Abstract:

On a global scale, the abundance and surface area of man-made ponds is nearly equal to that of natural ponds (Downing 2007). Despite this, little is known about the biogeochemical role of man-made ponds in organic and inorganic nutrient cycling. Recent research suggests that CPOM is an important resource in ponds because it is abundant, variable, and decomposes slowly (Fortino). In order to better understand its significance, an experiment was devised that allowed us to simultaneously test the effects of CPOM and/or nutrient enrichment on sediment oxygen demand. The experiment utilized a factorial design, with four BOD bottles for each treatment level. To perform the experiment, sediment samples were collected on 29 May 2014 and water samples on 9 June 2014 from a local, man-made pond, Lancer Park Pond. These samples were placed into 300 ml BOD bottles to mimic a man-made system, and then stored in a cool, dark place between sample runs. It was found that CPOM, and to a lesser degree nutrient enrichment, increased overall sediment oxygen demand in the system. Based on separate analyses, we also found evidence to support that the kind of organic matter introduced to the system was more important than the amount. Spectrometry scans revealed that the labile organic matter greatly decreased in the CPOM treatments eventually beginning to even out around \_\_\_\_\_\_\_\_.

Introduction:

The abundance and surface area covered by man-made ponds is nearly equal to that of natural ponds (Downing 2007). In addition, in regions such as Virginia where natural lakes are rare, man-made ponds represent the dominant lake habitat. Despite their abundance, little is known about the biogeochemical role of man-made ponds. In particular, there has been relatively little research done to understand how man-made ponds cycle watershed organic and inorganic nutrients (Tranvik et al. 2009).

When allochthonous organic matter enters an aquatic system, there are a number of different fates for the mass of organic matter (Gessner et al 1999). The organic matter will initially lose some of its mass due to leaching. A portion of the remaining mass can be consumed by microbes (bacteria and fungi) and invertebrates (Webster and Benfield 1985). Once the organic matter has been consumed, the microbes and animals will release the mineralized food as either inorganic nutrients or CO2 (Gessner et al. 1999). Organic matter that escapes assimilation by consumers is converted to fine particulate organic matter (FPOM; Gessner et al. 1999).

Recent evidence (Fortino unpub. data) suggests that coarse particulate organic matter (CPOM) is an important resource in man-made ponds because it is abundant, variable, and decomposes slowly. Our proposed experiment specifically looks at how the presence of CPOM affects sediment oxygen demand and how CPOM alters the effects of nutrient enrichment. YOU NEED A MORE DETAILED DESCRIPTION OF THE HYPOTHESES HERE.

Methods:

We evaluated the effect of CPOM and nutrient enrichment on (LIST RESPONSE VARIABLES) with a complete factorial design. Each treatment combination was replicated 4 times.

This experiment was designed with a complete factorial design, which allowed us to simultaneously manipulate two variables: CPOM and nutrient enrichment. For each treatment, there were four BOD bottles, resulting in a total of 16 BOD bottles. Each bottle contained either no CPOM and ambient nutrients (control), CPOM and ambient nutrients, no CPOM and added nutrients, or CPOM and added nutrients. NEED A DESCRIPTION OF HOW TREATMENTS WERE CREATED , We gathered sediments from Lancer Park Pond on 29 May 2014, using an ekman dredge. Once obtained, we ran the sediments through a 243 micrometer mesh net to remove all CPOM and macroinvertebrates. The collected sediments were allowed to settle overnight and the overlying water was siphoned off. The BOD bottles (300 ml) were filled with 100 ml of sediment slurry, and 185 ml of Lancer Park Pond water collected from 0.5 m on 9 June 2014. The bottles and remaining lake water were incubated in the dark at ambient lab temperature (min - max). The BOD bottles were gently agitated on rocker-shakers (tilt = 8o  rate = 8 rpm).

We sampled the bottles on (LIST DATES). On each sampling date, the samples of the overlying water were collected approximately 2 cm from the sediment water interface with a 30 ml glass syringe fitted with a cannula. These samples consisted of 15 ml for dissolved oxygen, 15 ml for water respiration, 30 ml for nutrients, and 5 ml for absorbance. An additional 3 ml of overlying water was removed with a pipette for bacterial abundance, Once the samples were removed, 83 ml of lake water would be added to the bottle and capped. In approximately 5 hours, the bottle would be removed again, uncapped, and 15 ml pulled for the second dissolved oxygen sample. Oxygen concentration was determined using Winkler titration adjusted for 10 ml (Carpenter 1965). Sediment oxygen demand was calculated as the change in oxygen concentration over time. NEED BREAKDOWN DESCRIPTION HERESediment and CPOM OM was calculated by loss on ignition.