# Metadata for literature-derived dataset

## Database structure

The dataset includes three levels: full citation information (Table S1), variables specific to sites (Table S2), and stand (“plot”)-level carbon and biomass data with associated covariates (Table S3). Individual measurements are nested within plots, where plots are defined as stands with unique qualities (e.g., a single age, land use or combination). Plots are nested within sites. Sites are defined by having a unique latitude and longitude, though the specificity of geolocation varied across studies with some reporting highly precise locations for each stand and others giving a single geolocation for a larger region.

We followed a few general rules for data extraction. If multiple publications described the same geolocation, we coded all data with a single site to avoid pseudoreplication. If a range was given for a variable, we calculated the average, but excluded data with large ranges, such as a forest age that spanned more than 10 years or a geolocation that spanned more than a degree latitude or longitude. Finally, for graphical data we used WebPlotDigitizer83 to extract the variables.

Note that we make available our full dataset, which includes some variables that we did not include in our final analysis but may be useful for future work. For some fields, data are missing, because studies did not provide all details (e.g., type of prior disturbance).

Table S3**: Explanation of variables in literature datasheet (“GROA literature.csv”)**

| **Column name** | **Description** |
| --- | --- |
| study.id | unique numeric identifier for each publication |
| citations.author | last name of first author |
| citations.year | year of publication |
| citations.journal | citation information including journal, volume and page number |
| citations.title | full title from publication |

### Table S4: Explanation of variables in site datasheet (“sites.csv”)

| **Column name** | **Description** |
| --- | --- |
| site.id | unique numeric identifier for each geolocation |
| study.id | unique numeric identifier for each publication |
| site.sitename | text description of site name |
| site.state | sub-national jurisdiction such as state, province etc., if given |
| site.country | country name |
| lat\_dec | latitude in decimal degrees |
| long\_dec | longitude in decimal degrees |
| other reference | other publications or resources used to fill out site information |
| elevation | height above sea level in meters, if given |
| AMT | annual mean temperature in degrees Celsius, if given |
| AMP | annual mean precipitation in millimeters, if given |
| soil.classification | soil order converted to US system of nomenclature, if given |

### Table S5: Explanation of variables in measurement datasheets (“biomass\_litter\_CWD.csv” and “soil.csv”)

| **Column name** | **Description** |
| --- | --- |
| measurement.id | unique identifier for each carbon/biomass measurement |
| plot.id | unique identifier for distinct spatial unit(s) within a site, e.g., if a study reported a single mean aboveground biomass measure for 12-year-old stands, this would receive a single plot.id whereas if separate measures were given for 12-year-old stands in previous pasture versus cropland, then each would have a distinct plot.id. |
| site.id | unique numeric identifier for each geolocation |
| study.id | unique numeric identifier for each publication |
| refor.type | Approach to restoring forest or reference condition; SNR = spontaneous natural regeneration (or “natural forest regrowth”), TMC = intensive tree monocrop (reference), C = cropland (reference), PA = pasture (reference) |
| species | name of dominant species, if given |
| prior | type of most recent disturbance or land use, if given; C = crop; SC = shifting cultivation/fallow; H = clear-cut harvest of land in forest use; F = fire; D = non-fire disturbance such as landslide or hurricane; PA = pasture; M = mining; TMC = tree monocrop (e.g., banana or rubber plantation) |
| stand.age | age of forest stand; crop and pasture = 0, otherwise age is as given in study; age range is between 0 and 100 years |
| date | year data were collected, if given |
| n | number of plots (e.g. distinct spatial units) per measurement |
| sub\_n | number of subplots per plot, e.g., soil samples pooled for a single measure |
| plot.size | largest plot dimension in m2 (e.g., plot size used to measure largest diameter trees) |
| variables.name | name of carbon pool; variables include aboveground\_biomass/carbon; understory\_biomass/carbon; litter\_biomass/carbon; deadwood\_biomass/carbon; belowground\_biomass/carbon; soil organic carbon (SOC)/percent soil organic matter (SOM\_per)/percent soil organic carbon (soil\_perC); or combinations of above if study did not parse data by pool, see “Definitions of Pools” below |
| mean\_ha | value of biomass or carbon estimate per hectare in Mg/ha |
| covar\_1 | type of covariate (see “Definitions of Pools”) |
| coV1\_value | value of covariate 1 |
| covar\_2 | type of covariate (see “Definitions of Pools”) |
| coV2\_value | value of covariate 2 |
| covar\_3 | type of covariate (see “Definitions of Pools”) |
| coV3\_value | value of covariate 3 |
| density | number of individual trees per hectare, if given |
| allometry | direct harvest = harvest of all site biomass; site-specific harvest = individual trees harvested on site; species-specific = based on species; forest-type-specific = based on similar forest in the region; biome-specific = based on general equations for a biome (e.g., 84) |
| ref | reference type to estimate rate of soil carbon accumulation; no\_comp = no comparison plot; plot\_change = repeated measurement of same plot; site\_chrono = chronosequence within a site; site\_ref = comparison of restored and unrestored plots within the same site; study\_chrono = chronosequence across sites; study\_ref = comparison of restored and unrestored plots across sites |
| clay | percent clay |
| silt | percent silt |
| sand | percent sand |
| texture | text description of soil texture |

## Definitions of Pools

1. Aboveground\_biomass/carbon refers to aboveground tree biomass excluding understory biomass/carbon. If the two pools are combined, we note the presence of the latter by adding “+ understory\_biomass/carbon” to the variables.name column. A minimum diameter at breast height (min\_dbh, covariate 1) is typically listed with this measurement with a “0” indicating all trees were sampled. Alternatively, studies sometimes measured only trees above a certain height, in which case we note minimum height (min\_height, covariate 1). Note that aboveground\_biomass\_woody indicates only stem and branch biomass, not foliage.
2. Understory\_biomass/carbon typically refers to herbaceous biomass, shrubs, lianas, and/ trees saplings shorter than breast height. Possible covariates (covariate 1) include maximum height (max\_height) or maximum dbh (max\_dbh) measured.
3. Belowground\_biomass/carbon refers to root biomass. We did not include studies that only quantified fine root biomass. Possible covariates (covariate 1) include minimum root diameter measured (root\_diameter\_min) or maximum depth of sampling (max\_depth). If a study only quantified roots up to a specific size, we noted this in root\_diameter\_max (covariate 2). We extracted but did not include in our analyses, data quantifying root biomass where there was no estimate of aboveground biomass.
4. Soil biomass/carbon was reported as soil organic carbon density (SOC), percent soil organic matter (SOM\_per), or soil organic carbon concentration (soil\_perC), depending on the study. If a study reported soil organic carbon concentration, we also included bulk\_density (covariate 3) where it was given. For all soil measures, we noted the maximum depth (max\_depth, covariate 1) and minimum depth (min\_depth, covariate 2) of measurement and analyzed data as the sum of all shallower soil profiles.
5. Litter\_biomass/carbon refers to litter and CWD\_biomass/carbon refers to coarse woody debris. We parsed data where possible according to IPCC guidelines85, where coarse woody debris includes wood lying on the surface, dead roots and stumps larger than or equal to 10cm. Litter includes all non-living biomass that is distinguishable from mineral soil, typically 2mm or greater and less than 10cm.

## **Studies included in database**

The references list first author, year, title and citation information for all studies (N = 257) in the larger database (N = 13,033 measurements). We included data from peer-reviewed publications or datasets from respected institutions with asterisks denoting the latter.

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