Quantifying Pedogenic Carbon Content Within the Boise River Terraces Using Pressurized Calcimetry

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Abstract: Soil carbon is the third largest pool within the global carbon cycle, however, soil carbon amounts are not well quantified, and exchange rates of soil carbon are not well understood. Soil carbon can be divided into organic carbon and inorganic carbon, where inorganic carbon (pedogenic carbon) is precipitated during soil formation and accumulates over time in semi-arid and arid environments. Calcic soils within the semiarid regions of the Boise Valley result from active pedogenic accumulation of secondary CaCO₃ resulting in prominent ‘caliche’ layers in soils formed on the Boise River terraces. The large goals of this project are to quantify inorganic carbon sequestered within the Boise River terraces, and investigate rates of carbonate dissolution due to irrigation. This portion of the project focuses on developing methods for measuring inorganic carbon content in soils using pressurized calcimetry. Samples are acidified within a closed system to form CO₂ under constant temperature, allowing for pressure readings to delineate the levels of inorganic carbon present. Future work will reveal trends in carbon content with depth in individual soil profiles, and variations in carbon content for terraces of different ages.

INTRODUCTION

This study quantifies amounts of inorganic carbon in terrace soils of the Boise River; future studies will investigate variability in soil carbon with terrace age and land use.

METHODS

ASD

Figure 3: PROFILE Investigates the content of carbonate in terrace soils of the Boise River; future studies will investigate variability in soil carbon with terrace age and land use.

RESULTS

Figure 4: To determine that a representative sample is collected, all samples were polished, divided, and powdered to reach final consistency of 200µm. Chipmunks create rodent burrows filled with invertebrates such as beetles, and the assemblage of invertebrates and rodent burrows can be used to estimate the carbonate content of the sample. The samples were then analyzed using a combination of direct and indirect methods. Direct methods include a combination of pressure and temperature measurements.

CONCLUSIONS

The inorganic carbon content within the Boise River terraces is located south of an irrigated field and appears to be undisturbed, where the profiles were taken. The eastern corner of the profile, near to profile B, contains an ephemeral stream. Profile A contains a slight increase from profile B, which is located approximately 50 yards west of the same profile. The inorganic carbon content within the Ten Mile Rd profiles are located south of an irrigated field and appear to be undisturbed, with lower disturbance values of 25%. Carbon levels for Airport Rd. are 1.3% as if it were condensed into tabular form with a visible thickness. Each thickness is plotted as a depth analogous to the thickness of the horizon from which it is derived. Carbon sequestered in the Boise River terraces using pressurized calcimetry.

FUTURE WORK

1. Quantify the carbon within terraces, determine variations in carbon content with terrace age, and extrapolate soil carbon values to larger areas.

2. Investigate if and to what extent variations in carbon storage can be measured due to irrigation.

REFERENCES

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