

Dataset for Geomorphology and Climate Interact to Control Organic Carbon Stock and Age in Mountain River Valley Bottoms

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Abstract: Organic carbon (OC) in valley bottom downed wood and soil that cycles over short to moderate timescales (10^1 to 10^5 yr) represents a large, dynamic, and poorly quantified pool of carbon whose distribution and residence time affects global climate. We sought to quantify this potentially important OC pool at the watershed scale to estimate its magnitude and age, as well as determine the controls on its variability within watersheds. To do this, we compared four disparate mountain river basins to show that mountain river valley bottoms store substantial estimated OC stocks in floodplain soil and downed wood (median OC of $127.3^{+24.5}_{-37.4}$ MgC/ha, $n = 178$). Although soil OC is generally young (exhibiting a median radiocarbon fraction modern value of $0.97^{+0.02}_{-0.01}$, $n = 121$), geomorphic processes regulate soil burial and processes that limit microbial respiration, preserving aged OC in especially deep, unconfined, wet, and/or high-elevation floodplain soils. We statistically modeled OC stocks to show that valley bottom morphology and hydrology regulate variability in floodplain soil retention and resulting variability in OC stock and age in floodplain soil throughout river networks. Comparing the distribution of OC stocks between wood and soil, we find that where floodplain soils are present, their OC stocks are generally greater than OC stocks stored in wood. Our results suggest that although mountain rivers may accumulate large OC stocks relatively rapidly, those stocks are highly sensitive to alterations in soil and wood retention, implying that human alterations to either disturb or restore floodplain wood and soil storage may have substantial impacts on OC storage in river corridors.

- **Format of data files:** .csv
- **Description:** These data describe organic carbon stocks and ages in rivers and associated characteristics. These data were collected during 2016 and 2017, and support analyses described in the journal article listed below.
- **Location where data were collected:** Middle Fork Snoqualmie Watershed, WA, USA; Sitkum and South Fork Calawah Watersheds, WA, USA; Big Sandy Watershed, WY, USA. See data sheet for lat/lon for each datum.
- **Time period during which data were collected:** 2016 and 2017
- **File Information:** 3 files:
 1. README.pdf: this README file
 2. DataSet_S1_metadata.csv: metadata describing each column in dataset

3. DataSet_S1.csv: data sheet, with columns defined by metadata. Data are processed.

- **Definitions of acronyms, site abbreviations, or other project-specific designations used in the data file names or documentation files:** see DataSetS1_metadata.csv
- **Variable information:** see DataSetS1_metadata.csv
- **Definitions of acronyms, site abbreviations, or other project-specific designations**
- **Software:** All data were processed using Excel, the R statistical package, and ArcGIS
- **Method(s):** See accompanying journal article (DOI will be included when published)
- **Data citation:**

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