

The *fortedata* R package: open-science datasets from a manipulative experiment testing forest resilience

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Plots table

Table S1. Plots table. The `fd_plots()` function is an internal function that contains plot level metadata.

| field | description | class | units |
|----------------|----------------------------------|-----------|-----------|
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| latitude_plot | Decimal latitude of plot center | numeric | degrees N |
| longitude_plot | Decimal longitude of plot center | numeric | degrees E |
| plot_area_m2 | Plot area | integer | m2 |

25 **Subplots table**

Table S2. Subplots table. `fd_subplots()` is an internal function that returns subplot-level metadata.

| field | description | class | units |
|-------|-------------|-------|-------|
|-------|-------------|-------|-------|

| | | | |
|-------------------|-------------------------------------|-----------|-----------|
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| latitude_subplot | Decimal latitude of subplot center | numeric | degrees N |
| longitude_subplot | Decimal longitude of subplot center | numeric | degrees E |
| subplot_area_m2 | | integer | m2 |

Nested subplots table

30 **Table S3.** Nested subplots table. `fd_nested_subplots()` is an internal function that returns nested subplot metadata. Nested subplots are either sampling points (0, 1, 3, 5, 7) for specific FoRTE measurements (e.g. soil respiration, micrometeorology) or 4 m² herbaceous layer vegetation sampling plots (2, 4, 6, 8)—illustrated in Figure 1B.

| field | description | class | units |
|------------------------|-----------------------|-----------|-------|
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| nested_subplot | Nested subplot number | integer | |
| nested_subplot_area_m2 | Nested subplot area | integer | m2 |

Number of Observations

Inventory dataset

35 **Table S4.** Inventory dataset. `fd_inventory` is an external function that returns forest inventory data.

| field | description | class | units |
|------------|-------------|-----------|-------|
| subplot_id | | character | |
| tag | | integer | |

| | | |
|---------------|---|------------|
| species | Species code from the USDA Plants Database | character |
| dbh_cm | Bole diameter at 1.37 m | numeric cm |
| health_status | Live (L), moribund (M), or dead (D) | character |
| canopy_status | Overstory dominant (OD), overstory submissive (OS), sapling (SA), understory (UN) | character |
| date | Date of measurement | date |
| notes | | character |
| replicate | (from plots table) | character |
| plot | (from plots table) | integer |
| subplot | (from subplots table) | character |

Soil respiration

Table S5. Soil respiration table. `fd_soil_respiration()` is an external function that returns soil respiration collected with a LI-COR Biosciences LI-6400 portable gas analyzer with 10 cm diameter soil CO₂ closed chamber cuvette (LI-COR Inc, Lincoln, NE, USA). This dataset includes concurrently measured soil temperature (from surface to 7 cm depth) and soil water content (measured using a Campbell Sciences CS620 (Logan, UT)).

| field | description | class | units |
|----------------|--|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| date | Date of measurement | date | |
| timestamp | Timestamp of measurement | POSIXct | |
| nested_subplot | Nested subplot sampling point inside subplot | character | |

| | | | |
|-----------------|--|---------|----------------|
| run | Indicates first or second sample taken with IRGA | integer | |
| soil_co2_efflux | Soil surface CO2 efflux measured with a LI-6400 | numeric | Âµmol CO2/m2/s |
| soil_temp | Soil temperature measured at 7 cm depth | numeric | degrees C |
| vwc | Volumetric water content | numeric | percent |

Leaf spectrometry

45 **Table S6.** Leaf spectrometry. `fd_leaf_spectrometry()` is an external function that returns vegetation indices calculated from leaf spectra data collected on leaves from understory vegetation with a CID Biosciences CI-710 Handheld spectrometer (Camas, WA).

| field | description | class | units |
|-------------|---|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| date | Date of measurement | Date | |
| species | Species code from the USDA Plants Database; see https://plants.sc.egov.usda.gov/java/ | character | |
| index | Spectral index measured from the CID 710 | character | |
| index_value | Measured index value corresponding to the index | numeric | |

Photosynthesis

50 **Table S7.** Photosynthesis table. `fd_photosynthesis()` is an external function that returns ecophysiological data (e.g. photosynthesis, transpiration) on subcanopy leaves measured with a LI-COR Biosciences LI-6400 (Lincoln, NE).

| field | description | class | units |
|-------|-------------|-------|-------|
|-------|-------------|-------|-------|

| | | | |
|------------|---|-----------|---|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| timestamp | Timestamp of measurement | POSIXct | |
| obs | Observation number within file | integer | |
| ftime | Number of seconds since logging began | numeric | |
| ebal | Energy balance on? | integer | |
| photo | Photosynthetic rate | numeric | $\mu\text{mol CO}_2/\text{m}^2/\text{s}$ |
| cond | Stomatal conductance | numeric | $\text{mol H}_2\text{O}/\text{m}^2/\text{s}$ |
| ci | Intracellular CO ₂ concentration | numeric | $\mu\text{mol}/\text{mol}$ |
| trmmol | Transpiration rate | numeric | $\text{mmol H}_2\text{O}/\text{m}^2/\text{s}$ |
| vpdl | Leaf-level vapor pressure deficit | numeric | kPa |
| ctleaf | Leaf temperature from energy balance calculation | numeric | degrees C |
| area | In-chamber leaf area (note that this area is not the true sampled tissue area for needleleaf samples) | numeric | cm ² |
| blc_1 | One sided boundary layer conductance | numeric | $\text{mol}/\text{m}^2/\text{s}$ |
| stmrat | Stomatal ratio estimate | numeric | |
| blcond | Boundary layer conductance | numeric | $\text{mol}/\text{m}^2/\text{s}$ |
| tair | Chamber air temperature | numeric | degrees C |
| tleaf | Leaf surface temperature | numeric | degrees C |
| tblk | IRGA block temperature | numeric | degrees C |
| co2r | Reference CO ₂ concentration | numeric | $\mu\text{mol}/\text{mol}$ |
| co2s | Sample CO ₂ concentration | numeric | $\mu\text{mol}/\text{mol}$ |
| h2or | Reference H ₂ O concentration | numeric | $\mu\text{mol}/\text{mol}$ |

| | | | |
|----------|---|-----------|------------------------|
| h2os | Sample H2O concentration | numeric | μmol/mol |
| rh_r | Reference relative humidity | numeric | percent |
| rh_s | Sample relative humidity | numeric | percent |
| flow | Flow rate | numeric | μmol/mol |
| pari | In-chamber PAR | integer | μmol/m ² /s |
| paro | External PAR | integer | μmol/m ² /s |
| press | Atmospheric pressure | numeric | kPa |
| csmch | | numeric | |
| hsmch | | numeric | |
| csmchsd | Standard deviation of CO2S during averaging time of most recent match | numeric | |
| hsmchsd | Standard deviation of H2OS during averaging time of most recent match | numeric | |
| crmchsd | Standard deviation of CO2S during averaging time of most recent match | numeric | |
| hrmchsd | Standard deviation of CO2R during averaging time of most recent match | numeric | |
| stablef | Stable/total as a fraction | numeric | |
| blcslope | Slope term used in calculating boundary layer conductance | numeric | |
| blcofst | Intercept term using in calculating boundary layer conductance | numeric | |
| f_parin | Fraction of ParIn_um to use for energy balance | numeric | |
| f_parout | Fraction of ParOut_um to use for energy balance | numeric | |
| alphak | Used in conversion of \hat{A} μmol/mol to W/m ² | numeric | |
| status | Status variable | integer | |
| species | Species code from the USDA Plants Database; see https://plants.sc.egov.usda.gov/java/ | character | |
| sample | Sample number varies by species by plot | integer | |

comments ID of closest vegetation survey plot (NE, SE, SW, NW) to the character
stem measured, plus any additional comments

Litter

Table S8. Litterfall table. `fd_litter()` is an external function that returns dry litter mass collected in litter traps located at nested subplots (1, 3, 5, 7) within each FoRTE subplot. The `bag_mass_g` values represent air-dried mass.

| field | description | class | units |
|------------|---|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| year | Year of litter collection | integer | |
| species | Species code from the USDA Plants Database; see https://plants.sc.egov.usda.gov/java/ | character | |
| bagtare_g | Mass of bag | numeric | g |
| bagmass_g | Mass of bag + litter | numeric | g |

55 Hemispherical camera

Table S9. Hemispherical imagery table. `fd_hemi_camera()` is an external function that returns undercanopy, hemispherical imagery captured using a Sony DSLR camera (Regent Instruments; Quebec, QU) where the blue channel has been replaced with near-infrared in order to calculate normalized difference vegetation index (NDVI). Raw imagery has been processed using WinsCANOPY
60 (Regent Instruments; Quebec, QU).

| field | description | class | units |
|------------|--|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |

| | | |
|----------------|--|-----------|
| subplot | Subplot (E, W) | character |
| nested_subplot | NestedSubplotSampling points | integer |
| date | Date of measurement | Date |
| ndvi | Normalized Difference Vegetation Index, estimates greenness | numeric |
| gap_fraction | Ratio of gap space in the canopy, or open area | numeric |
| openness | Fraction of open gap space in the canopy | numeric |
| lai_cam | Leaf area index | numeric |
| clumping_index | The ratio of the effective leaf area index to the true leaf area index | numeric |

Canopy structure

Table S10. Canopy structural traits table. `fd_canopy_structure()` is an external function that returns canopy structural trait data collected using a terrestrial based portable canopy lidar unit (Regent Instruments 3100 FHS; . Raw lidar data has been processed using `forestr` version 1.0.1 (Atkins et al. 2018) in R 3.6 (R Core Team, 2020) to calculate canopy structural trait metrics.

| field | description | class | units |
|-----------------|--|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| year | Year of measurement | integer | |
| mean.height | Mean height of vai | numeric | |
| height.2 | Standard deviation of mean height | numeric | |
| mean.height.var | Variance of mean height | numeric | |

| | | |
|-------------------|--|---------|
| mean.height.rms | Root mean square height | numeric |
| transect.length | Length of transect | integer |
| mode.el | Mean height of maximum VAI | numeric |
| max.el | Greatest density of vai x, z position | numeric |
| mode.2 | Variance of maximum vai | numeric |
| max.can.ht | Maximum measured canopy height | numeric |
| mean.max.ht | Mean outer canopy height or moch | numeric |
| mean.vai | Average vai across transect | numeric |
| mean.peak.vai | Average height of maximum vai | numeric |
| deep.gaps | Number of 1 m wide bins with no lidar returns | integer |
| deep.gap.fraction | Deep gaps divided by transect length | numeric |
| porosity | Ratio of empty to filled bins in the canopy | numeric |
| std.std | Precursor to rugosity | numeric |
| mean.std | Precursor to rugosity | numeric |
| rugosity | Accumulated canopy complexity metric | numeric |
| top.rugosity | Standard deviation of final lidar returns | numeric |
| mean.return.ht | Average lidar return distance | numeric |
| sd.return.ht | Standard deviation of lidar return distances | numeric |
| sky.fraction | Ratio of sky hits to lidar returns | numeric |
| cover.fraction | 1/sky fraction | numeric |
| max.ht | Same as max can ht, removed in later forestr updates | numeric |

| | | |
|----------------|--|---------|
| scan.density | No. of lidar returns divided by transect length | numeric |
| rumple | Outer surface variability divided by transect length | numeric |
| clumping.index | The ratio of the effective leaf area index to the true leaf area index | numeric |
| enl | Effective number of layers | numeric |

Ceptometer

Table S11. Ceptometer table. `fd_par()` is an external function that returns concurrently measured above- and below-canopy light availability, as well as leaf area index (calculated from above- and below-canopy light) collected along 40 m long north-to-south and east-to-west transects through the center of each FoRTE subplot. Data were collected using a Decagon Devices LP-80 handheld ceptometer (Pullman, WA).

| field | description | class | units |
|------------|--|-----------|-------|
| subplot_id | Subplot ID number, a concatenation of replicate, plot, and subplot codes | character | |
| replicate | Replicate group (A-D) | character | |
| plot | Plot number | integer | |
| subplot | Subplot (E, W) | character | |
| timestamp | Timestamp of measurement | POSIXct | |
| a_par | Above canopy PAR (photosynthetically available radiation) | numeric | |
| b_par | Below canopy PAR (photosynthetically available radiation) | numeric | |
| fapar | Fraction of PAR absorbed by the canopy | numeric | |
| lai_cept | Leaf area index derived from ceptometer | numeric | |