

# Effects of Macondo Oil and Corexit Dispersant on Bacterial Respiration and Growth

Kevin Dillon  
Lynn Wilking



THE UNIVERSITY OF  
SOUTHERN MISSISSIPPI

GULF COAST RESEARCH LABORATORY



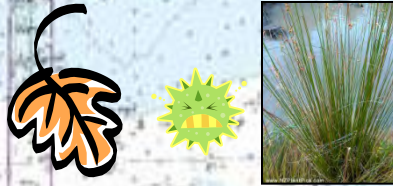
**NGI**  
NORTHERN GULF INSTITUTE

# Methods & Materials: Experiment Setup

GCRL Pier

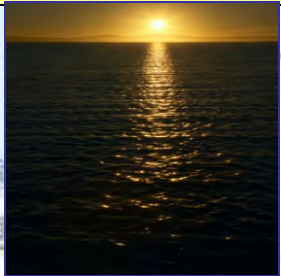


Amendments



1 micron  
filtered

Offshore water



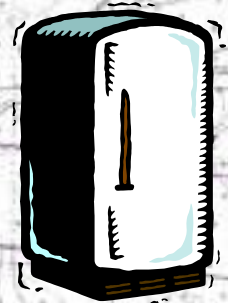
Stored in dark lab overnight  
in 50 L carboy



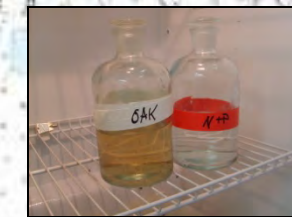
Distributed  
into 20 L  
carboys to be  
amended



60 mL  
BOD  
bottles



Incubation bottles  
stored in dark,  
temp-controlled  
incubator.



2L glass stoppedpered  
bottle

# Methods & Materials: Amendments



## 2008 – 2009 Amendments

- Inorganic nutrients
- Red Creek Detritus
- Juncus leaves
- Phytoplankton/algae
- Dried Oak leaves

## 2010 Amendments

Oil + dispersant (20:1 ratio) 0.5 – 1%

Dispersant (0.05 – 0.25%)

# Methods & Materials

## Sample Collection

- Bacteria Abundance
  - Duplicates samples were collected in 20ml vials.
  - Preserved with Lugol's solution (Nollet 2000).
- O<sub>2</sub> Conc.
  - At the start of the experiment about thirty BOD bottles were filled (from bottom up) with treatment water.
  - Triplicate BOD bottles were sacrificed at each timepoint and “pickled” for analysis within 48 hours.
- DOC/TDN
  - 20 mL vials were filled 2/3's full with precombusted GF/F filtered sample water and frozen for later analysis.



# Methods & Materials: Sample Analysis

- **Bacterial abundance**
  - 2mL samples were cleared with Sodium Thiosulfate and dyed with DAPI.
  - Samples were filtered onto filters and oil plated.
  - Hand counted (Hobbie et al. 1977).
- **O<sub>2</sub> conc.**
  - Triplicate BOD bottles.
  - Automated amperometric O<sub>2</sub> titrator (Langdon Enterprises)
  - Winkler titration method (Strickland & Parsons 1972, Carpenter J. H. 1965 ).
- **DOC/TDN**
  - Shimadzu TOC-V with TN unit.

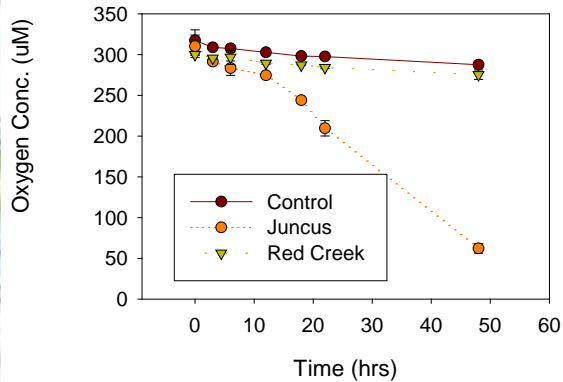


# Methods & Materials: Water Collection Sites

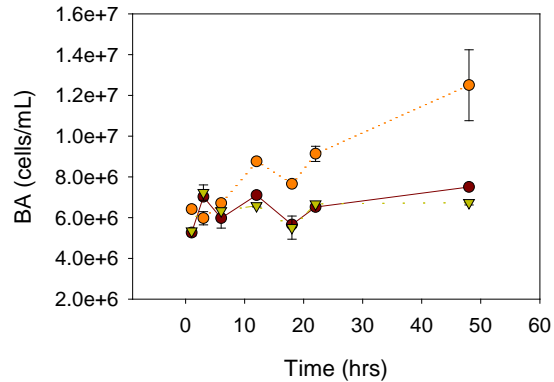


# Example of Organic Amendment Experiments

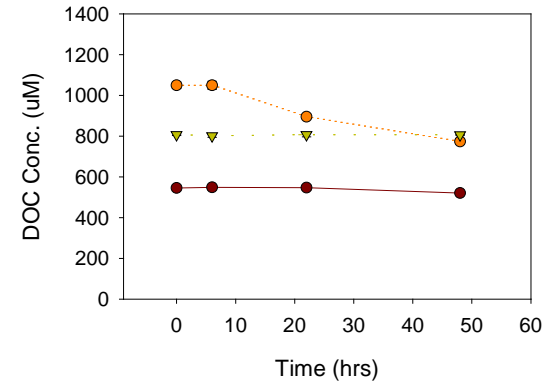
A) Oxygen Conc. ( $\mu\text{M}$ ) vs. Time (hrs)



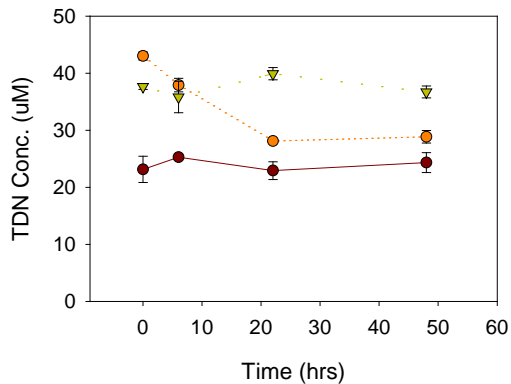
B) Bacterial Abundance (cells/mL) vs. Time (hrs)



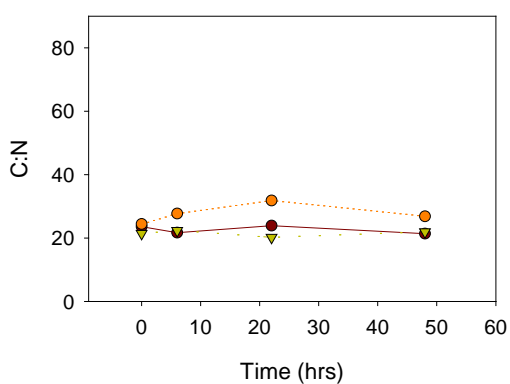
C) DOC Conc. ( $\mu\text{M}$ ) vs. Time (hrs)



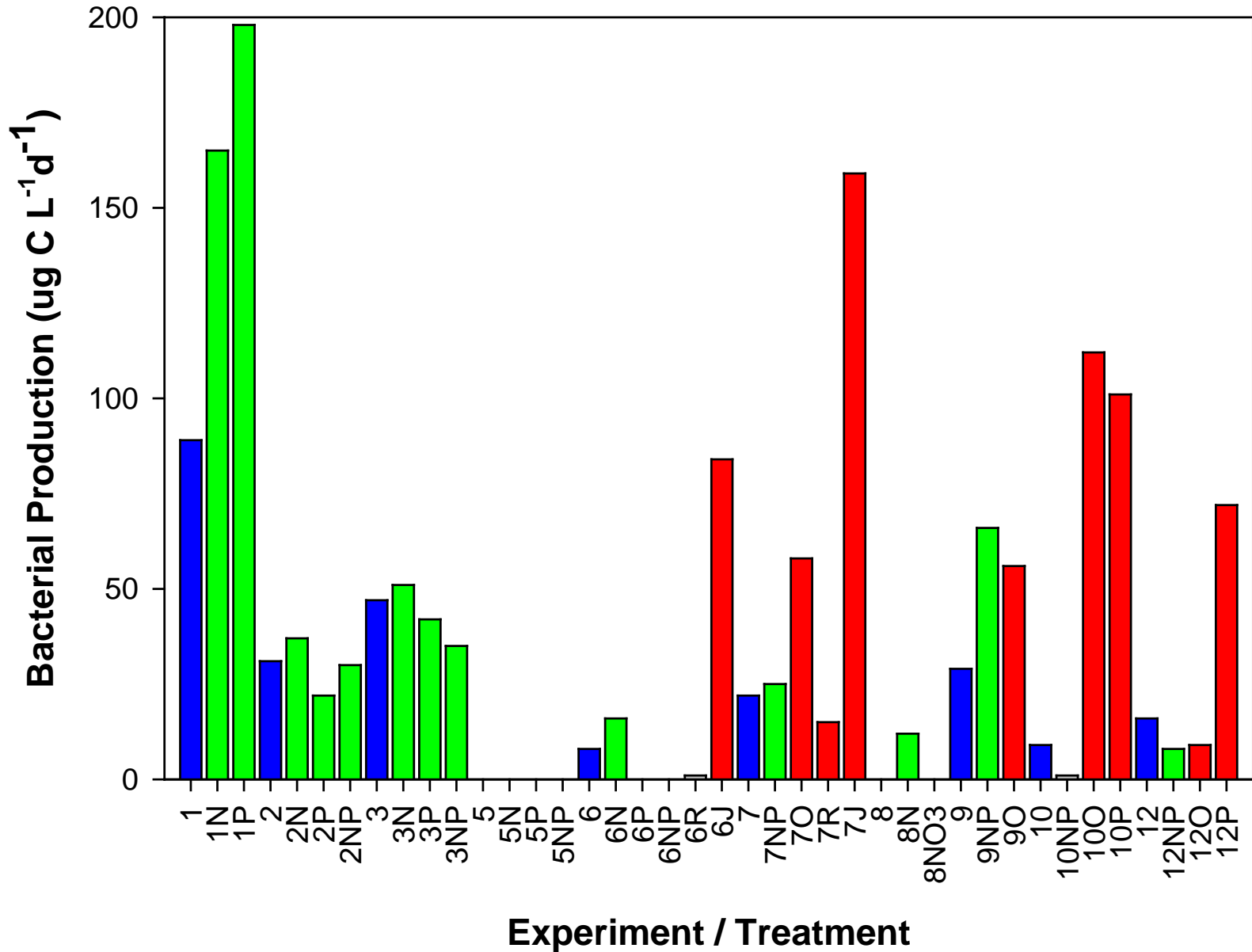
D) TDN Conc. ( $\mu\text{M}$ ) vs. Time (hrs)



E) C:N vs. Time (hrs)

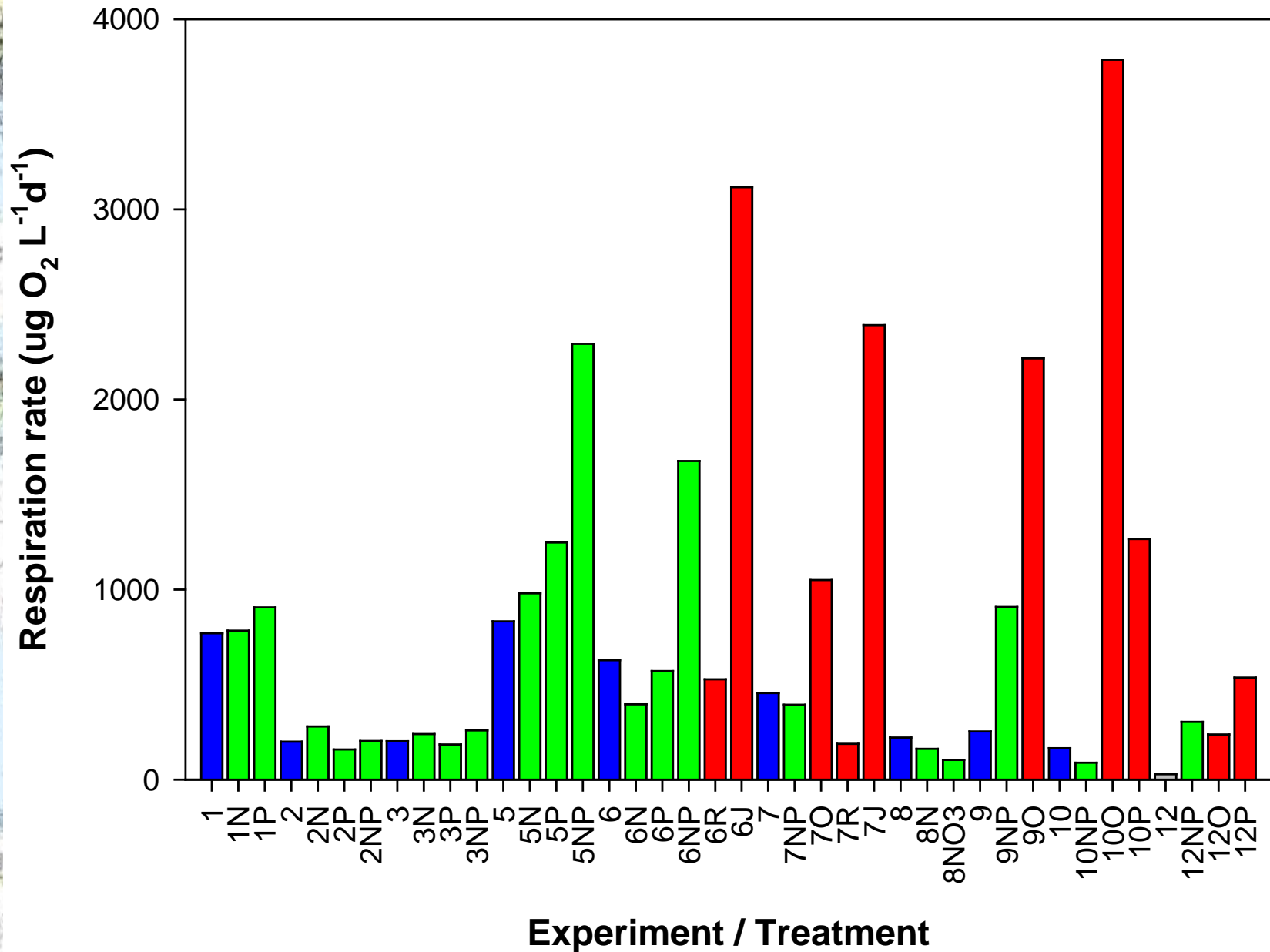


# Bacterial Production Estimates 2008 - 2009

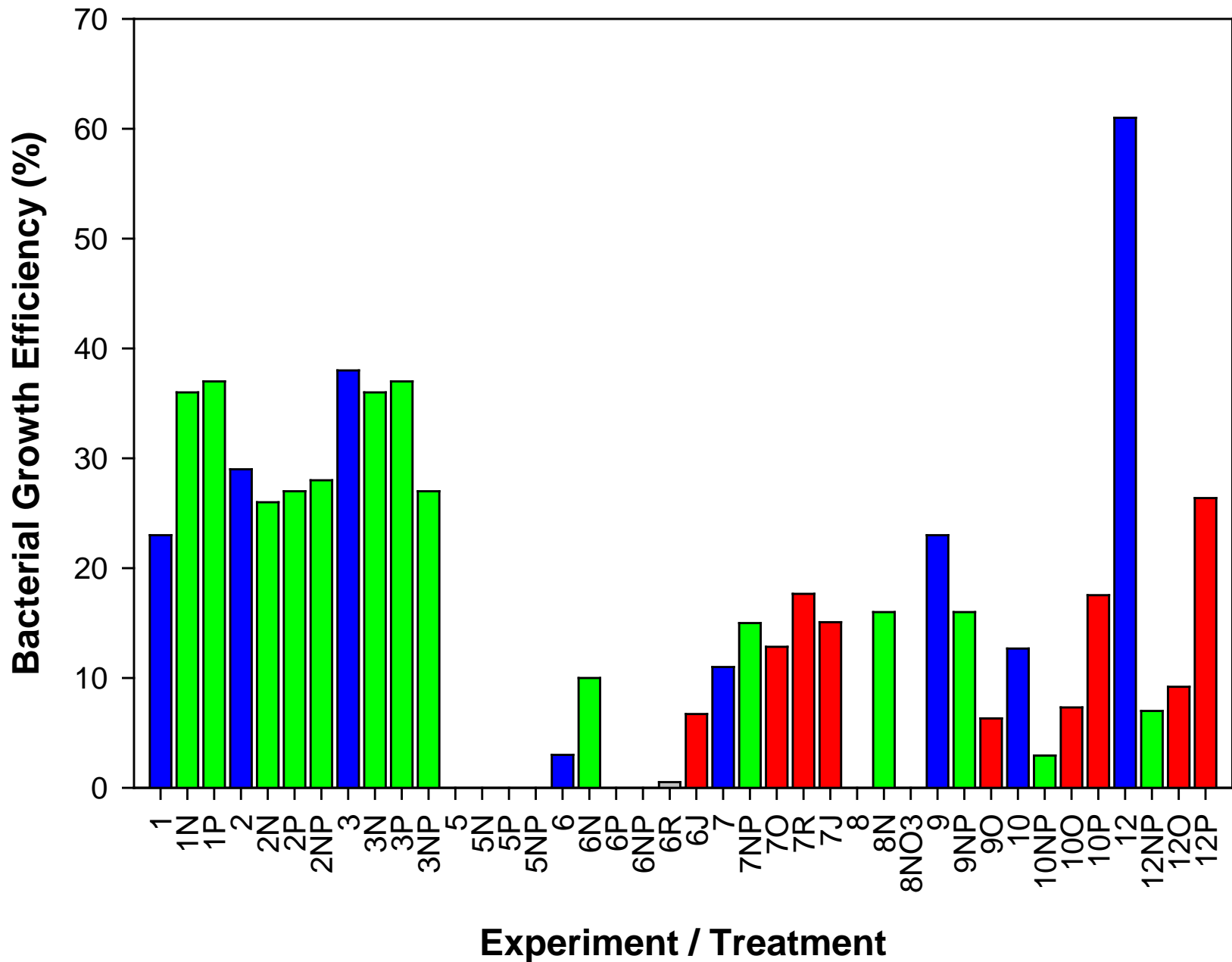




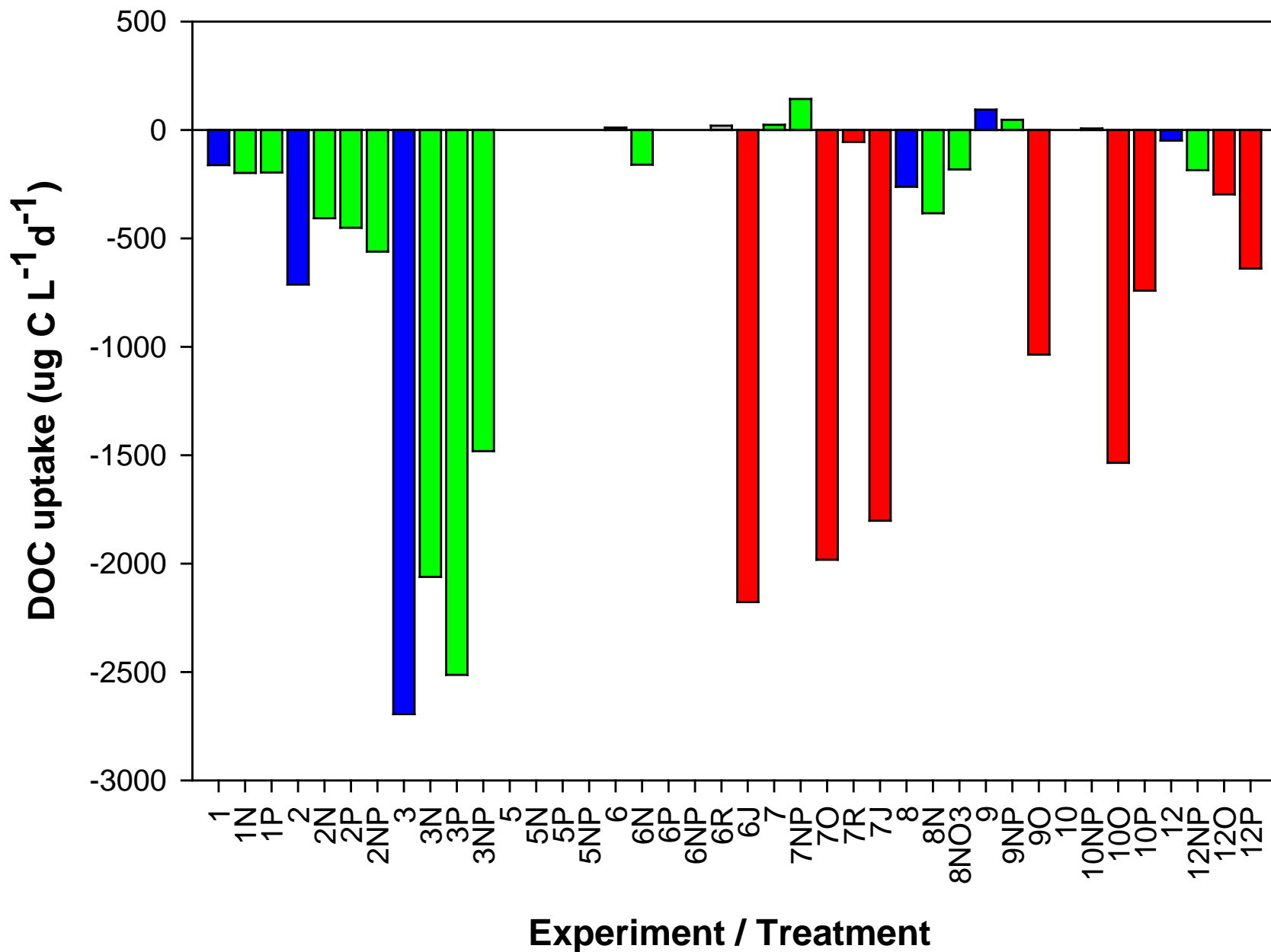
# Bacterial Respiration Estimates 2008 - 2009

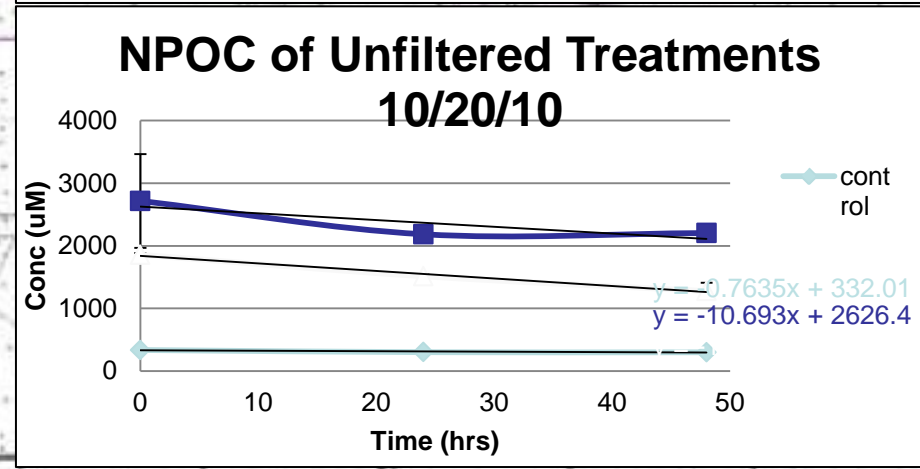
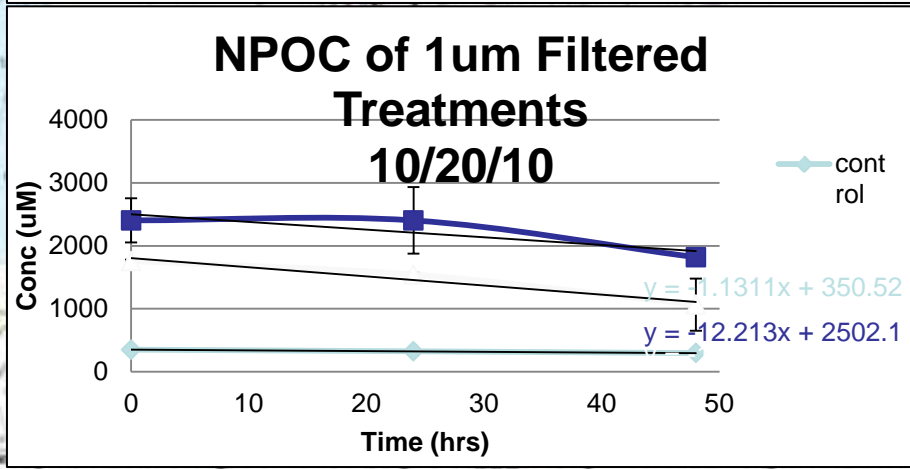
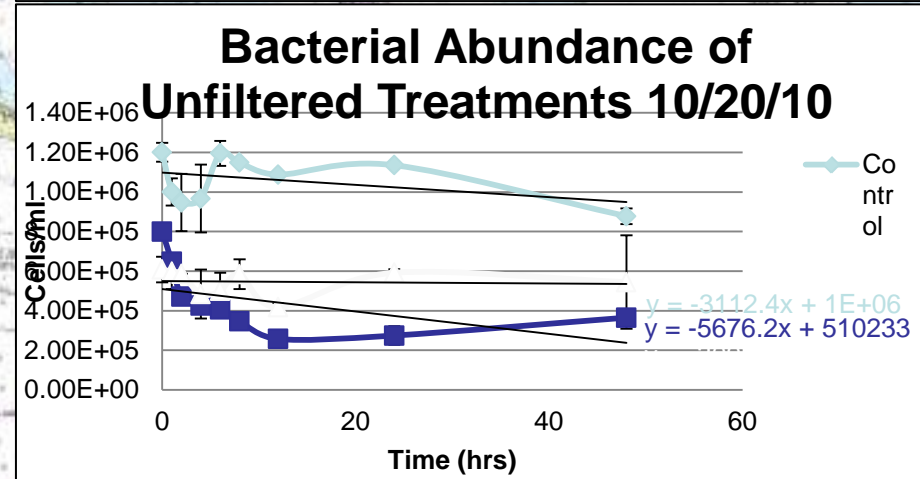
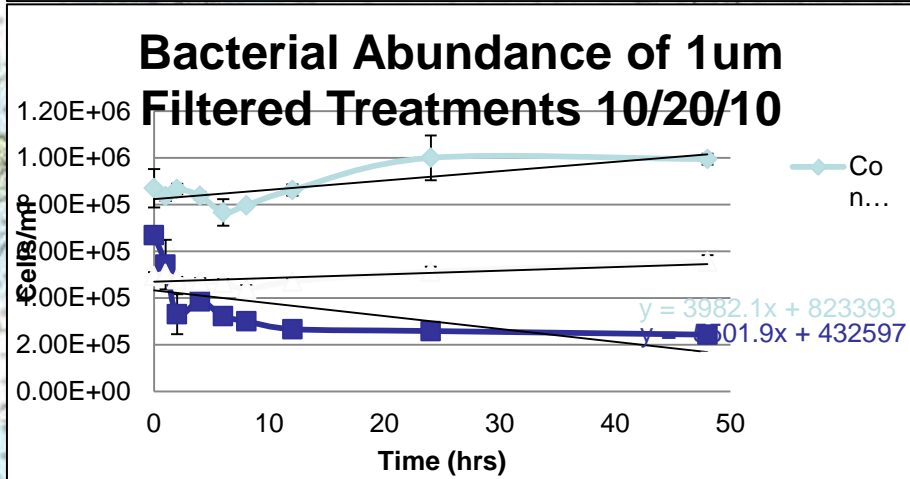
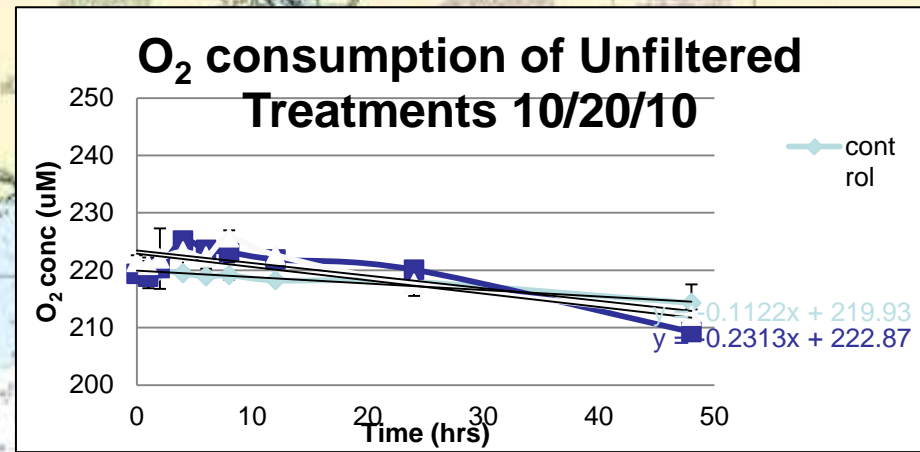
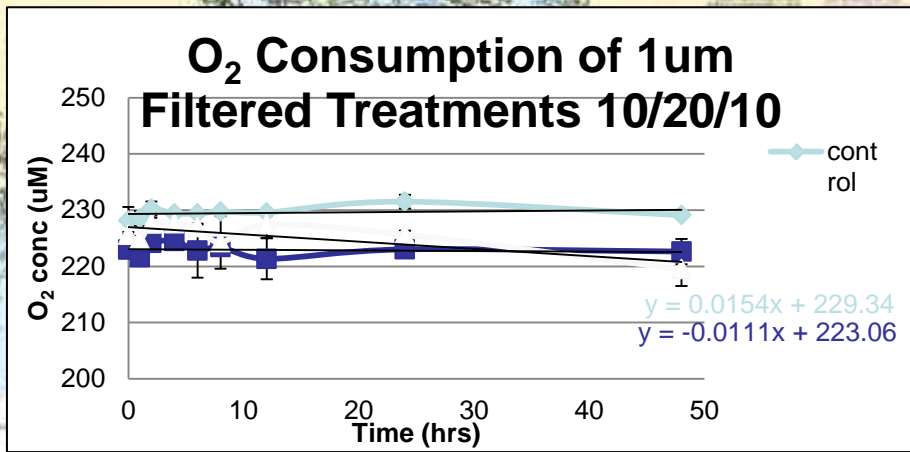


# Bacterial Growth Efficiency Estimates 2008 - 2009

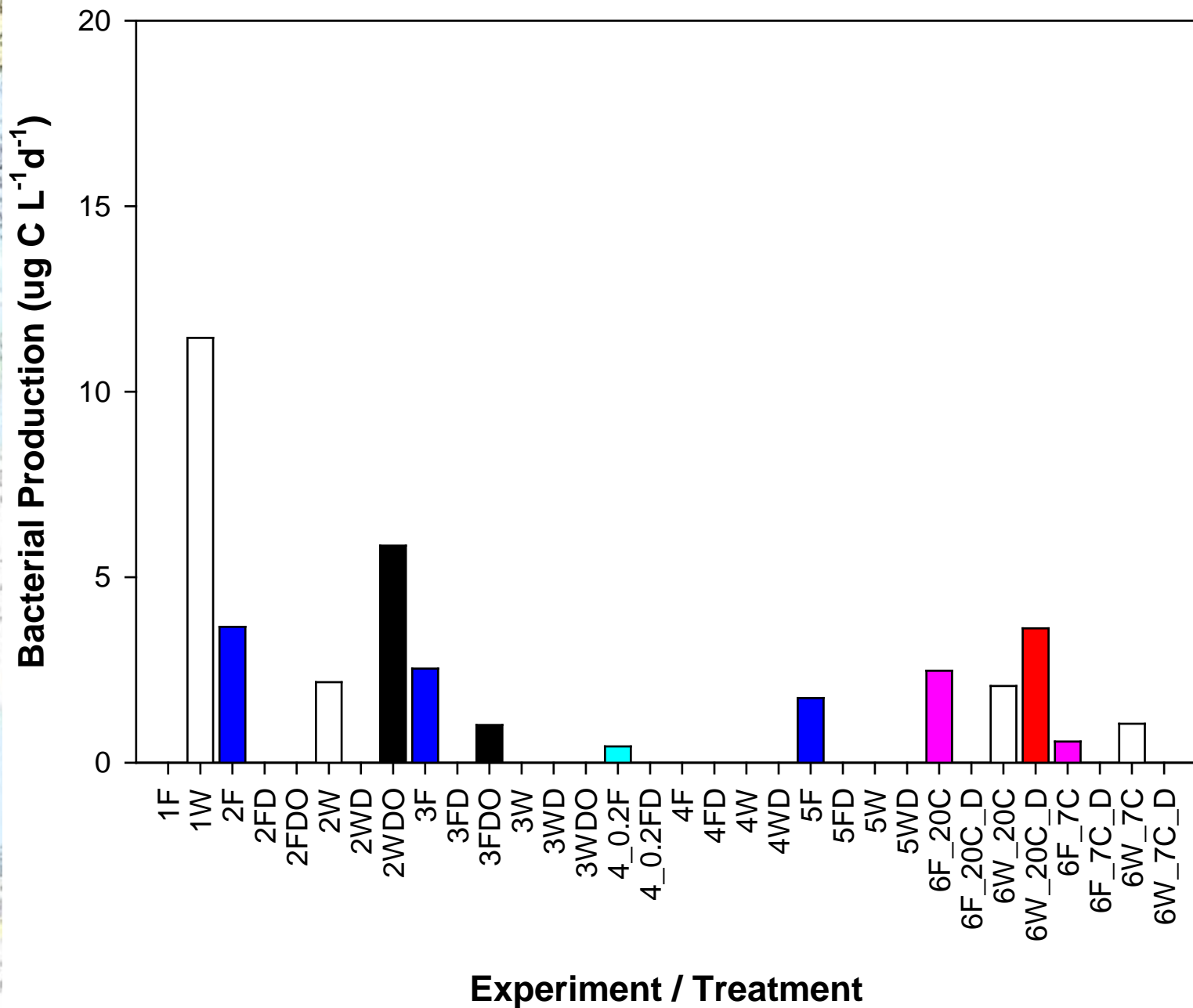


# DOC uptake estimates 2008 - 2009

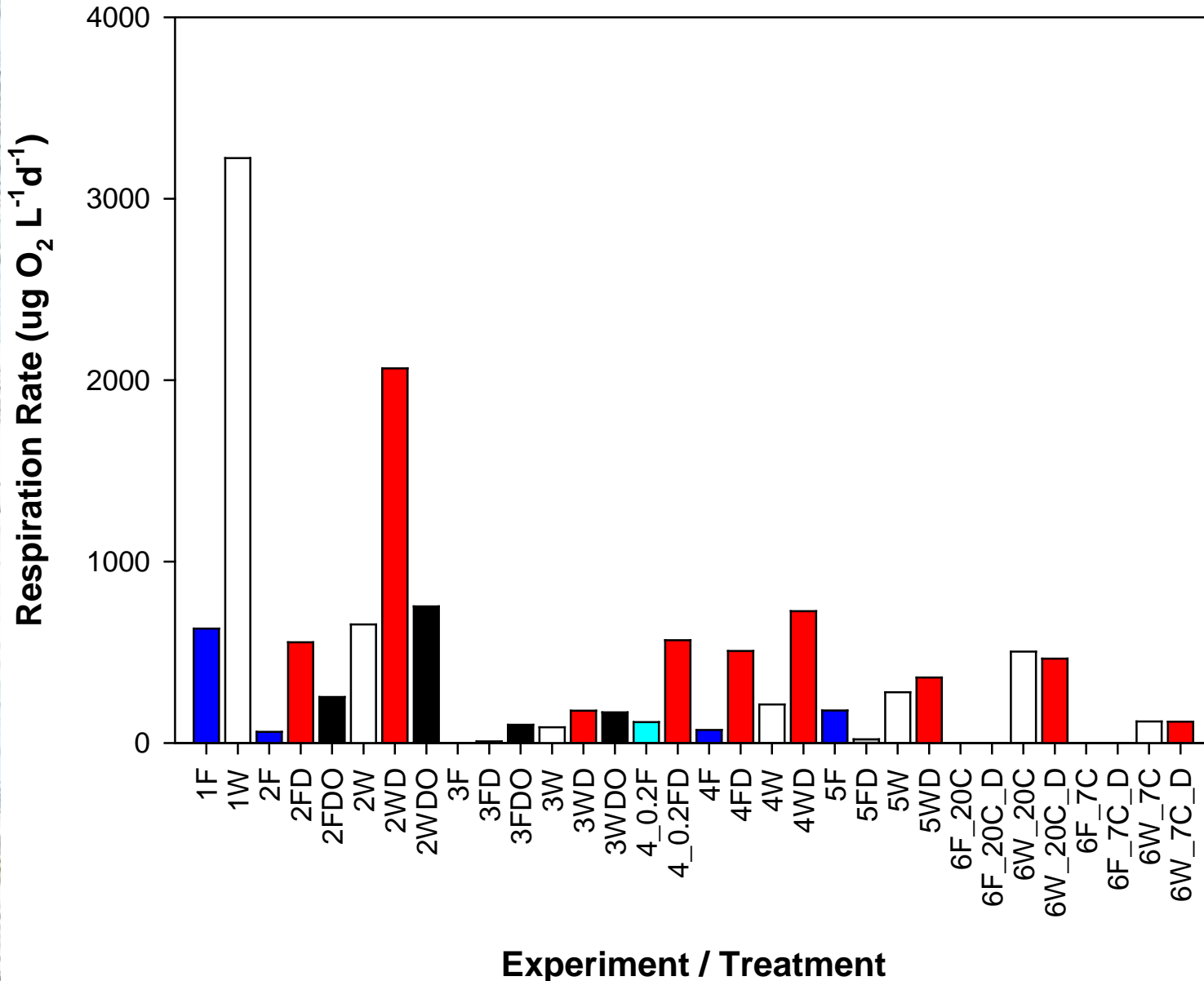




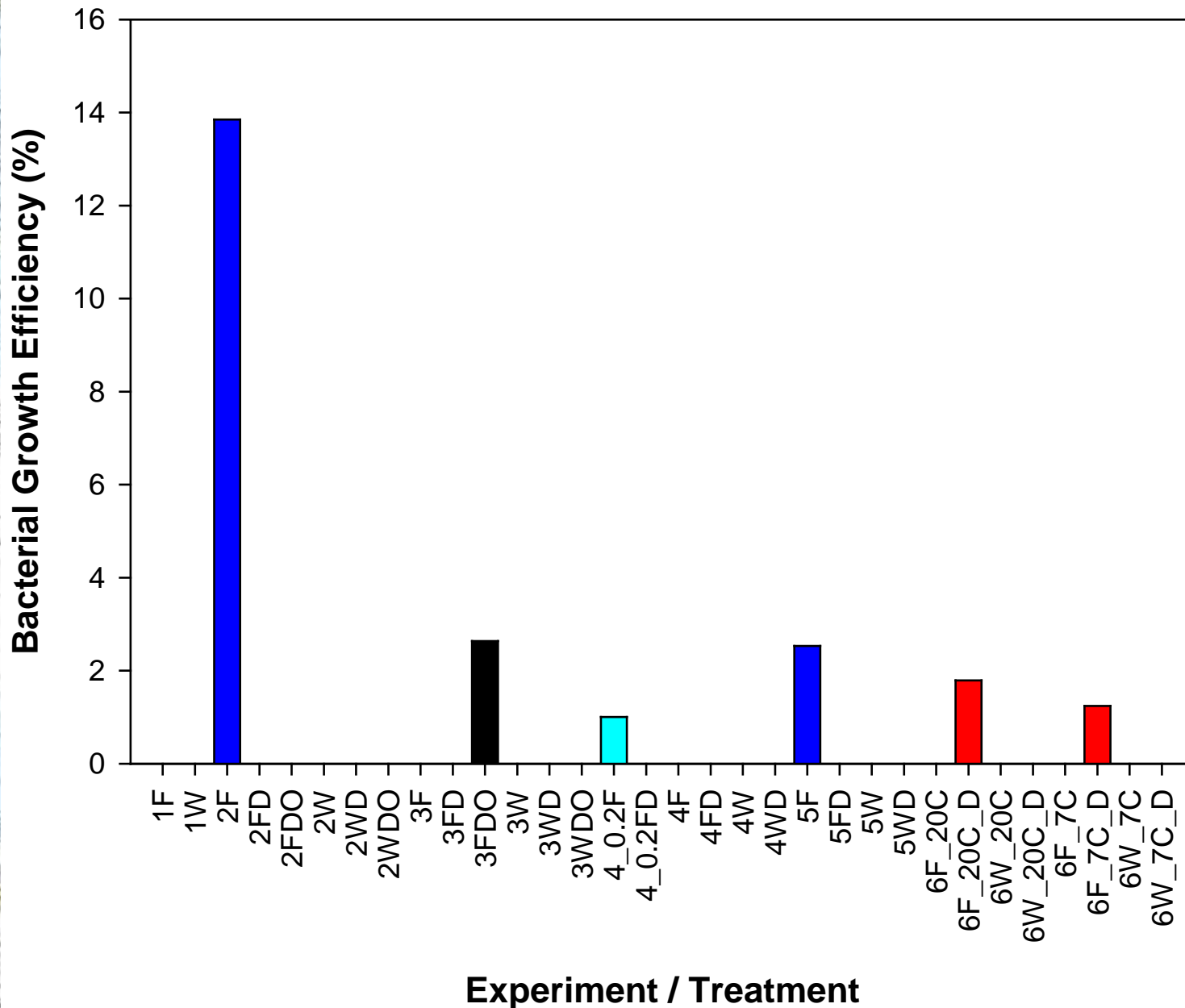
# Bacterial Production Estimates 2010



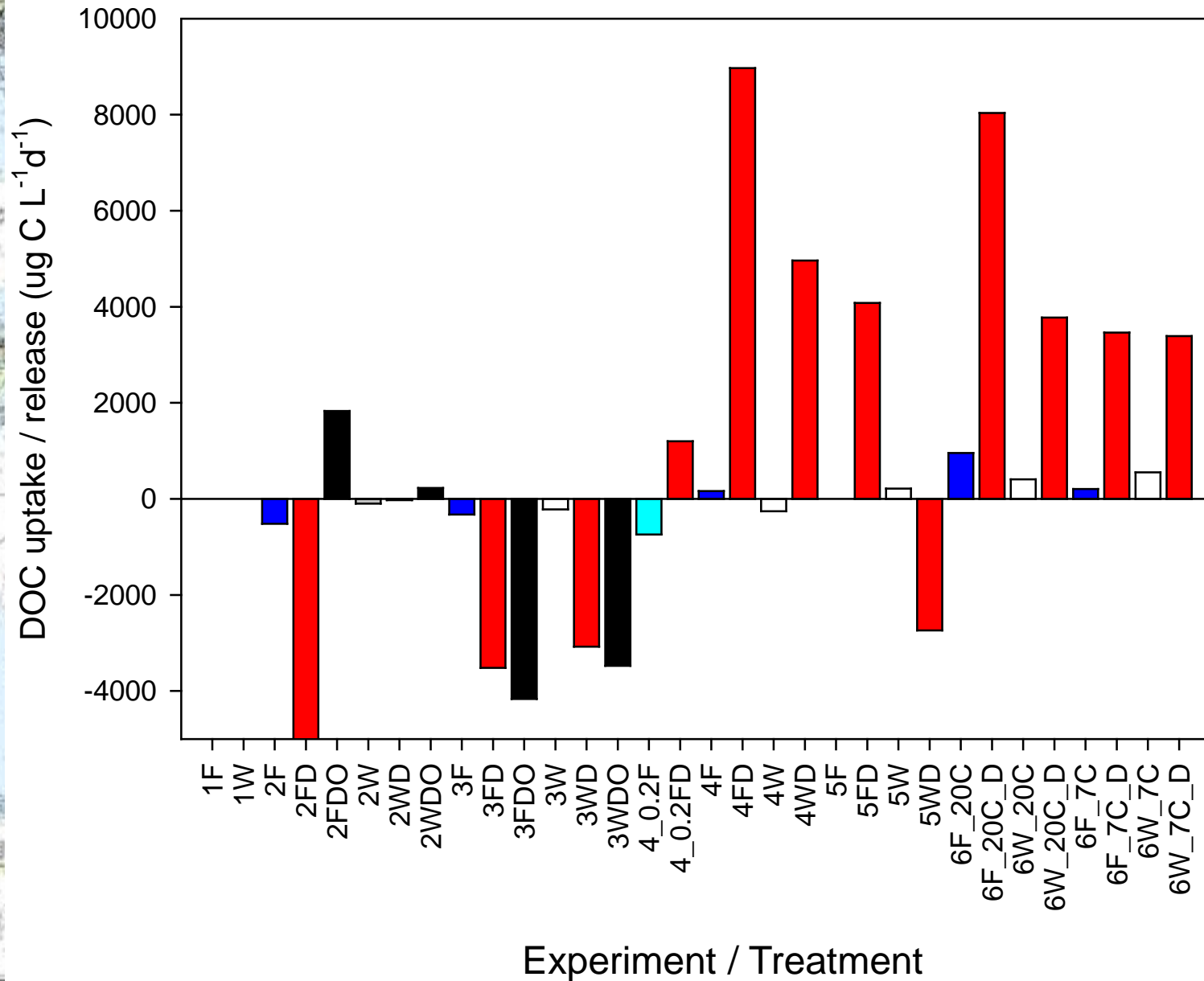
# Respiration Rate Estimates Whole and filtered 2010



# Bacterial Growth Efficiency Estimates - 2010



# DOC uptake / release estimates (Non Purgable DOC) 2010





# Summary to date

- Bacteria like natural DOM – no surprise
- Bacteria in MS Sound C limited
- Oil + Dispersant results similar to Controls
- Dispersant appears to reduce bacterial abundance the most dramatically – but  $O_2$  uptake was often highest in dispersant treatments.
- DOC often increased in dispersant treatments

A nautical chart of Chaybelleur Sound, showing various navigational features, depth soundings, and a grid. The chart is overlaid with a semi-transparent text box containing a title and a list of bullet points.

# What's Next??

- **Get more oil!**
- Bacterial community profiling for incubations.
- Gene expression for PAH degrading enzymes
- Independent measurements of bacterial production