

Carbon Processes in the Presence of Cover Crop on Diverse Terrain

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Introduction

This spring, measurements were taken at two field sites in Michigan, Mason and Kellogg Biological Station (KBS), to quantify the carbon cycling through corn and soybean plots with a rye cover crop and three topographical positions: summit, slope, and depression.

Objectives

The objectives are 1) evaluate the components of spring C inputs and outputs, including rye biomass, decomposition of rye litter, and CO₂ emissions from soil; and 2) to assess the changes in organic C that took place between the first two years of the study (2011-2013).

Rye Cover Crop Biomass

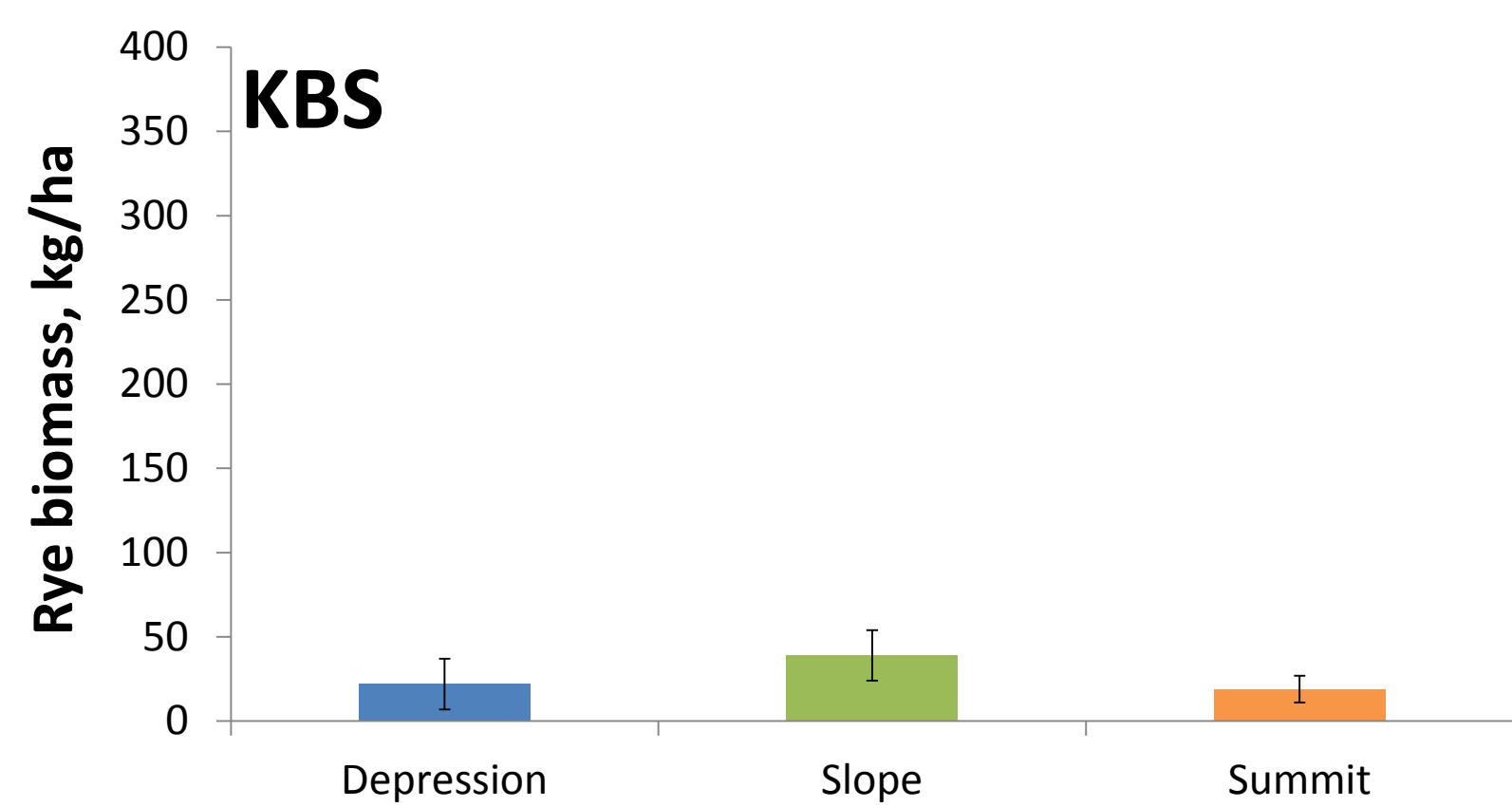
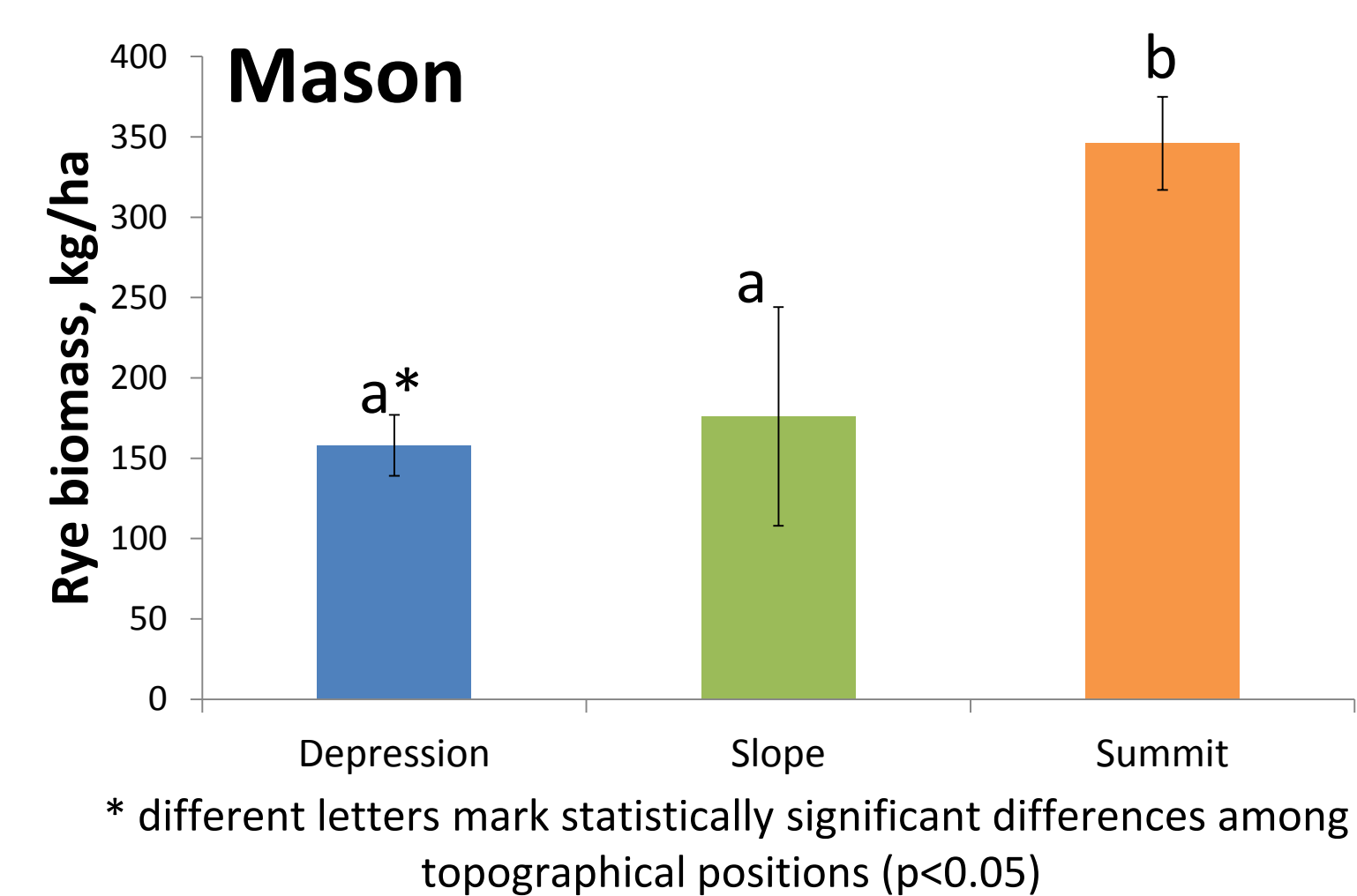


Figure 1. Rye biomass at spring termination

- The depression at Mason did not have much rye growth. This was mainly due to flooding at the site (Picture 1 shows similar flooding that happened during rye growth)
- KBS has poorer soil, so limited rye growth was expected compared to Mason.

Decomposition of Rye Litter

- Dry rye was placed in mesh bags and buried near surface of cover crop plots at Mason site
- Samples were removed from plots, dried, and weighed at day 7, 12, and 39 after burial

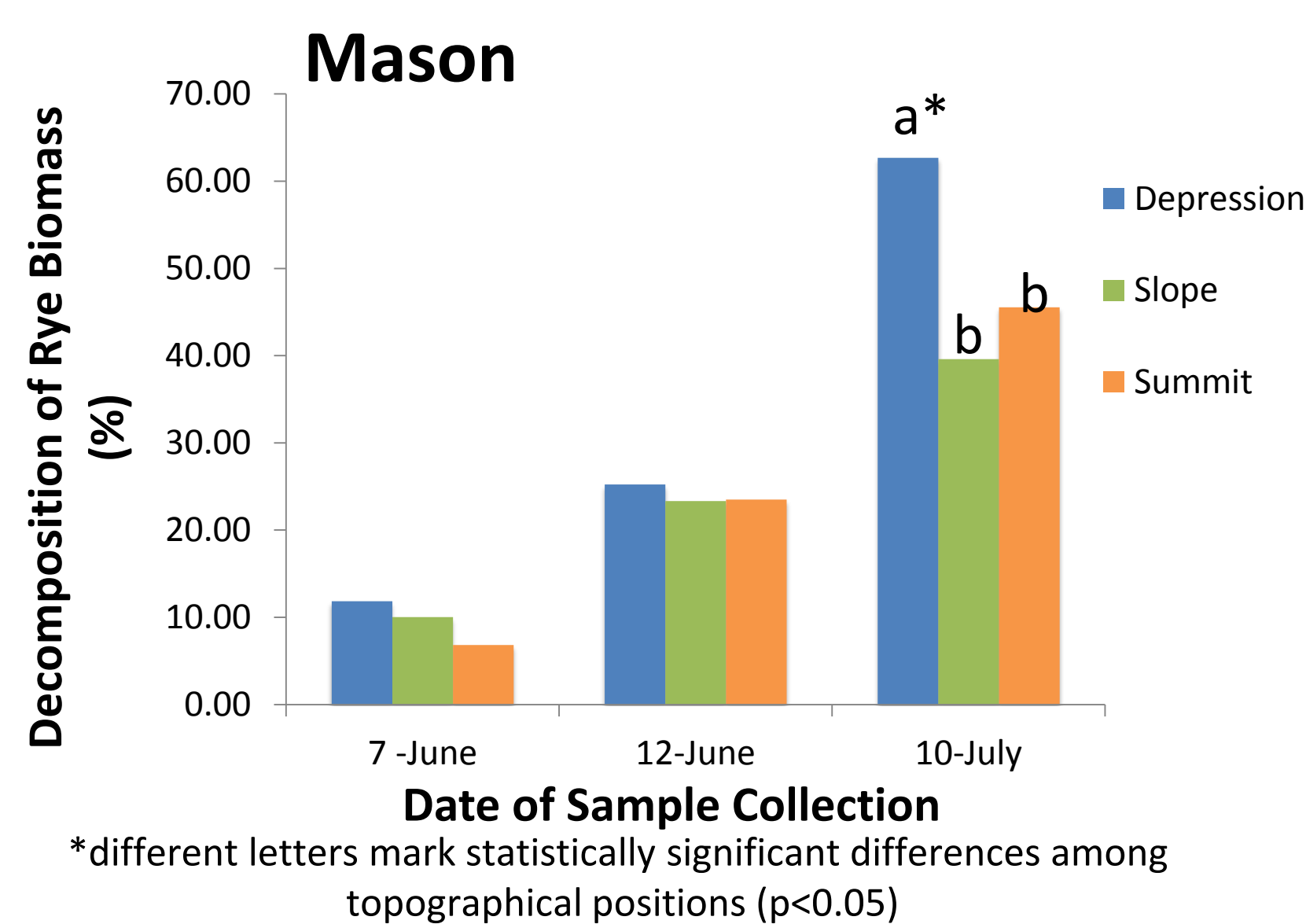


Figure 2. Decomposition of rye biomass at 7, 12, and 39 days after burial.

- While there were no differences in decomposition rates for litter bags buried for 7 and 12 days in June, decomposition rate became substantially greater for the litter bags buried for 39 days through July. Greater microbial activity at depressions is the likely reason for the observed difference.

CO₂ Measurements

- Infrared Photoacoustic Spectroscopy was used to sample CO₂ from the surface soil.
- Samples are taken bi-weekly from 8:00 am to 12:00 pm in plots with and without the presence of the rye cover crop

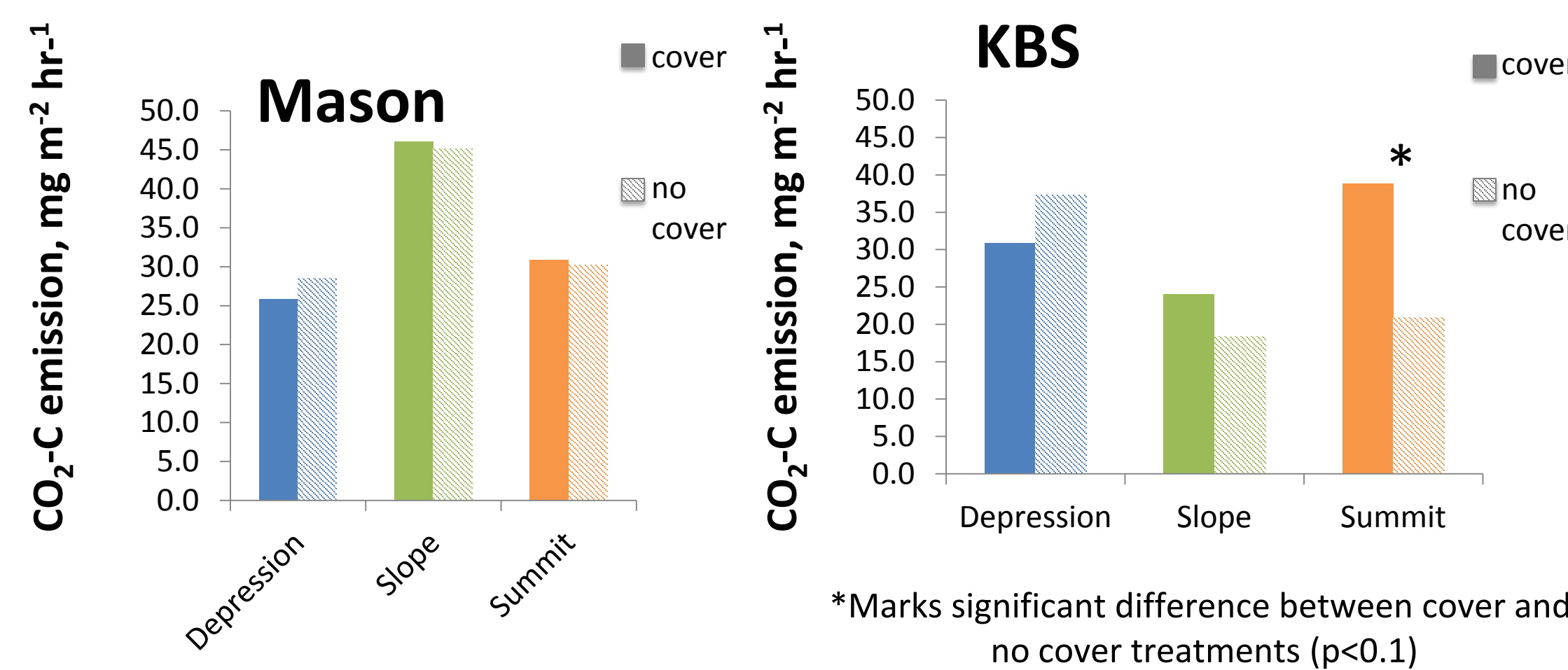


Figure 3. CO₂-C emissions (mg m⁻² hr⁻¹) from plots with the presence of rye cover crop and without at each topography

- Contrary to previous years (2012-2014) the differences between cover and no cover crops were present only in KBS summits. Extremely wet soil conditions in June is the likely reason for difference in behavior of 2015 data.

Total Soil Carbon

- 2013 data suggest the ability of the poor soil at KBS to sequester carbon in presence of cover crop.

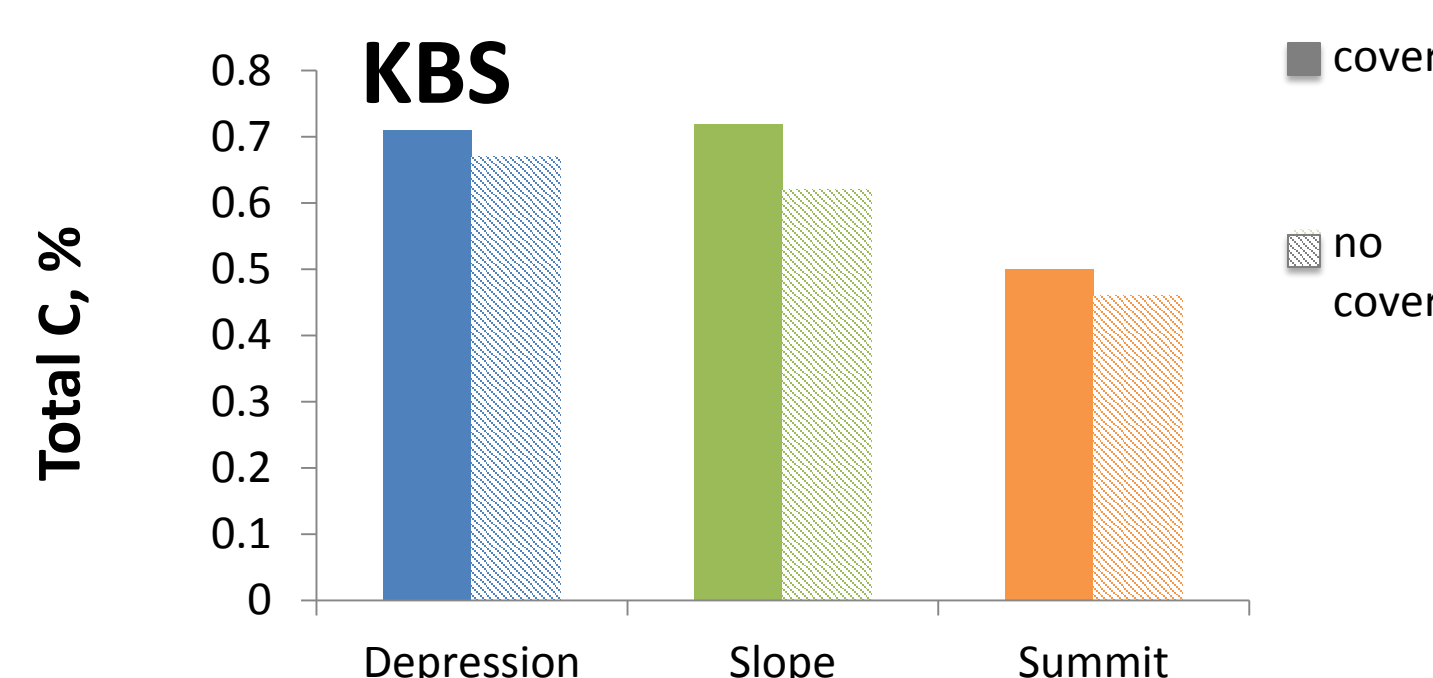


Figure 4. Total soil carbon (%) for each topography at KBS



Picture 1. Flooding in the Mason depression plots