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# Grasstree output variables

See DayCent manual for all other output variables not specific to grasstrees or the DayCent-CABBI version.

## Monthly list100 output variables for GRASSTREES

iel: 1=N, 2=P, 3=S

LIVE LEAVES

agtlvcis(1) – annual accumulator for leaf production (unlabeled, g C m-2)

agtlvcis(2) – annual accumulator for leaf production (labeled, g C m-2)

gtlvcis(1) – live leaf carbon (unlabeled, g C m-2)

gtlvcis(2) – live leaf carbon (labeled, g C m-2)

gtleavc – gtlvcis(1) + gtlvcis(2)

gtleave(iel) – live leaf N,P,S (g E m-2)

gtlvacc – annual accumulator: agtlvcis(1) + agtlvcis(2) (g C m-2)

gtlvprd – gtlvacc in the last month of the growing season (g C m-2)

DEAD LEAVES

gtdlvcis(1) – dead attached leaf carbon (unlabeled, g C m-2)

gtdlvcis(2) – dead attached leaf carbon (labeled, g C m-2)

gtdleavc – gtdlvcis(1) + gtdlvcis(2)

gtdleave(iel) – dead attached leaf N,P,S (g E m-2)

LIVE STEMS

agtstmcis(1) – annual accumulator for stem production (unlabeled, g C m-2)

agtstmcis(1) – annual accumulator for stem production (labeled, g C m-2)

gtstmcis(1) – live stem carbon (unlabeled, g C m-2)

gtstmcis(2) – live stem carbon (labeled, g C m-2)

gtstemc – gtstmcis(1) + gtstmcis(2)

gtsteme(iel) – live stem carbon (g E m-2)

gtstemacc – annual accumulator: agtstmcis(1) + agtstmcis(2) (g C m-2)

gtstemprd – gtstemacc in the last month of the growing season (g C m-2)

DEAD STEMS

gtdstmcis(1) – dead standing stem carbon (unlabeled, g C m-2)

gtdstmcis(2) – dead standing stem carbon (labeled, g C m-2)

gtdstemc – gtdstmcis(1) + gtdstmcis(2)

gtdsteme(iel) – dead standing stem N,P,S (g E m-2)

LIVE JUVENILE FINE ROOTS

agtfrcisj(1) – annual accumulator for juvenile fine root production (unlabeled, g C m-2)

agtfrcisj(2) – annual accumulator for juvenile fine root production (labeled, g C m-2)

gtfrootcj – gtfrtcisj(1) + gtfrtcisj(2)

gtfrtcisj(1) – live juvenile fine root carbon (unlabeled, g C m-2)

gtfrtcisj(2) – live juvenile fine root carbon (labeled, g C m-2)

gtfrootej(iel) – live juvenile fine root N,P,S (g E m-2)

gtfrtjacc – annual accumulator: agtfrcisj(1) + agtfrcisj(2) (g C m-2)

gtfrtjprd – gtfrtjacc in the last month of the growing season (g C m-2)

LIVE MATURE FINE ROOTS

agtfrcism(1) – annual accumulator for mature fine root production (unlabeled, g C m-2)

agtfrcism(2) – annual accumulator for mature fine root production (labeled, g C m-2)

gtfrootcm – gtfrtcism(1) + gtfrtcism(2)

gtfrtcism(1) – live mature fine root carbon (unlabeled, g C m-2)

gtfrtcism(2) – live mature fine root carbon (labeled, g C m-2)

gtfrootem(iel) – live mature fine root N,P,S (g E m-2)

gtfrtmacc – annual accumulator: agtfrcism(1) + agtfrcism(2) (g C m-2)

gtfrtmprd – gtfrtmacc in the last month of the growing season (g C m-2)

LIVE COARSE ROOTS

agtcrtcis(1) – annual accumulator for coarse root production (unlabeled, g C m-2)

agtcrtcis(2) – annual accumulator for coarse root production (labeled, g C m-2)

gtcrtcis(1) – live coarse root carbon (unlabeled, g C m-2)

gtcrtcis(2) – live coarse root carbon (labeled, g C m-2)

gtcrootc – gtcrtcis(1) + gtcrtcis(2)

gtcroote(iel) ) – live coarse root N,P,S (g E m-2)

gtcrtacc – annual accumulator: agtcrtcis(1) + agtcrtcis(2) (g C m-2)

gtcrtprd – gtcrtacc in the last month of the growing season (g C m-2)

PLANT UPTAKE of N, P, S

eupgtprt(1,iel) – annual accumulator of N,P,S uptake by leaves (g E m-2)

eupgtprt(2,iel) – annual accumulator of N,P,S uptake by stems(g E m-2)

eupgtprt(3,iel) – annual accumulator of N,P,S uptake by juvenile fine roots (g E m-2)

eupgtprt(4,iel) – annual accumulator of N,P,S uptake by mature fine roots (g E m-2)

eupgtprt(5,iel) – annual accumulator of N,P,S uptake by coarse roots (g E m-2)

PLANT and SYSTEM C, N, P, and S

gtpltc = gtleavc + gtfrootcj + gtfrootcm + gtstemc + gtcrootc + gtdleavc + gtdstemc

gtplte(iel) = gtleave(iel) + gtfrootej(iel) + gtfrootem(iel) + gtsteme(iel) + gtcroote(iel)

+ gtdleave(iel) + gtdsteme(iel)

gtsysc = gtpltc + litter C + soil C (g C m-2)

gtsyse(iel) = gtplte(iel) + litter N,P,S + soil N,P,S (g E m-2)

POTENTIAL PRODUCTION

potgtacc – accumulator for potential growing season production for a grasstree (g C m-2 yr-1)

PLANT PRODUCTION and UPTAKE of N, P, S

gtcmth(12) – monthly production for grasstree system (not working yet!)

gtcacc – gtlvacc + gtfrtjacc + gtfrtmacc + gtstemacc + gtcrtacc

gtcprd – gtcacc in the last month of the growing season

cprodgt – total monthly C production for grasstree system (g C m-2)

eprodgt(1) – total monthly N uptake for grasstree system (g N m-2)

eprodgt(2) – total monthly P uptake for grasstree system (gP m-2)

eprodgt(3) – total monthly S uptake for grasstree system (gS m-2)

HARVEST (TREM)

These accumulators were changed from simulation to annual accumulators on 9/3/2019

gtcrem – **annual** accumulator of C removed from harvest of live and dead leaves and live and dead stems (g C m-2)

gterem(1) – **annual** accumulator of N removed from harvest of live and dead leaves and live and dead stems (g N m-2)

gterem(2) – **annual** accumulator of P removed from harvest of live and dead leaves and live and dead stems (g P m-2)

gterem(3) – **annual** accumulator of S removed from harvest of live and dead leaves and live and dead stems (g S m-2)

RETURN of C and E after TREM event

These accumulators were changed from simulation to annual accumulators on 9/3/2019

gtcreta- **annual** accumulator of C returned to system as litter or charcoal during a TREM (grasstree removal) event for a grasstree system (g C m-2)

gtereta(1) – **annual** accumulator of N returned to system as litter or elemental return to mineral soil during a TREM (grasstree removal) event for a grasstree system (g N m-2)

gtereta(2) – **annual** accumulator of P returned to system as litter or elemental return to mineral soil during a TREM (grasstree removal) event for a grasstree system (g P m-2)

gtereta(3) – **annual** accumulator of S returned to system as litter or elemental return to mineral soil during a TREM (grasstree removal) event for a grasstree system (g S m-2)

AUTOTROPHIC RESPIRATION

grspann(3) – Accumulator for annual growth respiration for grasstree (g C m-2)

grspmth(3) – Monthly growth respiration for grasstree (g C m-2)

mrspann(3) – Accumulator for annual maintenance respiration for grasstree (g C m-2)

mrspmth(3) – Monthly maintenance respiration for grasstree (g C m-2)

arspmth(3,1) – Monthly unlabeled autotrophic respiration for grasstree (g C m-2)

arspmth(3,2) – Monthly labeled autotrophic respiration for grasstree (g C m-2)

gtautoresp(1) – annual accumulator for unlabeled autotrophic respiration for grasstree system (g C m‑2)

gtautoresp(2) – annual accumulator for labeled autotrophic respiration for grasstree system (g C m‑2)

srspann(3) – Accumulator for annual root respiration for grasstree system(g C m-2)

srspmth(3) – Monthly root respiration for grasstree system (g C m-2)

CARBOHYDRATE STORAGE

carbostg(3,1) – internal carbohydrate storage (unlabeled, g C m-2)

carbostg(3,2) – internal carbohydrate storage (labeled, g C m-2)

ELEMENTAL RETRANSLOCATION STORAGE

gtstg(1) – internal N storage (g N m-2)

gtstg(2) – internal P storage (g P m-2)

gtstg(3) – internal S storage (g S m-2)

OTHER

dcarbostg(3) – not currently used

dautoresp(3) – not currently used

ATMOSPHERIC CO2 EFFECTS

co2cpr(3) – the calculated effect on grasstree potential production of doubling atmospheric CO2 concentration from 350 ppm to 700 ppm

co2ctr(3) – the calculated effect on grasstree transpiration of doubling atmospheric CO2 concentration from 350 ppm to 700 ppm

co2crs(3) – the calculated effect on grasstree root-shoot ratio of doubling atmospheric CO2 concentration from 350 ppm to 700 ppm

co2cce(3,1,iel) – the calculated effect on grasstree minimum C/E ratios of doubling atmospheric CO2 concentration from 350 ppm to 700 ppm

co2cce(3,2,iel) – the calculated effect on grasstree maximum C/E ratios of doubling atmospheric CO2 concentration from 350 ppm to 700 ppm

SYMBIOTIC N FIXATION

snfxac(3) – annual accumulator for symbiotic N fixation (g N m-2)

## Time representation in output files

DayCent ASCII output files are produced in addition to the monthly output in the \*.bin file. Simulation time in the DayCent output file is represented as a decimal value with the value preceding the decimal point representing the year of the simulation and the value after the decimal point representing the month in the simulation using the following values:

Jan – .00

Feb – .08

Mar – .17

Apr – .25

May – .33

Jun – .42

Jul – .50

Aug – .58

Sep – .67

Oct – .75

Nov – .83

Dec – .92

The \*.bin file that is produced when using DayCent contains monthly output values. Simulation times for the monthly output from the \*.bin file are represented as a decimal value with the value preceding the decimal point representing the year of the simulation and the value after the decimal point representing the month in the simulation using the following values:

Jan – .08

Feb – .17

Mar – .25

Apr – .33

May – .42

Jun – .50

Jul – .58

Aug – .67

Sep – .75

Oct – .83

Nov – .92

Dec – 1.00

These month fractions are added to the year value so that, for example January of year 1998 will output as time 1998.08 (1998 + .08) and December of year 1998 will output as time 1999.00 (1999 + 1.00).

Note that the monthly time values in the \*.bin files are shifted by 1/12 from the DayCent ASCII \*.out output files such that:

\*.out file \*.bin file

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Jan – .00 Jan – .08

Feb – .08 Feb – .17

Mar – .17 Mar – .25

Apr – .25 Apr – .33

May – .33 May – .42

Jun – .42 Jun – .50

Jul – .50 Jul – .58

Aug – .58 Aug – .67

Sep – .67 Sep – .75

Oct – .70 Oct – .83

Nov – .83 Nov – .92

Dec – .92 Dec – 1.00

## Daily above and below ground live carbon and nitrogen: bio.csv

(Note: the order of forest columns in this file differ from other versions of DayCent)

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

aglivc (Column 3) – Carbon in aboveground live for grass/crop (g C m-2)

bglivcj (Column 4) – Carbon in juvenile live fine roots for grass/crop (g C m-2)

bglivcm (Column 5) – Carbon in mature live fine roots for grass/crop (g C m-2)

aglivn (Column 6) – Nitrogen in aboveground live for grass/crop (g N m-2)

bglivnj (Column 7) – Nitrogen in juvenile live fine roots for grass/crop (g N m-2)

bglivnm (Column 8) – Nitrogen in mature live fine roots for grass/crop (g N m-2)

rleavc (Column 9) – Carbon in forest system leaf component (g C m-2)

fbrchc (Column 10) – Carbon in forest system fine branch component (g C m-2)

rlwodc (Column 11) – Carbon in forest system large wood component (g C m-2)

frootcj (Column 12) – Carbon in forest system juvenile fine root component (g C m-2)

frootcm (Column 13) – Carbon in forest system mature fine root component (g C m-2)

crootc (Column 14) – Carbon in forest system coarse root component (g C m-2)

rleavn (Column 15) – Nitrogen in forest system leaf component (g N m-2)

fbrchn (Column 16) – Nitrogen in forest system fine branch component (g N m-2)

rlwodn (Column 17) – Nitrogen in forest system large wood component (g N m-2)

frootnj (Column 18) – Nitrogen in forest system juvenile fine root component (g N m-2)

frootnm (Column 19) – Nitrogen in forest system mature fine root component (g N m-2)

crootn (Column 20) – Nitrogen in forest system coarse root component (g N m-2)

gtleavc (Column 21) – Carbon in grasstree live leaf component (g C m‑2)

gtstemc (Column 22) – Carbon in grasstree live stem component (g C m‑2)

gtfrootcj (Column 23) – Carbon in grasstree live juvenile fine root component (g C m‑2)

gtfrootcm (Column 24) – Carbon in grasstree live mature fine root component (g C m‑2)

gtcrootc (Column 25) – Nitrogen in grasstree live coarse root component (g C m‑2)

gtleavn (Column 26) – Nitrogen in grasstree live leaf component (g N m‑2)

gtstemn (Column 27) – Nitrogen in grasstree live stem component (g N m‑2)

gtfrootnj (Column 28) – Nitrogen in grasstree live juvenile fine root component (g N m‑2)

gtfrootnm (Column 29) – Nitrogen in grasstree live mature fine root component (g N m‑2)

gtcrootn (Column 30) – Nitrogen in grasstree live coarse root component (g N m‑2)

h2ogef(1) (Column 31) – Water effect on crop/grass production (0.0 – 1.0)

h2ogef(2) (Column 32) – Water effect on forest production (0.0 – 1.0)

h2ogef(3) (Column 33) – Water effect on grasstree production (0.0 – 1.0)

## Daily carbon flows to soil organic matter pools: cflows.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

som11tosom21 (Column 3) – Carbon flow from active surface organic matter pool to slow surface organic matter pool (g C m-2 d-1)

som12tosom22 (Column 4) – Carbon flow from active soil organic matter pool to slow soil organic matter pool (g C m-2 d-1)

som12tosom3 (Column 5) – Carbon flow from active soil organic matter pool to passive soil organic matter pool (g C m-2 d-1)

som21tosom11 (Column 6) – Carbon flow from slow surface organic matter pool to active surface organic matter pool (g C m-2 d-1)

som21tosom22 (Column 7) – Carbon flow from slow surface organic matter pool to slow soil organic matter pool (g C m-2 d-1)

som22tosom12 (Column 8) – Carbon flow from slow soil organic matter pool to active soil organic matter pool (g C m-2 d-1)

som22tosom3 (Column 9) – Carbon flow from slow soil organic matter pool to passive soil organic matter pool (g C m-2 d-1)

som3tosom12 (Column 10) – Carbon flow from passive soil organic matter pool to active soil organic matter pool (g C m-2 d-1)

metc1tosom11 (Column 11) – Carbon flow from surface metabolic pool to active surface organic matter pool (g C m-2 d-1)

metc2tosom12 (Column 12) – Carbon flow from soil metabolic pool to active soil organic matter pool (g C m-2 d-1)

struc1tosom11 (Column 13) – Carbon flow from surface structural pool to active surface organic matter pool (g C m-2 d-1)

struc1tosom21 (Column 14) – Carbon flow from surface structural pool to slow surface organic matter pool (g C m-2 d-1)

struc2tosom12 (Column 15) – Carbon flow from soil structural pool to active soil organic matter pool (g C m-2 d-1)

struc2tosom22 (Column 16) – Carbon flow from soil structural pool to slow soil organic matter pool (g C m-2 d-1)

wood1tosom11 (Column 17) – Carbon flow from dead fine branch pool to active surface organic matter pool (g C m-2 d-1)

wood1tosom21 (Column 18) – Carbon flow from dead fine branch pool to slow surface organic matter pool (g C m-2 d-1)

wood2tosom11 (Column 19) – Carbon flow from dead large wood pool to active surface organic matter pool (g C m-2 d-1)

wood2tosom21 (Column 20) – Carbon flow from dead large wood pool to slow surface organic matter pool (g C m-2 d-1)

wood3tosom12 (Column 21) – Carbon flow from dead coarse root pool to active soil organic matter pool (g C m-2 d-1)

wood3tosom22 (Column 22) – Carbon flow from dead coarse root pool to slow soil organic matter pool (g C m-2 d-1)

Note: the following daily outputs are the inputs from the previous day:

inputmetabc1 (Column 23) – Total C inputs to surface metabolic pool (g C m-2 d-1)

inputmetabc2 (Column 24) – Total C inputs to soil metabolic pool (g C m-2 d-1)

inputstrucc1 (Column 25) – Total C inputs to surface structural pool (g C m-2 d-1)

inputstrucc2 (Column 26) – Total C inputs to soil structural pool (g C m-2 d-1)

inputmetabn1 (Column 27) – Total N inputs to surface metabolic pool (g N m-2 d-1)

inputmetabn2 (Column 28) – Total N inputs to soil metabolic pool (g N m-2 d-1)

inputstrucn1 (Column 29) – Total N inputs to surface structural pool (g N m-2 d-1)

inputstrucn2 (Column 30) – Total N inputs to soil structural pool (g N m-2 d-1)

exudc2m2 (Column 31) – C inputs to soil metabolic pool from root exudation (g C m-2 d-1)

exudn2m2 (Column 32) – N inputs to soil metabolic pool from root exudation (g N m-2 d-1)

## Daily evapotranspiration, defac, soil temperature, snow water, and growing degree day, and luxury N uptake variables: daily.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

PET(cm) (Column 3) – Potential evapotranspiration rate (cm H2O d-1)

agdefac (Column 4) – Surface decomposition factor based on temperature and moisture (0 – 1)

bgdefac (Column 5) – Soil decomposition factor based on temperature and moisture (0 – 1)

stemp(C) (Column 6) – Average soil temperature near the soil surface (°C)

snow (Column 7) – Snowpack water content (cm H2O)

snlq (Column 8) – Liquid snow water content (cm H2O)

thermunits (Column 9) – Accumulator of thermal units for growing degree day implementation (°C)

aglivc (Column 10) – C in above ground live biomass (g C m-2)

aglivn (Column 11) – N in above ground live biomass (g N m-2)

aggreenc (Column 12) – C in above ground live photosynthetically active biomass (g C m-2). Includes aglivc\*senefrac + rleavc + grleavc.

hwstress (Column 13) – water stress term used to determine if full maturity has been reached (0.0-1.0). For growing degree day implementation only (FRTCINDX in crop.100 ≥ 4).

scenfrac (Column 14) – multiplier used to indicate the fraction of the aboveground live carbon that is photosynthetic active carbon (0.0-1.0). 1.0 = no senescence has occurred, 100% photosynthetic active carbon; 0.0 = full senescence, 0% photosynthetic active carbon. This fraction is 1.0 by default, and will not drop below 1.0 except when running growing degree day options (FRTCINDX in crop.100 ≥ 4).

srad (Column 15) – mean incoming solar radiation (W m-2)

eupcrpN (Column 16) – total plant N uptake (g N m-2 dy-1)

eupcrpSoilN (Column 17) – plant N uptake of mineral N (g N m-2 dy-1)

eupcrpStgN (Column 18) – N uptake from internal storage (g N m-2 dy-1)

eupcrpNfix (Column 19) – N uptake from symbiotic N fixation (g N m-2 dy-1)

eupcrpAuFertN (Column 20) – N uptake from auto fertilization uptake (g N m-2 dy-1)

cercrpMinAbvN (Column 21) – minimum C:N of above ground live biomass

cercrpMaxAbvN (Column 22) – maximum C:N of above ground live biomass

cercrpNewGrowthN (Column 23) – C:N of new crop growth

crpstg (Column 24) – internal N storage (g N m-2)

claypg (Column 25) – number of Century layers that crop roots occupy

## Daily evaporation, transpiration, heterotrophic respiration, and NPP: dc\_sip.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

trandly (Column 3) – Water transpired from soil (cm H2O d-1)

evapdly (Column 4) – Water evaporated from the soil (cm H2O d-1)

intrcpt (Column 5) – Evaporation of precipitation that was intercepted by the standing crop and litter biomass (cm H2O d-1)

sublim (Column 6) – Water sublimated from the snowpack (cm H2O d-1)

drain (Column 7) – Water in outflow that comes from drainage out of the soil profile (cm H2O d‑1)

runoff (Column 8) – Water (rain or snowmelt) that did not infiltrate soil profile (cm H2O d-1)

ppt (Column 9) – Precipitation for the day (cm H2O d-1)

accum (Column 10) – Snow added to the snowpack (cm H2O d-1)

melt (Column 11) – Snow melted from the snowpack, if daily air temperature is warm enough (cm H2O d‑1)

snow (Column 12) – Current snowpack (equiv. cm H2O)

snlq (Column 13) – The liquid water in the snowpack (cm H2O)

petdly (Column 14) – Potential evapotranspiration rate (cm H2O d-1)

stemp (Column 15) – Soil surface temperature (°C)

wc\_2cm (Column 16) – Water holding capacity of a 2 cm soil layer (cm H2O)

wc\_3cm (Column 17) – Water holding capacity of a 3 cm soil layer (cm H2O)

wc\_5cm (Column 18) – Water holding capacity of a 5 cm soil layer (cm H2O)

wc\_10cm (Column 19) – Water holding capacity of a 10 cm soil layer (cm H2O)

wc\_15cm (Column 20) – Water holding capacity of a 15 cm soil layer (cm H2O)

wc\_30cm (Column 21) – Water holding capacity of a 30 cm soil layer (cm H2O)

Rh (Column 22) – Heterotrophic CO2 respiration (g C m-2 d-1)

mcprd(1) (Column 23) – Daily NPP for shoots for grass/crop system (g C m-2 d-1)

mcprd(2) (Column 24) – Daily NPP for juvenile roots for grass/crop system (g C m-2 d-1)

mcprd(3) (Column 25) – Daily NPP for mature roots for grass/crop system (g C m-2 d-1)

mfprd(1) (Column 26) – Daily NPP for live leaves for tree system (g C m-2 d-1)

mfprd(2) (Column 27) – Daily NPP for live juvenile fine roots for tree system (g C m-2 d-1)

mfprd(6) (Column 28) – Daily NPP for live mature fine roots for tree system (g C m-2 d-1)

mfprd(3) (Column 29) – Daily NPP for live fine branches for tree system (g C m-2 d-1)

mfprd(4) (Column 30) – Daily NPP for live large wood for tree system (g C m-2 d-1)

mfprd(5) (Column 31) – Daily NPP for live coarse roots for tree system (g C m-2 d-1)

mgtprd(1) (Column 32) – Daily NPP for live leaves for grasstree system (g C m-2 d-1)

mgtprd(2) (Column 33) – Daily NPP for live stems for grasstree system (g C m-2 d-1)

mgtprd(3) (Column 34) – Daily NPP for live juvenile fine roots for grasstree system (g C m-2 d-1)

mfprd(4) (Column 35) – Daily NPP for live coarse roots for grasstree system (g C m-2 d-1)

mgtprd(5) (Column 36) – Daily NPP for live mature roots for tree system (g C m-2 d-1)

NPP (Column 37) – Summation of all production values (g C m-2 d-1)

NEE (Column 38) – Net ecosystem exchange (Rh - NPP) (g C m-2 d-1)

tlai (Column 43) – LAI of the tree leaves (m2 m-2)

## Daily carbon in dead plant material: deadc.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

stdedc (Column 3) – C in standing dead material for grass/crop (g C m-2)

dleavc (Column 4) – C in attached dead leaf component of forest system (g C m-2)

dfbrchc (Column 5) – C in attached dead fine branch component of forest system (g C m-2)

dlwodc (Column 6) – C in attached dead standing large wood component of forest system (g C m-2)

wood1c (Column 7) – C in downed dead fine branch component of forest system (g C m-2)

wood1c (Column 8) – C in downed dead large wood component of forest system (g C m-2)

wood3c (Column 9) – C in dead coarse root component of forest system (g C m-2)

gtdleavc (Column 10) – C in dead attached leaves for grasstree (g C m-2)

gtstemc (Column 11) – C in standing dead stems for grasstree (g C m-2)

metabc(1) (Column 12) – metabolic C in surface litter (g C m-2)

metabc(2) (Column 13) – metabolic C in soil litter (g C m-2)

strucc(1) (Column 14) – surface litter structural C (g C m-2)

strucc(2) (Column 15) – soil litter structural C (g C m-2)

## Grasstree Harvest: harvestgt.csv (state of the system at time of harvest)

time (Column 1) – Simulation time

dayofyr (Column 2) – Day of the year (1 – 366)

crpval (Column 3) – numerical representation of the current crop

gtlvacc (Column 4) – growing season accumulator for leaf carbon production, reset to 0.0 on GLST event (g C m‑2 y‑1)

gtstemacc (Column 5) – growing season accumulator for stem carbon production, reset to 0.0 on GLST event (g C m‑2 y‑1)

gtfrtjacc (Column 6) – growing season accumulator for juvenile fine root carbon production, reset to 0.0 on GLST event (g C m‑2 y‑1)

gtfrtmacc (Column 7) – growing season accumulator for mature fine root carbon production, reset to 0.0 on GLST event (g C m‑2 y‑1)

gtcrtacc (Column 8) – growing season accumulator for coarse root carbon production, reset to 0.0 on GLST event (g C m‑2 y‑1)

potgtacc (Column 9) – growing season potential production accumulator for all grasstree parts, reset to 0.0 on GLST event (g C m‑2 y‑1)

cgrain (Column 10) – amount of carbon in harvested grain (g C m‑2 harvest-1)

egrain(N) (Column 11) – amount of nitrogen in harvested grain (g N m‑2 harvest-1)

egrain(P) (Column 12) – amount of phosphorus in harvested grain (g P m‑2 harvest‑1)

egrain(S) (Column 13) – amount of sulfur in harvested grain (g S m‑2 harvest-1)

hi (Column 14) – harvest index: fraction of live leaf C (gtleavc) going to grain (0.0 – 1.0)

gtlvcrem (Column 15) – amount of live leaf C removed during harvest event (g C m‑2 harvest-1)

gtlverem(N) (Column 16) – amount of live leaf N removed during harvest event (g N m‑2 harvest‑1)

gtlverem(P) (Column 17) – amount of live leaf P removed during harvest event (g P m‑2 harvest ‑1)

gtlverem(S) (Column 18) – amount of live leaf S removed during harvest event (g S m‑2 harvest ‑1)

gtdlvcrem (Column 19) – amount of dead leaf C removed during harvest event (g C m‑2 harvest-1)

gtdlverem(N) (Column 20) – amount of dead leaf N removed during harvest event (g N m‑2 harvest‑1)

gtdlverem(P) (Column 21) – amount of dead leaf P removed during harvest event (g P m‑2 harvest ‑1)

gtdlverem(S) (Column 22) – amount of dead leaf S removed during harvest event (g S m‑2 harvest ‑1)

gtstmcrem (Column 23) – amount of live stem C removed during harvest event (g C m‑2 harvest-1)

gtstmerem(N) (Column 24) – amount of live stem N removed during harvest event (g N m‑2 harvest‑1)

gtstmerem(P) (Column 25) – amount of live stem P removed during harvest event (g P m‑2 harvest ‑1)

gtstmerem(S) (Column 26) – amount of live stem S removed during harvest event (g S m‑2 harvest ‑1)

gtdstmcrem (Column 27) – amount of dead stem C removed during harvest event (g C m‑2 harvest-1)

gtdstmerem(N) (Column 28) – amount of dead stem N removed during harvest event (g N m‑2 harvest‑1)

gtdstmerem(P) (Column 29) – amount of dead stem P removed during harvest event (g P m‑2 harvest ‑1)

gtdstmerem(S) (Column 30) – amount of dead stem S removed during harvest event (g S m‑2 harvest ‑1)

gtlv2dlvc (Column 31) – amount of live leaf C transferred to dead leaf C during harvest (g C m‑2 harvest-1)

gtlv2dlve(N) (Column 32) – amount of live leaf N transferred to dead leaf N during harvest (g N m‑2 harvest‑1)

gtlv2dlve(P) (Column 33) – amount of live leaf P transferred to dead leaf P during harvest (g P m‑2 harvest ‑1)

gtlv2dlve(S) (Column 34) – amount of live leaf S transferred to dead leaf S during harvest (gS/m2)

gtstm2dstmc (Column 35) – amount of live stem C transferred to dead stem C during harvest (g C m‑2 harvest-1)

gtstm2dstme(N) (Column 36) – amount of live stem N transferred to dead stem N during harvest (g N m‑2 harvest‑1)

gtstm2dstme(P) (Column 37) – amount of live stem P transferred to dead stem P during harvest (g P m‑2 harvest ‑1)

gtstm2dstme(S) (Column 38) – amount of live stem S transferred to dead stem S during harvest (g S m‑2 harvest ‑1)

gtlvcret (Column 39) – amount of live leaf C removed that is returned to surface litter (g C m‑2 harvest-1)

gtlveret(N) (Column 40) – amount of live leaf N removed that is returned to surface litter (g N m‑2 harvest‑1)

gtlveret(P) (Column 41) – amount of live leaf P removed that is returned to surface litter (g P m‑2 harvest ‑1)

gtlveret(S) (Column 42) – amount of live leaf S removed that is returned to surface litter (g S m‑2 harvest‑1)

gtdlvcret (Column 43) – amount of dead leaf C removed that is returned to surface litter (g C m‑2 harvest‑1)

gtdlveret(N) (Column 44) – amount of dead leaf N removed that is returned to surface litter (g N m‑2 harvest‑1)

gtdlveret(P) (Column 45) – amount of dead leaf P removed that is returned to surface litter (g P m‑2 harvest ‑1)

gtdlveret(S) (Column 46) – amount of dead leaf S removed that is returned to surface litter (g S m‑2 harvest ‑1)

gtstmcret (Column 47) – amount of live stem C removed that is returned to surface litter (g C m‑2 harvest-1)

gtstmeret(N) (Column 48) – amount of live stem N removed that is returned to surface litter (g N m‑2 harvest‑1)

gtstmeret(P) (Column 49) – amount of live stem P removed that is returned to surface litter (g P m‑2 harvest ‑1)

gtstmeret(S) (Column 50) – amount of live stem S removed that is returned to surface litter (g S m‑2 harvest ‑1)

gtdstmcret (Column 51) – amount of dead stem C removed that is returned to surface litter (g C m‑2 harvest-1)

gtdstmeret(N) (Column 52) – amount of dead stem N removed that is returned to surface litter (g N m‑2 harvest ‑1)

gtdstmeret(P) (Column 53) – amount of dead stem P removed that is returned to surface litter (g P m‑2 harvest ‑1)

gtdstmeret(S) (Column 54) – amount of dead stem S removed that is returned to surface litter (g S m‑2 harvest ‑1)

irrapp (Column 55) – amount of irrigation applied since the previous HARV event (cm H2O harvest‑1)

fertapp(N) (Column 56) – amount of nitrogen fertilizer applied since previous HARV event (g N m‑2 harvest‑1)

fertapp(P) (Column 57) – amount of phosphorus fertilizer applied since previous HARV event (g P m‑2 harvest ‑1)

fertapp(S) (Column 58) – amount of sulfur fertilizer applied since previous HARV event (g S m‑2 harvest ‑1)

omadapp (Column 59) – amount of carbon added to the system through organic matter addition events since the previous HARV event (g C m‑2 harvest ‑1)

omaeapp(N) (Column 60) – amount of nitrogen added to the system through organic matter addition events since the previous HARV event (g N m‑2 harvest ‑1)

omaeapp(P) (Column 61) – amount of phosphorus added to the system through organic matter addition events since the previous HARV event (g P m‑2 harvest ‑1)

omaeapp(S) (Column 62) – amount of for sulfur added to the system through organic matter addition events since the previous HARV event (g S m‑2 harvest ‑1)

strmac(1) (Column 63 ) – accumulator of stream flow (base flow + runoff) since the beginning of the year (cm H2O yr‑1)

strmac(2) (Column 64) – accumulator for mineral N leached out of the bottom of the soil profile into stream flow since the beginning of the year (g N m‑2 yr‑1)

strmac(3) (Column 65) – accumulator for mineral P leached out of the bottom of the soil profile into stream flow since the beginning of the year (g P m‑2 yr‑1)

strmac(4) (Column 66) – accumulator for mineral S leached out of the bottom of the soil profile into stream flow since the beginning of the year (g S m‑2 yr‑1)

strmac(5) (Column 67) – accumulator for organic C leached from the soil organic layer into stream flow since the beginning of the year (g C m‑2 yr‑1)

strmac(6) (Column 68) – accumulator for organic N leached from the soil organic layer into stream flow since the beginning of the year (g N m‑2 yr‑1)

strmac(7) (Column 69) – accumulator for organic P leached from the soil organic layer into stream flow since the beginning of the year (g P m‑2 yr‑1)

strmac(8) (Column 70) – accumulator for organic S leached from the soil organic layer into stream flow since the beginning of the year (g S m‑2 yr‑1)

carbostgloss (Column 71) – amount of carbohydrate storage lost when coarse roots are killed (g C m‑2 harvest‑1)

gtstgloss(N) (Column 72) – amount of internal N storage lost when coarse roots are killed (g N m‑2 harvest-1)

gtstgloss(P) (Column 73) – amount of internal P storage lost when coarse roots are killed (g P m‑2 harvest‑1)

gtstgloss(S) (Column 74) – amount of internal S storage lost when coarse roots are killed (g S m‑2 harvest‑1)

cgracc (Column 75) – accumulator for carbon in harvested grain and tubers since the beginning of the year (sum of cgrain) (g C m‑2 yr‑1)

egracc(N) (Column 76) –accumulator of nitrogen in harvested grain and tubers since the beginning of the year (sum of egrain(N)) (g N m‑2 yr‑1)

egracc(P) (Column 77) –accumulator of phosphorus in harvested grain and tubers since the beginning of the year (sum of egrain(P)) (g P m‑2 yr‑1)

egracc(S) (Column 78) –accumulator of sulfur in harvested grain and tubers since the beginning of the year (sum of egrain(S)) (g S m‑2 yr‑1)

srfclittrj (Column 79) – amount of dead juvenile fine root carbon transferred to surface litter pool (metabc(1) and strucc(1)) due to a harvest event (g C m‑2 harvest‑1)

esrfclittrj(N) (Column 80) – amount of dead juvenile fine root nitrogen transferred to surface litter pool (metabe(1,1) and struce(1,1)) due to a harvest event (g N m‑2 harvest‑1)

esrfclittrj(P) (Column 81) – amount of dead juvenile fine root phosphorus transferred to surface litter pool (metabe(1,2) and struce(1,2)) due to a harvest event (g P m‑2 harvest‑1)

esrfclittrj(S) (Column 82) – amount of dead juvenile fine root sulfur transferred to surface litter pool (metabe(1,3) and struce(1,3)) due to a harvest event (g S m‑2 harvest‑1)

soillittrj (Column 83) – amount of dead juvenile fine root carbon transferred to soil litter pool (metabc(2) and strucc(2)) due to a harvest event (g C m‑2 harvest‑1)

esoillittrj(N) (Column 84) – amount of dead juvenile fine root nitrogen transferred to soil litter pool (metabe(2,1) and struce(2,1)) due to a harvest event (g N m‑2 harvest‑1)

esoillittrj(P) (Column 85) – amount of dead juvenile fine root phosphorus transferred to soil litter pool (metabe(2,2) and struce(2,2)) due to a harvest event (g P m‑2 harvest‑1)

esoillittrj(S) (Column 86) – amount of dead juvenile fine root sulfur transferred to soil litter pool (metabe(2,3) and struce(2,3)) due to a harvest event (g S m‑2 harvest‑1)

srfclittrm (Column 87) – amount of dead mature fine root carbon transferred to surface litter pool (metabc(1) and strucc(1)) due to a harvest event (g C m‑2 harvest‑1)

esrfclittrm(N) (Column 88) – amount of dead mature fine root nitrogen transferred to surface litter pool (metabe(1,1) and struce(1,1)) due to a harvest event (g N m‑2 harvest‑1)

esrfclittrm(P) (Column 89) – amount of dead mature fine root phosphorus transferred to surface litter pool (metabe(1,2) and struce(1,2)) due to a harvest event (g P m‑2 harvest‑1)

esrfclittrm(S) (Column 90) – amount of dead mature fine root sulfur transferred to surface litter pool (metabe(1,3) and struce(1,3)) due to a harvest event (g S m‑2 harvest‑1)

soillittrm (Column 91) – amount of dead mature fine root carbon transferred to soil litter pool (metabc(2) and strucc(2)) due to a harvest event (g C m‑2 harvest‑1)

esoillittrm(N) (Column 92) – amount of dead mature fine root nitrogen transferred to soil litter pool (metabe(2,1) and struce(2,1)) due to a harvest event (g N m‑2 harvest‑1)

esoillittrm(P) (Column 93) – amount of dead mature fine root phosphorus transferred to soil litter pool (metabe(2,2) and struce(2,2)) due to a harvest event (g P m‑2 harvest‑1)

esoillittrm(S) (Column 94) – amount of dead mature fine root sulfur transferred to soil litter pool (metabe(2,3) and struce(2,3)) due to a harvest event (g S m‑2 harvest‑1)

srfclittrccrt (Column 95) – amount of dead coarse root carbon transferred to surface litter pool (metabc(1) and strucc(1)) due to a harvest event (g C m‑2 harvest‑1)

esrfclittrcrt(N) (Column 96) – amount of dead coarse root nitrogen transferred to surface litter pool (metabe(1,1) and struce(1,1)) due to a harvest event (g N m‑2 harvest‑1)

esrfclittrcrt(P) (Column 97) – amount of dead coarse root phosphorus transferred to surface litter pool (metabe(1,2) and struce(1,2)) due to a harvest event (g P m‑2 harvest‑1)

esrfclittrcrt(S) (Column 98) – amount of dead coarse root sulfur transferred to surface litter pool (metabe(1,3) and struce(1,3)) due to a harvest event (g S m‑2 harvest‑1)

soillittrcrt (Column 99) – amount of dead coarse root carbon transferred to soil litter pool (metabc(2) and strucc(2)) due to a harvest event (g C m‑2 harvest‑1)

esoillittrcrt(N) (Column 100) – amount of dead coarse root nitrogen transferred to soil litter pool (metabe(2,1) and struce(2,1)) due to a harvest event (g N m‑2 harvest‑1)

esoillittrcrt(P) (Column 101) – amount of dead coarse root phosphorus transferred to soil litter pool (metabe(2,2) and struce(2,2)) due to a harvest event (g P m‑2 harvest‑1)

esoillittrcrt(S) (Column 102) – amount of dead coarse root sulfur transferred to soil litter pool (metabe(2,3) and struce(2,3)) due to a harvest event (g S m‑2 harvest‑1)

## Daily carbon in live plant material: livc.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

aglivc (Column 3) – C in aboveground live for grass/crop (g C m‑2)

bglivcj (Column 4) – C in live juvenile fine roots for grass/crop (g C m‑2)

bglivcm (Column 5) – C in live mature fine roots for grass/crop (g C m‑2)

rleavc (Column 6) – C in forest system live leaf component (g C m‑2)

frootcj (Column 7) – C in forest system live juvenile fine root component (g C m‑2)

frootcm (Column 8) – C in forest system live mature fine root component (g C m‑2)

fbrchc (Column 9) – C in forest system live fine branch component (g C m‑2)

rlwodc (Column 10) – C in forest system live large wood component (g C m‑2)

crootc (Column 11) – C in forest system live coarse root component (g C m‑2)

gtleavc (Column 12) – C in grasstree live leaf component (g C m‑2)

gtstemc (Column 13) – C in grasstree live stem component (g C m‑2)

gtfrootcj (Column 14) – C in grasstree live juvenile fine root component (g C m‑2)

gtfrootcm (Column 15) – C in grasstree live mature fine root component (g C m‑2)

gtcrootc (Column 16) – C in grasstree live coarse root component (g C m‑2)

## Nitrogen Fluxes: nflux.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

nit\_N2O-N (Column 3) – Nitrous oxide nitrification (g N ha‑1 d‑1)

dnit\_N2O-N (Column 4) – Nitrous oxide denitrification (g N ha‑1 d‑1)

dnit\_N2-N (Column 5) – Elemental inert nitrogen gas denitrification (g N ha‑1 d‑1)

NO-N (Column 6) – Nitric oxide (g N ha‑1 d‑1)

CUM-N2O (Column 7) – Annual accumulator for nitrous oxide (g N ha‑1 yr‑1)

CUM-NO (Column 8) – Annual accumulator for nitric oxide (g N ha‑1 yr‑1)

netNmin1 (Column 9) – Above ground net mineralization (g N m‑2 dy‑1)

netNmin2 (Column 10) – Below ground net mineralization (g N m‑2 dy‑1)

NO3-N-leach (Column 11) – Nitrate leaching (g N m‑2 dy‑1)

Rn2n2o\_1 (Column 12) – Ratio of N2:N2O in topmost layer where denitrification occurs before adjustment for pH effect

Rn2n2opH (Column 13) – Ratio of N2:N2O in the topmost layer where denitrification occurs adjusted for pH effect

pH (Column 13) – soil pH in top 3 soils.in layers and adjusted by pH scaling factor (if used). This is the pH value used for pH effect on decomposition, nitrification, and denitrification

## Potential Production of Crops/Grasses: potcrp.csv

time (Column 1) – simulation time (years)

dayofyr (Column 2) – day of year (1-366)

daylen (Column 2) – daylength (hours)

langleys (Column 4) – incoming solar radiation (langleys)

prdx (Column 5) – PRDX(1) parameter from crop.100

gdpf (Column 6) – multiplier for air temperature effect on potential crop/grass production

h2ogef (Column 8) – multiplier for soil moisture effect on potential crop/grass production

wstress (Column 9) – relative soil water content effect from the following equation:

,

where *wscoeff(1,\*)* are crop.100 parameters.

fldeff (Column 10) – multiplier for flood effect (saturated soil water conditions) on potential crop/grass production (1.0 = no effect)

biof (Column 11) – multiplier for the effect of the ratio of live biomass to dead biomass on the reduction of potential growth rate crop/grass production (1.0 = no effect)

shdmod (Column 12) – multiplier for shading effect on potential crop/grass production in a savanna system (1.0 = no effect)

sdlng (Column 13) – multiplier for seedling effect on potential crop/grass production (1.0 = no effect)

co2cpr (Column 42) – multiplier for CO2 effect on potential crop/grass production (1.0 = no effect)

tprod (Column 15) – potential crop/grass production (g biomass m-2 day-1)



where *tfrac* = 1/(days in the current month), and *scenfrac* = fraction of aglivc that is photosynthetically active.

## Potential Production of Forests: potfor.csv

time (Column 1) – simulation time (years)

dayofyr (Column 2) – day of year (1-366)

daylen (Column 2) – daylength (hours)

langleys (Column 4) – incoming solar radiation (langleys)

prdx (Column 5) – PRDX(2) parameter from tree.100

gdpf (Column 6) – multiplier for air temperature effect on potential tree production

h2ogef (Column 8) – multiplier for soil moisture effect on potential tree production

wstress (Column 9) – relative soil water content effect from the following equation:

,

where *wscoeff(2,\*)* are tree.100 parameters.

fldeff (Column 10) – multiplier for flood effect (saturated soil water conditions) on potential tree production (1.0 = no effect)

biof (Column 11) – effect of the ratio of live biomass to dead biomass on the reduction of potential tree production (always -99 = not applicable for trees)

LAI (Column 12) – leaf area index

laiprd (Column 13) – reduction in production when tree is young (1.0 = no reduction)

co2cpr (Column 42) – multiplier for CO2 effect on potential tree production (1.0 = no effect)

pforc (Column 15) – potential tree production (g C m-2 day-1)

,

where *tfrac* = 1/(days in the current month)

## Potential Production of Grasstrees: potgt.csv

time (Column 1) – simulation time (years)

dayofyr (Column 2) – day of year (1-366)

daylen (Column 2) – daylength (hours)

langleys (Column 4) – incoming solar radiation (langleys)

prdx (Column 5) – PRDX(3) parameter from grasstree.100

gdpf (Column 6) – multiplier for air temperature effect on potential grasstree production

h2ogef (Column 8) – multiplier for soil moisture effect on potential grasstree production

wstress (Column 9) – relative soil water content effect from the following equation:

,

where *wscoeff(3,\*)* are grasstree.100 parameters.

fldeff (Column 10) – multiplier for flood effect (saturated soil water conditions) on potential grasstree production (1.0 = no effect)

biof (Column 11) – multiplier for the effect of the ratio of live biomass to dead biomass on the reduction of potential grasstree production (1.0 = no effect)

LAI (Column 12) – leaf area index

laiprd (Column 13) – reduction in production when grasstree is young (1.0 = no reduction)

co2cpr (Column 42) – multiplier for CO2 effect on potential grasstree production (1.0 = no effect)

tprod (Column 15) – potential grasstree production (g biomass m-2 day-1)

,

where *tfrac* = 1/(days in the current month)

## Daily Photosynthesis: psyn.csv

(values for grasstrees are reported in the same column as those for grass/crop since a grasstree and a crop cannot be grown at the same time)

time – Simulation time (see above)

dayofyr – Day of the year (1 - 366)

tmindly – Minimum temperature for day (degrees C)

tmaxdly – Maximum temperature for day (degrees C)

prcann – Average annual precipitation for site (cm)

pptdly – Precipitation for current day (cm)

aetdly – Actual evapotranspiration (cm H2O)

petdly – Potential evapotranspiration rate for day (cm H2O)

daylength – Fraction of day that has sunlight (0.0 - 1.0)

srad – Shortwave radiation value for day (W m-2)

avg\_temp – Average temperature for daylight hours (°C)

avg\_vpd – Average vapor pressure deficit (kPa)

crpLAI – Grass/crop or grasstree system leaf area index

crpdTemp – Decrease in photosynthesis due to temperature for grass/crop or grasstree system (0 – 1)

crpdVpd – Decrease in photosynthesis due to vapor pressure deficit for grass/crop or grasstree system (0 – 1)

crpdWater – Effect of water stress on photosynthesis for grass/crop or grasstree system (0 – 1)

crpLtEff – Decrease in photosynthesis due to amount of light absorbed for grass/crop or grasstree system (0 – 1)

crpPGrPsn – Potential photosynthesis, without water stress, for grass/crop or grasstree system (g C m‑2 day‑1)

crpGrPsn – Gross photosynthesis (GPP), with water stress, for grass/crop or grasstree system (g C m‑2 day‑1)

forLAI – Forest system leaf area index

fordTemp – Decrease in photosynthesis due to temperature for forest system (0 – 1)

fordVpd – Decrease in photosynthesis due to vapor pressure deficit for forest system (0 – 1)

fordWater – Effect of water stress on photosynthesis for forest system (0 – 1)

forLtEff – Decrease in photosynthesis due to amount of light absorbed for forest system (0 – 1)

forPGrPsn – Potential photosynthesis, without water stress, for forest system (g C m‑2 day‑1)

forGrPsn – Gross photosynthesis (GPP), with water stress, for forest system (g C m‑2 day‑1)

## Daily Respiration output variables: resp.csv

(grasstree variables follow carbostg(2.2))

time – Simulation time (see above)

dayofyr – Day of the year (1 - 366)

oiresp – Daily heterotrophic respiration from OI layer (from surface metabolic and structural litter pools and surface som1 pool) (g C m-2)

oeresp – Daily heterotrophic respiration from OE layer (from surface som2 pool) (g C m-2)

slitrsp – Daily heterotrophic respiration from surface litter (oiresp + oeresp) (g C m-2)

sminrlrsp – Daily heterotrophic respiration from mineral soil (from all soil litter and soil SOM pools) (g C m-2)

hresp – Daily heterotrophic respiration (g C m-2)

crtjresp – Daily growth and maintenance respiration from crop/grass juvenile fine root pool (g C m-2). crtjresp = cmrspflux(2) + cgrspflux(2).

crtmresp – Daily growth and maintenance respiration from crop/grass mature fine root pool (g C m-2). crtmresp = cmrspflux(3) + cgrspflux(3).

frtjresp – Daily growth and maintenance respiration from forest juvenile fine root pool (g C m-2). frtjresp = fmrspflux(2) + fgrspflux(2).

frtmresp – Daily growth and maintenance respiration from forest mature fine root pool (g C m-2). frtmresp = fmrspflux(6) + fgrspflux(6).

frtcresp – Daily growth and maintenance respiration from forest coarse root pool (g C m-2). frtcresp = fmrspflux(5) + fgrspflux(5).

sresp – Daily soil respiration (heterotrophic + root autotrophic) (g C m-2)

mresp – Daily maintenance respiration (g C m-2)

gresp – Daily growth respiration (g C m-2)

mrspflux(1) – Daily maintenance respiration flux from storage pool (CARBOSTG(1,\*) to C source/sink for grass/crop system (g C m-2)

mrspflux(2) – Daily maintenance respiration flux from storage pool (CARBOSTG(2,\*) to C source/sink for tree system (g C m-2)

cmrspflux(1) – Amount of daily maintenance respiration flux from aboveground grass/crop material that flows from the grass/crop carbohydrate storage pool (CARBOSTG(1,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

cmrspflux(2) – Amount of daily maintenance respiration flux from juvenile fine root grass/crop material that flows from the grass/crop carbohydrate storage pool (CARBOSTG(1,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

cmrspflux(3) – Amount of daily maintenance respiration flux from mature fine root grass/crop material that flows from the grass/crop carbohydrate storage pool (CARBOSTG(1,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

fmrspflux(1) – Amount of daily maintenance respiration flux from live leaf material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

fmrspflux(2) – Amount of daily maintenance respiration flux from live juvenile fine root material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

fmrspflux(6) – Amount of daily maintenance respiration flux from live mature fine root material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2) – Note: this appears out of order because FROOTM = 6.

fmrspflux(3) – Amount of daily maintenance respiration flux from live fine branch material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

fmrspflux(4) – Amount of daily maintenance respiration flux from live large wood material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

fmrspflux(5) – Amount of daily maintenance respiration flux from live coarse root material that flows from the tree carbohydrate storage pool (CARBOSTG(2,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

mrspann(1) – Accumulator for annual maintenance respiration for grass/crop (g C m-2)

mrspann(2) – Accumulator for annual maintenance respiration for tree (g C m-2)

tavedly – Mean air temperature over production period (°C)

mrspTempEffect(1.1) – Temperature effect on maintenance respiration for aboveground crop/grass biomass (0 – 1)

mrspTempEffect(1.2) – Temperature effect on maintenance respiration for belowground crop/grass biomass (0 – 1)

mrspWaterEffect(1) – Water effect on maintenance respiration for crop/grass system (0 – 1)

mrspTempEffect(2.1) – Temperature effect on maintenance respiration for leaves, fine branch, and large wood forest system components (0 – 1)

mrspTempEffect(2.2) – Temperature effect on maintenance respiration for juvenile fine root, mature fine root, and coarse root forest system components (0 – 1)

mrspWaterEffect(2) – Water effect on maintenance respiration for forest system (0 – 1)

grspflux(1) – Daily growth respiration flux from storage pool (CARBOSTG(1,\*) to C source/sink for grass/crop system (g C m-2)

grspflux(2) – Daily growth respiration flux from storage pool (CARBOSTG(2,\*) to C source/sink for tree system (g C m-2)

cgrspflux(1) – Amount of daily growth respiration flux from aboveground grass/crop material that is released into the atmosphere during crop/grass carbon production (g C m-2)

cgrspflux(2) – Amount of daily growth respiration flux from juvenile fine root grass/crop material that is released into the atmosphere during crop/grass carbon production (g C m-2)

cgrspflux(3) – Amount of daily growth respiration flux from mature fine root grass/crop material that is released into the atmosphere during crop/grass carbon production (g C m-2)

fgrspflux(1) – Amount of daily growth respiration loss from live leaf material that is released into the atmosphere during tree carbon production (g C m-2)

fgrspflux(2) – Amount of daily growth respiration loss from live juvenile fine root material that is released into the atmosphere during tree carbon production (g C m-2)

fgrspflux(6) – Amount of daily growth respiration loss from live mature fine root material that is released into the atmosphere during tree carbon production (g C m-2)

fgrspflux(3) – Amount of daily growth respiration loss from live fine branch material that is released into the atmosphere during tree carbon production (g C m-2)

fgrspflux(4) – Amount of daily growth respiration loss from live large wood material that is released into the atmosphere during tree carbon production (g C m-2)

fgrspflux(5) – Amount of daily growth respiration loss from live coarse root material that is released into the atmosphere during tree carbon production (g C m-2)

grspann(1) – Accumulator for annual growth respiration for grass/crop (g C m-2)

grspann(2) – Accumulator for annual growth respiration for trees (g C m-2)

carbostg(1.1) – Unlabeled C in carbohydrate storage for grass/crop system (g C m-2)

carbostg(1.2) – Labeled C in carbohydrate storage for grass/crop system (g C m-2)

carbostg(2.1) – Unlabeled C in carbohydrate storage for forest system (g C m-2)

carbostg(2.2) – Labeled C in carbohydrate storage for forest system (g C m-2)

mrspflux(3) – Daily maintenance respiration flux from storage pool (CARBOSTG(3,\*) to C source/sink for grasstree system (g C m-2)

mrspann(3) – Accumulator for annual maintenance respiration for grasstree (g C m-2)

grspflux(3) – Daily growth respiration flux from storage pool (CARBOSTG(3,\*) to C source/sink for grasstree system (g C m-2)

grspann(3) – Accumulator for annual growth respiration for grasstree (g C m-2)

gtmrspflux(1) – Amount of daily maintenance respiration flux from live leaf material that flows from the grasstree carbohydrate storage pool (CARBOSTG(3,\*)) to the C source/sink pool (CSRSNK) (g C m‑2)

gtmrspflux(2) – Amount of daily maintenance respiration flux from live stem material that flows from the grasstree carbohydrate storage pool (CARBOSTG(3,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

gtmrspflux(3) – Amount of daily maintenance respiration flux from live juvenile fine root material that flows from the grasstree carbohydrate storage pool (CARBOSTG(3,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

gtmrspflux(4) – Amount of daily maintenance respiration flux from live mature fine root material that flows from the grasstree carbohydrate storage pool (CARBOSTG(3,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

gtmrspflux(5) – Amount of daily maintenance respiration flux from live coarse root material that flows from the grasstree carbohydrate storage pool (CARBOSTG(3,\*)) to the C source/sink pool (CSRSNK) (g C m-2)

mrspTempEffect(3.1) – Temperature effect on maintenance respiration for aboveground grasstree biomass (0 – 1)

mrspTempEffect(3.2) – Temperature effect on maintenance respiration for belowground grasstree biomass (0 – 1)

mrspWaterEffect(3) – Water effect on maintenance respiration for grasstree system (0 – 1)

gtgrspflux(1) – Amount of daily growth respiration loss from leaf material that is released into the atmosphere during grasstree production (g C m-2)

gtgrspflux(2) – Amount of daily growth respiration loss from stem material that is released into the atmosphere during grasstree production (g C m-2)

gtgrspflux(3) – Amount of daily growth respiration loss from juvenile fine root material that is released into the atmosphere during grasstree production (g C m-2)

gtgrspflux(4) – Amount of daily growth respiration loss from mature fine root material that is released into the atmosphere during grasstree production (g C m-2)

gtgrspflux (5) – Amount of daily growth respiration loss from live coarse root material that is released into the atmosphere during grasstree production (g C m-2)

carbostg(3.1) – Unlabeled C in carbohydrate storage for grasstree system (g C m-2)

carbostg(3.2) – Labeled C in carbohydrate storage for grasstree system (g C m-2)

## Daily carbon in litter and soil organic matter pools: soilc.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

metabc(1) (Column 3) – metabolic C in surface litter (g C m-2)

metabc(2) (Column 4) – metabolic C in soil litter (g C m-2)

strucc(1) (Column 5) – surface litter structural C (g C m-2)

strucc(2) (Column 6) – soil litter structural C (g C m-2)

som1c(1) (Column 7) – C in surface active pool soil organic matter (g C m-2)

som1c(2) (Column 8) – C in soil active soil pool organic matter (g C m-2)

som2c(1) (Column 9) – C in surface slow pool soil organic matter (g C m-2)

som2c(2) (Column 10) – C in soil slow pool soil organic matter (g C m-2)

som3c (Column 11) – C in passive pool soil organic matter (g C m-2)

## Daily system carbon: sysc.csv

time (Column 1) – Simulation time (see above)

dayofyr (Column 2) – Day of the year (1 – 366)

livec (Column 3) – C live material (g C m‑2) (aglivc + bglivcj + bglivcm + rleavc + frootcj + frootcm + fbrchc + rlwodc + crootc + gtleavc + gtstemc + gtfrootcj + gtfrootcm + gtcrootc)

deadc (Column 4) – C in dead material (g C m‑2) (stdedc + metabc(1) + strucc(1) + dleavc + dfbrchc + dlwodc + wood1c + wood2c + wood3c + gtdleavc + gtdstemc)

soilc (Column 5) – C in soil organic matter pools (g C m‑2) (metabc(2) + strucc(2) + som1c(1) + som1c(2) + som2c(1) + som2c(2) + som3c)

sysc (Column 6) – System C (g C m‑2) (livec + deadc + soilc)

CO2resp (Column 7) – CO2 losses from heterotrophic respiration plus UV-degradation (g C m‑2 d-1)

## Annual accumulators for carbon flows to Litter and SOM pools: year\_cflows.csv

time (Column 1) – Simulation time (see above)

asom11tosom21 (Column 2) – carbon flow from active surface organic matter pool to slow surface organic matter pool (g C m-2 yr-1)

asom12tosom22 (Column 3) – Annual accumulator for carbon flow from active soil organic matter pool to slow soil organic matter pool (g C m-2 yr-1)

asom12tosom3 (Column 4) – Annual accumulator for carbon flow from active soil organic matter pool to passive soil organic matter pool (g C m-2 yr-1)

asom21tosom11 (Column 5) – Annual accumulator for carbon flow from slow surface organic matter pool to active surface organic matter pool (g C m-2 yr-1)

asom21tosom22 (Column 6) – Annual accumulator for carbon flow from slow surface organic matter pool to slow soil organic matter pool (g C m-2 yr-1)

asom22tosom12 (Column 7) – Annual accumulator for carbon flow from slow soil organic matter pool to active soil organic matter pool (g C m-2 yr-1)

asom22tosom3 (Column 8) – Annual accumulator for carbon flow from slow soil organic matter pool to passive soil organic matter pool (g C m-2 yr-1)

asom3tosom12 (Column 9) – Annual accumulator for carbon flow from passive soil organic matter pool to active soil organic matter pool (g C m-2 yr-1)

ametc1tosom11 (Column 10) – Annual accumulator for carbon flow from surface metabolic pool to active surface organic matter pool (g C m-2 yr-1)

ametc2tosom12 (Column 11) – Annual accumulator for carbon flow from soil metabolic pool to active soil organic matter pool (g C m-2 yr-1)

astruc1tosom11 (Column 12) – Annual accumulator for carbon flow from surface structural pool to active surface organic matter pool (g C m-2 yr-1)

astruc1tosom21 (Column 13) – Annual accumulator for carbon flow from surface structural pool to slow surface organic matter pool (g C m-2 yr-1)

astruc2tosom12 (Column 14) – Annual accumulator for carbon flow from soil structural pool to active soil organic matter pool (g C m-2 yr-1)

astruc2tosom22 (Column 15) – Annual accumulator for carbon flow from soil structural pool to slow soil organic matter pool (g C m-2 yr-1)

awood1tosom11 (Column 16) – Annual accumulator for carbon flow from dead fine branch pool to active surface organic matter pool (g C m-2 yr-1)

awood1tosom21 (Column 17) – Annual accumulator for carbon flow from dead fine branch pool to slow surface organic matter pool (g C m-2 yr-1)

awood2tosom11 (Column 18) – Annual accumulator for carbon flow from dead large wood pool to active surface organic matter pool (g C m-2 yr-1)

awood2tosom21 (Column 19) – Annual accumulator for carbon flow from dead large wood pool to slow surface organic matter pool (g C m-2 yr-1)

awood3tosom12 (Column 20) – Annual accumulator for carbon flow from dead coarse root pool to active soil organic matter pool (g C m-2 yr-1)

awood3tosom22 (Column 21) – Annual accumulator for carbon flow from dead coarse root pool to slow soil organic matter pool (g C m‑2yr‑1)

ainputmetbc1 (Column 22) – annual accumulator for C inputs to surface metabolic pool (g C m‑2yr‑1)

ainputmetbc2 (Column 23) – annual accumulator for C inputs to soil metabolic pool (g C m‑2yr‑1)

ainputstrucc1 (Column 24) – annual accumulator for C inputs to surface structural pool (g C m‑2yr‑1)

ainputstrucc2 (Column 25) – annual accumulator for C inputs to soil structural pool (g C m‑2yr‑1)

ainputmetbn1 (Column 26) – annual accumulator for N inputs to surface metabolic pool (g N m‑2yr‑1)

ainputmetbn2 (Column 27) – annual accumulator for N inputs to soil metabolic pool (g N m‑2yr‑1)

ainputstrucn1 (Column 28) – annual accumulator for N inputs to surface structural pool (g N m‑2yr‑1)

ainputstrucn2 (Column 29) – annual accumulator for N inputs to soil structural pool (g N m‑2yr‑1)

aexudc2m2 (Column 30) – C inputs to soil metabolic pool from root exudation (g C m-2 yr-1)

aexudn2m2 (Column 31) – N inputs to soil metabolic pool from root exudation (g N m-2 yr-1)