# Methods S1. Updates to ForC (ForC v4.0)

Here, we describe changes relative to ForC v3.0 (Anderson-Teixeira *et al.*, 2021), which were implemented prior to the release of ForC v4.0.

## New or modified fields

We added or modified a total of 18 fields (Table S1). Most notably, these included improvement of the representation of uncertainty, recording of original units and organic matter to C conversion factors, and expanding the information recorded in the citations table. For the latter, we used an R script to automatically harvest (scrape) the URL, citation, abstract and language of the publications, based on their DOI, using R package rvest(Wickham & RStudio, 2022). That information was manually retrieved when the web scraping failed.

## New variables

To create structure for EFDB-relevant records, we added a total of 15 new variables to the set of named and defined variables, counting each pair of variables with units in C (ending in \_C) or organic matter (ending in \_OM) as one. The majority of these were increment variables (n=11), adding to only one previously defined increment variable (aboveground biomass increment, *delta.agb*). These are directly related to C stocks as previously defined in ForC, with “*delta.*” added in front of the variable name. Further, we added variables capturing the belowground component of woody mortality (*woody.mortality\_root*) and the combined aboveground and belowground components of woody mortality (*woody.mortality*). Although most of these variables lacked records in ForC as of August 19, 2024, their addition gave the structure such that records can be populated over time. Finally, to provide better definition of the previously existing variable *organic.layer*, which has a nebulous definition that reflects the varied definitions adopted by original studies, we added two clearly defined variables: *litter* (relatively undecomposed plant material/ OL horizon), and *O.horizon* (entire O-horizon, including OL).

## Quality control measures

Prior to releasing ForC v4.0, we executed several quality control measures. First, we implemented a system of continuous integration using GitHub Actions (*sensu* Kim *et al.*, 2022) to run some automatic checks any time the master data files are updated, including outlier tests and checks for completeness and naming consistency of records across data files. Second, to improve information on geographic coordinates, we created a field to record coordinate precision (Table S1), and flagged and reviewed records with suspected low precision. Third, to identify erroneous climate data, we compared ForC climate values to those extracted from WorldClim version 2.1 (van de Pol *et al.*, 2016; Bailey & Pol, 2016) based on site coordinates. Records deviating from WorldClim values by more variable-specific thresholds (>5°C for mean annual temperature, >7.5°C for mean temperatures of the warmest and coldest months, or >1 for log(mean annual precipitation in mm)) were flagged as requiring review prior to use in analysis or submission to EFDB.

Because ForC v4.0 contained known duplicate records, we used R scripts to identify likely duplicates, as detailed in Anderson-Teixeira *et al.* (2021). Henceforth, we refer to the set of records with likely duplicates removed as “independent records”. All records sent to EFDB were ensured to be independent and original through manual review, as detailed below.

## Manual review of records to be sent to EFDB

EFDB data submissions required information that was not recorded in previous versions of ForC, but for which new fields were created for EFDB compatibility (Table S1). It was therefore necessary to return to original publications to retrieve relevant information, including (1) estimates in original units, (2) confidence intervals (when not already in ForC), (3) whether records of interest were presented in tables or text or digitized from figures (EFDB will not accept digitized data), and (4) whether records of interest were presented directly, as opposed to having been calculated from related variables (for example, if a study presents aboveground biomass and root biomass but not total biomass, EFDB would not accept the sum of these as a valid record of total biomass). We also checked that existing ForC records were complete and correct.

Manual review of records was the limiting step for data submission to EFDB. We prioritized review of (1) records from the Forest Global Earth Observatory (ForestGEO, Anderson-Teixeira *et al.*, 2015; Davies *et al.*, 2021), which are familiar to our team and generally high quality, (2) studies with confidence intervals recorded in ForC (because uncertainty estimates are important to the IPCC), (3) original publications containing large numbers of EFDB-relevant records, and (4) records from tropical regions. The latter criteria was motivated by the fact that although tropical forest is the single most important biome for climate change mitigation (Griscom *et al.*, 2017; Griscom *et al.*, 2020), ground-based data on tropical forest C cycling tends to be more scarce due to a variety of challenges (Anderson-Teixeira *et al.*, 2021; de Lima *et al.*, 2022), and tropical countries are more likely to apply Tier 1 methodology that bases forest C budgets on internationally defined IPCC default values (Romijn *et al.*, 2015).

## Addition of new records

In addition to reviewing existing records, we added a total of 329 new records to ForC. These included 104 records from two studies (Lutz *et al.*, 2021; Piponiot *et al.*, 2022) that were not previously included in ForC. In addition, we created new records for 225 EFDB-relevant estimates presented in the original publication that were not yet present in ForC.

## References

**Anderson-Teixeira KJ, Davies SJ, Bennett AC, Gonzalez-Akre EB, Muller-Landau HC, Joseph Wright S, Abu Salim K, Almeyda Zambrano AM, Alonso A, Baltzer JL, *et al.*** **2015**. [CTFS-ForestGEO : A worldwide network monitoring forests in an era of global change](https://doi.org/10.1111/gcb.12712). *Global Change Biology* **21**: 528–549.

**Anderson-Teixeira KJ, Herrmann V, Morgan RB, Bond-Lamberty B, Cook-Patton SC, Ferson AE, Muller-Landau HC, Wang MMH**. **2021**. [Carbon cycling in mature and regrowth forests globally](https://doi.org/10.1088/1748-9326/abed01). *Environmental Research Letters* **16**: 053009.

**Bailey LD, Pol M van de**. **2016**. [Climwin: An R Toolbox for Climate Window Analysis](https://doi.org/10.1371/journal.pone.0167980). *PLOS ONE* **11**: e0167980.

**Davies SJ, Abiem I, Abu Salim K, Aguilar S, Allen D, Alonso A, Anderson-Teixeira K, Andrade A, Arellano G, Ashton PS, *et al.*** **2021**. [ForestGEO: Understanding forest diversity and dynamics through a global observatory network](https://doi.org/10.1016/j.biocon.2020.108907). *Biological Conservation* **253**: 108907.

**de Lima RAF, Phillips OL, Duque A, Tello JS, Davies SJ, de Oliveira AA, Muller S, Honorio Coronado EN, Vilanova E, Cuni-Sanchez A, *et al.*** **2022**. [Making forest data fair and open](https://doi.org/10.1038/s41559-022-01738-7). *Nature Ecology & Evolution*.

**Griscom BW, Adams J, Ellis PW, Houghton RA, Lomax G, Miteva DA, Schlesinger WH, Shoch D, Siikamäki JV, Smith P, *et al.*** **2017**. [Natural climate solutions](https://doi.org/10.1073/pnas.1710465114). *Proceedings of the National Academy of Sciences* **114**: 11645–11650.

**Griscom BW, Busch J, Cook-Patton SC, Ellis PW, Funk J, Leavitt SM, Lomax G, Turner WR, Chapman M, Engelmann J, *et al.*** **2020**. [National mitigation potential from natural climate solutions in the tropics](https://doi.org/10.1098/rstb.2019.0126). *Philosophical Transactions of the Royal Society B: Biological Sciences* **375**: 20190126.

**Kim AY, Herrmann V, Bareto R, Calkins B, Gonzalez-Akre E, Johnson DJ, Jordan JA, Magee L, McGregor IR, Montero N, *et al.*** **2022**. [Implementing GitHub Actions continuous integration to reduce error rates in ecological data collection](https://doi.org/10.1111/2041-210X.13982). *Methods in Ecology and Evolution* **13**: 2572–2585.

**Lutz JA, Struckman S, Furniss TJ, Birch JD, Yocom LL, McAvoy DJ**. **2021**. [Large-diameter trees, snags, and deadwood in southern Utah, USA](https://doi.org/10.1186/s13717-020-00275-0). *Ecological Processes* **10**: 9.

**Piponiot C, Anderson-Teixeira KJ, Davies SJ, Allen D, Bourg NA, Burslem DFRP, Cárdenas D, Chang-Yang C-H, Chuyong G, Cordell S, *et al.*** **2022**. [Distribution of biomass dynamics in relation to tree size in forests across the world](https://doi.org/10.1111/nph.17995). *New Phytologist* **n/a**.

**Romijn E, Lantican CB, Herold M, Lindquist E, Ochieng R, Wijaya A, Murdiyarso D, Verchot L**. **2015**. [Assessing change in national forest monitoring capacities of 99 tropical countries](https://doi.org/10.1016/j.foreco.2015.06.003). *Forest Ecology and Management* **352**: 109–123.

**van de Pol M, Bailey LD, McLean N, Rijsdijk L, Lawson CR, Brouwer L**. **2016**. [Identifying the best climatic predictors in ecology and evolution](https://doi.org/10.1111/2041-210X.12590) (O Gimenez, Ed.). *Methods in Ecology and Evolution* **7**: 1246–1257.

**Wickham H, RStudio**. **2022**. Rvest: Easily Harvest (Scrape) Web Pages.