Mega-cosms: A Climate Manipulation Experiment in Green Lakes Valley, CO
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What are mesocosms?
- Mesocosms are controlled aquatic enclosures used to approximate natural conditions of water bodies and simulate their response to changing environmental conditions.

What is DOC and Chlorophyll a?
- An essential regulator of lake ecosystems is dissolved organic carbon (DOC), a component of dissolved organic matter (DOM). DOC contributes to the function of the lake ecosystem in many ways, including providing food for microbial organisms such as bacteria and absorbing UV radiation (Miller et al 2015, Sommaruga et al 2009 Toming et al 2016).
- Chlorophyll a (chl-a) is the pigment used in the cells of organisms that perform photosynthesis to make food. Waters with high concentrations of nutrients will have excess phytoplankton (i.e. algae) growth and therefore higher amounts of chl-a. (US EPA 2013, Jones et al 2009).

Why Does it Matter?
- The Green Lakes Valley in the Silver Lakes watershed accounts for nearly 40% of the Boulder Valley’s municipal drinking water. According to Preston et al. 2016, overall chl-a in the Green Lakes Valley has been increasing over time. Increasing chl-a is a sign of decreasing water quality and precedes Harmful Algal Blooms, which can cause acute illnesses if toxins produced by bacteria cannot be filtered out of drinking water. (US EPA 2013, 2018).

RESULTS AND DISCUSSION
Due to the time constraints of this study, results were inconclusive. More sampling events must be conducted. In tank E20, zooplankton were not observed in high numbers, suggesting an anoxic environment has been created due to excess bacterial growth, allowing the phytoplankton to flourish. In contrast to E block, zooplankton in tanks A3 and D16 were observed in significant quantities, suggesting that anoxic environments were not created. There is previous evidence to suggest that DOC may have an inverse relationship to chl-a or a positive correlation to increased bacterial growth. Future work could include a bacterial analysis of the tanks. (Jones et al 2009, Sonderegger et al 1995).

HYPOTHESIS
We predicted tanks with DOM/DOC treatments would have higher levels of chl-a than non-treatment tanks.

ACKNOWLEDGEMENTS
I would like to thank my mentor, Samuel Yevak from the Niwot Ridge LTER Limnology team, as well as Alicia Christianen, Rebecca Batchelor, Dana Starnes, and Jeffrey Wright from the RECCS program. Grant Funding: LTER funding (2018 – 1637686).

METHODS
Twenty 700-gallon plastic cattle tanks were placed into five blocks of four from A to E. Within each group, one beige and one black were given Dissolved Organic Matter (DOM) treatments, hosing filled with local dried willow leaves and placed on the bottom. The other two tanks were given control treatments, a sponge of similar size to the leaf packs. Tiles were placed on the bottom to grow ash-free dry mass (AFDM), HOBO loggers were placed to log temperature.

Water samples from each tank were collected in Nalgene bottles and filtered to separate solids containing phytoplankton cells. The filters were placed in a saturated acetone-magnesium carbonate solution to extract the cells. After extraction, they were lyzed with hydrochloric acid to release the chl-a and analyzed using a Trilogy Fluorometer.

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