Benthic Metabolism in the Lower Muskegon River Watershed

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Outline

I. Introduction
II. Methods
III. Results
   i. Spatial data by season
   ii. Overall temporal data
   iii. Overall spatial data
IV. Summary
V. Future work

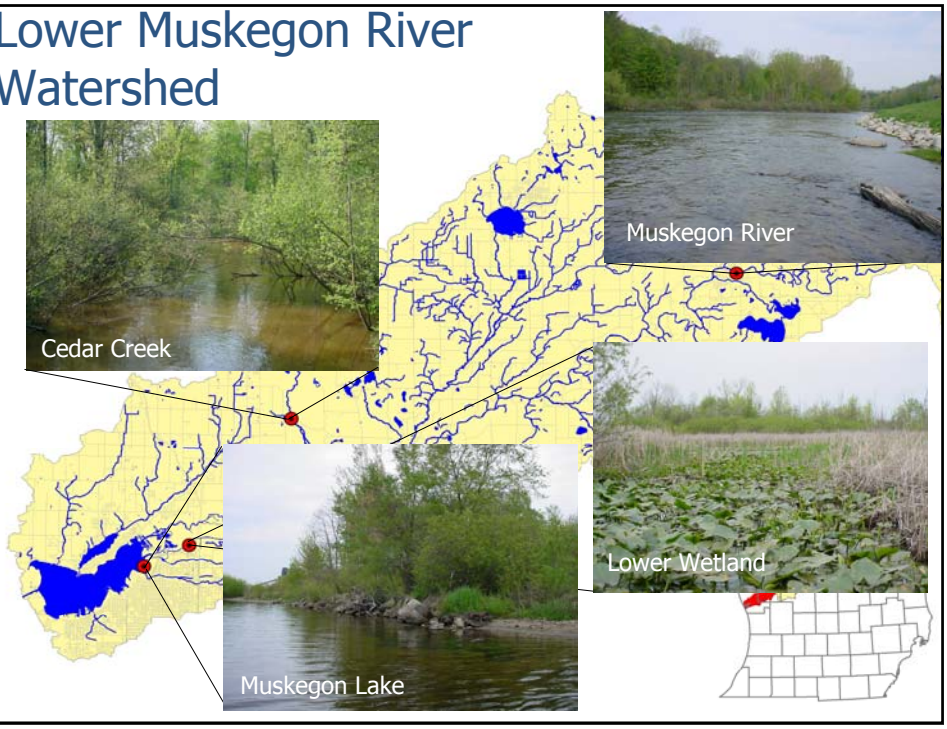
I. Introduction

- Muskegon River Initiative/Fish Recruitment Project
  - Funded by Great Lakes Fisheries Trust
- Algal productivity in the Lower Muskegon
  - Rapid Periphyton Survey (RPS)
  - Biomass Accrual
  - Metabolism
    - Benthic
    - Planktonic

II. Methods

- Spatial scale: macro-habitat
  - Tributary
  - Main stem Muskegon River
  - Wetland complex
  - Muskegon Lake

Lower Muskegon River Watershed



II. Methods

- Spatial scale: macro-habitat
- Temporal scale: seasonal, annual
  - summer, fall, winter 2004
- Sampling equipment
  - Modified Bott-style chamber (n=2)

II. Methods

Chamber Setup

1. Dark Treatment

2. Light Treatment

II. Methods

Benthic Areal Metabolism: g O_2 m^{-2} day^{-1}

NCM = DO rate of Δ (light) / substrate surface area
- extrapolated over photoperiod

CR = DO rate of Δ (dark) / substrate surface area
- extrapolated over 24 hrs.

GCP = NCM + | CR |

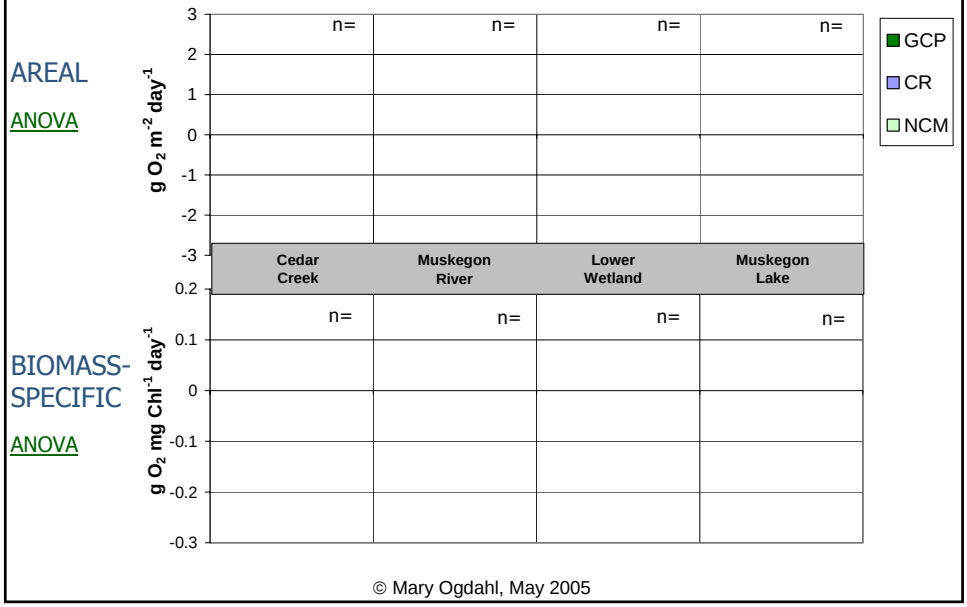
Benthic Biomass-Specific Metabolism: g O_2 mg Chl^{-1} day^{-1}

NCM = DO rate of Δ (light) / periphyton chl *a*
- extrapolated over photoperiod

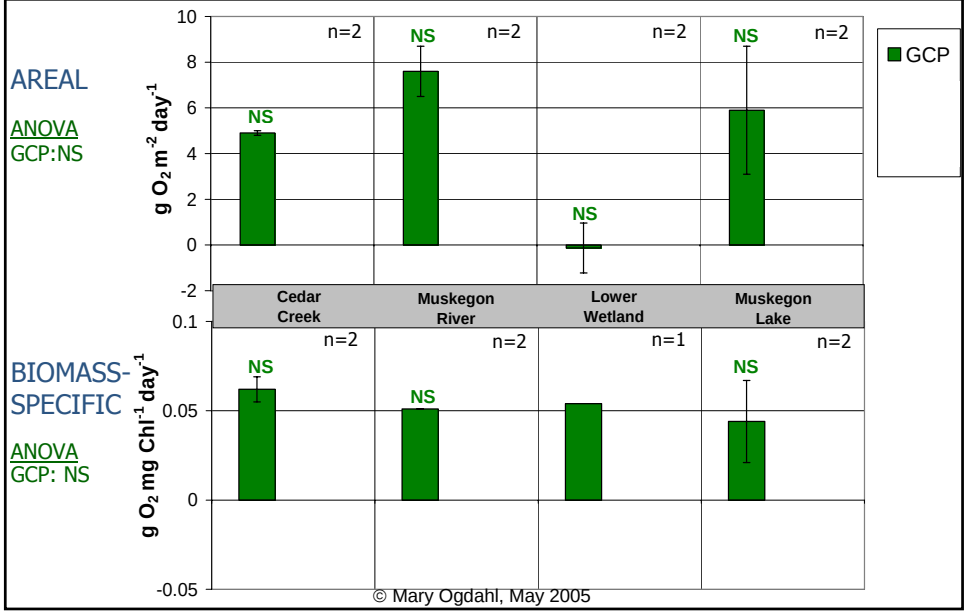
CR = DO rate of Δ (dark) / periphyton chl *a*
- extrapolated over 24 hrs.

GCP = NCM + | CR |

III. Results: Spatial data by season
Mean ± Range



III. Results: Spatial data by season
AUGUST 2004 Mean ± Range



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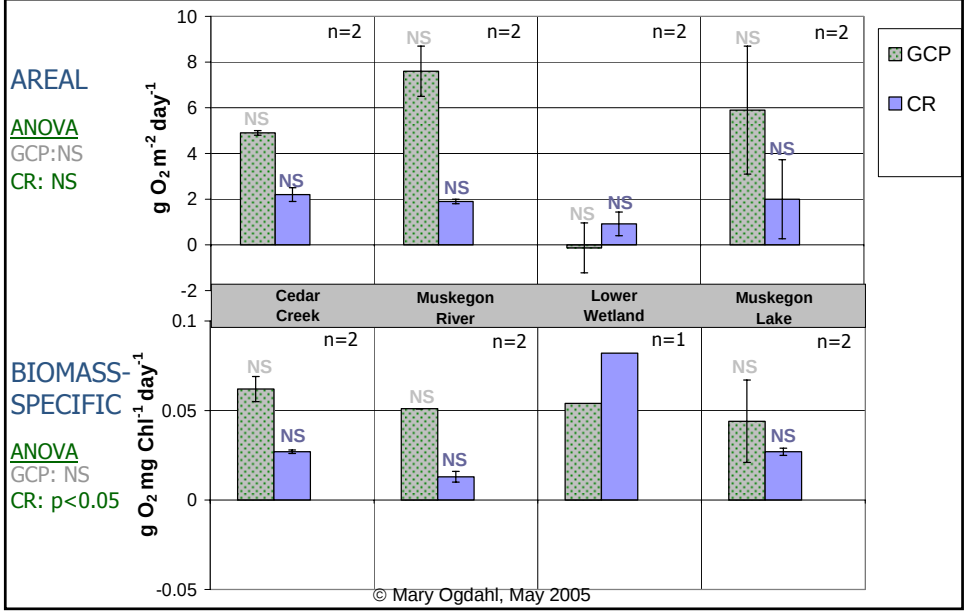

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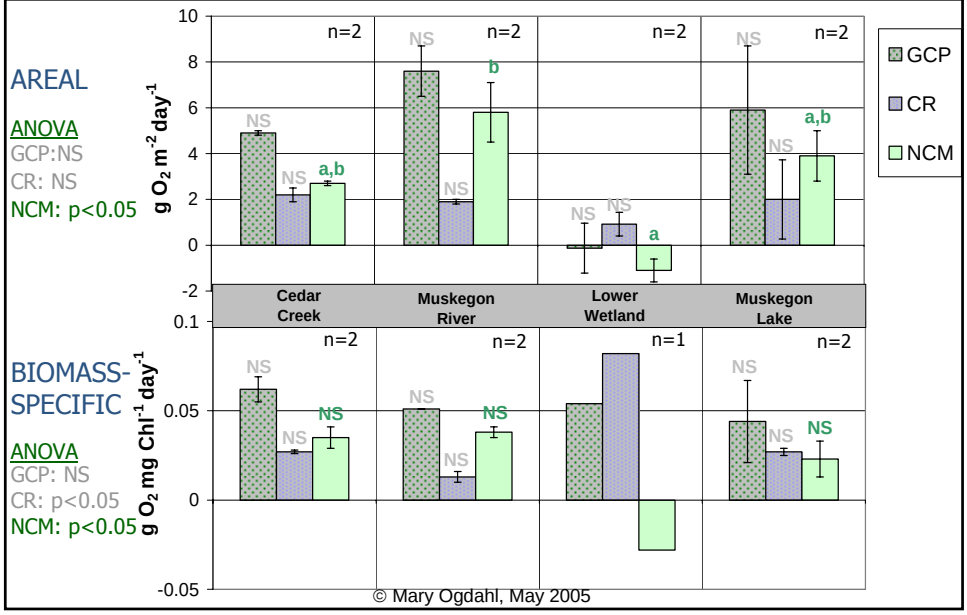

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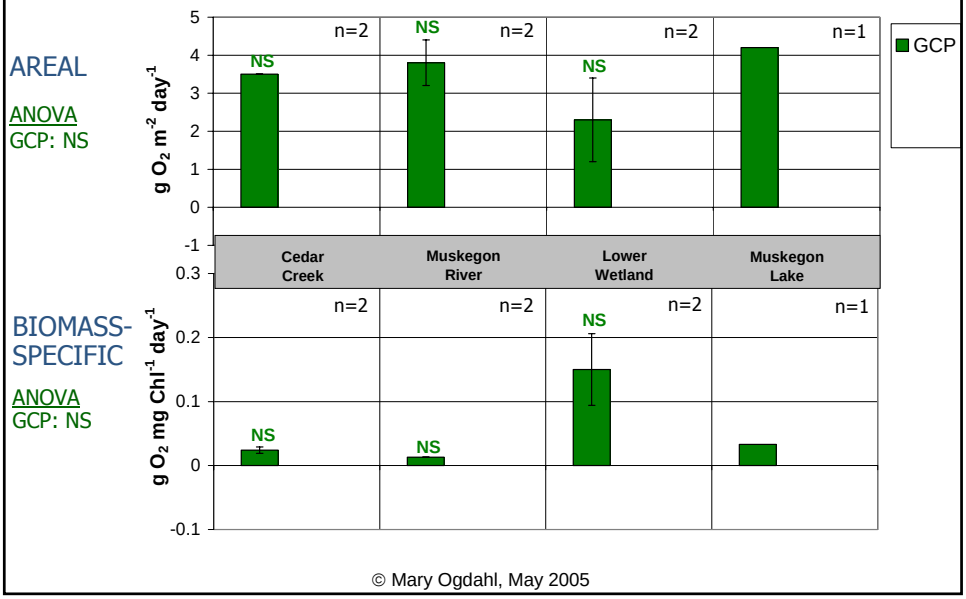
OCTOBER 2004 Mean ± Range



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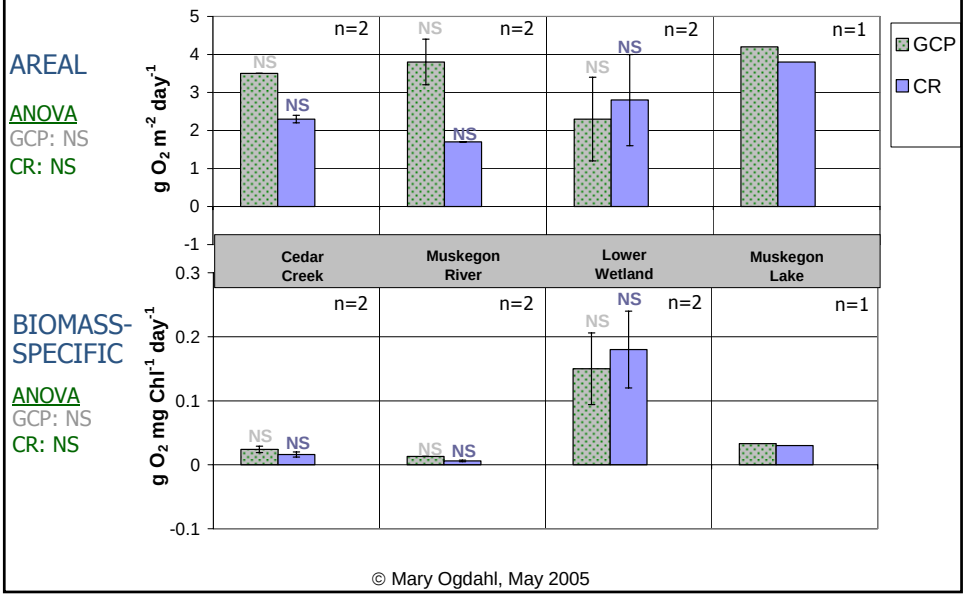

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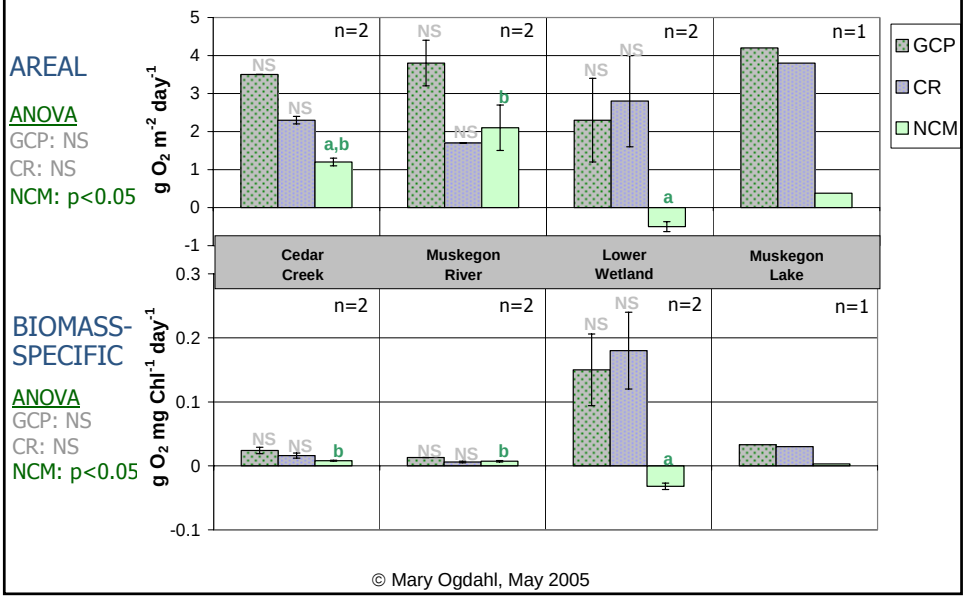
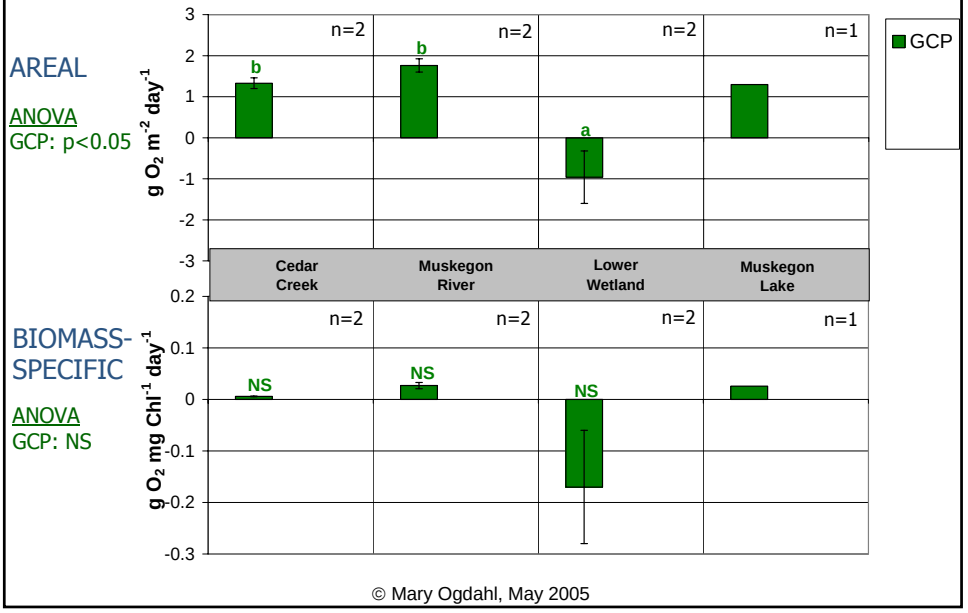


III. Results: Spatial data by season
DECEMBER 2004 Mean ± Range



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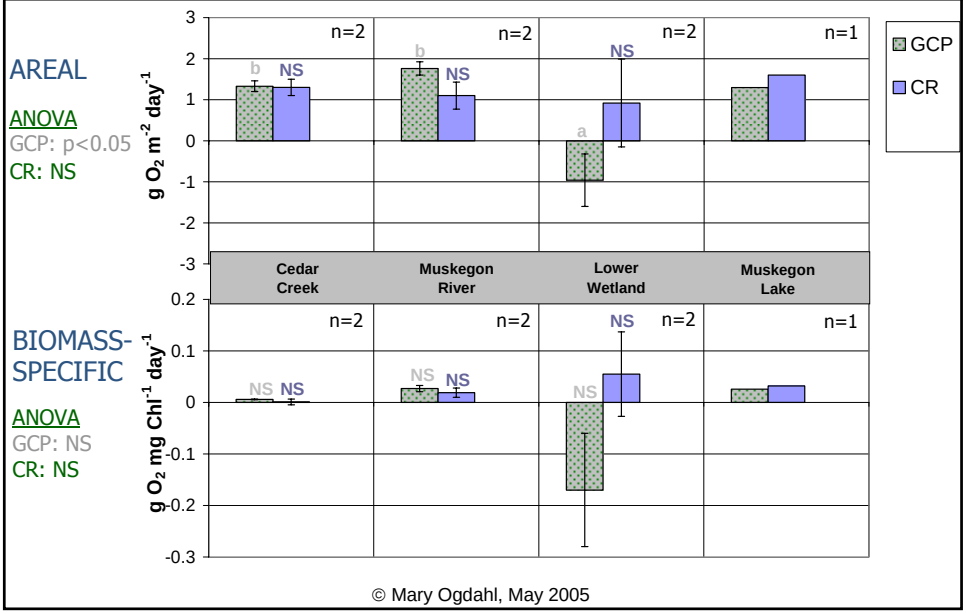

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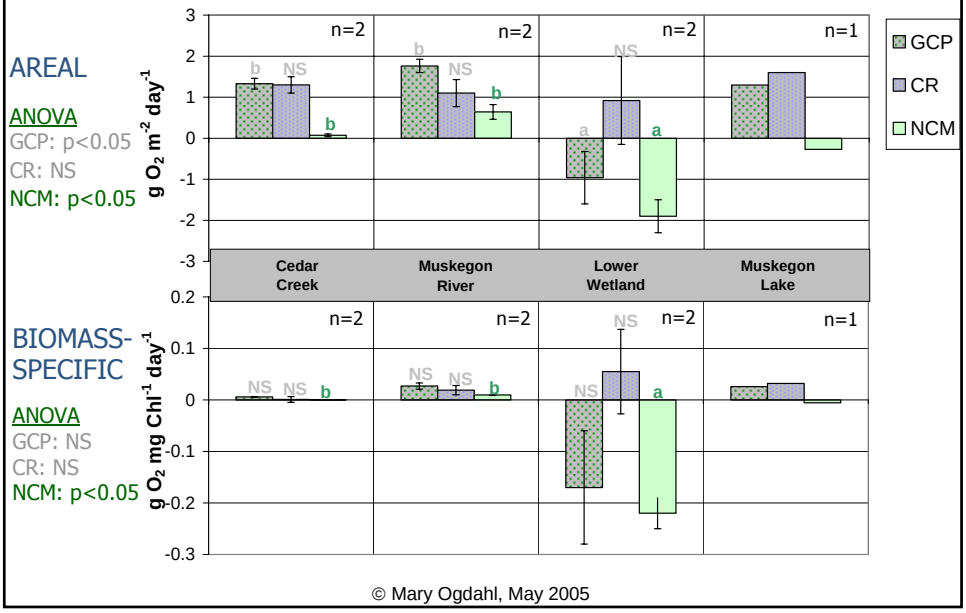
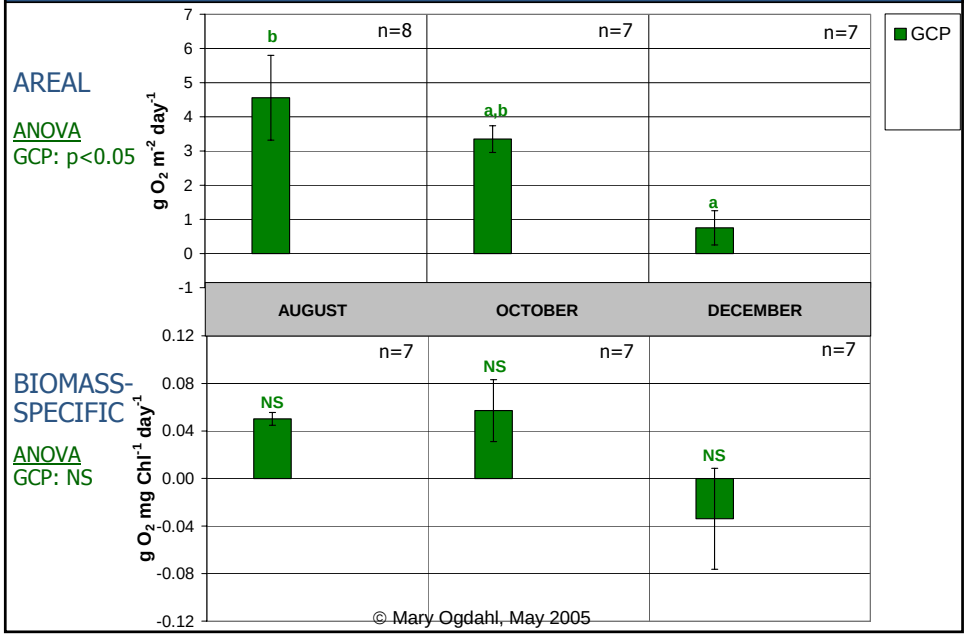


III. Results: Overall temporal data
Mean ± SE



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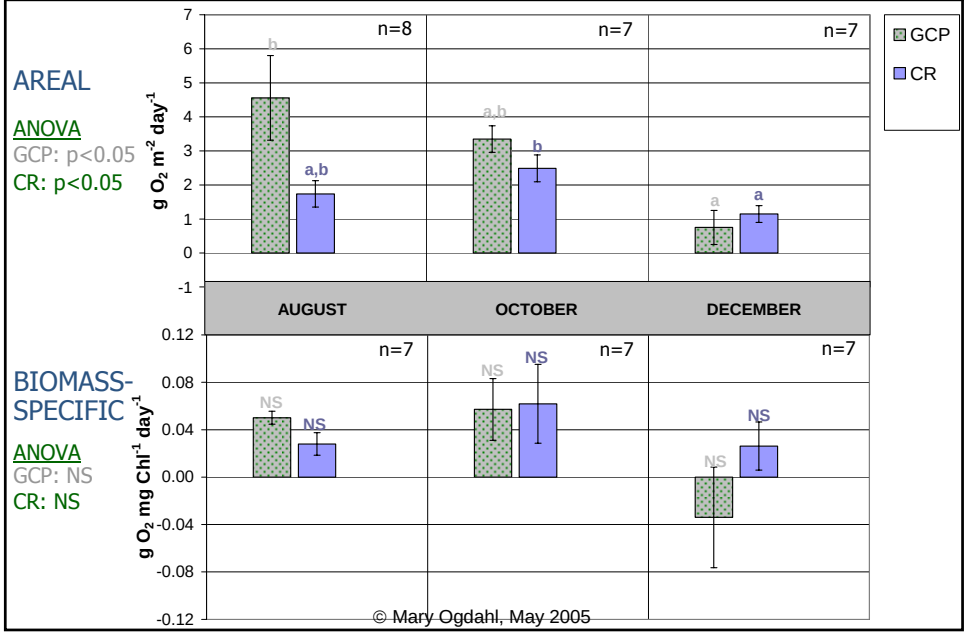

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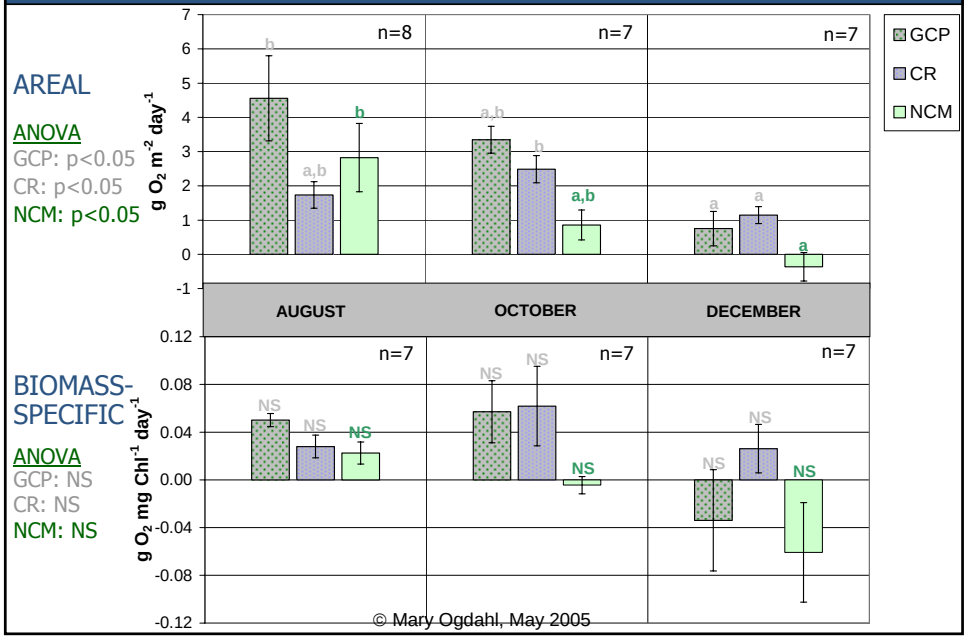

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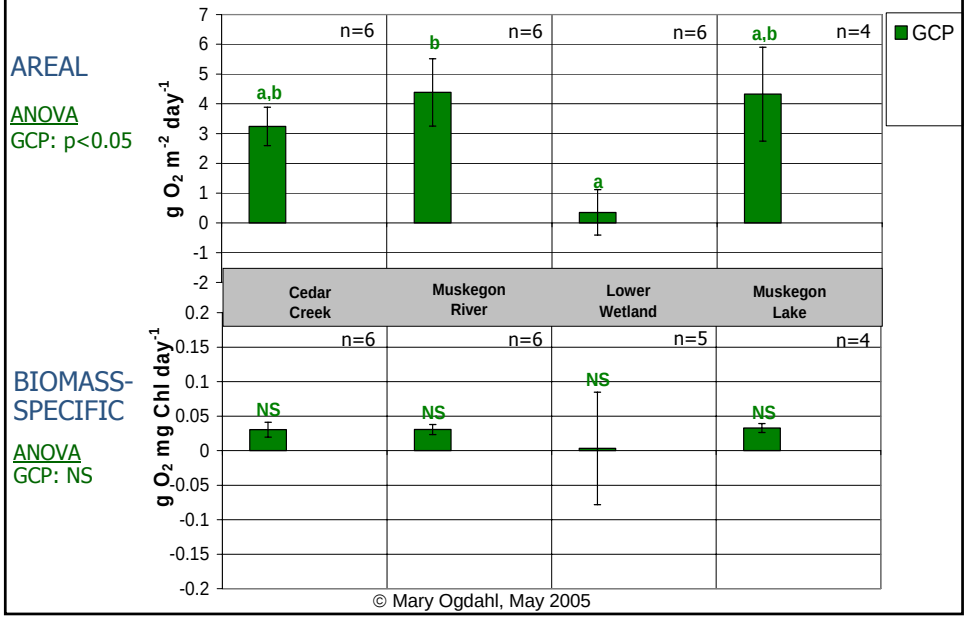

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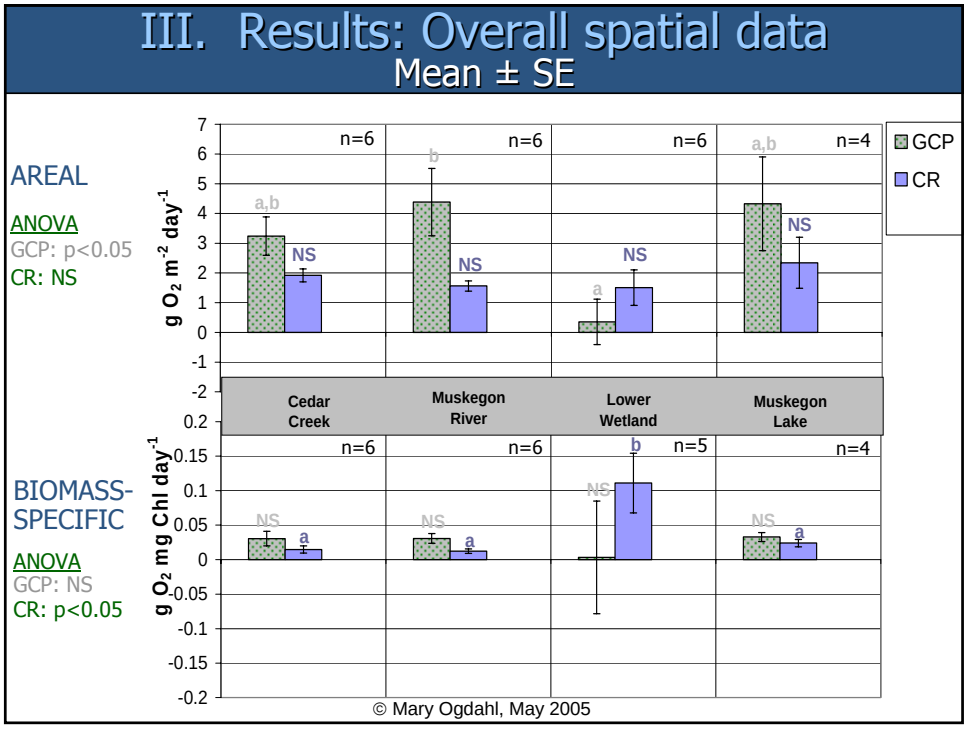

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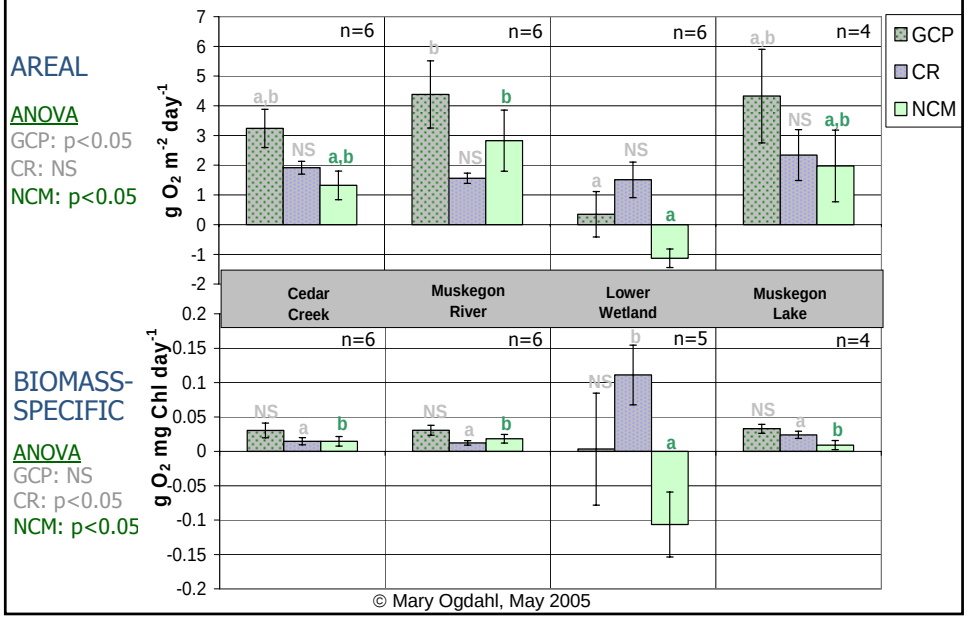

IV. Summary

- Productivity highest in summer, lowest in winter

  Autotrophy ⟶ Heterotrophy

- GCP & NCM greatest in the main stem of Muskegon River
- CR greatest in the wetland complex
- Overall, wetland complex is heterotrophic, all other macro-habitats autotrophic
- Biomass response similar to areal data

V. Future Work

- Continue sampling in 2005
- Analyze spatial and temporal patterns
- Integrate with water column metabolism
- Extrapolate metabolism data to entire Lower Muskegon Watershed

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