Assessing Soil Redox Conditions Using IRIS Tubes in a Central Georgia Wetland

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Abstract

The process of documenting soil redox potential has become increasingly important to environmental professionals for use in wetland delineation studies. Wetlands are characterized by hydric soils, which are formed in saturated conditions, and are typically home to an anaerobic, reducing redox environment. Most established wetland delineation studies document soil redox conditions through Eh measurements via platinum electrodes and/or alpha-alpha-dipyridyl dye. However, these methods are costly, time-intensive, and complex. An alternative method of assessing reduction potential *in situ* is through the use of Iron Reduction in Soils (IRIS) tubes, which are fabricated from PVC pipes that have been sanded and coated with a synthetic Fe(III) (oxy)hydroxide paint, then inserted into wetland soils for approximately 4 weeks. We anticipate the reducing environment of the wetland soils to facilitate reductive dissolution of Fe(III) painted on the tubes to Fe(II), causing a visually notable decrease in paint upon removal. This study aims to explore whether the use of IRIS tubes, in conjunction with measurements of physicochemical soil properties and hydric soils identification procedures, is effective in delineating wetland gradients in Central Georgia. Iron removal from IRIS tubes was assessed using both X-ray fluorescence (XRF) and Geographic Information Systems (GIS) methods. We assessed reducible Fe(III) in wetland soils via selective Fe extractions. Evidence of redoximorphic features such as gley and oxidized root channels were also observed. Initial data from XRF and GIS analysis suggests that the highest Fe removal, as high as 88%, occurred deeper (40-50 cm) into the soil profile where anaerobic conditions are greatest, supporting our expectation of anaerobic soils. Based on the evidence collected, IRIS tubes showed promise in demonstrating reducing soil conditions and delineating wetlands in Central Georgia, while efficiently managing expenses and time spent in both the field and laboratory.