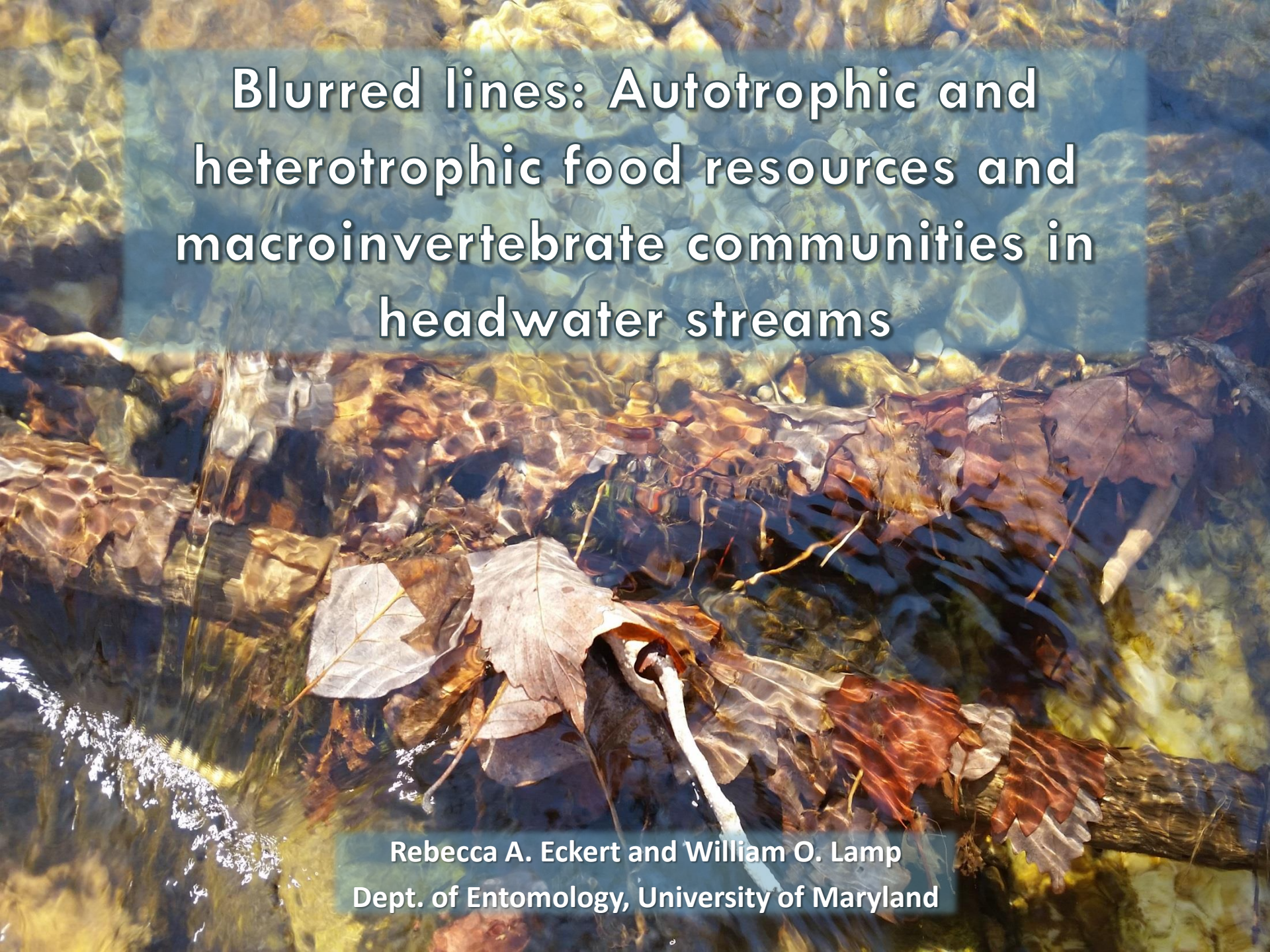

Blurred lines: Autotrophic and heterotrophic food resources and macroinvertebrate communities in headwater streams

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Green *or* brown…

Secondary Consumer

Primary Consumer

Basal Microbes

Energy Source








…or green *and* brown?

Algae in heterotrophic streams:

- May influence decomposition
  (Danger et al. 2013)
- High quality food resource for insects
  (Brett & Müller-Navara 1997; Guo et al. 2016)
- Food for grazers
  (Dobson et al. 1994)

Environmental Conditions Matter for Algae

- Higher nutrients = higher algal biomass
  (Smith et al. 1999)
- Higher light = higher algal biomass
  (Hill et al. 2009)

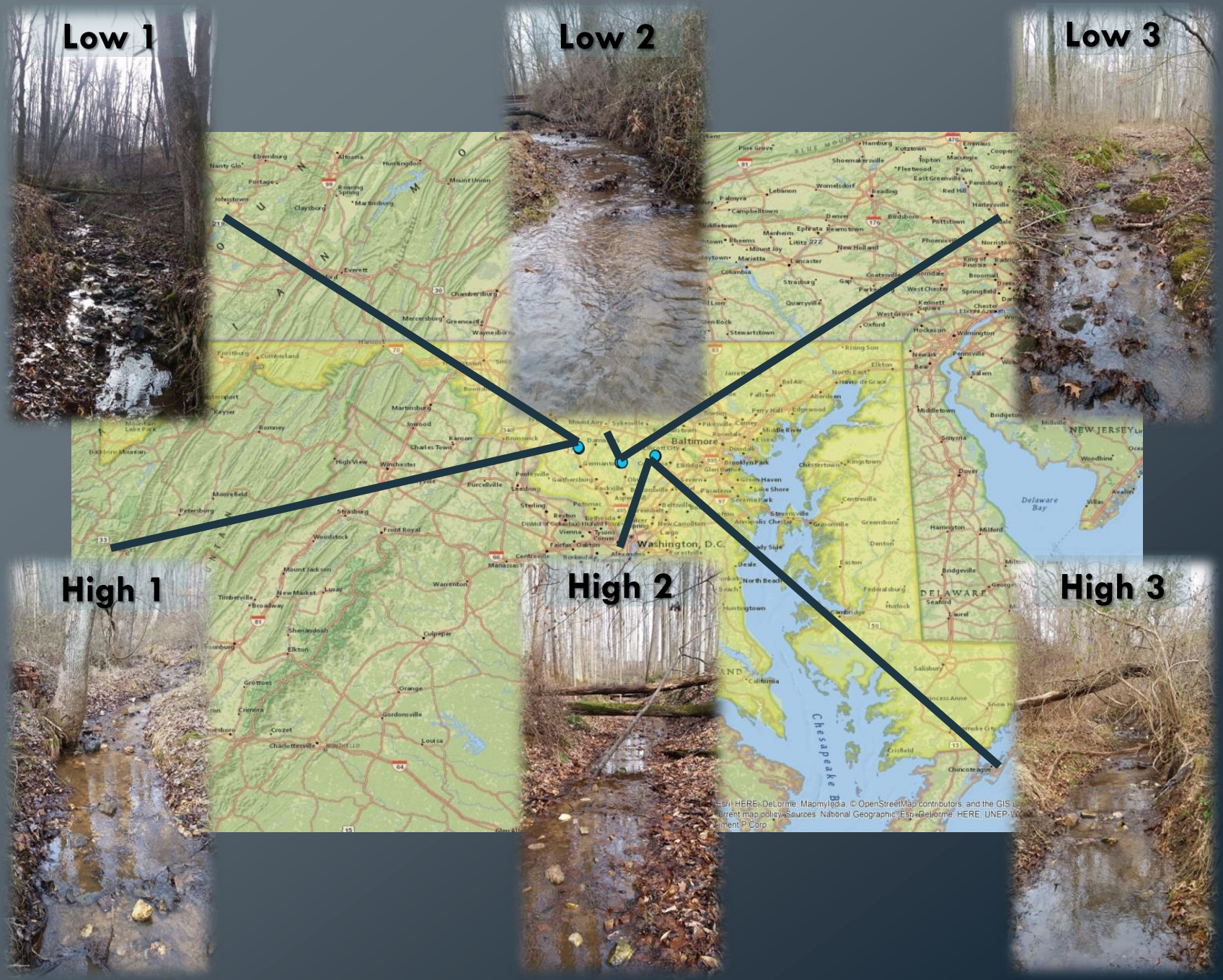
High nutrients

High light, low nutrients

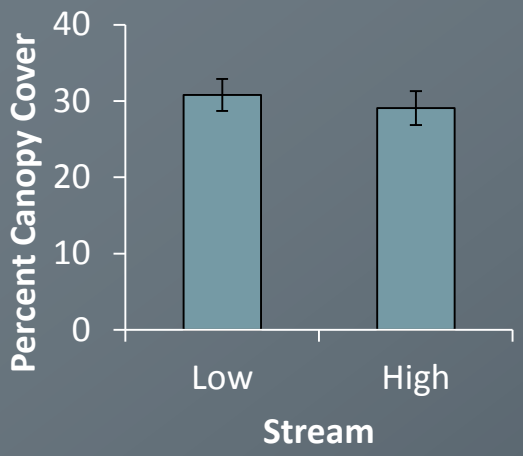
Objectives

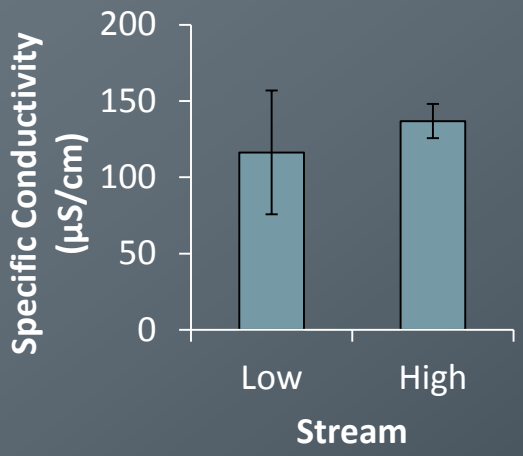
In temperate headwater streams:

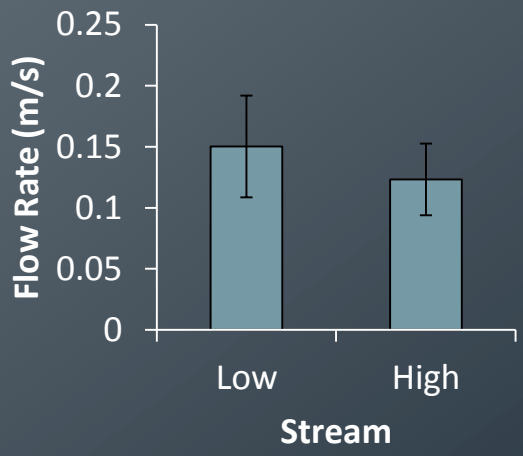
- Determine whether algal biomass on leaves changes with light and nutrient conditions
- Determine whether macroinvertebrate communities change with changes in algal biomass on leaves

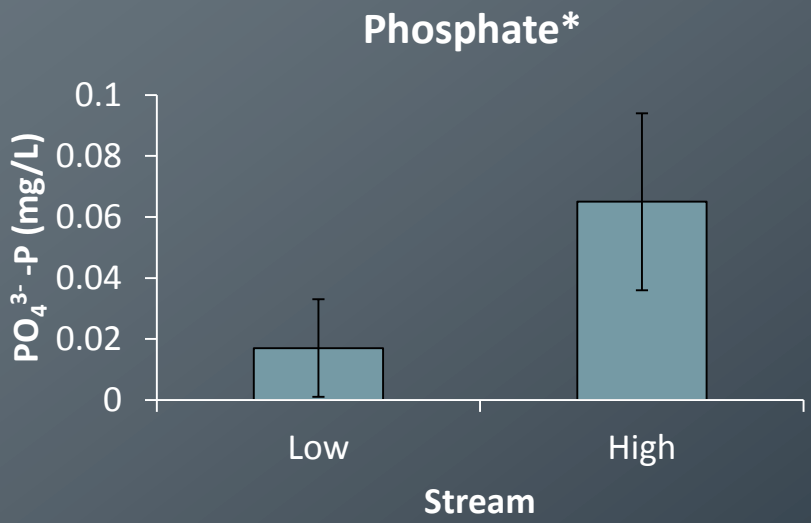

Low 1
Low 2
Low 3
High 1
High 2
High 3
Baltimore
Washington, D.C.
Chesapeake Bay
Delaware Bay
DELAWARE
NEW JERSEY

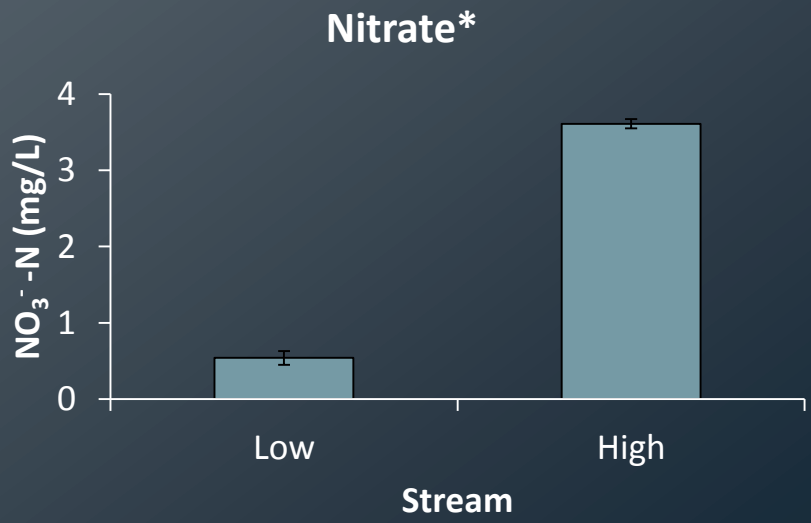
Methods: Stream Characteristics











*Using colorimeric tests via absorbance readings on Turner Designs Trilogy Laboratory Fluorometer equipped with Phosphate and Nitrate Absorbance modules

Low = low nutrient streams
High = high nutrient streams

Methods: Field experiment

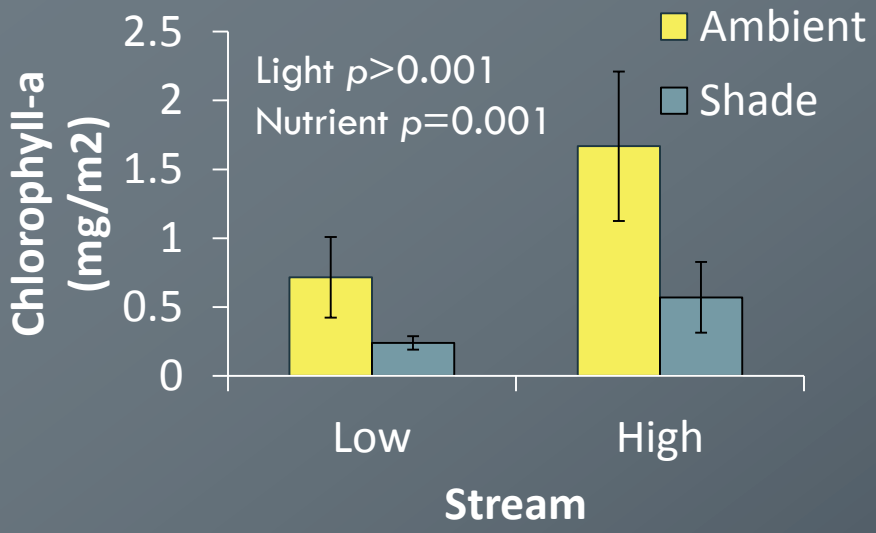
Randomized

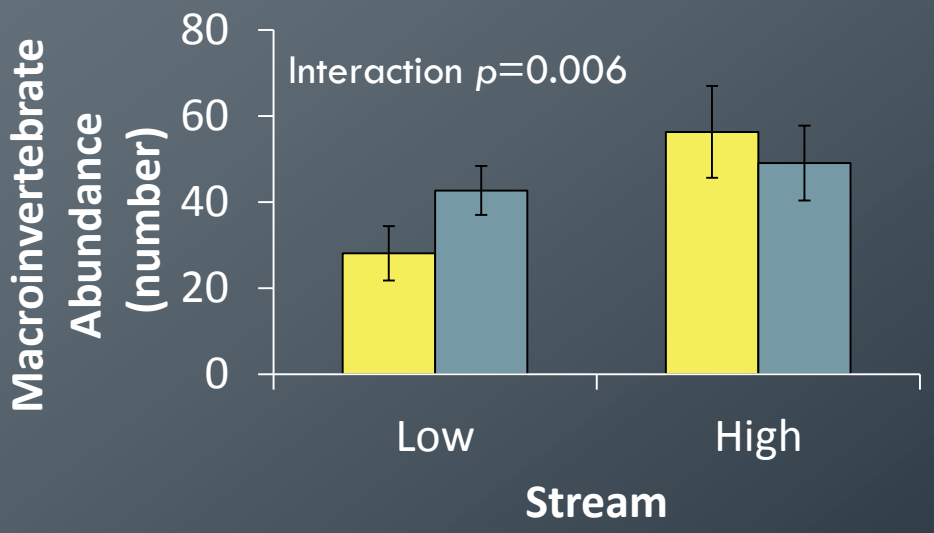
Methods: Lab processing

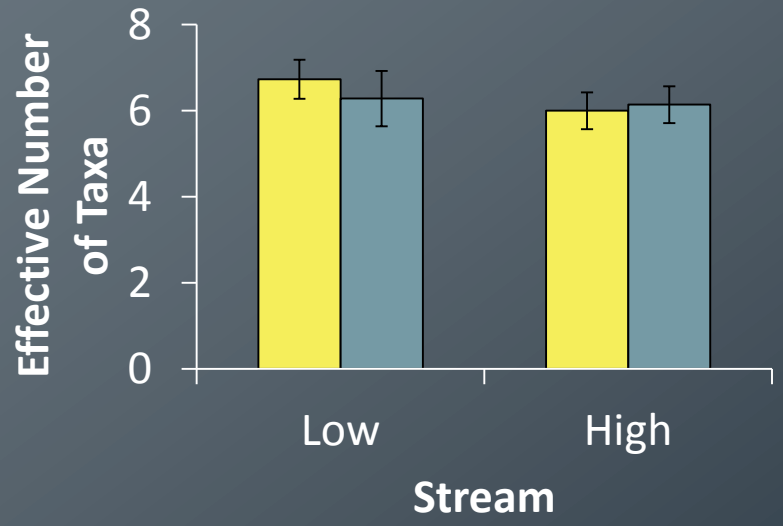
- Remove, preserve, identify macroinvertebrates
- Use leaf discs to assess algal biomass (chlorophyll-a*)
- Future work includes leaf stoichiometry, chl-a:AFDM to estimate degree of autotrophy to heterotrophy, algal community identification

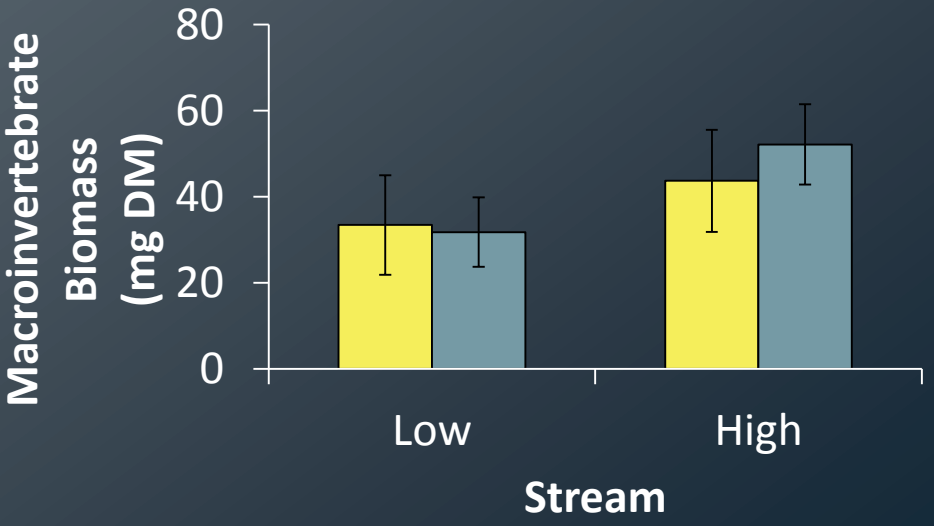
*Measured extracted chlorophyll-a fluorescence on Turner Designs Trilogy Laboratory Fluorometer using Chlorophyll-a Non-acidification Module

Results: Algal Biomass and Macroinvertebrates

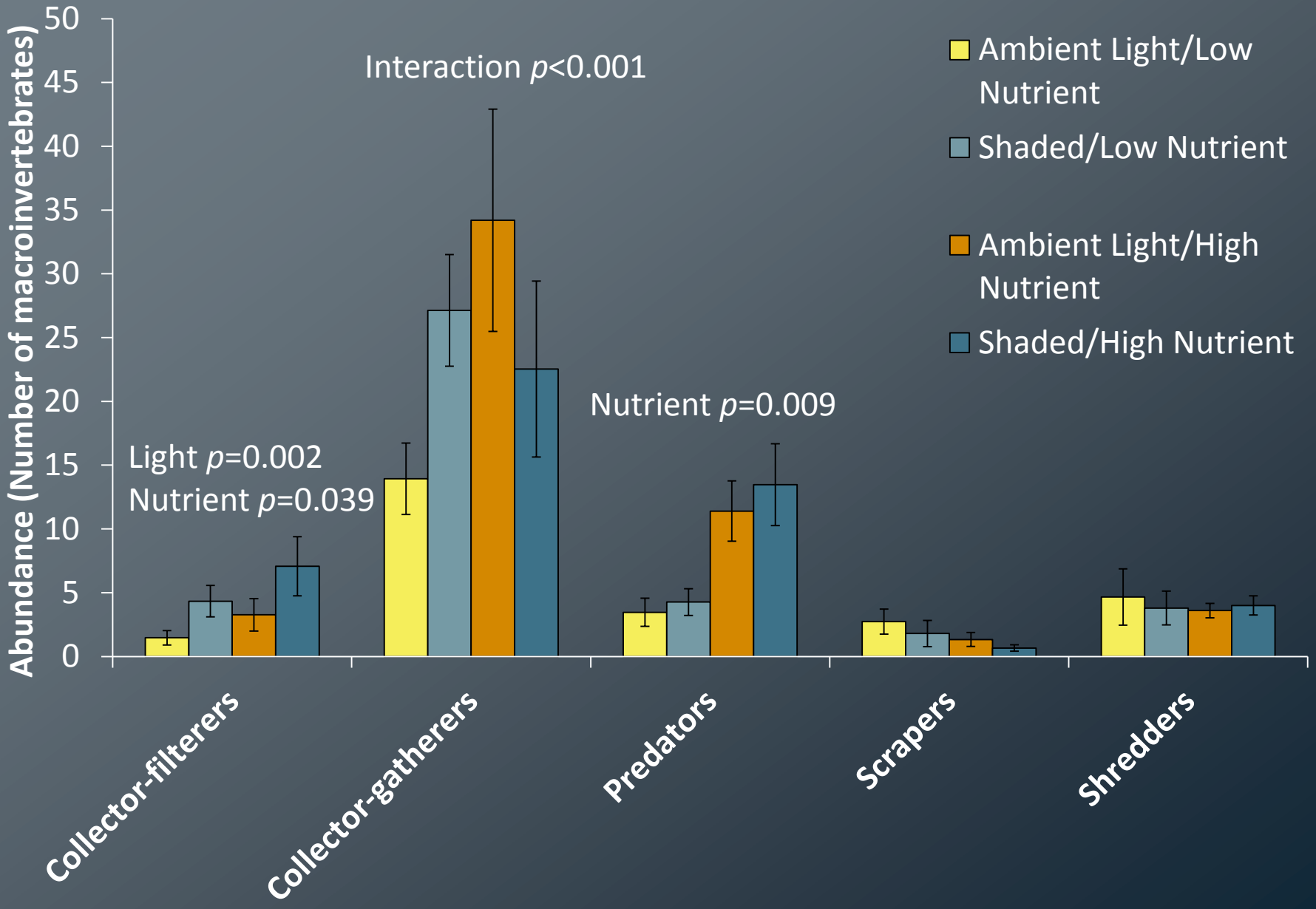




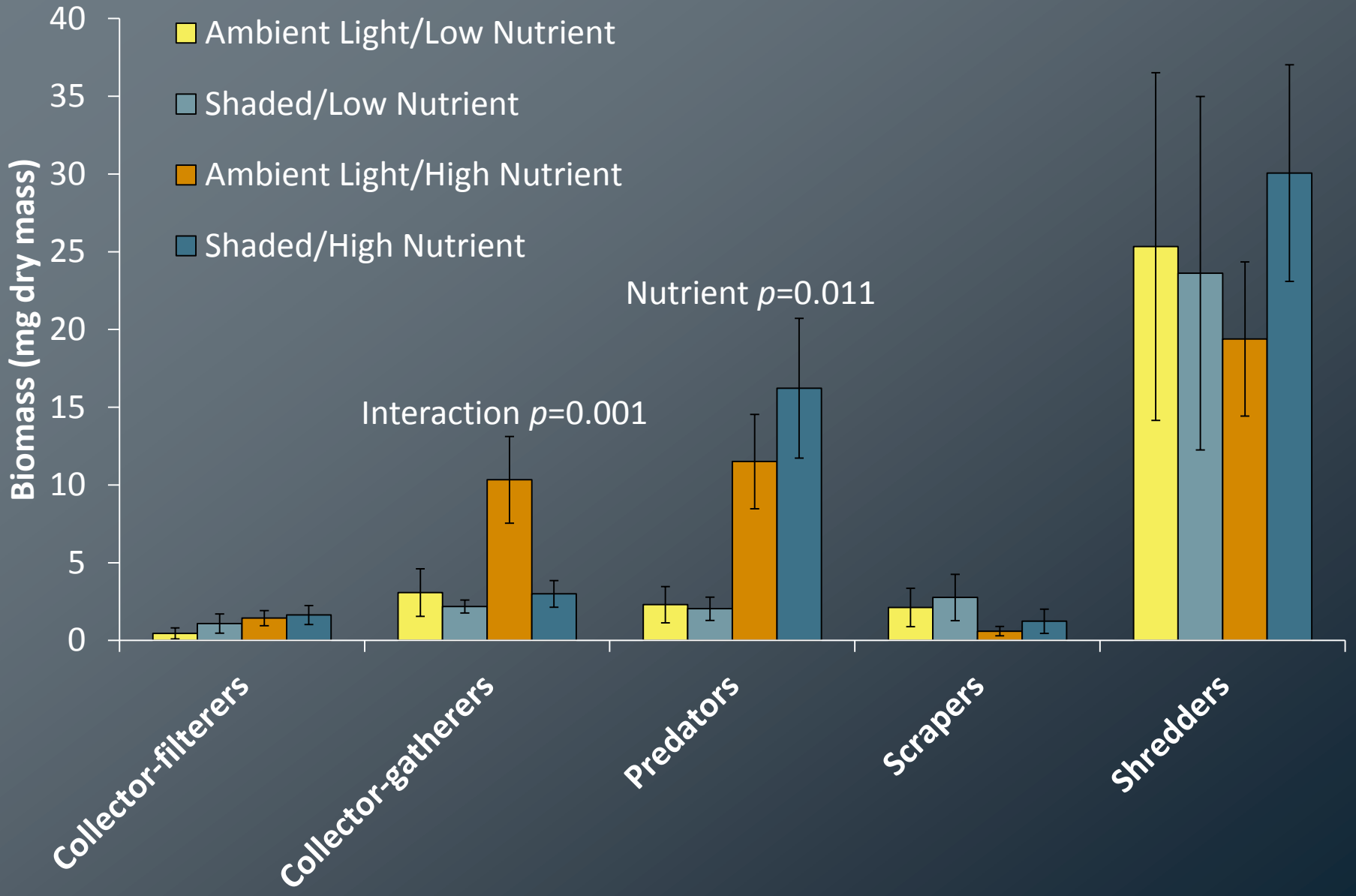




Results: Feeding Guild Abundance

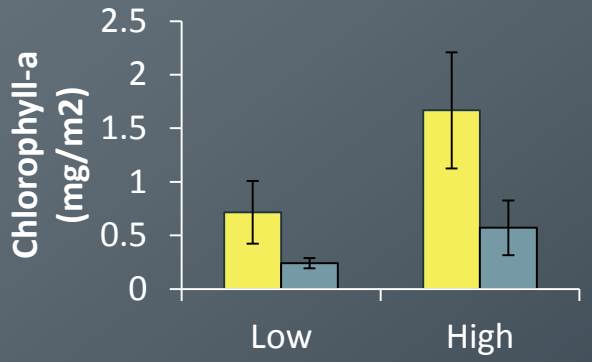


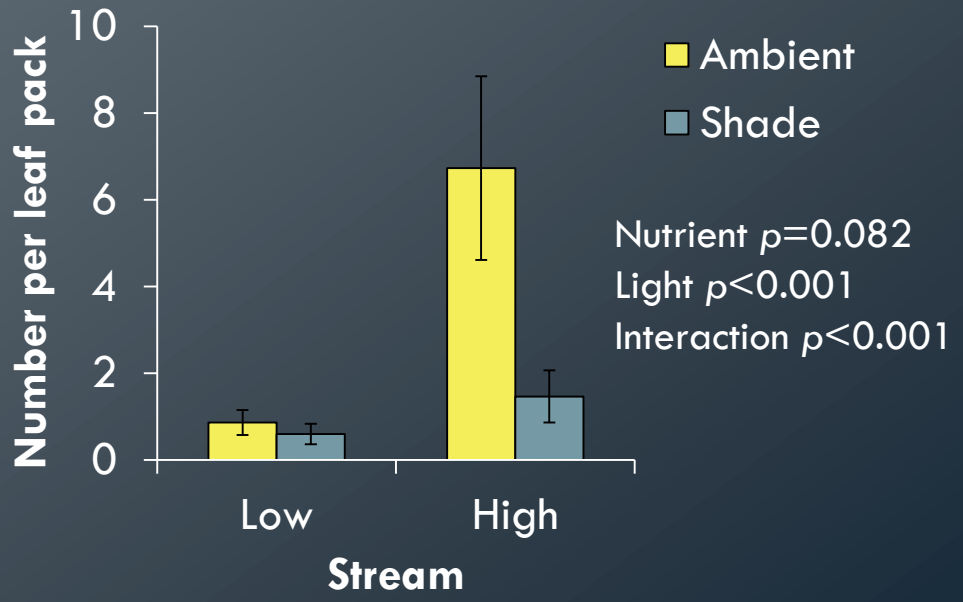
Results: Feeding Guild Biomass



Results: Ephemerellidae

- Significantly correlated to algal biomass (r=0.417, p=0.001, n=60)
- Classified as collector-gatherers
- Often collect algae (diatoms)
- Largely *Ephemerella*, some *Eurylophella* and *Serratella*





Summary

- Algal biomass on leaves
  - Nutrients and light
- Macroinvertebrate abundance on leaves
  - Complex
- Macroinvertebrate biomass on leaves
  - Marginally higher with high nutrients
- Diversity
  - No apparent effect
- Community composition
  - Are specific taxa associated with specific characteristics?
    - Ephemerellidae: correlated to algal biomass
    - *Tipula*: abundance marginally lower in light conditions
  - Is it driven more by stream?
  - Seasonal differences

- Certain macroinvertebrates may be associated with specific conditions, not necessarily following green or brown food web expectations
- Green and brown food webs are not separate but interconnected in temperate headwater streams

Green *and* Brown

Questions?

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