PRMS-IV, the Precipitation-Runoff Modeling System, Version 4

By Steven L. Markstrom, R. Steven Regan, Lauren E. Hay, Roland J. Viger, Richard M. T. Webb, Robert A. Payn, and Jacob H. LaFontaine

Updated tables from version 4.0.3 to version 5.2.1

January 15, 2022

Suggested citation:
Markstrom, S.L., Regan, R.S., Hay, L.E., Viger, R.J., Webb, R.M.T., Payn, R.A., and LaFontaine, J.H., 2015, PRMS-IV, the precipitation-runoff modeling system, version 4: U.S. Geological Survey Techniques and Methods, book 6, chap. B7, 158 p.

Table 2. Description of modules implemented in the Precipitation-Runoff Modeling System, version 5 (PRMS-V).

[HRU, Hydrologic Response Unit; CBH, climate by HRU; red highlight indicates new for PRMS-5.2; pink highlight indicates new for PRMS-5.1.0; green highlight indicates new for PRMS-5.0; ~~strikethrough~~ indicates items removed]

Module name	Description
	Basin definition process
basin	Defines shared watershed-wide and hydrologic response unit (HRU) physical parameters and variables.
	Cascading flow process
cascade	Determines computational order of the HRUs and groundwater reservoirs for routing flow downslope.
	Solar table process
soltab	Compute potential solar radiation and sunlight hours for each HRU for each day of year.
	Time series data process
obs	Reads and stores observed data from all specified measurement stations.
dynamic_param_read	Reads and makes available dynamic parameters by HRU from pre-processed files.
water_use_read	Reads and makes available water-use data (diversions and gains) from pre-processed files.
	Temperature distribution process
temp_1sta	Distributes maximum and minimum temperatures to each HRU by using temperature data measured at one station and specified monthly lapse rates. Note, each HRU uses data from a single station, but, multiple stations can be used in a model with each HRU assigned data from one of those stations.
temp_laps	Distributes maximum and minimum temperatures to each HRU by computing a daily lapse rate with temperature data measured at a base station and a lapse station with differing altitudes.
temp_dist2	Distributes maximum and minimum temperatures to each HRU by using a basin-wide lapse rate applied to the temperature data, adjusted for distance, measured at each station.
temp_map	Distributes maximum and minimum temperatures to each HRU by using time series temperature data using an area-weighted method and correction factors to each HRU.
temp_sta	Distributes maximum and minimum temperatures to each HRU by using temperature data measured at one station, similar to `temp_1sta` except there is no lapse rate.
climate_hru	Reads distributed minimum and maximum air temperature values for each HRU directly from pre-processed files.
	Precipitation distribution process
precip_1sta	Determines the form of precipitation and distributes it to each HRU by using monthly correction factors to account for differences in altitude, spatial variation, topography, and measurement gage efficiency and observed data from one station. Note, each HRU uses data from a single station, but, multiple stations can be used in a model with each HRU assigned data from one of those stations.
precip_laps	Determines the form of precipitation and distributes it to each HRU by using monthly lapse rates.
precip_dist2	Determines the form of precipitation and distributes it to each HRU by using an inverse distance weighting scheme.
precip_map	Distributes precipitation and determines form to each HRU by using time series precipitation data using an area-weighted method and correction factors to each HRU.
climate_hru	Reads distributed precipitation values for each HRU directly from pre-processed files.
	Combined climate distribution process
ide_dist	Determines the form of precipitation and distributes precipitation and temperatures to each HRU on the basis of measurements at stations with closest elevation or shortest distance to the respective HRU.

xyz_dist	Determines the form of precipitation and distributes precipitation and temperatures to each HRU by using a multiple linear regression of measured data from a group of measurement stations or from atmospheric model simulation.
climate_hru	Reads distributed minimum and maximum air temperature and precipitation values for each HRU directly from pre-processed files.
	Solar radiation distribution process
ddsolrad	Distributes solar radiation to each HRU and estimates missing solar radiation data using a maximum temperature per degree-day relation.
ccsolrad	Distributes solar radiation to each HRU and estimates missing solar radiation data using a relation between solar radiation and cloud cover.
climate_hru	Reads distributed solar radiation values for each HRU directly from pre-processed files.
	Transpiration period process
transp_frost	Determines whether the current time step is in a period of active transpiration by the killing frost method.
transp_tindex	Determines whether the current time step is in a period of active transpiration by the temperature index method.
climate_hru	Reads distributed transpiration values for each HRU directly from pre-processed files.
	Potential evapotranspiration process
potet_hamon	Computes the potential evapotranspiration by using the Hamon formulation (Hamon, 1961).
potet_jh	Computes the potential evapotranspiration by using the Jensen-Haise formulation (Jensen and Haise, 1963).
potet_hs	Computes the potential evapotranspiration by using the Hargreaves-Samani formulation (Hargreaves and Samani, 1982).
potet_pt	Computes the potential evapotranspiration by using the Priestley-Taylor formulation (Priestley and Taylor, 1972).
potet_pm	Computes the potential evapotranspiration by using the Penman-Monteith formulation (Penman, 1948; Monteith, 1965); requires windspeed and humidity specified in CBH Files.
potet_pm_sta	Computes the potential evapotranspiration by using the Penman-Monteith formulation (Penman, 1948; Monteith, 1965); requires windspeed and humidity specified in the Data File.
potet_pan	Computes the potential evapotranspiration for each HRU by using pan-evaporation data.
climate_hru	Reads distributed potential evapotranspiration values for each HRU directly from pre-processed files.
	Canopy Interception process
intcp	Computes volume of intercepted precipitation, evaporation from intercepted precipitation, and throughfall (net precipitation) that reaches the soil or snowpack.
	Snow process
snowcomp	Initiates development of a snowpack and simulates snow accumulation and depletion processes by using an energy-budget approach.
glacr_melt	Computes glacier dynamics using three linear reservoirs (snow, firn, ice) with time lapses and ability to advance or retreat according to volume-area scaling.
	Surface runoff process
srunoff_smidx	Computes surface runoff and infiltration for each HRU by using a nonlinear variable-source-area method allowing for cascading flow.
srunoff_carea	Computes surface runoff and infiltration for each HRU by using a linear variable-source-area method allowing for cascading flow.
	Soil-zone process
soilzone	Computes inflows to and outflows from the soil zone of each HRU and includes inflows from infiltration, groundwater, and upslope HRUs, and outflows to gravity drainage, interflow, and surface runoff to down-slope HRUs.
	Groundwater process

gwflow	Sums inflow to and outflow from PRMS groundwater reservoirs; outflow can be routed to downslope groundwater reservoirs and stream segments.
	Streamflow process
muskingum	Computes flow in the stream network using the Muskingum routing method (Linsley and others, 1982).
muskingum_lake	Computes flow in the stream network using the Muskingum routing method and flow and storage in on-channel lake using several methods.
muskingum_mann	Computes flow in the stream network using the Muskingum routing method with Manning's N equation.
routing	Computes common segment routing flows for modules `strmflow_in_out` and `Muskingum`.
stream_temp	Computes daily mean stream temperature for each stream segment in the stream network, module based on the Stream Network Temperature Model (SNTEMP, Theurer and others, 1984).
strmflow	Computes daily streamflow as the sum of surface runoff, shallow-subsurface flow (interflow), detention reservoir flow, and groundwater flow.
strmflow_in_out	Routes water between segments in the stream network by setting the outflow to the inflow.
~~strmflow_lake~~	~~Computes basin on-channel reservoir storage and outflows.~~
	Summary process
basin_sum	Computes daily, monthly, yearly, and total flow summaries of volumes and flows for all HRUs.
basin_summary	Write user-selected results for variables of dimension **one** to separate CSV Files at daily, monthly, mean monthly, mean yearly, and yearly total time steps when control parameter **basinOutON_OFF** is specified equal to 1.
convert_params	Writes values for new PRMS-V parameters to a file based on a PRMS-IV Parameter File when control parameter **model_mode** is specified equal to CONVERT. Writes values for old PRMS-IV parameters to a file based on a PRMS-V Parameter File when control parameter **model_mode** is specified equal to CONVERT4.
frost_date	Writes a parameter file of the last spring frost and first fall frost for each HRU based on the simulation time period and distributed temperature as required by the `transp_frost` module; land, subsurface, and stream processes are not computed.
map_results	Writes HRU summaries to a user specified target map at weekly, monthly, yearly, and total time steps.
nhru_summary	Writes user-selected results dimensioned by the value of dimension **nhru** to separate CSV Files at daily, monthly, mean monthly, mean yearly, and yearly total time steps when control parameter **nhruOutON_OFF** is specified equal to 1 or 2.
nsegment_summary	Writes user-selected results dimensioned by the value of dimension **nsegment** to separate CSV Files at daily, monthly, mean monthly, mean yearly, and yearly total time steps when control parameter **nsegmentOutON_OFF** is specified equal to 1 or 2.
nsub_summary	Writes user-selected results dimensioned by the value of dimension **nsub** to separate CSV Files at daily, monthly, mean monthly, mean yearly, and yearly total time steps when control parameter **nsubOutON_OFF** is specified equal to 1 or 2.
prms_summary	Writes selected basin area-weighted results to a Comma-Separated Values (CSV) File when control parameter **csvON_OFF** is specified equal to 1.
subbasin	Computes streamflow at internal basin nodes and variables by subbasin.
write_climate_hru	Writes climate-by-HRU Files of user-selected climate variables on the basis of distributed climate; land, subsurface, and stream processes are not computed.

Table 1-1. Dimensions used in the Precipitation-Runoff Modeling System, version 5 (PRMS-V).

[HRU, hydrologic response unit; GWR, groundwater reservoir; >, greater than; POI, points-of-interest; control parameters **temp_module**, **precip_module**, **solrad_module**, **et_module**, **strmflow_module**, **subbasin_flag**, **cascade_flag**, **cascadegw_flag**, and **mapOutON_OFF** defined in table 1-2; parameter **hru_solsta** defined in table 1-3; red highlight indicates new for PRMS-5.2; pink highlight indicates new for PRMS-5.1.0; green highlight indicates new for PRMS-5.0]

on[3]	Description	Default	Required/Condition
	Spatial dimensions		
	Number of GWRs	1	required
	Number of spatial units in the target map for mapped results	0	**mapOutON_OFF** = 1
	Number of hydrologic response units	1	required
	Number of unique intersections between HRUs and spatial units of a target map for mapped results	0	**mapOutON_OFF** = 1
	Number of lakes	0	required when any HRU has **hru_type** specifi
rus	Number of lake HRUs	0	required when any HRU has **hru_type** specifi
t	Number of stream-channel segments	0	**strmflow_module** = `muskingum_lake`, m `muskingum_mann`, or `strmflow_in_ou` **cascade_flag** = 1 or 2 or **cascadegw_flag** = 1
	Number of subsurface reservoirs	1	required
	Number of internal subbasins	0	**subbasin_flag** = 1
	Time-series input data dimensions[1]		
ned	Number of consumptive water-use destinations	0	optional
	Number of pan-evaporation data sets	0	**et_module** = `potet_pan`
l	Number of external water-use sources or destinations	0	optional
	Number of relative humidity measurement stations	0	optional
v	Maximum number of lake elevations for any rating table data set	0	**strmflow_module** = `muskingum_lake`
	Number of spatial units in mapped climate	0	**temp_module** = `temp_map` or **precip_modu** `precip_map`
ru	Number of intersections between HRUs and spatial units in mapped climate	0	**temp_module** = `temp_map` or **precip_modu** `precip_map`
	Number of streamflow-measurement stations	0	replacement flow when **strmflow_module** = `muskingum_lake`, `muskingum`, `muskin` or `strmflow_in_out`
es	Number of points-of-interest streamflow gages	0	optional
	Number of precipitation-measurement stations	0	**precip_module** = `precip_1sta`, `precip_` `precip_dist2`, `ide_dist`, or `xyz_dis`
	Number of rating-table data sets for lake elevations	0	**strmflow_module** = `muskingum_lake`
	Number of snow-depth measurement stations	0	optional
	Number of solar-radiation measurement stations	0	computation of solar radiation distribution usi **hru_solsta**
	Number of air-temperature-measurement stations	0	**temp_module** = `temp_1sta`, `temp_sta`, t `temp_dist2`, `ide_dist`, or `xyz_dist`
se	Number of unique sources and destinations	0	Input of water-use information
	Number of wind-speed measurement stations	0	optional
	Computation dimensions		
e	Number of HRU links for cascading flow	0	**cascade_flag** = 1 or 2
w	Number of GWR links for cascading flow	0	**cascadegw_flag** = 1 or 2
	Number of snow-depletion curves	1	required

on[3]	Description	Default	Required/Condition
	Number of values in all snow-depletion curves (set to **ndepl***11)	11	required
	Lake computation dimensions		
	Maximum number of storage/outflow table values for storage-detention reservoirs and lakes connected to the stream network using Puls routing	0	**strmflow_module** = `muskingum_lake`
	Maximum number of reservoir gate-opening values (columns) for lake rating table 1	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of reservoir gate-opening values (columns) for lake rating table 2	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of reservoir gate-opening values (columns) for lake rating table 3	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of reservoir gate-opening values (columns) for lake rating table 4	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of lake elevations values (rows) for lake rating table 1	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of lake elevations values (rows) for lake rating table 2	0	**strmflow_module** = `muskingum_lake` an 1
	Maximum number of lake elevations values (rows) for lake rating table 3	0	**strmflow_module** = `muskingum_lake` and
	Maximum number of lake elevations values (rows) for lake rating table 4	0	**strmflow_module** = `muskingum_lake` an 3
	Fixed dimensions		
	Number of glacier variables in integer array	4	**glacier_flag** = `1`
	Maximum number of days in a year	366	optional
	Number of reservoirs in a glacier	3	**glacier_flag** = `1`
	Number of lapse rates in X, Y, and Z directions	3	**precip_module** = `xyz_dist`
s	Number of months in a year	12	optional
	Dimension of scalar parameters and variables	1	optional
	Number of glacier variables in real array	7	**glacier_flag** = `1`

[1]All associated data specified in Data File can be used for calibration purposes. While the default value for these dimensions is 0, there must be at least one column of measured data in the Data File, which could be a column of zeros.

[2]Use of **nssr** and **ngw** not equal to **nhru** is deprecated.

[3]Dimensions that do not have an associated parameter specified in the Parameter File or variable specified in the Data File are optional.

Table 1-2. Parameters specified in the Control File for the Precipitation-Runoff Modeling System, version 4 (PRMS-IV).

[Data Type: 1=integer, 2=single precision floating point (real), 3=double precision floating point (double); 4=character string; HRU, hydrologic response unit; GWR, groundwater reservoir; CBH, climate-by-HRU; ET, evapotranspiration; PET, potential evapotranspiration; >, greater than; dimensions **ncascade**, **ncascdgw**, and **nsub** defined in table 1-1; the first two blocks of control parameters listed in the table are recommended for every simulation, though all parameters are optional depending appropriateness of the default values; red text indicates new for PRMS-5.2.1; red highlight indicates new for PRMS-5.2; pink highlight indicates new for PRMS 5.1.0; green highlight indicates new for PRMS-5.0; maximum value specified for integer parameters having a single value is 128]

r name	Description	Option	Number of Values	Data type	De
	Simulation execution and required input and output files				
[2]	Pathname(s) for measured input Data File(s), typically a single Data File is specified	measured input	number of Data Files	4	pr
	Simulation end date and time specified in order in the control item as: year, month, day, hour, minute, second	time period	6	1	2001,
ode	Flag to indicate the simulation mode (`PRMS`=version IV parameters; `PRMS5`=version V parameters; `FROST`=growing season for each HRU; `WRITE_CLIMATE`=write CBH files of minimum and maximum air temperature (variables *tminf* and *tmaxf*, in units: degrees Fahrenheit); precipitation (variable *hru_ppt*, in units: inches/day); solar radiation (variable *swrad*, in units: Langleys/day); potential ET (variable *potet*, in units: inches/day); and/or transpiration flag (variable *transp_on*, in units: none); `POTET`=simulate processes in computation sequence to potential ET; `TRANSPIRE`=simulate processes in computation sequence to determine transpiration period; `DOCUMENTATION`=write files of all declared parameters and variables in the executable)	simulation mode selection	1	4	
utput_file[2]	Pathname for Water-Budget File for results module `basin_sum`	simulation output	1	4	p
le[2]	Pathname(s) for Parameter File(s)	parameter input	number of Parameter Files	4	prm
rmup	Number of years to simulate before writing mapped results, Basin, **nhru**, **nsub**, or **nsegment** Summary Output Files	**map_resultsON_OFF** = `1`, **basinOutON_OFF** = `1`, **nsubOutON_OFF** = `1`, **nsegmentOutON_OFF** = `1` or `2`, or **nhruOutON_OFF** = `1` or `2`	1	1	
e	Simulation start date and time specified in order in the control item as: year, month, day, hour, minute, second	time period	6	1	2000,
	Module selection and simulation options				
flag	Flag to indicate if HRU cascades are computed (`0`=no; `1`=yes; 2=simple cascades defined by parameter **hru_segment**)	cascade flow with **ncascade** > `0`	1	1	
w_flag	Flag to indicate if GWR cascades are computed (`0`=no; `1`=yes; 2 = GWR cascades are set equal to the HRU cascades and parameters **gw_up_id**, **gw_strmseg_down_in**, **gw_down_id**, and **gw_pct_up** are not required)	cascade flow with **ncascdgw** > `0`	1	1	
g	Flag to indicate if depression-storage simulation is computed (`0`=no; `1`=yes)	surface-depression storage	1	1	
e	Module name for potential evapotranspiration method (`climate_hru`, `potet_jh`, `potet_hamon`, `potet_hs`,	module selection	1	4	p

er name	Description	Option	Number of Values	Data type	De
	potet_pt, potet_pm, potet_pm_sta, or potet_pan				
ag	Flag to indicate if continuous frozen ground index simulation is computed (0=no; 1=yes)	frozen ground	1	1	
ag	Flag to indicate if glacier simulation is computed (0=no; 1=yes)	glacier	1	1	
le_flag	Flag to indicate if GWR swales are allowed (0=no; 1=groundwater flow goes to groundwater sink; 2=groundwater flow goes to stream segment specified using parameter **hru_segment**	swales	1	1	
lag	Flag to indicate initial mass balance of glaciers (0=no optimization; 1=use first year of climate data; 2=constant mass balance gradient above and below equilibrium line altitude (ELA)	**glacier_flag** = 1	1	1	
odule	Module name for precipitation-distribution method (climate_hru, ide_dist, precip_1sta, precip_dist2, precip_laps, precip_map, or xyz_dist)	module selection	1	4	pre
urve_flag	Flag to specify snow depletion curve calculation method. (0=specify snow depletion curves with parameter **hru_deplcrv** and **snarea_curve**; 1=compute using parameters **snarea_a**, **snarea_b**, **snarea_c**, and **snarea_d**)	optional	1	1	
aet_flag	Flag to specify soil-water evapotranspiration (ET) compute method. Either it's based on unsatisfied potential ET (PET) (0=compute soil-water ET based on unsatisfied ET and old upper zone replenishment method; 1=based on PET and new replenishment method); set to 0 for downward compatibility of old models, though it is recommended setting to 1 for new models	optional	1	1	
odule	Module name for solar-radiation-distribution method (ccsolrad or ddsolrad)	module selection	1	4	d
nodule	Module name for surface-runoff/infiltration computation method (srunoff_carea or srunoff_smidx)	module selection	1	4	srun
emp_flag	Flag to specify whether to simulate stream temperature; **strmflow_module** must be set to muskingum, muskingum_mann, strmflow_in_out, or muskingum_lake	stream temperature	1	1	
emp_shade_flag	Flag to indicate how shade is used in the stream_temp module (0 = compute shade; 1 = specified constant)	stream temperature	1	1	
_module	Module name for streamflow routing simulation method (strmflow, muskingum, muskingum_mann, strmflow_in_out, or muskingum_lake)	module selection	1	4	s
o_humidity_flag	Flag to specify where humidity information is read from Data File for use by the stream_temp module (0=CBH File specified by control parameter **humidity_day**; 1=parameter **seg_humidity**; 2=Data File with values assigned based on parameter **seg_humidity_sta**), **strmflow_module** must be set to muskingum, muskingum_mann, strmflow_in_out, or muskingum_lake	stream temperature	1	1	
_flag	Flag to indicate if internal subbasins are computed (0=no; 1=yes)	**nsub** > 0	1	1	
dule	Module name for temperature-distribution method (climate_hru, temp_1sta, temp_sta, temp_dist2, temp_laps, temp_map, ide_dist, or xyz_dist)	module selection	1	4	te
odule	Module name for transpiration simulation method (climate_hru, transp_frost, or transp_tindex)	module selection	1	4	tran

er name	Description	Option	Number of Values	Data type	De
	Climate-by-HRU Files				
bh_flag	Flag to specify whether to input snowpack albedo in a CBH file (0=no; 1=yes)	input options	1	1	
ay[2]	Pathname of the CBH file of pre-processed snowpack albedo input data for each HRU to specify variable *albedo_hru* (units: decimal fraction)	input options	1	4	al
ry_flag	Flag to specify whether to input CBH files in a binary format using the same order of values as the text file version (0=no; 1=yes)	input options	1	1	
ver_cbh_flag	Flag to specify whether to input snowpack albedo in a CBH file (0=no; 1=yes)	input options	1	1	
ver_day[2]	Pathname of the CBH file of pre-processed snowpack albedo input data for each HRU to specify variable *albedo_hru* (units: decimal fraction)	input options	1	4	clou
_cbh_flag	Flag to specify whether to input humidity in a CBH file (0=no; 1=yes)	**et_module** = potet_pm or potet_pt, or **stream_temp_flag** = 1 and **strmtemp_humidity_flag** = 0	1	1	
_day[2]	Pathname of the CBH file of pre-processed humidity input data for each HRU to specify variable *humidity_hru* (units: percentage)	**et_module** = potet_pm	1	4	hum
g	Flag to specify whether the variable *orad* is specified as the last column of the **swrad_day** CBH file (0=no; 1=yes)	**solrad_module** = climate_hru	1	1	
y[2]	Pathname of the CBH file of pre-processed potential-ET input data for each HRU to specify variable *potet* (units: inches/day)	**et_module** = climate_hru	1	4	po
ay[2]	Pathname of the CBH file of pre-processed precipitation input data for each HRU to specify variable *precip* (units based on value specified for parameter **precip_units)**	**precip_module** = climate_hru	1	4	pr
udcover_flag	Flag to indicate if approximation of cloud cover for snowpack computations is computed using HRU dimensioned variables (0=no; 1=yes)	input options	1	1	
ay[2]	Pathname of the CBH file of pre-processed solar-radiation input data for each HRU to specify variable *swrad* (units: Langleys/day)	**solrad_module** = climate_hru	1	4	sw
y[2]	Pathname of the CBH file of pre-processed maximum air temperature input data for each HRU to specify variable *tmaxf* (units: degrees Fahrenheit)	**temp_module** = climate_hru	1	4	t
[2]	Pathname of the CBH file of pre-processed minimum air temperature input data for each HRU to specify variable *tminf* (units: degrees Fahrenheit)	**temp_module** = climate_hru	1	4	t
ay[2]	Pathname of the CBH file of pre-processed transpiration on or off flag for each HRU file to specify variable *transp_on* (units: none)	**transp_module** = climate_hru	1	4	tr
d_cbh_flag	Flag to specify whether to input windspeed in a CBH file (0=no; 1=yes)	**et_module** = potet_pm	1	1	
d_day[2]	Pathname of the CBH file of pre-processed wind speed input data for each HRU to specify variable *windspeed_hru* (units: meters/second)	**et_module** = potet_pm	1	4	winc
	Dynamic Parameter Input				
um_dynamic	Pathname of the time series of pre-processed values for summer plant-cover density used to set values of **covden_sum** for each HRU	**dyn_covden_flag** = 1 or 3	1	4	dy

r name	Description	Option	Number of Values	Data type	De
in_dynamic	Pathname of the time series of pre-processed values for winter plant-cover density used to set values of **covden_win** for each HRU	**dyn_covden_flag** = 2 or 3	1	4	dy
dynamic	Pathname of the time series of pre-processed values used to set values of **cov_type** for each HRU	**dyn_covtype_flag** = 1	1	4	dy
pth_dynamic	Pathname of the time series of pre-processed values used to set values of **dprst_depth_avg**	**dyn_dprst_flag** = 2 or 3	1	4	dynd
c_dynamic	Pathname of the time series of pre-processed values used to set values of **dprst_frac**	**dyn_dprst_flag** = 1 or 3	1	4	dync
len_flag	Flag to indicate if a time series of plant-canopy density values are input in a Dynamic Parameter File(s) (0=no; 1=file **covden_sum_dynamic**; 2=file **covden_win_dynamic**; 3=both)	dynamic canopy cover density	1	1	
ype_flag	Flag to indicate if a time series of plant-canopy type values are input in Dynamic Parameter File **covtype_dynamic** (0=no; 1=yes)	dynamic canopy cover type	1	1	
t_flag	Flag to indicate if a time series of surface-depression values are input in a Dynamic Parameter File(s) (0=no; 1=file **dprst_frac_dynamic**; 2=file **dprst_depth_dynamic**; 3=both)	dynamic surface depression	1	1	
rost_flag	Flag to indicate if a time series of transpiration-start Julian day values are input in a Dynamic Parameter File(s) (0=no; 1 =file **fallfrost_dynamic**)	dynamic transpiration and transp_module = transp_frost	1	1	
erv_flag	Flag to indicate if a time series of impervious values are input in a Dynamic Parameter File(s) (0=no; 1=file **imperv_frac_dynamic**; 2=file **imperv_stor_dynamic**; 3=both)	dynamic impervious	1	1	
_flag	Flag to indicate if a time series of plant canopy interception values are input in a Dynamic Parameter File(s) (0=no; 1=file **wrain_intcp_dynamic**; 2=file **srain_intcp_dynamic**; 4=file **snow_intcp_dynamic**; additive combinations, such as 3=file wrain_intcp_dynamic and srain_intcp_dynamic, but not snow_intcp_dynamic)	dynamic interception	1	1	
t_flag	Flag to indicate if a time series of potential ET coefficient values are input in Dynamic Parameter File **potet_coef_dynamic** to update coefficients for the specified month for the selected potential ET module specified by control parameter **et_module** (0=no; 1=parameter **jh_coef**, **pt_alpha**, **hs_krs**, **hamon_coef**, **epan_coef**, **potet_cbh_adj**, and **pm_n_coef** used in potet_jh, potet_pt, potet_hs, potet_hamon, potet_pan, climate_hru, potet_pm, and potet_pm_sta modules, respectively; 2=parameter **jh_coef_hru, pm_d_coef** used in potet_jh , potet_pm, and potet_pm_sta modules, respectively)	dynamic potential ET	1	1	
rncf_flag	Flag to indicate if a time series of solar radiation values are input in Dynamic Parameter File **radtrncf_dynamic** (0=no; 1=yes)	dynamic solar radiation transmission	1	1	
flag	Flag to indicate if a time series of soil-water capacity values are input in a Dynamic Parameter File(s) (0=no; 1=file **soilmoist_dynamic** only, 2=file **soilrechr_dynamic** only; 3=both)	dynamic soil moisture	1	1	
ngfrost_flag	Flag to indicate if a time series of transpiration-start Julian day values are input in a Dynamic Parameter File(s) (0=no; 1=file **springfrost_dynamic**)	dynamic transpiration and transp_module = transp_frost	1	1	
dprst_perv_flag	Flag to indicate if a time series of fraction of surface runoff from the pervious portion of an HRU are input in Dynamic Parameter File **sro2dprst_perv_dyn** (0=no; 1=yes)	dynamic surface depression	1	1	
dprst_imperv_flag	Flag to indicate if a time series of fraction of surface runoff from	dynamic surface depression	1	1	

er name	Description	Option	Number of Values	Data type	De
	the impervious portion of an HRU are input in Dynamic Parameter File **sro2dprst_imperv_dynamic** (0=no; 1=yes)				
sp_flag	Flag to indicate if a time series of transpiration month values are input in a Dynamic Parameter File(s) (0=no; 1=file **transpbeg_dynamic**; 2=file **transpend_dynamic** only, 3=both)	dynamic transpiration and transp_module = `transp_tindex`	1	1	
_param_log_file	Pathname of the log file that summarizes dynamic parameter changes	for all dynamic parameter input	1	4	dyna t
dynamic	Pathname of the time series of pre-processed values for dynamic parameter **fall_frost**	**dyn_fallfrost_flag** = 1 and transp_module = `transp_frost`	1	4	dyn
rac_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **hru_percent_imperv**	**dyn_imperv_flag** = 1 or 3	1	4	dy
tor_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **imperv_stor_max**	**dyn_imperv_flag** = 2 or 3	1	4	dy
f_dynamic	Pathname of the time series of pre-processed potential evapotranspiration coefficient values where the parameter is dependent on the value of **et_module**	**dyn_potet_flag** = 1 or 2	1	4	dyn
_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **rad_trncf**	**dyn_radtrncf_flag** = 1	1	4	dyr
cp_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **snow_intcp**	**dyn_intcp_flag** = 4, 5, 6, or 7	1	4	dyn
_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **soil_moist_max**	**dyn_soil_flag** = 1 or 3	1	4	dyn
_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **soil_rechr_max_frac**	**dyn_soil_flag** = 2 or 3	1	4	dyn
st_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **spring_frost**	**dyn_springfrost_flag** = 1 and transp_module = `transp_frost`	1	4	dyns
cp_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **srain_intcp**	**dyn_intcp_flag** = 2, 3, 6, or 7	1	4	dyns
_perv_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **sro_to_dprst_perv**	**dyn_sro2dprst_perv_flag** = 1	1	4	dyns
_imperv_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **sro_to_dprst_imperv**	**dyn_sro2dprst_imperv_flag** = 1	1	4	dyns
g_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **transp_beg**	**dyn_transp_flag** = 1 or 3 and transp_module = `transp_tindex`	1	4	dyn
d_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **transp_end**	**dyn_transp_flag** = 2 or 3 and transp_module = `transp_tindex`	1	4	dyn
tcp_dynamic	Pathname of the time series of pre-processed values for dynamic parameter **wrain_intcp**	**dyn_intcp_flag** = 1, 3, 5, or 7	1	4	dynw
		Water Use Input			
nsfer_file	Pathname of the time series of pre-processed flow rates for transfers from surface-depression storage	**dprst_transferON_OFF** = 1 and **dprst_flag** = 1	1	4	dprs
nsferON_OFF	Flag to indicate to use time series of surface-depression transfer flow rates from the **dprst_transfer_file** (0=no; 1=yes)	surface depression transfer and **dprst_flag** = 1	1	1	
transfer_file	Pathname of the time series of pre-processed flow rates for transfers from external sources	**external_transferON_OFF** = 1	1	4	ext

r name	Description	Option	Number of Values	Data type	De
transferON_OFF	Flag to indicate to use external transfer flow rates from the **external_transfer_file** (0=no; 1=yes)	external transfer	1	1	
sfer_file	Pathname of the time series of pre-processed flow rates for transfers from groundwater reservoir storage	**gwr_transferON_OFF** = 1	1	4	gwr
sferON_OFF	Flag to indicate to use groundwater transfer flow rates from the **gwr_transfer_file** (0=no; 1=yes)	groundwater transfer	1	1	
sfer_file	Pathname of the time series of pre-processed flow rates for transfers from lake HRUs	**lake_transferON_OFF** = 1	1	4	lake
sferON_OFF	Flag to indicate to use lake HRU transfer flow rates from the **lake_transfer_file** (0=no; 1=yes)	lake water transfer	1	1	
transfer_file	Pathname of the time series of pre-processed flow rates for transfers from stream segments	**segment_transferON_OFF** = 1	1	4	seg
transferON_OFF	Flag to indicate to use stream segment transfer flow rates from the **segment_transfer_file** (0=no; 1=yes)	stream water transfer	1	1	
	Debug options				
k_flag	Flag to indicate if CBH values are validated each time step (0=no; 1=yes)	CBH input	1	1	
r_check_flag	Flag to indicate if selected parameter values validation checks are treated as warnings or errors (0=warnings; 1=errors; 2=check parameters and then stop)	parameter validation check	1	1	
ug[1]	Flag to indicate type of debug output (-2=minimal output to screen and no **model_output_file**; -1 =minimize screen output; 0=none; 1=water balances; 2=basin module; 4=basin_sum module; 5=soltab module; 7=soilzone module; 9=snowcomp module; 13=cascade module; 14=subbasin module)	debug output	1	1	
	Statistic Variables (statvar) Files				
s	Number of variables to include in Statistics Variables File and names specified in **statVar_names**	**statsON_OFF** = 1	1	1	
file[2]	Pathname for Statistics Variables File	**statsON_OFF** = 1	1	4	sta
OFF	Switch to specify whether the Statistics Variables File is generated (0=no; 1=statvar text format; 2=CSV format)	**statsON_OFF** = 1	1	1	
element	List of identification numbers corresponding to variables specified in **statVar_names** list (1 to variable's dimension size)	**statsON_OFF** = 1	**nstatVars**	4	
names	List of variable names for which output is written to Statistics Variables File	**statsON_OFF** = 1	**nstatVars**	4	
	Initial Condition Files				
_from_file	Flag to specify whether or not the Initial Conditions File is specified as an input file (0=no; 1=yes; 2=yes and use parameters **dprst_frac_init**, **snowpack_init**, **segment_flow_init**, **elevlake_init**, **gwstor_init**, (**soil_rechr_init**, **soil_moist_init**, **ssstor_init** for **model_mode**=PRMS) or (**soil_rechr_init_frac**, **soil_moist_init_frac**, **ssstor_init_frac** for **model_mode**=PRMS5), and **stream_tave_init**; 3=yes and use parameter **snowpack_init**; 4=yes and use parameter **elevlake_init**; 5=yes and use parameters (**soil_rechr_init**, **soil_moist_init**, **ssstor_init** for **model_mode**=PRMS) or (**soil_rechr_init_frac**, **soil_moist_init_frac**, **ssstor_init_frac** for **model_mode**=PRMS5); 6=yes and use parameter **gwstor_init**; 7=yes and use parameter	initial conditions	1	1	

er name	Description	Option	Number of Values	Data type	De
	dprst_frac_init; 8=yes and use parameter **stream_tave_init**)				
s_to_file	Flag to determine if an Initial Conditions File will be generated at the end of simulation (0=no; 1=yes)	initial conditions	1	1	
file[2]	Pathname for Initial Conditions input file	**init_vars_from_file** = 1	1	4	pr
_file[2]	Pathname for the Initial Conditions File to be generated at end of simulation	**save_vars_to_file** = 1	1	4	prm
	Animation Files				
ut_file[2]	Pathname for Animation Files(s) to which a filename suffix based on dimension name associated with selected variables is appended	**aniOutON_OFF** = 1	1	4	anim
N_OFF	Switch to specify whether Animation File(s) are generated (0=no; 1=yes)	animation output	1	1	
ar_names	List of variable names for which all values of the variable (that is, the entire dimension size) for each time step are written Animation Dimension Files(s)	**aniOutON_OFF** = 1	**naniOutVars**	4	
/ars	Number of output variables specified in the **aniOutVar_names** list	**aniOutON_OFF** = 1	1	1	
	Basin Summary Results Files				
BaseFileName[2]	String to define the prefix for each basin summary output file.	**basinOutON_OFF** = 1	1	4	basi
ON_OFF	Switch to specify whether basin summary output files are generated (0=no; 1=yes)	**basin** summary results	1	1	
Var_names	List of variable names for which output is written to basin summary Comma Separated Values (CSV) output file(s). Each variable is written to files in the order specified in **basinOutVars** with the prefix of each file equal to the value of **basinOutBaseFileName**. The suffix of the files is based on the value of **basinOut_freq** and will be .csv; _meanyearly.csv; _yearly.csv; _meanmonthly.csv; or _monthly.csv; variables must be of type real or double	**basinOutON_OFF** = 1	**basinOutVars**	4	
Vars	Number of variables to include in basin summary output file(s)	**basinOutON_OFF** = 1	1	1	
_freq	Output frequency and type (1=daily; 2=monthly; 3=both; 4=mean monthly; 5=mean yearly; 6=yearly)	**basinOutON_OFF** = 1	1	1	
	Mapped Results Files				
ON_OFF	Switch to specify whether mapped output file(s) by a specified number of columns (parameter **ncol**) of daily, monthly, yearly, or total simulation results is generated (0=no; 1=yes)	mapped results	1	1	
/ar_names	List of variable names for which output is written to mapped output files(s); variables must be of type real or double.	**map_resultsON_OFF** = 1	**nmapOutVars**	4	
tVars	Number of variables to include in mapped output file(s)	**map_resultsON_OFF** = 1	1	1	
	Nhru Summary Results Files				
_format	Format of values (1=scientific notation with 4 significant digits (default); 2=2 decimal places; 3=3 decimal places; 4=4 decimal places; 5=5 decimal places)	**nhruOutON_OFF** = 1 or 2	1	1	
_freq	Output frequency and type (1=daily; 2=monthly; 3=both; 4=mean monthly; 5=mean yearly; 6=yearly)	**nhruOutON_OFF** = 1 or 2	1	1	
BaseFileName[2]	String to define the prefix for each **nhru** summary output file.	**nhruOutON_OFF** = 1 or 2	1	4	nhr
Ncol	Number of columns written per line, which can be used to generate gridded output (0=all values for each timestep are written on a single line as in previous versions; >0 number of columns)	**nhruOutON_OFF** = 1 or 2	1	1	
ON_OFF	Switch to specify whether **nhru** summary output files are generated (0=no; 1=yes; 2=yes and use values of **nhm_id** as column heading)	**nhru** summary results	1	1	
Var_names	List of variable names for which output is written to **nhru** summary	**nhruOutON_OFF** = 1 or 2	**nhruOutVars**	4	

r name	Description	Option	Number of Values	Data type	De
	Comma Separated Values (CSV) output files(s). Each variable is written to a separate file with the prefix of each file equal to the value of **nhruOutBaseFileName**; variables must be of type real or double. Each variable is written to a separate file with the prefix of each file equal to the value of **nhruOutBaseFileName**. The suffix of the files is based on the value of **nhruOut_freq** and will be .csv; _meanyearly.csv; _yearly.csv; _meanmonthly.csv; or _monthly.csv				
Vars	Number of variables to include in **nhru_summary** output file(s)	**nhruOutON_OFF** = 1 or 2	1	1	
lectDatesON_OFF	Switch to indicate if **nhru_summary** output files are generated for a specified set of dates (0=no, output time series on basis of **nhruOut_freq**; 1=yes, specify dates in file specified by **selectDatesFileName**)	**nhru** summary results and **nhruOut_freq** = 1 or 3	1	1	
esFileName[2]	String to define the filename of the set of dates to output values of **nhru_summary** output files in chronological order with dates specified as YEAR MONTH DAY with a space(s) and/or comma separating YEAR and MONTH and MONTH and DAY (e.g. 1959 09 01)	**outputSelectDatesON_OFF** = 1	1	4	sele
	Nsub Summary Results Files				
BaseFileName[2]	String to define the prefix for each **nsub** summary output file.	**nsubOutON_OFF** = 1	1	4	nsu
ON_OFF	Switch to specify whether **nsub** summary output files are generated (0=no; 1=yes)	**nsub** summary results	1	1	
Var_names	List of variable names for which output is written to **nsub** summary Comma Separated Values (CSV) output files(s). Each variable is written to a separate file with the prefix of each file equal to the value of **nsubOutBaseFileName**; variables must be of type real or double. The suffix of the files is based on the value of **nsubOut_freq** and will be .csv; _meanyearly.csv; _yearly.csv; _meanmonthly.csv; or _monthly.csv.	**nsubOutON_OFF** = 1	**nsubOutVars**	4	
Vars	Number of variables to include in **nsub** summary output file(s)	**nsubOutON_OFF** = 1	1	1	
_format	Format of values (1=scientific notation with 4 significant digits (default); 2=2 decimal places; 3=3 decimal places; 4=4 decimal places; 5=5 decimal places)	**nsubOutON_OFF** = 1	1	1	
_freq	Output frequency and type (1=daily; 2=monthly; 3=both; 4=mean monthly; 5=mean yearly; 6=yearly)	**nsubOutON_OFF** = 1	1	1	
	Nsegment Summary Results Files				
OutBaseFileName	String to define the prefix for each **nsegment** summary output file.	**nsegmentOutON_OFF** = 1 or 2	1	4	nseg
OutON_OFF	Switch to specify whether **nsegment** summary output files are generated (0=no; 1=yes; 2=yes and use values of **nhm_seg** as column heading)	**nsegment** summary results	1	1	
OutVar_names	List of variable names for which output is written to **nsegment** summary Comma Separated Values (CSV) output files(s). Each variable is written to a separate file with the prefix of each file equal to the value of **nsegmentOutBaseFileName**; variables must be of type real or double; the suffix of the files is based on the value of **nsegmentOut_freq** and will be .csv; _meanyearly.csv; _yearly.csv; _meanmonthly.csv; or _monthly.csv	**nsegmentOutON_OFF** = 1 or 2	**nsubOutVars**	4	
OutVars	Number of variables to include in **nsegment** summary output file(s)	**nsegmentOutON_OFF** = 1 or 2	1	1	
Out_format	Format of values (1=scientific notation with 4 significant digits	**nsegmentOutON_OFF** = 1	1	1	

er name	Description	Option	Number of Values	Data type	De
	(default); 2=2 decimal places; 3=3 decimal places; 4=4 decimal places; 5=5 decimal places)	or 2			
Out_freq	Output frequency and type (1=daily; 2=monthly; 3=both; 4=mean monthly; 5=mean yearly; 6=yearly)	**nsegmentOutON_OFF** = 1 or 2	1	1	
	PRMS Summary Results Files				
FF	Switch to specify whether or not the PRMS Comma-Separated-Values (CSV) output file is generated (0=no; 1=yes; 2=only output pairs of simulated and measured flows)	PRMS summary results	1	1	
ut_file[2]	Pathname of CSV output file	**csvON_OFF** = 1	1	4	prms
	Runtime graphs				
hsBuffSize	Number of time steps to wait before updating the runtime graph	**ndispGraphs** > 0	1	1	
element	List of identification numbers corresponding to variables specified in **dispVar_names** list (1 to variable's dimension size)	**ndispGraphs** > 0	number of variables	4	
names	List of variable names for which plots are output to the runtime graph	**ndispGraphs** > 0	number of variables	4	
plot	List of variable names for which plots are output to the runtime graph	**ndispGraphs** > 0	number of variables	4	
le_desc	Descriptive text to identify the PRMS executable	**ndispGraphs** > 0	1	4	ex
le_model[2]	Pathname (full or relative) of the PRMS executable	**ndispGraphs** > 0	1	4	
ltat	Initial time step for the simulation	**ndispGraphs** > 0	1	2	
phs	Number of plots included in the runtime graph	graphical output	1	1	

[1]File and screen output options: 1=water balance output files written in current directory, for intcp module file intcp.wbal; for snowcomp module snowcomp.wbal; for srunoff module srunoff_smidx.wbal or srunoff_carea.wbal; for soilzone module soilzone.wbal; for gwflow module gwflow.wbal; 2=basin module output written to screen; 4=basin_sum debug information written to file basin_sum.dbg in current directory; 5=soltab module output written to the file soltab_debug in current directory; 7=soilzone debug information concerning input parameter consistency written to file soilzone.dbg in current directory; 9=arrays of *net_rain*, *net_snow*, and *snowmelt* written to screen; 13=subbasin error and warning messages and cascade paths are written to the file cascade.msgs in current directory; 14=subbasin computation order written to file tree_structure in current directory.

[2]Pathnames for all files can have a maximum of 256 characters.

Table 1-3. Parameters listed by usage with the associated modules in which they are used for the Precipitation-Runoff Modeling System, version 4 (PRMS-IV).

[HRU, hydrologic response unit; GWR, groundwater reservoir; cfs, cubic feet per second; cms, cubic meters per second; ET, evapotranspiration; Id, number of modeling unit; dday, degree-day, the amount a day's average temperature departed from 65 degrees Fahrenheit; km, kilometer; m, meters; POI, point-of-interest; ELA, equilibrium line altitude, >, greater than; dimensions defined in table 1-1; control parameters **temp_module**, **precip_module**, **solrad_module**, **et_module**, **transp_module**, **srunoff_module**, **strmflow_module**, **model_mode**, **dprst_flag**, **subbasin_flag**, **cascade_flag**, **cascadegw_flag**, and **mapOutON_OFF** defined in table 1-2; red highlight indicates new for PRMS-5.2; pink highlight indicates new for PRMS-5.1; green highlight indicates new for PRMS-5.0; turquoise highlight indicates deprecated but retained for PRMS-IV backward compatibility; ~~strikethrough~~ indicates items removed]

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	Basic physical attributes						
ts	Flag to indicate the units of elevation values (0=feet; 1=meters)	**one**	integer	none	0 or 1	0	n
a	Area of each HRU	**nhru**	real	acres	0.0001 to 1.0E9	1.0	n
ect	Aspect of each HRU	**nhru**	real	angular degrees	0.0 to 360.0	0.0	n
	Mean elevation for each HRU	**nhru**	real	**elev_units**	-1,000.0 to 30,000.0	0.0	n
	Latitude of each HRU	**nhru**	real	degrees North	-90.0 to 90.0	40.0	n
	Longitude of each HRU	**nhru**	real	degrees East	-360.0 to 360.0	-105.0	c
e	Slope of each HRU	**nhru**	real	decimal fraction	0.0 to 10.0	0.0	n
e[5]	Type of each HRU (0=inactive; 1=land; 2=lake; 3=swale; 4=glacier)	**nhru**	integer	none	0 to 4	1	n
	National Hydrologic Model HRU ID	**nhru**	integer	none	1 to 9999999	1	c
	National Hydrologic Model segment ID	**nsegment**	integer	none	1 to 9999999	1	c
w	Index in parent model for each GWR	**ngw**	integer	none	1 to 9999999	1	c
ru	Index in parent model for each HRU	**nhru**	integer	none	1 to 9999999	1	c
oigages	Index in parent model for each POI gage	**npoigages**	integer	none	1 to 9999999	1	c
egment	Index in parent model for each segment	**nsegment**	integer	none	1 to 9999999	1	c
sr	Index in parent model for each SSR	**nssr**	integer	none	1 to 9999999	1	c
	Measured input						
a	Index of measured streamflow station corresponding to the basin outlet	**one**	integer	none	0 to **nobs**	0	**n**
nits	Flag to indicate the units of measured precipitation values (0=inches; 1=mm)	**one**	integer	none	0 or 1	0	n
v	Conversion factor to Langleys for measured solar radiation	**one**	real	Langleys/ radiation units	0.1 to 100.0	1.0	**n**
le	Monthly (January to December) flag indicating rule for precipitation measurement station use (1=only	**nmonths**	integer	none	1 to 5	2	**preci** xy

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	precipitation if the regression stations have precipitation; 2=only precipitation if any station in the basin has precipitation; 3=precipitation if module `xyz_dist` computes any; 4=only precipitation if *rain_day* variable is set to 1; 5=only precipitation if **psta_freq_nuse** stations have precipitation)						
nits	Measured streamflow units (0=cfs; 1=cms)	**one**	integer	none	0 or 1	0	**n**
its	Flag to indicate the units of measured air-temperature values (0=Fahrenheit; 1=Celsius)	**one**	integer	none	0 or 1	0	r
		Water Use input					
	Application method of irrigation water for each HRU (0 = sprinkler method with interception only; 1=ditch/drip method with no interception; 2=ignore; 3=sprinkler across whole HRU with interception and throughfall; 4=sprinkler method with amount of water applied on the basis of cover density, such as a living filter), for options 1, 2, and 3 irrigation water is specified as an' HRU-area weighted average value	**nhru**	integer	none	0 to 4	0	**nwater** least c destinat canopy
		Air temperature and precipitation distribution					
rain	Monthly (January to December) factor to adjust rain proportion in a mixed rain/snow event	**nhru, nmonths**	real	decimal fraction	0.0 to 3.0	1.0	r
ain	Monthly (January to December) rain downscaling adjustment factor for each precipitation measurement station	**nrain, nmonths**	real	decimal fraction	-0.5 to 3.0	-0.4	**preci** `ide` `xy`
now	Monthly (January to December) snow downscaling adjustment factor for each precipitation measurement station	**nrain, nmonths**	real	decimal fraction	-0.5 to 3.0	-0.4	**preci** `ide` `xy`
a	Index of temperature station used to compute basin temperature values	**one**	integer	none	0 to **ntemp**	0	**temp** `ter` `te` `temp` `ter`
g	Elevation conversion flag (0=none; 1=feet to meters; 2=meters to feet)	**one**	integer	none	0 to 2	0	**precip** **temp** `xy`
	Exponent for inverse distance calculations	**one**	real	none	0.0 to 10.0	2.0	**precip** **temp** `id`
k	Maximum distance from an HRU to a measurement station for use in calculations	**one**	real	feet	0.0 to 1.0E9	1.0E9	**preci** `prec` and/or = `te`
_id	HRU identification number for each HRU to mapped spatial units' intersection	**nmap2hru**	integer	none	0 to **nmap**	0	**preci** `preci` **temp** `te`
_pct	Portion of HRU associated with each HRU to map intersection	**nmap2hru**	real	decimal fraction	0.0 to 1.0	0.0	**preci** `preci` **temp** `te`
s	Index of the lapse precipitation measurement station used for lapse rate calculations for each HRU	**nhru**	integer	none	0 to **nrain**	0	**preci** `pre`

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
n	Index of the base precipitation measurement station used for lapse rate calculations for each HRU	**nhru**	integer	none	0 to **nrain**	0	**preci** prec pre
s	Index of the lapse temperature station used for lapse rate calculations	**nhru**	integer	none	0 to **ntemp**	0	**temp** ter
	Index of the base temperature station used for lapse rate calculations	**nhru**	integer	none	0 to **ntemp**	0	**temp** ter tem ter
	Longitude (X) of each HRU for the centroid in albers projection	**nhru**	real	meters	-1.0E7 to 1.0E7	0.0	**precip** **temp** ide xy
ng	Longitude of each HRU for the centroid, State Plane Coordinate System	**nhru**	real	feet	-1.0E9 to 1.0E9	0.0	**temp** temp **preci** prec
	Latitude (Y) of each HRU for the centroid in albers projection	**nhru**	real	meters	-1.0E7 to 1.0E7	0.0	**precip** **temp** ide xy
	Latitude of each HRU for the centroid, State Plane Coordinate System	**nhru**	real	feet	-1.0E9 to 1.0E9	0.0	**temp** temp_ **preci** prec
x_max	Monthly (January to December) maximum lapse rate to constrain lowest maximum lapse rate based on historical daily air temperatures for all air temperature-measurement stations	**nmonths**	real	**temp_units**/ feet	-3.0 to 3.0	2.0	**temp** tem
x_min	Monthly (January to December) maximum lapse rate to constrain lowest minimum lapse rate on the basis of historical daily air temperatures for all air temperature-measurement stations	**nmonths**	real	**temp_units**/ feet	-7.0 to -3.0	-6.5	**temp** tem
_max	Monthly (January to December) minimum lapse rate to constrain lowest maximum lapse rate on the basis of historical daily air temperatures for all air temperature-measurement stations	**nmonths**	real	**temp_units**/ feet	-2.0 to 4.0	3.0	**temp** tem
_min	Monthly (January to December) minimum lapse rate to constrain lowest minimum lapse rate on the basis of historical daily air temperatures for all air temperature-measurement stations	**nmonths**	real	**temp_units**/ feet	-7.0 to -3.0	-4.0	**temp** tem
_id	Mapped spatial unit identification number for each HRU to map intersection	**nmap2hru**	integer	none	0 to **nhru**	0	**preci** preci **temp** te
se	Monthly (January to December) maximum air temperature lapse rate for each direction (X, Y, and Z))	**nlapse**, **nmonths**	real	none	-100.0 to 100.0	0.0	**temp** xy
ssing	Maximum number of consecutive missing values allowed for any air temperature measurement station; missing value set to last valid value; 0=unlimited	**one**	integer	none	0 to 10	3	**temp** ter tem ter
a	Maximum number of precipitation measurement stations to use for distributing precipitation to an HRU	**one**	integer	none	0 to **nrain**	0	**preci** prec

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
n	Maximum number of air temperature measurement stations to use for distributing temperature to an HRU	**one**	integer	none	0 to **ntemp**	0	**temp** tem
_prec	Maximum measured precipitation value above which precipitation is assumed to be in error	**one**	real	**precip_units**	0.0 to 20.0	15.0	**preci** prec
se	Monthly (January to December) minimum air temperature lapse rate for each direction (X, Y, and Z)	**nlapse, nmonths**	real	none	-100.0 to 100.0	0.0	**temp** xy
.	Monthly maximum air temperature to constrain lowest maximum air temperatures for bad values on the basis of historical temperature for all measurement stations	**nmonths**	real	**temp_units**	0.0 to 115.0	100.0	**temp** tem
	Monthly minimum air temperature to constrain lowest maximum air temperatures for bad values on the basis of historical temperature for all measurement stations	**nmonths**	real	**temp_units**	-60.0 to 65.0	-60.0	**temp** tem
ta	Number of precipitation measurement stations for inverse distance calculations	**one**	integer	none	0 to **nrain**	0	**preci** ic
a	Number of air temperature measurement stations for inverse distance calculations	**one**	integer	none	0 to **ntemp**	0	**temp** ic
	Monthly (January to December) factor to adjust rain lapse rate computed between station **hru_psta** and station **hru_plaps**; positive factors are multiplied times the lapse rate and negative factors are made positive and substituted for the computed lapse rate	**nrain, nmonths**	real	**precip_units**	-2.0 to 10.0	1.0	**preci** pre
	Monthly (January to December) factor to adjust snow lapse rate computed between station **hru_psta** and station **hru_plaps**; positive factors are multiplied times the lapse rate and negative factors are made positive and substituted for the computed lapse rate	**nrain, nmonths**	real	**precip_units**	-2.0 to 10.0	1.0	**preci** pre
	Mean monthly (January to December) precipitation for each lapse precipitation measurement station	**nrain, nmonths**	real	**precip_units**	0.00001 to 100.0	1.0	**preci** pre
h_adj	Monthly (January to December) adjustment factor to potential evapotranspiration specified in CBH Files for each HRU	**nhru, nmonths**	real	decimal fraction	0.5 to 1.5	1.0	**et_** clin
	Mean value for the precipitation measurement station transformation equation	**one**	real	**precip_units**	-10.0 to 10.0	0.0	**preci** xy
	Standard deviation for the precipitation measurement station transformation equation (not `0.0`)	**one**	real	**precip_units**	-10.0 to 10.0	1.0	**preci** xy
e	Monthly (January to December) precipitation lapse rate for each direction (X, Y, and Z)	**nlapse, nmonths**	real	none	-10.0 to 10.0	0.0	**preci** xy
_thresh	Precipitation below this amount is set to 0.0	**one**	real	**precip_units**	0.0 to 0.1	0.0	r
ht_dist	Monthly (January to December) precipitation weighting function for inverse distance calculations	**nmonths**	real	decimal fraction	0.0 to 1.0	0.5	**preci** ic
nap_adj	Monthly (January to December) multiplicative adjustment factor to mapped precipitation to account for differences in elevation, and so forth	**nmap, nmonths**	real	decimal fraction	0.5 to 2.0	1.0	**preci** pre
v	Elevation of each precipitation measurement station	**nrain**	real	**elev_units**	-300.0 to 30,000.0	0.0	**preci** id xyz pre
q_nuse	The subset of precipitation measurement stations used to determine if there is precipitation in the basin (`0`=station not used; `1`=station used)	**nrain**	integer	none	0 or 1	1	**preci** xy
n	Monthly (January to December) factor to precipitation at each measured station to adjust precipitation distributed to each HRU to account for differences in elevation, and	**nrain, nmonths**	real	**precip_units**	0.0 to 50.0	1.0	**preci** prec

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	so forth						
nth_ppt	Average monthly (January to December) maximum precipitation at each precipitation measurement station	**nrain**, **nmonths**	real	**precip_units**	0.0 to 20.0	0.0	**preci** xy
e	The subset of precipitation measurement stations used in the distribution regression (`0`=station not used; `1`=station used)	**nrain**	integer	none	0 or 1	1	**preci** ide xy
	Longitude (X) for each precipitation measurement station in albers projection	**nrain**	real	meters	-1.0E7 to 1.0E7	0.0	**preci** ide xy
ng	Longitude of each precipitation measurement station, State Plane Coordinate System	**nrain**	real	feet	-1.0E9 to 1.0E9	0.0	**preci** prec
	Latitude (Y) for each precipitation measurement station in albers projection	**nrain**	real	meters	-1.0E7 to 1.0E7	0.0	**preci** ide xy
t	Latitude of each precipitation measurement station, State Plane Coordinate System	**nrain**	real	feet	-1.0E9 to 1.0E9	0.0	**preci** prec
	Monthly (January to December) factor to adjust measured rain on each HRU to account for differences in elevation, and so forth	**nhru**, **nmonths**	real	decimal fraction	0.5 to 10.0	1.0	**preci** pre
_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be rain on each HRU to account for differences in elevation, and so forth	**nhru**, **nmonths**	real	decimal fraction	0.5 to 2.0	1.0	**preci** cli
n	Monthly (January to December) factor to rain on each HRU to adjust precipitation distributed to each HRU to account for differences in elevation, and so forth	**nhru, nmonths**	real	**precip_units**	0.0 to 50.0	1.0	**preci** prec
j	Monthly (January to December) factor to adjust measured snow on each HRU to account for differences in elevation, and so forth	**nhru**, **nmonths**	real	decimal fraction	0.5 to 2.5	1.0	**preci** pre
h_adj	Monthly (January to December) adjustment factor to measured precipitation determined to be snow on each HRU to account for differences in elevation, and so forth	**nhru**, **nmonths**	real	decimal fraction	0.5 to 2.0	1.0	**preci** cli
on	Monthly (January to December) factor to snow on each HRU to adjust precipitation distributed to each HRU to account for differences in elevation, and so forth	**nhru, nmonths**	real	**precip_units**	0.0 to 50.0	1.0	**preci** prec
lev	Elevation of the solar radiation station used for the degree-day curves to distribute temperature	**one**	real	meters	-300.0 to 30,000.0	0.0	**temp** ide xy
ght_dist	Monthly (January to December) temperature weighting function for inverse distance calculations	**nmonths**	real	decimal fraction	0.0 to 1.0	0.5	**temp** ic
d	Mean value for the air-temperature measurement station transformation equation for maximum air temperature	**one**	real	**temp_units**	-100.0 to 100.0	0.0	**temp** xy
j	Adjustment to maximum air temperature for each HRU, estimated on the basis of slope and aspect	**nhru, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** ter te ter tem ide xy
rain	Monthly (January to December) maximum air temperature when precipitation is assumed to be rain; if HRU air temperature is greater than or equal to this value, precipitation is rain	**nhru, nmonths**	real	**temp_units**	-8.0 to 75.0	38.0	**model_**
rain_dist	Monthly (January to December) maximum air	**nmonths**	real	**temp_units**	-8.0 to 75.0	38.0	**temp**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	temperature when precipitation is assumed to be rain; if HRU air temperature is greater than or equal to this value, precipitation is rain						xy
rain_offset	Monthly (January to December) maximum air temperature when precipitation is assumed to be rain; if HRU air temperature is greater than or equal to **tmax_allsnow** plus this value, precipitation is rain	**nhru, nmonths**	real	**temp_units**	0.0 to 50.0	1.0	**mod**
rain_sta	Monthly (January to December) maximum air temperature when precipitation is assumed to be rain; if air temperature is greater than or equal to this value, precipitation is rain	**nrain, nmonths**	real	**temp_units**	-8.0 to 75.0	38.0	**temp** ic
snow	Monthly (January to December) maximum air temperature when precipitation is assumed to be snow; if HRU air temperature is less than or equal to this value, precipitation is snow	**nhru, nmonths**	real	**temp_units**	-10.0 to 40.0	32.0	r
snow_dist	Maximum air temperature when precipitation is assumed to be snow; if mean air temperature is less than or equal to this value, precipitation is snow	**one**	real	**temp_units**	-10.0 to 40.0	32.0	**temp** xy
snow_sta	Monthly (January to December) maximum air temperature when precipitation is assumed to be snow; if air temperature is less than or equal to this value, precipitation is snow	**nrain, nmonths**	real	**temp_units**	-10.0 to 40.0	38.0	**temp** ic
h_adj	Monthly (January to December) adjustment factor to maximum air temperature for each HRU, estimated on the basis of slope and aspect	**nhru, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** cli
v	Standard deviation for the air-temperature-measurement station transformation equation for maximum air temperature (not `0.0`)	**one**	real	**temp_units**	-100.0 to 100.0	1.0	**temp** xy
ap_adj	Monthly (January to December) additive adjustment factor to maximum air temperature for each mapped spatial unit estimated on the basis of slope and aspect	**nmap, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** te
ose	Monthly (January to December) values representing the change in maximum air temperature per 1,000 **elev_units** of elevation change for each HRU	**nhru, nmonths**	real	**temp_units/ elev_units**	-20.0 to 20.0	3.0	**temp** ter
d	Mean value for the air-temperature-measurement station transformation equation for minimum air temperature	**one**	real	**temp_units**	-100.0 to 100.0	0.0	**temp** xy
j	Adjustment to minimum air temperature for each HRU, estimated on the basis of slope and aspect	**nhru, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** ter te ter tem ide xy
h_adj	Monthly (January to December) adjustment factor to minimum air temperature for each HRU, estimated on the basis of slope and aspect	**nhru, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** cli
/	Standard deviation for the air-temperature-measurement station transformation equation for minimum air temperature (not `0.0`)	**one**	real	**temp_units**	-100.0 to 100.0	1.0	**temp** xy
p_adj	Monthly (January to December) additive adjustment factor to minimum air temperature for each mapped spatial unit, estimated on the basis of slope and aspect	**nmap, nmonths**	real	**temp_units**	-10.0 to 10.0	0.0	**temp** te
ose	Monthly (January to December) values representing the	**nhru,**	real	**temp_units/**	-20.0 to	3.0	**temp**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	change in minimum air temperature per 1,000 **elev_units** of elevation change for each HRU	**nmonths**		**elev_units**	20.0		`ter`
	Elevation of each air-temperature-measurement station	**ntemp**	real	**elev_units**	-300.0 to 30,000.0		
nth_max	Average monthly (January to December) maximum air temperature at each air-temperature-measurement station	**ntemp, nmonths**	real	**temp_units**	-100.0 to 100.0	0.0	**temp** `xy`
nth_min	Average monthly (January to December) minimum air temperature at each air-temperature-measurement station	**ntemp, nmonths**	real	**temp_units**	-100.0 to 100.0	0.0	**temp** `xy`
e	The subset of temperature stations used in the distribution regression (`0`=station not used; `1`=station used)	**ntemp**	integer	none	0 or 1	0	**temp** `ide` `xy`
	Longitude (X) for each air-temperature-measurement station in albers projection	**ntemp**	real	meters	-1.0E7 to 1.0E7	0.0	**temp** `ide` `xy`
ng	Longitude of each air-temperature-measurement station, State Plane Coordinate System	**ntemp**	real	feet	-1.0E9 to 1.0E9	0.0	**temp** `tem`
	Latitude (Y) for each air-temperature-measurement station in albers projection	**ntemp**	real	meters	-1.0E7 to 1.0E7	0.0	**temp** `ide` `xy`
	Latitude of each air-temperature-measurement station, State Plane Coordinate System	**ntemp**	real	feet	-1.0E9 to 1.0E9	0.0	**temp** `tem`
	Mean value for the climate station transformation equation for the longitude (X) coordinate	**one**	real	meters	-1.0E7 to 1.0E7	0.0	**precip** **temp** `xy`
	Standard deviation for the climate station transformation equation for the longitude (X) coordinate (not `0.0`)	**one**	real	meters	-1.0E7 to 1.0E7	1.0	**precip** **temp** `xy`
	Mean value for the climate station transformation equation for the latitude (Y) coordinate	**one**	real	meters	-1.0E7 to 1.0E7	0.0	**precip** **temp** `xy`
	Standard deviation for the climate station transformation equation for the latitude (Y) coordinate	**one**	real	meters	-1.0E7 to 1.0E7	1.0	**precip** **temp** `xy`
	Mean value for the climate station transformation equation for the elevation (Z) coordinate	**one**	real	meters	-1.0E7 to 1.0E7	0.0	**precip** **temp** `xy`
	Standard deviation for the climate station transformation equation for the elevation (Z) coordinate (not `0.0`)	**one**	real	meters	-1.0E7 to 1.0E7	1.0	**precip** **temp** `xy`
		Solar radiation					
lsta	Index of solar radiation station used to compute basin radiation values; used when dimension **nsol**>`0`	**one**	integer	none	0 to **nsol**	0	**r**
cp	Monthly (January to December) intercept in cloud-cover relationship	**nhru, nmonths**	real	none	0.0 to 5.0	1.83	**solra** `cc`
pe	Monthly (January to December) coefficient in cloud-cover relationship	**nhru, nmonths**	real	none	-0.5 to -0.01	-0.13	**solra** `cc`
ef	Coefficient(B) in Thompson (1976) equation; varies by region, contour map of values in reference	**nhru, nmonths**	real	none	0.1 to 0.7	0.4	**solra** `cc`
o	Exponent(P) in Thompson (1976) equation	**nhru, nmonths**	real	none	0.2 to 0.8	0.61	**solra** `cc`
tcp	Monthly (January to December) intercept in degree-day equation for each HRU	**nhru, nmonths**	real	dday	-60.0 to 10.0	-40.0	**solra** `dc`
ope	Monthly (January to December) slope in degree-day	**nhru,**	real	dday/	0.1 to 1.4	0.4	**solra**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	equation for each HRU	**nmonths**		**temp_units**			dc
ta	Index of solar radiation station associated with each HRU	**nhru**	integer	none	0 to **nsol**	0	**r**
_adj	Monthly minimum precipitation, if HRU precipitation exceeds this value, radiation is multiplied by **radj_sppt** or **radj_wppt** precipitation adjustment factor	**nhru, nmonths**	real	inches	0.0 to 0.5	0.02	F
ntcp	Monthly (January to December) intercept in air temperature range adjustment to degree-day equation for each HRU	**nhru, nmonths**	real	none	0.0 to 1.0	1.0	**solra** dc
lope	Monthly (January to December) slope in air temperature range adjustment to degree-day equation for each HRU	**nhru, nmonths**	real	1/ **temp_units**	0.0 to 1.0	0.0	**solra** dc
t	Adjustment factor for computed solar radiation for summer day with greater than **ppt_rad_adj** inches of precipitation for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.44	r
pt	Adjustment factor for computed solar radiation for winter day with greater than **ppt_rad_adj** inches of precipitation for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.5	r
	Monthly (January to December) maximum fraction of the potential solar radiation that may reach the ground due to haze, dust, smog, and so forth, for each HRU	**nhru, nmonths**	real	decimal fraction	0.1 to 1.0	0.8	r
dex	Monthly (January to December) index temperature used to determine precipitation adjustments to solar radiation for each HRU	**nhru, nmonths**	real	**temp_units**	-10.0 to 110.0	50.0	**solra** dc
	Potential evapotranspiration distribution						
ef	Monthly (January to December) crop coefficient for each HRU	**nhru, nmonths**	real	decimal fraction	0.0 to 2.0	1.0	**et_** pot pote
ef	Monthly (January to December) evaporation pan coefficient for each HRU	**nhru, nmonths**	real	decimal fraction	0.01 to 3.0	1.0	**et_** po
coef	Monthly (January to December) air temperature coefficient used in Hamon potential ET computations for each HRU	**nhru, nmonths**	real	none	0.004 to 0.008	0.0055	**et_** pote
idity_sta	Index of humidity measurement station for each HRU	**nhru**	integer	none	0 to **nhumid**	0	**et_** potet **nh**
sta	Index of pan evaporation station used to compute HRU potential ET	**nhru**	integer	none	0 to **nevap**	0	**et_** pote **ne**
dspeed_sta	Index of wind speed measurement station for each HRU	**nhru**	integer	none	0 to **nwind**	0	**et_** potet **nw**
	Monthly (January to December) adjustment factor used in Hargreaves-Samani potential ET computations for each HRU	**nhru, nmonths**	real	decimal fraction	0.01 to 0.24	0.0135	**et_** pc
_percent	Monthly humidity for each HRU	**nhru, nmonths**	real	percentage	0.0 to 100.0	0.0	**et_** pot pot hum specif
	Monthly (January to December) air temperature coefficient used in Jensen-Haise potential ET computations for each HRU	**nhru, nmonths**	real	per degrees Fahrenheit	-0.5 to 1.5	0.014	**et_** pc

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
hru	Air temperature coefficient used in Jensen-Haise potential ET computations for each HRU	**nhru**	real	per degrees Fahrenheit	-99.0 to 150.0	13.0	**et_** po
oef	Monthly (January to December) Penman-Monteith potential ET D wind speed coefficient for each HRU	**nhru**, **nmonths**	real	seconds/ meter	0.25 to 0.45	0.34	**et_** pot pote
oef	Monthly (January to December) Penman-Monteith potential ET N temperature coefficient for each HRU	**nhru**, **nmonths**	real	degrees Celsius per day	850.0 to 950.0	900.0	**et_** pot pote
h_adj	Monthly (January to December) adjustment factor to potential evapotranspiration specified in CBH Files for each HRU	**nhru**, **nmonths**	real	degrees decimal fraction	0.5 to 1.5	1.0	**et_** clir
	Monthly (January to December) adjustment factor used in Priestly-Taylor potential ET computations for each HRU	**nhru**, **nmonths**	real	decimal fraction	1.0 to 2.0	1.26	**et_** po
	Evapotranspiration and sublimation						
t	The solar date (number of days after winter solstice) of the first killing frost of the fall	**nhru**	integer	solar date	1 to 366	264	**trans** tran
np	Temperature of killing frost	**nhru**	real	**temp_units**	-10.0 to 32.0	28.0	**mod**
blim	Fraction of potential ET that is sublimated from snow in the canopy and snowpack for each HRU	**nhru**	real	decimal fraction	0.1 to 0.75	0.5	r
ef	Transmission coefficient for short-wave radiation through the winter vegetation canopy	**nhru**	real	decimal fraction	0.0 to 1.0	0.5	r
e	Soil type of each HRU (1=sand; 2=loam; 3=clay)	**nhru**	integer	none	1 to 3	2	r
rost	The solar date (number of days after winter solstice) of the last killing frost of the spring	**nhru**	integer	solar date	1 to 366	111	**trans** tran
eg	Month to begin summing maximum air temperature for each HRU; when sum is greater than or equal to **transp_tmax**, transpiration begins	**nhru**	integer	month	1 to 12	1	**trans** tran
nd	Month to stop transpiration computations; transpiration is computed through the end of previous month	**nhru**	integer	month	1 to 13	13	**trans** tran
max	Temperature index to determine the specific date of the start of the transpiration period; the maximum air temperature for each HRU is summed starting with the first day of month **transp_beg**; when the sum exceeds this index, transpiration begins	**nhru**	real	**temp_units**	0.0 to 1,000.0	1.0	**trans** tran
	Interception						
e	Vegetation cover type for each HRU (0=bare soil; 1=grasses; 2=shrubs; 3=trees; 4=coniferous)	**nhru**	integer	none	0 to 4	3	r
sum	Summer vegetation cover density for the major vegetation type in each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.5	r
win	Winter vegetation cover density for the major vegetation type in each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.5	r
tcp	Snow interception storage capacity for the major vegetation type in each HRU	**nhru**	real	inches	0.0 to 1.0	0.1	r
tcp	Summer rain interception storage capacity for the major vegetation type in each HRU	**nhru**	real	inches	0.0 to 1.0	0.1	r
ntcp	Winter rain interception storage capacity for the major vegetation type in each HRU	**nhru**	real	inches	0.0 to 1.0	0.1	r
	Snow computations						
na	Fraction of rain in a mixed precipitation event above which the snow albedo is not reset; applied during the snowpack accumulation stage	**one**	real	decimal fraction	0.5 to 1.0	0.8	r

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
m	Fraction of rain in a mixed precipitation event above which the snow albedo is not reset; applied during the snowpack melt stage	**one**	real	decimal fraction	0.4 to 1.0	0.6	r
a	Minimum snowfall, in water equivalent, needed to reset snow albedo during the snowpack accumulation stage	**one**	real	inches	0.01 to 1.0	0.05	r
m	Minimum snowfall, in water equivalent, needed to reset snow albedo during the snowpack melt stage	**one**	real	inches	0.1 to 1.0	0.2	r
f	Monthly (January to December) convection condensation energy coefficient for each HRU	**nhru, nmonths**	real	calories per degree Celsius > 0	0.02.0 to 20.0	5.0	r
	Initial density of new-fallen snow	**nhru**	real	grams/cubic centimeters	0.01 to 0.5	0.1	r
	Average maximum snowpack density	**nhru**	real	grams/cubic centimeters	0.1 to 0.8	0.6	r
ppt	Average emissivity of air on days without precipitation for each HRU	**nhru**	real	decimal fraction	0.757 to 1.0	0.757	r
cap	Free-water holding capacity of snowpack expressed as a decimal fraction of the frozen water content of the snowpack (*pk_ice*) for each HRU	**nhru**	real	decimal fraction	0.01 to 0.2	0.05	r
lcrv	Index number for the snowpack areal depletion curve associated with each HRU	**nhru**	integer	none	1 to **ndepl**	1	**snarea_**
ce	Julian date to force snowpack to spring snowmelt stage; varies with region depending on length of time that permanent snowpack exists for each HRU	**nhru**	integer	Julian day	1 to 366	140	r
k	Julian date to start looking for spring snowmelt stage; varies with region depending on length of time that permanent snowpack exists for each HRU	**nhru**	integer	Julian day	1 to 366	90	r
nst	Snowpack settlement time constant	**nhru**	real	decimal fraction	0.01 to 0.5	0.1	r
	Snow area depletion curve minimum snow-water equivalent (SWE) value for each HRU	**nhru**	real	inches	0.0 to 1.0	0.0	**snarea_**
	Snow area depletion curve B coefficient used in computing values off an S curve for each HRU	**nhru**	real	none	0.5 to 20.0	2.0	**snarea_**
	Snow area depletion curve C coefficient used in computing values off an S curve for each HRU	**nhru**	real	none	0.001 to 3.0	1.5	**snarea_**
	Snow area depletion curve D coefficient used in computing values off an S curve for each HRU	**nhru**	real	none	0.0 to 3.0	0.975	**snarea_**
urve	Snow area depletion curve values, 11 values for each curve (0.0 to 1.0 in 0.1 increments)	**ndeplval**	real	decimal fraction	0.0 to 1.0	1.0	**snarea_**
hresh	Maximum threshold snowpack water equivalent below which the snow-covered-area curve is applied	**nhru**	real	inches	0.0 to 200.0	50.0	r
k_init	Storage of snowpack in each HRU at the beginning of a simulation	**nhru**	real	inches	0.0 to 5000.0	0.0	r
no	Monthly indicator for prevalent storm type (0=frontal storms; 1=convective storms) for each HRU	**nhru, nmonths**	integer	none	0 or 1	0	r
			Glacier and frozen ground computations				
_range	Average HRU snowfield ablation zones elevation range or approximate median-min elevation	**nhru**	real	**elev_units**	0.0 to 17000.0	1000.0	**glaci**
oef	Coefficient in calculation of ice albedo	**nhru**	real	none	0.1 to 0.3	0.137	**glaci**
ce	Ice albedo 300 meters below equilibrium line altitude (ELA)	**nhru**	real	decimal fraction	0.2 to 0.6	0.344	**glaci**
ay	Continuous frozen ground index (CFGI) daily decay of	**one**	real	decimal	0.1 to 1.0	0.97	**froz**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	index; value of `1.0` is no decay			fraction			
hld	Continuous frozen ground index (CFGI) threshold value indicating frozen soil	**one**	real	none	1.0 to 500.0	52.55	**froz**
rac_init	Initial fraction of glaciation (0=none; 1=100%) in glacier-capable HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.0	**glaci**
eeh2o_cap	Free-water holding capacity of glacier ice of the frozen water content of the glacier ice (*glacr_pk_ice*)	**nhru**	real	decimal fraction	0.0 to 0.1	0.002	**glaci**
yer	Active layer is 0 to 15 m (590.6 inches) thick at start of year, when melts will set daily *glacr_pk_temp* to 0	**nhru**	real	inches	0.0 to 590.6	0.0	**glaci**
coef	Volume area scaling coefficient for glaciers, average value by region	**nhru**	real	m**(3-2***glacrva_exp**)	0.01 to 2.0	0.28	**glaci**
exp	Volume area exponential coefficient for glaciers, average value by region	**nhru**	real	none	1.0 to 2.0	1.375	**glaci**
rac_init	Initial fraction of glacierette (too small for glacier dynamics)	**nhru**	real	decimal fraction	0.0 to 1.0	0.0	**glaci**
gth	Length of segment covering all of glacier-possible for each HRU	**nhru**	real	km	0.0 to 10000.0	0.0	**glaci**
th	Width of glacier-possible for each HRU	**nhru**	real	km	0.0 to 10000.0	0.0	**glaci**
epth	Upper bound on glacier thickness, thickest glacier measured is Taku at 1.5 km, ice sheet 3 km	**nhru**	real	km	0.1 to 3.0	1.5	**glaci**
n	Monthly (January to December) storage coefficient for firn melt on glaciers	**nhru**	real	hours	150.0 to 1000.0	400.0	**glaci**
	Monthly (January to December) storage coefficient for ice melt on glaciers	**nhru**	real	hours	5.0 to 29.0	10.0	**glaci**
w	Monthly (January to December) storage coefficient for ice melt on glaciers	**nhru**	real	hours	30.0 to 149.0	80.0	**glaci**
	Index of down-flowline HRU to which the HRU glacier melt flows, for non-glacier HRUs that do not flow to another HRU enter `0`	**nhru**	integer	none	0 to **nhru**	0	**glaci**
	Hortonian surface runoff, infiltration, and impervious storage						
ax	Maximum possible area contributing to surface runoff expressed as a portion of the HRU area	**nhru**	real	decimal fraction	0.0 to 1.0	0.6	r
in	Minimum possible area contributing to surface runoff expressed as a portion of the area for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.2	**sruno** `srun`
cent_imperv	Fraction of each HRU area that is impervious	**nhru**	real	decimal fraction	0.0 to 0.999	0.0	r
stor_max	Maximum impervious area retention storage for each HRU	**nhru**	real	inches	0.0 to 0.5	0.05	r
oef	Coefficient in non-linear contributing area algorithm for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.005	**sruno** `srun`
xp	Exponent in non-linear contributing area algorithm for each HRU	**nhru**	real	1/inch	0.0 to 5.0	0.3	**sruno** `srun`
l_max	Maximum snow infiltration per day for each HRU	**nhru**	real	inches/day	0.0 to 20.0	2.0	r
	Surface depression storage						
ea	Aggregate sum of surface-depression storage areas of each HRU (recommend that **dprst_frac_hru** be used instead of **dprst_area**)	**nhru**	real	acres	0.0 to 1.0E9	0.0	**dprst_ model_**
pth_avg	Average depth of storage depressions at maximum storage capacity	**nhru**	real	inches	0.0 to 500.0	132.0	**dpr**
_coef	Fraction of unsatisfied potential evapotranspiration to	**nhru**	real	decimal	0.5 to 1.5	1.0	**dpr**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	apply to surface-depression storage			fraction			
ow_coef	Coefficient in linear flow routing equation for open surface depressions for each HRU	**nhru**	real	fraction/day	0.00001 to 0.5	0.05	**dpr**
ac_hru	Fraction of each HRU area that has surface depressions (If specified, the parameter **dprst_area** is ignored if it also is specified, default of -1.0 means use **dprst_area**)	**nhru**	real	decimal fraction	-1.0 to 0.999	-1.0	**dprst_ model_**
ac	Fraction of each HRU area that has surface depressions	**nhru**	real	decimal fraction	0.0 to 0.999	0.0	**dprst mod**
ac_init	Fraction of maximum surface-depression storage that contains water at the start of a simulation	**nhru**	real	decimal fraction	0.0 to 1.0	0.5	**dpr**
ac_open	Fraction of open surface-depression storage area within an HRU that can generate surface runoff as a function of storage volume	**nhru**	double	decimal fraction	0.0 to 1.0	1.0	**dpr**
ep_rate_clos	Coefficient used in linear seepage flow equation for closed surface depressions for each HRU	**nhru**	real	fraction/day	0.0 to 0.2	0.02	**dpr**
ep_rate_open	Coefficient used in linear seepage flow equation for open surface depressions for each HRU	**nhru**	real	fraction/day	0.0 to 0.2	0.02	**dpr**
_thres	Fraction of open depression storage above which surface runoff occurs; any water above maximum open storage capacity spills as surface runoff	**nhru**	real	decimal fraction	0.01 to 1.0	1.0	**dpr**
prst_imperv	Fraction of impervious surface runoff that flows into surface-depression storage; the remainder flows to a stream network for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.2	**dpr**
prst	Fraction of pervious surface runoff that flows into surface-depression storage; the remainder flows to a stream network for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.2	**dprst_ model_**
prst_perv	Fraction of pervious surface runoff that flows into surface-depression storage; the remainder flows to a stream network for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.2	**dprst_ mod**
exp	Coefficient in the exponential equation relating maximum surface area to the fraction that closed depressions are full to compute current surface area for each HRU; 0.001 is an approximate cylinder; 1.0 is a cone	**nhru**	real	none	0.0001 to 10.0	0.001	**dpr**
_exp	Coefficient in the exponential equation relating maximum surface area to the fraction that open depressions are full to compute current surface area for each HRU; 0.001 is an approximate cylinder; 1.0 is a cone	**nhru**	real	none	0.0001 to 10.0	0.001	**dpr**
	Soil zone storage, interflow, gravity drainage, Dunnian surface runoff						
_lin	Linear coefficient in equation to route preferential-flow storage downslope for each HRU	**nhru**	real	fraction/day	0.0 to 1.0	0.1	r
_sq	Non-linear coefficient in equation to route preferential-flow storage downslope for each HRU	**nhru**	real	none	0.0 to 1.0	0.8	r
v_den	Fraction of the gravity reservoir in which preferential flow occurs for each HRU	**nhru**	real	decimal fraction	0.0 to 0.5	0.0	r
shold	Water holding capacity of the gravity and preferential-flow reservoirs; difference between field capacity and total soil saturation for each HRU	**nhru**	real	inches	0.00001 to 999.0	999.0	r
_lin	Linear coefficient in equation to route gravity-reservoir storage downslope for each HRU	**nhru**	real	fraction/day	0.0 to 1.0	0.015	r
_sq	Non-linear coefficient in equation to route gravity-	**nhru**	real	none	0.0 to 1.0	0.1	r

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	reservoir storage downslope for each HRU						
st_init	Initial value of available water in capillary reservoir for each HRU	**nhru**	real	inches	0.0 to 20.0	3.0	**model_**
st_init_frac	Initial fraction of available water in the capillary reservoir (fraction of **soil_moist_max** for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.0	**mod**
st_max	Maximum available water holding capacity of capillary reservoir from land surface to rooting depth of the major vegetation type of each HRU	**nhru**	real	inches	0.00001 to 20.0	2.0	r
r_init	Initial storage for soil recharge zone (upper part of capillary reservoir where losses occur as both evaporation and transpiration) for each HRU; must be less than or equal to **soil_moist_init**	**nhru**	real	inches	0.0 to 20.0	1.0	**model_**
r_init_frac	Initial fraction of available water in the capillary reservoir where losses occur as both evaporation and transpiration (upper zone of capillary reservoir) for each HRU	**nhru**	real	decimal fraction	0.0 to 1.0	0.0	**mod**
r_max	Maximum storage for soil recharge zone (upper portion of capillary reservoir where losses occur as both evaporation and transpiration); must be less than or equal to **soil_moist_max**	**nhru**	real	inches	0.00001 to 20.0	1.5	**model_**
r_max_frac	Fraction of the capillary reservoir water-holding capacity (**soil_moist_max**) where losses occur as both evaporation and transpiration (upper zone of capillary reservoir) for each HRU	**nhru**	real	decimal fraction	0.00001 to 1.0	1.0	**mod**
max	Maximum amount of the capillary reservoir excess that is routed directly to the GWR for each HRU	**nhru**	real	inches	0.0 to 5.0	0.0	F
exp	Non-linear coefficient in equation used to route water from the gravity reservoirs to the GWR for each HRU	**nssr**	real	none	0.0 to 3.0	1.0	F
rate	Linear coefficient in equation used to route water from the gravity reservoir to the GWR for each HRU	**nssr**	real	inches/day	0.0001 to 999.0	0.1	F
it	Initial storage of the gravity and preferential-flow reservoirs for each HRU	**nssr**	real	inches	0.0 to 10.0	0.0	**model_**
it_frac	Initial fraction of available water in the gravity plus preferential-flow reservoirs (fraction of **sat_threshold**) for each HRU	**nssr**	real	decimal fraction	0.0 to 1.0	0.0	**mod**
		Groundwater flow					
coef	Linear coefficient in the equation to compute groundwater discharge for each GWR	**ngw**	real	fraction/day	0.0 to 0.5	0.015	r
coef	Linear coefficient in the equation to compute outflow to the groundwater sink for each GWR	**ngw**	real	fraction/day	0.0 to 1.0	0.0	r
nit	Storage in each GWR at the beginning of a simulation	**ngw**	real	inches	0.0 to 50.0	2.0	r
min	Minimum storage in each GWR to ensure storage is greater than specified value to account for inflow from deep aquifers or injection wells with the water source outside the basin	**ngw**	real	inches	0.0 to 1.0	0.0	r
		Streamflow					
nent	Segment index to which an HRU contributes lateral flows (surface runoff, interflow, and groundwater discharge)	**nhru**	integer	none	0 to **nsegment**	0	**strmflo** `mus` `strmf` , `musk` `musk`
	Travel time of flood wave from one segment to the next	**nsegment**	real	hours	0.01 to	1.0	**strmflo**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	downstream segment, called the Muskingum storage coefficient; enter `1.0` for reservoirs, diversions, and segment(s) flowing out of the basin				24.0		mu
	Manning's roughness coefficient for each segment	**nsegment**	real	dimensionless	0.001 to 0.15	0.04	**strmfl** muski
gment	Index of measured streamflow station that replaces inflow to a segment	**nsegment**	integer	none	0 to **nobs**	0	**strmfl** mus strmf , muski muski
egment	Index of measured streamflow station that replaces outflow from a segment	**nsegment**	integer	none	0 to **nobs**	0	**strmfl** mus strmf , muski muski
h	Segment river depth at bank full; shallowest depth from Blackburn-Lynch (2017); Congo is deepest at 250 m but in the US, it is probably the Hudson at 66 m	**nsegment**	real	meters	0.03 to 250.0	1.0	**strmfl** muski
th	Length of each segment, bounds based on CONUS	**nsegment**	real	meters	1.0 to 100000.0	1000.0	**strmfl** muski or **stre**
e	Surface slope of each segment as approximation for bed slope of stream	**nsegment**	real	decimal fraction	0.0 to 2.0	0.0001	**strmfl** muski or **stre**
_flow_init	Initial flow in each stream segment	**nsegment**	real	cfs	0 to 1.0E7	0.0	**strmfl** mus strmf , muski muski
_type	Segment type (0=segment; 1= headwater; 2=lake; 3=replace inflow; 4=inbound to NHM; 5=outbound from NHM; 6=inbound to region; 7=outbound from region; 8=drains to ocean; 9=sink; 10=inbound from Great Lakes; 11=outbound to Great Lakes, add 100 to flag that the value is updated)	**nsegment**	integer	none	0 to 111	0	**strmfl** mus strmf , muski muski
nt	Index of downstream segment to which the segment streamflow flows; for segments that do not flow to another segment enter `0`	**nsegment**	integer	none	0 to 9999999	0	**strmfl** mus strmf , muski muski
nt_nhm	National Hydrologic Model downstream segment ID	**nsegment**	integer	none	0 to 9999999	0	c
	The amount of attenuation of the flow wave, called the Muskingum routing weighting factor; enter `0.0` for reservoirs, diversions, and segment(s) flowing out of the basin	**nsegment**	real	decimal fraction	0.0 to 0.5	0.2	**strmfl** mus muski

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
		Lake routing					
flow	Elevation of the main outflow point for each lake using broad-crested weir routing	**nlake**	real	feet	-300.0 to 10,000.0	0.0	**strmfl** muski
_init	Initial lake surface elevation for each lake using broad-crested weir routing or gate opening routing	**nlake**	real	feet	-300.0 to 10,000.0	1.0	**strmfl** muski
_coef	Linear coefficient in equation to compute lakebed seepage to the GWR and groundwater discharge to each lake using broad-crested weir routing or gate opening routing	**ngw**	real	fraction/day	0.001 to 0.05	0.015	**strmfl** muski
f	Coefficient in equation to route storage to streamflow for each lake using linear routing	**nlake**	real	fraction/day	0.0001 to 1.0	0.1	**strmfl** muski
1	Initial inflow to each lake using Puls or linear storage routing	**nlake**	real	cfs	0.0 to 1.0E7	0.1	**strmfl** muski
p_adj	Monthly (January to December) adjustment factor for potential ET for each lake	**nhru**	real	decimal fraction	0.5 to 1.5	1.0	**strmf** muski
~~ı~~	~~Index of HRU for each lake~~	~~**nlake**~~	~~integer~~	~~none~~	~~0 to **nhru**~~	~~0~~	~~**strmfl** strm~~
_id	Identification number of the lake associated with an HRU; more than one HRU can be associated with each lake	**nhru**	integer	none	0 to **nlake**	0	**strmfl** muski
	Initial storage in each lake using Puls or linear storage routing	**nlake**	real	cfs-days	0.0 to 1.0E7	0.0	**strmfl** muski
2	Switch to specify a second outflow point from each lake using gate opening routing (0=no; 1=yes)	**nlake**	integer	none	0 or 1	0	**strmfl** muski
2_a	Coefficient A in outflow equation for each lake with a second outlet using gate opening routing	**nlake**	real	cfs/feet	0.0 to 10,000.0	1.0	**strmfl** muski
2_b	Coefficient B in outflow equation for each lake with a second outlet using gate opening routing	**nlake**	real	cfs	0.0 to 10,000.0	100.0	**strmfl** muski
	Initial daily mean outflow from each lake	**nlake**	real	cfs	0.0 to 1.0E7	0.1	**strmfl** muski
p_elev	Elevation over which lakebed seepage to the GWR occurs for lake HRUs using broad-crested weir routing or gate opening routing	**nlake**	real	feet	-300.0 to 10,000.0	1.0	**strmfl** muski
ment_id	Index of lake associated with a segment	**nsegment**	integer	none	0 to **nlake**	0	**strmfl** muski and **cas**
e	Type of lake routing method (1=Puls routing; 2=linear routing; 3=flow through; 4=broad crested weir; 5=gate opening; and 6=measured flow)	**nlake**	integer	none	1 to 6	1	**strmfl** muski
_init	Initial lake volume for each lake using broad-crested weir or gate opening routing	**nlake**	real	acre-feet	0.0 to 1.0E7	0.0	**strmfl** muski
	Number of storage/outflow values in table for each lake using Puls routing	**mxnsos**, **nlake**	integer	none	0 to **mxnsos**	0	**strmfl** muski
	Outflow values in outflow/storage tables for each lake using Puls routing	**mxnsos**, **nlake**	real	cfs	0.0 to 1.0E7	0.0	**strmfl** muski
ake	Index of streamflow measurement station that specifies outflow from each lake using measured flow replacement	**nlake**	integer	none	0 to **nobs**	0	**strmfl** muski
le	Rating table with stage (rows) and gate opening (cols) for rating table 1 for lakes using gate opening routing and **nratetbl**>0	**nstage**, **ngate**	real	cfs	-100.0 to 1,000.0	5.0	**strmfl** muski
le2	Rating table with stage (rows) and gate opening (cols) for rating table 2 for lakes using gate opening routing	**nstage2**, **ngate2**	real	cfs	-100.0 to 1,000.0	5.0	**strmfl** muski

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
	and **nratetbl**>1						
le3	Rating table with stage (rows) and gate opening (cols) for rating table 3 for lakes using gate opening routing and **nratetbl**>2	**nstage3**, **ngate3**	real	cfs	-100.0 to 1,000.0	5.0	**strmfl** muski
le4	Rating table with stage (rows) and gate opening (cols) for rating table 4 for lakes using gate opening routing and **nratetbl**>3	**nstage4**, **ngate4**	real	cfs	-100.0 to 1,000.0	5.0	**strmfl** muski
ake	Index of lake associated with each rating table for each lake using gate opening routing	**nratetbl**	integer	none	0 to **nlake**	0	**strmfl** muski
	Storage values in outflow/storage table for each lake using Puls routing	**mxnsos**, **nlake**	real	cfs	0.0 to 1.0E7	0.0	**strmfl** muski
	Gate openings for each column for rating table 1 for lakes using gate opening routing and **nratetbl**>0	**ngate**	real	inches	0.0 to 20.0	0.0	**strmfl** muski
2	Gate openings for each column for rating table 2 for lakes using gate opening routing and **nratetbl**>1	**ngate2**	real	inches	0.0 to 20.0	0.0	**strmfl** muski
3	Gate openings for each column for rating table 3 for lakes using gate opening routing and **nratetbl**>2	**ngate3**	real	inches	0.0 to 20.0	0.0	**strmfl** muski
4	Gate openings for each column for rating table 4 for lakes using gate opening routing and **nratetbl**>3	**ngate4**	real	inches	0.0 to 20.0	0.0	**strmfl** muski
e	Stage values for each row for rating table 1 for lakes using gate opening routing and **nratetbl>**0	**nstage**	real	feet	-100.0 to 1,000.0	5.0	**strmfl** muski
e2	Stage values for each row for rating table 2 for lakes using gate opening routing and **nratetbl**>1	**nstage2**	real	feet	-100.0 to 1,000.0	5.0	**strmfl** muski
e3	Stage values for each row for rating table 3 for lakes using gate opening routing and **nratetbl**>2	**nstage3**	real	feet	-100.0 to 1,000.0	5.0	**strmfl** muski
e4	Stage values for each row for rating table 4 for lakes using gate opening routing and **nratetbl**>3	**nstage4**	real	feet	-100.0 to 1,000.0	5.0	**strmfl** muski
f	Coefficient for lakes using broad-crested weir routing	**nlake**	real	none	2.0 to 3.0	2.7	**strmfl** muski
	Weir length for lakes using broad-crested weir routing	**nlake**	real	feet	1.0 to 1,000.0	5.0	**strmfl** muski
		Output options					
eq	Flag to select the output frequency; for combinations, add index numbers, e.g., daily plus yearly = 10; yearly plus total = 3 (0=none; 1=run totals; 2=yearly; 4=monthly; 8=daily; or additive combinations)	**one**	integer	none	0 to 15	3	r
pe	Flag to select the type of results written to the output file (0=measured and simulated flow only; 1=water balance table; 2=detailed output)	**one**	integer	none	0 to 2	1	r
		Subbasin parameters					
basin	Index of subbasin assigned to each HRU	**nhru**	integer	none	0 to user defined	0	**subba**
_down	Index number for the downstream subbasin whose inflow is outflow from this subbasin	**nsub**	integer	none	0 to **nsub**	0	**subba**
		Stream temperature simulation					
	Short-wave solar radiation reflected by streams	**one**	real	decimal fraction	0.0 to 1.0	0.1	**stream**
	East bank topographic altitude of each segment	**nsegment**	real	radians	0.0 to 1.570796	0.0	**stream**
	West bank topographic altitude of each segment	**nsegment**	real	radians	0.0 to 1.570796	0.0	**stream**
	Azimuth angle of each segment	**nsegment**	real	radians	-1.570796	0.0	**stream**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
					to 1.570796		
	Average residence time in groundwater flow	**nsegment**	integer	days	1 to 365	365	**stream**
_adj	Correction factor to adjust the bias of the temperature of the lateral inflow	**nsegment, nmonths**	real	decimal fraction	-5.0 to 5.0	0.0	**stream**
sntemp	Maximum number of Newton-Raphson iterations to compute stream temperature	**one**	integer	none	10 to 2000	1000	**stream**
np	Temperature at which snowmelt enters a stream	**one**	real	degrees Celsius	0.0 to 10.0	1.5	**stream**
	Segment elevation at midpoint	**nsegment**	real	meters	-1000.0 to 30000.0	0.0	**stream**
idity	Mean monthly humidity for each segment, used when values not input in CBH File	**nsegment, nmonths**	real	decimal fraction	0.0 to 1.0	0.7	**stream**
	Latitude of each segment	**nsegment**	real	degrees North	-90.0 to 90.0	40.0	**stream**
_sum	Total shade fraction for summer vegetation	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
_win	Total shade fraction for winter vegetation	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
	Average residence time of subsurface interflow	**nsegment**	integer	days	1 to 365	30	**stream**
ave_init	Initial average stream temperature in each segment at the beginning of a simulation	**nsegment**	real	degrees Celsius	-10.0 to 100.0	0.0	**stream**
	East bank average vegetation crown width for each segment	**nsegment**	real	meters	0.0 to 15.0	0.0	**stream**
	West bank average vegetation crown width for each segment	**nsegment**	real	meters	0.0 to 15.0	0.0	**stream**
	Minimum east bank vegetation density for each segment	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
	Maximum east bank vegetation density for each segment	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
	Minimum west bank vegetation density for each segment	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
	Maximum west bank vegetation density for each segment	**nsegment**	real	decimal fraction	0.0 to 1.0	0.0	**stream**
	East bank average vegetation height for each segment	**nsegment**	real	meters	0.0 to 30.0	0.0	**stream**
	West bank average vegetation height for each segment	**nsegment**	real	meters	0.0 to 30.0	0.0	**stream**
	East bank vegetation offset for each segment	**nsegment**	real	meters	0.0 to 100.0	0.0	**stream**
	West bank vegetation offset for each segment	**nsegment**	real	meters	0.0 to 100.0	0.0	**stream**
pha	Alpha coefficient in power function for width calculation	**nsegment**	real	unknown	0.0001 to 2.0	0.015	**stream**
	M value in power function for width calculation	**nsegment**	real	unknown	0.0001 to 2.0	0.015	**stream**
	Mapped results parameters						
_id[9]	Index of the grid cell associated with each gravity reservoir	**nhrucell**	integer	none	0 to **ngwcell**	0	**mapOu**
_pct[9]	Proportion of the grid cell area associated with each gravity reservoir	**nhrucell**	real	decimal fraction	0.0 to 1.0	1.0	**mapOu**

r name	Description	Dimension[1]	Type	Units	Range	Default	Require
_id[9]	Index of the HRU associated with each gravity reservoir	**nhrucell**	integer	none	0 to **nhrucell**	1	**mapOu**
_freq	Flag to specify the output frequency (0=none; 1=monthly; 2=yearly; 3=total; 4=monthly and yearly; 5=monthly, yearly, and total; 6=weekly; 7=daily)	**one**	integer	none	0 to 7	0	**mapOu**
_units	Flag to specify the output units of mapped results (0=units of the variable; 1=inches to feet; 2=inches to centimeters; 3=inches to meters; as states or fluxes)	**one**	integer	none	0 to 3	0	**mapOu**
	Number of columns for each row of the mapped results	**one**	integer	none	1 to 50000	1	**mapOu**
~~**armup**~~	~~Number of years to simulate before writing mapped results~~	~~**one**~~	~~integer~~	~~years~~	~~0 to user defined~~	~~1~~	~~**mapOu** or **nhru**~~
	Summary results CSV file parameters						
_id	USGS stream gage ID for each POI gage	**npoigages**	string	none	user defined	0	**npoig csvO**
_segment	Segment index for each POI gage	**npoigages**	integer	none	0 to **nsegment**	0	**npoig csvO**
	Type code for each POI gage (0=non-calibration gage, 1=calibration gage, 2=flow replacement gage)	**npoigages**	integer	none	1	1	**c**
	Parameters for cascading-flow simulation						
flg	Flag to indicate cascade type (0=allow many to many; 1=force one to one)	**one**	integer	none	0 or 1	0	**cascad ncasca cascad nca**
tol	Cascade area below which a cascade link is ignored	**one**	real	acres	0.0 to 7.5% of **hru_area**	5.0	**cascad ncasca cascad nca**
itch	Switch to check for circles (0=no check; 1=check)	**one**	integer	none	0 or 1	1	**cascad ncasca cascad nca**
n_id[3]	Index number of the downslope GWR to which the upslope GWR contributes flow	**ncascdgw**	integer	none	0 to **ngw**	0	**cascad** and **n**
up	Fraction of GWR area used to compute flow contributed to a downslope GWR or stream segment for cascade area	**ncascdgw**	real	decimal fraction	0.0 to 1.0	1.0	**cascad** and **n**
seg_down_id	Index number of the stream segment that cascade area contributes flow	**ncascdgw**	integer	none	0 to **nsegment**	0	**cascad** and **n**
d	Index of GWR containing cascade area	**ncascdgw**	integer	none	1 to **ngw**	0	**cascad** and **n**
n_id[4]	Index number of the downslope HRU to which the upslope HRU contributes flow	**ncascade**	integer	none	0 to **nhru**	0	**cascade nca**
_up	Fraction of HRU area used to compute flow contributed to a downslope HRU or stream segment for cascade area	**ncascade**	real	decimal fraction	0.0 to 1.0	1.0	**cascade nca**
nseg_down_id	Index number of the stream segment that cascade area contributes flow	**ncascade**	integer	none	0 to **nsegment**	0	**cascade nca**
id	Index of HRU containing cascade area	**ncascade**	integer	none	0 to **nhru**	0	**cascade nca**

[1]Dimensions defined in table 1-1.

[3] If the value of **gw_strmseg_down_id**>0 for cascade link, this value is ignored.

[4]If the value of **hru_strmseg_down_id**>0 for cascade link, this value is ignored.

[5]Parameter can be modified if the code determines an HRU is a swale, based on values of the cascade parameters.

[9]Parameter name is based on parameter of same name specified for the Groundwater and Surface-Water Flow (GSFLOW) model (Markstrom and others, 2008). Only required if the HRU map is different than the target map, that is, dimension **nhru** not equal to **ngwcell**.

Table 1-4. Time-series input variables that may be included in the Data File for the Precipitation-Runoff Modeling System, version 5 (PRMS-V).

[cfs, cubic feet per second; cms, cubic meters per second; **runoff_units**, 0=cfs; 1=cms; **precip_units**, 0=inches; 1=millimeters; **temp_units**, 0=degrees Fahrenheit; 1=degrees Celsius; >=, greater than or equal to; red text indicates new for PRMS-5.2.1; pink highlight indicates new for PRMS-5.1.0; green highlight indicates new for PRMS-5.0]

Variable	Definition	Units	Valid range	Dimension[1]
gate_ht	Height of the gate opening at each dam with a gate	inches	>=0.0	**nratetbl**
humidity	Relative humidity at each measurement station	percentage	0.0 to 1.0	**nhumid**
lake_elev	Elevation of each simulated lake surface	feet	unlimited	**nlakeelev**
pan_evap	Pan evaporation at each measurement station	inches	>=0.0	**nevap**
precip	Precipitation at each measurement station	**precip_units**	>=0.0	**nrain**
rain_day	Flag to set the form of any precipitation to rain (0=determine form; 1=rain)	none	0 or 1	**one**
runoff	Streamflow at each measurement station	**runoff_units**	>=0.0	**nobs**
snowdepth	Snow depth at each measurement station	inches	>=0.0	**nsnow**
solrad	Solar radiation at each measurement station	Langleys	>=0.0	**nsol**
tmax	Maximum air temperature at each measurement station	**temp_units**	-150.0 to 200.0	**ntemp**
tmin	Minimum air temperature at each measurement station	**temp_units**	-150.0 to 200.0	**ntemp**
wind_speed	Wind speed at each measurement station	**meters per second**	0.0 to 500.0	**nwind**

[1]Dimensions defined in table 1-1.

Table CBH (NEW). Time-series input variables that can be specified in Climate-by-HRU Files for the Precipitation-Runoff Modeling System, version 5 (PRMS-V).

[ET, evapotranspiration; **precip_units**, 0=inches; 1=millimeters; **temp_units**, 0=degrees Fahrenheit; 1=degrees Celsius; >=, greater than or equal to; red text indicates new for PRMS-5.2.1]

Variable	Definition	Units	Valid range	Dimension[1]	Used in Modules
albedo_hru	Snowpack albedo of each HRU read from CBH File	decimal fraction	0.0 to 1.0	**nhru**	snowcomp
cloud_cover_cbh	Cloud_cover of each HRU read from CBH File	decimal fraction	0.0 to 1.0	**nhru**	ccsolrad
hru_ppt	Precipitation distributed to each HRU	**precip_units**	>=0.0	**nhru**	precipitation distribution process
humidity_hru	Relative humidity of each HRU read from CBH File	percentage	0.0 to 100.0	**nhru**	potet_pm, potet_pt, and stream_temp
potet	Potential ET for each HRU	inches	>=0.0	**nhru**	potential evapotranspiration process
swrad	Shortwave radiation distributed to each HRU	Langleys	>=0.0	**nhru**	solar radiation process
tmax[2]	Maximum air temperature distributed to each HRU	**temp_units**	-150.0 to 200.0	**nhru**	temperature distribution process
tmin[3]	Minimum air temperature distributed to each HRU	**temp_units**	-150.0 to 200.0	**nhru**	temperature distribution process
transp_on	Flag indicating whether transpiration is occurring (0=no; 1=yes)	none	0 or 1	**nhru**	transpiration period process
windspeed_hru	Wind speed for each HRU read from CBH File	meters per second	>=0.0	**nhru**	potet_pm

[1]Dimensions defined in table 1-1.

[2]Values used to set *tmaxf* and *tmaxc*.

[3]Values used to set *tminf* and *tminc*.

Table 1-5. Input and output variables for the Precipitation-Runoff Modeling System, version 5 (PRMS-V).

[HRU, hydrologic response unit; GWR, groundwater reservoir; CBH, climate-by-HRU; ET, evapotranspiration; cfs: cubic feet per second; cms: cubic meters per second; >, greater than; Ngl, number of glaciers counted by termini; Ntp, number of tops of glaciers; **runoff_units**, 0=cfs; 1=cms; **precip_units**, 0=inches; 1=millimeters; **temp_units**, 0=degrees Fahrenheit; 1=degrees Celsius; control parameters **temp_module**, **precip_module**, **et_module**, **strmflow_module**, **model_mode**, **dprst_flag**, **subbasin_flag**, **cascade_flag**, and **cascadegw_flag** defined in table 1-2; green highlight indicates new for PRMS-V **water_use_flag** = 1 if **segment_transferON_OFF**=1 or **gwr_transferON_OFF**=1 or **external_transferON_OFF**=1 or **dprst_transferON_OFF**=1 or **lake_transferON_OFF**=1 or **nconsumed**>0 or **nwateruse**>0; ; red text indicates new for PRMS-5.2.1; red highlight indicates new for PRMS-5.2; pink highlight indicates new for PRMS-5.1.0; green highlight indicates new for PRMS-5.0; ~~strikethrough~~ indicates items removed]

ame	Description	Dimension[1]	Units	Data type	Availability
		Climate distribution			
eprecip	Basin area-weighted average precipitation on lake HRUs	**one**	inches	double	**nlake**
se_max	Basin area-weighted average maximum air temperature lapse rate per 1,000 feet	**one**	**temp_units**/ feet	real	**temp_module** =
se_min	Basin area-weighted average minimum air temperature lapse rate per 1,000 feet	**one**	**temp_units**/ feet	real	**temp_module** =
x_temp_mo	Monthly basin area-weighted average maximum air temperature	**one**	**temp_units**	double	alwa
x_temp_tot	Total simulation basin area-weighted average maximum air temperature	**one**	**temp_units**	double	alwa
x_temp_yr	Yearly basin area-weighted average maximum air temperature	**one**	**temp_units**	double	alwa
n_temp_mo	Monthly basin area-weighted average minimum air temperature	**one**	**temp_units**	double	alwa
n_temp_tot	Total simulation basin area-weighted average minimum air temperature	**one**	**temp_units**	double	alwa
n_temp_yr	Yearly basin area-weighted average minimum air temperature	**one**	**temp_units**	double	alwa
_ppt	Basin area-weighted average net precipitation	**one**	inches	double	alwa
_ppt_mo	Monthly basin area-weighted average net precipitation	**one**	inches	double	alwa
_ppt_yr	Yearly basin area-weighted average net precipitation	**one**	inches	double	alwa
s_ppt	Basin area-weighted measured average precipitation	**one**	inches	double	alwa
	Basin area-weighted average precipitation	**one**	inches	double	alwa
_mo	Monthly basin area-weighted average precipitation	**one**	inches	double	alwa
_tot	Total simulation basin area-weighted average precipitation	**one**	inches	double	alwa
_yr	Yearly basin area-weighted average precipitation	**one**	inches	double	alwa
n	Basin area-weighted average rainfall	**one**	inches	double	alwa
ow	Basin area-weighted average snowfall	**one**	inches	double	alwa
np	Basin area-weighted average air temperature	**one**	**temp_units**	double	alwa
ax	Basin area-weighted maximum air temperature	**one**	**temp_units**	double	alwa
n	Basin area-weighted minimum air temperature	**one**	**temp_units**	double	alwa
	Precipitation distributed to each HRU	**nhru**	inches	real	alwa
	Rain distributed to each HRU	**nhru**	inches	real	alwa
	Snow distributed to each HRU	**nhru**	inches	real	alwa
	Relative humidity at each measurement station	**nhumid**	percentage	real	**nhumi**
hru	Relative humidity for each HRU	**nhru**	percentage	real	**et_module** = p potet
ay	Flag to indicate if it is raining anywhere in the basin	**one**	none	integer	**precip_module** or xyz_
ip	Total precipitation into each lake HRU	**nlake**	cfs	double	**strmflow_** muskingu

ame	Description	Dimension[1]	Units	Data type	Availability
	Flag to indicate if new snow fell on each HRU (`0`=no; `1`=yes)	**nhru**	none	integer	alwa
	Flag to indicate if precipitation is a mixture of rain and snow for each HRU (`0`=no; `1`=yes)	**nhru**	none	integer	alwa
	Precipitation at each measurement station	**nrain**	**precip_units**	real	**nrain**
	Fraction of rain in a mixed precipitation event for each HRU	**nhru**	decimal fraction	real	alwa
ecip	Area-weighted average precipitation on associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
in	Area-weighted average rain from associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
ow	Area-weighted average snow on associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
vgc	Area-weighted average air temperature for associated HRUs to each subbasin	**nsub**	degrees Celsius	double	**subbasin_**
axc	Area-weighted average maximum air temperature for associated HRUs to each subbasin	**nsub**	degrees Celsius	double	**subbasin_**
inc	Area-weighted average minimum air temperature for associated HRUs to each subbasin	**nsub**	degrees Celsius	double	**subbasin_**
	Average air temperature distributed to each HRU	**nhru**	degrees Celsius	real	alwa
	Average air temperature distributed to each HRU	**nhru**	degrees Fahrenheit	real	alwa
	Maximum air temperature at each measurement station	**ntemp**	**temp_units**	real	**ntemp**
_sta	Maximum air temperature distributed to the precipitation stations	**nrain**	degrees Fahrenheit	real	**precip_module** or `xyz_`
	Maximum air temperature distributed to each HRU	**nhru**	degrees Celsius	real	alwa
	Maximum air temperature distributed to each HRU	**nhru**	degrees Fahrenheit	real	alwa
	Minimum air temperature at each measurement station	**ntemp**	**temp_units**	real	**ntemp**
	Minimum air temperature distributed to each HRU	**nhru**	**temp_units**	real	alwa
_sta	Minimum air temperature distributed to the precipitation measurement stations	**nrain**	degrees Fahrenheit	real	**precip_module** or `xyz_`
	Minimum air temperature distributed to each HRU	**nhru**	degrees Celsius	real	alwa
	Minimum air temperature distributed to each HRU	**nhru**	degrees Fahrenheit	real	alwa
ed	Wind speed at each measurement station	**nwind**	miles per hour	real	**nwind**
ed_hru	Wind speed for each HRU	**nhru**	miles per hour	real	**et_module** =
	Solar radiation distribution				
ud_cover	Basin area-weighted average cloud cover proportion	**one**	decimal fraction	double	**solrad_module**
rad	Potential shortwave radiation for the basin centroid	**one**	Langleys	double	alwa
d	Basin area-weighted average shortwave radiation on a horizontal surface	**one**	Langleys	double	**solrad_module** or `ddso`
sw	Basin area-weighted average shortwave radiation	**one**	Langleys	double	alwa
ladj	Basin area-weighted average potential radiation adjustment for cloud cover	**one**	decimal fraction	double	**solrad_module**
rad	Basin area-weighted average shortwave radiation	**one**	Langleys	double	alwa
ver_hru	Cloud cover proportion of each HRU	**nhru**	decimal fraction	double	**solrad_module**
ladj	Radiation adjustment for cloud cover of each HRU	**nhru**	decimal fraction	double	**solrad_module**
t	Net long-wave radiation for each HRU	**nhru**	Megajoules/m**2/day	real	**et_module** = `potet_pm` `potet`
	Measured or computed solar radiation on a horizontal surface	**one**	Langleys	real	**solrad_module** or `ddso`

ame	Description	Dimension[1]	Units	Data type	Availability
	Solar radiation on a horizontal surface for each HRU	**one**	Langleys	double	**solrad_module** or `ddsc`
rad	Area-weighted average solar radiation for each segment from HRUs contributing flow to the segment	**nsegment**	Langleys	double	**nsegme**
	Solar radiation at each measurement station	**nsol**	Langleys	real	**nsol**
ax[5]	Basin maximum air temperature for use with solar radiation calculations	**one**	**temp_units**	real	alwa
in[5]	Basin minimum air temperature for use with solar radiation calculations	**one**	**temp_units**	real	alwa
~~*rad_potsw*~~	~~Potential solar radiation on a horizontal plane for each Julian Day, for each HRU~~	~~**ndays, nhru**~~	~~Langleys~~	~~double~~	~~alwa~~
~~*tsw*~~	~~Potential solar radiation for each Julian Day, for each HRU~~	~~**ndays, nhru**~~	~~Langleys~~	~~double~~	~~alwa~~
rad	Area-weighted average shortwave radiation distributed to associated HRUs of each subbasin	**nsub**	Langleys	double	**subbasin_**
	Shortwave radiation distributed to each HRU	**nhru**	Langleys	real	alwa
		Water Use			
_apply	Basin area-weighted average *canopy_gain*	**one**	inches	double	**water_use**
_apply	Basin area-weighted average net application	**one**	inches	double	**water_use**
ain	Transfer gains to the canopy reservoir for each HRU for each time step	**nhru**	cfs	real	**water_use**
ain_tot	Transfer gains to the canopy reservoir for each HRU for the simulation	**nhru**	cfs	real	**water_use_f** **nconsum**
_gain	Transfer gains to each water-use consumption destination for each time step	**nconsumed**	cfs	real	**water_use_f** **nconsum**
_gain_tot	Transfer gains to each water-use consumption destination for the simulation	**nconsumed**	cfs	real	**water_use_f** **nconsum**
n	Transfer gains to surface-depression storage for each HRU for each time step	**nhru**	cfs	real	**dprst_transfer** and **dprst_**
n_tot	Transfer gains to surface-depression storage for each HRU for the simulation	**nhru**	cfs	real	**dprst_transfer** and **dprst_**
nsfer	Transfer flow rate from surface-depression storage for each HRU for each time step	**nhru**	cfs	real	**dprst_transfer** and **dprst_**
nsfer_tot	Transfer flow rate from surface-depression storage for each HRU for the simulation	**nhru**	cfs	real	**dprst_transfer** and **dprst_**
gain	Transfer gains to each external location for each time step	**nexternal**	cfs	real	**external_transfe** and **nexte**
gain_tot	Transfer gains to each external location for the simulation	**nexternal**	cfs	real	**external_transfe** and **nexte**
transfer	Transfer flow rate from each external location for each time step	**nexternal**	cfs	real	**external_transfe** and **nexte**
transfer_tot	Transfer flow rate from each external location for the simulation	**nexternal**	cfs	real	**external_transfe** and **nexte**
es	*canopy_gain* as depth in canopy	**nhru**	inches	real	**water_use**
es_hru	*canopy_gain* in canopy as depth over the HRU	**nhru**	inches	real	**water_use**
	Transfer gains to the groundwater reservoir of each HRU for each time step	**nhru**	cfs	real	**water_use**
_tot	Transfer gains to the groundwater reservoir of each HRU for the simulation	**nhru**	cfs	real	**water_use**
fer	Transfer flow rate from the groundwater reservoir of each HRU	**nhru**	cfs	real	**gwr_transfer**

ame	Description	Dimension[1]	Units	Data type	Availability
	for each time step				
sfer_tot	Transfer flow rate from the groundwater reservoir of each HRU for the simulation	**nhru**	cfs	real	**gwr_transferC**
	Transfer gains to each lake HRU for each time step	**nhru**	cfs	real	**water_use_f** **strmflow_** muskingu
_tot	Transfer gains to each lake HRU for the simulation	**nhru**	cfs	real	**water_use_f** **strmflow_** muskingu
sfer	Transfer flow rate from each lake HRU for each time step	**nhru**	cfs	real	**lake_transferON** **strmflow_** muskingu
sfer_tot	Transfer flow rate from each lake HRU for the simulation	**nhru**	cfs	real	**lake_transferON** **strmflow_** muskingu
	canopy_gain minus interception	**nhru**	inches	real	**water_use**
gain	Transfer gains to each stream segment for each time step	**nhru**	cfs	real	**water_use_f** **strmflow_** muski strmflow muskingum muskingu
gain _tot	Transfer gains to each stream segment for the simulation	**nhru**	cfs	real	**water_use_f** **strmflow_** muski strmflow muskingum muskingu
transfer	Transfer flow rate from each stream segment for each time step	**nhru**	cfs	real	**segment_transfe** and **strmflow** muski strmflow muskingum muskingu
transfer_tot	Transfer flow rate from each stream segment for the simulation	**nhru**	cfs	real	**segment_transfe** and **strmflow** muski strmflow muskingum muskingu
gain	Transfer gains to the capillary reservoir within the soilzone for each HRU for each time step	**nhru**	cfs	real	**water_use**
gain_hru	Irrigation added to soilzone as depth over each HRU	**nhru**	inches	real	**water_use**
gain _tot	Transfer gains to the capillary reservoir within the soilzone for each HRU for the simulation	**nhru**	cfs	real	**water_use**
opy_gain	Transfer gains to all canopy reservoirs for each time step	**one**	cfs	double	**water_use**
sumed_gain	Transfer flow rates to all water-use consumption destinations for each time step	**one**	cfs	double	**water_use**
st_gain	Transfer gains to all surface-depression storage for each time step	**one**	cfs	double	**water_use_f** **dprst_fl**

ame	Description	Dimension[1]	Units	Data type	Availability
st_transfer	Transfer flow rates from all surface-depression storage for each time step	**one**	cfs	double	**dprst_transfer** and **dprst_**
rnal_gain	Transfer gains to all external locations for each time step	**one**	cfs	double	**water_use_**
rnal_transfer	Transfer flow rates from all external locations for each time step	**one**	cfs	double	**external_transfe** and **nexte**
_gain	Transfer gains to all groundwater reservoirs for each time step	**one**	cfs	double	**water_use_**
_transfer	Transfer flow rates from all groundwater reservoirs for each time step	**one**	cfs	double	**water_use_f** **gwr_transferO**
_gain	Transfer gains to all lake HRUs for each time step	**one**	cfs	double	**water_use_f** **strmflow_** muskingu
_transfer	Transfer flow rates from all lake HRUs for each time step	**one**	cfs	double	**lake_transferON** **strmflow_** muskingu
ment_gain	Transfer gains to all stream segments for each time step	**one**	cfs	double	**water_use_f** **strmflow_** muski strmflow muskingum muskingu
ment_transfer	Transfer flow rates from all stream segments for each time step	**one**	cfs	double	**segment_transfe** and **strmflow** muski strmflow muskingum muskingu
zone_gain	Transfer gains to all capillary reservoirs for each time step	**one**	cfs	double	**water_use_**
sfers	Transfer of all water-use transfers for each time step	**one**	cfs	double	**water_use_**
rate	Transfer of each water-use transfer for each time step	**nwateruse**	cfs	double	**water_use_**
	Interception				
ngeover	Basin area-weighted average water released from a change over of canopy cover type	**one**	inches	double	alwa
cp_stor	Basin area-weighted average interception storage	**one**	inches	double	alwa
_rain	Basin area-weighted average rain net precipitation	**one**	inches	double	alwa
_snow	Basin area-weighted average snow net precipitation	**one**	inches	double	alwa
ovden	Canopy cover density for each HRU	**nhru**	decimal fraction	real	alwa
stor	Interception storage in the canopy for each HRU	**nhru**	inches	real	alwa
ngeover	Water released from a change over of canopy cover type for each HRU	**nhru**	inches	real	alwa
n	Form (0=rain; 1=snow) of interception for each HRU	**nhru**	none	integer	alwa
	Flag indicating interception storage for each HRU (`0`=no; `1`=yes)	**nhru**	none	integer	alwa
	Interception storage in canopy for cover density for each HRU	**nhru**	inches	real	alwa
	Precipitation (rain and/or snow) that falls through the canopy for each HRU	**nhru**	inches	real	alwa
	Rain that falls through canopy for each HRU	**nhru**	inches	real	alwa
	Snow that falls through canopy for each HRU	**nhru**	inches	real	alwa
	Snow computations				
	Maximum snowpack for each HRU	**nhru**	inches	real	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
	Snow surface albedo or the fraction of radiation reflected from the snowpack surface for each HRU	**nhru**	decimal fraction	real	alwa
_precip	Basin area-weighted average precipitation added to snowpack	**one**	inches	double	alwa
eqv	Basin area-weighted average snowpack water equivalent (not including glacier)	**one**	inches	double	alwa
wcov	Basin area-weighted average snow-covered area	**one**	decimal fraction	double	alwa
wmelt	Basin area-weighted average snowmelt (not on including snow on glacier)	**one**	inches	double	alwa
wmelt_mo	Monthly basin area-weighted average snowmelt	**one**	inches	double	alwa
wmelt_tot	Total simulation basin area-weighted average snowmelt	**one**	inches	double	alwa
wmelt_yr	Yearly basin area-weighted average snowmelt	**one**	inches	double	alwa
l	Basin area-weighted average net snowpack energy balance	**one**	Langleys	double	alwa
	Fraction of maximum snow-water equivalent (**snarea_thresh**) on each HRU	**nhru**	decimal fraction	real	alwa
	Storage of free liquid water in the snowpack on each HRU	**nhru**	inches	real	alwa
	Flag indicating that snow covered area is interpolated between previous location on curve and maximum (`1`), or is on the defined curve (`0`)	**nhru**	none	integer	alwa
	Flag to indicate (1: accumulation season curve; 2: use of the melt season curve)	**nhru**	none	integer	alwa
	Flag to indicate if time is before (`1`) or after (`2`) the day to force melt season (**melt_force**)	**nhru**	none	integer	alwa
	Counter for tracking the number of days the snowpack is at or above 0 degrees Celsius	**nhru**	number of iterations	integer	alwa
	Flag indicating whether there was new snow that was insufficient to reset the albedo curve (`1`) (**albset_snm** or **albset_sna**), otherwise (`0`)	**nhru**	none	integer	alwa
	Flag to indicate if time is before (`1`) or after (`2`) the first potential day for melt season (**melt_look**)	**nhru**	none	integer	alwa
	Heat deficit, amount of heat necessary to make the snowpack isothermal at 0 degrees Celsius	**nhru**	Langleys	real	alwa
	Density of the snowpack on each HRU	**nhru**	grams/cubic centimeters	real	alwa
	Depth of snowpack on each HRU	**nhru**	inches	double	alwa
	Storage of frozen water in the snowpack on each HRU	**nhru**	inches	real	alwa
	Precipitation added to snowpack for each HRU	**nhru**	inches	real	alwa
	Temperature of the snowpack on each HRU	**nhru**	**temp_units**	real	alwa
	Snowpack water equivalent when there is new snow and in melt phase; used to interpolate between depletion curve and 100 percent on each HRU	**nhru**	inches	real	alwa
nte	Antecedent snowpack water equivalent on each HRU	**nhru**	inches	double	alwa
equiv	Snowpack water equivalent on each HRU	**nhru**	inches	double	alwa
pack	Flag indicating that a mixed precipitation event has occurred with no snowpack present on an HRU (`1`), otherwise (`0`)	**nhru**	none	integer	alwa
	Previous snowpack water equivalent plus new snow	**nhru**	inches	real	alwa
	While a snowpack exists, *pst* tracks the maximum snow water equivalent of that snowpack	**nhru**	inches	real	alwa
	Days since last new snow to reset albedo for each HRU	**nhru**	days	real	alwa
	Snowpack water equivalent plus a portion of new snow on each HRU	**nhru**	inches	double	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
	Days since last new snow for each HRU	**nhru**	days	real	alwa
	Snow depth at each measurement station	**nsnow**	inches	real	**nsnow**
e	Fraction of snow-free surface for each HRU	**nhru**	decimal fraction	real	alwa
area	Snow-covered area on each HRU prior to melt and sublimation unless snowpack depleted	**nhru**	decimal fraction	real	alwa
areasv	Snow cover fraction when there is new snow and in melt phase; used to interpolate between depletion curve and 100 percent on each HRU	**nhru**	decimal fraction	real	alwa
	Snowmelt from snowpack on each HRU (not including snow on glacier)	**nhru**	inches	real	alwa
	Tracks the cumulative amount of new snow until there is enough to reset the albedo curve (**albset_snm** or **albset_sna**)	**nhru**	inches	real	alwa
weqv	Area-weighted average snowpack water equivalent from associated HRUs of each subbasin	**nsub**	inches	double	**subbasin_**
owcov	Area-weighted average snow-covered area from associated HRUs to each subbasin	**nsub**	decimal fraction	double	**subbasin_**
owmelt	Area-weighted average snowmelt from associated HRUs of each subbasin	**nsub**	inches	double	**subbasin_**
	Net snowpack energy balance on each HRU	**nhru**	Langleys	real	alwa
	Glacier and frozen ground computations				
_ela	Altitude above equilibrium line altitude (ELA)	**nhru**	**elev_units**	real	**glacier_f**
c	Current average year air temperature over each HRU	**nhru**	degrees Celsius	real	**glacier_f**
_slope	Glacier average basal slope at flowline location, indexed by *glacr_tag*	**nhru**	decimal fraction	real	**glacier_f**
	Glacier average HRU mass balance gradient with elevation at flowline at end of each hydrological year, Ngl of these	**nhru**	decimal fraction	real	**glacier_f**
v	Glacier basal elevation mean over HRU	**nhru**	**elev_units**	real	**glacier_f**
pe	Glacier basal slope down flowline mean over each HRU	**nhru**	decimal fraction	real	**glacier_f**
area	Basin area-weighted average glacier-covered area	**one**	decimal fraction	double	**glacier_f**
cfs	Basin glacier surface melt (rain, snow, ice) leaving the basin through the stream network	**one**	cfs	double	**glacier_f**
ice_melt	Basin area-weighted glacier ice (firn) melt coming out of termini of all glaciers and glacierettes	**one**	inches	double	**glacier_f**
storage	Basin area-weighted average storage change in glacier reservoirs	**one**	inches	double	**glacier_f**
storstart	Basin area-weighted average storage estimated start in glacier reservoirs	**one**	inches	double	**glacier_f**
storvol	Basin storage volume in glacier storage reservoirs	**one**	acre-inches	double	**glacier_f**
top_gain	Basin area-weighted glacier surface gain (snow and rain minus evaporation) for all glaciers and glacierettes	**one**	inches	double	**glacier_f**
top_melt	Basin area-weighted glacier surface melt (snow, ice and rain) coming out of termini of all glaciers and glacierettes	**one**	inches	double	**glacier_f**
crb_melt	Basin area-weighted average basal melt of glacier, goes to soil	**one**	inches	double	**glacier_f**
crevap	Basin area-weighted average glacier ice evaporation and sublimation	**one**	inches	double	**glacier_f**
wicecov	Basin area-weighted average snow and glacier and glacierette covered area	**one**	decimal fraction	double	**glacier_f**
	Continuous Frozen Ground Index for each HRU	**nhru**	none	integer	**frozen_f**
	Continuous Frozen Ground Index from previous time step for each HRU	**nhru**	none	integer	**frozen_f**

ame	Description	Dimension[1]	Units	Data type	Availability
r	Year total volume change for each glacier, indexed by *glacr_tag* for each HRU	**nhru**	inches cubed	double	**glacier_f**
	HRU number at ELA corresponding to each top in each glacier (Ntp)	**nhru**	none	integer	**glacier_f**
	Flag for frozen ground for each HRU (0=no; 1=yes)	**nhru**	none	integer	**frozen_f**
	Area of each glacier, indexed by *glacr_tag*	**nhru**	acres	double	**glacier_f**
elt	Amount of glacier ice (firn) melt coming out of terminus of glacier, indexed by *glacr_tag*	**nhru**	inches	real	**glacier_f**
mul	Cumulative mass balance for each glacier since start day, indexed by *glacr_tag*	**nhru**	inches	double	**glacier_f**
cumul	Yearly mass balance for each glacier, indexed by *glacr_tag*	**nhru**	inches	real	**glacier_f**
elt	Amount of glacier surface melt (snow, ice, rain) coming out of terminus of glacier, indexed by *glacr_tag*	**nhru**	inches	real	**glacier_f**
ac	Fraction of glaciation (0=none; 1=100%)	**nhru**	decimal fraction	real	**glacier_f**
snow	Current 5-yr average snow over glacier or glacierette HRUs	**nhru**	inches/year	real	**glacier_f**
snow1	First 5-yr average snow over glacier or glacierette HRUs	**nhru**	inches/year	real	**glacier_f**
_5avtemp	Current 5-yr average summer (June July Aug) air temperature over glacier or glacierette HRUs	**nhru**	degrees Celsius	real	**glacier_f**
_5avtemp1	First 5-yr average summer temperature over glacier or glacierette HRUs	**nhru**	degrees Celsius	real	**glacier_f**
_deltemp	Change in 5-yr average air temperature over glacier or glacierette HRUs from first time step	**nhru**	degrees Celsius	real	**glacier_f**
edo	Ice surface albedo or the fraction of radiation reflected from the icepack surface for each glacier HRU	**nhru**	decimal fraction	real	**glacier_f**
snow	Change in 5-yr average snow over glacier or glacierette for each HRU from first time step	**nhru**	inches/year	real	**glacier_f**
_init	Glacier surface elevation mean over each HRU at initiation extrapolating to 100% glacierized HRU	**nhru**	**elev_units**	real	**glacier_f**
p	Evaporation and sublimation from icepack on each glacier HRU	**nhru**	inches	real	**glacier_f**
v	Glacier melt and rain from HRU to stream network, only nonzero at termini HRUs and snowfield HRUs	**nhru**	inches cubed	real	**glacier_f**
eh2o	Storage of free liquid water in the icepack on each glacier HRU	**nhru**	inches	real	**glacier_f**
eh2o_capm	Free-water holding capacity of glacier ice, changes to 0 if active layer melts	**nhru**	decimal fraction	real	**glacier_f**
def	Heat deficit, amount of heat necessary to make the glacier snowpack isothermal at 0 degrees Celsius	**nhru**	Langleys	real	**glacier_f**
den	Density of the icepack on each glacier HRU, hard coded to equal 0.917	**nhru**	gm/cm3	real	**glacier_f**
depth	Depth of icepack on each glacier HRU, make essentially infinite	**nhru**	inches	double	**glacier_f**
ice	Storage of frozen water in the icepack on each glacier HRU	**nhru**	inches	real	**glacier_f**
temp	Temperature of the glacier on each HRU	**nhru**	degrees Celsius	real	**glacier_f**
ater_ante	Antecedent icepack water equivalent on each glacier HRU	**nhru**	inches	double	**glacier_f**
ater_equiv	Icepack water equivalent on each glacier HRU	**nhru**	inches	double	**glacier_f**
	Previous glacier pack water equivalent plus new ice	**nhru**	inches	double	**glacier_f**
	While an icepack exists, *glacr_pst* tracks the maximum ice water equivalent of that icepack	**nhru**	inches	double	**glacier_f**
e_init	Glacier surface slope mean over HRU at initiation extrapolating to 100% glacierized HRU	**nhru**	**elev_units**	real	**glacier_f**
	Identifies which glacier each HRU belongs to	**nhru**	none	integer	**glacier_f**

ame	Description	Dimension[1]	Units	Data type	Availability
elt	Glacier basal melt, goes to soil	**nhru**	inches/day	real	**glacier_f**
area	Ice-covered area (no snowpack) on each glacier HRU or HRU with glacierette at start of time step	**nhru**	decimal fraction	real	**glacier_f**
	Melt from icepack on each glacier HRU, includes rain water that does not absorb	**nhru**	inches	real	**glacier_f**
delta	Sum of area change of each glacier since start year, indexed by *glacr_tag*	**nhru**	acres	double	**glacier_f**
ac	Fraction of snow field (too small for glacier dynamics)	**nhru**	decimal fraction	real	**glacier_f**
elt	Amount of glacierette surface melt (snow, ice, rain) from an HRU	**nhru**	inches	real	**glacier_f**
ts	HRU elevation for timestep, which can change for glaciers; used in computations in modules: `ide_dist`, `xyz_dist`, `precip_laps`, `temp_1sta`, `temp_laps`, and `temp_dist2`	**nhru**	**elev_units**	real	**glacier_f**
_melt	Amount of glacier surface melt (snow, ice, rain) from an HRU that goes into reservoirs	**nhru**	inches	real	**glacier_f**
rcumul	Mass balance for a glacier HRU, cumulative for year	**nhru**	inches	double	**glacier_f**
rend	Glacier HRU mass balance at end of previous hydrological year	**nhru**	inches	real	**glacier_f**
_ts	HRU slope for timestep, which can change for glaciers	**nhru**	decimal fraction	real	**glacier_f**
	Glacier integer variables keeping from first year	**nhru**	none	integer	**glacier_f**
	Glacier real variables keeping from first year	**nhru**	none	integer	**glacier_f**
	Number of at least partially glacierized HRUs at initiation	**nhru**	none	integer	**glacier_f**
va_coef	Estimate of **glacrva_coef** from ODE basal topography of each glacier, indexed by *glacr_tag*		m**(3-2***glacrva_exp**)	real	**glacier_f**
wline	Order of flowlines that belong together as glaciers, Ntp of these	**nhru**	none	integer	**glacier_f**
l	Previous year glacier-covered area above each HRU where all branches of the glacier are included	**nhru, nglres**	inches squared	real	**glacier_f**
	Antecedent outflow of the 3 reservoirs in each glacier, indexed by *glacr_tag*	**nhru**	inches cubed	real	**glacier_f**
	Antecedent outflow of the 3 reservoirs in each glacier for only ice (firn) melt, indexed by *glacr_tag*	**nhru**	inches cubed	real	**glacier_f**
	Previous volume of each glacier, indexed by *glacr_tag*	**nhru**	inches cubed	real	**glacier_f**
	HRU number at terminus of each glacier, Ngl of these	**nhru**	none	integer	**glacier_f**
	HRU number at tops of each glacier, Ntp of these	**nhru**	none	integer	**glacier_f**
	Identifies which glacier top each HRU is fed by. If = -1, then has multiple feeders	**nhru**	none	integer	**glacier_f**
	Number of days since last 5-year mark	**nhru**	days	integer	**glacier_f**
	Evapotranspiration				
et	Basin area-weighted average actual ET	**one**	inches	double	Alwa
et_mo	Monthly basin area-weighted average actual ET	**one**	inches	double	Alwa
et_tot	Total simulation basin area-weighted average actual ET	**one**	inches	double	alwa
et_yr	Yearly basin area-weighted average actual ET	**one**	inches	double	alwa
rst_evap	Basin area-weighted average evaporation from surface depression storage	**one**	inches	double	**dprst_fl**
_frost	Basin area-weighted average fall frost	**one**	**solar date**	real	**model_mod**
midity	Basin area-weighted average humidity	**one**	percentage	double	**et_module** = `potet_pm` `potet`
perv_evap	Basin area-weighted average evaporation from impervious area	**one**	inches	double	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
eevap	Basin area-weighted average lake evaporation	**one**	inches	double	**nlake**
cp_evap	Basin area-weighted evaporation from the canopy	**one**	inches	double	alwa
cp_evap_mo	Monthly basin area-weighted average interception evaporation	**one**	inches	double	alwa
cp_evap_tot	Total simulation basin area-weighted average interception evaporation	**one**	inches	double	alwa
cp_evap_yr	Yearly basin area-weighted average interception evaporation	**one**	inches	double	alwa
v_et	Basin area-weighted average ET from capillary reservoirs	**one**	inches	double	alwa
et	Basin area-weighted average potential ET	**one**	inches	double	alwa
et_mo	Monthly area-weighted average potential ET	**one**	inches	double	alwa
et_tot	Total simulation area-weighted average potential ET	**one**	inches	double	alwa
et_yr	Yearly area-weighted average potential ET	**one**	inches	double	alwa
owevap	Basin area-weighted average evaporation and sublimation from snowpack (not including glacier)	**one**	inches	double	alwa
ing_frost	Basin area-weighted average spring frost	**one**	**solar date**	real	**model_mod**
ale_et	Basin area-weighted average ET from swale HRUs	**one**	inches	double	alwa
nsp_on	Flag indicating whether transpiration is occurring anywhere in the basin (`0`=no; `1`=yes)	**one**	none	integer	alwa
dspeed	Basin area-weighted average wind speed	**one**	meters per second	double	**et_module** = `p` `potet_p`
p_hru	Evaporation from surface-depression storage for each HRU	**nhru**	inches	real	**dprst_fl**
	The solar date (number of days after winter solstice) of the first killing frost of the fall	**nhru**	**solar date**	real	**model_mod**
	Actual ET for each HRU	**nhru**	inches	real	alwa
	Yearly area-weighted average actual ET for each HRU	**nhru**	inches	double	**print_fr**
evap	Evaporation from the canopy for each HRU	**nhru**	inches	real	alwa
vap	Evaporation from impervious area for each HRU	**nhru**	inches	real	alwa
p	Evaporation from the canopy for each HRU	**nhru**	inches	real	alwa
	Total evaporation from each lake HRU	**nlake**	cfs	double	**nlake**
	Pan evaporation at each measurement station	**nevap**	inches	real	**nevap**
t	Actual ET from the capillary reservoir of each HRU	**nhru**	inches	real	alwa
	Potential ET for each HRU	**nhru**	inches	real	alwa
er	Potential ET in the lower zone of the capillary reservoir for each HRU	**nhru**	inches	real	alwa
hr	Potential ET in the recharge zone of the capillary reservoir for each HRU	**nhru**	inches	real	alwa
~~*l_et*~~	~~Unsatisfied ET available to the capillary reservoir of each HRU~~	~~**nhru**~~	~~inches~~	~~real~~	~~alwa~~
otet	Area-weighted average potential ET for each segment from HRUs contributing flow to the segment	**nsegment**	inches	double	**strmflow_** `muski` `strmflow_` `muskingum` `muskingu`
p	Evaporation and sublimation from snowpack on each HRU	**nhru**	inches	real	alwa
ost	The solar date (number of days after winter solstice) of the last killing frost of the spring	**nhru**	**solar date**	real	**model_mod**
tet	Area-weighted average actual ET from associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
otet	Area-weighted average potential ET from associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
et	Evaporation from the gravity and preferential-flow reservoirs	**nhru**	inches	real	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
	that exceeds **sat_threshold**				
wpt	Air temperature at dew point for each HRU	**nhru**	degrees Celsius	real	**et_module** = potet_pm potet
n	Flag indicating whether transpiration is occurring (0=no; 1=yes)	**nhru**	none	integer	alwa
otet	Unsatisfied potential evapotranspiration	**nhru**	inches	real	alwa
	Actual vapor pressure for each HRU	**nhru**	kilopascals	real	**et_module** = potet_pm potet
	Saturation vapor pressure for each HRU	**nhru**	kilopascals	real	**et_module** = potet_pm potet
	Slope of saturation vapor pressure versus air temperature curve for each HRU	**nhru**	kilopascals/degrees Celsius	real	**et_module** = potet_pm potet
	Hortonian surface runoff, infiltration, and impervious storage				
p_infil_tot	Basin area-weighted average infiltration with cascading flow into capillary reservoirs	**one**	inches	double	alwa
~~*w_max*~~	~~Maximum infiltration and any cascading interflow and Dunnian surface runoff that can be added to capillary reservoir storage for each HRU~~	~~**nhru**~~	~~inches~~	~~real~~	~~alwa~~
rin	Infiltration and any cascading interflow and Dunnian surface runoff added to capillary reservoir storage for each HRU	**nhru**	inches	real	alwa
~~*dunnianflow*~~	~~Cascading Dunnian flow for each HRU~~	~~**nhru**~~	~~inches~~	~~real~~	~~**cascade_fla ncascad**~~
~~*nterflow*~~	~~Cascading interflow for each HRU~~	~~**nhru**~~	~~inches~~	~~real~~	~~**cascade_fla ncascad**~~
ntrib_fraction	Basin area-weighted average contributing area of the pervious area of each HRU	**one**	decimal fraction	double	alwa
rtonian	Basin area-weighted average Hortonian runoff	**one**	inches	double	alwa
rtonian_lakes	Basin area-weighted average Hortonian surface runoff to lakes	**one**	inches	double	**cascade_fla ncascad**
perv_stor	Basin area-weighted average storage on impervious area	**one**	inches	double	alwa
l	Basin area-weighted average infiltration to the capillary reservoirs	**one**	inches	double	alwa
ff	Basin area-weighted average surface runoff to the stream network	**one**	inches	double	alwa
ff_cfs	Basin area-weighted average surface runoff to the stream network	**one**	cfs	double	alwa
ff_down	Basin area-weighted average cascading surface runoff	**one**	inches	double	**cascade_fla ncascad**
ff_mo	Monthly basin area-weighted average surface runoff	**one**	inches	double	alwa
ff_tot	Total simulation basin area-weighted average surface runoff	**one**	inches	double	alwa
ff_upslope	Basin area-weighted average cascading surface runoff received from upslope HRUs	**one**	inches	double	**cascade_fla ncascad**
ff_yr	Yearly basin area-weighted average surface runoff	**one**	inches	double	alwa
ffi	Basin area-weighted average surface runoff from impervious areas	**one**	inches	double	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
ffp	Basin area-weighted average surface runoff from pervious areas	**one**	inches	double	alwa
raction	Contributing area of each HRU pervious area	**nhru**	decimal fraction	real	alwa
_flow	Hortonian surface runoff reaching stream network for each HRU	**nhru**	inches	real	alwa
_lakes	Surface runoff to lakes for each HRU	**nhru**	inches	double	**cascade_flag** = 0, and **nl**
~~*perv*~~	~~Fraction of HRU that is pervious~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
_cascflow	Cascading Hortonian surface runoff leaving each HRU	**nhru**	inches	double	**cascade_fla** **ncascad**
rv	Area of HRU that is impervious	**nhru**	acres	real	alwa
rvstor	Storage on impervious area for each HRU	**nhru**	inches	real	alwa
	Area of HRU that is pervious	**nhru**	acres	real	alwa
	Surface runoff from impervious areas for each HRU	**nhru**	inches	real	alwa
p	Surface runoff from pervious areas for each HRU	**nhru**	inches	real	alwa
or	Storage on impervious area for each HRU	**nhru**	inches	real	alwa
	Infiltration to the capillary reservoir for each HRU	**nhru**	inches	real	alwa
off	Area-weighted average surface runoff for each segment from HRUs contributing flow to the segment	**nsegment**	cfs	double	**nsegme**
	Surface runoff to the stream network for each HRU	**nhru**	inches	real	alwa
	Area-weighted average Hortonian plus Dunnian surface runoff from associated HRUs to each subbasin and from upstream subbasins	**nsub**	cfs	double	**subbasin_**
off	Area-weighted average Hortonian plus Dunnian surface runoff from associated HRUs to each subbasin	**nsub**	cfs	double	**subbasin_**
hortonian	Hortonian surface runoff received from upslope HRUs	**nhru**	inches	double	**cascade_fla** **ncascad**
		Surface depression storage			
rst_seep	Basin area-weighted average seepage surface-depression storage	**one**	inches	double	**dprst_fl**
rst_sroff	Basin area-weighted average surface runoff from open surface-depression storage	**one**	inches	double	**dprst_fl**
rst_volcl	Basin area-weighted average storage volume in closed surface depressions	**one**	inches	double	**dprst_fl**
rst_volop	Basin area-weighted average storage volume in open surface depressions	**one**	inches	double	**dprst_fl**
a_clos	Surface area of closed surface depressions based on volume for each HRU	**nhru**	acres	real	**dprst_fl**
a_clos_max	Aggregate sum of closed surface-depression storage areas of each HRU	**nhru**	acres	real	**dprst_fl**
a_max	Aggregate sum of surface-depression storage areas of each HRU	**nhru**	acres	real	**dprst_fl**
a_open	Surface area of open surface depressions based on volume for each HRU	**nhru**	acres	real	**dprst_fl**
a_open_max	Aggregate sum of open surface-depression storage areas of each HRU	**nhru**	acres	real	**dprst_fl**
roff_hru	Surface runoff from pervious and impervious portions into surface depression storage for each HRU	**nhru**	inches	real	**dprst_fl**
p_hru	Seepage from surface-depression storage to associated GWR for each HRU	**nhru**	inches	double	**dprst_fl**
ff_hru	Surface runoff from open surface-depression storage for each	**nhru**	inches	double	**dprst_fl**

ame	Description	Dimension[1]	Units	Data type	Availability
	HRU				
_hru	Surface-depression storage for each HRU	**nhru**	inches	double	**dprst_fl**
_clos	Storage volume in closed surface depressions for each HRU	**nhru**	acre-inches	double	**dprst_fl**
_clos_frac	Fraction of closed surface-depression storage of the maximum storage for each HRU	**nhru**	decimal fraction	double	**dprst_fl**
_frac	Fraction of surface-depression storage of the maximum storage for each HRU	**nhru**	decimal fraction	double	**dprst_fl**
_open	Storage volume in open surface depressions for each HRU	**nhru**	acre-inches	double	**dprst_fl**
_open_frac	Fraction of open surface-depression storage of the maximum storage for each HRU	**nhru**	decimal fraction	double	**dprst_fl**
	Soil zone storage, interflow, gravity drainage, Dunnian surface runoff				
_infil_tot	Basin area-weighted average infiltration with cascading flow into capillary reservoirs	**one**	inches	double	alwa
_up_max	Basin area-weighted average maximum cascade flow that flows to capillary reservoirs	**one**	inches	double	**cascade_fla** **ncascad**
waterin	Basin area-weighted average infiltration and any cascading interflow and Dunnian flow added to capillary reservoir storage	**one**	inches	double	alwa
_stor_frac	Basin area-weighted average fraction of capillary reservoir storage of the maximum storage	**one**	decimal fraction	double	alwa
cascadeflow	Basin area-weighted average cascading interflow and Dunnian surface runoff	**one**	inches	double	**cascade_fla** **ncascad**
dunnianflow	Basin area-weighted average cascading Dunnian flow	**one**	inches	double	**cascade_fla** **ncascad**
nterflow	Basin area-weighted average cascading interflow	**one**	inches	double	**cascade_fla** **ncascad**
nian	Basin area-weighted average Dunnian surface runoff that flows to the stream network	**one**	inches	double	alwa
nian_gvr	Basin area-weighted average excess flow to preferential-flow reservoirs from gravity reservoirs	**one**	inches	double	alwa
nian_pfr	Basin area-weighted average excess infiltration to preferential-flow reservoirs from variable *infil*	**one**	inches	double	alwa
nianflow	Basin area-weighted average cascading Dunnian flow	**one**	inches	double	alwa
2pfr	Basin area-weighted average excess flow to preferential-flow reservoir storage from gravity reservoirs	**one**	inches	double	alwa
_stor_frac	Basin area-weighted average fraction of gravity reservoir storage of the maximum storage	**one**	decimal fraction	double	alwa
erflow_max	Basin area-weighted average maximum interflow that flows from gravity reservoirs	**one**	inches	double	alwa
einsz	Basin area-weighted average lake inflow from land HRUs	**one**	inches	double	**cascade_flag** = 0, and **nl**
_stor_frac	Basin area-weighted average fraction of preferential-flow reservoir storage of the maximum storage	**one**	decimal fraction	double	alwa
f_flow_infil	Basin area-weighted average infiltration to preferential-flow reservoir storage	**one**	inches	double	alwa
f_stor	Basin area-weighted average storage in preferential-flow reservoirs	**one**	inches	double	alwa
fflow	Basin area-weighted average interflow from preferential-flow reservoirs to the stream network	**one**	inches	double	alwa
harge	Basin area-weighted average recharge to GWRs	**one**	inches	double	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
wflow	Basin area-weighted average interflow from gravity reservoirs to the stream network	**one**	inches	double	alwa
or	Basin area-weighted average storage of gravity reservoirs	**one**	inches	double	alwa
2gvr	Basin area-weighted average excess flow from capillary reservoirs to gravity reservoir storage	**one**	inches	double	alwa
2gvr_maxin	Basin area-weighted average maximum excess flow from capillary reservoirs that flows to gravity reservoirs	**one**	inches	double	alwa
l_lower_stor_frac	Basin area-weighted average fraction of soil lower zone storage of the maximum storage	**one**	decimal fraction	double	alwa
l_moist	Basin area-weighted average capillary reservoir storage	**one**	inches	double	alwa
l_moist_tot	Basin area-weighted average total soil-zone water storage	**one**	inches	double	alwa
l_rechr	Basin area-weighted average storage for recharge zone; upper portion of capillary reservoir where both evaporation and transpiration occurs	**one**	inches	double	alwa
l_rechr_stor_frac	Basin area-weighted average fraction of soil recharge zone storage of the maximum storage	**one**	decimal fraction	double	alwa
l_to_gw	Basin area-weighted average excess flow to capillary reservoirs that drains to GWRs	**one**	inches	double	alwa
ow	Basin area-weighted average interflow from gravity and preferential-flow reservoirs to the stream network	**one**	inches	double	alwa
ow_cfs	Basin area-weighted average interflow from gravity and preferential-flow reservoirs to the stream network	**one**	cfs	double	alwa
ow_mo	Monthly basin area-weighted average interflow	**one**	inches	double	alwa
ow_tot	Simulation total basin area-weighted average interflow	**one**	inches	double	alwa
ow_yr	Yearly basin area-weighted average interflow	**one**	inches	double	alwa
n	Basin area-weighted average inflow to gravity and preferential-flow reservoir storage	**one**	inches	double	alwa
tor	Basin area-weighted average gravity and preferential-flow reservoir storage	**one**	inches	double	alwa
gw	Basin area-weighted average drainage from gravity reservoirs to GWRs	**one**	inches	double	alwa
stor_frac	Basin area-weighted average fraction of soil zone storage of the maximum storage	**one**	decimal fraction	double	alwa
tot	Infiltration and cascading interflow and Dunnian flow added to capillary reservoir storage for each HRU	**nhru**	inches	real	alwa
rin	Infiltration and any cascading interflow and Dunnian surface runoff added to capillary reservoir storage for each HRU	**nhru**	inches	real	alwa
~~*frac*~~	~~Fraction of capillary reservoir storage of the maximum storage for each HRU~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
flow	Dunnian surface runoff that flows to the stream network for each HRU	**nhru**	inches	real	alwa
~~*frac*~~	~~Fraction of gravity reservoir storage of the maximum storage for each HRU~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
scadeflow	Cascading interflow and Dunnian surface runoff from each HRU	**nhru**	inches	real	**cascade_fla ncascac**
~~*max*~~	~~Maximum interflow for each HRU~~	~~**nhru**~~	~~inches~~	~~real~~	~~alwa~~
~~*rac*~~	~~Fraction of preferential flow reservoir storage of the maximum storage for each HRU~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
	Interflow from the preferential-flow reservoir that flows to the stream network for each HRU	**nhru**	inches	real	alwa
_in	Infiltration and flow from gravity reservoir storage to the	**nhru**	inches	real	alwa

ame	Description	Dimension[1]	Units	Data type	Availability
	preferential-flow reservoir				
_infil	Infiltration to the preferential-flow reservoir storage for each HRU	**nhru**	inches	real	alwa
_max	Maximum storage of the preferential-flow reservoir for each HRU	**nhru**	inches	real	alwa
_stor	Storage in preferential-flow reservoir for each HRU	**nhru**	inches	real	alwa
_thrsh	Soil storage threshold defining storage between field capacity and maximum soil saturation minus the any' preferential-flow storage	**nhru**	inches	real	alwa
	Recharge to the associated GWR as the sum of *soil_to_gw*, *ssr_to_gw*, and *dprst_seep_hru* for each HRU	**nhru**	inches	real	alwa
flow	Area-weighted average interflow for each segment from HRUs contributing flow to the segment	**nsegment**	cfs	double	**nsegme**
,	Interflow from gravity reservoir that flows to the stream network for each HRU	**nhru**	inches	real	alwa
	Storage of gravity reservoir for each HRU	**nhru**	inches	real	alwa
r	Storage in the lower zone of the capillary reservoir that is only available for transpiration for each HRU	**nhru**	inches	real	alwa
r_ratio	Water content ratio in the lower zone of the capillary reservoir for each HRU	**nhru**	decimal fraction	real	alwa
t	Storage of capillary reservoir for each HRU	**nhru**	inches	real	alwa
~~*t_frac*~~	~~Fraction soil zone storage of the maximum storage for each HRU~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
t_tot	Total soil-zone storage (*soil_moist* + *ssres_stor*) for each HRU	**nhru**	inches	real	alwa
r	Storage for recharge zone (upper portion) of the capillary reservoir that is available for both evaporation and transpiration	**nhru**	inches	real	alwa
~~*r_ratio*~~	~~Water content ration in the recharge zone of the capillary reservoir for each HRU~~	~~**nhru**~~	~~decimal fraction~~	~~real~~	~~alwa~~
rated	Flag set if infiltration saturates capillary reservoir (0=no, 1=yes)	**nhru**	none	integer	alwa
w	Portion of excess flow to the capillary reservoir that drains to the associated GWR for each HRU	**nhru**	inches	real	alwa
r	Portion of excess flow to the capillary reservoir that flows to the gravity reservoir for each HRU	**nhru**	inches	real	alwa
~~*_max*~~	~~Maximum storage of all soil zone reservoirs~~	~~**nhru**~~	~~inches~~	~~real~~	~~alwa~~
,	Drainage from the gravity-reservoir to the associated GWR for each HRU	**nssr**	inches	real	alwa
v	Interflow from gravity and preferential-flow reservoirs to the stream network for each HRU	**nssr**	inches	real	alwa
	Inflow to the gravity and preferential-flow reservoirs for each HRU	**nssr**	inches	real	alwa
r	Storage in the gravity and preferential-flow reservoirs for each HRU	**nssr**	inches	real	alwa
flow	Area-weighted average interflow from associated HRUs to each subbasin and from upstream subbasins	**nsub**	cfs	double	**subbasin_**
pstor_frac	Area-weighted average fraction of capillary reservoir water content storage for associated HRUs of each subbasin	**nsub**	decimal fraction	double	**subbasin_**
terflow	Area-weighted average interflow from associated HRUs to each subbasin	**nsub**	cfs	double	**subbasin_**
charge	Area-weighted average recharge from associated HRUs to each subbasin	**nsub**	inches	double	**subbasin_**
stor_frac	Area-weighted average fraction of soil-zone water content	**nsub**	decimal fraction	double	**subbasin_**

ame	Description	Dimension[1]	Units	Data type	Availability
	storage for associated HRUs of each subbasin				
lunnianflow	Cascading Dunnian surface runoff that flows to the capillary reservoir of each downslope HRU for each upslope HRU	**nhru**	inches	double	**cascade_fla ncascac**
nterflow	Cascading interflow runoff that flows to the capillary reservoir of each downslope HRU for each upslope HRU	**nhru**	inches	double	**cascade_fla ncascac**
	Groundwater flow				
flow	Basin area-weighted average groundwater flow to the stream network	**one**	inches	double	alwa
flow_cfs	Basin area-weighted average groundwater flow to the stream network	**one**	cfs	double	alwa
flow_mo	Monthly basin area-weighted average groundwater discharge	**one**	inches	double	alwa
flow_tot	Total simulation basin area-weighted average groundwater discharge	**one**	inches	double	alwa
flow_yr	Yearly basin area-weighted average groundwater discharge	**one**	inches	double	alwa
in	Basin area-weighted average inflow to GWRs	**one**	inches	double	alwa
sink	Basin area-weighted average GWR outflow to the groundwater sink	**one**	inches	double	alwa
stor	Basin area-weighted average storage in GWRs	**one**	inches	double	alwa
stor_minarea_wb	Basin area-weighted average storage added to each GWR when storage is less than **gwstor_min**	**one**	inches	double	alwa
pe	Groundwater flow received from upslope GWRs for each GWR	**ngw**	acre-inches	double	**cascadegw_fl ncascdg**
w	Groundwater discharge from each GWR to the stream network	**ngw**	inches	real	alwa
	Total inflow to each GWR from associated capillary and gravity reservoirs	**ngw**	acre-inches	double	alwa
k	Outflow from GWRs to the groundwater sink; water is considered underflow or flow to deep aquifers and does not flow to the stream network	**ngw**	inches	real	alwa
r	Storage in each GWR	**ngw**	inches	double	alwa
inarea_wb	Storage added to each GWR when storage is less than **gwstor_min**	**ngw**	inches	double	alwa
ascadeflow	Cascading groundwater flow from each GWR	**ngw**	inches	double	**cascadegw_fl ncascdg**
flow	Groundwater flow received from upslope GWRs for each Lake GWR	**nlake**	acre-inches	double	**nlake**
vflow	Area-weighted average groundwater discharge for each segment from HRUs contributing flow to the segment	**nsegment**	cfs	double	**nsegme**
ow	Area-weighted average groundwater discharge from associated GWRs to each subbasin and from upstream subbasins	**nsub**	cfs	double	**subbasin_**
vflow	Area-weighted average groundwater discharge from associated GWRs to each subbasin	**nsub**	cfs	double	**subbasin_**
	Streamflow				
	Streamflow leaving the basin through the stream network	**one**	cfs	double	alwa
_mo	Monthly total streamflow to stream network	**one**	cfs	double	**print_del**
_tot	Total simulation basin area-weighted average streamflow	**one**	cfs	double	**print_del**
_yr	Yearly total streamflow to stream network	**one**	cfs	double	**print_del**
s	Streamflow leaving the basin through the stream network	**one**	cms	double	alwa
off_ratio	Basin area-weighted average discharge/precipitation ratio	**one**	decimal fraction	double	**print_del**
off_ratio_mo	Monthly area-weighted average discharge/precipitation ratio	**one**	decimal fraction	double	**print_del**

ame	Description	Dimension[1]	Units	Data type	Availability
ment_storage	Basin area-weighted average storage in the stream network	**one**	inches	double	**strmflow_** muski muskingum muskingu
ow_in	Basin area-weighted average lateral flow entering the stream network	**one**	inches	double	alwa
ow_mo	Monthly basin area-weighted average simulated streamflow	**one**	inches	double	**print_del**
ow_out	Basin area-weighted average streamflow leaving through the stream network	**one**	inches	double	**print_del**
ow_tot	Total simulation basin area-weighted average simulated streamflow	**one**	inches	double	**print_del**
ow_yr	Yearly basin area-weighted average simulated streamflow	**one**	inches	double	**print_del**
lwater	Total flow out of headwater segments (**segment_type**=1)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
reat_lakes	Total flow into model domain from Great Lakes (**segment_type**=10)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
ation	Total flow into model domain from Mexico or Canada (**segment_type**=4)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
egion	Total flow into region (**segment_type**=6)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
	Total flow out of model domain	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
NHM	Total flow out of model domain to Mexico or Canada (**segment_type**=5)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
region	Total flow out of region (**segment_type**=7)	**one**	cfs	double	**strmflow_** muski strmflow muskingum muskingu
acement	Total flow out from replacement flow (**segment_type**=3)	**one**	cfs	double	**strmflow_** muski strmflow

ame	Description	Dimension[1]	Units	Data type	Availability
inus	Total flow to terminus segments (**segment_type**=9)	**one**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
reat_lakes	Total flow to Great Lakes (**segment_type**=11)	**one**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
akes	Total flow to lakes (**segment_type**=2)	**one**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
cean	Total flow to oceans (**segment_type**=8)	**one**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
ow	Total flow leaving each HRU	**nhru**	cfs	double	muskingum muskingu alwa
mflow_out	Total flow to stream network from each HRU	**nhru**	cfs	double	alwa
f_mo	Monthly measured streamflow at basin outlet	**one**	cfs	double	**print_del**
f_tot	Total simulation measured streamflow at basin outlet	**one**	cfs	double	**print_del**
f_yr	Yearly measured streamflow at basin outlet	**one**	cfs	double	**print_del**
es	Measured streamflow at specified outlet station	**one**	inches	double	**print_del**
es_mo	Monthly measured streamflow at specified outlet station	**one**	inches	double	**print_del**
es_tot	Total simulation basin area-weighted average measured streamflow at specified outlet station	**one**	inches	double	**print_del**
es_yr	Yearly measured streamflow at specified outlet station	**one**	inches	double	**print_del**
	Streamflow at each measurement station	**nobs**	**runoff_units**	real	**nobs**
ow	Area-weighted average groundwater discharge for each segment from HRUs contributing flow to the segment and upstream HRUs	**nsegment**	inches	double	**strmflow_** muski strmflow_
v	Total flow entering a segment	**nsegment**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
al_inflow	Lateral inflow entering a segment	**nsegment**	cfs	double	muskingum muskingu **strmflow_** muski strmflow_
ow	Streamflow leaving a segment	**nsegment**	cfs	double	muskingum muskingu **strmflow_** muski

ame	Description	Dimension[1]	Units	Data type	Availability
					strmflow_
					muskingum
					muskingu
	Area-weighted average surface runoff for each segment from HRUs contributing flow to the segment and upstream HRUs	**nsegment**	inches	double	**strmflow_r**
					muski
					strmflow_
					muskingum
					muskingu
v	Area-weighted average interflow for each segment from HRUs contributing flow to the segment and upstream HRUs	**nsegment**	inches	double	**strmflow_r**
					muski
					strmflow_
					muskingum
					muskingu
eam_inflow	Sum of inflow from upstream segments	**nsegment**	cfs	double	**strmflow_r**
					muski
					strmflow_
					muskingum
					muskingu
delta_flow	Cumulative flow minus flow out for each stream segment	**nsegment**	cfs	double	**strmflow_r**
					muski
					muskingum
					muskingu
v_cfs	Streamflow at each measurement station	**nobs**	cfs	double	**nobs**
v_cms	Streamflow at each measurement station	**nobs**	cms	double	**nobs**
_in[3]	Flow in stream segments as a result of cascading flow in each stream segment	**nsegment**	cfs	double	**cascade_fla** **ncascad**
	Total streamflow leaving each subbasin	**nsub**	cfs	double	**subbasin_**
	Total streamflow leaving each subbasin	**nsub**	cms	double	**subbasin_**
	Sum of streamflow from upstream subbasins to each subbasin	**nsub**	cfs	double	**subbasin_**
	Stream Temperature				
	Area-weighted average cloud cover fraction for each segment from HRUs contributing flow to the segment	**nsegment**	decimal fraction	real	**stream_tem**
ght	Hours of daylight	**nsegment**	hours	real	**stream_tem**
d	Area-weighted average relative humidity for each segment from HRUs contributing flow to the segment	**nsegment**	decimal fraction	real	**stream_tem**
	Area-weighted average snowmelt for each segment from HRUs contributing flow to the segment	**nsegment**	inches	real	**stream_tem**
	Area-weighted average rainfall for each segment from HRUs contributing flow to the segment	**nsegment**	inches	real	**stream_tem**
e	Area-weighted average shade fraction for each segment	**nsegment**	decimal fraction	real	**stream_tem**
air	Area-weighted average air temperature for each segment from HRUs contributing flow to the segment	**nsegment**	degrees Celsius	real	**stream_tem**
gw	Groundwater temperature	**nsegment**	degrees Celsius	real	**stream_tem**
lat	Lateral flow temperature	**nsegment**	degrees Celsius	real	**stream_tem**
ss	Subsurface temperature	**nsegment**	degrees Celsius	real	**stream_tem**
upstream	Temperature of streamflow entering each segment	**nsegment**	degrees Celsius	real	**stream_tem**
water	Computed daily mean stream temperature for each segment	**nsegment**	degrees Celsius	real	**stream_tem**
	Width of each segment	**nsegment**	meters	real	**stream_tem**

ame	Description	Dimension[1]	Units	Data type	Availability
	Lake dynamics				
dstflow	Streamflow from second output point for lake HRUs using gate opening routing	**one**	inches	double	**strmflow_** muskingu
e_seep	Basin area-weighted average lake-bed seepage to GWRs	**one**	acre-feet	double	**strmflow_** muskingu
e_stor	Basin volume-weighted average storage for all lakes using broad-crested weir or gate opening routing	**one**	inches	double	**strmflow_** muskingu
	Inflow to each lake HRU using Puls or linear storage routing	**nlake**	cfs	double	**strmflow_** muskingu
	Surface elevation of each lake	**nlake**	feet	real	**strmflow_** muskingum **nratetb**
	Height of the gate opening at each dam with a gate	**nratetbl**	inches	real	**strmflow_** muskingum **nratetb**
lakein	Groundwater discharge to each lake HRU for each GWR	**ngw**	acre-feet	double	**strmflow_** muskingu
	Cascading interflow and Dunnian surface runoff to lake HRUs from each upslope HRU	**nhru**	inches	double	**cascade_flag** = 0, and **nl**
	Total seepage from each lake using broad-crested weir or gate opening routing	**nlake**	cfs	double	**strmflow_** muskingu
	Elevation of each simulated lake surface	**nlakeelev**	feet	real	**strmflow_** muskingum **nlakeel**
ow	Total groundwater flow into each lake	**nlake**	cfs	double	**strmflow_** muskingu
w	Total inflow to each lake	**nlake**	cfs	double	**strmflow_** muskingu
rflow	Total interflow into each lake	**nlake**	cfs	double	**strmflow_** muskingu
l	Inflow to each lake using broad-crested weir or gate opening routing	**nlake**	acre-feet	double	**strmflow_** muskingu
ral_inflow	Lateral inflow to each lake	**nlake**	cfs	double	**strmflow_** muskingu
fs	Streamflow leaving each lake, includes any second outlet flow	**nlake**	cfs	double	**strmflow_** muskingu
ms	Streamflow leaving each lake, includes any second outlet flow	**nlake**	cms	double	**strmflow_** muskingu
ow	Evaporation and seepage from each lake	**nlake**	cfs	double	**strmflow_** muskingu
2	Streamflow from second outlet for each lake with a second outlet	**nlake**	cfs	double	**strmflow_** muskingu
ol	Outflow from each lake using broad-crested weir or gate opening routing	**nlake**	acre-feet	double	**strmflow_** muskingu
ol_ts	Outflow from each lake using broad-crested weir or gate opening routing for the time step	**nlake**	acre-inches	double	**strmflow_** muskingu
_in	Total seepage into each lake using broad-crested weir or gate opening routing	**nlake**	cfs	double	**strmflow_** muskingu
age	Lake-bed seepage from each lake to the associated GWR	**ngw**	acre-feet	double	**strmflow_** muskingu
age_gwr	Net lake-bed seepage to associated GWR	**ngw**	inches	double	**strmflow_**

ame	Description	Dimension[1]	Units	Data type	Availability
					muskingu
f	Total surface runoff into each lake	**nlake**	cfs	double	**cascade_**
	Storage in each lake using Puls or linear storage routing	**nlake**	cfs-days	double	**strmflow_** muskingu
um_in	Total streamflow to each lake	**nlake**	cfs	double	**strmflow_** muskingu
	Storage in each lake using broad-crested weir or gate opening routing	**nlake**	acre-feet	double	**strmflow_** muskingu
			Water balance		
pillary_wb	Basin area-weighted average capillary reservoir storage	**one**	inches	double	**print_del**
rst_wb	Basin area-weighted average surface-depression storage	**one**	inches	double	**print_del**
vity_wb	Basin area-weighted average gravity reservoir storage	**one**	inches	double	**print_del**
lzone_wb	Basin area-weighted average storage in soilzone reservoirs	**one**	inches	double	**print_del**
rage	Basin area-weighted average storage in all water-storage reservoirs	**one**	inches	double	alwa
rvol	Basin area-weighted average storage volume in all water-storage reservoirs	**one**	acre-inches	double	alwa
face_storage	Basin area-weighted average storage in all water storage reservoirs	**one**	inches	double	**csvON_C**
al_storage	Basin area-weighted average storage in all water storage reservoirs	**one**	inches	double	**csvON_C**
al_flow	Lateral flow to stream network from each HRU	**nhru**	inches	double	alwa
ge	Storage for each HRU	**nhru**	inches	double	alwa
_stor	Basin area-weighted average storage in all water storage reservoirs from previous time step	**one**	inches	double	**print_del**
ltastor	Change in storage for each subbasin	**nsub**	inches	double	**subbasin_**
or	Area-weighted average total water content in storage reservoirs for associated HRUs of each subbasin	**nsub**	inches	double	**subbasin_**
b	Water balance for each subbasin	**nsub**	inches	double	**subbasin_**
m	Water balance aggregate	**one**	inches	double	alwa

[1]Dimension variables defined in table 1-1.
[2]Set by precipitation distribution module and can be modified by the interception module if all precipitation captured in canopy.
[3]Initially set by surface runoff module and can be modified by the soilzone module if Dunnian surface runoff occurs.
[4]Reflects availability of variables based on module selections. See variable description for the reason(s) a variable is conditional or always available.
[5]Values are set to the last valid computed value; value is < -99.0 or > 150.

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