

## UNIVERSITY OF FLORIDA

### *Database infrastructure for integrative carbon science research*

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**Description:** Rising CO<sub>2</sub> concentrations in the atmosphere and effects on global climate change have been well documented, and future impacts are uncertain but potentially devastating. Florida's natural and agro-forest ecosystems have much potential to sequester carbon in biomass and soils due to unique climatic and landscape conditions. However, research gaps exist to accurately assess carbon pools and fluxes at coarse scales, ranging from county to the region and larger. The overarching objective of this project is to address these obstacles by creating a terrestrial carbon information system (called "TerraC") for the carbon science community, focused on ecosystems in Florida. The information system will be administered through the UF Carbon Resources Science Center (<http://carboncenter.ifas.ufl.edu>), a multi-disciplinary Center dedicated to research in support of enhanced agricultural and natural resource carbon management.



**Budget:** \$199,440

**Universities:** UF

**External Collaborators:** Natural Resources Conservation Service-U.S. Department of Agriculture.

### **Progress Summary**

Over the past year, we have enhanced the Terrestrial Carbon Information System (TerraC) by incorporating data and meta data standards from a variety of sources. These enhancements provide several benefits: (i) users new to the system will be familiar with the data standards since they are widely used in the community; (ii) data compatibility and exchange will be enhanced; (iii) meta data tracking (e.g. laboratory methods to measure carbon content, stocks or fluxes) is enhanced; (iv) carbon data from different projects will be more readily comparable because units are standardized; and (v) the TerraC search engine, essential for carbon synthesis projects, will return consistent results due to the standardization.

The following standards have been coded into TerraC:

1. Soil carbon data:
  - a. Soil Survey Laboratory Methods Manual developed by Natural Resources Conservation Service (NRCS) - United States Department of Agriculture (USDA) (<http://soils.usda.gov/technical/lmm/>)
  - b. Soil Data Mart – Soil Survey Geographic Data developed by NRCS-USDA
2. Atmospheric carbon data:
  - a. aAmeriFlux

We are currently adding additional national standards for vegetation/biota and water. This requires to program in TerraC the variable names, variable descriptions, units, and methods used to measure variables. National standards also accommodate ancillary environmental variables which provide complimentary information related to carbon. For example, NRCS-USDA defines various soil carbon forms (e.g. total soil carbon, soil organic carbon, soil inorganic carbon) measured in form of concentration units and stocks. In addition, it also defines other environmental variables related to soil carbon, such as nutrients (e.g. soil phosphorus and soil nitrogen), soil taxonomic data (e.g. Soil Series or Soil Great Group), and soil hydrologic variables (e.g. hydric soil type). In TerraC users have the option to input not only the core soil carbon data, but also ancillary environmental data, which are extremely important for synthesis analysis and large-scale carbon modeling across ecosystems.

We are in the process of finalizing a TerraC tool which allows the creation of variables which are not defined by any national standard. Researchers may have measured in their projects physical (e.g. size partitioned carbon) or chemical (e.g. labile and recalcitrant forms, or mineralizable) carbon fractions in soils which characterize ecosystem processes. These laboratory methods are specialized and only documented in the peer-reviewed literature, but not any national or federal agency standard. TerraC will allow users to create new variables on-the-fly which are added to the core data fields of TerraC (SQL database) and TerraC meta data pool. This work is in progress and will be completed over the next 6 months.

