



Evaluating Different Methods for Measuring Organic Matter in Wetlands

Touqeer Abbas and Shannon Osborne

USDA-ARS North Central Agricultural Research Laboratory, Brookings, SD



Key Findings:

- There was a strong correlation between the different analytical methods for measuring soil organic carbon and organic matter.
- Relationships were significant regardless of initial soil texture, bulk density, wetland age or soil organic matter levels.
- Standard methods used for agricultural soil produce consistent results for wetland sediments.



Background

Soil organic carbon and organic matter can be determined with different analytical methods, including loss-on-ignition (LOI), total combustion, and Walkley-Black. There are benefits and disadvantages to each method, including sample preparation, cost, labor and time. Extensive research has been conducted to determine the relationship between these methods for agricultural soils, but the relationship has not been thoroughly evaluated for a wide range of wetland soils with varying age, soil texture, location, organic matter content, and bulk density.



Objective

Utilize a representative subset of soil samples from a larger project to assess the relationship between multiple analytical methods for evaluating soil carbon and organic matter and indicate whether different methods produce biased results for a range of wetland soils.

Methods

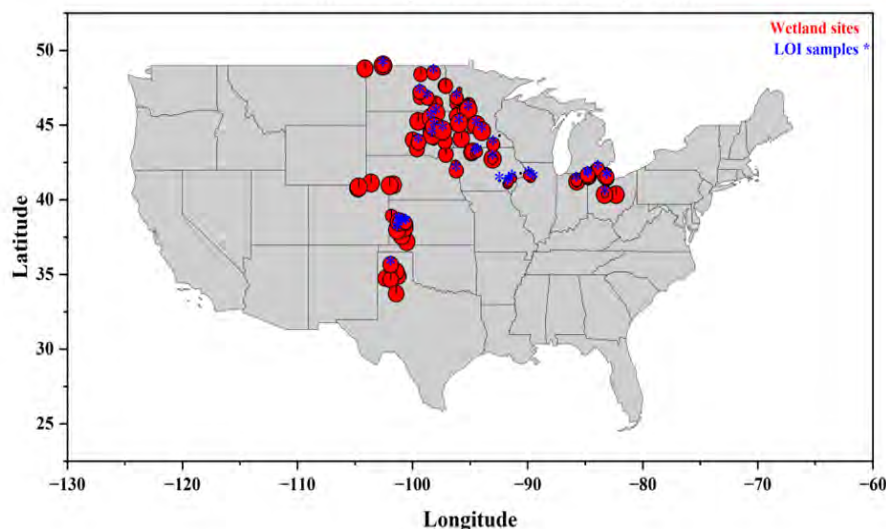
A subset of soils were selected from a larger project that sampled wetlands across the central U.S.

The subset was selected to represent the range of soil textures, sampling depths, organic matter levels, and wetland ages.

All samples were processed as follows:

Wetlands sample collection → drying and processing → archiving for later use → lab analysis → subset selection for LOI methods → batch analysis for combustion temperature and time assessment → LOI analysis → comparison with other methods (total combustion and Walkley-Black).

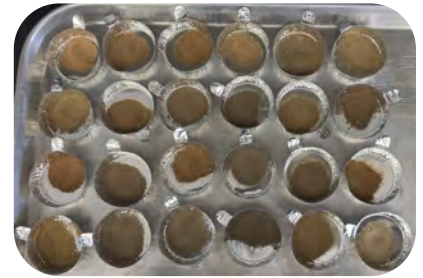
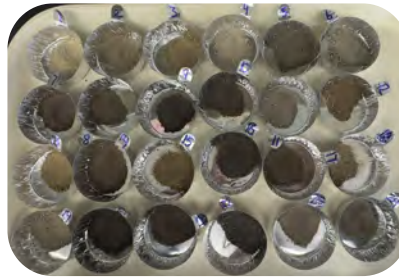
Wetlands study area vs LOI sample sites



Sample processing



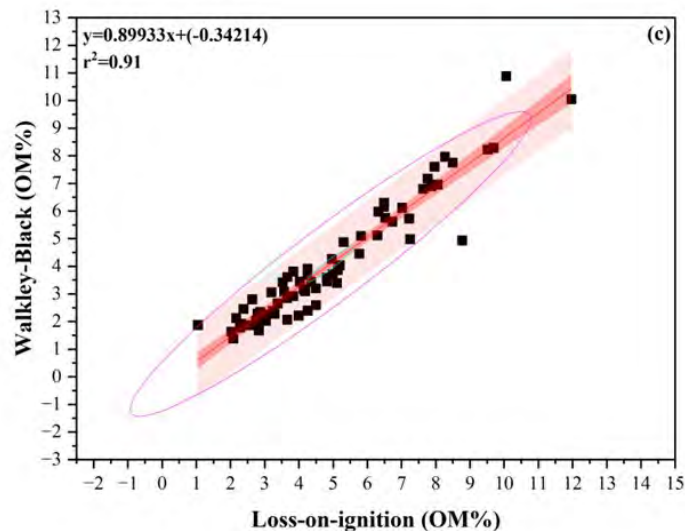
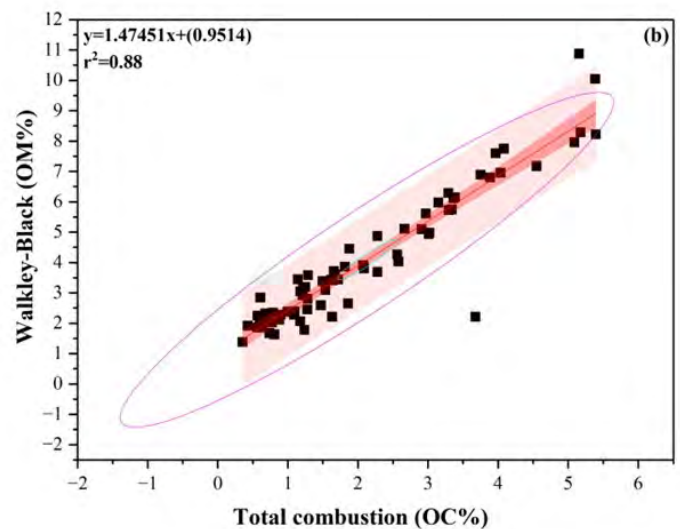
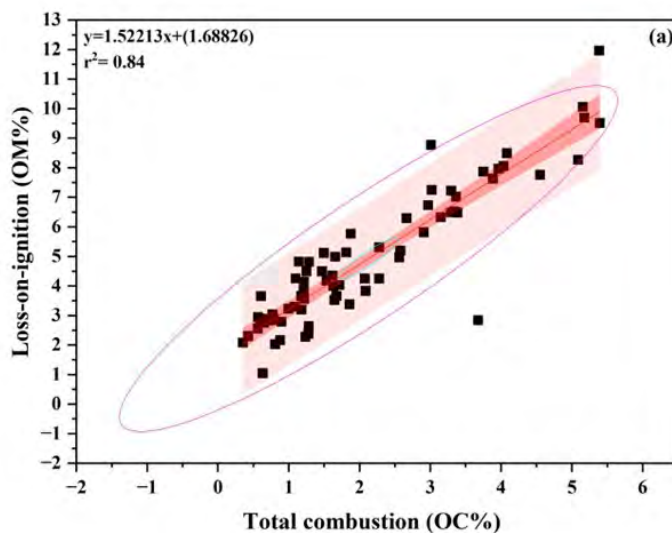
Soil samples before and after combustion



Results

There is a strong relationship between the three methods utilized for a broad range of U.S. wetland soils. The relationship between organic carbon determined by total combustion and organic matter measured by LOI or Walkley-Black was similar with a factor of 1.52 for LOI (**Fig a**) and 1.47 for Walkley-Black (**Fig b**) with both significant. The relationship between the two different organic matter methods was highly significant (**Fig c**).

These results suggest that all three methods provide consistent estimates of organic soil matter, allowing flexibility in method selection based on resources, cost, and laboratory access.





Next Steps

This research will be developed into a research manuscript that can help researchers and practitioners utilize low cost/labor methods to evaluate soil organic matter in wetland soils similar to agricultural soils. The larger component of this project will evaluate how organic matter is impacted by wetland age and vegetative cover in natural vs restored wetlands.

Touqeer Abbas
ORISE Postdoc Fellow



Shannon Osborne
Research Agronomist



Questions or comments?
Email: Shannon.Osborne@usda.gov
Phone: 605-693-5234

About NCARL

The North Central Agricultural Research Laboratory (NCARL) is a USDA-Agricultural Research Service laboratory located in Brookings, SD. The goal of NCARL is to develop, document, and promote soil, crop, and pest management practices that are ecologically sustainable while maintaining producer profitability.

