**C:\data\modular\_datasets\_rev60\_5\_6\documentation\SWAT+\_Outputs.docx**

**Water Balance Landscape Output Files**

We refer to the landscape as any object related to hru’s which includes soil and plant processes. Landscape units are the area weighted sum of hru’s and are typically defined as subbasins. The basin output file is the area weighted sum of all hru’s in the basin. Each variable is reported in mm summed over the time step, for the day, month, or year. Average annual is the total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years. The curve number variable is averaged over the time period and is dimensionless.

The output files use the same naming convention starting with the object followed by the water balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for hru’s is hru\_wb\_aa.txt.

basin\_wb\_\*.txt

lsunit\_wb\_\*.txt

hru\_wb\_\*.txt

hru-lte\_wb\_\*.txt

real :: precip = 0. !mm H2O |precipitation falling as rain and snow

real :: snofall = 0. !mm H2O |precipitation falling as snow, sleet or freezing rain

real :: snomlt = 0. !mm H2O |snow or melting ice

real :: surq\_gen = 0. !mm H2O |surface runoff generated from the landscape

real :: latq = 0. !mm H2O |lateral soil flow

real :: wateryld = 0. !mm H2O |water yield - sum of surface runoff, lateral soil flow and tile flow

real :: perc = 0. !mm H2O |amt of water perc out of the soil profile & into the vadose zone

real :: et = 0. !mm H2O |actual evapotranspiration from the soil

real :: ecanopy = 0. !mm H2O |not reported

real :: eplant = 0. !mm H2O |plant transpiration

real :: esoil = 0. !mm H2O |soil evaporation

real :: surq\_cont = 0. !mm H2O |surface runoff leaving the landscape

real :: cn = 0. !none |average curve number value for timestep

real :: sw\_init = 0. !mm H2O |initial soil water content of soil profile at start of time step

real :: sw\_final = 0. !mm H2O |final soil water content of soil profile at end of time step

real :: sw = 0. !mm H2O |average soil water content of soil profile

real :: sw\_300 = 0. !mm H2O |final soil water content of upper 300 mm at end of time step

real :: sno\_init = 0. !mm H2O |initial soil water content of snow pack

real :: sno\_final = 0. !mm H2O |final soil water content of snow pack

real :: snopack = 0. !mm |water equivalent in snow pack

real :: pet = 0. !mm H2O |potential evapotranspiration

real :: qtile = 0. !mm H2O |subsurface tile flow leaving the landscape

real :: irr = 0. !mm H2O |irrigation water applied

real :: surq\_runon = 0. !mm H2O |surface runoff from upland landscape

real :: latq\_runon = 0. !mm H2O |lateral soil flow from upland landscape

real :: overbank = 0. !mm H2O |overbank flooding from channels

real :: surq\_cha = 0. !mm H2O |surface runoff flowing into channels

real :: surq\_res = 0. !mm H2O |surface runoff flowing into reservoirs

real :: surq\_ls = 0. !mm H2O |surface runoff flowing onto the landscape

real :: latq\_cha = 0. !mm H2O |lateral soil flow into channels

real :: latq\_res = 0. !mm H2O |lateral soil flow into reservoirs

real :: latq\_ls = 0. !mm H2O |lateral soil flow into a landscape element

real :: gwtran = 0. !mm H2O |gw transf to soil profile (when water table is in soil profile)

real :: satex = 0. !mm H2O |saturation excess flow developed from high water table !rtb gwflow

real :: satex\_chan = 0. !mm H2O |saturation excess flow reaching main channel !rtb gwflow

real :: delsw = 0. !mm H2O |change in soil water volume !rtb gwflow

real :: lagsurf = 0. !mm H2O |surface runoff in transit to channel

real :: laglatq = 0. !mm H2O |lateral flow in transit to channel

real :: lagsatex = 0. !mm H2O |saturation excess flow in transit to channel

real :: wet\_out = 0. !mm H2O |outflow (spill) from wetland

**Nutrient Balance Landscape Output Files**

We refer to the landscape as any object related to hru’s which includes soil and plant processes. Landscape units are the area weighted sum of hru’s and are typically defined as subbasins. The basin output file is the area weighted sum of all hru’s in the basin. Each variable is reported in kg/ha summed over the time step, for the day, month, or year. Average annual is the total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years.

The output files use the same naming convention starting with the object followed by the nutrient balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for hru’s is hru\_nb\_aa.txt.

basin\_nb\_\*.txt

lsunit\_nb\_\*.txt

hru\_nb\_\*.txt

hru-lte\_nb\_\*.txt

real :: grazn = 0. !kg N/ha |total nitrogen added to soil from grazing

real :: grazp = 0. !kg P/ha |total phophorous added to soil from grazing

real :: lab\_min\_p = 0. !kg P/ha |phos moving from the labile mineral pool to the active mineral pool

real :: act\_sta\_p = 0. !kg P/ha |phos moving from the active mineral pool to the stable mineral pool

real :: fertn = 0. !kg N/ha |total nitrogen applied to soil

real :: fertp = 0. !kg P/ha |total phosphorus applied to soil

real :: fixn = 0. !kg N/ha |nitrogen added to plant biomass via fixation

real :: denit = 0. !kg N/ha |nitrogen lost from nitrate pool by denitrification

real :: act\_nit\_n = 0. !kg N/ha |nitrogen moving from active organic pool to nitrate pool

real :: act\_sta\_n = 0. !kg N/ha |nitrogen moving from active organic pool to stable pool

real :: org\_lab\_p = 0. !kg P/ha |phosphorus moving from the organic pool to labile pool

real :: rsd\_nitorg\_n = 0. !kg N/ha |nit moving from the fresh org pool (residue) to the nitrate (80%)

! and active org (20%) pools

real :: rsd\_laborg\_p = 0. !kg P/ha |phos moving from the fresh org pool (residue) to the labile (80%)

! and org (20%) pools

real :: no3atmo = 0. !kg N/ha |nitrate added to the soil from atmospheric deposition

real :: nh4atmo = 0. !kg N/ha |ammonia added to the soil from atmospheric deposition

real :: nuptake = 0. !kg N/ha |plant nitrogen uptake

real :: puptake = 0. !kg N/ha |plant phosphorus uptake

real :: gwtrann = 0. !kg N/ha |nitrate added to the soil from the aquifer (rtb gwflow)

real :: gwtranp = 0. !kg P/ha |Phos added to the soil from the aquifer (rtb gwflow)

**Losses from the Landscape Output Files**

We refer to the landscape as any object related to hru’s which includes soil and plant processes. Landscape units are the area weighted sum of hru’s and are typically defined as subbasins. The basin output file is the area weighted sum of all hru’s in the basin. Nutrient variables are reported in kg/ha and sediment variables are reported in t/ha summed over the time step, for the day, month, or year. Average annual is total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years.

The output files use the same naming convention starting with the object followed by the nutrient balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for hru’s is hru\_ls\_aa.txt.

basin\_ls\_\*.txt

lsunit\_ls\_\*.txt

hru\_ls\_\*.txt

hru-lte\_ls\_\*.txt

real :: sedyld = 0. !metric tons/ha |sediment yield leaving the landscape caused by water erosion

real :: sedorgn = 0. !kg N/ha |organic nitrogen transported in surface runoff

real :: sedorgp = 0. !kg P/ha |organic phosphorus transported in surface runoff

real :: surqno3 = 0. !kg N/ha |nitrate NO3-N transported in surface runoff

real :: latno3 = 0. !kg N/ha |nitrate NO3-N transported in lateral runoff

real :: surqsolp = 0. !kg P/ha |soluble phosphorus transported in surface runoff

real :: usle = 0. !metric tons/ha |sediment erosion predicted with the USLE equation

real :: sedminp = 0. !kg P/ha |mineral phosphorus leaving the landscape transported in sediment

real :: tileno3 = 0. !kg N/ha |nitrate NO3 in tile flow

real :: lchlabp = 0. !kg P/ha |soluble P (labile) leaching past bottom soil layer

real :: tilelabp = 0. !kg N/ha |soluble P (labile) NO3 in tile flow

real :: satexn = 0. !kg N/ha |amt of NO3-N in saturation excess surface runoff in HRU for the day

**Plant and Weather Output Files**

We refer to the landscape as any object related to hru’s which includes soil and plant processes. Landscape units are the area weighted sum of hru’s and are typically defined as subbasins. The basin output file is the area weighted sum of all hru’s in the basin. Leaf are index, plant biomass, surface plant residue, soil temperature, and climate variables are averaged over the time period. Plant stresses, nutrient uptake, and heat units are summed over the time step, for the day, month, or year. Average annual is total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years.

The output files use the same naming convention starting with the object followed by the plant/weather designation and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for hru’s is hru\_pw\_aa.txt.

basin\_pw\_\*.txt

lsunit\_pw\_\*.txt

hru\_pw\_\*.txt

hru-lte\_pw\_\*.txt

real :: lai = 0. !m\*\*2/m\*\*2 |average leaf area index during timestep

real :: bioms = 0. !kg/ha |average total plant biomass during timestep

real :: yield = 0. !kg/ha |harvested biomass yield (dry weight) during timestep

real :: residue = 0. !kg/ha |average surface residue cover during timestep

real :: sol\_tmp = 0. !deg C |average temperature of soil layer 2 during timestep

real :: strsw = 0. !days |limiting water (drought) stress

real :: strsa = 0. !days |excess water (aeration) stress

real :: strstmp = 0. !days |temperature stress

real :: strsn = 0. !days |nitrogen stress

real :: strsp = 0. !days |phosphorus stress

real :: nplnt = 0. !kg N/ha |plant uptake of nitrogen

real :: percn = 0. !kg N/ha |nitrate NO3-N leached from bottom of soil profile

real :: pplnt = 0. !kg P/ha |plant uptake of phosphorus

real :: tmx = 0. !deg C |average maximum temperature during timestep

real :: tmn = 0. !deg C |average minimum temperature during timestep

real :: tmpav = 0. !deg C |average of daily air temperature during timestep

real :: solrad = 0. !MJ/m^2 |average solar radiation during timestep

real :: wndspd = 0. !m/s |average windspeed during timestep

real :: rhum = 0. !none |average relative humidity during timestep

real :: phubase0 = 0. !deg c/deg c |base zero potential heat units

real :: lai\_max = 0. !m\*\*2/m\*\*2 |maximum leaf area index during timestep

real :: bm\_max = 0. !kg/ha |maximum total plant biomass during timestep

real :: bm\_grow = 0. !kg/ha |total plant biomass growth during timestep

real :: c\_gro = 0. !kg/ha |total plant carbon growth during timestep

**Aquifer Output Files**

We model aquifers as geologic storage under soil (hru), channels, and reservoirs. The basin aquifer output file is the area weighted sum of all aquifer’s in the basin. Water storage, water table depth, and nitrate storage are average over the time period. All other variables are reported in mm or kg summed over the time step, for the day, month, or year. Average annual is total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years. Organic carbon and organic nitrogen are currently static.

The output files use the same naming convention starting with the object followed by the water balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for aquifers is aquifer\_wb\_aa.txt.

basin\_aqu\_\*.txt

aquifer\_\*.txt

real :: flo = 0. !mm |lateral flow from aquifer

real :: dep\_wt = 0. !m |average depth from average surface elevation to water table

real :: stor = 0. !mm |average water storage in aquifer in timestep

real :: rchrg = 0. !mm |recharge entering aquifer from other objects

real :: seep = 0. !mm |seepage from bottom of aquifer

real :: revap = 0. !mm |plant water uptake and evaporation

real :: no3\_st = 0. !kg/ha N |current total NO3-N mass in aquifer

real :: minp = 0. !kg/ha P |mineral phosphorus transported in return (lateral) flow

real :: cbn = 0. !percent |organic carbon in aquifer - currently static

real :: orgn = 0. !kg/ha P |organic nitrogen in aquifer - currently static

real :: no3\_rchg = 0. !kg/ha N |nitrate NO3-N flowing into aquifer from another object

real :: no3\_loss = 0. !kg/ha |nitrate NO3-N loss

real :: no3\_lat !kg/ha N |nitrate loading to reach in groundwater

real :: no3\_seep = 0. !kg/ha N |seepage of no3 to next object

real :: flo\_cha = 0. !mm H2O |surface runoff flowing into channels

real :: flo\_res = 0. !mm H2O |surface runoff flowing into reservoirs

real :: flo\_ls = 0. !mm H2O |surface runoff flowing into a landscape element (hru or ru)

**Channel, Reservoir, and Wetland Output Files**

The same output variables and format is used for channels, reservoirs, and wetlands. A channel is defined as a flowing water body transporting water from one point to another. A reservoir is defined as a stationary water body sitting directly over an aquifer. There is no simulation of soil and plant processes. A wetland is defined as water ponding on an hru. If no water is ponding, the wetland functions exactly as an hru. The ponded water can evaporate, seep into the soil, or flow out of the wetland as simulated by the assigned decision table. The general structure of output files is the first print surface area, precipitation, evaporation, and seepage into an aquifer (seepage into the soil for a wetland). Then storage of all variables at the end of the time period, inflow of all variables, followed by outflow of all variables. The basin channel, reservoir, and wetland output files report the area weighted sum of all of each object’s types in the basin.

Surface area and storage variables are output at the end of the time period. All inflow and outflow variables are summed over the time step, for the day, month, or year. Average annual is total sum divided by the number of years of simulation. All timesteps outputs start after the skipped years.

The output files use the same naming convention starting with the object followed by the water balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for reservoirs is reservoir\_wb\_aa.txt.

basin\_sd\_cha\_\*.txt

channel\_sd\_\*.txt

basin\_res\_\*.txt

reservoir\_\*.txt

wetland\_\*.txt (printed when reservoir printing is chosen)

real :: area\_ha = 0. ! ha |water body surface area

real :: precip = 0. ! ha-m |precipitation on the water body

real :: evap = 0. ! ha-m |evaporation from the water surface

real :: seep = 0. ! ha-m |seepage from bottom of water body

real :: flo\_stor = 0. ! m^3 |water stored at end of time period

real :: sed\_stor = 0. ! metric tons |sediment stored at end of time period

real :: orgn\_stor = 0. ! kg N |organic N stored at end of time period

real :: sedp\_stor = 0. ! kg P |organic P stored at end of time period

real :: no3\_stor = 0. ! kg N |NO3-N stored at end of time period

real :: solp\_stor = 0. ! kg P |mineral (soluble P) stored at end of time period

real :: chla\_stor = 0. ! kg |chlorophyll-a stored at end of time period

real :: nh3\_stor = 0. ! kg N |NH3-N (ammonium) stored at end of time period

real :: no2\_stor = 0. ! kg N |NO2-N (nitrite) stored at end of time period

real :: cbod\_stor = 0. ! kg |carbonaceous biological oxygen demand stored at end of time period

real :: dox\_stor = 0. ! kg |dissolved oxygen stored at end of time period

real :: san\_stor = 0. ! tons |detached sand stored at end of time period

real :: sil\_stor = 0. ! tons |detached silt stored at end of time period

real :: cla\_stor = 0. ! tons |detached clay stored at end of time period

real :: sag\_stor = 0. ! tons |detached small ag stored at end of time period

real :: lag\_stor = 0. ! tons |detached large ag stored at end of time period

real :: grv\_stor = 0. ! tons |gravel stored at end of time period

real :: temp\_stor = 0. ! deg c |water temperature

real :: flo\_in = 0. ! m^3 |water in

real :: sed\_in = 0. ! metric tons |sediment in

real :: orgn\_in = 0. ! kg N |organic N in

real :: sedp\_in = 0. ! kg P |organic P in

real :: no3\_in = 0. ! kg N |NO3-N (nitrate) in

real :: solp\_in = 0. ! kg P |mineral (soluble P) in

real :: chla\_in = 0. ! kg |chlorophyll-a in

real :: nh3\_in = 0. ! kg N |NH3-N (ammonium) in

real :: no2\_in = 0. ! kg N |NO2-N (nitrite) in

real :: cbod\_in = 0. ! kg |carbonaceous biological oxygen demand in

real :: dox\_in = 0. ! kg |dissolved oxygen in

real :: san\_in = 0. ! tons |detached sand in

real :: sil\_in = 0. ! tons |detached silt in

real :: cla\_in = 0. ! tons |detached clay in

real :: sag\_in = 0. ! tons |detached small ag in

real :: lag\_in = 0. ! tons |detached large ag in

real :: grv\_in = 0. ! tons |gravel in

real :: temp\_in = 0. ! deg c |temperature in

real :: flo\_out = 0. ! m^3 |water out

real :: sed\_out = 0. ! metric tons |sediment out

real :: orgn\_out = 0. ! kg N |organic N out

real :: sedp\_out = 0. ! kg P |organic P out

real :: no3\_out = 0. ! kg N |NO3-N out

real :: solp\_out = 0. ! kg P |mineral (soluble P) out

real :: chla\_out = 0. ! kg |chlorophyll-a out

real :: nh3\_out = 0. ! kg N |NH3-N (ammonium) out

real :: no2\_out = 0. ! kg N |NO2-N (nitrite) out

real :: cbod\_out = 0. ! kg |carbonaceous biological oxygen demand out

real :: dox\_out = 0. ! kg |dissolved oxygen out

real :: san\_out = 0. ! tons |detached sand out

real :: sil\_out = 0. ! tons |detached silt out

real :: cla\_out = 0. ! tons |detached clay out

real :: sag\_out = 0. ! tons |detached small ag out

real :: lag\_out = 0. ! tons |detached large ag out

real :: grv\_out = 0. ! tons |gravel out

real :: temp\_out = 0. ! deg c |temperature out

**Channel Morphology Output Files**

SWAT+ simulates channel downcutting and widening and gully morphology (gully erosion and head cut retreat). In addition to channel widening, downcutting, and slope adjustment, the channel morphology files output a detailed sediment budget. Total water inflow, aquifer inflow, and water outflow are output by rate (average daily m3/s) and by volume (cumulative mm over the drainage area). The m3/s units allow easy comparison to gage data while the mm unit is intuitive and can be compared with landscape runoff. The width, depth, and slope correspond to the end of each time step. Downcutting, widening, and head cut retreat are all total distances for the time period. All incoming and outgoing sediment loads (tons) are summed for the time period.

The output files use the same naming convention starting with the object followed by the water balance, and then the time step (day, mon, yr and aa). For example, the average annual water balance output text file for reservoirs is reservoir\_wb\_aa.txt.

basin\_sd\_chamorph\_\*.txt

channel\_sdmorph\_\*.txt

        real :: flo\_in = 0.             ! (m^3/s)       !average daily inflow rate during time step

        real :: aqu\_in = 0.             ! (m^3/s)       !average daily aquifer inflow rate during time step

        real :: flo = 0.                ! (m^3/s)       !average daily outflow rate during time step

        real :: peakr = 0.              ! (m^3/s)       |average peak runoff rate during time step

        real :: sed\_in = 0.             ! (tons)        !sediment in

        real :: sed\_out = 0.            ! (tons)        !sediment out

        real :: washld = 0.             ! (tons)        !wash load (suspended) out

        real :: bedld = 0.              ! (tons)        !bed load out

        real :: dep = 0.                ! (tons)        !deposition in channel and flood plain

        real :: deg\_btm = 0.            ! (tons)        !erosion of channel bottom

        real :: deg\_bank = 0.           ! (tons)        !erosion of channel bank

        real :: hc\_sed = 0.             ! (tons)        !erosion from gully head cut

        real :: width = 0.              ! m !channel bank full top width at end of time step

        real :: depth = 0.              ! m !channel bank full depth at end of time step

        real :: slope = 0.              ! m/m !channel slope

        real :: deg\_btm\_m = 0.          ! (m)           !downcutting of channel bottom

        real :: deg\_bank\_m = 0.         ! (m)           !widening of channel banks

        real :: hc\_m = 0.               ! (m)           !headcut retreat

        real :: flo\_in\_mm = 0.          ! (mm)          !inflow rate total sum for each time step

        real :: aqu\_in\_mm = 0.          ! (mm)          !aquifer inflow rate total sum for each time step

        real :: flo\_mm = 0.             ! (mm)          !outflow rate total sum for each time step

 real :: sed\_stor = 0.           ! (tons)        !sed storage at end of time step

**Point Source Output Files**

SWAT+ allows users to input point sources (wastewater treatment plant waste or industrial waste), stream gage data, and simulated flows from other models. The point source files output the data at daily, monthly, yearly, and average annual time steps. The basin output aggregates all point sources in the simulation. Temperature is averaged over the time period and all other variables are summed.

The output files use the same naming convention starting with the object followed by the point source designation (psc), and then the time step (day, mon, yr and aa). For example, the average output text file for point sources is recall\_aa.txt.

basin\_psc\_\*.txt

recall\_\*.txt

real :: flo = 0. !! m^3 |volume of water

real :: sed = 0. !! metric tons |sediment

real :: orgn = 0. !! kg N |organic N

real :: sedp = 0. !! kg P |organic P

real :: no3 = 0. !! kg N |nitrate NO3-N

real :: solp = 0. !! kg P |mineral (soluble P)

real :: chla = 0. !! kg |chlorophyll-a

real :: nh3 = 0. !! kg N |ammonium NH3-N

real :: no2 = 0. !! kg N |nitrite NO2-N

real :: cbod = 0. !! kg |carbonaceous biological oxygen demand

real :: dox = 0. !! kg |dissolved oxygen

real :: san = 0. !! tons |detached sand

real :: sil = 0. !! tons |detached silt

real :: cla = 0. !! tons |detached clay

real :: sag = 0. !! tons |detached small ag

real :: lag = 0. !! tons |detached large ag

real :: grv = 0. !! tons |gravel

real :: temp = 0. !! deg c |temperature

**Nutrient gain loss output file. This file prints when HRU\_LS print codes are entered and can print on a daily, monthly, yearly or aveann basis.**

hru\_nut\_carb\_gl\_\*.txt (printed when HRU\_LS print is chosen)

real :: sedyld = 0. !metric tons/ha |sediment yield leaving the landscape caused by water erosion

real :: usle = 0. !metric tons/ha |sediment erosion predicted with the USLE equation

real :: sedorgc = 0. !kg N/ha |organic carbon in surface runoff

real :: sedorgn = 0. !kg N/ha |organic nitrogen transported in surface runoff

real :: sedorgp = 0. !kg P/ha |organic phosphorus transported in surface runoff

real :: surqno3 = 0. !kg N/ha |nitrate NO3-N transported in surface runoff

real :: latno3 = 0. !kg N/ha |nitrate NO3-N transported in lateral runoff

real :: surqsolp = 0. !kg P/ha |soluble phosphorus transported in surface runoff

real :: sedmin = 0. !kg P/ha |mineral phosphorus leaving the landscape transported in sediment

real :: tileno3 = 0. !kg N/ha |nitrate NO3 in tile flow

real :: no3atmo = 0. !kg N/ha |nitrate added to the soil from atmospheric deposition (rainfall+dry)

real :: nh4atmo = 0. !kg N/ha |ammonia added to the soil from atmospheric deposition (rainfall+dry)

real :: manurec = 0. !kg N/ha |amount of carbon applied to soil

real :: manuren = 0. !kg N/ha |amount of nitrogen applied to soil

real :: manurep = 0. !kg P/ha |amount of phosphorus applied to soil

real :: fertc = 0. !kg N/ha |amount of carbon applied to soil

real :: fertn = 0. !kg N/ha |amount of nitrogen applied to soil

real :: fertp = 0. !kg P/ha |amount of phosphorus applied to soil

real :: grazc\_eat = 0. !kg N/ha |amount of carbon added to soil in grazing

real :: grazn\_eat = 0. !kg N/ha |amount of nitrogen added to soil in grazing

real :: grazp\_eat = 0. !kg P/ha |amount of phosphorus added to soil in grazing

real :: grazc\_man = 0. !kg N/ha |amount of carbon added to soil manually

real :: grazn\_man = 0. !kg N/ha |amount of nitrogen added to soil manually

real :: grazp\_man = 0. !kg P/ha |amount of phosphorus added to soil manually

real :: fixn = 0. !kg N/ha |amount of nitrogen added to plant biomass via fixation

real :: denit = 0. !kg N/ha |amount of nitrogen lost from nitrate pool by denit in soil profile

real :: yieldc = 0. !kg N/ha |amount of carbon in the biomass yield

real :: yieldn = 0. !kg N/ha |amount of nitrogen in the biomass yield

real :: yieldp = 0. !kg P/ha |amount of phosphorus in the biomass yield

**Nutrient cycling output file. This file prints when HRU\_NB print codes are entered and can print on a daily, monthly, yearly or ave ann basis.**

hru\_ncycle\_\*.txt (printed when HRU\_NB print is chosen)

real :: lab\_min\_p = 0. !kg P/ha |phosphorus moving from the labile mineral pool to the active mineral pool

real :: act\_sta\_p = 0. !kg P/ha |phosphorus moving from the active mineral pool to the stable mineral pool

real :: act\_nit\_n = 0. !kg N/ha |nitrogen moving from active organic pool to nitrate pool

real :: act\_sta\_n = 0. !kg N/ha |nitrogen moving from active organic pool to stable pool

real :: org\_lab\_p = 0. !kg P/ha |phosphorus moving from the organic pool to labile pool

real :: rsd\_hs\_c = 0. !kg N/ha |amt of carbon moving from the fresh org (residue) to soil slow humus

real :: rsd\_nitorg\_n = 0. !kg P/ha |phosphorus moving from the organic pool to labile pool

real :: rsd\_laborg\_p = 0. !kg P/ha |phosphorus moving from the fresh organic pool (residue) to the labile (80%)

! and org (20%) pools

**Object Hydrograph Output Files**

The object hydrograph output files allow users to print specific hydrographs from specific objects. This is commonly used to: 1) print daily channel outflow to compare to a stream gage and 2) print daily flow to a file that can be read in as a point source from another SWAT+ simulation. A user could also output daily surface runoff, lateral flow, tile flow, or percolation from and an individual hru. The only timestep for the object hydrograph files is daily. In the object.prt file (or the file name given in file.cio), the user specifies the object type :

hru (hru)  
 hlt (hru-lte)  
 ru (routing unit)  
 res (reservoir)  
 cha (channel)  
 exc (export coefficient)  
 dr (delivery ratio)  
 out (outlet)  
 sdc (swat-deg channel)  
  
the object number, the hydrograph type:

tot (total flow)  
rhg (percolation)  
sur (surface runoff)  
lat (lateral soil flow)  
til (tile flow)  
sol (soil moisture by layer)

and the file name to write the output.

Daily soil water (mm) for each soil layer can also be printed for an hru using the sol hydrograph type. Using object type 0 prints soil water for all hrus. This only works for soil moisture for all HRU’s to be printed in one file. For runoff you need to include a separate object file for every HRU. A channel or reservoir has total flow out (tot) which can be used as a point source file without modification.

**This is an example object.prt file:**

NUMB OBTYP OBTYPNO HYDTYP FILENAME

1 hru **1**  sur **surf\_hru1.out**

1 hru **0** sol **soils\_st.out**

1 sdc **3** tot **flow\_cha3.out**

**Hydrograph Output**

real :: flo = 0. !! m^3 |volume of water

real :: sed = 0. !! metric tons |sediment

real :: orgn = 0. !! kg N |organic N

real :: sedp = 0. !! kg P |organic P

real :: no3 = 0. !! kg N |nitrate NO3-N

real :: solp = 0. !! kg P |mineral (soluble P)

real :: chla = 0. !! kg |chlorophyll-a

real :: nh3 = 0. !! kg N |ammonium NH3-N

real :: no2 = 0. !! kg N |nitrite NO2-N

real :: cbod = 0. !! kg |carbonaceous biological oxygen demand

real :: dox = 0. !! kg |dissolved oxygen

real :: san = 0. !! tons |detached sand

real :: sil = 0. !! tons |detached silt

real :: cla = 0. !! tons |detached clay

real :: sag = 0. !! tons |detached small ag

real :: lag = 0. !! tons |detached large ag

real :: grv = 0. !! tons |gravel

real :: temp = 0. !! deg c |temperature