

If pesticides were applied during the simulation, then a pesticide narrative will be displayed after the bacteria table. The pesticide narrative includes the amount of applied and decayed pesticide, the amount of dissolved and sorbed pesticide in surface runoff enter stream, the amount of pesticide leached out of soil profile, and the amount of pesticide in lateral flow entering stream. In addition, the final amounts of pesticide on the plants and in the ground will be displayed.

32.3 HRU OUTPUT FILE (OUTPUT.HRU)

The HRU output file contains summary information for each of the hydrologic response units in the watershed. The file is written in spreadsheet format.

Following is a brief description of the output variables in the HRU output file.

Variable name	Definition
LULC	Four letter character code for the cover/plant on the HRU. (code from crop.dat file)
HRU	Hydrologic response unit number
GIS	GIS code reprinted from watershed configuration file (.fig). See explanation of subbasin command (Chapter 2).
SUB	Topographically-defined subbasin to which the HRU belongs.
MGT	Management number. This is pulled from the management (.mgt) file. Used by the SWAT/GRASS interface to allow development of output maps by landuse/management type.

Variable name	Definition
MON	Daily time step: the julian date Monthly time step: the month (1-12) Annual time step: four-digit year Average annual summary lines: total number of years averaged together
AREA	Drainage area of the HRU (km ²).
PRECIP	Total amount of precipitation falling on the HRU during time step (mm H ₂ O).
SNOFALL	Amount of precipitation falling as snow, sleet or freezing rain during time step (water-equivalent mm H ₂ O).
SNOMELT	Amount of snow or ice melting during time step (water-equivalent mm H ₂ O).
IRR	Irrigation (mm H ₂ O). Amount of irrigation water applied to HRU during the time step.
PET	Potential evapotranspiration (mm H ₂ O). Potential evapotranspiration from the HRU during the time step.
ET	Actual evapotranspiration (soil evaporation and plant transpiration) from the HRU during the time step (mm H ₂ O).
SW_INIT	Soil water content (mm H ₂ O). For daily output, this column provides the amount of water in soil profile at beginning of day. For monthly and annual output, this is the average soil water content for the time period. The amount of water in the soil profile at the beginning of the day is used to calculate daily curve number values.
SW_END	Soil water content (mm H ₂ O). Amount of water in the soil profile at the end of the time period (day, month or year).
PERC	Water that percolates past the root zone during the time step (mm H ₂ O). There is usually a lag between the time the water leaves the bottom of the root zone and reaches the shallow aquifer. Over a long period of time, this variable should equal groundwater recharge (PERC = GW_RCHG as time → ∞).
GW_RCHG	Recharge entering aquifers during time step (total amount of water entering shallow and deep aquifers during time step) (mm H ₂ O).
DA_RCHG	Deep aquifer recharge (mm H ₂ O). The amount of water from the root zone that recharges the deep aquifer during the time step. (shallow aquifer recharge = GW_RCHG - DA_RCHG)
Variable name	Definition

REVAP	Water in the shallow aquifer returning to the root zone in response to a moisture deficit during the time step (mm H ₂ O). The variable also includes water uptake directly from the shallow aquifer by deep tree and shrub roots.
SA_IRR	Irrigation from shallow aquifer (mm H ₂ O). Amount of water removed from the shallow aquifer for irrigation during the time step.
DA_IRR	Irrigation from deep aquifer (mm H ₂ O). Amount of water removed from the deep aquifer for irrigation during the time step.
SA_ST	Shallow aquifer storage (mm H ₂ O). Amount of water in the shallow aquifer at the end of the time period.
DA_ST	Deep aquifer storage (mm H ₂ O). Amount of water in the deep aquifer at the end of the time period.
SURQ_GEN	Surface runoff generated in HRU during time step (mm H ₂ O).
SURQ_CNT	Surface runoff contribution to streamflow in the main channel during time step (mm H ₂ O).
TLOSS	Transmission losses (mm H ₂ O). Water lost from tributary channels in the HRU via transmission through the bed. This water becomes recharge for the shallow aquifer during the time step. Net surface runoff contribution to the main channel streamflow is calculated by subtracting TLOSS from SURQ.
LATQ_GEN	Lateral flow generated in HRU during timestep (mm H ₂ O). Water flowing laterally within the soil profile that enters the main channel during time step.
GW_Q	Groundwater contribution to streamflow (mm H ₂ O). Water from the shallow aquifer that enters the main channel during the time step. Groundwater flow is also referred to as baseflow.
WYLD	Water yield (mm H ₂ O). Total amount of water leaving the HRU and entering main channel during the time step. (WYLD = SURQ + LATQ + GWQ – TLOSS – pond abstractions)
DAILYCN	Average curve number for time period. The curve number adjusted for soil moisture content.
TMP_AV	Average daily air temperature (°C). Average of mean daily air temperature for time period.

Variable name	Definition
TMP_MX	Average maximum air temperature (°C). Average of maximum daily air temperatures for time period.
TMP_MN	Average minimum air temperature (°C). Average of minimum daily air temperatures for time period.
SOL_TMP	Soil temperature (°C). Average soil temperature of first soil layer for time period.
SOLAR	Average daily solar radiation (MJ/m ²). Average of daily solar radiation values for time period.
SYLD	Sediment yield (metric tons/ha). Sediment from the HRU that is transported into the main channel during the time step.
USLE	Soil loss during the time step calculated with the USLE equation (metric tons/ha). This value is reported for comparison purposes only.
N_APP	Nitrogen fertilizer applied (kg N/ha). Total amount of nitrogen (mineral and organic) applied in regular fertilizer operations during the time step.
P_APP	Phosphorus fertilizer applied (kg P/ha). Total amount of phosphorus (mineral and organic) applied in regular fertilizer operations during the time step.
NAUTO	Nitrogen fertilizer auto-applied (kg N/ha). Total amount of nitrogen (mineral and organic) auto-applied during the time step.
PAUTO	Phosphorus fertilizer auto-applied (kg P/ha). Total amount of phosphorus (mineral and organic) auto-applied during the time step.
NGRZ	Nitrogen applied during grazing operation (kg N/ha). Total amount of nitrogen (mineral and organic) added to soil by grazing operation during the time step.
PGRZ	Phosphorus applied during grazing operation (kg P/ha). Total amount of phosphorus (mineral and organic) added to soil by grazing operation during the time step.
CFERTN	Nitrogen applied during continuous fertilizer operation (kg N/ha). Total amount of nitrogen (mineral and organic) added to soil by continuous fertilizer operation during time step.
CFERTP	Phosphorus applied during continuous fertilizer operation (kg P/ha). Total amount of phosphorus (mineral and organic) added to soil by continuous fertilizer operation during time step.

Variable name	Definition
NRAIN	Nitrate added to soil profile by rain (kg N/ha).
NFIX	Nitrogen fixation (kg N/ha). Amount of nitrogen fixed by legumes during the time step.
F-MN	Fresh organic to mineral N (kg N/ha). Mineralization of nitrogen from the fresh residue pool to the nitrate (80%) pool and active organic nitrogen (20%) pool during the time step. A positive value denotes a net gain in the nitrate and active organic pools from the fresh organic pool while a negative value denotes a net gain in the fresh organic pool from the nitrate and active organic pools.
A-MN	Active organic to mineral N (kg N/ha). Movement of nitrogen from the active organic pool to the nitrate pool during the time step.
A-SN	Active organic to stable organic N (kg N/ha). Movement of nitrogen from the active organic pool to the stable organic pool during the time step.
F-MP	Fresh organic to mineral P (kg P/ha). Mineralization of phosphorus from the fresh residue pool to the labile (80%) pool (P in solution) and the active organic (20%) pool. A positive value denotes a net gain in solution and active organic pools from the fresh organic pool while a negative value denotes a net gain in the fresh organic pool from the labile and active organic pools.
AO-LP	Organic to labile mineral P (kg P/ha). Movement of phosphorus between the organic pool and the labile mineral pool during the time step. A positive value denotes a net gain in the labile pool from the organic pool while a negative value denotes a net gain in the organic pool from the labile pool.
L-AP	Labile to active mineral P (kg P/ha). Movement or transformation of phosphorus between the "labile" mineral pool (P in solution) and the "active" mineral pool (P sorbed to the surface of soil particles) during the time step. A positive value denotes a net gain in the active pool from the labile pool while a negative value denotes a net gain in the labile pool from the active pool.

Variable name	Definition
A-SP	Active to stable P (kg P/ha). Movement or transformation of phosphorus between the "active" mineral pool (P sorbed to the surface of soil particles) and the "stable" mineral pool (P fixed in soil) during the time step. A positive value denotes a net gain in the stable pool from the active pool while a negative value denotes a net gain in the active pool from the stable pool.
DNIT	Denitrification (kg N/ha). Transformation of nitrate to gaseous compounds during the time step.
NUP	Plant uptake of nitrogen (kg N/ha). Nitrogen removed from soil by plants during the time step.
PUP	Plant uptake of phosphorus (kg P/ha). Phosphorus removed from soil by plants during the time step.
ORGN	Organic N yield (kg N/ha). Organic nitrogen transported out of the HRU and into the reach during the time step.
ORGP	Organic P yield (kg P/ha). Organic phosphorus transported with sediment into the reach during the time step.
SEDP	Sediment P yield (kg P/ha). Mineral phosphorus sorbed to sediment transported into the reach during the time step.
NSURQ	NO ₃ in surface runoff (kg N/ha). Nitrate transported with surface runoff into the reach during the time step.
NLATQ	NO ₃ in lateral flow (kg N/ha). Nitrate transported by lateral flow into the reach during the time step.
NO3L	NO ₃ leached from the soil profile (kg N/ha). Nitrate that leaches past the bottom of the soil profile during the time step. <i>The nitrate is not tracked through the shallow aquifer.</i>
NO3GW	NO ₃ transported into main channel in the groundwater loading from the HRU (kg N/ha).
SOLP	Soluble P yield (kg P/ha). Soluble mineral forms of phosphorus transported by surface runoff into the reach during the time step.
P_GW	Soluble phosphorus transported by groundwater flow into main channel during the time step (kg P/ha).
W_STRS	Water stress days during the time step (days).
TMP_STRS	Temperature stress days during the time step (days).
N_STRS	Nitrogen stress days during the time step (days).

Variable name	Definition
P_STRS	Phosphorus stress days during the time step (days).
BIOM	Biomass. Total biomass, i.e. aboveground and roots at the end of the time period reported as dry weight. Daily biomass is reported in kg ha ⁻¹ , monthly in tons ha ⁻¹ and yearly in tons ha ⁻¹ .
LAI	Leaf area index at the end of the time period.
YLD	Harvested yield (metric tons/ha). The model partitions yield from the total biomass on a daily basis (and reports it). However, the actual yield is not known until it is harvested. The harvested yield is reported as dry weight.
BACTP	Number of persistent bacteria in surface runoff entering reach (# cfu/100 mL).
BACTLP	Number of less persistent bacteria in surface runoff entering reach (#cfu/100 mL).
WTAB	Water table from above the soil profile (mm). (Written only in daily output file. This is not used in the tile flow equations).
WTABELO	Water table depth from the bottom of the soil surface (mm). (Written only in daily output file. This is not used in the tile flow equations).
SNO_HRU	Current snow content in the hru (mm). (Not summed)
CMUP_KGH	Current soil carbon for first soil layer (kg/ha)
CMTOT_KGH	Current soil carbon integrated – aggregating all soil layers (kg/ha)
QTILE	Drainage tile flow in soil profile for the day (mm H ₂ O).
TNO3	NO ₃ in tile (kg N/ha)
LNO3	Amount of NO ₃ -N in lateral flow in HRU for the day (kg/N/ha).
GW_Q_D	Deep aquifer groundwater contribution to streamflow (mm H ₂ O). Water from the shallow aquifer that enters the main channel during the time step. Groundwater flow is also referred to as baseflow.
LATQ_CNT	Lateral flow contribution to streamflow in the main channel during time step (mm H ₂ O).

The file format for the HRU output file (output.hru) is:

Variable name	Line #	Position	Format	F90 Format
LULC	All	space 1-4	character	a4
HRU	All	space 5-8	4-digit integer	i4
GIS	All	space 10-17	8-digit integer	i8
SUB	All	space 19-22	4-digit integer	i4
MGT	All	space 24-27	4-digit integer	i4
MON	All	space 29-32	4-digit integer	i4
AREA	All	space 33-42	decimal(xxxxxx.xxx)	f10.3
PRECIP	All	space 43-52	decimal(xxxxxx.xxx)	f10.3
SNOFALL	All	space 53-62	decimal(xxxxxx.xxx)	f10.3
SNOMELT	All	space 63-72	decimal(xxxxxx.xxx)	f10.3
IRR	All	space 73-82	decimal(xxxxxx.xxx)	f10.3
PET	All	space 83-92	decimal(xxxxxx.xxx)	f10.3
ET	All	space 93-102	decimal(xxxxxx.xxx)	f10.3
SW_INIT	All	space 103-112	decimal(xxxxxx.xxx)	f10.3
SW_END	All	space 113-122	decimal(xxxxxx.xxx)	f10.3
PERC	All	space 123-132	decimal(xxxxxx.xxx)	f10.3
GW_RCHG	All	space 133-142	decimal(xxxxxx.xxx)	f10.3
DA_RCHG	All	space 143-152	decimal(xxxxxx.xxx)	f10.3
REVAP	All	space 153-162	decimal(xxxxxx.xxx)	f10.3
SA_IRR	All	space 163-172	decimal(xxxxxx.xxx)	f10.3
DA_IRR	All	space 173-182	decimal(xxxxxx.xxx)	f10.3
SA_ST	All	space 183-192	decimal(xxxxxx.xxx)	f10.3
DA_ST	All	space 193-202	decimal(xxxxxx.xxx)	f10.3
SURQ_GEN	All	space 203-212	decimal(xxxxxx.xxx)	f10.3
SURQ_CNT	All	space 213-222	decimal(xxxxxx.xxx)	f10.3
TLOSS	All	space 223-232	decimal(xxxxxx.xxx)	f10.3
LATQ	All	space 233-242	decimal(xxxxxx.xxx)	f10.3
GW_Q	All	space 243-252	decimal(xxxxxx.xxx)	f10.3
WYLD	All	space 253-262	decimal(xxxxxx.xxx)	f10.3
DAILYCN	All	space 263-272	decimal(xxxxxx.xxx)	f10.3
TMP_AV	All	space 273-282	decimal(xxxxxx.xxx)	f10.3
TMP_MX	All	space 283-292	decimal(xxxxxx.xxx)	f10.3
TMP_MN	All	space 293-302	decimal(xxxxxx.xxx)	f10.3
SOL_TMP	All	space 303-312	decimal(xxxxxx.xxx)	f10.3

Variable name	Line #	Position	Format	F90 Format
SOLAR	All	space 313-322	decimal(xxxxxxx.xxx)	f10.3
SYLD	All	space 323-332	decimal(xxxxxxx.xxx)	f10.3
USLE	All	space 333-342	decimal(xxxxxxx.xxx)	f10.3
N_APP	All	space 343-352	decimal(xxxxxxx.xxx)	f10.3
P_APP	All	space 353-362	decimal(xxxxxxx.xxx)	f10.3
NAUTO	All	space 363-372	decimal(xxxxxxx.xxx)	f10.3
PAUTO	All	space 373-382	decimal(xxxxxxx.xxx)	f10.3
NGRZ	All	space 383-392	decimal(xxxxxxx.xxx)	f10.3
PGRZ	All	space 393-402	decimal(xxxxxxx.xxx)	f10.3
CFERTN	All	space 403-412	decimal(xxxxxxx.xxx)	f10.3
CFERTP	All	space 413-422	decimal(xxxxxxx.xxx)	f10.3
NRAIN	All	space 423-432	decimal(xxxxxxx.xxx)	f10.3
NFIX	All	space 433-442	decimal(xxxxxxx.xxx)	f10.3
F-MN	All	space 443-452	decimal(xxxxxxx.xxx)	f10.3
A-MN	All	space 453-462	decimal(xxxxxxx.xxx)	f10.3
A-SN	All	space 463-472	decimal(xxxxxxx.xxx)	f10.3
F-MP	All	space 473-482	decimal(xxxxxxx.xxx)	f10.3
AO-LP	All	space 483-492	decimal(xxxxxxx.xxx)	f10.3
L-AP	All	space 493-502	decimal(xxxxxxx.xxx)	f10.3
A-SP	All	space 503-512	decimal(xxxxxxx.xxx)	f10.3
DNIT	All	space 513-522	decimal(xxxxxxx.xxx)	f10.3
NUP	All	space 523-532	decimal(xxxxxxx.xxx)	f10.3
PUP	All	space 533-542	decimal(xxxxxxx.xxx)	f10.3
ORGN	All	space 543-552	decimal(xxxxxxx.xxx)	f10.3
ORGP	All	space 553-562	decimal(xxxxxxx.xxx)	f10.3
SEDP	All	space 563-572	decimal(xxxxxxx.xxx)	f10.3
NSURQ	All	space 573-582	decimal(xxxxxxx.xxx)	f10.3
NLATQ	All	space 583-592	decimal(xxxxxxx.xxx)	f10.3
NO3L	All	space 593-602	decimal(xxxxxxx.xxx)	f10.3
NO3GW	All	space 603-612	decimal(xxxxxxx.xxx)	f10.3
SOLP	All	space 613-622	decimal(xxxxxxx.xxx)	f10.3
P_GW	All	space 623-632	decimal(xxxxxxx.xxx)	f10.3
W_STRS	All	space 633-642	decimal(xxxxxxx.xxx)	f10.3
TMP_STRS	All	space 643-652	decimal(xxxxxxx.xxx)	f10.3
N_STRS	All	space 653-662	decimal(xxxxxxx.xxx)	f10.3

Variable name	Line #	Position	Format	F90 Format
P_STRS	All	space 663-672	decimal(xxxxxxx.xxx)	f10.3
BIOM	All	space 673-682	decimal(xxxxxxx.xxx)	f10.3
LAI	All	space 683-692	decimal(xxxxxxx.xxx)	f10.3
YLD	All	space 693-702	decimal(xxxxxxx.xxx)	f10.3
BACTP	All	space 703-712	decimal(xxxxxxx.xxx)	f10.3
BACTLP	All	space 713-722	decimal(xxxxxxx.xxx)	f10.3
WTAB	All	space 723-732	decimal(xxxxxxx.xxx)	f10.3
WTABELO	All	space 733-742	decimal(xxxxxxx.xxx)	f10.3
SNO_HRU	All	space 743-752	decimal(xxxxxxx.xxx)	f10.3
CMUP_KGH	All	space 753-762	decimal(xxxxxxx.xxx)	f10.3
CMTOT_KGH	All	space 763-772	decimal(xxxxxxx.xxx)	f10.3
QTILE	All	space 773-782	decimal(xxxxxxx.xxx)	f10.3
TNO3	All	space 783-792	decimal(xxxxxxx.xxx)	f10.3
LNO3	All	space 793-802	decimal(xxxxxxx.xxx)	f10.3
GW_Q_D	All	space 803-812	decimal(xxxxxxx.xxx)	f10.3
LATQ_CNT	All	space 813-922	decimal(xxxxxxx.xxx)	f10.3