Quantifying the Carbon Budget and Soil Carbon Uptake Rate in Reclaimed Surface Mine Soil

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Overview

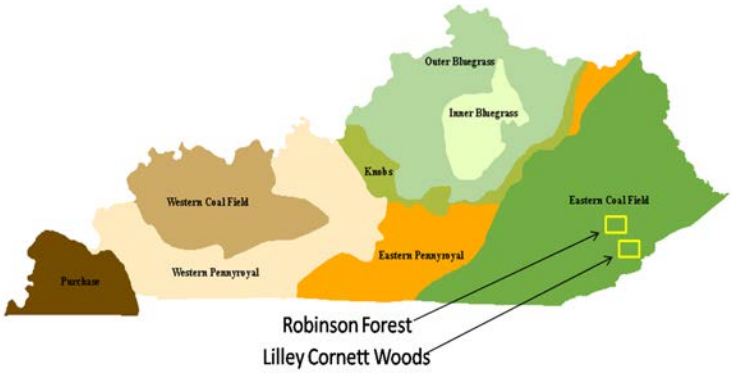
It has been hypothesized that reclaimed mine lands could potentially act as carbon sinks. The goal of this study is to better understand the role of carbon sequestration in the reclaimed mine lands of Southeastern Kentucky and relate them to baseline data of the region. This was done by conducting extensive fieldwork as well as gathering data from previous studies. Fully understanding carbon cycling in reclaimed soil is crucial if proper reclamation techniques are to be mandated.

Methods

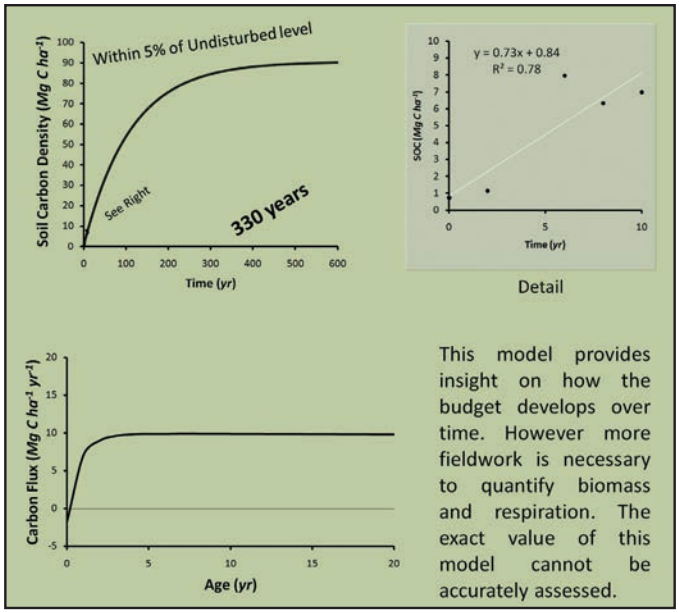
Samples were gathered from five depth intervals throughout the soil column. Carbon density was then quantified and plotted over time to develop the soil organic carbon vs. time curve.

The ecosystem carbon budget encompasses the quantification of biomass, erosion rates, precipitation, respiration rates, and leaching.

Sites of Interest



The study sites were located in Breathitt and Letcher Counties in Southeastern Kentucky. Lilley Cornett Woods in Letcher County provided data from an old-growth forest as well as 0-year and 6-year mining reclamation sites. Robinson Forest in Breathitt County provided 2-, 8- and 10- year reclamation sites.



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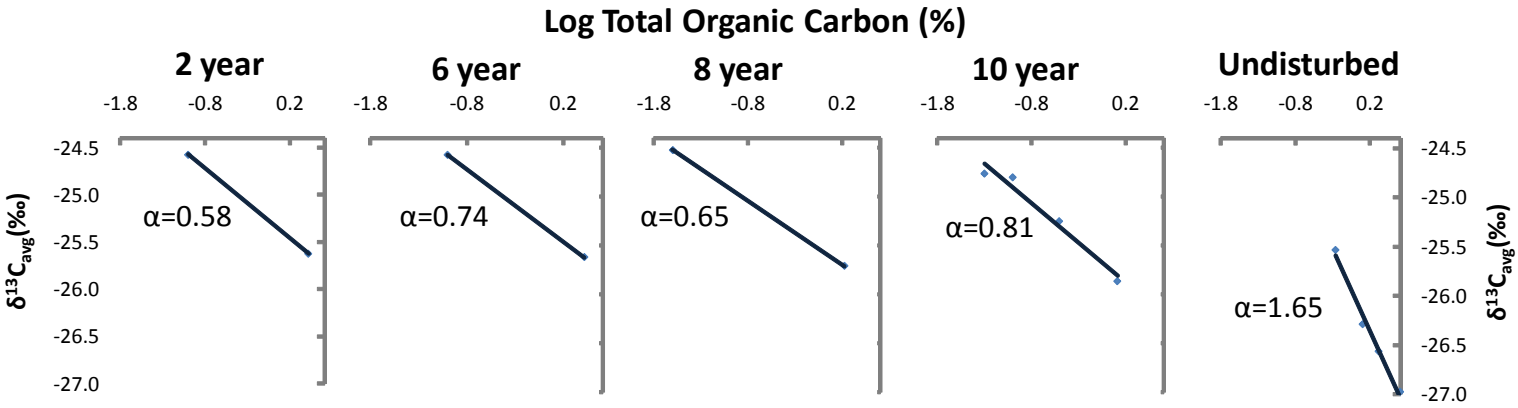
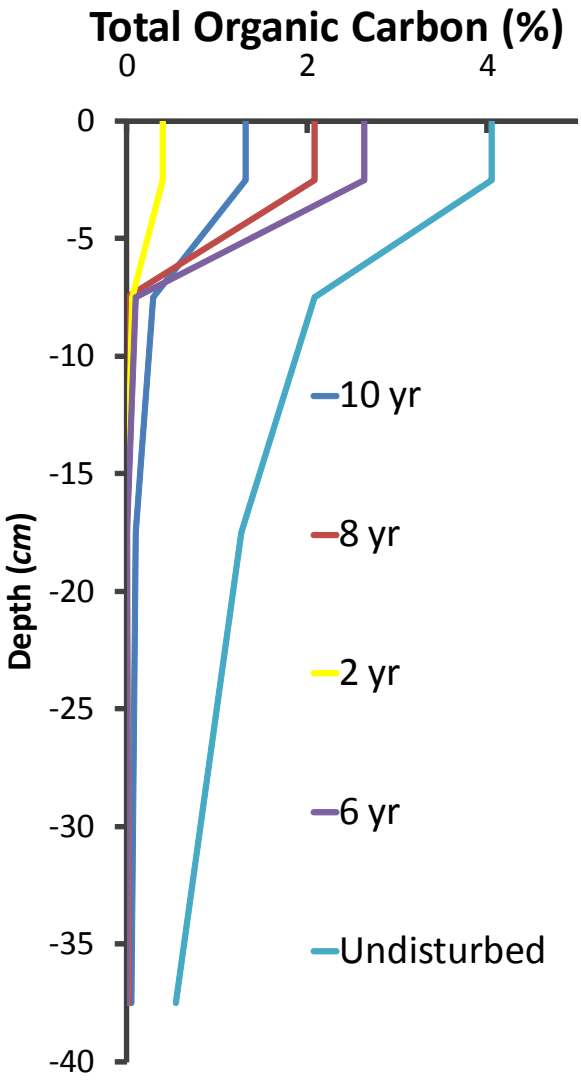


The alpha values represent the slopes of the trend lines. These values are indicative of the soil turnover rate and soil activity.



The full depth of the soil column can be visualized and compared with baseline forest data to understand how it develops over time.

Conclusion

The net flux of carbon is primarily dependent on vegetation regrowth and respiration. The development of soil carbon in reclaimed soils, takes place in the first 10 centimeters as compared to the entire soil column in undisturbed forest conditions. The results suggest that it will take 330 years for the soil carbon in reclaimed areas to reach a value within 5% of the carbon found in the soil of the undisturbed site.

Areas of Further Research

In order to further develop models of carbon sequestration in post-reclamation soils these sites will need to be studied over the long term. More detailed lab work needs to be conducted in order to quantify biomass growth over time.

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