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Rapid Carbon Assessment Project: Data Summary and Availability

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The Rapid Carbon Assessment (RaCA) project was undertaken to estimate regional soil organic carbon (SOC) stocks across the conterminous United States (CONUS) as a one-time event. Sample locations were selected randomly using the NRI (National Resource Inventory) sampling framework covering all areas in CONUS with SSURGO certified maps as of Dec 2012. Within each of 17 regions, sites were selected by a combination of soil and land use/cover groups (LUGR). At each of more than 6,000 sites five pedons were described and sampled to a depth of 100cm (one central and 4 satellites 30m in each cardinal direction). There were 144,833 samples described from 32,084 pedons at 6, 017 sites. A combination of measurement and modeled bulk density was used for all samples. A visible near-infrared (VNIR) spectrophotometer was used to scan each sample for prediction of soil carbon contents. The samples of each central pedon were analyzed by the Kellogg Soil Survey Laboratory for combustion carbon and calcimeter inorganic carbon. SOC stocks were calculated for each pedon using a standard fixed depth technique to depths of 5, 30 and 100cm. Pedon SOC stocks were transformed to better approach normality before LUGR, regional and land use/cover summaries were calculated. The values reported are geometric means. A detailed spatial map can be produced using LUGR mean assignment to correlated pixels. LUGR values range from 1 to ∼3,000 Mg ha-1. While some artifacts are visible due to the stratified nature of sampling and extrapolation, the predictions are generally smooth and highlight some distinct geomorphic features including the sandhills in the Great Plains in the central US, mountainous regions in the West and coastal wetlands in the East. Regional averages range from 46 Mg ha-1 in the desert Southwest to 182 Mg ha-1 in the Northeast. Regional trends correlate to climate variables such as precipitation and potential evapotranspiration. While land use/cover classes vary in mean values, the range within each class overlap and they are not significantly different. As expected, wetlands have the highest SOC stocks, 261 Mg ha-1, and range lands the lowest, 51 Mg ha-1. This is due primarily to the great stocks between 30 and 100cm in wetlands. Ongoing work includes incorporating measurement error into uncertainties and using Bayesian inference to test differences between land use/cover classes.

Project information and raw data including sample descriptions, sample data, processing scripts, VNIR scans, and maps are available via web and R based packages. Future work will be done to map carbon across landscapes using environmental covariates and produce probabilities of C concentrations and stocks across multiple land use and management scenarios