REVISION 60.5.2

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.
II. NEW_OUTPUT_FILES
Contains a list of new output files being review.
III. Existing output files
List of changes in output files
IV. Existing input files
List of changes in input files
V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

III. EXISTING OUTPUT FILES

- **Added an output variable to sd_chanmorph files:**
  SED_STOR (sediment storage at the end of the timestep (tons)
- **Added an output variable to hyd_output files:**
  AREA_HA_CALC (calculated drainage area – ha)
- **Channel output files headers were incorrect; changed from 'mtons' to 'tons'**

IV. EXISTING INPUT FILES

- **Renaming of the .pst extension files:**

	Old	New
Pesticide database **input** file:	pesticide.pst	pesticide.pes
Pesticide **output** file	pest_metabolite.pst	pest_metabolite.pes

- **Updated plants.plt file: (See plant_chg_from_prev.xls in 'database' directory)**
- **CODES.BSN file: PRF input variable default changed from 1 to 484.**
  Note: a new peak runoff equation was added and is still in testing mode)

V. OTHER

- **Subroutines added:**
  HRU_LUM_INIT.f90
  CALSOFT_PLANT_ZERO.f90

REVISION 60.5.1

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.
II. NEW_OUTPUT_FILES
Contains a list of new output files being review.
III. Existing output files
List of changes in output files
IV. Existing input files
List of changes in input files
V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

III. EXISTING OUTPUT FILES

IV. EXISTING INPUT FILES

- plants.plt file – Winter wheat days to maturity too low; updated in all directories.

V. OTHER

- There was an error in leaf senescence causing LAI to decline too rapidly;
- Added SWAT+ Flowchart to documentation directory;

REVISION 60.5

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.

II. NEW_OUTPUT_FILES
Contains a list of new output files being review.

III. Existing output files
List of changes in output files

IV. Existing input files
List of changes in input files

V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

- Added new water allocation output file (water_allo_*.txt); (still testing; it is not set up in print.prt todate);

III. EXISTING OUTPUT FILES

- Added pesticide metabolic columns to files the listed below; Hendrik is testing

IV. EXISTING INPUT FILES

1) In the lum decision table, the LIM_VAR input for plant_gro can either be a '1', for plant growing (original code) OR the plant name (e.g., CORN)

```
plant_gro   hru      0   corn    -      -    -    =
 year_rot   hru      0   null    -      1    =    =
```

(Notes from Jeff):

if "corn" is growing, then the condition is met. Much better than the old way of saying if plant "1" in pcomdb is "y".

2) Added CN_UPDATE to the lum.dtl file; allows users to update the curve number with the decision table (not currently being used in example datasets but updated file is included in database files directory);

Example:

```
cn_update   hru     0   corn_update    abschg    3    0      null    y    n
```

Notes from Jeff: The cn_update action adds 3 (abschg) to the current cn2 value. All of the change options will work (absval, abschg, pctchg, relchg) but if you use the absval and you change cn2 at the start of the simulation using the calibration.cal file, the absval will override the change in the calibration.cal file. We should tell users not to use absval option.

V. OTHER

NEW subroutines added to this revision:

- proc_hru.f90
- calsoft_hyd_bfr.f90
- calsoft_hyd_bfr_et.f90
- calsoft_hyd_bfr_latq.f90
- calfost_hyd_bfr_surq.f90
- calsoft_hyd_bfr_perc.f90
- cn2_init.f90
- gwflow_module.f90
- gwflow_read.f90
- gwflow_simulate.f90
- pest_metabolite_read.f90
- pl_write_parms_cal.f90
- plant_transplant_read.f90
- mgt_transplant.f90
- rls_routeaqu.f90
- sd_channel_sediment.f90
- header_water_allocation.f90
- water_allocation.f90
- water_allocation_module.f90
- water_allocation_read.f90
- water_allocation_output.f90

REVISION 60.4 – June 15, 2020

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.
II. NEW_OUTPUT_FILES
Contains a list of new output files being review.
III. Existing output files
List of changes in output files
IV. Existing input files
List of changes in input files
V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

III. EXISTING OUTPUT FILES

- ALL water balance WB output files:
  added: SNO_INIT and SNO_FINAL columns
- OBJECT.PRT file: now has the option to print soil storage value (by soil layer) output file
  (See the ceap_connectivity_test data for example)
- SD_CHANNEL output files:
  This file now produces output for FLO_IN/AQU_IN/FLO_OUT in m3^s and mm

IV. EXISTING INPUT FILES

- HYD-SED-LTE.CHA file:
  HC_COV input (head cut cover factor) now named WD_RTO (width depth ratio)

V. OTHER

- WB_PARMS.SFT – file updated in …/databases
  K_LO variable(k (lowest layer) adjustment or at limit) renamed to PETCO
- CAL_PARMS.CAL – updated
- Deleted these routines: sim_inityr.f90/ru_allo.f90/proc_allo.f90
  /flow_hyd_hru_ru.f90/readtime_read.f90
- Added: proc_aqu.f90/time_read.f90/unit_hyd_ru_hru.f90

REVISION 60.3 – April 6, 2020

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.

II. NEW_OUTPUT_FILES
Contains a list of new output files being review.

III. Existing output files
List of changes in output files

IV. Existing input files
List of changes in input files

V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

III. EXISTING OUTPUT FILES

- Added two outputs to the WB (waterbal) files entered after the CN variable shown below in **bold**:

real :: cn = 0.	!none	|CN values during mon in HRU
real :: sw_init = 0.	**!mm H2O**	**|initial soil water content of entire profile**
real :: sw_final = 0.	**!mm H2O**	**|final soil water content of entire profile**
real :: sw = 0.	!mm H2O	|average soil water content of entire profile

IV. EXISTING INPUT FILES

- **HYDROLOGY.WET** file (check to ensure the order of the values of these columns are correct; psa/pdep values only switched in Mike's CEAP datasets; headers and spreadsheet correct;

The order is:
psa/pdep/esa/edep/k/evrsv/acoef/bcoef/ccoef/frac ←type
hru_ps/dp_ps/hru_es/dp_es/k/evap/vol_area_co/vol_dp_a/vol_dp_b/hru_frac ←modular sheet

- PLANT_PARMS.SFT
- PLANT_GRO.SFT
- WATER_BALANCE. SFT file

Additional inputs added or removed in each of these files (spreadsheet updated and examples are in the database directory)

V. OTHER

NOTE: Edited the subroutine 'structure_set_parms.f90' in the case for filter strips. Case was labelled incorrect as 'filter' when it should have been 'fstrip'.

NEW SUBROUTINES: soil_text_init.f90
soil_awc_init.f90
water_rights_read.f90

Added two 'sections' to the documentation on:

- Water Allocation
- Output files and variable definitions

REVISION 60.2 – February 25, 2020

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.

II. NEW_OUTPUT_FILES
Contains a list of new output files being review.

III. Existing output files
List of changes in output files

IV. Existing input files
List of changes in input files

V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

III. EXISTING OUTPUT FILES

- BASIN_SD_CHANNEL and SD_CHANNEL output files restructured
  FLO units in this file changed to == m^3/s
- BASIN_WB_*.TXT – added SW_INIT and SW_FINAL;
- New columns (**SW_INIT** and **SW_FINAL**) added to these output files:
  1) Basin water balance
  2) HRU water balance
  3) HRU LTE water balance
  4) RU water balance

- **NOTE**: if the channel length is < I meter, there will be not routing and the output for these channels will be printed as 0.0

IV. EXISTING INPUT FILES

-- **PLANTS.PLT** –

1) Added 2 plants from Mike's CEAP runs (urban_cool and urban_warm)
2) Removed BARR and WATR from the file (barren and water)
3) CORN50 was added
4) The 'plnt_typ' column for the following crops are now typed as 'tuber'
   carrt (carrot)
   pnut (peanut)
   pota (potato)
   radi (radish)
   sgbt (surgar beets)
   spot (sweet potato)

-- **CODES.BSN** – SOIL_P (Soil P Model input) column should be changed to '0'
-- **PARAMETERS.BSN** – N_PERC column should be changed to '0.1'
-- **HARV.OPS** – tuber plants updated in this file (updated in /databases);

tuber	tuber	1.10000	0.95000	0.00000
peanuts	tuber	1.10000	0.95000	0.00000

CAL_PARMS.CAL – added two aquifer calibration parameters to this file (updated in directories)

deep_seep	aqu	0.00100	0.40000	m/m
sp_yld	aqu	0.00000	0.50000	fraction

Also added cha variables to the **CAL_PARMS.CAL** file:

Renamed existing:
w (rte) → chw (cha)
d (rte) → chd (cha)
s (rte) → chs (cha)
l (rte) → chl (cha)
n (rte) → chn (cha)

Added:

cov	cha	0.00000	1.00000	fraction
cherod	cha	0.00000	1.00000	fraction
shear_bnk	cha	0.00000	1.00000	fraction
hc_erod	cha	0.00000	1.00000	fraction
hc_co	cha	0.00000	5.00000	m/m
hc_len	cha	0.00000	100.00000	m
hc_hgt	cha	0.00000	3.00000	m

Removed: rte variables from this file;

Changed SURLAG from OBJ_TYP BSN to HRU (It is still input in the .bsn file)

surlag	**hru**	0.05000	24.00000	days

HYD-SED-LTE.CHA - CHK column changed to mm/day (originally mm/hr)

V. OTHER

Removed the following routines: calsoft_init.f90
basin_water_init.f90

Added the following routine: basin_sw_init.f90

REVISION 60.1 – October 11, 2019

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.

II. NEW_OUTPUT_FILES
Contains a list of new output files being review.

III. Existing output files
List of changes in output files

IV. Existing input files
List of changes in input files

V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

- **BASIN CROP YIELD FILES ADDED (no code included in the 'print.prt' file; always prints when HRU spatial objects > 0)**

  basin_crop_yld_yr.xt
  basin_crop_yld_aa.txt

III. EXISTING OUTPUT FILES

- Added new output variables to:
  basin_aqu_pest*.txt
  aquifer_pest_*.txt
  (sol_flo/sor_flo/sol_perc/stor_ave/stor_init/stor_final)
- Rename 'crop_yld_aa.out' to' crop_yld_aa.txt'
- Adjusted the headers in channel_sd*.txt and basin_sd_cha*.* txt files
  (moved the following up one line to be included in the 'area…..precip….evap' line)
  jday mon day yr unit gis_id name

IV. EXISTING INPUT FILES

- Updated 'PLANTS.PLT' with changes in:
  CORN/CORN50/CORN100/CORN110/CORN120/CORN90
  SOYB/SOYB100/SOYB105/SOYB110/SOYB115/SOYB120

  Values in the following columns changed:
  bm_e/harv_idx/lai_max1/hu_lai_decl/frac_n_yld/frac_p_yld/frac_n_em/frac_n_50/frac_n_mat/
  frac_p_em/frac_p_50/frac_p_mat
  (all example input datasets updated with this file)
- UPDATED 'FERTILIZER.FRT' file with "p" added for CEAP simulation runs
  (all example input datasets updated with this file)
- Deleted Treynor_Iowa from the example datasets (…data)
- Added 'tropic_dataset' and '07120002_Iroquois_IL' to the example datasets
- PARAMETERS.BSN – SCOEF inserted in 'openvar1' spot (all example datasets changed)

- HYDROLOGY.HYD – added column named LATQ_CO – plant ET curve number coefficient (formerly CNCOEF)
- WATER_BALANCE.SFT
  --PET (ave annual potential et) column added after TFR
  --ORGN removed
- CAL_PARMS.CAL (updated in …\databases directory)
  --added PETCO and LATQ_CO as soft calibration variables
  --updated cn2, cn3_swf, slope ABS_MIN and ABS_MAX values

V. OTHER

- Removed the following subroutines: **wattable.f90/smp_filtw.f90/calsoft_init.f90**

- Added new subroutine: **cli_precip_control.f90**

- **LS_UNIT.ELE** – BSN_FRAC column carried to 3 significant digits (Ryan Bailey excessive rainfall issue)
  NOTE: (Jaclyn has fixed this problem in the editor (updated 59.3) to read this column in an exponential format)

REVISION 60 – August 19, 2019

I. NEW_INPUT_FILES
Contains a list of new input files that are being tested.

II. NEW_OUTPUT_FILES
Contains a list of new output files being review.

III. Existing output files
List of changes in output files

IV. Existing input files
List of changes in input files

V. Other
Other files that were modified in this revision.

I. NEW INPUT FILES

II. NEW OUTPUT FILES

Pesticide output files added:

(basin_aquifer)	basin_aqu_pest_*.txt
(basin channel)	basin_ch_pest_*.txt
(basin_reservoir)	basin_res_pest_*.txt
(basin landscape units)	basin_ls_pest_*.txt
(aquifer)	aquifer_pest_*.txt
(channel)	channel_pest_*.txt
(reservoir)	reservoir_pest_*.txt
(hru)	hru_pest_*.txt

(Note: The PRINT.PRT file, PEST section triggers the outputs for all the files above)

III. EXISTING OUTPUT FILES

IV. EXISTING INPUT FILES

- OVN_TABLE.LUM file – the inputs for 'urban_asphalt' should be .011 instead of .110 (all example datasets updated)

PLANTS.PLT (all example input datasets updated with updated file)

- Removed Water (WATR) from this database; User will use one of the wetland plants (wehb, wetf, wetl, wetn, wewo)

- Removed Barren (BARR) from this database;
(the interface will include 'null' in the LU_MGT column in HRU-DATA.HRU which indicates no landuse)

- Edit input for BLAI in rngb (originally == 2.0) and rnge (originally == 2.5) - both changed == 4.0

AQUIFER.AQU file:

- GW_FLO is initial groundwater flow in mm units

The definition of the next two variables in this file that were not being used are now:

- 'orgn' - this column renamed to 'carbon' (default == 0.5)
- 'orgp' – this column renamed to 'flo_dist' (default == 50.0)

CODES.BSN

- Added an option in the NOSTRESS column (option ==2)
  nostress = 0 (all stresses applied)
  1 (turn off all plant stress)
  2 (turn off nutrient plant stress only)
- **CALIBRATION FILES UPDATES** (files in …/database_files)
  cal_parms.cal
  wb_parms.sft

V. OTHER

The following new subroutines were added:

aqu_pesticide_module.f90
basin_aqu_pest_output.f90
aqu_pesticide_output.f90