SWAT

Generated by Doxygen 1.8.16

Chapter 1

SWAT

An updated SWAT 2012 revision 670 code

Objectives

- Standard indentation and translation to Fortran 90 by using `findent`. See the translate-fortran90.pl perl script file (:heavy_check_mark:)
- Exhaustive use of the "implicit none" directive to detect bad variable usage (:heavy_check_mark:)
- Generate a GNU `Make` makefile and compile with GNU `GFortran`. See the gernerate-makefile.pl perl script file (:heavy_check_mark:)
- Remove non-used variables and format labels (:heavy_check_mark:)
- Detect and solve all uninitialized variables (:heavy_check_mark: :construction:, some proposed solutions could be incorrect)
- Remove unneeded variable initializations (:heavy_check_mark:) as:

```
j=0 !  this line is not necessary
j=ihru
```

- Remove redundant code (:heavy_check_mark:)
- Exhaustive use of the "parameter" directive on constants (:heavy_check_mark:)
- Generate a detailed list of issues detected in the original code (:heavy_check_mark:, see at the end of this README)
- Remove obsolete commented code (:x:)
- Update variable descriptions in comments (:construction:, a lot of work)
- Standardize comments by using Doxygen style in order to generate documentation. See at latex/refman.pdf (:construction:, a lot of work)

Required tools

- GFortran (to compile the source code)
- Make (to build the executable file)
- Perl (optional: to execute the perl scripts to update the makefile or to translate original files to Fortran 90)
- Findent (optional: to translate original files to Fortran 90 with a standard indentation)
- Doxygen (optional: to generate a reference programming manual from source code)
- TeX Live or MiKTeX (optional: to generate a reference programming manual from source code)
- On Microsoft Windows systems you have to install MSYS2 and the required utilities (GFortran and Make). You can follow detailed instructions in install-unix

Instructions to generate Fortran 90 style code from original code

In order to generate Fortran 90 style code with standard indentation from original code you have to type on a UNIX type terminal (you need Perl and Findent):

```
$ perl translate-fortran90.pl
```

Instructions to generate an initial GNU make Makefile

Type on the UNIX type terminal, when translated the original code to Fortran 90 style (you need Perl):

```
$ perl generate-makefile.pl
```

Instructions to generate an executable to test

Type on the UNIX type terminal (you need GFortran and Make)

- In UNIX type operative systems:

  ```
  $ make
  ```

- In a MSYS2 terminal in Microsoft Windows:

  ```
  $ EXE=".exe" LDFLAGS="-static" make
  ```

- Cross-compiling a 32 bits Microsoft Windows executable in a UNIX type operative system:

  ```
  $ prefix="i686-w64-mingw32-" EXE=".exe" LDFLAGS="-static" make
  ```

- Cross-compiling a 64 bits Microsoft Windows executable in a UNIX type operative system:

  ```
  $ prefix="x86\_64-w64-mingw32-" EXE=".exe" LDFLAGS="-static" make
  ```

Instructions to generate an optimized executable file

Type on the UNIX type terminal (you need GFortran and Make)

- In UNIX type operative systems:

  $ CFLAGS="-march=native -flto" LDFLAGS="-flto" make strip

- In a MSYS2 terminal in Microsoft Windows:

  $ EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

- Cross-compiling a 32 bits Microsoft Windows executable in a UNIX type operative system:

  $ prefix="i686-w64-mingw32-" EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

- Cross-compiling a 64 bits Microsoft Windows executable in a UNIX type operative system:

  $ prefix="x86_64-w64-mingw32-" EXE=".exe" CFLAGS="-flto" LDFLAGS="-flto -static" make strip

Instructions to generate a reference programming manual from source code

Type on the UNIX type terminal (you need Doxygen and TeX Live or MiKTeX):

$ doxygen
$ cd latex
$ make

The reference programming manual file latex/refman.pdf is generated from source code in PDF format

Issues in the original source code

This is a list of possible issues detected in the original source code. These issues have been mostly detected by the GFortran compiler warnings. Some of them could not arise because the logic of the variables is not possible.

- In biofilm.f:
  - "dcoef" is used but not initialized. `dcoef=3` as in watqual.f? Then, I propose at beginning: `real*8, parameter :: dcoef = 3.`
- In bmp_ri_pond.f:
  - "qseep" and "qet" could be used not initialized at lines 133 and 134. However the problem only arises for `nstep<1`
- In bmp_sand_filter.f:
  - "sed_removed" at line 342 could be used not initialized if `sfsedstdev<=0`
- In bpm_sed_pond.f:
  - `bmp_sed _pond` seems to be `bmp_sed_pond` at line 186

- In bmp_wet_pond.f:
  - "hvol" could be used not initialized in "ext_dpth" subroutine at line 267 in first bucle iteration
- In clicon.f:
  - "tmxbsb", "tmnbsb", "rbsb", "rstpbsb", "rhdbsb", "rabsb", "rmxbsb", "daylbsb", "fradbsb" and "u10bsb" could be used not initialized at 186-207 lines
- In conapply.f:
  - "k" and "kk" could be used not initialized at 121-122 lines if `iday_pest(j)/=ipst_freq(j)` and `curyr>nyskip`
- In confert.f:
  - "ifrt" seems to be "it" at line 214
- In curno.f:
  - "smxold" could be used not initialized if `cn1(h)<=1.e-6` and `curyr/=0` at line 96
- In drains.f:
  - "nlayer" could be used not initialized at line 23. However, the problem only arises if it is not set in the previous bucle (`mlyr<=1` or `sol_z(j1,j)<=0`)
- In etact.f:
  - "sev" could be used not initialized at line 286 if `dep>=esd` and `ly==2`
- In filter.f:
  - "remove21" seems to be "remove2" at line 316
- In grass_wway.f:
  - "sf_depth" and "sf_sed" could be used not initialized at lines 133 and 137 if `sf_area>0` and `sf_area<=1.e-6`
- In hhnoqual.f:
  - "algon" seems to be "algcon" at line 190
- In hhwatqual.f
  - "orgnpin" seems to be "orgpin" at line 278
  - `thour=1.0` at line 377 overwrites previous "thour" calculation. It is wrong
- In hmeas.f:
  - "rhdbsb" could be used not initialized at line 84
- In killop.f:
  - "ff1" and "ff2" are used but not initialized at lines 167 and 267. They are set in harvkillop.f file (lines 257-258). They have to be included in modparm.f to share harvkillop.f values? or they have to be redefined as in harvkillop.f?
- In NCsed_leach.f90:
  - "perc_clyr" could be used not initialized at line 221 if `sol_nly(j)<2`
- In nrain.f:
  - "no2pcp" seems to be "no3pcp" at line 72
- In pmeas.f:

  - "rbsb" could be used not initialized at line 143
  - "flag" could be used not initialized if 'a==' 'at line 210
  - "rainsb" could be used not initialized, however only ifnstep<=0`
- In pminrl2.f:
  - at line 95 a comma is necessary between "base" and "vara"
  - "ssp" could be used not initialized at line 196 if xx<=1.e-6
- In pothole.f:
  - "solp_tileo" could be used not initialized at line 593 if pot_vol(j)<=1.e-6 or potvol_↩ tile<=1.e-6
- In potholehr.f:
  - "potflow" seems to be "potflwo" at line 447
- In readatmodep.f:
  - momax=12*nbyr is defined at line 65 but not used. It has to be "mo_max"? but then, it overwrites the file read
- In readops.f:
  - year = 0. seems to be iyear = 0 at line 98
  - "mg13" seems to be "mgt13" at line 206
- In readpnd.f:
  - "vselsetlpnd" seems to be "velsetlpnd" at line 279
- In readru.f:
  - "tck" is used but not initialized at line 79
- In readsepticbz.f:
  - at line 135 4. e-8 seems to be 4.e-8
- In rewind_init.f:
  - "orig_tnylda" is used but not initialized at line 174
- In routels.f:
  - "dstor" is used but not initialized at line 134. It has to be calculated as in watbal.f? or as in the commented line 109?
  - "latqout" and "gwqout" could be used not initialized at lines 142-143
- In rtbact.f:
  - "netwtr" could be used not initialized at line 124, however only if nstep<1
- In rthpest.f:
  - thour=1.0 at line 183 overwrites previous "thour" calculation. It is wrong
  - "frsol" and "frsrb" could be used not initialized at lines 289-290 if hrtwtr(ii)>0.001 and hrtwtr(ii)/(idt*60)<=0.01
- In rtpest.f:
  - tday=1.0 at line 180 overwrites previous "tday" calculation. It is wrong
- In sched_mgt.f:
  - < = seems to be <= at 202 line

  - "husc" and "igrow" at lines 264-265 are used but not initialized. "husc" has to be `phu_op(iop,ihru)` has in readmgt.f? "igrow" has to be `igro(ihru)` has in readmgt.f?

- In smeas.f:
  - "rabsb" could be used not initialized at line 86
- In sweep.f:
  - "fr_curb" is used but not initialized at line 56. It has to be added to modparm.f to share result with sched_mgt.f? or it has to be `mgt5op(nop(ihru),ihru)` as in sched_mgt.f?
- In tmeas.f:
  - "tmxbsb" and "tmnbsb" could be used not initialized at lines 109-110
- In transfer.f:
  - "ratio", "xx" and "ratio1" could be used not initialized at lines 236, 239 and 241 if `ihout==2`
- In wmeas.f:
  - "u10bsb" could be used not initialized at line 85
- In zero0.f:
  - "sol_sumn03" seems to be "sol_sumno3" at line 508
- In zero_urbn.f:
  - "stp_stagdis" seems to be "dtp_stagdis" at line 84
  - "subdr_kg" seems to be "subdr_km" at line 149
  - "spl_eros" is not defined at line 21, it could be "eros_spl"?

Chapter 2

Modules Index

2.1 Modules List

Here is a list of all documented modules with brief descriptions:

Chapter 3

Data Type Index

3.1 Data Types List

Here are the data types with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 5

Module Documentation

5.1 parm Module Reference

main module contatining the global variables

Data Types

- interface ascrv
- interface atri
- interface aunif
- interface dstn1
- interface ee
- interface expo
- interface fcgd
- interface HQDAV
- interface layersplit
- interface ndenit
- interface qman
- interface regres
- interface rsedaa
- interface tair
- interface theta
- interface vbl

Variables

- integer, parameter mvaro = 33

  max number of variables routed through the reach
- integer, parameter mhruo = 79

  max number of variables in output.hru
- integer, parameter mrcho = 62

  max number of variables in reach file
- integer, parameter msubo = 24

  max number of variables in output.sub
- integer, parameter mstdo = 113

max number of variables summarized in output.std

- integer, parameter **motot** = 600
- integer **icalen**
- real ∗8 prf_bsn

  Basinwide peak rate adjustment factor for sediment routing in the channel. Allows impact of peak flow rate on sediment routing and channel reshaping to be taken into account.
- real ∗8 **co2_x2**
- real ∗8 **co2_x**
- real ∗8, dimension(:), allocatable **alph_e**
- real ∗8, dimension(:), allocatable cdn

  denitrification exponential rate coefficient
- real ∗8, dimension(:), allocatable nperco

  nitrate percolation coefficient (0-1)
  0:concentration of nitrate in surface runoff is zero
  1:percolate has same concentration of nitrate as surface runoff
- real ∗8, dimension(:), allocatable surlag

  Surface runoff lag time. This parameter is needed in subbasins where the time of concentration is greater than 1 day. SURLAG is used to create a "storage" for surface runoff to allow the runoff to take longer than 1 day to reach the subbasin outlet (days)
- real ∗8, dimension(:), allocatable **co_p**
- real ∗8, dimension(:), allocatable cmn

  rate factor for humus mineralization on active organic N
- real ∗8, dimension(:), allocatable phoskd

  Phosphorus soil partitioning coefficient. Ratio of soluble phosphorus in surface layer to soluble phosphorus in runoff.
- real ∗8, dimension(:), allocatable psp

  Phosphorus availibility index. The fraction of fertilizer P remaining in labile pool after initial rapid phase of P sorption.
- real ∗8, dimension(:), allocatable sdnco

  denitrification threshold: fraction of field capacity triggering denitrification
- real ∗8 r2adj_bsn

  basinwide retention parameter adjustment factor (greater than 1)
- real ∗8 **yield**
- real ∗8 **burn_frlb**
- real ∗8 **pst_kg**
- real ∗8 **yieldgrn**
- real ∗8 **yieldbms**
- real ∗8 **yieldtbr**
- real ∗8 **yieldn**
- real ∗8 **yieldp**
- real ∗8 **hi_bms**
- real ∗8 **hi_rsd**
- real ∗8 **yieldrsd**
- real ∗8, dimension(:), allocatable **l_k1**
- real ∗8, dimension(:), allocatable **l_k2**
- real ∗8, dimension(:), allocatable **l_lambda**
- real ∗8, dimension(:), allocatable **l_beta**
- real ∗8, dimension(:), allocatable **l_gama**
- real ∗8, dimension(:), allocatable **l_harea**
- real ∗8, dimension(:), allocatable **l_vleng**
- real ∗8, dimension(:), allocatable **l_vslope**
- real ∗8, dimension(:), allocatable **l_ktc**
- real ∗8, dimension(:), allocatable **biofilm_mumax**
- real ∗8, dimension(:), allocatable **biofilm_kinv**
- real ∗8, dimension(:), allocatable **biofilm_klw**
- real ∗8, dimension(:), allocatable **biofilm_kla**

- real ∗8, dimension(:), allocatable **biofilm_cdet**
- real ∗8, dimension(:), allocatable **biofilm_bm**
- real ∗8, dimension(:,:), allocatable **hru_rufr**
- real ∗8, dimension(:,:), allocatable **daru_km**
- real ∗8, dimension(:,:), allocatable **ru_k**
- real ∗8, dimension(:,:), allocatable **ru_c**
- real ∗8, dimension(:,:), allocatable **ru_eiq**
- real ∗8, dimension(:,:), allocatable **ru_ovsl**
- real ∗8, dimension(:,:), allocatable **ru_a**
- real ∗8, dimension(:,:), allocatable **ru_ovs**
- real ∗8, dimension(:,:), allocatable **ru_ktc**
- real ∗8, dimension(:), allocatable **gwq_ru**
- real ∗8, dimension(:), allocatable **qdayout**
- integer, dimension(:), allocatable **ils2**
- integer, dimension(:), allocatable **ils2flag**
- integer **iru**
- integer **mru**
- integer **irch**
- integer **isub**
- integer **idum**
- integer **mhyd_bsn**
- integer **ipest**
- integer **ils_nofig**
- integer **mhru1**
- integer, dimension(:), allocatable **mhyd1**
- integer, dimension(:), allocatable **irtun**
- real ∗8 **wshd_sepno3**
- real ∗8 **wshd_sepnh3**
- real ∗8 **wshd_seporgn**
- real ∗8 **wshd_sepfon**
- real ∗8 **wshd_seporgp**
- real ∗8 **wshd_sepfop**
- real ∗8 **wshd_sepsolp**
- real ∗8 **wshd_sepbod**
- real ∗8 **wshd_sepmm**
- integer, dimension(:), allocatable **isep_hru**
- real ∗8 fixco

  nitrogen fixation coefficient
- real ∗8 nfixmx

  maximum daily n-fixation (kg/ha)
- real ∗8 res_stlr_co

  reservoir sediment settling coefficient
- real ∗8 rsd_covco

  residue cover factor for computing frac of cover
- real ∗8 vcrit

  critical velocity
- real ∗8 **wshd_sw**
- real ∗8 **wshd_snob**
- real ∗8 **wshd_pndfr**
- real ∗8 **wshd_pndv**
- real ∗8 **wshd_pndsed**
- real ∗8 percop

pesticide percolation coefficient (0-1)
0: concentration of pesticide in surface runoff is zero
1: percolate has same concentration of pesticide as surface runoff

- real ∗8 **wshd_wetfr**
- real ∗8 **wshd_resfr**
- real ∗8 **wshd_resha**
- real ∗8 **wshd_pndha**
- real ∗8 **wshd_fminp**
- real ∗8 **wshd_ftotn**
- real ∗8 **wshd_fnh3**
- real ∗8 **wshd_fno3**
- real ∗8 **wshd_forgn**
- real ∗8 **wshd_forgp**
- real ∗8 **wshd_ftotp**
- real ∗8 **wshd_yldn**
- real ∗8 **wshd_yldp**
- real ∗8 **wshd_fixn**
- real ∗8 **wshd_pup**
- real ∗8 **wshd_wstrs**
- real ∗8 **wshd_nstrs**
- real ∗8 **wshd_pstrs**
- real ∗8 **wshd_tstrs**
- real ∗8 **wshd_astrs**
- real ∗8 ffcb

  initial soil water content expressed as a fraction of field capacity
- real ∗8 **wshd_hmn**
- real ∗8 **wshd_rwn**
- real ∗8 **wshd_hmp**
- real ∗8 **wshd_rmn**
- real ∗8 **wshd_dnit**
- real ∗8 wdpq

  die-off factor for persistent bacteria in soil solution (1/day)
- real ∗8 **wshd_rmp**
- real ∗8 **wshd_voln**
- real ∗8 **wshd_nitn**
- real ∗8 **wshd_pas**
- real ∗8 **wshd_pal**
- real ∗8 wof_p

  wash off fraction for persistent bacteria on foliage during a rainfall event
- real ∗8 **wshd_plch**
- real ∗8 **wshd_raino3**
- real ∗8 **ressedc**
- real ∗8 **basno3f**
- real ∗8 **basorgnf**
- real ∗8 **wshd_pinlet**
- real ∗8 **wshd_ptile**
- real ∗8 sftmp

  Snowfall temperature (deg C)
- real ∗8 smfmn

  Minimum melt rate for snow during year (Dec. 21) where deg C refers to the air temperature. (mm/deg C/day)
- real ∗8 smfmx

  Maximum melt rate for snow during year (June 21) where deg C refers to the air temperature. SMFMX and SM↩ FMN allow the rate of snow melt to vary through the year. These parameters are accounting for the impact of soil temperature on snow melt. (mm/deg C/day)

- real ∗8 smtmp

  Snow melt base temperature. Mean air temperature at which snow melt will occur. (deg C)
- real ∗8 wgpq

  growth factor for persistent bacteria in soil solution (1/day)
- real ∗8 **basminpf**
- real ∗8 **basorgpf**
- real ∗8 wdlpq

  die-off factor for less persistent bacteria in soil solution (1/day)
- real ∗8 **wshd_resv**
- real ∗8 **wshd_ressed**
- real ∗8 **basno3i**
- real ∗8 **basorgni**
- real ∗8 **basminpi**
- real ∗8 wdps

  die-off factor for persistent bacteria adsorbed to soil particles (1/day)
- real ∗8 wglpq

  growth factor for less persistent bacteria in soil solution (1/day)
- real ∗8 **basorgpi**
- real ∗8 **peakr**
- real ∗8 **pndsedin**
- real ∗8 **sw_excess**
- real ∗8 **albday**
- real ∗8 timp

  Snow pack temperature lag factor (0-1)
  1 = no lag (snow pack temp=current day air temp) as the lag factor goes to zero, the snow pack's temperature will be less influenced by the current day's air temperature.
- real ∗8 **wtabelo**
- real ∗8 **tilep**
- real ∗8 **wt_shall**
- real ∗8 **sq_rto**
- real ∗8 **tloss**
- real ∗8 **inflpcp**
- real ∗8 **snomlt**
- real ∗8 **snofall**
- real ∗8 **fixn**
- real ∗8 **qtile**
- real ∗8 **crk**
- real ∗8 **latlyr**
- real ∗8 **pndloss**
- real ∗8 **wetloss**
- real ∗8 **potloss**
- real ∗8 **lpndloss**
- real ∗8 **lwetloss**
- real ∗8 **sedrch**
- real ∗8 **fertn**
- real ∗8 **sol_rd**
- real ∗8 **cfertn**
- real ∗8 **cfertp**
- real ∗8 **sepday**
- real ∗8 **bioday**
- real ∗8 **sepcrk**
- real ∗8 **sepcrktot**
- real ∗8 **fertno3**
- real ∗8 **fertnh3**

- real ∗8 **fertorgn**
- real ∗8 **fertsolp**
- real ∗8 **fertorgp**
- real ∗8 wgps

  growth factor for persistent bacteria adsorbed to soil particles (1/day)
- real ∗8 **fertp**
- real ∗8 **grazn**
- real ∗8 **grazp**
- real ∗8 **soxy**
- real ∗8 **qdfr**
- real ∗8 **sdti**
- real ∗8 **rtwtr**
- real ∗8 **ressa**
- real ∗8 wdlps

  die-off factor for less persistent bacteria absorbed to soil particles (1/day)
- real ∗8 wglps

  growth factor for less persistent bacteria adsorbed to soil particles (1/day)
- real ∗8 **rttime**
- real ∗8 **rchdep**
- real ∗8 **rtevp**
- real ∗8 **rttlc**
- real ∗8 **da_km**
- real ∗8 **resflwi**
- real ∗8 wdprch

  die-off factor for persistent bacteria in streams (1/day)
- real ∗8 **resflwo**
- real ∗8 **respcp**
- real ∗8 **resev**
- real ∗8 **ressep**
- real ∗8 **ressedi**
- real ∗8 **ressedo**
- real ∗8 **dtot**
- real ∗8 pperco_bsn

  phosphorus percolation coefficient. Ratio of soluble phosphorus in surface to soluble phosphorus in percolate
- real ∗8 nperco_bsn

  basin nitrate percolation coefficient (0-1)
  0:concentration of nitrate in surface runoff is zero
  1:percolate has same concentration of nitrate as surface runoff
- real ∗8 rsdco

  residue decomposition coefficient. The fraction of residue which will decompose in a day assuming optimal moisture, temperature, C:N ratio, and C:P ratio
- real ∗8 **phoskd_bsn**
- real ∗8 **voltot**
- real ∗8 msk_x

  weighting factor controling relative importance of inflow rate and outflow rate in determining storage on reach
- real ∗8 **volcrmin**
- real ∗8 bactkdq

  bacteria soil partitioning coefficient. Ratio of solution bacteria in surface layer to solution bacteria in runoff soluble and sorbed phase in surface runoff.
- real ∗8 wdpf

  die-off factor for persistent bacteria on foliage (1/day)
- real ∗8 **uno3d**
- real ∗8 **canev**
- real ∗8 **usle**

- real ∗8 **rcn**
- real ∗8 **surlag_bsn**
- real ∗8 **precipday**
- real ∗8 thbact

  temperature adjustment factor for bacteria die-off/growth
- real ∗8 wlpq20

  overall rate change for less persistent bacteria in soil solution (1/day)
- real ∗8 wlps20

  overall rate change for less persistent bacteria adsorbed to soil particles (1/day)
- real ∗8 wpq20

  overall rate change for persistent bacteria in soil solution (1/day)
- real ∗8 wps20

  overall rate change for persistent bacteria adsorbed to soil particles (1/day)
- real ∗8 **bactrop**
- real ∗8 **bactsedp**
- real ∗8 wgpf

  growth factor for persistent bacteria on foliage (1/day)
- real ∗8 **bactlchp**
- real ∗8 **bactlchlp**
- real ∗8 **enratio**
- real ∗8 **wetpcp**
- real ∗8 **pndpcp**
- real ∗8 **wetsep**
- real ∗8 **pndsep**
- real ∗8 **wetev**
- real ∗8 **pndev**
- real ∗8 **pndsedo**
- real ∗8 **wetsedo**
- real ∗8 **pndflwi**
- real ∗8 **wetflwi**
- real ∗8 **pndflwo**
- real ∗8 **wetflwo**
- real ∗8 **wetsedi**
- real ∗8 **da_ha**
- real ∗8 **vpd**
- real ∗8 evlai

  leaf area index at which no evaporation occurs. This variable is used in ponded HRUs where evaporation from the water surface is restricted by the plant canopy cover. Evaporation from the water surface equals potential ET when LAI = 0 and decreased linearly to O when LAI = EVLAI
- real ∗8 evrch

  Reach evaporation adjustment factor. Evaporation from the reach is multiplied by EVRCH. This variable was created to limit the evaporation predicted in arid regions.
- real ∗8 wdlpf

  die-off factor for less persistent bacteria on foliage (1/day)
- real ∗8 **bactrolp**
- real ∗8 **bactsedlp**
- real ∗8 **pet_day**
- real ∗8 **ep_day**
- real ∗8 adj_pkr

  peak rate adjustment factor in the subbasin. Used in the MUSLE equation to account for impact of peak flow on erosion.
- real ∗8 n_updis

nitrogen uptake distribution parameter. This parameter controls the amount of nitrogen removed from the different soil layer layers by the plant. In particular, this parameter allows the amount of nitrogen removed from the surface layer via plant uptake to be controlled. While the relationship between UBN and N removed from the surface layer is affected by the depth of the soil profile, in general, as UBN increases the amount of N removed from the surface layer relative to the amount removed from the entire profile increases

- real ∗8 nactfr

  nitrogen active pool fraction. The fraction of organic nitrogen in the active pool.

- real ∗8 p_updis

  phosphorus uptake distribution parameter This parameter controls the amount of phosphorus removed from the different soil layers by the plant. In particular, this parameter allows the amount of phosphorus removed from the surface layer via plant uptake to be controlled. While the relationship between UBP and P uptake from the surface layer is affected by the depth of the soil profile, in general, as UBP increases the amount of P removed from the surface layer relative to the amount removed from the entire profile increases

- real ∗8 **snoev**
- real ∗8 **sno3up**
- real ∗8 **reactw**
- real ∗8 **sdiegropq**
- real ∗8 **sdiegrolpq**
- real ∗8 **sdiegrops**
- real ∗8 **sdiegrolps**
- real ∗8 **es_day**
- real ∗8 wof_lp

  wash off fraction for less persistent bacteria on foliage during a rainfall event

- real ∗8 **sbactrop**
- real ∗8 **sbactrolp**
- real ∗8 **sbactsedp**
- real ∗8 **sbactsedlp**
- real ∗8 **ep_max**
- real ∗8 **sbactlchp**
- real ∗8 **sbactlchlp**
- real ∗8 **psp_bsn**
- real ∗8 **rchwtr**
- real ∗8 **resuspst**
- real ∗8 **setlpst**
- real ∗8 **bsprev**
- real ∗8 **bssprev**
- real ∗8 **spadyo**
- real ∗8 **spadyev**
- real ∗8 **spadysp**
- real ∗8 **spadyrfv**
- real ∗8 **spadyosp**
- real ∗8 **qday**
- real ∗8 **usle_ei**
- real ∗8 **al5**
- real ∗8 **pndsedc**
- real ∗8 **no3pcp**
- real ∗8 **rcharea**
- real ∗8 **volatpst**
- real ∗8 ubw

  water uptake distribution parameter. This parameter controls the amount of water removed from the different soil layers by the plant. In particular, this parameter allows the amount of water removed from the surface layer via plant uptake to be controlled. While the relationship between UBW and H2O removed from the surface layer is affected by the depth of the soil profile, in general, as UBW increases the amount of water removed from the surface layer relative to the amount removed from the entire profile increases

- real ∗8 uobn

nitrogen uptake normalization parameter. This variable normalizes the nitrogen uptake so that the model can easily verify that upake from the different soil layers sums to 1.0

- real ∗8 uobp

  phosphorus uptake normalization parameter. This variable normalizes the phosphorus uptake so that the model can easily verify that uptake from the different soil layers sums to 1.0
- real ∗8 uobw

  water uptake normalization parameter. This variable normalizes the water uptake so that the model can easily verify that uptake from the different soil layers sums to 1.0
- real ∗8 wglpf

  growth factor for less persistent bacteria on foliage (1/day)
- real ∗8 **wetsedc**
- real ∗8 **respesti**
- real ∗8 rcor

  correction coefficient for generated rainfall to ensure that the annual means for generated and observed values are comparable (needed only if IDIST=1)
- real ∗8 rexp

  value of exponent for mixed exponential rainfall distribution (needed only if IDIST=1)
- real ∗8 snocov1

  1st shape parameter for snow cover equation. This parameter is determined by solving the equation for 50% snow cover
- real ∗8 snocov2

  2nd shape parameter for snow cover equation. This parameter is determined by solving the equation for 95% snow cover
- real ∗8 snocovmx

  Minimum snow water content that corresponds to 100% snow cover. If the snow water content is less than SNOC↩ OVMX, then a certain percentage of the ground will be bare (mm H2O)
- real ∗8 **lyrtile**
- real ∗8 **lyrtilex**
- real ∗8 sno50cov

  Fraction of SNOCOVMX that corresponds to 50% snow cover. SWAT assumes a nonlinear relationship between snow water and snow cover.
- real ∗8 ai0

  ratio of chlorophyll-a to algal biomass (ug chla/mg alg)
- real ∗8 ai1

  fraction of algal biomass that is nitrogen (mg N/mg alg)
- real ∗8 ai2

  fraction of algal biomass that is phosphorus (mg P/mg alg)
- real ∗8 ai3

  the rate of oxygen production per unit of algal photosynthesis (mg O2/mg alg)
- real ∗8 ai4

  the rate of oxygen uptake per unit of algae respiration (mg O2/mg alg)
- real ∗8 ai5

  the rate of oxygen uptake per unit of NH3 nitrogen oxidation (mg O2/mg N)
- real ∗8 ai6

  the rate of oxygen uptake per unit of NO2 nitrogen oxidation (mg O2/mg N)
- real ∗8 rhoq

  algal respiration rate (1/day or 1/hr)
- real ∗8 tfact

  fraction of solar radiation computed in the temperature heat balance that is photosynthetically active
- real ∗8 k_l

  half-saturation coefficient for light (MJ/(m2∗hr))
- real ∗8 k_n

  michaelis-menton half-saturation constant for nitrogen (mg N/L)

- real ∗8 k_p

  michaelis-menton half saturation constant for phosphorus (mg P/L)
- real ∗8 lambda0

  non-algal portion of the light extinction coefficient (1/m)
- real ∗8 lambda1

  linear algal self-shading coefficient (1/(m∗ug chla/L))
- real ∗8 lambda2

  nonlinear algal self-shading coefficient ((1/m)(ug chla/L)∗∗(-2/3))
- real ∗8 mumax

  maximum specific algal growth rate (1/day or 1/hr)
- real ∗8 p_n

  algal preference factor for ammonia
- real ∗8 **rnum1**
- real ∗8 **autop**
- real ∗8 **auton**
- real ∗8 **etday**
- real ∗8 **hmntl**
- real ∗8 **rwntl**
- real ∗8 **hmptl**
- real ∗8 **rmn2tl**
- real ∗8 **rmptl**
- real ∗8 **wdntl**
- real ∗8 **cmn_bsn**
- real ∗8 **rmp1tl**
- real ∗8 **roctl**
- real ∗8 **gwseep**
- real ∗8 **revapday**
- real ∗8 **reswtr**
- real ∗8 wdlprch

  die-off factor for less persistent bacteria in streams (1/day)
- real ∗8 wdpres

  die-off factor for persistent bacteria in reservoirs (1/day)
- real ∗8 **bury**
- real ∗8 **difus**
- real ∗8 **reactb**
- real ∗8 **solpesto**
- real ∗8 **petmeas**
- real ∗8 wdlpres

  die-off factor for less persistent bacteria in reservoirs (1/day)
- real ∗8 **sorpesto**
- real ∗8 **spcon_bsn**
- real ∗8 **spexp_bsn**
- real ∗8 **solpesti**
- real ∗8 **sorpesti**
- real ∗8 msk_co1

  calibration coefficient to control impact of the storage time constant for the reach at bankfull depth (phi(10,:) upon the storage time constant for the reach used in the Muskingum flow method
- real ∗8 msk_co2

  calibration coefficient to control impact of the storage time constant for the reach at 0.1 bankfull depth (phi(13,:) upon the storage time constant for the reach used in the Muskingum flow method
- real ∗8 **snoprev**
- real ∗8 **swprev**
- real ∗8 **shallstp**

- real ∗8 **deepstp**
- real ∗8 **ressolpo**
- real ∗8 **resorgno**
- real ∗8 **resorgpo**
- real ∗8 **resno3o**
- real ∗8 **reschlao**
- real ∗8 **resno2o**
- real ∗8 **resnh3o**
- real ∗8 **qdbank**
- real ∗8 **potpcpmm**
- real ∗8 **potevmm**
- real ∗8 **potsepmm**
- real ∗8 **potflwo**
- real ∗8 bactminlp

  Threshold detection level for less persistent bacteria. When bacteria levels drop to this amount the model considers bacteria in the soil to be insignificant and sets the levels to zero (cfu/m^ 2)
- real ∗8 bactminp

  Threshold detection level for persistent bacteria. When bacteria levels drop to this amount the model considers bacteria in the soil to be insignificant and sets the levels to zero (cfu/m^ 2)
- real ∗8 trnsrch

  fraction of transmission losses from main channel that enter deep aquifer
- real ∗8 wp20p_plt

  overall rate change for persistent bacteria on foliage (1/day)
- real ∗8 **potsedo**
- real ∗8 **pest_sol**
- real ∗8 bact_swf

  fraction of manure containing active colony forming units (cfu)
- real ∗8 bactmx

  bacteria percolation coefficient. Ratio of solution bacteria in surface layer to solution bacteria in percolate
- real ∗8 cncoef

  plant ET curve number coefficient
- real ∗8 wp20lp_plt

  overall rate change for less persistent bacteria on foliage (1/day)
- real ∗8 **cdn_bsn**
- real ∗8 **sdnco_bsn**
- real ∗8 **bactmin**
- real ∗8 cn_froz

  drainge coefficient (mm day -1)
- real ∗8 dorm_hr

  time threshold used to define dormant (hours)
- real ∗8 smxco

  adjustment factor for max curve number s factor (0-1)
- real ∗8 tb_adj

  adjustment factor for subdaily unit hydrograph basetime
- real ∗8 chla_subco

  regional adjustment on sub chla_a loading (fraction)
- real ∗8 depimp_bsn

  depth to impervious layer. Used to model perched water tables in all HRUs in watershed (mm)
- real ∗8 ddrain_bsn

  depth to the sub-surface drain (mm)
- real ∗8 tdrain_bsn

  time to drain soil to field capacity (hours)

- real ∗8 **gdrain_bsn**
- real ∗8 **rch_san**
- real ∗8 **rch_sil**
- real ∗8 **rch_cla**
- real ∗8 **rch_sag**
- real ∗8 **rch_lag**
- real ∗8 **rch_gra**
- real ∗8 hlife_ngw_bsn

  Half-life of nitrogen in groundwater? (days)
- real ∗8 **ch_opco_bsn**
- real ∗8 **ch_onco_bsn**
- real ∗8 decr_min

  Minimum daily residue decay.
- real ∗8 rcn_sub_bsn

  Concentration of nitrogen in the rainfall (mg/kg)
- real ∗8 **bc1_bsn**
- real ∗8 **bc2_bsn**
- real ∗8 **bc3_bsn**
- real ∗8 **bc4_bsn**
- real ∗8 **anion_excl_bsn**
- real ∗8, dimension(:), allocatable **wat_tbl**
- real ∗8, dimension(:), allocatable **sol_swpwt**
- real ∗8, dimension(:,:), allocatable **vwt**
- real ∗8 re_bsn

  Effective radius of drains (range 3.0 - 40.0) (mm)
- real ∗8 sdrain_bsn

  Distance bewtween two drain or tile tubes (range 7600.0 - 30000.0) (mm)
- real ∗8 **sstmaxd_bsn**
- real ∗8 drain_co_bsn

  Drainage coeffcient (range 10.0 - 51.0) (mm-day-1)
- real ∗8 latksatf_bsn

  Multiplication factor to determine lateral ksat from SWAT ksat input value for HRU (range 0.01 - 4.0)
- real ∗8 pc_bsn

  Pump capacity (def val = 1.042 mm h-1 or 25 mm day-1) (mm h-1)
- integer **i_subhw**
- integer **imgt**
- integer **idlast**
- integer **iwtr**
- integer **ifrttyp**
- integer **mo_atmo**
- integer **mo_atmo1**
- integer **ifirstatmo**
- integer **iyr_atmo**
- integer **iyr_atmo1**
- integer **matmo**
- integer mch

  maximum number of channels
- integer mcr

  maximum number of crops grown per year
- integer mcrdb

  max number of lu/lc defined in crop.dat
- integer mfcst

  maximum number of forecast stations

- integer mfdb

  max number of fertilizers in fert.dat
- integer mhru

  maximum number of HRUs in watershed
- integer mhyd

  maximum number of hydrograph nodes
- integer mpdb

  max number of pesticides in pest.dat
- integer mrg

  max number of rainfall/temp gages
- integer mcut

  maximum number of cuttings per year
- integer mgr

  maximum number of grazings per year
- integer mnr

  max number of years of rotation
- integer myr

  max number of years of simulation
- integer isubwq

  subbasin water quality code
  0 do not calculate algae/CBOD 1 calculate algae/CBOD drainmod tile equations
- integer **ffcst**
- integer isproj

  special project code: 1 test rewind (run simulation twice)
- integer nbyr

  number of calendar years simulated
- integer irte

  water routing method:
  0 variable storage method
  1 Muskingum method

- integer **nhru**
- integer **mo**
- integer **immo**
- integer **nrch**
- integer **nres**
- integer **i_mo**
- integer wndsim

  wind speed input code
  1 measured data read for each subbasin
  2 data simulated for each subbasin
- integer **icode**
- integer **ihout**
- integer **inum1**
- integer **inum2**
- integer **inum3**
- integer **inum4**
- integer **ihru**
- integer icfac

  icfac = 0 for C-factor calculation using Cmin (as described in manual)
  = 1 for new C-factor calculation from RUSLE (no minimum needed)
- integer **inum5**
- integer **inum6**

- integer **inum7**
- integer **inum8**
- integer mrech

  maximum number of rechour files
- integer nrgage

  number of raingage files
- integer nrgfil

  number of rain gages per file
- integer nrtot

  total number of rain gages
- integer ntgage

  number of temperature gage files
- integer ntgfil

  number of temperature gages per file
- integer nttot

  total number of temperature gages
- integer tmpsim

  temperature input code
  1 measured data read for each subbasin
  2 data simulated for each subbasin
- integer icrk

  crack flow code
  1: compute flow in cracks
- integer irtpest

  number of pesticide to be routed through the watershed
- integer igropt

  Qual2E option for calculating the local specific growth rate of algae
  1: multiplicative.
- integer lao

  Qual2E light averaging option. Qual2E defines four light averaging options. The only option currently available in SWAT is #2.
- integer **npmx**
- integer **curyr**
- integer **iihru**
- integer itdrn

  tile drainage equations flag/code
  1 simulate tile flow using subroutine drains(wt_shall)
  0 simulate tile flow using subroutine origtile(wt_shall,d)
- integer iwtdn

  water table depth algorithms flag/code
  1 simulate wt_shall using subroutine new water table depth routine
  0 simulate wt_shall using subroutine original water table depth routine
- integer ismax

  maximum depressional storage selection flag/code
  0 = static depressional storage
  1 = dynamic storage based on tillage and cumulative rainfall
- integer iroutunit

  not being implemented in this version drainmod tile equations
- integer **ires_nut**
- integer iclb

  auto-calibration flag
- integer mrecc

  maximum number of reccnst files

- integer mrecd

  maximum number of recday files
- integer mrecm

  maximum number of recmon files
- integer mtil

  max number of tillage types in till.dat
- integer mudb

  maximum number of urban land types in urban.dat
- integer idist

  rainfall distribution code
  0 for skewed normal dist
  1 for mixed exponential distribution
- integer mrecy

  maximum number of recyear files
- integer nyskip

  number of years to not print output
- integer slrsim

  solar radiation input code
  1 measured data read for each subbasin
  2 data simulated for each subbasin
- integer ideg

  channel degredation code
  1: compute channel degredation (downcutting and widening)
- integer ievent

  rainfall/runoff code
  0 daily rainfall/curve number technique 1 sub-daily rainfall/Green&Ampt/hourly routing 3 sub-daily rainfall/Green&Ampt/hourly routing
- integer ipet

  code for potential ET method
  0 Priestley-Taylor method
  1 Penman/Monteith method
  2 Hargreaves method
  3 read in daily potential ET data
- integer **iopera**
- integer idaf

  beginning day of simulation (julian date)
- integer idal

  ending day of simulation (julian date)
- integer rhsim

  relative humidity input code
  1 measured data read for each subbasin
  2 data simulated for each subbasin
- integer **id1**
- integer **leapyr**
- integer **mo_chk**
- integer nhtot

  number of relative humidity records in file
- integer nstot

  number of solar radiation records in file
- integer nwtot

  number of wind speed records in file
- integer **ifirsts**
- integer **ifirsth**
- integer **ifirstw**

- integer **icst**
- integer ilog

  streamflow print code
- integer itotr

  number of output variables printed (output.rch)
- integer iyr

  beginning year of simulation (year)
- integer iwq

  stream water quality code
  0 do not model stream water quality
  1 model stream water quality (QUAL2E & pesticide transformations)
- integer **i**
- integer **iskip**
- integer **ifirstpet**
- integer iprp

  print code for output.pst file
  0 do not print pesticide output
  1 print pesticide output
- integer itotb

  number of output variables printed (output.sub)
- integer itots

  number of output variables printed (output.hru)
- integer itoth

  number of HRUs printed (output.hru/output.wtr)
- integer pcpsim

  rainfall input code
  1 measured data read for each subbasin
  2 data simulated for each subbasin
- integer **nd_30**
- integer **iops**
- integer **iphr**
- integer **isto**
- integer **isol**
- integer fcstcycles

  number of times forecast period is simulated (using different weather generator seeds each time)
- integer fcstday

  beginning date of forecast period (julian date)
- integer fcstyr

  beginning year of forecast period
- integer iscen

  scenarios counter
- integer **subtot**
- integer **ogen**
- integer mapp

  maximum number of applications
- integer mlyr

  maximum number of soil layers
- integer mpst

  max number of pesticides used in wshed
- integer mres

  maximum number of reservoirs
- integer msub

  maximum number of subbasins

- integer igen

  random number generator code:
  0: use default numbers
  1: generate new numbers in every simulation
- integer iprint

  print code: 0=monthly, 1=daily, 2=annual
- integer **iida**
- integer icn

  CN method flag (for testing alternative method):
  0 use traditional SWAT method which bases CN on soil moisture
  1 use alternative method which bases CN on plant ET.
- integer ised_det

  max half-hour rainfall fraction calc option:
  0 generate max half-hour rainfall fraction from triangular distribution
  1 use monthly mean max half-hour rainfall fraction
- integer **fcstcnt**
- integer **mtran**
- integer **idtill**
- integer, dimension(100) **ida_lup**
- integer, dimension(100) **iyr_lup**
- integer **no_lup**
- integer **no_up**
- integer **nostep**
- character(len=8) date

  date simulation is performed where leftmost eight characters are set to a value of yyyymmdd, where yyyy is the year, mm is the month and dd is the day
- character(len=10) time

  time simulation is performed where leftmost ten characters are set to a value of hhmmss.sss, where hh is the hour, mm is the minutes and ss.sss is the seconds and milliseconds
- character(len=5) zone

  time difference with respect to Coordinated Universal Time (ie Greenwich Mean Time)
- character(len=80) prog

  SWAT program header string.
- character(len=13) calfile

  name of file containing calibration parameters
- character(len=13) rhfile

  relative humidity file name (.hmd)
- character(len=13) slrfile

  solar radiation file name (.slr)
- character(len=13) wndfile

  wind speed file name (.wnd)
- character(len=13) petfile

  potential ET file name (.pet)
- character(len=13) **atmofile**
- character(len=13) **lucfile**
- character(len=13) septdb

  name of septic tank database file (septwq1.dat)
- character(len=13) **dpd_file**
- character(len=13) **wpd_file**
- character(len=13) **rib_file**
- character(len=13) **sfb_file**
- character(len=13) **lid_file**
- integer, dimension(9) idg

array location of random number seed used for a given process

- integer, dimension(:), allocatable **ifirstr**
- integer, dimension(:), allocatable **ifirsthr**
- integer, dimension(8) values

  values(1): year simulation is performed
  values(2): month simulation is performed
  values(3): day in month simulation is performed
  values(4): time difference with respect to Coordinated Universal Time (ie Greenwich Mean Time)
  values(5): hour simulation is performed
  values(6): minute simulation is performed
  values(7): second simulation is performed
  values(8): millisecond simulation is performed
- integer, dimension(13) **ndays**
- integer, dimension(13) **ndays_noleap**
- integer, dimension(13) **ndays_leap**
- integer **mapex**
- real ∗8, dimension(:), allocatable **flodaya**
- real ∗8, dimension(:), allocatable **seddaya**
- real ∗8, dimension(:), allocatable **orgndaya**
- real ∗8, dimension(:), allocatable **orgpdaya**
- real ∗8, dimension(:), allocatable **no3daya**
- real ∗8, dimension(:), allocatable **minpdaya**
- real ∗8, dimension(:), allocatable hi_targ

  index target of cover defined at planting
- real ∗8, dimension(:), allocatable **bio_targ**
- real ∗8, dimension(:), allocatable **tnyld**
- integer, dimension(:), allocatable **idapa**
- integer, dimension(:), allocatable **iypa**
- integer, dimension(:), allocatable **ifirsta**
- integer, dimension(100) **mo_transb**
- integer, dimension(100) **mo_transe**
- integer, dimension(100) **ih_tran**
- integer **msdb**
- integer **iseptic**
- real ∗8, dimension(:), allocatable **sptqs**
- real ∗8, dimension(:), allocatable **percp**
- real ∗8, dimension(:), allocatable **sptbodconcs**
- real ∗8, dimension(:), allocatable **spttssconcs**
- real ∗8, dimension(:), allocatable **spttnconcs**
- real ∗8, dimension(:), allocatable **sptnh4concs**
- real ∗8, dimension(:), allocatable **sptno3concs**
- real ∗8, dimension(:), allocatable **sptno2concs**
- real ∗8, dimension(:), allocatable **sptorgnconcs**
- real ∗8, dimension(:), allocatable **spttpconcs**
- real ∗8, dimension(:), allocatable **sptminps**
- real ∗8, dimension(:), allocatable **sptorgps**
- real ∗8, dimension(:), allocatable **sptfcolis**
- real ∗8, dimension(:), allocatable **failyr**
- real ∗8, dimension(:), allocatable **qstemm**
- real ∗8, dimension(:), allocatable **bio_amn**
- real ∗8, dimension(:), allocatable **bio_bod**
- real ∗8, dimension(:), allocatable **biom**
- real ∗8, dimension(:), allocatable **rbiom**
- real ∗8, dimension(:), allocatable **fcoli**
- real ∗8, dimension(:), allocatable **bio_ntr**

- real ∗8, dimension(:), allocatable **bz_perc**
- real ∗8, dimension(:), allocatable **plqm**
- real ∗8, dimension(:), allocatable **sep_cap**
- real ∗8, dimension(:), allocatable **bz_area**
- real ∗8, dimension(:), allocatable **bz_z**
- real ∗8, dimension(:), allocatable **bz_thk**
- real ∗8, dimension(:), allocatable **bio_bd**
- real ∗8, dimension(:), allocatable **cmup_kgh**
- real ∗8, dimension(:), allocatable **cmtot_kgh**
- real ∗8, dimension(:), allocatable **coeff_bod_dc**
- real ∗8, dimension(:), allocatable **coeff_bod_conv**
- real ∗8, dimension(:), allocatable **coeff_fc1**
- real ∗8, dimension(:), allocatable **coeff_fc2**
- real ∗8, dimension(:), allocatable **coeff_fecal**
- real ∗8, dimension(:), allocatable **coeff_plq**
- real ∗8, dimension(:), allocatable **coeff_mrt**
- real ∗8, dimension(:), allocatable **coeff_rsp**
- real ∗8, dimension(:), allocatable **coeff_slg1**
- real ∗8, dimension(:), allocatable **coeff_slg2**
- real ∗8, dimension(:), allocatable **coeff_nitr**
- real ∗8, dimension(:), allocatable **coeff_denitr**
- real ∗8, dimension(:), allocatable **coeff_pdistrb**
- real ∗8, dimension(:), allocatable **coeff_solpslp**
- real ∗8, dimension(:), allocatable **coeff_solpintc**
- real ∗8, dimension(:), allocatable **coeff_psorpmax**
- integer, dimension(:), allocatable **i_sep**
- integer, dimension(:), allocatable **isep_typ**
- integer, dimension(:), allocatable **isep_opt**
- integer, dimension(:), allocatable **sep_tsincefail**
- integer, dimension(:), allocatable **isep_tfail**
- integer, dimension(:), allocatable **isep_iyr**
- integer, dimension(:), allocatable **sep_strm_dist**
- integer, dimension(:), allocatable **sep_den**
- real ∗8, dimension(:), allocatable **sol_sumno3**
- real ∗8, dimension(:), allocatable **sol_sumsolp**
- real ∗8, dimension(:), allocatable **strsw_sum**
- real ∗8, dimension(:), allocatable **strstmp_sum**
- real ∗8, dimension(:), allocatable **strsn_sum**
- real ∗8, dimension(:), allocatable **strsp_sum**
- real ∗8, dimension(:), allocatable **strsa_sum**
- real ∗8, dimension(:), allocatable **spill_hru**
- real ∗8, dimension(:), allocatable **tile_out**
- real ∗8, dimension(:), allocatable **hru_in**
- real ∗8, dimension(:), allocatable **spill_precip**
- real ∗8, dimension(:), allocatable **pot_seep**
- real ∗8, dimension(:), allocatable **pot_evap**
- real ∗8, dimension(:), allocatable **pot_sedin**
- real ∗8, dimension(:), allocatable **pot_solp**
- real ∗8, dimension(:), allocatable **pot_solpi**
- real ∗8, dimension(:), allocatable **pot_orgp**
- real ∗8, dimension(:), allocatable **pot_orgpi**
- real ∗8, dimension(:), allocatable **pot_orgn**
- real ∗8, dimension(:), allocatable **pot_orgni**
- real ∗8, dimension(:), allocatable **pot_mps**
- real ∗8, dimension(:), allocatable **pot_mpsi**

- real ∗8, dimension(:), allocatable **pot_mpa**
- real ∗8, dimension(:), allocatable **pot_mpai**
- real ∗8, dimension(:), allocatable **pot_no3i**
- real ∗8, dimension(:), allocatable **precip_in**
- real ∗8, dimension(:), allocatable **tile_sedo**
- real ∗8, dimension(:), allocatable **tile_no3o**
- real ∗8, dimension(:), allocatable **tile_solpo**
- real ∗8, dimension(:), allocatable **tile_orgno**
- real ∗8, dimension(:), allocatable **tile_orgpo**
- real ∗8, dimension(:), allocatable **tile_minpso**
- real ∗8, dimension(:), allocatable **tile_minpao**
- integer **ia_b**
- integer **ihumus**
- integer **itemp**
- integer **isnow**
- integer, dimension(41) **icolrsv**
- integer, dimension(mhruo) **icols**
- integer, dimension(mrcho) **icolr**
- integer, dimension(msubo) **icolb**
- integer, dimension(46) ipdvar

  output variable codes for output.rch file
- integer, dimension(mhruo) ipdvas

  output varaible codes for output.hru file
- integer, dimension(msubo) ipdvab

  output variable codes for output.sub file
- integer, dimension(:), allocatable ipdhru

  HRUs whose output information will be printed to the output.hru and output.wtr files.
- real ∗8, dimension(mstdo) **wshddayo**
- real ∗8, dimension(mstdo) **wshdmono**
- real ∗8, dimension(mstdo) **wshdyro**
- real ∗8, dimension(16) **fcstaao**
- real ∗8, dimension(mstdo) **wshdaao**
- real ∗8, dimension(:,:), allocatable **wpstdayo**
- real ∗8, dimension(:,:), allocatable **wpstmono**
- real ∗8, dimension(:,:), allocatable **wpstyro**
- real ∗8, dimension(:,:), allocatable **yldkg**
- real ∗8, dimension(:,:), allocatable **bio_hv**
- real ∗8, dimension(:,:), allocatable **wpstaao**
- real ∗8, dimension(:,:), allocatable **rchmono**
- real ∗8, dimension(:,:), allocatable **rchyro**
- real ∗8, dimension(:,:), allocatable **rchaao**
- real ∗8, dimension(:,:), allocatable **rchdy**
- real ∗8, dimension(:,:), allocatable **hrumono**
- real ∗8, dimension(:,:), allocatable **hruyro**
- real ∗8, dimension(:,:), allocatable **hruaao**
- real ∗8, dimension(:,:), allocatable **submono**
- real ∗8, dimension(:,:), allocatable **subyro**
- real ∗8, dimension(:,:), allocatable **subaao**
- real ∗8, dimension(:,:), allocatable **resoutm**
- real ∗8, dimension(:,:), allocatable **resouty**
- real ∗8, dimension(:,:), allocatable **resouta**
- real ∗8, dimension(12, 8) **wshd_aamon**
- real ∗8, dimension(:,:), allocatable **wtrmon**
- real ∗8, dimension(:,:), allocatable **wtryr**

- real ∗8, dimension(:,:), allocatable **wtraa**
- real ∗8, dimension(:,:), allocatable **sub_smfmx**
- real ∗8, dimension(:,:), allocatable **sub_smfmn**
- real ∗8, dimension(:,:,:), allocatable **hrupstd**
- real ∗8, dimension(:,:,:), allocatable **hrupsta**
- real ∗8, dimension(:,:,:), allocatable **hrupstm**
- real ∗8, dimension(:,:,:), allocatable **hrupsty**
- integer, dimension(:), allocatable **ifirstt**
- integer, dimension(:), allocatable **ifirstpcp**
- integer, dimension(:), allocatable **elevp**
- integer, dimension(:), allocatable **elevt**
- real ∗8, dimension(:,:), allocatable **ftmpstdmn**
- real ∗8, dimension(:,:), allocatable **ftmpmn**
- real ∗8, dimension(:,:), allocatable **ftmpmx**
- real ∗8, dimension(:,:), allocatable **ftmpstdmx**
- real ∗8, dimension(:,:,:), allocatable **fpr_w**
- real ∗8, dimension(:,:,:), allocatable **fpcp_stat**
- real ∗8, dimension(:), allocatable **flwin**
- real ∗8, dimension(:), allocatable **flwout**
- real ∗8, dimension(:), allocatable **bankst**
- real ∗8, dimension(:), allocatable **ch_wi**
- real ∗8, dimension(:), allocatable **ch_d**
- real ∗8, dimension(:), allocatable ch_onco

  channel organic n concentration (ppm)
- real ∗8, dimension(:), allocatable ch_opco

  channel organic p concentration (ppm)
- real ∗8, dimension(:), allocatable **ch_orgn**
- real ∗8, dimension(:), allocatable **ch_orgp**
- real ∗8, dimension(:), allocatable **drift**
- real ∗8, dimension(:), allocatable **rch_dox**
- real ∗8, dimension(:), allocatable **rch_bactp**
- real ∗8, dimension(:), allocatable **alpha_bnk**
- real ∗8, dimension(:), allocatable **alpha_bnke**
- real ∗8, dimension(:), allocatable **disolvp**
- real ∗8, dimension(:), allocatable **algae**
- real ∗8, dimension(:), allocatable **sedst**
- real ∗8, dimension(:), allocatable **rchstor**
- real ∗8, dimension(:), allocatable **organicn**
- real ∗8, dimension(:), allocatable **organicp**
- real ∗8, dimension(:), allocatable **chlora**
- real ∗8, dimension(:), allocatable **nitraten**
- real ∗8, dimension(:), allocatable **nitriten**
- real ∗8, dimension(:), allocatable **ch_li**
- real ∗8, dimension(:), allocatable **ch_si**
- real ∗8, dimension(:), allocatable **ch_bnk_san**
- real ∗8, dimension(:), allocatable **ch_bnk_sil**
- real ∗8, dimension(:), allocatable **ch_bnk_cla**
- real ∗8, dimension(:), allocatable **ch_bnk_gra**
- real ∗8, dimension(:), allocatable **ch_bed_san**
- real ∗8, dimension(:), allocatable **ch_bed_sil**
- real ∗8, dimension(:), allocatable **ch_bed_cla**
- real ∗8, dimension(:), allocatable **ch_bed_gra**
- real ∗8, dimension(:), allocatable **depfp**
- real ∗8, dimension(:), allocatable **depsanfp**

- real ∗8, dimension(:), allocatable **depsilfp**
- real ∗8, dimension(:), allocatable **depclafp**
- real ∗8, dimension(:), allocatable **depsagfp**
- real ∗8, dimension(:), allocatable **deplagfp**
- real ∗8, dimension(:), allocatable **depch**
- real ∗8, dimension(:), allocatable **depsanch**
- real ∗8, dimension(:), allocatable **depsilch**
- real ∗8, dimension(:), allocatable **depclach**
- real ∗8, dimension(:), allocatable **depsagch**
- real ∗8, dimension(:), allocatable **deplagch**
- real ∗8, dimension(:), allocatable **depgrach**
- real ∗8, dimension(:), allocatable **depgrafp**
- real ∗8, dimension(:), allocatable **grast**
- real ∗8, dimension(:), allocatable **depprch**
- real ∗8, dimension(:), allocatable **depprfp**
- real ∗8, dimension(:), allocatable **prf**
- real ∗8, dimension(:), allocatable **r2adj**
- real ∗8, dimension(:), allocatable spcon

  linear parameter for calculating sediment reentrained in channel sediment routing
- real ∗8, dimension(:), allocatable spexp

  exponent parameter for calculating sediment reentrained in channel sediment routing
- real ∗8, dimension(:), allocatable **sanst**
- real ∗8, dimension(:), allocatable **silst**
- real ∗8, dimension(:), allocatable **clast**
- real ∗8, dimension(:), allocatable **sagst**
- real ∗8, dimension(:), allocatable **lagst**
- real ∗8, dimension(:), allocatable **pot_san**
- real ∗8, dimension(:), allocatable **pot_sil**
- real ∗8, dimension(:), allocatable **pot_cla**
- real ∗8, dimension(:), allocatable **pot_sag**
- real ∗8, dimension(:), allocatable **pot_lag**
- real ∗8, dimension(:), allocatable **potsani**
- real ∗8, dimension(:), allocatable **potsili**
- real ∗8, dimension(:), allocatable **potclai**
- real ∗8, dimension(:), allocatable **potsagi**
- real ∗8, dimension(:), allocatable **potlagi**
- real ∗8, dimension(:), allocatable **sanyld**
- real ∗8, dimension(:), allocatable **silyld**
- real ∗8, dimension(:), allocatable **clayld**
- real ∗8, dimension(:), allocatable **sagyld**
- real ∗8, dimension(:), allocatable **lagyld**
- real ∗8, dimension(:), allocatable **grayld**
- real ∗8, dimension(:), allocatable **res_san**
- real ∗8, dimension(:), allocatable **res_sil**
- real ∗8, dimension(:), allocatable **res_cla**
- real ∗8, dimension(:), allocatable **res_sag**
- real ∗8, dimension(:), allocatable **res_lag**
- real ∗8, dimension(:), allocatable **res_gra**
- real ∗8, dimension(:), allocatable **pnd_san**
- real ∗8, dimension(:), allocatable **pnd_sil**
- real ∗8, dimension(:), allocatable **pnd_cla**
- real ∗8, dimension(:), allocatable **pnd_sag**
- real ∗8, dimension(:), allocatable **pnd_lag**
- real ∗8, dimension(:), allocatable **wet_san**

- real ∗8, dimension(:), allocatable **wet_sil**
- real ∗8, dimension(:), allocatable **wet_cla**
- real ∗8, dimension(:), allocatable **wet_lag**
- real ∗8, dimension(:), allocatable **wet_sag**
- real ∗8 **ressano**
- real ∗8 **ressilo**
- real ∗8 **resclao**
- real ∗8 **ressago**
- real ∗8 **reslago**
- real ∗8 **resgrao**
- real ∗8 **ressani**
- real ∗8 **ressili**
- real ∗8 **resclai**
- real ∗8 **ressagi**
- real ∗8 **reslagi**
- real ∗8 **resgrai**
- real ∗8 **potsano**
- real ∗8 **potsilo**
- real ∗8 **potclao**
- real ∗8 **potsago**
- real ∗8 **potlago**
- real ∗8 **pndsanin**
- real ∗8 **pndsilin**
- real ∗8 **pndclain**
- real ∗8 **pndsagin**
- real ∗8 **pndlagin**
- real ∗8 **pndsano**
- real ∗8 **pndsilo**
- real ∗8 **pndclao**
- real ∗8 **pndsago**
- real ∗8 **pndlago**
- real ∗8, dimension(:), allocatable **ch_di**
- real ∗8, dimension(:), allocatable **ch_erod**
- real ∗8, dimension(:), allocatable **ch_l2**
- real ∗8, dimension(:), allocatable **ch_cov**
- real ∗8, dimension(:), allocatable **ch_cov1**
- real ∗8, dimension(:), allocatable **ch_cov2**
- real ∗8, dimension(:), allocatable **ch_bnk_bd**
- real ∗8, dimension(:), allocatable **ch_bed_bd**
- real ∗8, dimension(:), allocatable **ch_bnk_kd**
- real ∗8, dimension(:), allocatable **ch_bed_kd**
- real ∗8, dimension(:), allocatable **ch_bnk_d50**
- real ∗8, dimension(:), allocatable **ch_bed_d50**
- real ∗8, dimension(:), allocatable **tc_bed**
- real ∗8, dimension(:), allocatable **tc_bnk**
- integer, dimension(:), allocatable **ch_eqn**
- real ∗8, dimension(:), allocatable **chpst_conc**
- real ∗8, dimension(:), allocatable **chpst_rea**
- real ∗8, dimension(:), allocatable **chpst_vol**
- real ∗8, dimension(:), allocatable **chpst_koc**
- real ∗8, dimension(:), allocatable **chpst_stl**
- real ∗8, dimension(:), allocatable **chpst_rsp**
- real ∗8, dimension(:), allocatable **chpst_mix**
- real ∗8, dimension(:), allocatable **sedpst_conc**
- real ∗8, dimension(:), allocatable **ch_wdr**

- real ∗8, dimension(:), allocatable **sedpst_rea**
- real ∗8, dimension(:), allocatable **sedpst_bry**
- real ∗8, dimension(:), allocatable **sedpst_act**
- real ∗8, dimension(:), allocatable **rch_cbod**
- real ∗8, dimension(:), allocatable **rch_bactlp**
- real ∗8, dimension(:), allocatable **chside**
- real ∗8, dimension(:), allocatable **rs1**
- real ∗8, dimension(:), allocatable **rs2**
- real ∗8, dimension(:), allocatable **rs3**
- real ∗8, dimension(:), allocatable **rs4**
- real ∗8, dimension(:), allocatable **rs5**
- real ∗8, dimension(:), allocatable **rs6**
- real ∗8, dimension(:), allocatable **rs7**
- real ∗8, dimension(:), allocatable **rk1**
- real ∗8, dimension(:), allocatable **rk2**
- real ∗8, dimension(:), allocatable **rk3**
- real ∗8, dimension(:), allocatable **rk4**
- real ∗8, dimension(:), allocatable **rk5**
- real ∗8, dimension(:), allocatable bc1

  rate constant for biological oxidation of NH3 to NO2 in reach at 20 deg C (1/hr)

- real ∗8, dimension(:), allocatable bc2

  rate constant for biological oxidation of NO2 to NO3 in reach at 20 deg C (1/hr)
- real ∗8, dimension(:), allocatable bc3

  rate constant for hydrolysis of organic N to ammonia in reach at 20 deg C (1/hr)

- real ∗8, dimension(:), allocatable bc4

  rate constant for the decay of organic P to dissolved P in reach at 20 deg C (1/hr)

- real ∗8, dimension(:), allocatable **rk6**
- real ∗8, dimension(:), allocatable **ammonian**
- real ∗8, dimension(:), allocatable **orig_sedpstconc**
- real ∗8, dimension(:,:), allocatable **wurch**
- integer, dimension(:), allocatable **icanal**
- integer, dimension(:), allocatable **itb**
- real ∗8, dimension(:), allocatable **ch_revap**
- real ∗8, dimension(:), allocatable **dep_chan**
- real ∗8, dimension(:), allocatable **harg_petco**
- real ∗8, dimension(:), allocatable **subfr_nowtr**
- real ∗8, dimension(:), allocatable **cncoef_sub**
- real ∗8, dimension(:), allocatable **dr_sub**
- real ∗8, dimension(:), allocatable **wcklsp**
- real ∗8, dimension(:), allocatable **sub_fr**
- real ∗8, dimension(:), allocatable **sub_minp**
- real ∗8, dimension(:), allocatable **sub_sw**
- real ∗8, dimension(:), allocatable **sub_sumfc**
- real ∗8, dimension(:), allocatable **sub_gwno3**
- real ∗8, dimension(:), allocatable **sub_gwsolp**
- real ∗8, dimension(:), allocatable **sub_km**
- real ∗8, dimension(:), allocatable **sub_tc**
- real ∗8, dimension(:), allocatable **wlat**
- real ∗8, dimension(:), allocatable **sub_pet**
- real ∗8, dimension(:), allocatable **co2**
- real ∗8, dimension(:), allocatable **welev**

- real ∗8, dimension(:), allocatable **sub_orgn**
- real ∗8, dimension(:), allocatable **sub_orgp**
- real ∗8, dimension(:), allocatable **sub_bd**
- real ∗8, dimension(:), allocatable **sub_wtmp**
- real ∗8, dimension(:), allocatable **sub_sedpa**
- real ∗8, dimension(:), allocatable **sub_sedps**
- real ∗8, dimension(:), allocatable **sub_minpa**
- real ∗8, dimension(:), allocatable **sub_minps**
- real ∗8, dimension(:), allocatable **daylmn**
- real ∗8, dimension(:), allocatable **latcos**
- real ∗8, dimension(:), allocatable **latsin**
- real ∗8, dimension(:), allocatable **phutot**
- real ∗8, dimension(:), allocatable **tlaps**
- real ∗8, dimension(:), allocatable **plaps**
- real ∗8, dimension(:), allocatable **tmp_an**
- real ∗8, dimension(:), allocatable **sub_precip**
- real ∗8, dimension(:), allocatable **pcpdays**
- real ∗8, dimension(:), allocatable **rcn_sub**
- real ∗8, dimension(:), allocatable **rammo_sub**
- real ∗8, dimension(:), allocatable **atmo_day**
- real ∗8, dimension(:), allocatable **sub_snom**
- real ∗8, dimension(:), allocatable **sub_qd**
- real ∗8, dimension(:), allocatable **sub_sedy**
- real ∗8, dimension(:), allocatable **sub_tran**
- real ∗8, dimension(:), allocatable **sub_no3**
- real ∗8, dimension(:), allocatable **sub_latno3**
- real ∗8, dimension(:,:), allocatable **sub_smtmp**
- real ∗8, dimension(:,:), allocatable **sub_timp**
- real ∗8, dimension(:,:), allocatable **sub_sftmp**
- real ∗8, dimension(:), allocatable **sub_tileno3**
- real ∗8, dimension(:), allocatable **sub_solp**
- real ∗8, dimension(:), allocatable **sub_subp**
- real ∗8, dimension(:), allocatable **sub_etday**
- real ∗8, dimension(:), allocatable **sub_wyld**
- real ∗8, dimension(:), allocatable **sub_surfq**
- real ∗8, dimension(:), allocatable **sub_elev**
- real ∗8, dimension(:), allocatable **qird**
- real ∗8, dimension(:), allocatable **sub_gwq**
- real ∗8, dimension(:), allocatable **sub_sep**
- real ∗8, dimension(:), allocatable **sub_chl**
- real ∗8, dimension(:), allocatable **sub_cbod**
- real ∗8, dimension(:), allocatable **sub_dox**
- real ∗8, dimension(:), allocatable **sub_solpst**
- real ∗8, dimension(:), allocatable **sub_sorpst**
- real ∗8, dimension(:), allocatable **sub_yorgn**
- real ∗8, dimension(:), allocatable **sub_yorgp**
- real ∗8, dimension(:), allocatable **sub_bactp**
- real ∗8, dimension(:), allocatable **sub_bactlp**
- real ∗8, dimension(:), allocatable **sub_lat**
- real ∗8, dimension(:), allocatable **sub_latq**
- real ∗8, dimension(:), allocatable **sub_gwq_d**
- real ∗8, dimension(:), allocatable **sub_tileq**
- real ∗8, dimension(:), allocatable **sub_vaptile**
- real ∗8, dimension(:), allocatable **sub_dsan**
- real ∗8, dimension(:), allocatable **sub_dsil**

- real ∗8, dimension(:), allocatable **sub_dcla**
- real ∗8, dimension(:), allocatable **sub_dsag**
- real ∗8, dimension(:), allocatable **sub_dlag**
- real ∗8 **vap_tile**
- real ∗8, dimension(:), allocatable **wnan**
- real ∗8, dimension(:,:), allocatable **sol_stpwt**
- real ∗8, dimension(:,:), allocatable **sub_pst**
- real ∗8, dimension(:,:), allocatable **sub_hhqd**
- real ∗8, dimension(:,:), allocatable **sub_hhwtmp**
- real ∗8, dimension(:,:), allocatable **rfinc**
- real ∗8, dimension(:,:), allocatable **tmpinc**
- real ∗8, dimension(:,:), allocatable **radinc**
- real ∗8, dimension(:,:), allocatable **huminc**
- real ∗8, dimension(:,:), allocatable **wndav**
- real ∗8, dimension(:,:), allocatable **ch_k**
- real ∗8, dimension(:,:), allocatable **elevb**
- real ∗8, dimension(:,:), allocatable **elevb_fr**
- real ∗8, dimension(:,:), allocatable **dewpt**
- real ∗8, dimension(:,:), allocatable **ch_w**
- real ∗8, dimension(:,:), allocatable **ch_s**
- real ∗8, dimension(:,:), allocatable **ch_n**
- real ∗8, dimension(:,:), allocatable **amp_r**
- real ∗8, dimension(:,:), allocatable **solarav**
- real ∗8, dimension(:,:), allocatable **tmpstdmx**
- real ∗8, dimension(:,:), allocatable **tmpstdmn**
- real ∗8, dimension(:,:), allocatable **pcf**
- real ∗8, dimension(:,:), allocatable **tmpmn**
- real ∗8, dimension(:,:), allocatable **tmpmx**
- real ∗8, dimension(:,:), allocatable **otmpstdmn**
- real ∗8, dimension(:,:), allocatable **otmpmn**
- real ∗8, dimension(:,:), allocatable **otmpmx**
- real ∗8, dimension(:,:), allocatable **otmpstdmx**
- real ∗8, dimension(:,:), allocatable **ch_erodmo**
- real ∗8, dimension(:,:), allocatable **uh**
- real ∗8, dimension(:,:), allocatable **hqdsave**
- real ∗8, dimension(:,:), allocatable **hsdsave**
- real ∗8, dimension(:,:,:), allocatable **pr_w**
- real ∗8, dimension(:,:,:), allocatable **pcp_stat**
- real ∗8, dimension(:,:,:), allocatable **opr_w**
- real ∗8, dimension(:,:,:), allocatable **opcp_stat**
- integer, dimension(:), allocatable **hrutot**
- integer, dimension(:), allocatable **hru1**
- integer, dimension(:), allocatable **ireg**
- integer, dimension(:), allocatable **isgage**
- integer, dimension(:), allocatable **ihgage**
- integer, dimension(:), allocatable **iwgage**
- integer, dimension(:), allocatable **irgage**
- integer, dimension(:), allocatable **itgage**
- integer, dimension(:), allocatable **subgis**
- integer, dimension(:), allocatable **fcst_reg**
- integer, dimension(:), allocatable **irelh**
- real ∗8, dimension(:,:), allocatable **sol_aorgn**
- real ∗8, dimension(:,:), allocatable **sol_tmp**
- real ∗8, dimension(:,:), allocatable **sol_fon**
- real ∗8, dimension(:,:), allocatable **sol_awc**

- real ∗8, dimension(:,:), allocatable **sol_prk**
- real ∗8, dimension(:,:), allocatable **volcr**
- real ∗8, dimension(:,:), allocatable pperco_sub

  subbasin phosphorus percolation coefficient. Ratio of soluble phosphorus in surface to soluble phosphorus in percolate
- real ∗8, dimension(:,:), allocatable **sol_actp**
- real ∗8, dimension(:,:), allocatable **sol_stap**
- real ∗8, dimension(:,:), allocatable **conv_wt**
- real ∗8, dimension(:,:), allocatable **sol_solp**
- real ∗8, dimension(:,:), allocatable **sol_ul**
- real ∗8, dimension(:,:), allocatable **sol_fc**
- real ∗8, dimension(:,:), allocatable **crdep**
- real ∗8, dimension(:,:), allocatable **sol_z**
- real ∗8, dimension(:,:), allocatable **sol_up**
- real ∗8, dimension(:,:), allocatable **sol_bd**
- real ∗8, dimension(:,:), allocatable **sol_st**
- real ∗8, dimension(:,:), allocatable **flat**
- real ∗8, dimension(:,:), allocatable **sol_nh3**
- real ∗8, dimension(:,:), allocatable **sol_hk**
- real ∗8, dimension(:,:), allocatable **sol_clay**
- real ∗8, dimension(:,:), allocatable **sol_ec**
- real ∗8, dimension(:,:), allocatable **sol_orgn**
- real ∗8, dimension(:,:), allocatable **sol_por**
- real ∗8, dimension(:,:), allocatable **sol_wp**
- real ∗8, dimension(:,:), allocatable **sol_orgp**
- real ∗8, dimension(:,:), allocatable **sol_hum**
- real ∗8, dimension(:,:), allocatable **sol_wpmm**
- real ∗8, dimension(:,:), allocatable **sol_k**
- real ∗8, dimension(:,:), allocatable **sol_cbn**
- real ∗8, dimension(:,:), allocatable **sol_no3**
- real ∗8, dimension(:,:), allocatable **sol_rsd**
- real ∗8, dimension(:,:), allocatable **sol_fop**
- real ∗8, dimension(:,:), allocatable **sol_silt**
- real ∗8, dimension(:,:), allocatable **sol_sand**
- real ∗8, dimension(:,:), allocatable **sol_rock**
- real ∗8, dimension(:,:), allocatable **orig_solno3**
- real ∗8, dimension(:,:), allocatable **orig_solorgn**
- real ∗8, dimension(:,:), allocatable **orig_solsolp**
- real ∗8, dimension(:,:), allocatable **orig_solorgp**
- real ∗8, dimension(:,:), allocatable **orig_soltmp**
- real ∗8, dimension(:,:), allocatable **orig_solrsd**
- real ∗8, dimension(:,:), allocatable **orig_solfop**
- real ∗8, dimension(:,:), allocatable **orig_solfon**
- real ∗8, dimension(:,:), allocatable **orig_solaorgn**
- real ∗8, dimension(:,:), allocatable **orig_solst**
- real ∗8, dimension(:,:), allocatable **orig_solactp**
- real ∗8, dimension(:,:), allocatable **orig_solstap**
- real ∗8, dimension(:,:), allocatable **orig_volcr**
- real ∗8, dimension(:,:), allocatable **conk**
- real ∗8, dimension(:,:,:), allocatable **sol_pst**
- real ∗8, dimension(:,:,:), allocatable **sol_kp**
- real ∗8, dimension(:,:,:), allocatable **orig_solpst**
- real ∗8, dimension(:), allocatable **velsetlr**
- real ∗8, dimension(:), allocatable **velsetlp**

- real ∗8, dimension(:), allocatable **br1**
- real ∗8, dimension(:), allocatable **res_k**
- real ∗8, dimension(:), allocatable **lkpst_conc**
- real ∗8, dimension(:), allocatable **evrsv**
- real ∗8, dimension(:), allocatable **res_evol**
- real ∗8, dimension(:), allocatable **res_pvol**
- real ∗8, dimension(:), allocatable **res_vol**
- real ∗8, dimension(:), allocatable **res_psa**
- real ∗8, dimension(:), allocatable **lkpst_rea**
- real ∗8, dimension(:), allocatable **lkpst_vol**
- real ∗8, dimension(:), allocatable **br2**
- real ∗8, dimension(:), allocatable **res_rr**
- real ∗8, dimension(:), allocatable **res_sed**
- real ∗8, dimension(:), allocatable **lkpst_koc**
- real ∗8, dimension(:), allocatable **lkpst_stl**
- real ∗8, dimension(:), allocatable **lkpst_rsp**
- real ∗8, dimension(:), allocatable **lkpst_mix**
- real ∗8, dimension(:), allocatable **lkspst_conc**
- real ∗8, dimension(:), allocatable **lkspst_rea**
- real ∗8, dimension(:), allocatable **theta_n**
- real ∗8, dimension(:), allocatable **theta_p**
- real ∗8, dimension(:), allocatable **con_nirr**
- real ∗8, dimension(:), allocatable **con_pirr**
- real ∗8, dimension(:), allocatable **lkspst_bry**
- real ∗8, dimension(:), allocatable **lkspst_act**
- real ∗8, dimension(:), allocatable **sed_stlr**
- real ∗8, dimension(7) **resdata**
- real ∗8, dimension(:), allocatable **wurtnf**
- real ∗8, dimension(:), allocatable **res_nsed**
- real ∗8, dimension(:), allocatable **chlar**
- real ∗8, dimension(:), allocatable **res_orgn**
- real ∗8, dimension(:), allocatable **res_orgp**
- real ∗8, dimension(:), allocatable **res_no3**
- real ∗8, dimension(:), allocatable **res_solp**
- real ∗8, dimension(:), allocatable **res_chla**
- real ∗8, dimension(:), allocatable **res_seci**
- real ∗8, dimension(:), allocatable **res_esa**
- real ∗8, dimension(:), allocatable **seccir**
- real ∗8, dimension(:), allocatable **res_no2**
- real ∗8, dimension(:), allocatable **res_nh3**
- real ∗8, dimension(:), allocatable **res_bactp**
- real ∗8, dimension(:), allocatable **res_bactlp**
- real ∗8, dimension(:), allocatable **oflowmn_fps**
- real ∗8, dimension(:), allocatable **starg_fps**
- real ∗8, dimension(:), allocatable **weirc**
- real ∗8, dimension(:), allocatable **weirk**
- real ∗8, dimension(:), allocatable **weirw**
- real ∗8, dimension(:), allocatable **acoef**
- real ∗8, dimension(:), allocatable **bcoef**
- real ∗8, dimension(:), allocatable **ccoef**
- real ∗8, dimension(:), allocatable **orig_resvol**
- real ∗8, dimension(:), allocatable **orig_ressed**
- real ∗8, dimension(:), allocatable **orig_lkpstconc**
- real ∗8, dimension(:), allocatable **orig_lkspstconc**
- real ∗8, dimension(:), allocatable **orig_ressolp**

- real ∗8, dimension(:), allocatable **orig_resorgp**
- real ∗8, dimension(:), allocatable **orig_resno3**
- real ∗8, dimension(:), allocatable **orig_resno2**
- real ∗8, dimension(:), allocatable **orig_resnh3**
- real ∗8, dimension(:), allocatable **orig_resorgn**
- real ∗8, dimension(:,:), allocatable **starg**
- real ∗8, dimension(:,:), allocatable **oflowmx**
- real ∗8, dimension(:,:), allocatable **oflowmn**
- real ∗8, dimension(:,:), allocatable **psetlr**
- real ∗8, dimension(:,:), allocatable **nsetlr**
- real ∗8, dimension(:,:), allocatable **wuresn**
- real ∗8, dimension(:,:,:), allocatable **res_out**
- integer, dimension(:), allocatable **ires1**
- integer, dimension(:), allocatable **ires2**
- integer, dimension(:), allocatable **res_sub**
- integer, dimension(:), allocatable **iresco**
- integer, dimension(:), allocatable **mores**
- integer, dimension(:), allocatable **iyres**
- integer, dimension(:), allocatable **iflod1r**
- integer, dimension(:), allocatable **iflod2r**
- integer, dimension(:), allocatable **ndtargr**
- real ∗8, dimension(:), allocatable **skoc**
- real ∗8, dimension(:), allocatable **ap_ef**
- real ∗8, dimension(:), allocatable **decay_f**
- real ∗8, dimension(:), allocatable **hlife_f**
- real ∗8, dimension(:), allocatable **hlife_s**
- real ∗8, dimension(:), allocatable **decay_s**
- real ∗8, dimension(:), allocatable **pst_wsol**
- real ∗8, dimension(:), allocatable **pst_wof**
- real ∗8, dimension(:), allocatable **irramt**
- real ∗8, dimension(:), allocatable **phusw**
- real ∗8, dimension(:), allocatable **phusw_nocrop**
- integer, dimension(:), allocatable pstflg

  flag for types of pesticide used in watershed array location is pesticide ID number
  0: pesticide not used
  1: pesticide used
- integer, dimension(:), allocatable **nope**
- integer, dimension(:), allocatable **nop**
- integer, dimension(:), allocatable **yr_skip**
- integer, dimension(:), allocatable **isweep**
- integer, dimension(:), allocatable **icrmx**
- integer, dimension(:), allocatable **nopmx**
- integer, dimension(:,:), allocatable **mgtop**
- integer, dimension(:,:), allocatable **idop**
- integer, dimension(:,:), allocatable **mgt1iop**
- integer, dimension(:,:), allocatable **mgt2iop**
- integer, dimension(:,:), allocatable **mgt3iop**
- real ∗8, dimension(:,:), allocatable **mgt4op**
- real ∗8, dimension(:,:), allocatable **mgt5op**
- real ∗8, dimension(:,:), allocatable **mgt6op**
- real ∗8, dimension(:,:), allocatable **mgt7op**
- real ∗8, dimension(:,:), allocatable **mgt8op**
- real ∗8, dimension(:,:), allocatable **mgt9op**
- real ∗8, dimension(:,:), allocatable **mgt10iop**
- real ∗8, dimension(:,:), allocatable **phu_op**

- real ∗8, dimension(:), allocatable **wac21**
- real ∗8, dimension(:), allocatable **wac22**
- real ∗8, dimension(:), allocatable **cnyld**
- real ∗8, dimension(:), allocatable **rsdco_pl**
- real ∗8, dimension(:), allocatable **wsyf**
- real ∗8, dimension(:), allocatable **leaf1**
- real ∗8, dimension(:), allocatable **leaf2**
- real ∗8, dimension(:), allocatable **alai_min**
- real ∗8, dimension(:), allocatable **t_base**
- real ∗8, dimension(:), allocatable **t_opt**
- real ∗8, dimension(:), allocatable **hvsti**
- real ∗8, dimension(:), allocatable **bio_e**
- real ∗8, dimension(:), allocatable **vpd2**
- real ∗8, dimension(:), allocatable **gsi**
- real ∗8, dimension(:), allocatable **chtmx**
- real ∗8, dimension(:), allocatable **wavp**
- real ∗8, dimension(:), allocatable **cvm**
- real ∗8, dimension(:), allocatable **blai**
- real ∗8, dimension(:), allocatable **dlai**
- real ∗8, dimension(:), allocatable **rdmx**
- real ∗8, dimension(:), allocatable **cpyld**
- real ∗8, dimension(:), allocatable **bio_leaf**
- real ∗8, dimension(:), allocatable **bio_n1**
- real ∗8, dimension(:), allocatable **bio_n2**
- real ∗8, dimension(:), allocatable **bio_p1**
- real ∗8, dimension(:), allocatable **bio_p2**
- real ∗8, dimension(:), allocatable **bmx_trees**
- real ∗8, dimension(:), allocatable **ext_coef**
- real ∗8, dimension(:), allocatable **bm_dieoff**
- real ∗8, dimension(:), allocatable **rsr1**
- real ∗8, dimension(:), allocatable **rsr2**
- real ∗8, dimension(:,:), allocatable **pltnfr**
- real ∗8, dimension(:,:), allocatable **pltpfr**
- integer, dimension(:), allocatable **idc**
- integer, dimension(:), allocatable **mat_yrs**
- real ∗8, dimension(:), allocatable **forgn**
- real ∗8, dimension(:), allocatable **forgp**
- real ∗8, dimension(:), allocatable **fminn**
- real ∗8, dimension(:), allocatable **bactpdb**
- real ∗8, dimension(:), allocatable **fminp**
- real ∗8, dimension(:), allocatable **fnh3n**
- real ∗8, dimension(:), allocatable **bactlpdb**
- real ∗8, dimension(:), allocatable **bactkddb**
- character(len=8), dimension(200) **fertnm**
- real ∗8, dimension(:), allocatable **fimp**
- real ∗8, dimension(:), allocatable **curbden**
- real ∗8, dimension(:), allocatable **urbcoef**
- real ∗8, dimension(:), allocatable **dirtmx**
- real ∗8, dimension(:), allocatable **thalf**
- real ∗8, dimension(:), allocatable **tnconc**
- real ∗8, dimension(:), allocatable **tpconc**
- real ∗8, dimension(:), allocatable **tno3conc**
- real ∗8, dimension(:), allocatable **fcimp**
- real ∗8, dimension(:), allocatable **urbcn2**
- real ∗8 **sweepeff**

- real ∗8 **frt_kg**
- real ∗8 **pst_dep**
- real ∗8 **fr_curb**
- real ∗8, dimension(:), allocatable **ranrns_hru**
- integer, dimension(:), allocatable **itill**
- real ∗8, dimension(:), allocatable **effmix**
- real ∗8, dimension(:), allocatable **deptil**
- real ∗8, dimension(:), allocatable **ranrns**
- character(len=8), dimension(550) **tillnm**
- real ∗8, dimension(:), allocatable **rnum1s**
- real ∗8, dimension(:), allocatable **hyd_dakm**
- real ∗8, dimension(:,:), allocatable **varoute**
- real ∗8, dimension(:,:), allocatable **shyd**
- real ∗8, dimension(:,:), allocatable **vartran**
- real ∗8, dimension(:,:,:), allocatable **hhvaroute**
- integer, dimension(:), allocatable **icodes**
- integer, dimension(:), allocatable **ihouts**
- integer, dimension(:), allocatable **inum1s**
- integer, dimension(:), allocatable **inum2s**
- integer, dimension(:), allocatable **inum3s**
- integer, dimension(:), allocatable **inum4s**
- integer, dimension(:), allocatable **inum5s**
- integer, dimension(:), allocatable **inum6s**
- integer, dimension(:), allocatable **inum7s**
- integer, dimension(:), allocatable **inum8s**
- integer, dimension(:), allocatable **subed**
- character(len=10), dimension(:), allocatable **recmonps**
- character(len=10), dimension(:), allocatable **reccnstps**
- character(len=5), dimension(:), allocatable **subnum**
- character(len=4), dimension(:), allocatable **hruno**
- real ∗8, dimension(:), allocatable **grwat_n**
- real ∗8, dimension(:), allocatable **grwat_i**
- real ∗8, dimension(:), allocatable **grwat_l**
- real ∗8, dimension(:), allocatable **grwat_w**
- real ∗8, dimension(:), allocatable **grwat_d**
- real ∗8, dimension(:), allocatable **grwat_s**
- real ∗8, dimension(:), allocatable **grwat_spcon**
- real ∗8, dimension(:), allocatable **tc_gwat**
- real ∗8, dimension(:), allocatable **pot_volmm**
- real ∗8, dimension(:), allocatable **pot_tilemm**
- real ∗8, dimension(:), allocatable **pot_volxmm**
- real ∗8, dimension(:), allocatable **pot_fr**
- real ∗8, dimension(:), allocatable **pot_tile**
- real ∗8, dimension(:), allocatable **pot_vol**
- real ∗8, dimension(:), allocatable **potsa**
- real ∗8, dimension(:), allocatable **pot_volx**
- real ∗8, dimension(:), allocatable **potflwi**
- real ∗8, dimension(:), allocatable **potsedi**
- real ∗8, dimension(:), allocatable **wfsh**
- real ∗8, dimension(:), allocatable **pot_nsed**
- real ∗8, dimension(:), allocatable **pot_no3l**
- real ∗8, dimension(:), allocatable **newrti**
- real ∗8, dimension(:), allocatable **gwno3**
- real ∗8, dimension(:), allocatable **pot_sed**
- real ∗8, dimension(:), allocatable **pot_no3**

- real ∗8, dimension(:), allocatable **fsred**
- real ∗8, dimension(:), allocatable **tmpavp**
- real ∗8, dimension(:), allocatable **evpot**
- real ∗8, dimension(:), allocatable **dis_stream**
- real ∗8, dimension(:), allocatable **pot_solpl**
- real ∗8, dimension(:), allocatable **sed_con**
- real ∗8, dimension(:), allocatable **orgn_con**
- real ∗8, dimension(:), allocatable **orgp_con**
- real ∗8, dimension(:), allocatable **soln_con**
- real ∗8, dimension(:), allocatable **solp_con**
- real ∗8, dimension(:), allocatable **pot_k**
- real ∗8, dimension(:), allocatable **n_reduc**
- real ∗8, dimension(:), allocatable **n_lag**
- real ∗8, dimension(:), allocatable **n_ln**
- real ∗8, dimension(:), allocatable **n_lnco**
- integer, dimension(:), allocatable **ioper**
- integer, dimension(:), allocatable **ngrwat**
- real ∗8, dimension(:), allocatable **filterw**
- real ∗8, dimension(:), allocatable **sumix**
- real ∗8, dimension(:), allocatable **usle_ls**
- real ∗8, dimension(:), allocatable **phuacc**
- real ∗8, dimension(:), allocatable epco

  plant water uptake compensation factor (0-1)
- real ∗8, dimension(:), allocatable esco

  soil evaporation compensation factor (0-1)
- real ∗8, dimension(:), allocatable **slsubbsn**
- real ∗8, dimension(:), allocatable **hru_slp**
- real ∗8, dimension(:), allocatable **erorgn**
- real ∗8, dimension(:), allocatable **erorgp**
- real ∗8, dimension(:), allocatable **biomix**
- real ∗8, dimension(:), allocatable **pnd_seci**
- real ∗8, dimension(:), allocatable **flowmin**
- real ∗8, dimension(:), allocatable **divmax**
- real ∗8, dimension(:), allocatable **canmx**
- real ∗8, dimension(:), allocatable **usle_p**
- real ∗8, dimension(:), allocatable **lat_sed**
- real ∗8, dimension(:), allocatable **rch_dakm**
- real ∗8, dimension(:), allocatable **pnd_no3s**
- real ∗8, dimension(:), allocatable **cn1**
- real ∗8, dimension(:), allocatable **cn2**
- real ∗8, dimension(:), allocatable **lat_ttime**
- real ∗8, dimension(:), allocatable **flowfr**
- real ∗8, dimension(:), allocatable **sol_zmx**
- real ∗8, dimension(:), allocatable **tile_ttime**
- real ∗8, dimension(:), allocatable **slsoil**
- real ∗8, dimension(:), allocatable **sed_stl**
- real ∗8, dimension(:), allocatable **gwminp**
- real ∗8, dimension(:), allocatable **sol_cov**
- real ∗8, dimension(:), allocatable **yldanu**
- real ∗8, dimension(:), allocatable **pnd_solp**
- real ∗8, dimension(:), allocatable **pnd_no3**
- real ∗8, dimension(:), allocatable **ov_n**
- real ∗8, dimension(:), allocatable **driftco**
- real ∗8, dimension(:), allocatable **pnd_orgp**

- real ∗8, dimension(:), allocatable **pnd_orgn**
- real ∗8, dimension(:), allocatable **cn3**
- real ∗8, dimension(:), allocatable **twlpnd**
- real ∗8, dimension(:), allocatable **twlwet**
- real ∗8, dimension(:), allocatable **sol_sumul**
- real ∗8, dimension(:), allocatable **pnd_chla**
- real ∗8, dimension(:), allocatable **hru_fr**
- real ∗8, dimension(:), allocatable **bio_ms**
- real ∗8, dimension(:), allocatable **sol_alb**
- real ∗8, dimension(:), allocatable **strsw**
- real ∗8, dimension(:), allocatable **hru_km**
- real ∗8, dimension(:), allocatable **pnd_fr**
- real ∗8, dimension(:), allocatable **pnd_psa**
- real ∗8, dimension(:), allocatable **pnd_pvol**
- real ∗8, dimension(:), allocatable **pnd_k**
- real ∗8, dimension(:), allocatable **pnd_esa**
- real ∗8, dimension(:), allocatable **pnd_evol**
- real ∗8, dimension(:), allocatable **pnd_vol**
- real ∗8, dimension(:), allocatable **yldaa**
- real ∗8, dimension(:), allocatable **pnd_sed**
- real ∗8, dimension(:), allocatable **pnd_nsed**
- real ∗8, dimension(:), allocatable **strsa**
- real ∗8, dimension(:), allocatable **dep_imp**
- real ∗8, dimension(:), allocatable **evpnd**
- real ∗8, dimension(:), allocatable **evwet**
- real ∗8, dimension(:), allocatable **wet_fr**
- real ∗8, dimension(:), allocatable **wet_nsa**
- real ∗8, dimension(:), allocatable **wet_nvol**
- real ∗8, dimension(:), allocatable **wet_k**
- integer, dimension(:), allocatable **iwetgw**
- integer, dimension(:), allocatable **iwetile**
- real ∗8, dimension(:), allocatable **wet_mxsa**
- real ∗8, dimension(:), allocatable **wet_mxvol**
- real ∗8, dimension(:), allocatable **wet_vol**
- real ∗8, dimension(:), allocatable **wet_sed**
- real ∗8, dimension(:), allocatable **wet_nsed**
- real ∗8, dimension(:), allocatable **smx**
- real ∗8, dimension(:), allocatable **sci**
- real ∗8, dimension(:), allocatable **bp1**
- real ∗8, dimension(:), allocatable **bp2**
- real ∗8, dimension(:), allocatable **bw1**
- real ∗8, dimension(:), allocatable **bw2**
- real ∗8, dimension(:), allocatable **bactpq**
- real ∗8, dimension(:), allocatable **bactp_plt**
- real ∗8, dimension(:), allocatable **bactlp_plt**
- real ∗8, dimension(:), allocatable **cnday**
- real ∗8, dimension(:), allocatable **bactlpq**
- real ∗8, dimension(:), allocatable **auto_eff**
- real ∗8, dimension(:), allocatable **sol_sw**
- real ∗8, dimension(:), allocatable **secciw**
- real ∗8, dimension(:), allocatable **bactps**
- real ∗8, dimension(:), allocatable **bactlps**
- real ∗8, dimension(:), allocatable **tmpav**
- real ∗8, dimension(:), allocatable **chlaw**
- real ∗8, dimension(:), allocatable **subp**

- real ∗8, dimension(:), allocatable **sno_hru**
- real ∗8, dimension(:), allocatable **hru_ra**
- real ∗8, dimension(:), allocatable **wet_orgn**
- real ∗8, dimension(:), allocatable **tmx**
- real ∗8, dimension(:), allocatable **tmn**
- real ∗8, dimension(:), allocatable **rsdin**
- real ∗8, dimension(:), allocatable **tmp_hi**
- real ∗8, dimension(:), allocatable **tmp_lo**
- real ∗8, dimension(:), allocatable **rwt**
- real ∗8, dimension(:), allocatable **olai**
- real ∗8, dimension(:), allocatable **usle_k**
- real ∗8, dimension(:), allocatable **tconc**
- real ∗8, dimension(:), allocatable **hru_rmx**
- real ∗8, dimension(:), allocatable **usle_cfac**
- real ∗8, dimension(:), allocatable **usle_eifac**
- real ∗8, dimension(:), allocatable **anano3**
- real ∗8, dimension(:), allocatable **aird**
- real ∗8, dimension(:), allocatable **t_ov**
- real ∗8, dimension(:), allocatable **sol_sumfc**
- real ∗8, dimension(:), allocatable **sol_avpor**
- real ∗8, dimension(:), allocatable **usle_mult**
- real ∗8, dimension(:), allocatable **wet_orgp**
- real ∗8, dimension(:), allocatable **aairr**
- real ∗8, dimension(:), allocatable **cht**
- real ∗8, dimension(:), allocatable **u10**
- real ∗8, dimension(:), allocatable **rhd**
- real ∗8, dimension(:), allocatable **shallirr**
- real ∗8, dimension(:), allocatable **deepirr**
- real ∗8, dimension(:), allocatable **lai_aamx**
- real ∗8, dimension(:), allocatable **canstor**
- real ∗8, dimension(:), allocatable **ovrlnd**
- real ∗8, dimension(:), allocatable **ch_l1**
- real ∗8, dimension(:), allocatable **wet_no3**
- real ∗8, dimension(:), allocatable **irr_mx**
- real ∗8, dimension(:), allocatable **auto_wstr**
- real ∗8, dimension(:), allocatable **cfrt_id**
- real ∗8, dimension(:), allocatable **cfrt_kg**
- real ∗8, dimension(:), allocatable **cpst_id**
- real ∗8, dimension(:), allocatable **cpst_kg**
- real ∗8, dimension(:), allocatable **irr_asq**
- real ∗8, dimension(:), allocatable **irr_eff**
- real ∗8, dimension(:), allocatable **irrsq**
- real ∗8, dimension(:), allocatable **irrefm**
- real ∗8, dimension(:), allocatable **irrsalt**
- real ∗8, dimension(:), allocatable **bio_eat**
- real ∗8, dimension(:), allocatable **bio_trmp**
- integer, dimension(:), allocatable **ifrt_freq**
- integer, dimension(:), allocatable **ipst_freq**
- integer, dimension(:), allocatable **irr_noa**
- integer, dimension(:), allocatable **irr_sc**
- integer, dimension(:), allocatable **irr_no**
- integer, dimension(:), allocatable **imp_trig**
- integer, dimension(:), allocatable **fert_days**
- integer, dimension(:), allocatable **irr_sca**
- integer, dimension(:), allocatable **pest_days**

- integer, dimension(:), allocatable **idplt**
- integer, dimension(:), allocatable **wstrs_id**
- real ∗8, dimension(:,:), allocatable **bio_aahv**
- real ∗8, dimension(:), allocatable **cumei**
- real ∗8, dimension(:), allocatable **cumeira**
- real ∗8, dimension(:), allocatable **cumrt**
- real ∗8, dimension(:), allocatable **cumrai**
- real ∗8, dimension(:), allocatable **wet_solp**
- real ∗8, dimension(:), allocatable **wet_no3s**
- real ∗8, dimension(:), allocatable **wet_chla**
- real ∗8, dimension(:), allocatable **wet_seci**
- real ∗8, dimension(:), allocatable **pnd_no3g**
- real ∗8, dimension(:), allocatable **pstsol**
- real ∗8, dimension(:), allocatable **gwht**
- real ∗8, dimension(:), allocatable **delay**
- real ∗8, dimension(:), allocatable **gw_q**
- real ∗8, dimension(:), allocatable **pnd_solpg**
- real ∗8, dimension(:), allocatable **alpha_bf**
- real ∗8, dimension(:), allocatable **alpha_bfe**
- real ∗8, dimension(:), allocatable **gw_spyld**
- real ∗8, dimension(:), allocatable **alpha_bf_d**
- real ∗8, dimension(:), allocatable **alpha_bfe_d**
- real ∗8, dimension(:), allocatable **gw_qdeep**
- real ∗8, dimension(:), allocatable **gw_delaye**
- real ∗8, dimension(:), allocatable **gw_revap**
- real ∗8, dimension(:), allocatable **rchrg_dp**
- real ∗8, dimension(:), allocatable anion_excl

  fraction of porosity from which anions are excluded
- real ∗8, dimension(:), allocatable **revapmn**
- real ∗8, dimension(:), allocatable **rchrg**
- real ∗8, dimension(:), allocatable **ffc**
- real ∗8, dimension(:), allocatable **bio_min**
- real ∗8, dimension(:), allocatable **surqsolp**
- real ∗8, dimension(:), allocatable **cklsp**
- real ∗8, dimension(:), allocatable **deepst**
- real ∗8, dimension(:), allocatable **shallst**
- real ∗8, dimension(:), allocatable **wet_solpg**
- real ∗8, dimension(:), allocatable **rchrg_src**
- real ∗8, dimension(:), allocatable **wet_no3g**
- real ∗8, dimension(:), allocatable **sol_avbd**
- real ∗8, dimension(:), allocatable **trapeff**
- real ∗8, dimension(:), allocatable **gwqmn**
- real ∗8, dimension(:), allocatable **tdrain**
- real ∗8, dimension(:), allocatable **pplnt**
- real ∗8, dimension(:), allocatable **snotmp**
- real ∗8, dimension(:), allocatable gdrain

  drain tile lag time (hours)
- real ∗8, dimension(:), allocatable **ddrain**
- real ∗8, dimension(:), allocatable **sol_crk**
- real ∗8, dimension(:), allocatable **dayl**
- real ∗8, dimension(:), allocatable **brt**
- real ∗8, dimension(:), allocatable sstmaxd

  static maximum depressional storage; read from .sdr (mm)
- real ∗8, dimension(:), allocatable **ddrain_hru**

- real ∗8, dimension(:), allocatable **re**
- real ∗8, dimension(:), allocatable **sdrain**
- real ∗8, dimension(:), allocatable **stmaxd**
- real ∗8, dimension(:), allocatable **drain_co**
- real ∗8, dimension(:), allocatable **pc**
- real ∗8, dimension(:), allocatable **latksatf**
- real ∗8, dimension(:), allocatable **twash**
- real ∗8, dimension(:), allocatable **rnd2**
- real ∗8, dimension(:), allocatable **rnd3**
- real ∗8, dimension(:), allocatable **sol_cnsw**
- real ∗8, dimension(:), allocatable **doxq**
- real ∗8, dimension(:), allocatable **rnd8**
- real ∗8, dimension(:), allocatable **rnd9**
- real ∗8, dimension(:), allocatable **percn**
- real ∗8, dimension(:), allocatable **sol_sumwp**
- real ∗8, dimension(:), allocatable **tauton**
- real ∗8, dimension(:), allocatable **tautop**
- real ∗8, dimension(:), allocatable **cbodu**
- real ∗8, dimension(:), allocatable **chl_a**
- real ∗8, dimension(:), allocatable **qdr**
- real ∗8, dimension(:), allocatable **tfertn**
- real ∗8, dimension(:), allocatable **tfertp**
- real ∗8, dimension(:), allocatable **tgrazn**
- real ∗8, dimension(:), allocatable **tgrazp**
- real ∗8, dimension(:), allocatable **latno3**
- real ∗8, dimension(:), allocatable **latq**
- real ∗8, dimension(:), allocatable **minpgw**
- real ∗8, dimension(:), allocatable **no3gw**
- real ∗8, dimension(:), allocatable **nplnt**
- real ∗8, dimension(:), allocatable **tileq**
- real ∗8, dimension(:), allocatable **tileno3**
- real ∗8, dimension(:), allocatable **sedminpa**
- real ∗8, dimension(:), allocatable **sedminps**
- real ∗8, dimension(:), allocatable **sedorgn**
- real ∗8, dimension(:), allocatable **sedorgp**
- real ∗8, dimension(:), allocatable **sedyld**
- real ∗8, dimension(:), allocatable **sepbtm**
- real ∗8, dimension(:), allocatable **strsn**
- real ∗8, dimension(:), allocatable **strsp**
- real ∗8, dimension(:), allocatable **strstmp**
- real ∗8, dimension(:), allocatable **surfq**
- real ∗8, dimension(:), allocatable **surqno3**
- real ∗8, dimension(:), allocatable **tcfrtn**
- real ∗8, dimension(:), allocatable **tcfrtp**
- real ∗8, dimension(:), allocatable **hru_ha**
- real ∗8, dimension(:), allocatable **hru_dafr**
- real ∗8, dimension(:), allocatable **drydep_no3**
- real ∗8, dimension(:), allocatable **drydep_nh4**
- real ∗8, dimension(:), allocatable **phubase**
- real ∗8, dimension(:), allocatable **bio_yrms**
- real ∗8, dimension(:), allocatable **hvstiadj**
- real ∗8, dimension(:), allocatable **laimxfr**
- real ∗8, dimension(:), allocatable **laiday**
- real ∗8, dimension(:), allocatable **chlap**
- real ∗8, dimension(:), allocatable **pnd_psed**

- real ∗8, dimension(:), allocatable **wet_psed**
- real ∗8, dimension(:), allocatable **seccip**
- real ∗8, dimension(:), allocatable **plantn**
- real ∗8, dimension(:), allocatable **plt_et**
- real ∗8, dimension(:), allocatable **plt_pet**
- real ∗8, dimension(:), allocatable **plantp**
- real ∗8, dimension(:), allocatable **bio_aams**
- real ∗8, dimension(:), allocatable **bio_aamx**
- real ∗8, dimension(:), allocatable **lai_yrmx**
- real ∗8, dimension(:), allocatable **dormhr**
- real ∗8, dimension(:), allocatable **lat_pst**
- real ∗8, dimension(:), allocatable **orig_snohru**
- real ∗8, dimension(:), allocatable **orig_potvol**
- real ∗8, dimension(:), allocatable **fld_fr**
- real ∗8, dimension(:), allocatable **orig_alai**
- real ∗8, dimension(:), allocatable **orig_bioms**
- real ∗8, dimension(:), allocatable **pltfr_n**
- real ∗8, dimension(:), allocatable **orig_phuacc**
- real ∗8, dimension(:), allocatable **orig_sumix**
- real ∗8, dimension(:), allocatable **pltfr_p**
- real ∗8, dimension(:), allocatable **orig_phu**
- real ∗8, dimension(:), allocatable **phu_plt**
- real ∗8, dimension(:), allocatable **orig_shallst**
- real ∗8, dimension(:), allocatable **orig_deepst**
- real ∗8, dimension(:), allocatable **orig_pndvol**
- real ∗8, dimension(:), allocatable **orig_pndsed**
- real ∗8, dimension(:), allocatable **rip_fr**
- real ∗8, dimension(:), allocatable **orig_pndno3**
- real ∗8, dimension(:), allocatable **orig_pndsolp**
- real ∗8, dimension(:), allocatable **orig_pndorgn**
- real ∗8, dimension(:), allocatable **orig_pndorgp**
- real ∗8, dimension(:), allocatable **orig_wetvol**
- real ∗8, dimension(:), allocatable **orig_wetsed**
- real ∗8, dimension(:), allocatable **orig_wetno3**
- real ∗8, dimension(:), allocatable **orig_wetsolp**
- real ∗8, dimension(:), allocatable **orig_wetorgn**
- real ∗8, dimension(:), allocatable **orig_wetorgp**
- real ∗8, dimension(:), allocatable **orig_solcov**
- real ∗8, dimension(:), allocatable **orig_solsw**
- real ∗8, dimension(:), allocatable **orig_potno3**
- real ∗8, dimension(:), allocatable **orig_potsed**
- real ∗8, dimension(:), allocatable **wtab**
- real ∗8, dimension(:), allocatable **wtab_mn**
- real ∗8, dimension(:), allocatable **wtab_mx**
- real ∗8, dimension(:), allocatable **shallst_n**
- real ∗8, dimension(:), allocatable **gw_nloss**
- real ∗8, dimension(:), allocatable **rchrg_n**
- real ∗8, dimension(:), allocatable **det_san**
- real ∗8, dimension(:), allocatable **det_sil**
- real ∗8, dimension(:), allocatable **det_cla**
- real ∗8, dimension(:), allocatable **det_sag**
- real ∗8, dimension(:), allocatable **det_lag**
- real ∗8, dimension(:), allocatable **tnylda**
- real ∗8, dimension(:), allocatable **afrt_surface**
- real ∗8 **frt_surface**

- real ∗8, dimension(:), allocatable **auto_nyr**
- real ∗8, dimension(:), allocatable **auto_napp**
- real ∗8, dimension(:), allocatable **manure_kg**
- real ∗8, dimension(:), allocatable **auto_nstrs**
- real ∗8, dimension(:,:), allocatable **rcn_mo**
- real ∗8, dimension(:,:), allocatable **rammo_mo**
- real ∗8, dimension(:,:), allocatable **drydep_no3_mo**
- real ∗8, dimension(:,:), allocatable **drydep_nh4_mo**
- real ∗8, dimension(:), allocatable **rcn_d**
- real ∗8, dimension(:), allocatable **rammo_d**
- real ∗8, dimension(:), allocatable **drydep_no3_d**
- real ∗8, dimension(:), allocatable **drydep_nh4_d**
- real ∗8, dimension(:,:), allocatable **yldn**
- real ∗8, dimension(:,:), allocatable **gwati**
- real ∗8, dimension(:,:), allocatable **gwatn**
- real ∗8, dimension(:,:), allocatable **gwatl**
- real ∗8, dimension(:,:), allocatable **gwatw**
- real ∗8, dimension(:,:), allocatable **gwatd**
- real ∗8, dimension(:,:), allocatable **gwatveg**
- real ∗8, dimension(:,:), allocatable **gwata**
- real ∗8, dimension(:,:), allocatable **gwats**
- real ∗8, dimension(:,:), allocatable **gwatspcon**
- real ∗8, dimension(:,:), allocatable **rfqeo_30d**
- real ∗8, dimension(:,:), allocatable **eo_30d**
- real ∗8, dimension(:,:), allocatable **wgncur**
- real ∗8, dimension(:,:), allocatable **wgnold**
- real ∗8, dimension(:,:), allocatable **wrt**
- real ∗8, dimension(:,:), allocatable **psetlp**
- real ∗8, dimension(:,:), allocatable **zdb**
- real ∗8, dimension(:,:), allocatable **pst_surq**
- real ∗8, dimension(:,:), allocatable **pst_enr**
- real ∗8, dimension(:,:), allocatable **plt_pst**
- real ∗8, dimension(:,:), allocatable **pst_sed**
- real ∗8, dimension(:,:), allocatable **psetlw**
- real ∗8, dimension(:,:), allocatable **pcpband**
- real ∗8, dimension(:,:), allocatable **wupnd**
- real ∗8, dimension(:,:), allocatable **tavband**
- real ∗8, dimension(:,:), allocatable **phi**
- real ∗8, dimension(:,:), allocatable **wat_phi**
- real ∗8, dimension(:,:), allocatable **wushal**
- real ∗8, dimension(:,:), allocatable **wudeep**
- real ∗8, dimension(:,:), allocatable **tmnband**
- real ∗8, dimension(:,:), allocatable **snoeb**
- real ∗8, dimension(:,:), allocatable **nsetlw**
- real ∗8, dimension(:,:), allocatable **snotmpeb**
- real ∗8, dimension(:,:), allocatable **bss**
- real ∗8, dimension(:,:), allocatable **surf_bs**
- real ∗8, dimension(:,:), allocatable **tmxband**
- real ∗8, dimension(:,:), allocatable **nsetlp**
- real ∗8, dimension(:,:), allocatable **rainsub**
- real ∗8, dimension(:,:), allocatable **frad**
- real ∗8, dimension(:), allocatable **rstpbsb**
- real ∗8, dimension(:,:), allocatable **orig_snoeb**
- real ∗8, dimension(:,:), allocatable **orig_pltpst**
- real ∗8, dimension(:,:), allocatable **terr_p**

- real ∗8, dimension(:,:), allocatable **terr_cn**
- real ∗8, dimension(:,:), allocatable **terr_sl**
- real ∗8, dimension(:,:), allocatable **drain_d**
- real ∗8, dimension(:,:), allocatable **drain_t**
- real ∗8, dimension(:,:), allocatable **drain_g**
- real ∗8, dimension(:,:), allocatable **drain_idep**
- real ∗8, dimension(:,:), allocatable **cont_cn**
- real ∗8, dimension(:,:), allocatable **cont_p**
- real ∗8, dimension(:,:), allocatable **filt_w**
- real ∗8, dimension(:,:), allocatable **strip_n**
- real ∗8, dimension(:,:), allocatable **strip_cn**
- real ∗8, dimension(:,:), allocatable **strip_c**
- real ∗8, dimension(:,:), allocatable **strip_p**
- real ∗8, dimension(:,:), allocatable **fire_cn**
- real ∗8, dimension(:,:), allocatable **cropno_upd**
- real ∗8, dimension(:,:), allocatable **hi_upd**
- real ∗8, dimension(:,:), allocatable **laimx_upd**
- real ∗8, dimension(:,:,:), allocatable **pst_lag**
- real ∗8, dimension(:,:,:), allocatable **phug**
- integer, dimension(:), allocatable **nrelease**
- integer, dimension(:), allocatable **swtrg**
- integer, dimension(:), allocatable **hrupest**
- integer, dimension(:), allocatable **nro**
- integer, dimension(:), allocatable **nrot**
- integer, dimension(:), allocatable **nfert**
- integer, dimension(:), allocatable **igro**
- integer, dimension(:), allocatable **nair**
- integer, dimension(:), allocatable **ipnd1**
- integer, dimension(:), allocatable **ipnd2**
- integer, dimension(:), allocatable **nirr**
- integer, dimension(:), allocatable **iflod1**
- integer, dimension(:), allocatable **iflod2**
- integer, dimension(:), allocatable **ndtarg**
- integer, dimension(:), allocatable **iafrttyp**
- integer, dimension(:), allocatable **nstress**
- integer, dimension(:), allocatable **igrotree**
- integer, dimension(:), allocatable **grz_days**
- integer, dimension(:), allocatable **nmgt**
- integer, dimension(:), allocatable **icr**
- integer, dimension(:), allocatable **ncut**
- integer, dimension(:), allocatable **nsweep**
- integer, dimension(:), allocatable **nafert**
- integer, dimension(:), allocatable **irn**
- integer, dimension(:), allocatable **irrno**
- integer, dimension(:), allocatable **sol_nly**
- integer, dimension(:), allocatable **npcp**
- integer, dimension(:), allocatable **igrz**
- integer, dimension(:), allocatable **ndeat**
- integer, dimension(:), allocatable **ngr**
- integer, dimension(:), allocatable **ncf**
- integer, dimension(:), allocatable **idorm**
- integer, dimension(:), allocatable **urblu**
- integer, dimension(:), allocatable **hru_sub**
- integer, dimension(:), allocatable **ldrain**
- integer, dimension(:), allocatable **hru_seq**

- integer, dimension(:), allocatable **iurban**
- integer, dimension(:), allocatable **iday_fert**
- integer, dimension(:), allocatable **icfrt**
- integer, dimension(:), allocatable **ndcfrt**
- integer, dimension(:), allocatable **irip**
- integer, dimension(:), allocatable **ifld**
- integer, dimension(:), allocatable **hrugis**
- integer, dimension(:), allocatable **orig_igro**
- integer, dimension(:), allocatable **ntil**
- integer, dimension(:), allocatable **irrsc**
- integer, dimension(:), allocatable **iwatable**
- integer, dimension(:), allocatable **curyr_mat**
- integer, dimension(:), allocatable **ncpest**
- integer, dimension(:), allocatable **icpst**
- integer, dimension(:), allocatable **ndcpst**
- integer, dimension(:), allocatable **iday_pest**
- integer, dimension(:), allocatable **irr_flag**
- integer, dimension(:), allocatable **irra_flag**
- integer, dimension(:,:), allocatable rndseed

  random number generator seed. The seeds in the array are used to generate random numbers for the following purposes:
  (1) wet/dry day probability
  (2) solar radiation
  (3) precipitation
  (4) USLE rainfall erosion index
  (5) wind speed
  (6) 0.5 hr rainfall fraction
  (7) relative humidity
  (8) maximum temperature
  (9) minimum temperature
  (10) generate new random numbers
- integer, dimension(:,:), allocatable **iterr**
- integer, dimension(:,:), allocatable **iyterr**
- integer, dimension(:,:), allocatable **itdrain**
- integer, dimension(:,:), allocatable **iydrain**
- integer, dimension(:,:), allocatable **ncrops**
- integer, dimension(:), allocatable **manure_id**
- integer, dimension(:,:), allocatable **mgt_sdr**
- integer, dimension(:,:), allocatable **idplrot**
- integer, dimension(:,:), allocatable **icont**
- integer, dimension(:,:), allocatable **iycont**
- integer, dimension(:,:), allocatable **ifilt**
- integer, dimension(:,:), allocatable **iyfilt**
- integer, dimension(:,:), allocatable **istrip**
- integer, dimension(:,:), allocatable **iystrip**
- integer, dimension(:,:), allocatable **iopday**
- integer, dimension(:,:), allocatable **iopyr**
- integer, dimension(:,:), allocatable **mgt_ops**
- real ∗8, dimension(:), allocatable **wshd_pstap**
- real ∗8, dimension(:), allocatable **wshd_pstdg**
- integer, dimension(12) **ndmo**
- integer, dimension(:), allocatable **npno**
- integer, dimension(:), allocatable **mcrhru**
- character(len=13), dimension(18) rfile

  rainfall file names (.pcp)
- character(len=13), dimension(18) tfile

temperature file names (.tmp)

- character(len=4), dimension(1000) **urbname**
- character(len=1), dimension(:), allocatable **hydgrp**
- character(len=1), dimension(:), allocatable **kirr**
- character(len=16), dimension(:), allocatable **snam**
- character(len=17), dimension(300) **pname**
- character(len=13), dimension(79) **heds**
- character(len=13), dimension(24) **hedb**
- character(len=13), dimension(46) **hedr**
- character(len=13), dimension(41) **hedrsv**
- character(len=13), dimension(40) **hedwtr**
- character(len=4), dimension(60) title

description lines in file.cio (1st 3 lines)

- character(len=4), dimension(5000) **cpnm**
- character(len=17), dimension(50) **fname**
- real ∗8, dimension(:,:,:), allocatable **flomon**
- real ∗8, dimension(:,:,:), allocatable **solpstmon**
- real ∗8, dimension(:,:,:), allocatable **srbpstmon**
- real ∗8, dimension(:,:,:), allocatable **sedmon**
- real ∗8, dimension(:,:,:), allocatable **orgnmon**
- real ∗8, dimension(:,:,:), allocatable **orgpmon**
- real ∗8, dimension(:,:,:), allocatable **no3mon**
- real ∗8, dimension(:,:,:), allocatable **minpmon**
- real ∗8, dimension(:,:,:), allocatable **nh3mon**
- real ∗8, dimension(:,:,:), allocatable **no2mon**
- real ∗8, dimension(:,:,:), allocatable **bactpmon**
- real ∗8, dimension(:,:,:), allocatable **bactlpmon**
- real ∗8, dimension(:,:,:), allocatable **cmtl1mon**
- real ∗8, dimension(:,:,:), allocatable **cmtl2mon**
- real ∗8, dimension(:,:,:), allocatable **cmtl3mon**
- real ∗8, dimension(:,:,:), allocatable **chlamon**
- real ∗8, dimension(:,:,:), allocatable **disoxmon**
- real ∗8, dimension(:,:,:), allocatable **cbodmon**
- real ∗8, dimension(:,:), allocatable **floyr**
- real ∗8, dimension(:,:), allocatable **sedyr**
- real ∗8, dimension(:,:), allocatable **orgnyr**
- real ∗8, dimension(:,:), allocatable **orgpyr**
- real ∗8, dimension(:,:), allocatable **no3yr**
- real ∗8, dimension(:,:), allocatable **minpyr**
- real ∗8, dimension(:,:), allocatable **nh3yr**
- real ∗8, dimension(:,:), allocatable **no2yr**
- real ∗8, dimension(:,:), allocatable **bactpyr**
- real ∗8, dimension(:,:), allocatable **bactlpyr**
- real ∗8, dimension(:,:), allocatable **cmtl1yr**
- real ∗8, dimension(:,:), allocatable **cmtl2yr**
- real ∗8, dimension(:,:), allocatable **cmtl3yr**
- real ∗8, dimension(:,:), allocatable **chlayr**
- real ∗8, dimension(:,:), allocatable **disoxyr**
- real ∗8, dimension(:,:), allocatable **cbodyr**
- real ∗8, dimension(:,:), allocatable **solpstyr**
- real ∗8, dimension(:,:), allocatable **srbpstyr**
- real ∗8, dimension(:,:), allocatable **sol_mc**
- real ∗8, dimension(:,:), allocatable **sol_mn**
- real ∗8, dimension(:,:), allocatable **sol_mp**

- real ∗8, dimension(:), allocatable **flocnst**
- real ∗8, dimension(:), allocatable **sedcnst**
- real ∗8, dimension(:), allocatable **orgncnst**
- real ∗8, dimension(:), allocatable **orgpcnst**
- real ∗8, dimension(:), allocatable **no3cnst**
- real ∗8, dimension(:), allocatable **minpcnst**
- real ∗8, dimension(:), allocatable **nh3cnst**
- real ∗8, dimension(:), allocatable **no2cnst**
- real ∗8, dimension(:), allocatable **bactpcnst**
- real ∗8, dimension(:), allocatable **cmtl1cnst**
- real ∗8, dimension(:), allocatable **cmtl2cnst**
- real ∗8, dimension(:), allocatable **bactlpcnst**
- real ∗8, dimension(:), allocatable **cmtl3cnst**
- real ∗8, dimension(:), allocatable **chlacnst**
- real ∗8, dimension(:), allocatable **disoxcnst**
- real ∗8, dimension(:), allocatable **cbodcnst**
- real ∗8, dimension(:), allocatable **solpstcnst**
- real ∗8, dimension(:), allocatable **srbpstcnst**
- integer nstep

  max number of time steps per day
- integer idt

  length of time step used to report precipitation data for sub-daily modeling (minutes)
- real ∗8, dimension(:), allocatable **hrtwtr**
- real ∗8, dimension(:), allocatable **hhstor**
- real ∗8, dimension(:), allocatable **hdepth**
- real ∗8, dimension(:), allocatable **hsdti**
- real ∗8, dimension(:), allocatable **hrchwtr**
- real ∗8, dimension(:), allocatable **halgae**
- real ∗8, dimension(:), allocatable **horgn**
- real ∗8, dimension(:), allocatable **hnh4**
- real ∗8, dimension(:), allocatable **hno2**
- real ∗8, dimension(:), allocatable **hno3**
- real ∗8, dimension(:), allocatable **horgp**
- real ∗8, dimension(:), allocatable **hsolp**
- real ∗8, dimension(:), allocatable **hbod**
- real ∗8, dimension(:), allocatable **hdisox**
- real ∗8, dimension(:), allocatable **hchla**
- real ∗8, dimension(:), allocatable **hsedyld**
- real ∗8, dimension(:), allocatable **hsedst**
- real ∗8, dimension(:), allocatable **hharea**
- real ∗8, dimension(:), allocatable **hsolpst**
- real ∗8, dimension(:), allocatable **hsorpst**
- real ∗8, dimension(:), allocatable **hhqday**
- real ∗8, dimension(:), allocatable **precipdt**
- real ∗8, dimension(:), allocatable **hhtime**
- real ∗8, dimension(:), allocatable **hbactp**
- real ∗8, dimension(:), allocatable **hbactlp**
- integer, dimension(10) **ivar_orig**
- real ∗8, dimension(10) **rvar_orig**
- integer nsave

  number of save commands in .fig file
- integer **nauto**
- integer **iatmodep**
- real ∗8, dimension(:), allocatable **wattemp**

- real ∗8, dimension(:), allocatable **lkpst_mass**
- real ∗8, dimension(:), allocatable **lkspst_mass**
- real ∗8, dimension(:), allocatable **vel_chan**
- real ∗8, dimension(:), allocatable **vfscon**
- real ∗8, dimension(:), allocatable **vfsratio**
- real ∗8, dimension(:), allocatable **vfsch**
- real ∗8, dimension(:), allocatable **vfsi**
- real ∗8, dimension(:,:), allocatable **filter_i**
- real ∗8, dimension(:,:), allocatable **filter_ratio**
- real ∗8, dimension(:,:), allocatable **filter_con**
- real ∗8, dimension(:,:), allocatable **filter_ch**
- real ∗8, dimension(:,:), allocatable **sol_n**
- integer cswat

  = 0 Static soil carbon (old mineralization routines)
  = 1 C-FARM one carbon pool model
  = 2 Century model
- real ∗8, dimension(:,:), allocatable **sol_bdp**
- real ∗8, dimension(:,:), allocatable **tillagef**
- real ∗8, dimension(:), allocatable **rtfr**
- real ∗8, dimension(:), allocatable **stsol_rd**
- integer **urban_flag**
- integer **dorm_flag**
- real ∗8 **bf_flg**
- real ∗8 **iabstr**
- real ∗8, dimension(:), allocatable **ubnrunoff**
- real ∗8, dimension(:), allocatable **ubntss**
- real ∗8, dimension(:,:), allocatable **sub_ubnrunoff**
- real ∗8, dimension(:,:), allocatable **sub_ubntss**
- real ∗8, dimension(:,:), allocatable **ovrlnd_dt**
- real ∗8, dimension(:,:,:), allocatable **hhsurf_bs**
- integer iuh

  unit hydrograph method: 1=triangular UH; 2=gamma funtion UH;
- integer sed_ch

  channel routing for HOURLY; 0=Bagnold; 2=Brownlie; 3=Yang;
- real ∗8 eros_expo

  an exponent in the overland flow erosion equation ranges 1.5-3.0
- real ∗8 eros_spl

  coefficient of splash erosion varing 0.9-3.1
- real ∗8 rill_mult

  Multiplier to USLE_K for soil susceptible to rill erosion, range 0.5-2.0.
- real ∗8 **sedprev**
- real ∗8 **c_factor**
- real ∗8 ch_d50

  median particle diameter of channel bed (mm)
- real ∗8 sig_g

  geometric standard deviation of particle sizes for the main channel. Mean air temperature at which precipitation is equally likely to be rain as snow/freezing rain.
- real ∗8 uhalpha

  alpha coefficient for estimating unit hydrograph using a gamma function (∗.bsn)
- real ∗8 **abstinit**
- real ∗8 **abstmax**
- real ∗8, dimension(:,:), allocatable **hhsedy**
- real ∗8, dimension(:,:), allocatable **sub_subp_dt**
- real ∗8, dimension(:,:), allocatable **sub_hhsedy**

- real ∗8, dimension(:,:), allocatable **sub_atmp**
- real ∗8, dimension(:), allocatable **rhy**
- real ∗8, dimension(:), allocatable **init_abstrc**
- real ∗8, dimension(:), allocatable **dratio**
- real ∗8, dimension(:), allocatable **hrtevp**
- real ∗8, dimension(:), allocatable **hrttlc**
- real ∗8, dimension(:,:,:), allocatable **rchhr**
- real ∗8, dimension(:), allocatable **hhresflwi**
- real ∗8, dimension(:), allocatable **hhresflwo**
- real ∗8, dimension(:), allocatable **hhressedi**
- real ∗8, dimension(:), allocatable **hhressedo**
- character(len=4), dimension(:), allocatable **lu_nodrain**
- integer, dimension(:), allocatable **bmpdrain**
- real ∗8, dimension(:), allocatable **sub_cn2**
- real ∗8, dimension(:), allocatable **sub_ha_urb**
- real ∗8, dimension(:), allocatable **bmp_recharge**
- real ∗8, dimension(:), allocatable **sub_ha_imp**
- real ∗8, dimension(:), allocatable **subdr_km**
- real ∗8, dimension(:), allocatable **subdr_ickm**
- real ∗8, dimension(:,:), allocatable **sf_im**
- real ∗8, dimension(:,:), allocatable **sf_iy**
- real ∗8, dimension(:,:), allocatable **sp_sa**
- real ∗8, dimension(:,:), allocatable **sp_pvol**
- real ∗8, dimension(:,:), allocatable **sp_pd**
- real ∗8, dimension(:,:), allocatable **sp_sedi**
- real ∗8, dimension(:,:), allocatable **sp_sede**
- real ∗8, dimension(:,:), allocatable **ft_sa**
- real ∗8, dimension(:,:), allocatable **ft_fsa**
- real ∗8, dimension(:,:), allocatable **ft_dep**
- real ∗8, dimension(:,:), allocatable **ft_h**
- real ∗8, dimension(:,:), allocatable **ft_pd**
- real ∗8, dimension(:,:), allocatable **ft_k**
- real ∗8, dimension(:,:), allocatable **ft_dp**
- real ∗8, dimension(:,:), allocatable **ft_dc**
- real ∗8, dimension(:,:), allocatable **ft_por**
- real ∗8, dimension(:,:), allocatable **tss_den**
- real ∗8, dimension(:,:), allocatable **ft_alp**
- real ∗8, dimension(:,:), allocatable **sf_fr**
- real ∗8, dimension(:,:), allocatable **sp_qi**
- real ∗8, dimension(:,:), allocatable **sp_k**
- real ∗8, dimension(:,:), allocatable **ft_qpnd**
- real ∗8, dimension(:,:), allocatable **sp_dp**
- real ∗8, dimension(:,:), allocatable **ft_qsw**
- real ∗8, dimension(:,:), allocatable **ft_qin**
- real ∗8, dimension(:,:), allocatable **ft_qout**
- real ∗8, dimension(:,:), allocatable **ft_sedpnd**
- real ∗8, dimension(:,:), allocatable **sp_bpw**
- real ∗8, dimension(:,:), allocatable **ft_bpw**
- real ∗8, dimension(:,:), allocatable **ft_sed_cumul**
- real ∗8, dimension(:,:), allocatable **sp_sed_cumul**
- integer, dimension(:), allocatable **num_sf**
- integer, dimension(:,:), allocatable **sf_typ**
- integer, dimension(:,:), allocatable **sf_dim**
- integer, dimension(:,:), allocatable **ft_qfg**
- integer, dimension(:,:), allocatable **sp_qfg**

- integer, dimension(:,:), allocatable **sf_ptp**
- integer, dimension(:,:), allocatable **ft_fc**
- real ∗8 **sfsedmean**
- real ∗8 **sfsedstdev**
- integer, dimension(:), allocatable **dtp_subnum**
- integer, dimension(:), allocatable **dtp_imo**
- integer, dimension(:), allocatable **dtp_iyr**
- integer, dimension(:), allocatable **dtp_numweir**
- integer, dimension(:), allocatable **dtp_numstage**
- integer, dimension(:), allocatable **dtp_stagdis**
- integer, dimension(:), allocatable **dtp_reltype**
- integer, dimension(:), allocatable **dtp_onoff**
- real ∗8, dimension(:), allocatable **cf**
- real ∗8, dimension(:), allocatable **cfh**
- real ∗8, dimension(:), allocatable **cfdec**
- real ∗8, dimension(:), allocatable **lat_orgn**
- real ∗8, dimension(:), allocatable **lat_orgp**
- integer, dimension(:,:), allocatable **dtp_weirtype**
- integer, dimension(:,:), allocatable **dtp_weirdim**
- real ∗8, dimension(:), allocatable **dtp_evrsv**
- real ∗8, dimension(:), allocatable **dtp_inflvol**
- real ∗8, dimension(:), allocatable **dtp_totwrwid**
- real ∗8, dimension(:), allocatable **dtp_lwratio**
- real ∗8, dimension(:), allocatable **dtp_wdep**
- real ∗8, dimension(:), allocatable **dtp_totdep**
- real ∗8, dimension(:), allocatable **dtp_watdepact**
- real ∗8, dimension(:), allocatable **dtp_outflow**
- real ∗8, dimension(:), allocatable **dtp_totrel**
- real ∗8, dimension(:), allocatable **dtp_backoff**
- real ∗8, dimension(:), allocatable **dtp_seep_sa**
- real ∗8, dimension(:), allocatable **dtp_evap_sa**
- real ∗8, dimension(:), allocatable **dtp_pet_day**
- real ∗8, dimension(:), allocatable **dtp_pcpvol**
- real ∗8, dimension(:), allocatable **dtp_seepvol**
- real ∗8, dimension(:), allocatable **dtp_evapvol**
- real ∗8, dimension(:), allocatable **dtp_flowin**
- real ∗8, dimension(:), allocatable **dtp_backup_length**
- real ∗8, dimension(:), allocatable **dtp_intcept**
- real ∗8, dimension(:), allocatable **dtp_expont**
- real ∗8, dimension(:), allocatable **dtp_coef1**
- real ∗8, dimension(:), allocatable **dtp_coef2**
- real ∗8, dimension(:), allocatable **dtp_coef3**
- real ∗8, dimension(:), allocatable **dtp_dummy1**
- real ∗8, dimension(:), allocatable **dtp_dummy2**
- real ∗8, dimension(:), allocatable **dtp_dummy3**
- real ∗8, dimension(:), allocatable **dtp_ivol**
- real ∗8, dimension(:), allocatable **dtp_ised**
- integer, dimension(:,:), allocatable **so_res_flag**
- integer, dimension(:,:), allocatable **ro_bmp_flag**
- real ∗8, dimension(:,:), allocatable **sol_watp**
- real ∗8, dimension(:,:), allocatable **sol_solp_pre**
- real ∗8, dimension(:,:), allocatable **psp_store**
- real ∗8, dimension(:,:), allocatable **ssp_store**
- real ∗8, dimension(:,:), allocatable **so_res**
- real ∗8, dimension(:,:), allocatable **sol_cal**

- real ∗8, dimension(:,:), allocatable **sol_ph**
- integer **sol_p_model**
- integer, dimension(:,:), allocatable **a_days**
- integer, dimension(:,:), allocatable **b_days**
- real ∗8, dimension(:), allocatable **harv_min**
- real ∗8, dimension(:), allocatable **fstap**
- real ∗8, dimension(:), allocatable **min_res**
- real ∗8, dimension(:,:), allocatable **ro_bmp_flo**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sed**
- real ∗8, dimension(:,:), allocatable **ro_bmp_bac**
- real ∗8, dimension(:,:), allocatable **ro_bmp_pp**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sp**
- real ∗8, dimension(:,:), allocatable **ro_bmp_pn**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sn**
- real ∗8, dimension(:,:), allocatable **ro_bmp_flos**
- real ∗8, dimension(:,:), allocatable **ro_bmp_seds**
- real ∗8, dimension(:,:), allocatable **ro_bmp_bacs**
- real ∗8, dimension(:,:), allocatable **ro_bmp_pps**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sps**
- real ∗8, dimension(:,:), allocatable **ro_bmp_pns**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sns**
- real ∗8, dimension(:,:), allocatable **ro_bmp_flot**
- real ∗8, dimension(:,:), allocatable **ro_bmp_sedt**
- real ∗8, dimension(:,:), allocatable **ro_bmp_bact**
- real ∗8, dimension(:,:), allocatable **ro_bmp_ppt**
- real ∗8, dimension(:,:), allocatable **ro_bmp_spt**
- real ∗8, dimension(:,:), allocatable **ro_bmp_pnt**
- real ∗8, dimension(:,:), allocatable **ro_bmp_snt**
- real ∗8, dimension(:), allocatable **bmp_flo**
- real ∗8, dimension(:), allocatable **bmp_sed**
- real ∗8, dimension(:), allocatable **bmp_bac**
- real ∗8, dimension(:), allocatable **bmp_pp**
- real ∗8, dimension(:), allocatable **bmp_sp**
- real ∗8, dimension(:), allocatable **bmp_pn**
- real ∗8, dimension(:), allocatable **bmp_sn**
- real ∗8, dimension(:), allocatable **bmp_flag**
- real ∗8, dimension(:), allocatable **bmp_flos**
- real ∗8, dimension(:), allocatable **bmp_seds**
- real ∗8, dimension(:), allocatable **bmp_bacs**
- real ∗8, dimension(:), allocatable **bmp_pps**
- real ∗8, dimension(:), allocatable **bmp_sps**
- real ∗8, dimension(:), allocatable **bmp_pns**
- real ∗8, dimension(:), allocatable **bmp_sns**
- real ∗8, dimension(:), allocatable **bmp_flot**
- real ∗8, dimension(:), allocatable **bmp_sedt**
- real ∗8, dimension(:), allocatable **bmp_bact**
- real ∗8, dimension(:), allocatable **bmp_ppt**
- real ∗8, dimension(:), allocatable **bmp_spt**
- real ∗8, dimension(:), allocatable **bmp_pnt**
- real ∗8, dimension(:), allocatable **bmp_snt**
- real ∗8, dimension(:,:), allocatable **dtp_wdratio**
- real ∗8, dimension(:,:), allocatable **dtp_depweir**
- real ∗8, dimension(:,:), allocatable **dtp_diaweir**
- real ∗8, dimension(:,:), allocatable **dtp_retperd**
- real ∗8, dimension(:,:), allocatable **dtp_pcpret**

- real ∗8, dimension(:,:), allocatable **dtp_cdis**
- real ∗8, dimension(:,:), allocatable **dtp_flowrate**
- real ∗8, dimension(:,:), allocatable **dtp_wrwid**
- real ∗8, dimension(:,:), allocatable **dtp_addon**
- real ∗8, dimension(:), allocatable **ri_subkm**
- real ∗8, dimension(:), allocatable **ri_totpvol**
- real ∗8, dimension(:), allocatable **irmmdt**
- real ∗8, dimension(:,:), allocatable **ri_sed**
- real ∗8, dimension(:,:), allocatable **ri_fr**
- real ∗8, dimension(:,:), allocatable **ri_dim**
- real ∗8, dimension(:,:), allocatable **ri_im**
- real ∗8, dimension(:,:), allocatable **ri_iy**
- real ∗8, dimension(:,:), allocatable **ri_sa**
- real ∗8, dimension(:,:), allocatable **ri_vol**
- real ∗8, dimension(:,:), allocatable **ri_qi**
- real ∗8, dimension(:,:), allocatable **ri_k**
- real ∗8, dimension(:,:), allocatable **ri_dd**
- real ∗8, dimension(:,:), allocatable **ri_evrsv**
- real ∗8, dimension(:,:), allocatable **ri_dep**
- real ∗8, dimension(:,:), allocatable **ri_ndt**
- real ∗8, dimension(:,:), allocatable **ri_pmpvol**
- real ∗8, dimension(:,:), allocatable **ri_sed_cumul**
- real ∗8, dimension(:,:), allocatable **hrnopcp**
- real ∗8, dimension(:,:), allocatable **ri_qloss**
- real ∗8, dimension(:,:), allocatable **ri_pumpv**
- real ∗8, dimension(:,:), allocatable **ri_sedi**
- character(len=4), dimension(:,:), allocatable **ri_nirr**
- integer, dimension(:), allocatable **num_ri**
- integer, dimension(:), allocatable **ri_luflg**
- integer, dimension(:), allocatable **num_noirr**
- integer, dimension(:), allocatable **wtp_subnum**
- integer, dimension(:), allocatable **wtp_onoff**
- integer, dimension(:), allocatable **wtp_imo**
- integer, dimension(:), allocatable **wtp_iyr**
- integer, dimension(:), allocatable **wtp_dim**
- integer, dimension(:), allocatable **wtp_stagdis**
- integer, dimension(:), allocatable **wtp_sdtype**
- real ∗8, dimension(:), allocatable **wtp_pvol**
- real ∗8, dimension(:), allocatable **wtp_pdepth**
- real ∗8, dimension(:), allocatable **wtp_sdslope**
- real ∗8, dimension(:), allocatable **wtp_lenwdth**
- real ∗8, dimension(:), allocatable **wtp_extdepth**
- real ∗8, dimension(:), allocatable **wtp_hydeff**
- real ∗8, dimension(:), allocatable **wtp_evrsv**
- real ∗8, dimension(:), allocatable **wtp_sdintc**
- real ∗8, dimension(:), allocatable **wtp_sdexp**
- real ∗8, dimension(:), allocatable **wtp_sdc1**
- real ∗8, dimension(:), allocatable **wtp_sdc2**
- real ∗8, dimension(:), allocatable **wtp_sdc3**
- real ∗8, dimension(:), allocatable **wtp_pdia**
- real ∗8, dimension(:), allocatable **wtp_plen**
- real ∗8, dimension(:), allocatable **wtp_pmann**
- real ∗8, dimension(:), allocatable **wtp_ploss**
- real ∗8, dimension(:), allocatable **wtp_k**
- real ∗8, dimension(:), allocatable **wtp_dp**

- real ∗8, dimension(:), allocatable **wtp_sedi**
- real ∗8, dimension(:), allocatable **wtp_sede**
- real ∗8, dimension(:), allocatable **wtp_qi**
- real ∗8 **bio_init**
- real ∗8 **lai_init**
- real ∗8 **cnop**
- real ∗8 **hi_ovr**
- real ∗8 **harveff**
- real ∗8 **frac_harvk**
- real ∗8 **lid_vgcl**
- real ∗8 **lid_vgcm**
- real ∗8 **lid_qsurf_total**
- real ∗8 **lid_farea_sum**
- real ∗8, dimension(:,:), allocatable **lid_cuminf_last**
- real ∗8, dimension(:,:), allocatable **lid_sw_last**
- real ∗8, dimension(:,:), allocatable **interval_last**
- real ∗8, dimension(:,:), allocatable **lid_f_last**
- real ∗8, dimension(:,:), allocatable **lid_cumr_last**
- real ∗8, dimension(:,:), allocatable **lid_str_last**
- real ∗8, dimension(:,:), allocatable **lid_farea**
- real ∗8, dimension(:,:), allocatable **lid_qsurf**
- real ∗8, dimension(:,:), allocatable **lid_sw_add**
- real ∗8, dimension(:,:), allocatable **lid_cumqperc_last**
- real ∗8, dimension(:,:), allocatable **lid_cumirr_last**
- real ∗8, dimension(:,:), allocatable **lid_excum_last**
- integer, dimension(:,:), allocatable **gr_onoff**
- integer, dimension(:,:), allocatable **gr_imo**
- integer, dimension(:,:), allocatable **gr_iyr**
- real ∗8, dimension(:,:), allocatable **gr_farea**
- real ∗8, dimension(:,:), allocatable **gr_solop**
- real ∗8, dimension(:,:), allocatable **gr_etcoef**
- real ∗8, dimension(:,:), allocatable **gr_fc**
- real ∗8, dimension(:,:), allocatable **gr_wp**
- real ∗8, dimension(:,:), allocatable **gr_ksat**
- real ∗8, dimension(:,:), allocatable **gr_por**
- real ∗8, dimension(:,:), allocatable **gr_hydeff**
- real ∗8, dimension(:,:), allocatable **gr_soldpt**
- real ∗8, dimension(:,:), allocatable **gr_dummy1**
- real ∗8, dimension(:,:), allocatable **gr_dummy2**
- real ∗8, dimension(:,:), allocatable **gr_dummy3**
- real ∗8, dimension(:,:), allocatable **gr_dummy4**
- real ∗8, dimension(:,:), allocatable **gr_dummy5**
- integer, dimension(:,:), allocatable **rg_onoff**
- integer, dimension(:,:), allocatable **rg_imo**
- integer, dimension(:,:), allocatable **rg_iyr**
- real ∗8, dimension(:,:), allocatable **rg_farea**
- real ∗8, dimension(:,:), allocatable **rg_solop**
- real ∗8, dimension(:,:), allocatable **rg_etcoef**
- real ∗8, dimension(:,:), allocatable **rg_fc**
- real ∗8, dimension(:,:), allocatable **rg_wp**
- real ∗8, dimension(:,:), allocatable **rg_ksat**
- real ∗8, dimension(:,:), allocatable **rg_por**
- real ∗8, dimension(:,:), allocatable **rg_hydeff**
- real ∗8, dimension(:,:), allocatable **rg_soldpt**
- real ∗8, dimension(:,:), allocatable **rg_dimop**

- real ∗8, dimension(:,:), allocatable **rg_sarea**
- real ∗8, dimension(:,:), allocatable **rg_vol**
- real ∗8, dimension(:,:), allocatable **rg_sth**
- real ∗8, dimension(:,:), allocatable **rg_sdia**
- real ∗8, dimension(:,:), allocatable **rg_bdia**
- real ∗8, dimension(:,:), allocatable **rg_sts**
- real ∗8, dimension(:,:), allocatable **rg_orifice**
- real ∗8, dimension(:,:), allocatable **rg_oheight**
- real ∗8, dimension(:,:), allocatable **rg_odia**
- real ∗8, dimension(:,:), allocatable **rg_dummy1**
- real ∗8, dimension(:,:), allocatable **rg_dummy2**
- real ∗8, dimension(:,:), allocatable **rg_dummy3**
- real ∗8, dimension(:,:), allocatable **rg_dummy4**
- real ∗8, dimension(:,:), allocatable **rg_dummy5**
- integer, dimension(:,:), allocatable **cs_onoff**
- integer, dimension(:,:), allocatable **cs_imo**
- integer, dimension(:,:), allocatable **cs_iyr**
- integer, dimension(:,:), allocatable **cs_grcon**
- real ∗8, dimension(:,:), allocatable **cs_farea**
- real ∗8, dimension(:,:), allocatable **cs_vol**
- real ∗8, dimension(:,:), allocatable **cs_rdepth**
- real ∗8, dimension(:,:), allocatable **cs_dummy1**
- real ∗8, dimension(:,:), allocatable **cs_dummy2**
- real ∗8, dimension(:,:), allocatable **cs_dummy3**
- real ∗8, dimension(:,:), allocatable **cs_dummy4**
- real ∗8, dimension(:,:), allocatable **cs_dummy5**
- integer, dimension(:,:), allocatable **pv_onoff**
- integer, dimension(:,:), allocatable **pv_imo**
- integer, dimension(:,:), allocatable **pv_iyr**
- integer, dimension(:,:), allocatable **pv_solop**
- real ∗8, dimension(:,:), allocatable **pv_grvdep**
- real ∗8, dimension(:,:), allocatable **pv_grvpor**
- real ∗8, dimension(:,:), allocatable **pv_farea**
- real ∗8, dimension(:,:), allocatable **pv_drcoef**
- real ∗8, dimension(:,:), allocatable **pv_fc**
- real ∗8, dimension(:,:), allocatable **pv_wp**
- real ∗8, dimension(:,:), allocatable **pv_ksat**
- real ∗8, dimension(:,:), allocatable **pv_por**
- real ∗8, dimension(:,:), allocatable **pv_hydeff**
- real ∗8, dimension(:,:), allocatable **pv_soldpt**
- real ∗8, dimension(:,:), allocatable **pv_dummy1**
- real ∗8, dimension(:,:), allocatable **pv_dummy2**
- real ∗8, dimension(:,:), allocatable **pv_dummy3**
- real ∗8, dimension(:,:), allocatable **pv_dummy4**
- real ∗8, dimension(:,:), allocatable **pv_dummy5**
- integer, dimension(:,:), allocatable **lid_onoff**
- real ∗8, dimension(:,:), allocatable **sol_bmc**
- real ∗8, dimension(:,:), allocatable **sol_bmn**
- real ∗8, dimension(:,:), allocatable **sol_hsc**
- real ∗8, dimension(:,:), allocatable **sol_hsn**
- real ∗8, dimension(:,:), allocatable **sol_hpc**
- real ∗8, dimension(:,:), allocatable **sol_hpn**
- real ∗8, dimension(:,:), allocatable **sol_lm**
- real ∗8, dimension(:,:), allocatable **sol_lmc**
- real ∗8, dimension(:,:), allocatable **sol_lmn**

- real ∗8, dimension(:,:), allocatable **sol_ls**
- real ∗8, dimension(:,:), allocatable **sol_lsl**
- real ∗8, dimension(:,:), allocatable **sol_lsc**
- real ∗8, dimension(:,:), allocatable **sol_lsn**
- real ∗8, dimension(:,:), allocatable **sol_rnmn**
- real ∗8, dimension(:,:), allocatable **sol_lslc**
- real ∗8, dimension(:,:), allocatable **sol_lslnc**
- real ∗8, dimension(:,:), allocatable **sol_rspc**
- real ∗8, dimension(:,:), allocatable **sol_woc**
- real ∗8, dimension(:,:), allocatable **sol_won**
- real ∗8, dimension(:,:), allocatable **sol_hp**
- real ∗8, dimension(:,:), allocatable **sol_hs**
- real ∗8, dimension(:,:), allocatable **sol_bm**
- real ∗8, dimension(:,:), allocatable **sol_cac**
- real ∗8, dimension(:,:), allocatable **sol_cec**
- real ∗8, dimension(:,:), allocatable **sol_percc**
- real ∗8, dimension(:,:), allocatable **sol_latc**
- real ∗8, dimension(:), allocatable **sedc_d**
- real ∗8, dimension(:), allocatable **surfqc_d**
- real ∗8, dimension(:), allocatable **latc_d**
- real ∗8, dimension(:), allocatable **percc_d**
- real ∗8, dimension(:), allocatable **foc_d**
- real ∗8, dimension(:), allocatable **nppc_d**
- real ∗8, dimension(:), allocatable **rsdc_d**
- real ∗8, dimension(:), allocatable **grainc_d**
- real ∗8, dimension(:), allocatable **stoverc_d**
- real ∗8, dimension(:), allocatable **soc_d**
- real ∗8, dimension(:), allocatable **rspc_d**
- real ∗8, dimension(:), allocatable **emitc_d**
- real ∗8, dimension(:), allocatable **sub_sedc_d**
- real ∗8, dimension(:), allocatable **sub_surfqc_d**
- real ∗8, dimension(:), allocatable **sub_latc_d**
- real ∗8, dimension(:), allocatable **sub_percc_d**
- real ∗8, dimension(:), allocatable **sub_foc_d**
- real ∗8, dimension(:), allocatable **sub_nppc_d**
- real ∗8, dimension(:), allocatable **sub_rsdc_d**
- real ∗8, dimension(:), allocatable **sub_grainc_d**
- real ∗8, dimension(:), allocatable **sub_stoverc_d**
- real ∗8, dimension(:), allocatable **sub_emitc_d**
- real ∗8, dimension(:), allocatable **sub_soc_d**
- real ∗8, dimension(:), allocatable **sub_rspc_d**
- real ∗8, dimension(:), allocatable **sedc_m**
- real ∗8, dimension(:), allocatable **surfqc_m**
- real ∗8, dimension(:), allocatable **latc_m**
- real ∗8, dimension(:), allocatable **percc_m**
- real ∗8, dimension(:), allocatable **foc_m**
- real ∗8, dimension(:), allocatable **nppc_m**
- real ∗8, dimension(:), allocatable **rsdc_m**
- real ∗8, dimension(:), allocatable **grainc_m**
- real ∗8, dimension(:), allocatable **stoverc_m**
- real ∗8, dimension(:), allocatable **emitc_m**
- real ∗8, dimension(:), allocatable **soc_m**
- real ∗8, dimension(:), allocatable **rspc_m**
- real ∗8, dimension(:), allocatable **sedc_a**
- real ∗8, dimension(:), allocatable **surfqc_a**

- real ∗8, dimension(:), allocatable **latc_a**
- real ∗8, dimension(:), allocatable **percc_a**
- real ∗8, dimension(:), allocatable **foc_a**
- real ∗8, dimension(:), allocatable **nppc_a**
- real ∗8, dimension(:), allocatable **rsdc_a**
- real ∗8, dimension(:), allocatable **grainc_a**
- real ∗8, dimension(:), allocatable **stoverc_a**
- real ∗8, dimension(:), allocatable **emitc_a**
- real ∗8, dimension(:), allocatable **soc_a**
- real ∗8, dimension(:), allocatable **rspc_a**
- integer, dimension(:), allocatable **tillage_switch**
- real ∗8, dimension(:), allocatable **tillage_depth**
- integer, dimension(:), allocatable **tillage_days**
- real ∗8, dimension(:), allocatable **tillage_factor**
- real ∗8 dthy

  time interval for subdaily routing
- integer, dimension(4) **ihx**
- integer, dimension(:), allocatable **nhy**
- real ∗8, dimension(:), allocatable **rchx**
- real ∗8, dimension(:), allocatable **rcss**
- real ∗8, dimension(:), allocatable **qcap**
- real ∗8, dimension(:), allocatable **chxa**
- real ∗8, dimension(:), allocatable **chxp**
- real ∗8, dimension(:,:,:), allocatable **qhy**
- real ∗8 **ff1**
- real ∗8 **ff2**

5.1.1 Detailed Description

main module contatining the global variables

Author

modified by Javier Burguete Tolosa

5.1.2 Variable Documentation

5.1.2.1 igropt

`integer parm::igropt`

Qual2E option for calculating the local specific growth rate of algae
1: multiplicative.

$$u = mumax\ fll\ fnn\ fpp$$

2: limiting nutrient

$$u = mumax\ fll\ \min(fnn,\ fpp)$$

3: harmonic mean

$$u = mumax\ fll\ \frac{2}{\frac{1}{fnn} + \frac{1}{fpp}}$$

Chapter 6

Data Type Documentation

6.1 parm::ascrv Interface Reference

Public Member Functions

- subroutine **ascrv** (x1, x2, x3, x4, x5, x6)

The documentation for this interface was generated from the following file:

- modparm.f90

6.2 parm::atri Interface Reference

Public Member Functions

- real ∗8 function **atri** (at1, at2, at3, at4i)

The documentation for this interface was generated from the following file:

- modparm.f90

6.3 parm::aunif Interface Reference

Public Member Functions

- real ∗8 function **aunif** (x1)

The documentation for this interface was generated from the following file:

- modparm.f90

6.4 parm::dstn1 Interface Reference

Public Member Functions

- real ∗8 function **dstn1** (rn1, rn2)

The documentation for this interface was generated from the following file:

- modparm.f90

6.5 parm::ee Interface Reference

Public Member Functions

- real ∗8 function **ee** (tk)

The documentation for this interface was generated from the following file:

- modparm.f90

6.6 parm::expo Interface Reference

Public Member Functions

- real ∗8 function **expo** (xx)

The documentation for this interface was generated from the following file:

- modparm.f90

6.7 parm::fcgd Interface Reference

Public Member Functions

- real ∗8 function **fcgd** (xx)

The documentation for this interface was generated from the following file:

- modparm.f90

6.8 parm::HQDAV Interface Reference

Public Member Functions

- subroutine **hqdav** (A, CBW, QQ, SSS, ZCH, ZX, CHW, FPW, jrch)

The documentation for this interface was generated from the following file:

- modparm.f90

6.9 parm::layersplit Interface Reference

Public Member Functions

- subroutine **layersplit** (dep_new)

The documentation for this interface was generated from the following file:

- modparm.f90

6.10 parm::ndenit Interface Reference

Public Member Functions

- subroutine **ndenit** (k, j, cdg, wdn, void)

The documentation for this interface was generated from the following file:

- modparm.f90

6.11 parm::qman Interface Reference

Public Member Functions

- real ∗8 function **qman** (x1, x2, x3, x4)

The documentation for this interface was generated from the following file:

- modparm.f90

6.12 parm::regres Interface Reference

Public Member Functions

- real ∗8 function **regres** (k)

The documentation for this interface was generated from the following file:

- modparm.f90

6.13 parm::rsedaa Interface Reference

Public Member Functions

- subroutine **rsedaa** (years)

The documentation for this interface was generated from the following file:

- modparm.f90

6.14 parm::tair Interface Reference

Public Member Functions

- real ∗8 function **tair** (hr, jj)

The documentation for this interface was generated from the following file:

- modparm.f90

6.15 parm::theta Interface Reference

Public Member Functions

- real ∗8 function **theta** (r20, thk, tmp)

The documentation for this interface was generated from the following file:

- modparm.f90

6.16 parm::vbl Interface Reference

Public Member Functions

- subroutine **vbl** (evx, spx, pp, qin, ox, vx1, vy, yi, yo, ysx, vf, vyf, aha)

The documentation for this interface was generated from the following file:

- modparm.f90

Chapter 7

File Documentation

7.1 allocate_parms.f90 File Reference

this subroutine allocates array sizes

Functions/Subroutines

- subroutine **allocate_parms**

7.1.1 Detailed Description

this subroutine allocates array sizes

Author

modified by Javier Burguete

7.2 aunif.f90 File Reference

This function generates random numbers ranging from 0.0 to 1.0.

Functions/Subroutines

- real ∗8 function **aunif** (x1)

7.2.1 Detailed Description

This function generates random numbers ranging from 0.0 to 1.0.

Author

modified by Javier Burguete

Parameters

x1	random number generator seed (integer) where $0 < x1 < 2147483647$

Returns

random number ranging from 0.0 to 1.0

In the process of calculating the random number, the seed (x1) is set to a new value. This function implements the prime-modulus generator

$$xi = 16807\, xi \bmod \left(2^{31} - 1\right)$$

using code which ensures that no intermediate result uses more than 31 bits. The theory behind the code is summarized in [1]

7.3 caps.f90 File Reference

this subroutine reads the input and output names given in file.cio and converts all capital letters to lowercase letters.

Functions/Subroutines

- subroutine **caps** (file_name)

7.3.1 Detailed Description

this subroutine reads the input and output names given in file.cio and converts all capital letters to lowercase letters.

Author

modified by Javier Burguete

Parameters

file_name	dummy argument, file name character string

7.4 gcycl.f90 File Reference

This subroutine initializes the random number seeds. If the user desires a different set of random numbers for each simulation run, the random number generator is used to reset the values of the seeds.

Functions/Subroutines

- subroutine **gcycl**

7.4.1 Detailed Description

This subroutine initializes the random number seeds. If the user desires a different set of random numbers for each simulation run, the random number generator is used to reset the values of the seeds.

Author

modified by Javier Burguete

7.5 getallo.f90 File Reference

This subroutine calculates the number of HRUs, subbasins, etc. in the simulation. These values are used to allocate array sizes.

Functions/Subroutines

- subroutine **getallo**

7.5.1 Detailed Description

This subroutine calculates the number of HRUs, subbasins, etc. in the simulation. These values are used to allocate array sizes.

Author

modified by Javier Burguete

7.6 main.f90 File Reference

this is the main program that reads input, calls the main simulation model, and writes output.

Functions/Subroutines

- program main

  this is the main program that reads input, calls the main simulation model, and writes output.

7.6.1 Detailed Description

this is the main program that reads input, calls the main simulation model, and writes output.

7.6.2 Function/Subroutine Documentation

7.6.2.1 main()

```
program main ( )
```

this is the main program that reads input, calls the main simulation model, and writes output.

Author

modified by Javier Burguete Tolosa

7.7 readbsn.f90 File Reference

this subroutine reads data from the basin input file (.bsn). This file contains information related to processes modeled or defined at the watershed level

Functions/Subroutines

- subroutine **readbsn**

7.7.1 Detailed Description

this subroutine reads data from the basin input file (.bsn). This file contains information related to processes modeled or defined at the watershed level

Author

modified by Javier Burguete

7.8 readfile.f90 File Reference

this subroutine opens the main input and output files and reads watershed information from the file.cio

Functions/Subroutines

- subroutine **readfile**

7.8.1 Detailed Description

this subroutine opens the main input and output files and reads watershed information from the file.cio

Author

modified by Javier Burguete

7.9 readwwq.f90 File Reference

this subroutine reads the watershed stream water quality input data (.wwq file) and initializes the QUAL2E variables which apply to the entire watershed

Functions/Subroutines

- subroutine **readwwq**

7.9.1 Detailed Description

this subroutine reads the watershed stream water quality input data (.wwq file) and initializes the QUAL2E variables which apply to the entire watershed

Author

modified by Javier Burguete

7.10 simulate.f90 File Reference

this subroutine contains the loops governing the modeling of processes in the watershed

Functions/Subroutines

- subroutine **simulate**

7.10.1 Detailed Description

this subroutine contains the loops governing the modeling of processes in the watershed

Author

modified by Javier Burguete

Bibliography

[1] P Bratley, B L Fox, and L E Schrage. *A Guide to Simulation*. Springer-Verlag, New York, USA, 1983. 70

Index