

# OU Water Day



Center for Restoration of  
Ecosystems and Watersheds  
University of Oklahoma

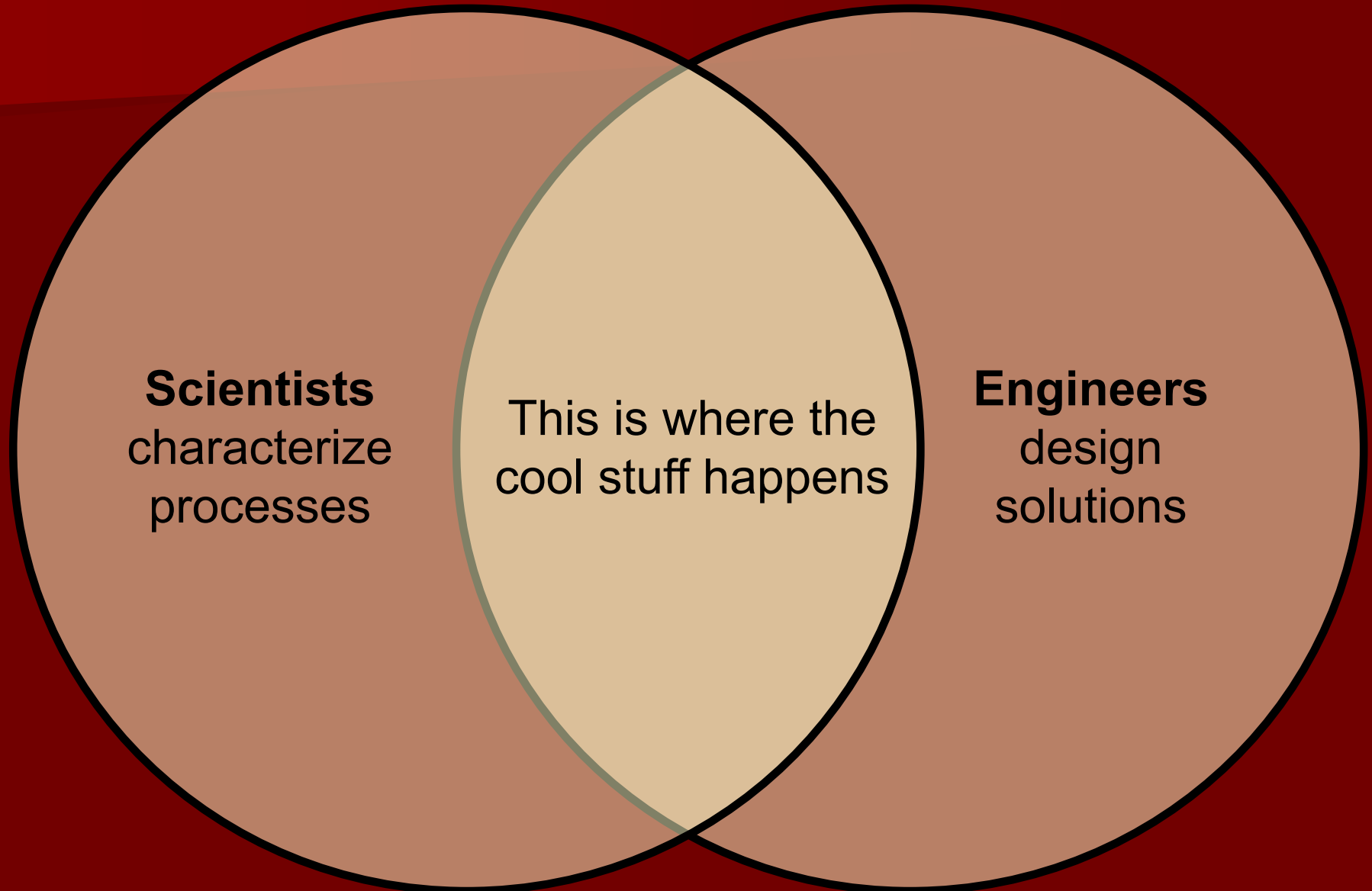
*Robert W. Nairn*  
David L. Boren Distinguished Professor  
Viersen Presidential Professor  
CREW, Director  
WaTER Center, Associate Director



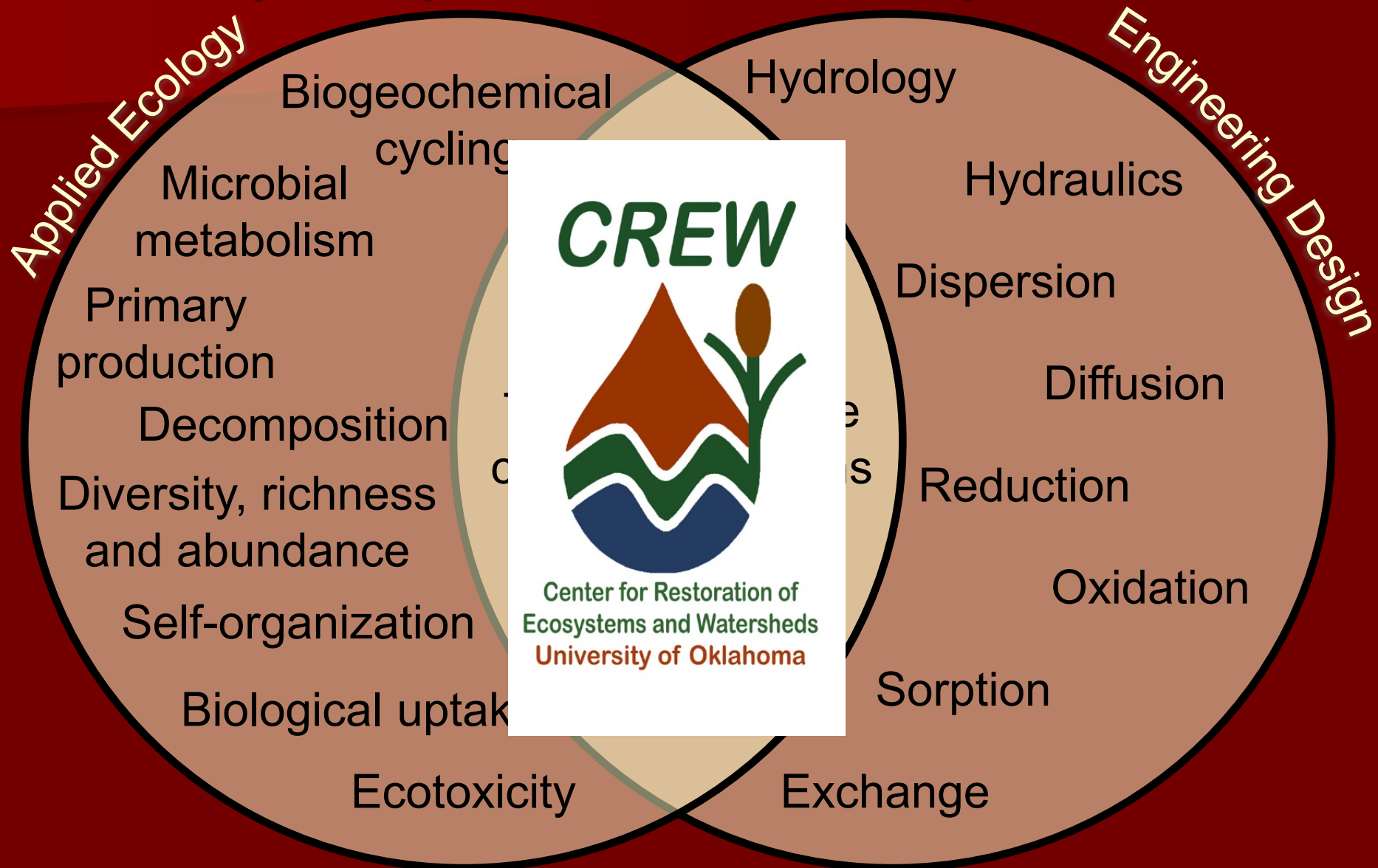
GALLOGLY COLLEGE OF ENGINEERING  
SCHOOL OF CIVIL ENGINEERING  
AND ENVIRONMENTAL SCIENCE  
The UNIVERSITY of OKLAHOMA



# How do we sustainably address critical water quality and availability concerns?



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# Center for Restoration of Ecosystems and Watersheds

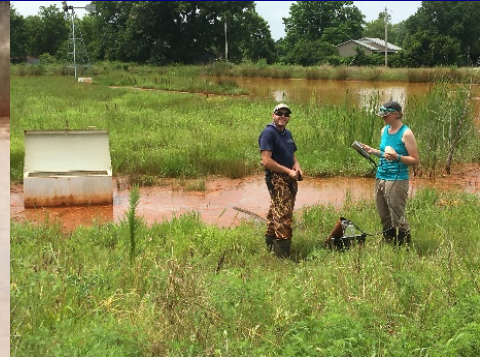
- Watershed biogeochemistry
  - Drainage-basin scale evaluations of materials and energy transport and fate





# Center for Restoration of Ecosystems and Watersheds

- Watershed biogeochemistry
  - Drainage-basin scale evaluations of materials and energy transport and fate
- Ecological engineering
  - Ecosystem conservation, restoration, creation and remediation
  - Passive treatment systems
  - Water quality improvement





# Mayer Ranch Passive Treatment System, Tar Creek Superfund Site, Commerce, OK

C1: Oxidation pond

SA

SD

SB

C2N/2S: Surface  
flow wetlands

C3N/3S:  
Vertical flow  
bioreactors

C4N/4S: Re-  
aeration ponds

C5N/5S:  
Horizontal flow  
limestone beds

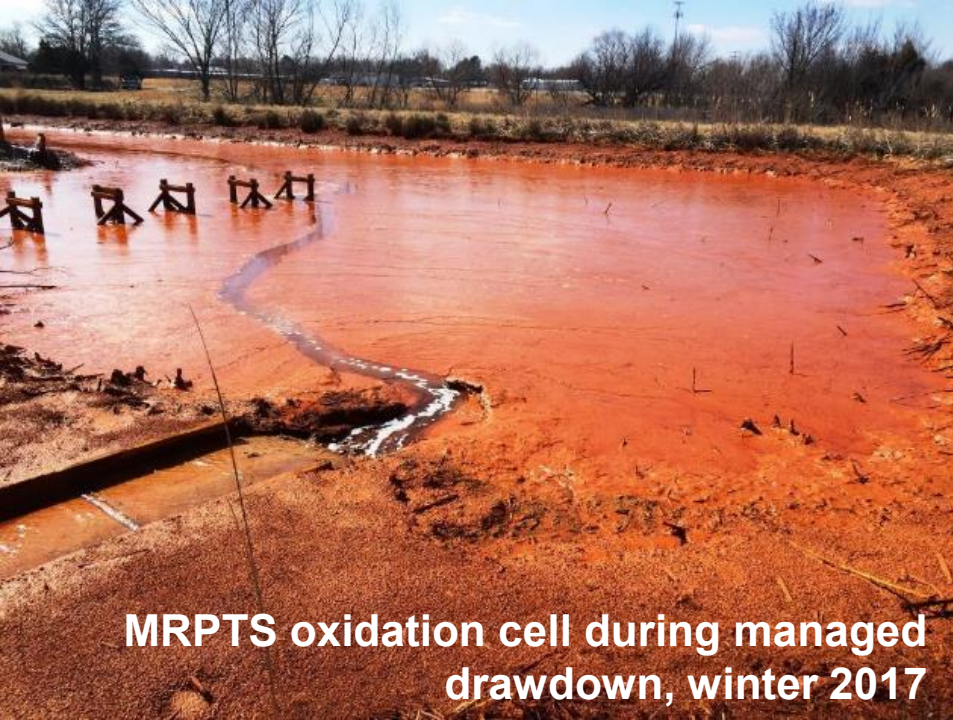
C6: Polishing  
pond/wetland

## Ecological engineering field research site

- Designed for 1400 m<sup>3</sup>/d
- Receives elevated Fe, Zn, Pb, Cd, As, SO<sub>4</sub>
- Six distinct process units (10 total)
- Parallel treatment trains
- No fossil fuel use
- Limited operation/maintenance
- Discharge meets receiving stream criteria

System start up 11/08





**MRPTS oxidation cell during managed drawdown, winter 2017**



**SECPTS oxidation cell solar-powered aerators and baffle curtains, early 2017**

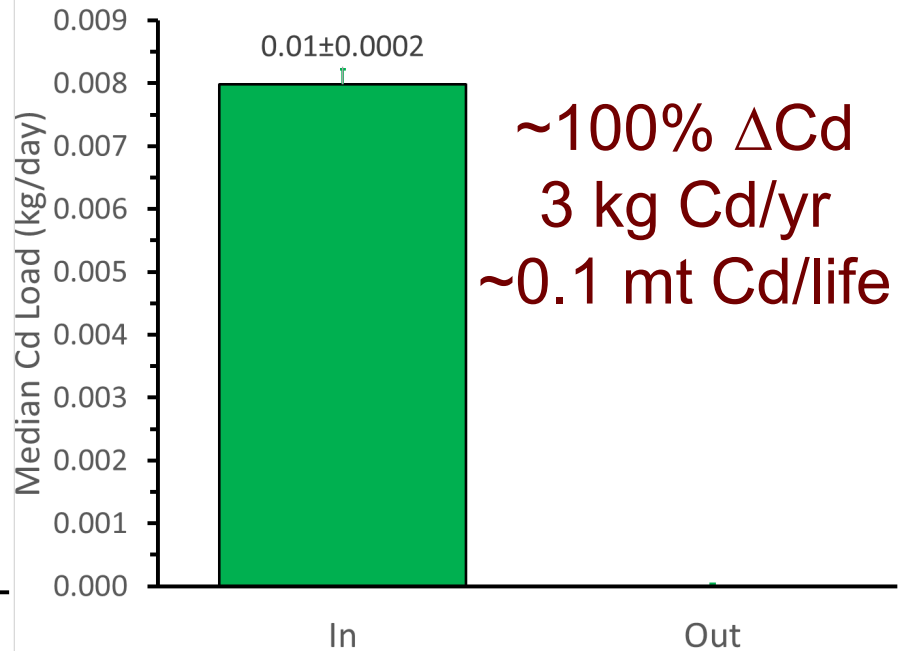
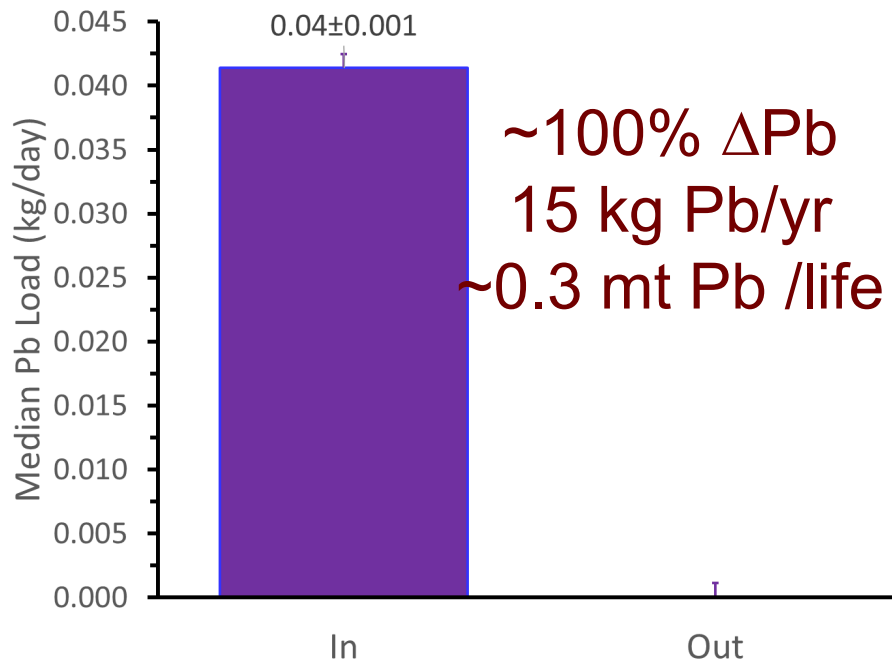
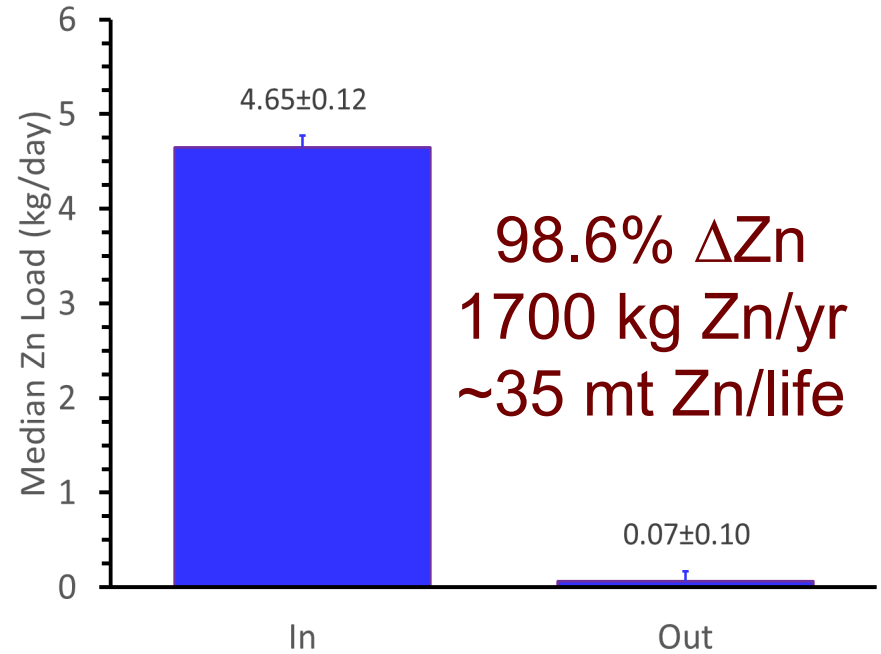
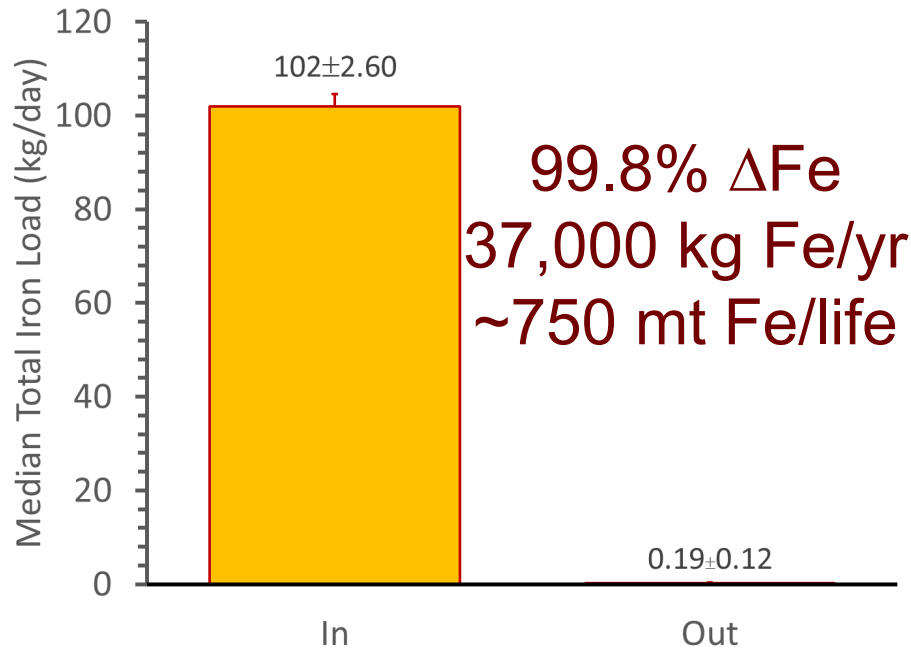


**MRPTS vertical flow bioreactor underdrain to be covered in stone, fall 2008**



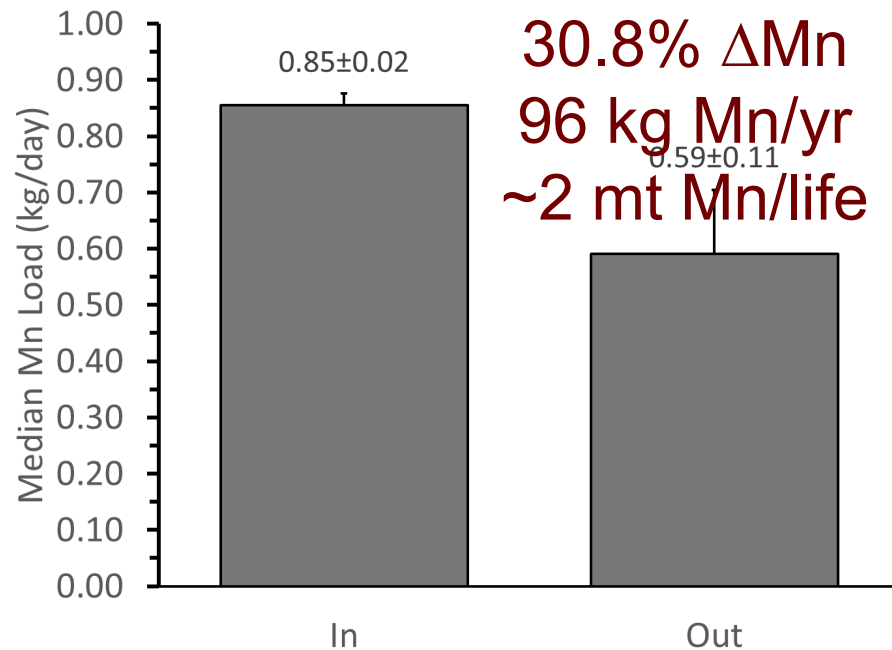
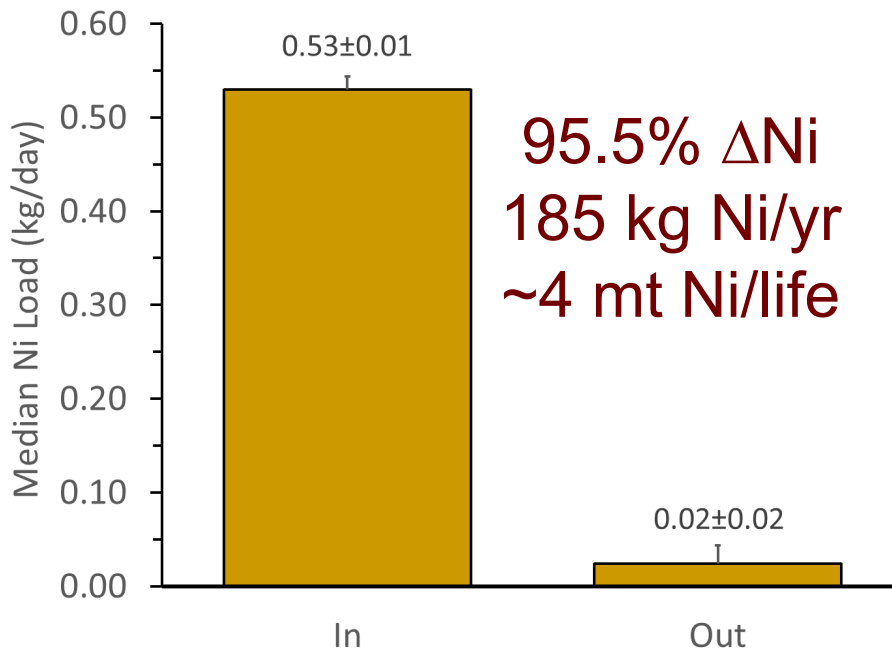
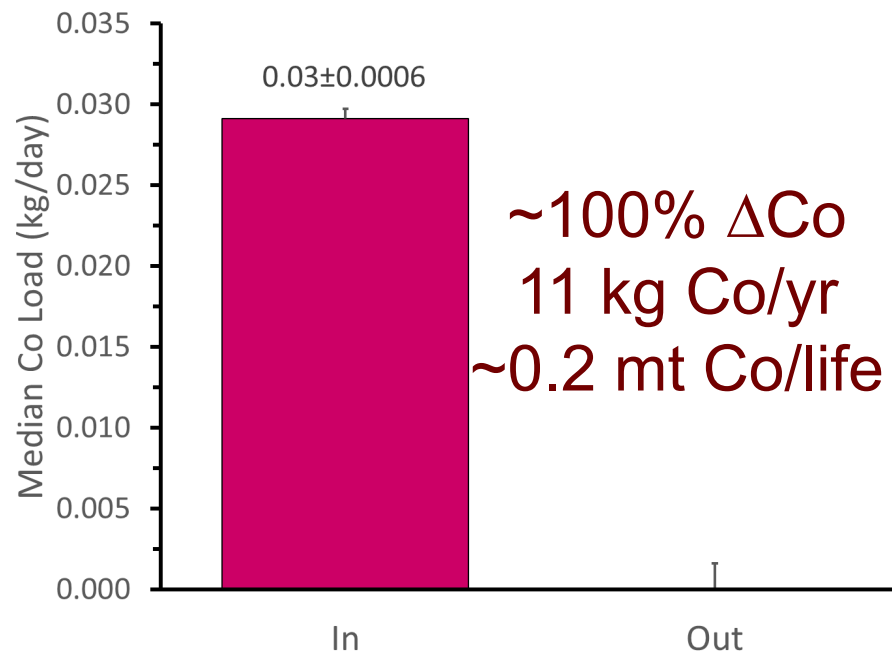
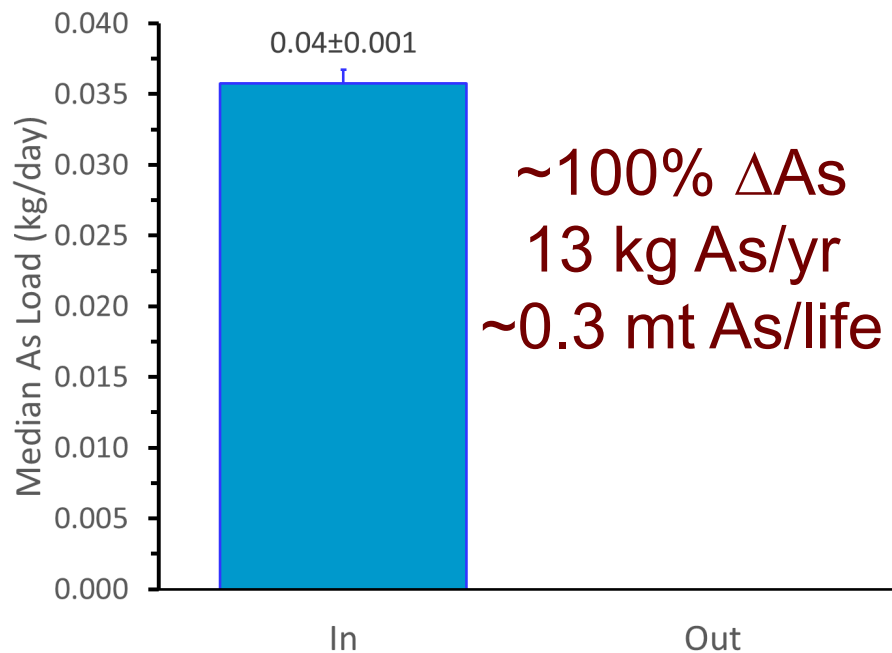
**SECPTS vertical flow bioreactor compost substrate before flooding, early 2017**

# Mayer Ranch PTS - COCs

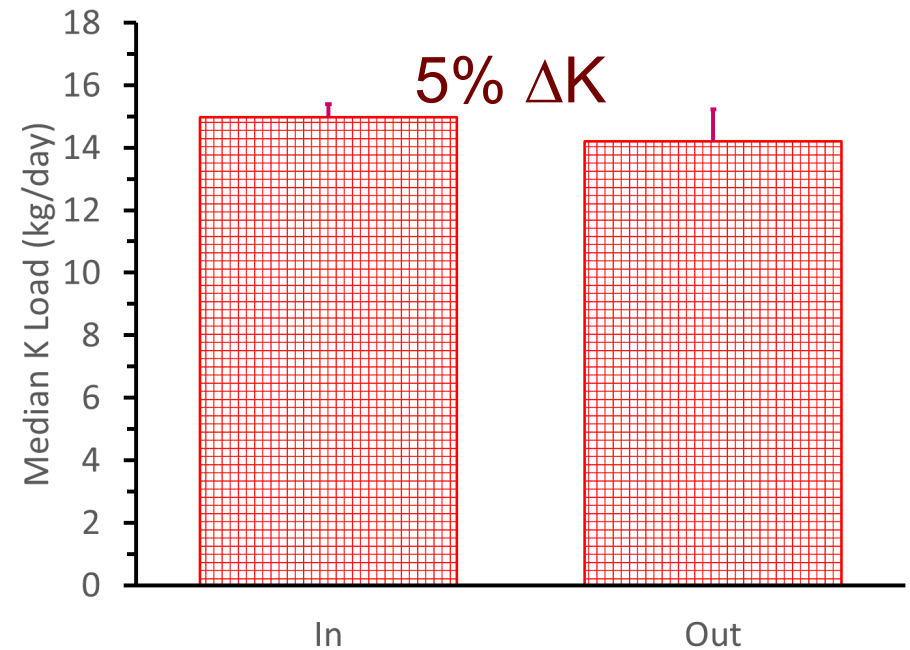
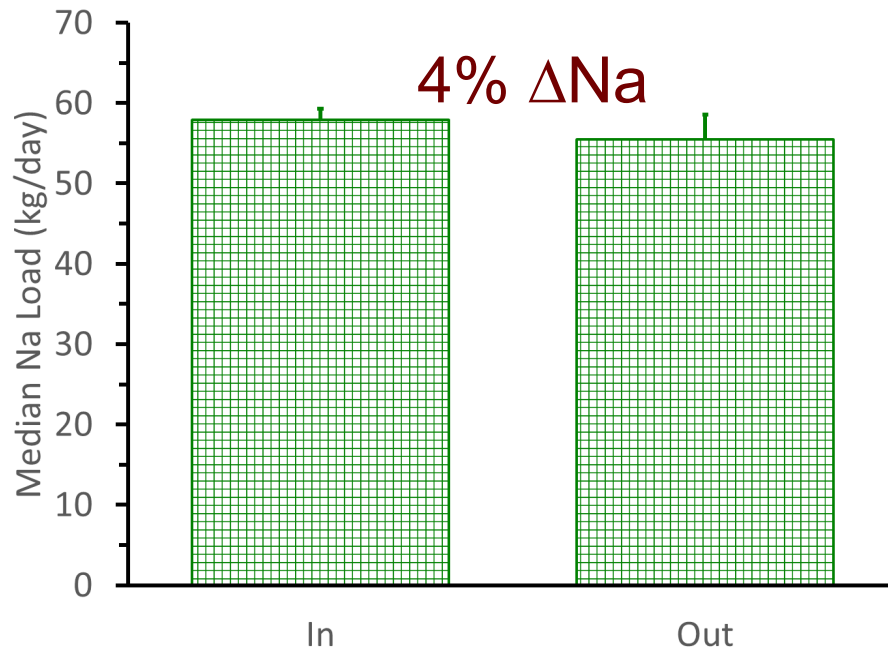
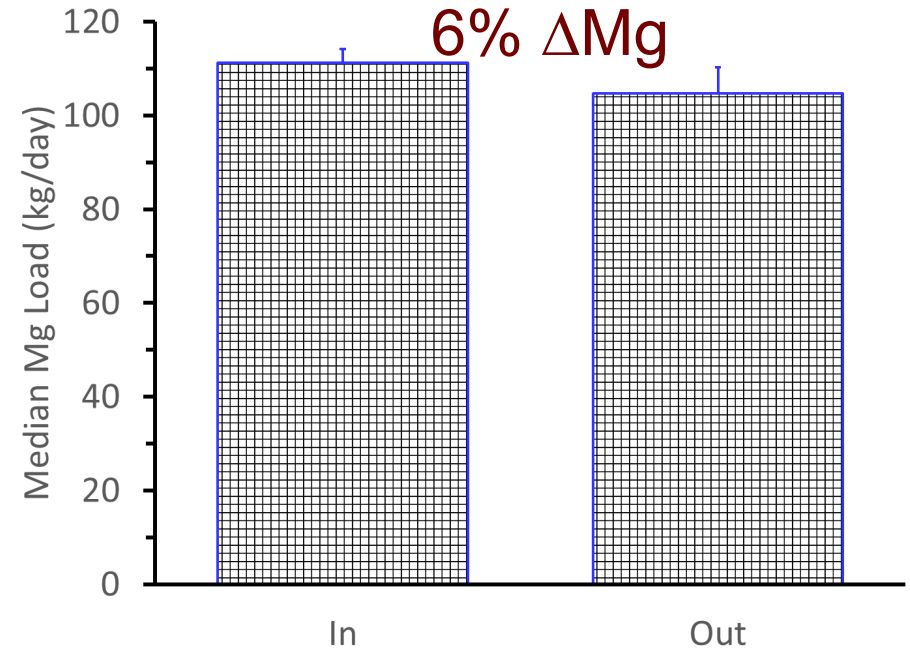
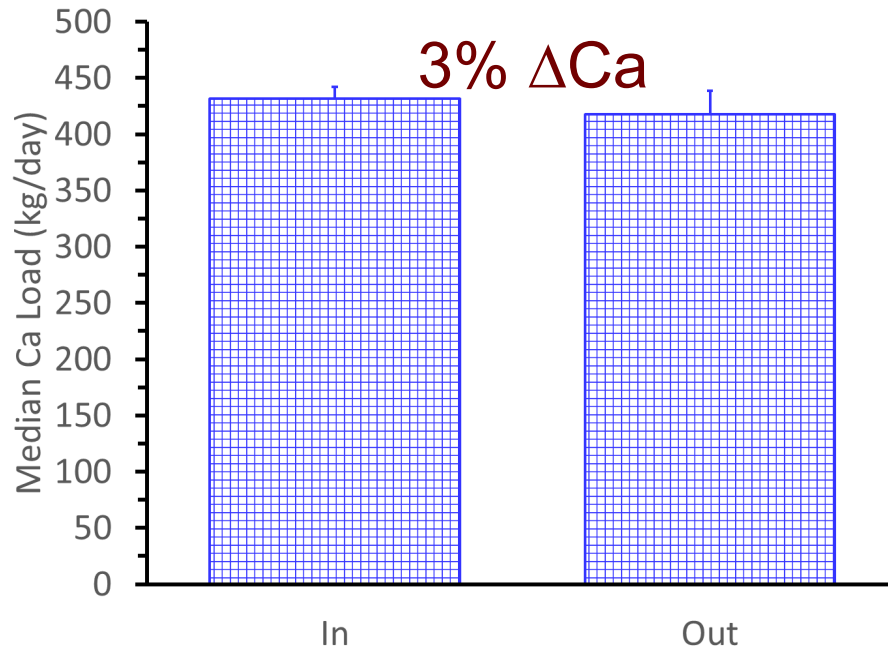




# Mayer Ranch PTS – Other Metals



# Mayer Ranch PTS – Base Cations





Results of single seine haul in receiving stream, October 2018, where no fish were previously present

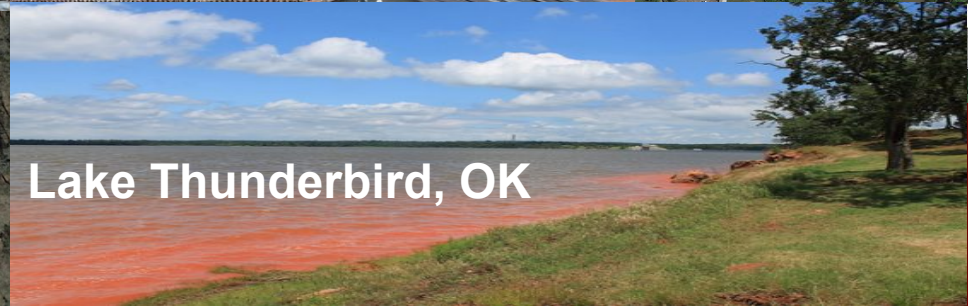




# Ecological Engineering – applying *natural infrastructure* to solve problems



**CREW builds ecosystems**





# Thank You!

- Grand Lake watershed management
- Novel reservoir water quality monitoring
- Tar Creek passive treatment systems
- Arkoma passive treatment systems
- Norman indirect potable reuse
- Agricultural and urban stormwater treatment
- Applications to produced waters

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