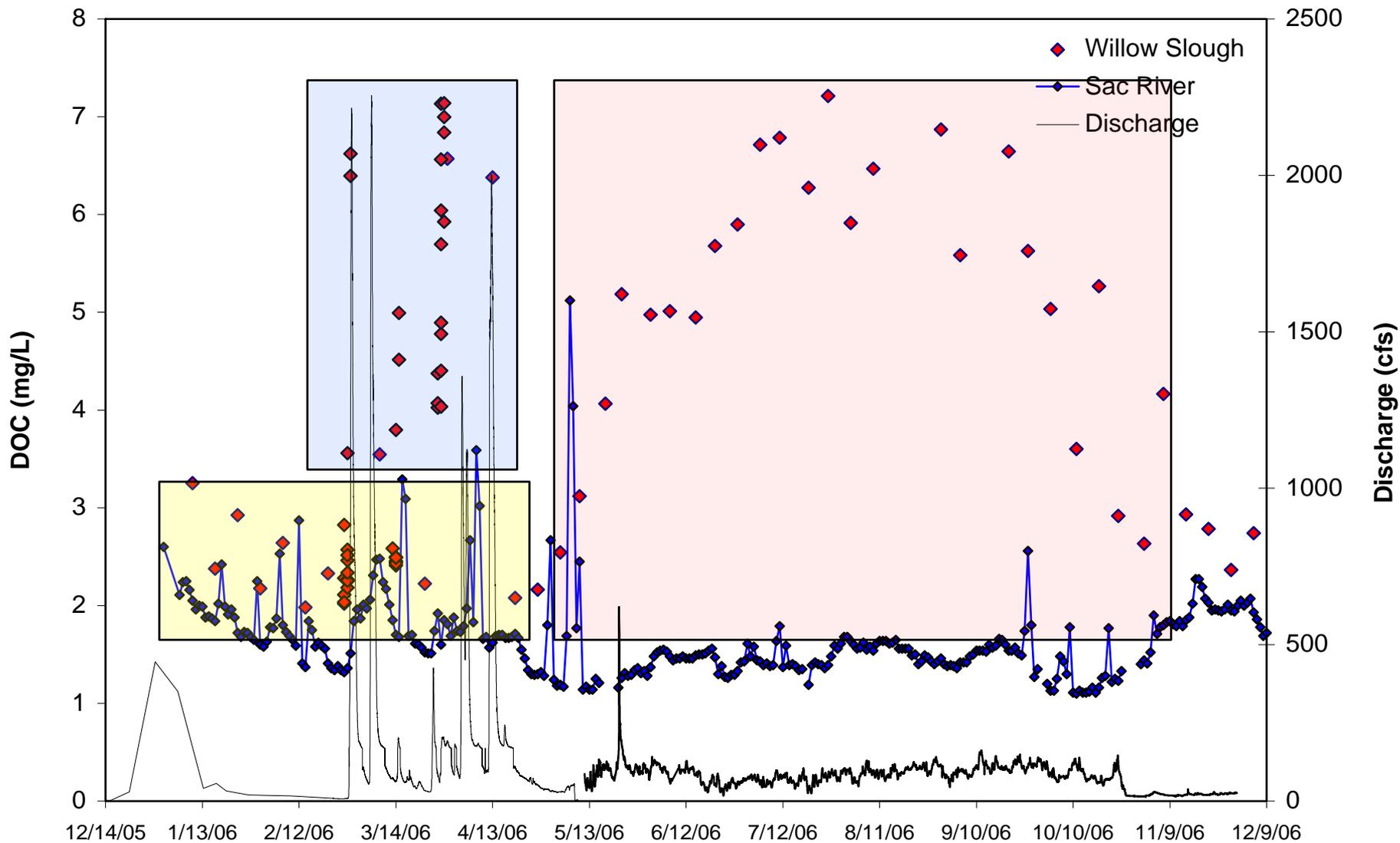
# Weekly DOC concentrations (2006), watershed mouth



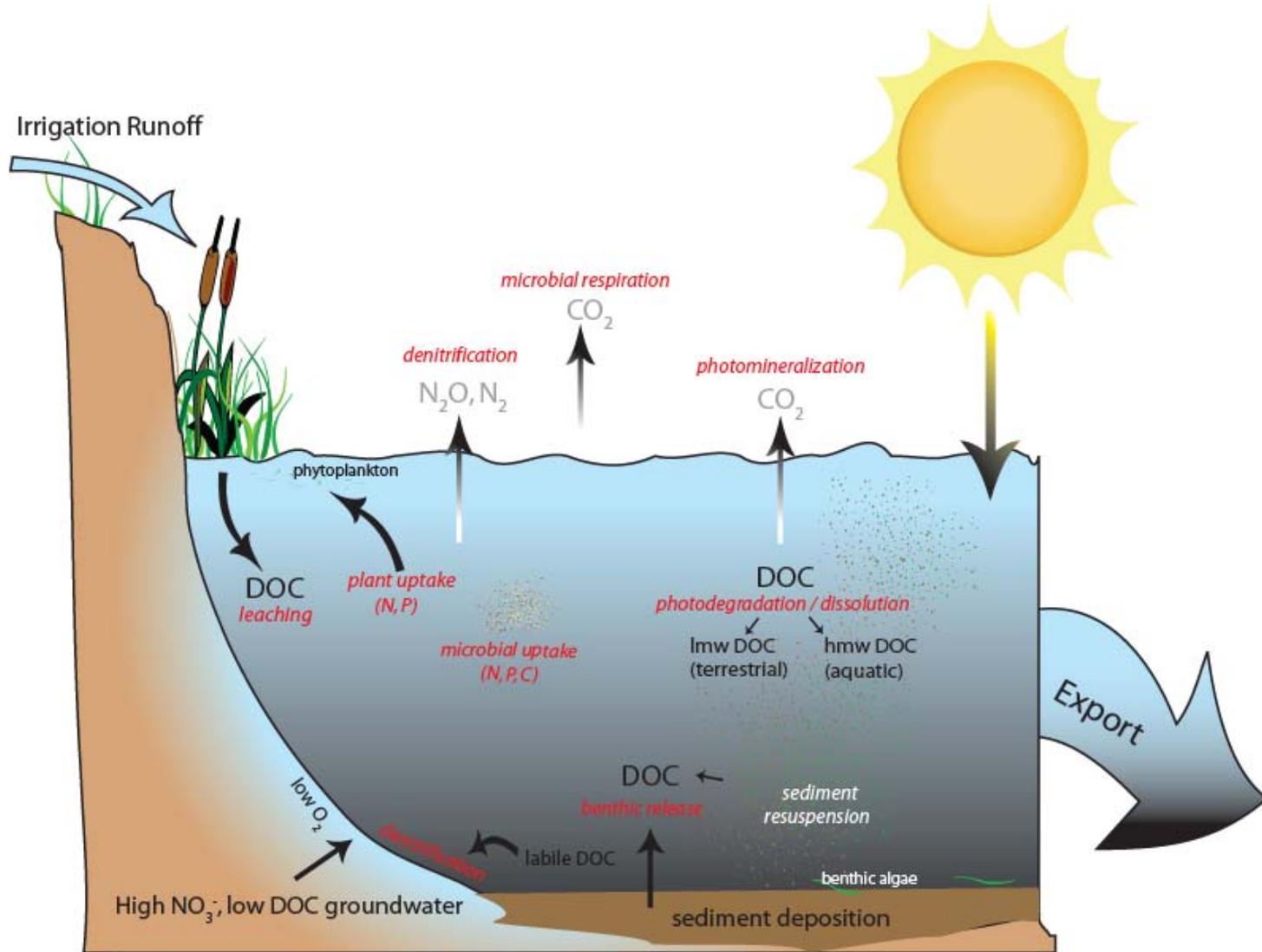
**≈ 30 % more THM per unit C in winter compared to summer (6 mg/L DOC)**



# Weekly DOC concentrations (2006), watershed mouth



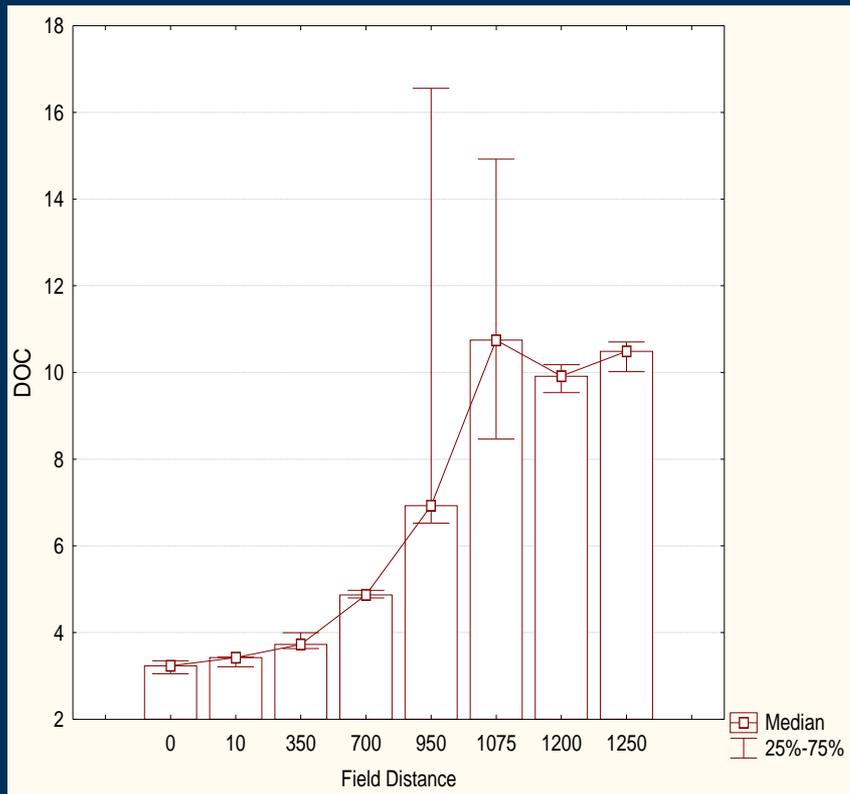
# Conceptual Model of DOC Dynamics – Aquatic Processes



# Hypotheses for high summer DOC

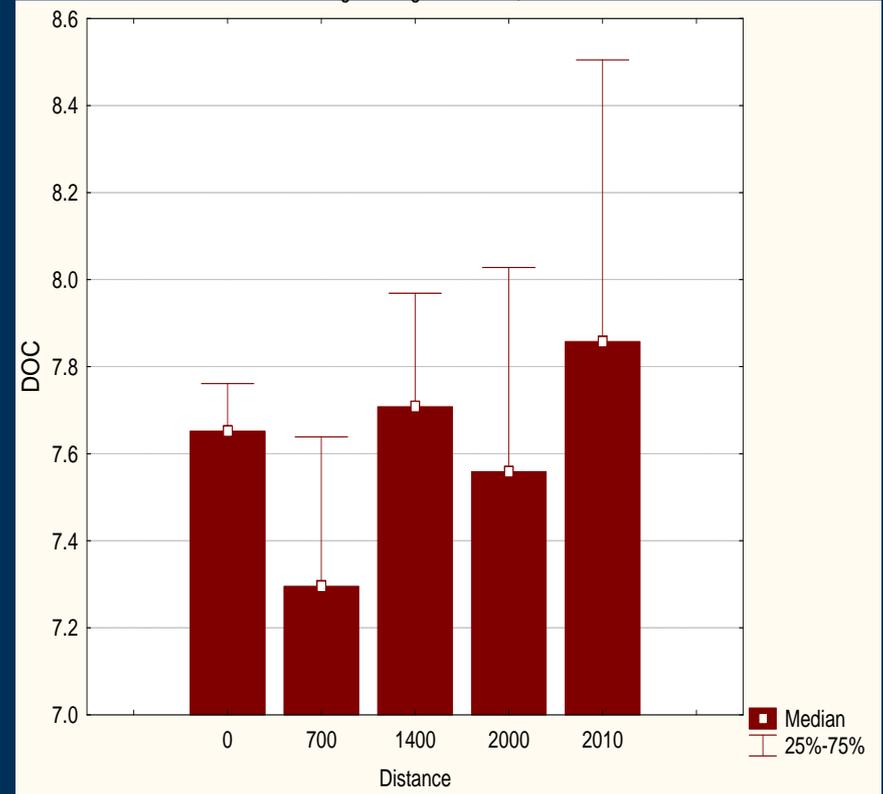
Direct DOC runoff from fields during irrigation events

## FLOOD IRRIGATION



Orchard grass field, 2007

## FURROW IRRIGATION

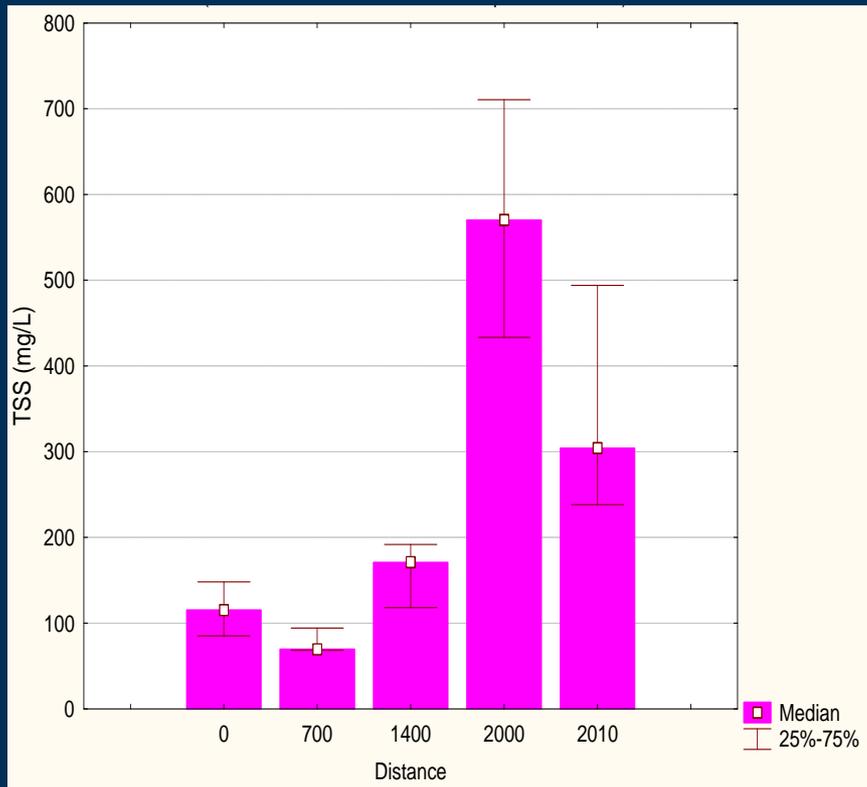


Corn field, 2007

# Hypotheses for high summer DOC

Release of organic carbon from sediments

## FURROW IRRIGATION



Corn field, 2007



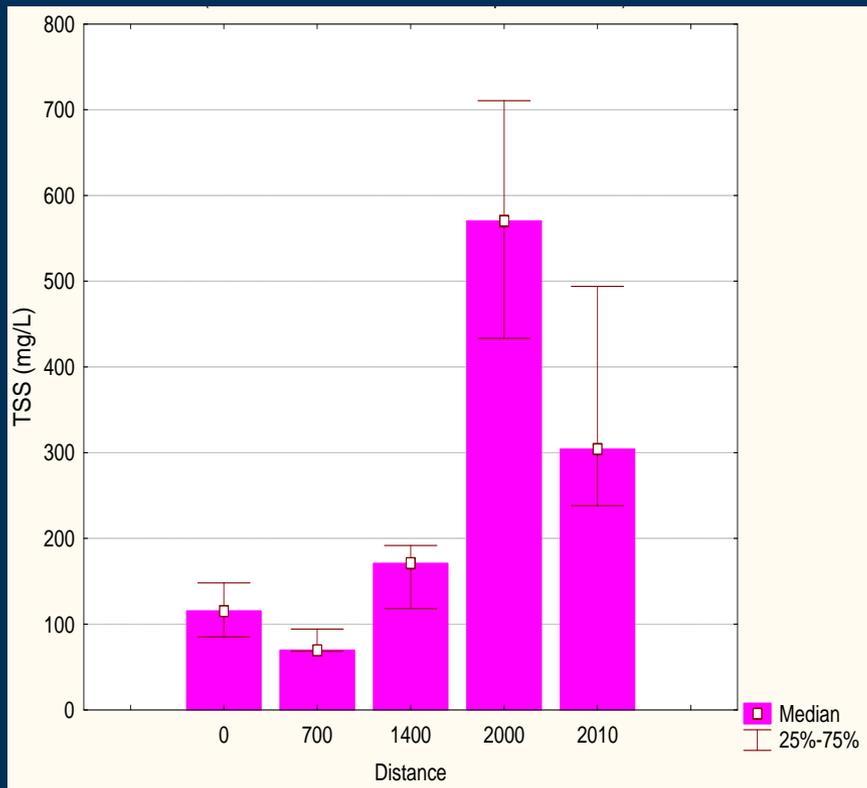
## Furrow drainage



# Hypotheses for high summer DOC

Release of organic carbon from sediments

## FURROW IRRIGATION



Corn field, 2007



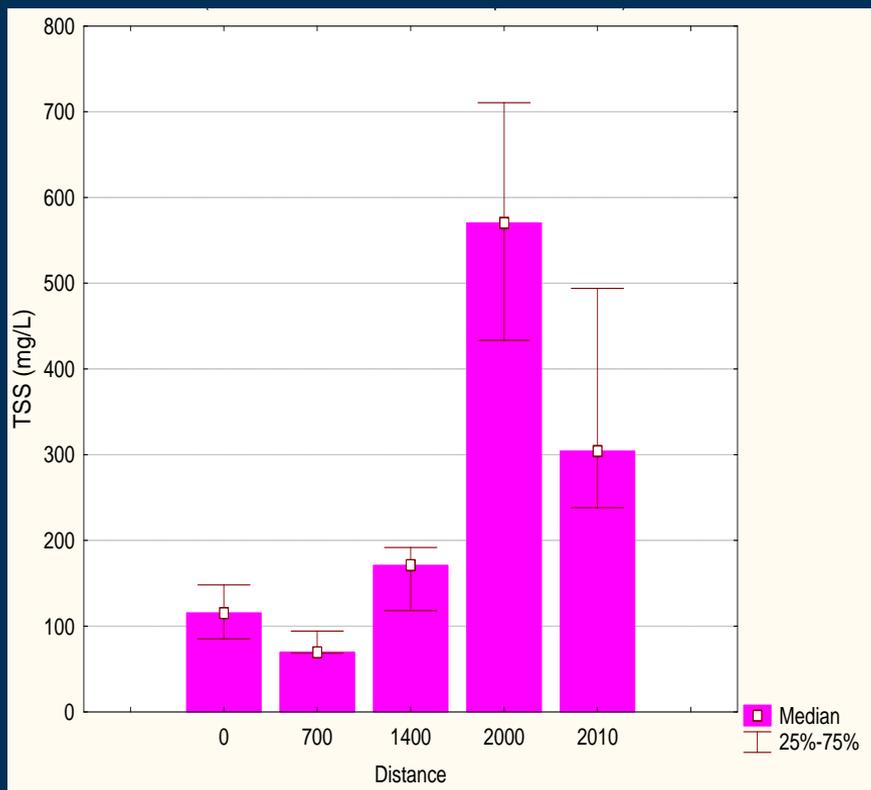
## Field drain



# Hypotheses for high summer DOC

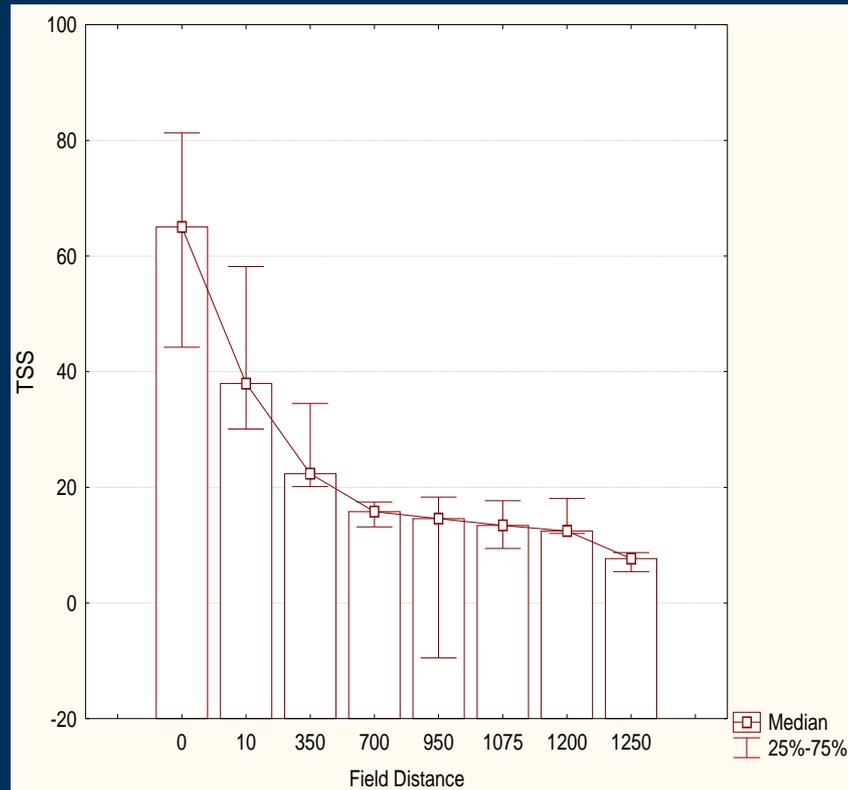
Release of organic carbon from sediments

## FURROW IRRIGATION



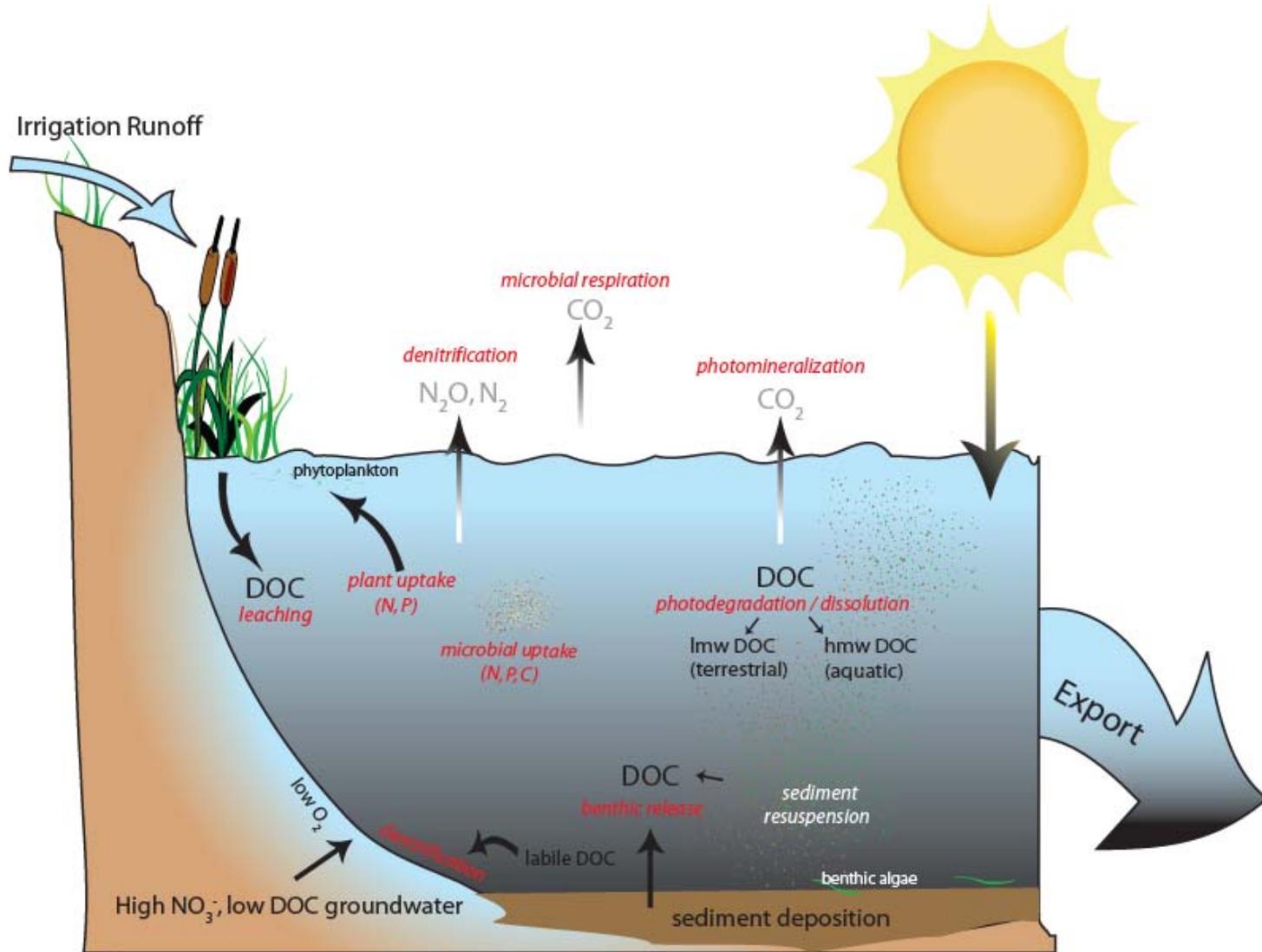
Corn field, 2007

## FLOOD IRRIGATION



Orchard grass field, 2007

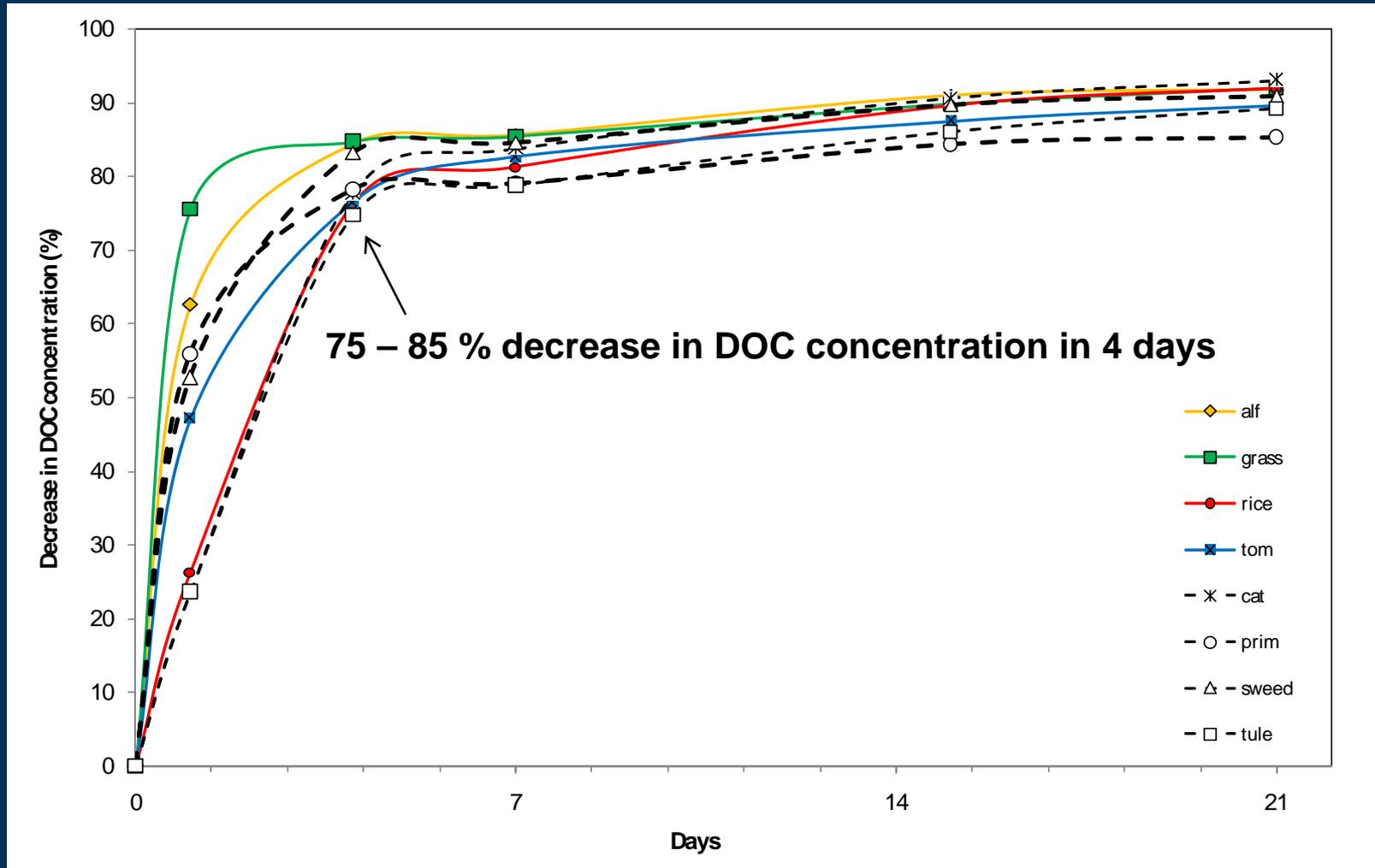
# Conceptual Model of DOC Dynamics – Aquatic Processes



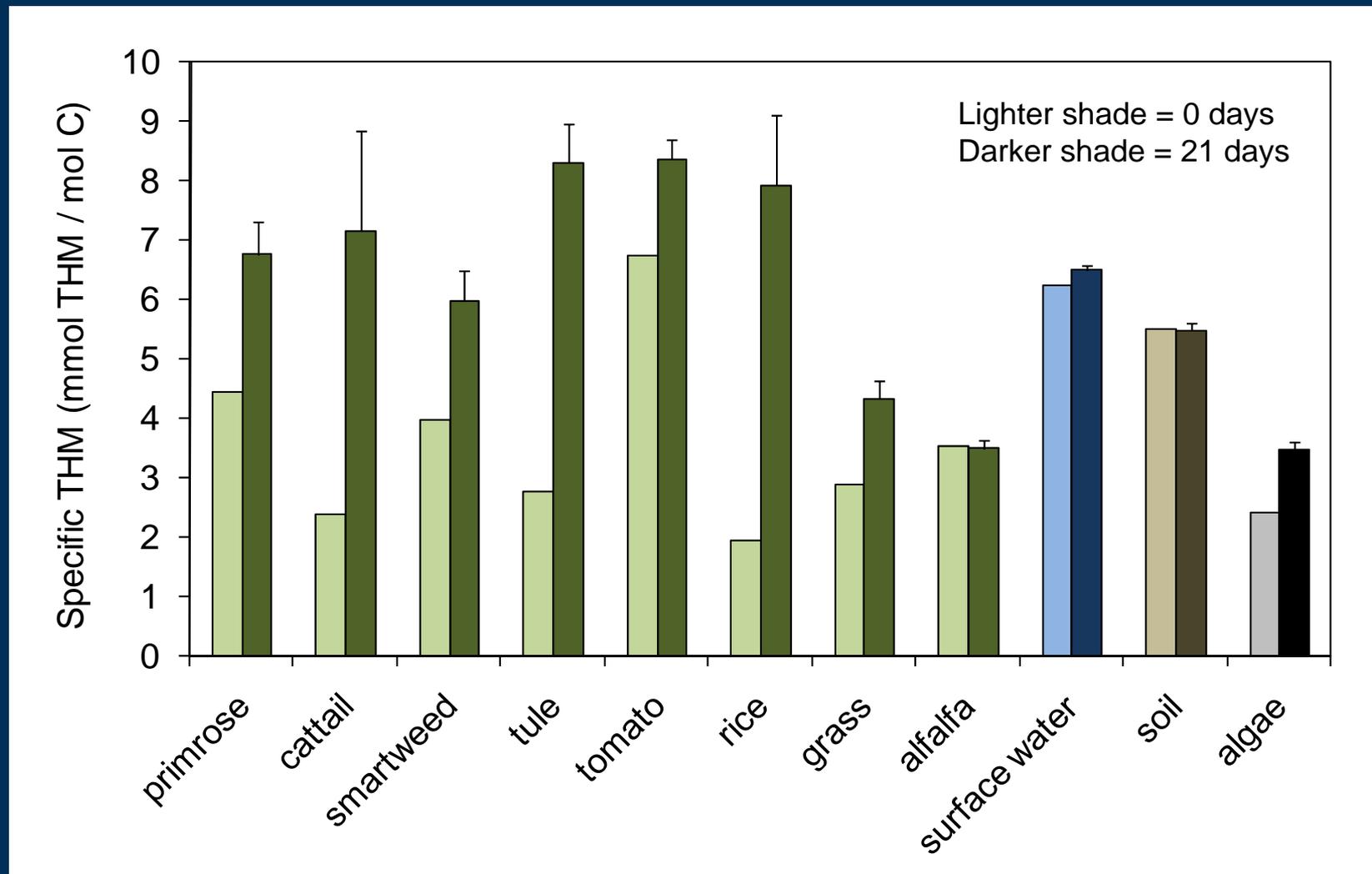
SUMMER

# Plant Leachate Biodegradation

21 day dark incubation, 22 °C, aerobic, no nutrient addition



# Ecosystem Needs vs. Drinking Water Concerns?



# Summary

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- **The water is muddy, but clearing...**
  - Spatial and temporal variability in DOM
  - Complex hydrology related to agriculture
  - Mix of natural and anthropogenic impacts
  - Aquatic and terrestrial processes important
- **Not all DOC is the same!**
- **“Practical” strategies to reduce concerns may exist**
- **Ecosystem needs vs. drinking water concerns?**

# ***Acknowledgements***

**USGS** (JohnFranco Saraceno, Frank Anderson, Kathryn Crepeau, Bryan Downing, Will Kerlin, Cat Roush, Liz Beaulieu)

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**Hydrofocus** (Steve Deverel)

**Yolo County RCD** (Paul Robins, Jeanette Wrynski)

**CALFED Bay Delta Program**