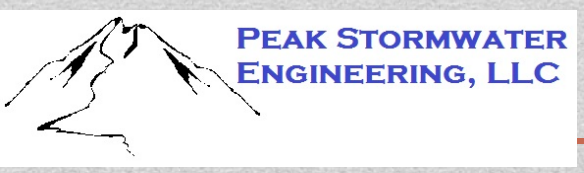
User Interface and File Management Improvements to the Colorado Urban Hydrograph Procedure (CUHP)

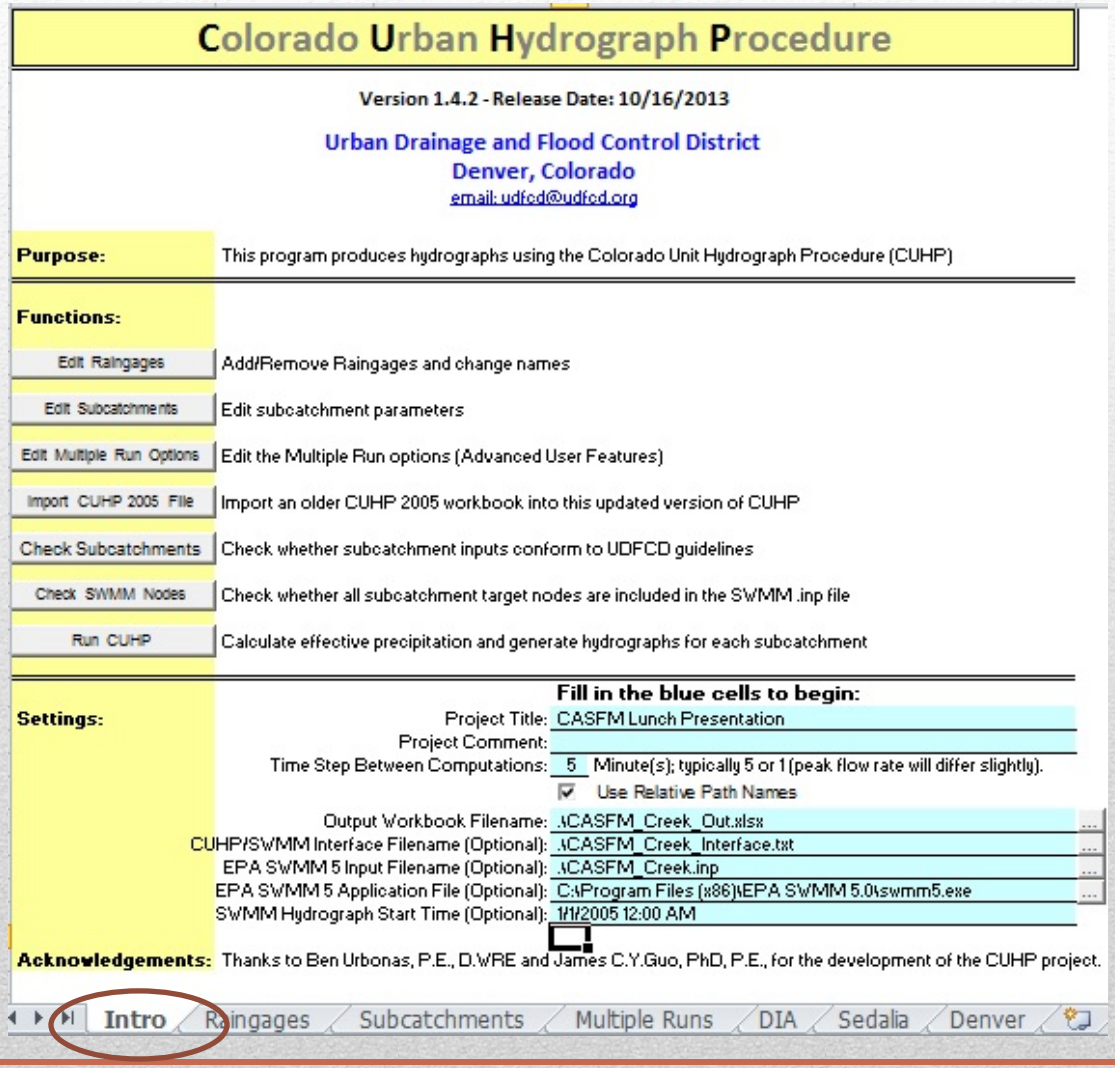
Derek Rapp - Peak Stormwater Engineering



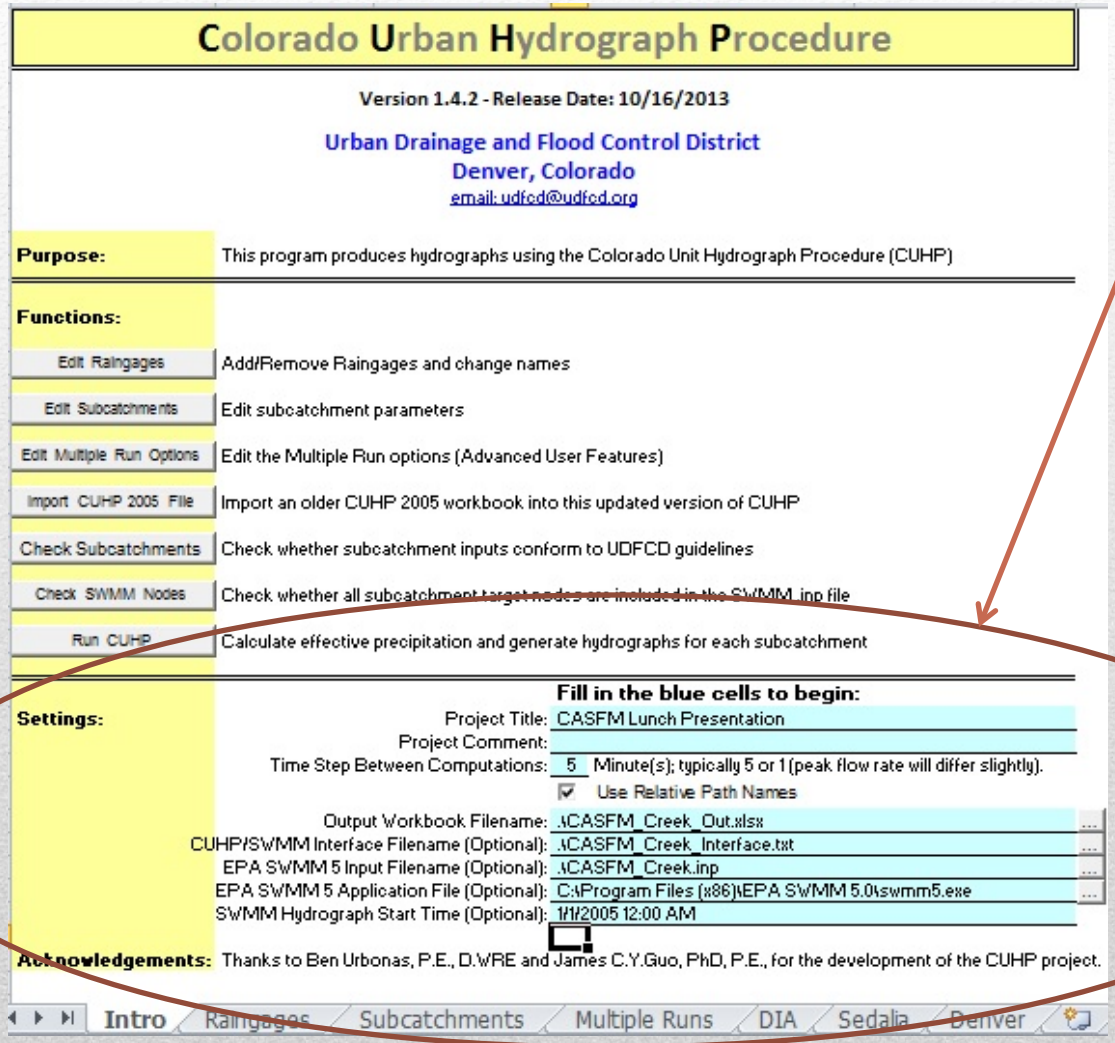
Overview of CUHP Update

- Created a standalone Excel spreadsheet that does not require separate code files for the math engine
- Simplified the user interface by removing unnecessary worksheets and consolidating user-input cells
- Updated the rainfall depth-area reduction factors (DARFs) and effective imperviousness calculations to be consistent with recent USDCM updates
- Added tools to allow the user to change input units and to run reasonableness checks on these inputs
- Added a check to compare SWMM target nodes for consistency with the actual SWMM input file
- Ability to create a single input file and then run several CUHP & SWMM scenarios to generate multiple output files

Intro Sheet


Colorado Urban Hydrograph Procedure
Version 1.4.2 - Release Date: 10/16/2013
Urban Drainage and Flood Control District
Denver, Colorado
email: udfcd@udfcd.org
Purpose:
This program produces hydrographs using the Colorado Unit Hydrograph Procedure (CUHP)
Functions:
Edit Raingages
Add/Remove Raingages and change names
Edit Subcatchments
Edit subcatchment parameters
Edit Multiple Run Options
Edit the Multiple Run options (Advanced User Features)
Import CUHP 2005 File
Import an older CUHP 2005 workbook into this updated version of CUHP
Check Subcatchments
Check whether subcatchment inputs conform to UDFCD guidelines
Check SWMM Nodes
Check whether all subcatchment target nodes are included in the SWMM .inp file
Run CUHP
Calculate effective precipitation and generate hydrographs for each subcatchment
Settings:
Fill in the blue cells to begin:
Project Title: CASFM Lunch Presentation
Project Comment:
Time Step Between Computations: 5 Minute(s); typically 5 or 1 (peak flow rate will differ slightly).
Use Relative Path Names
Output Workbook Filename: .\CASFM_Creek_Out.xlsx
CUHP/SWMM Interface Filename (Optional): .\CASFM_Creek_Interface.txt
EPA SWMM 5 Input Filename (Optional): .\CASFM_Creek.inp
EPA SWMM 5 Application File (Optional): C:\Program Files (x86)\EPA SWMM 5.0\swmm5.exe
SWMM Hydrograph Start Time (Optional): 1/1/2005 12:00 AM
Acknowledgements: Thanks to Ben Urbonas, P.E., D.WRE and James C.Y.Guo, PhD, P.E., for the development of the CUHP project.
Intro
Raingages
Subcatchments
Multiple Runs
DIA
Sedalia
Denver

Intro Sheet



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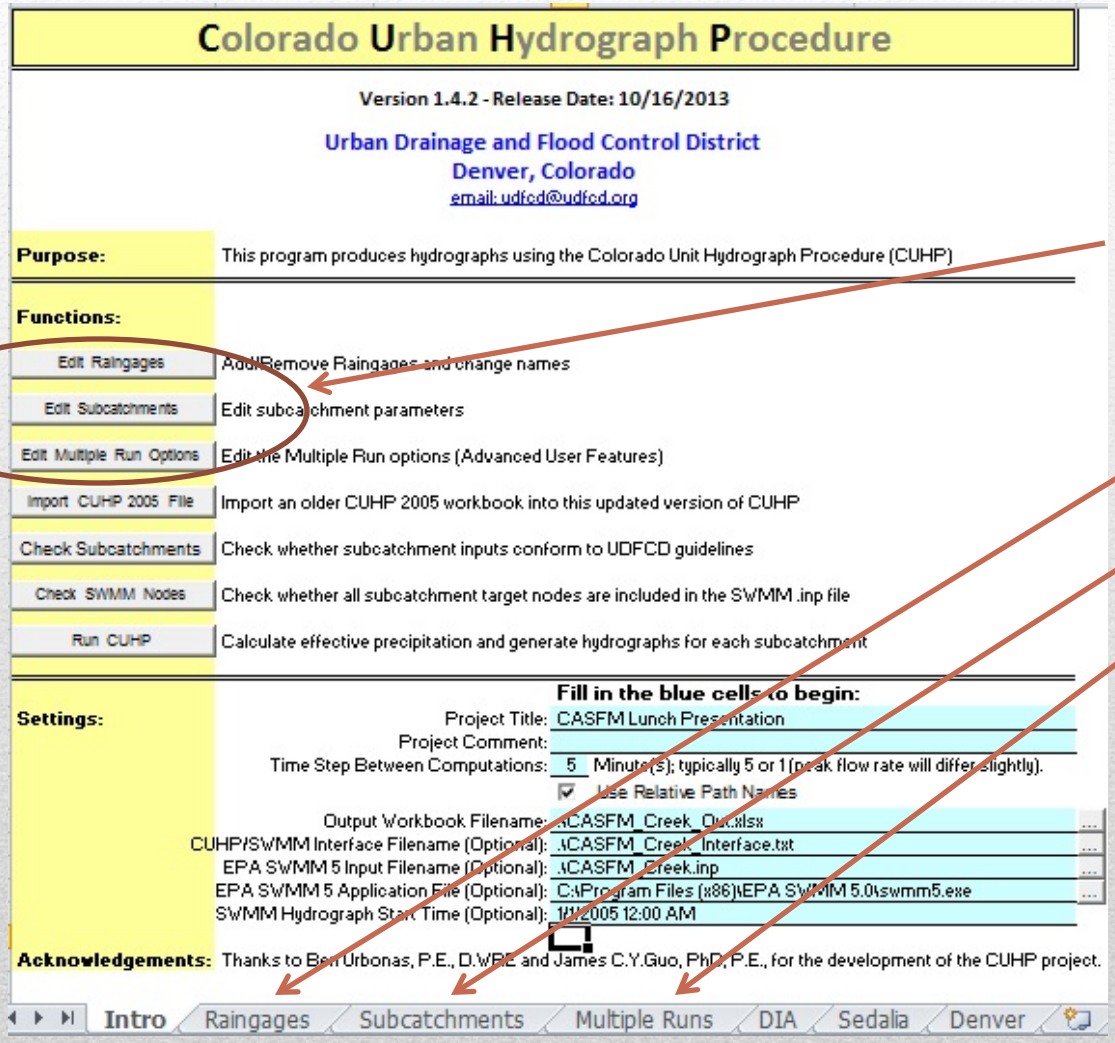
Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Time Step and File Settings have been moved to the Intro Sheet

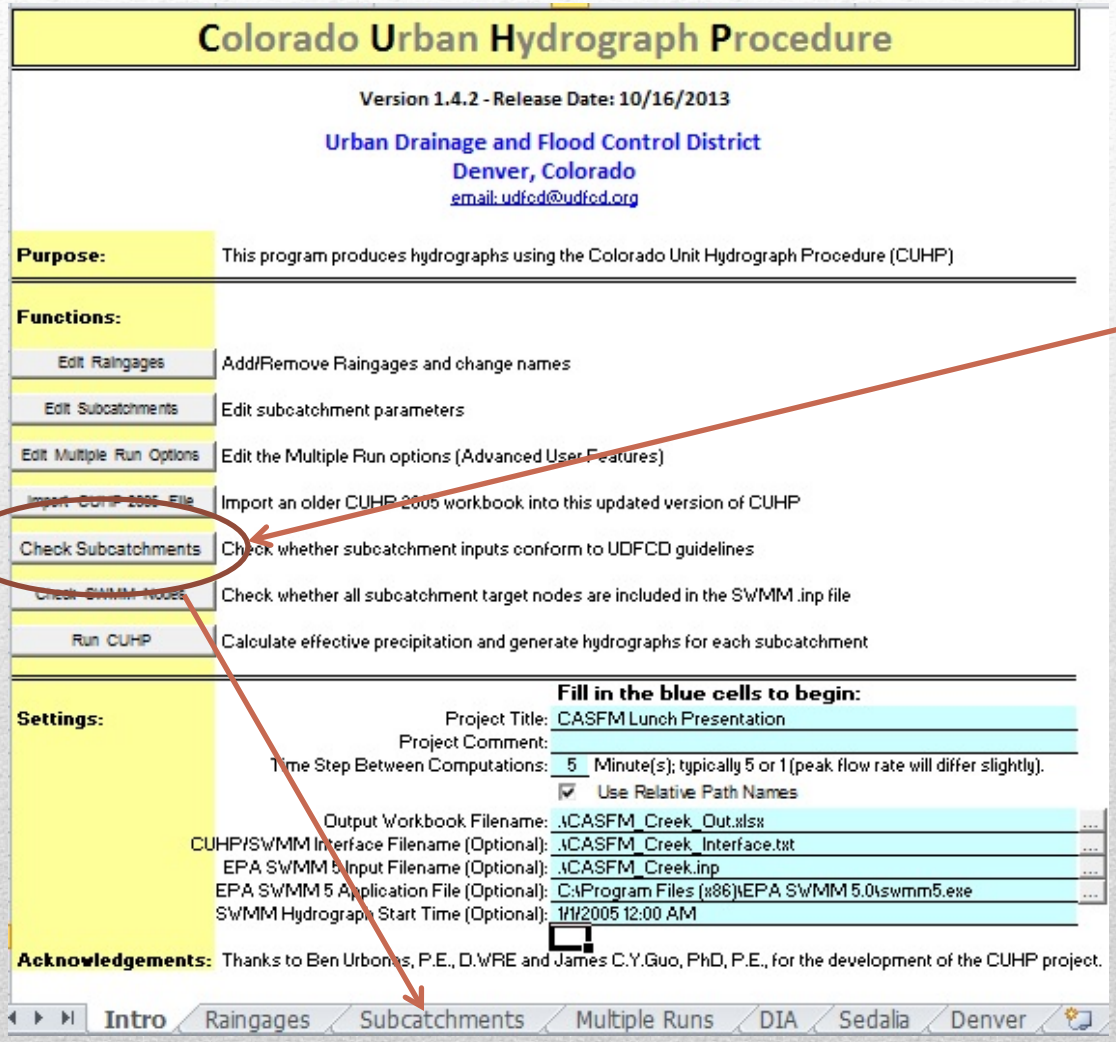
Intro Sheet



Shortcuts to other worksheets

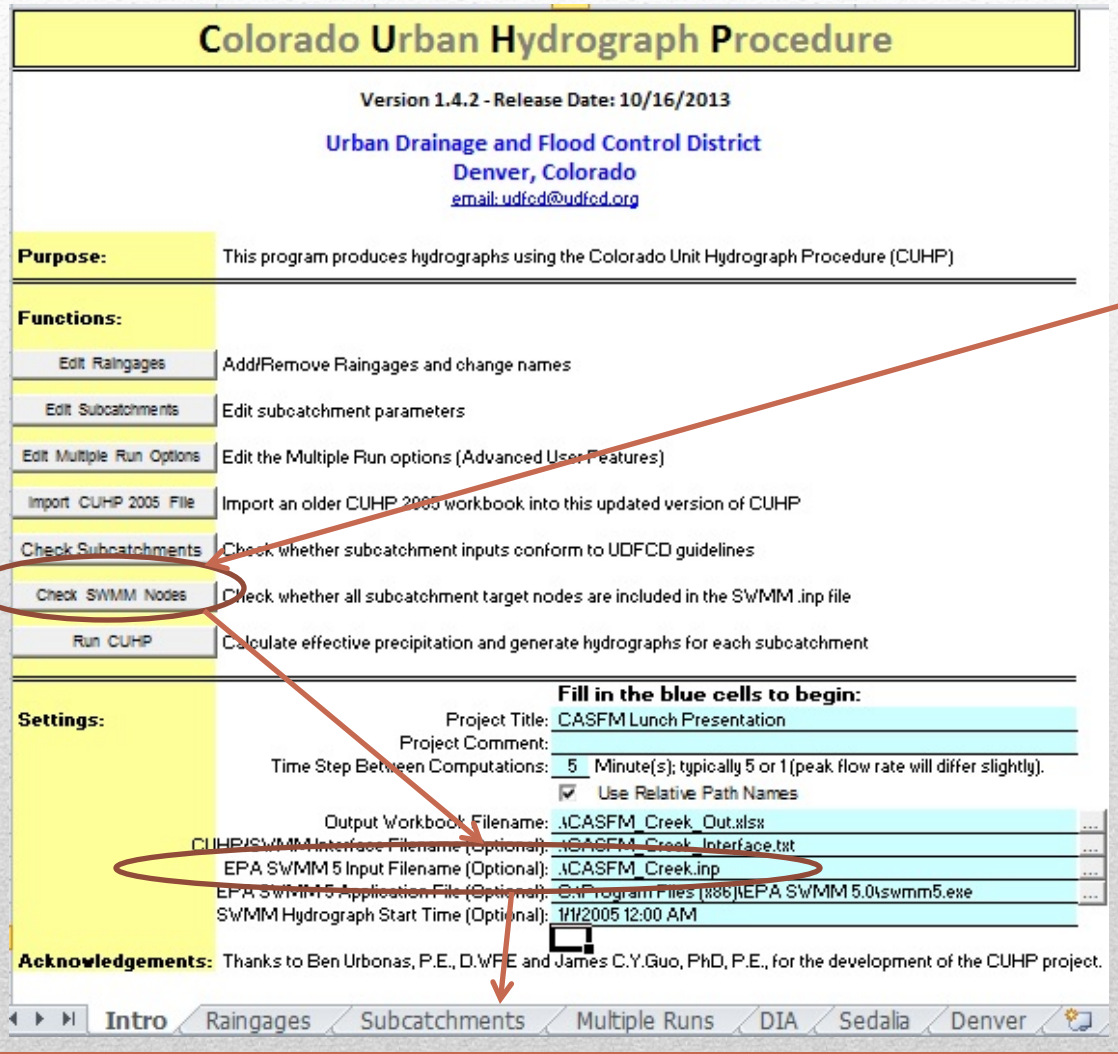
- Raingages
- Subcatchments
- Multiple Runs

Intro Sheet



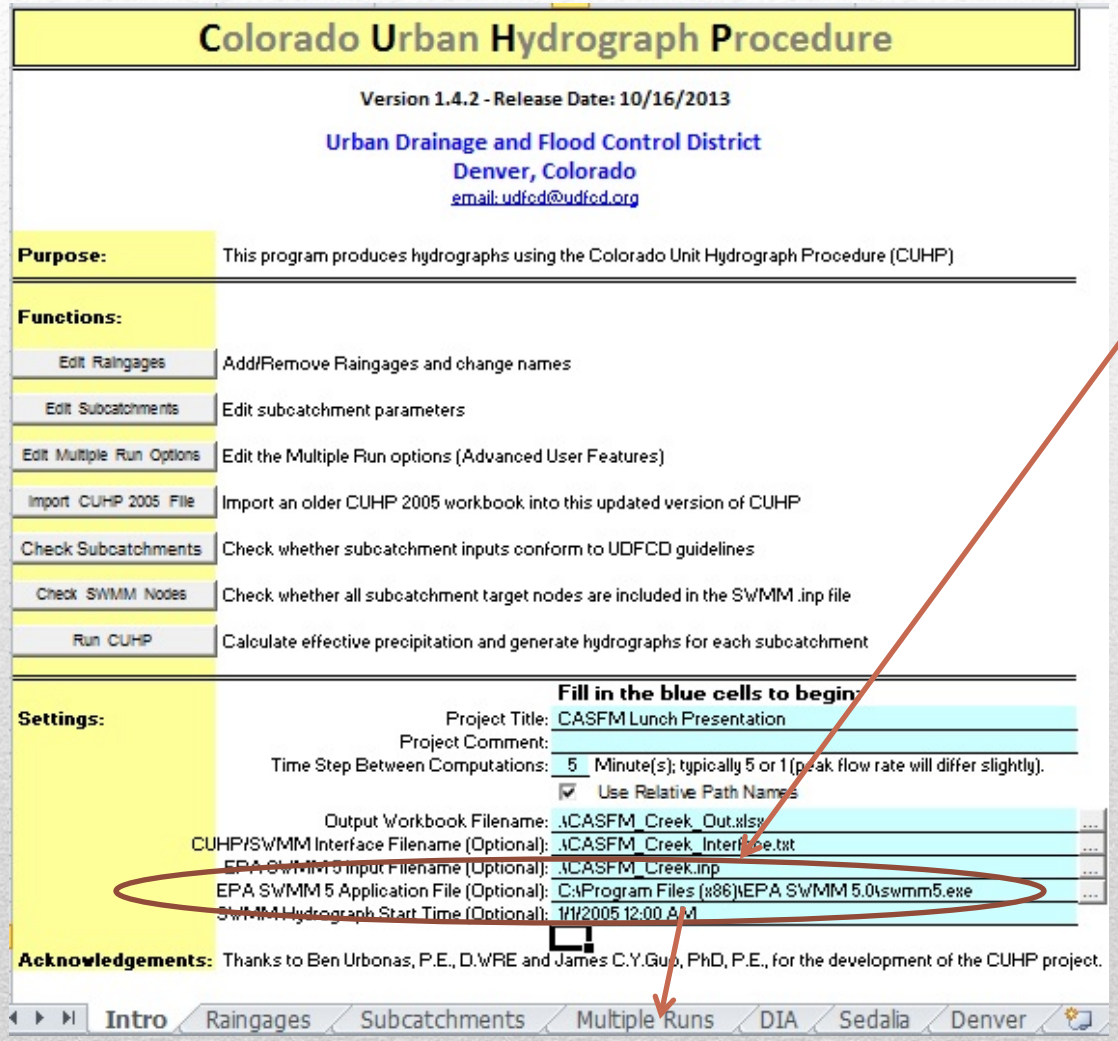
New tool added to check Subcatchment input parameters for reasonableness

Intro Sheet



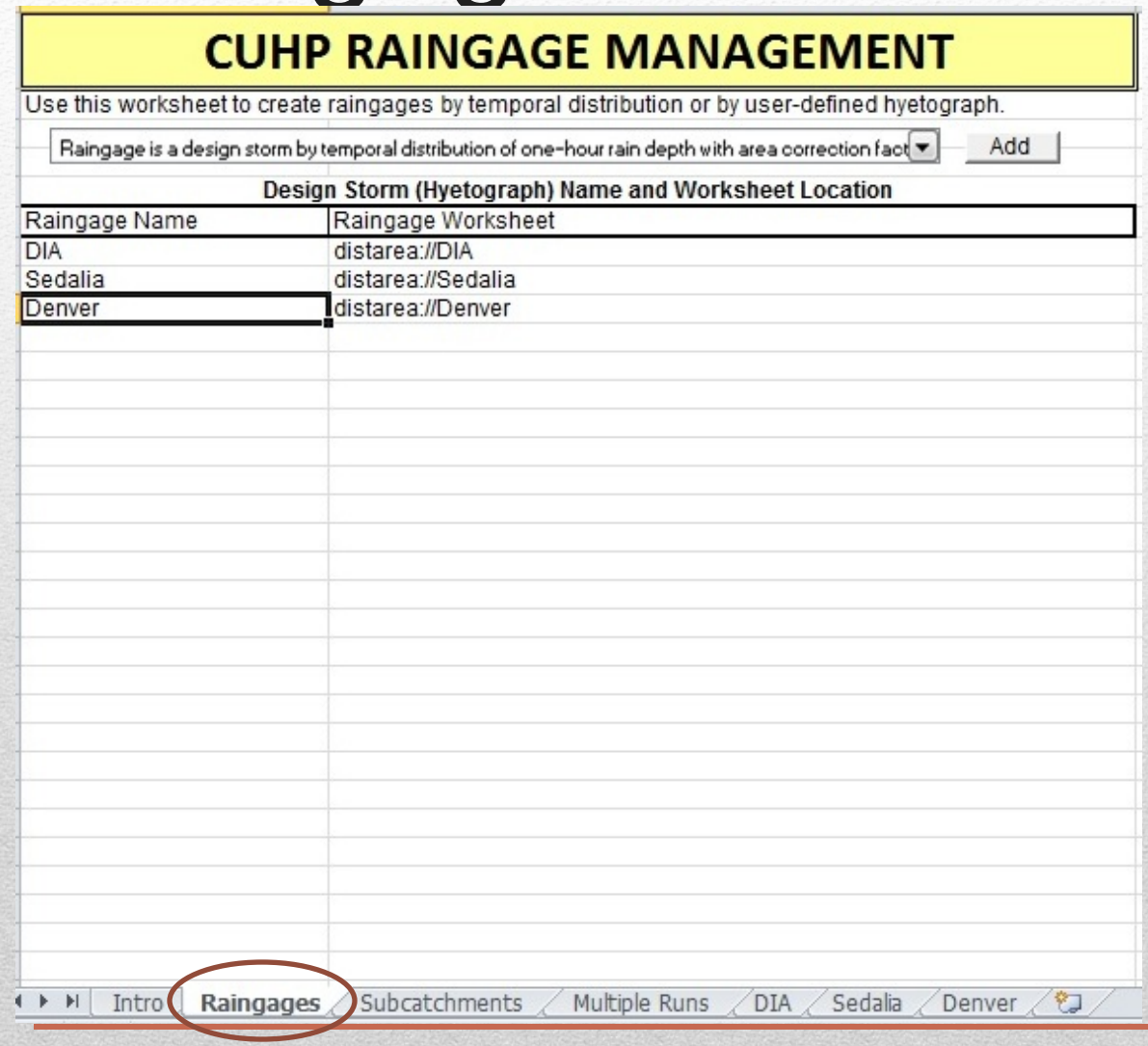
New tool to check that user-entered SWMM nodes are consistent with node names in SWMM input file (.inp)

Intro Sheet



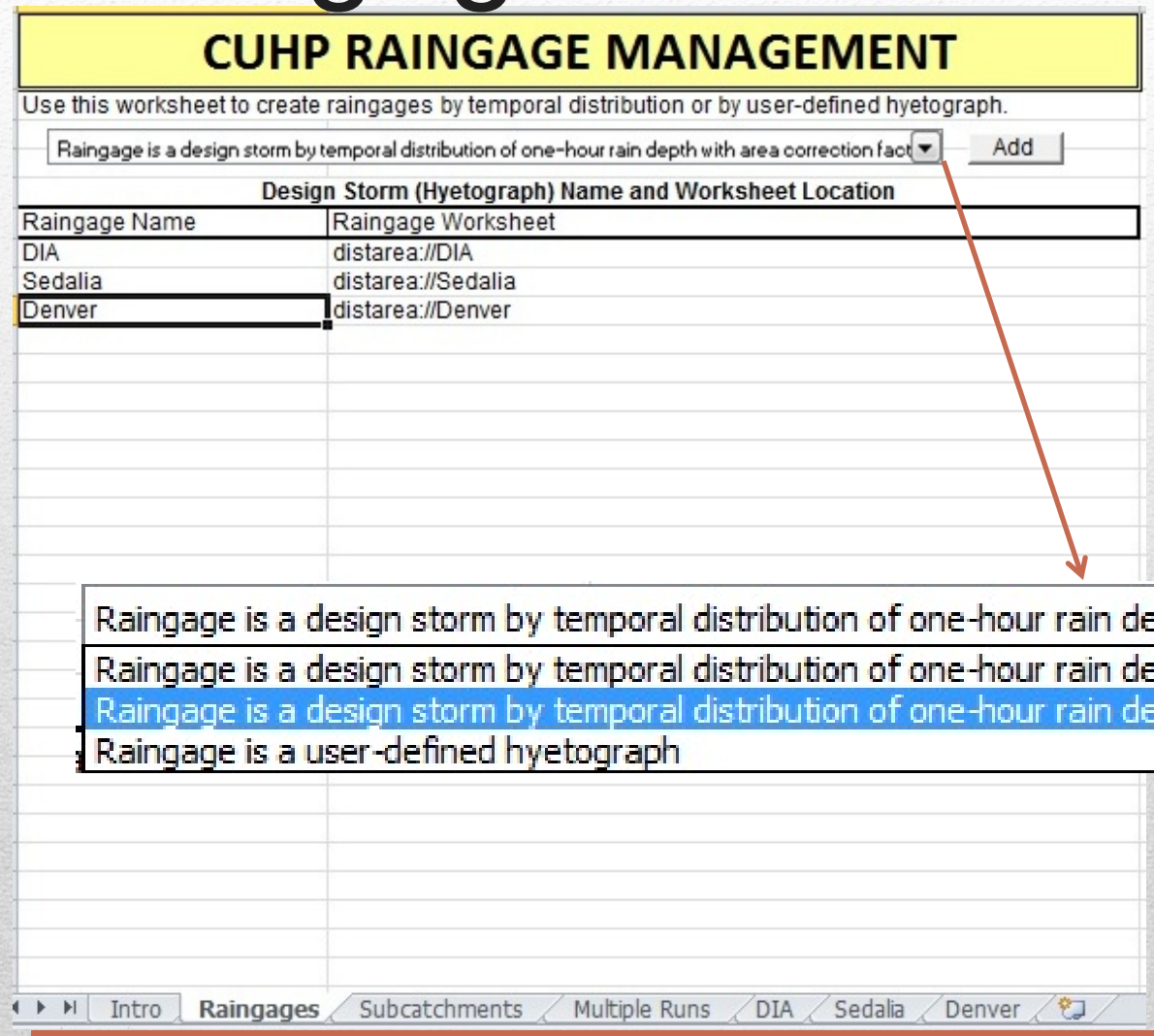
To run EPA SWMM 5.0 from the CUHP interface, the user needs to provide the path to the SWMM Application file (.exe)

Raingages Sheet



Minor changes to the worksheet layout were made

Raingages Sheet



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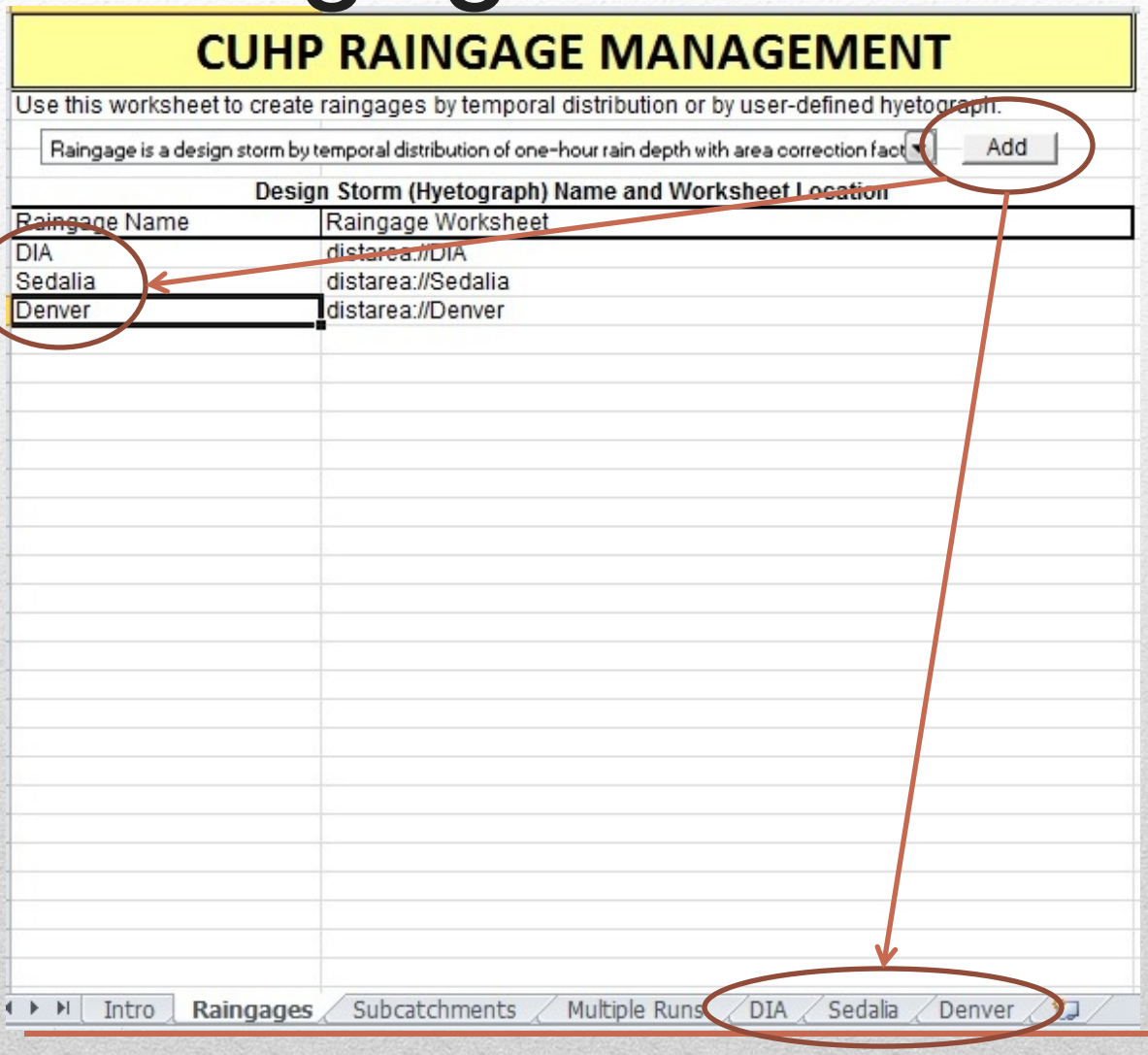

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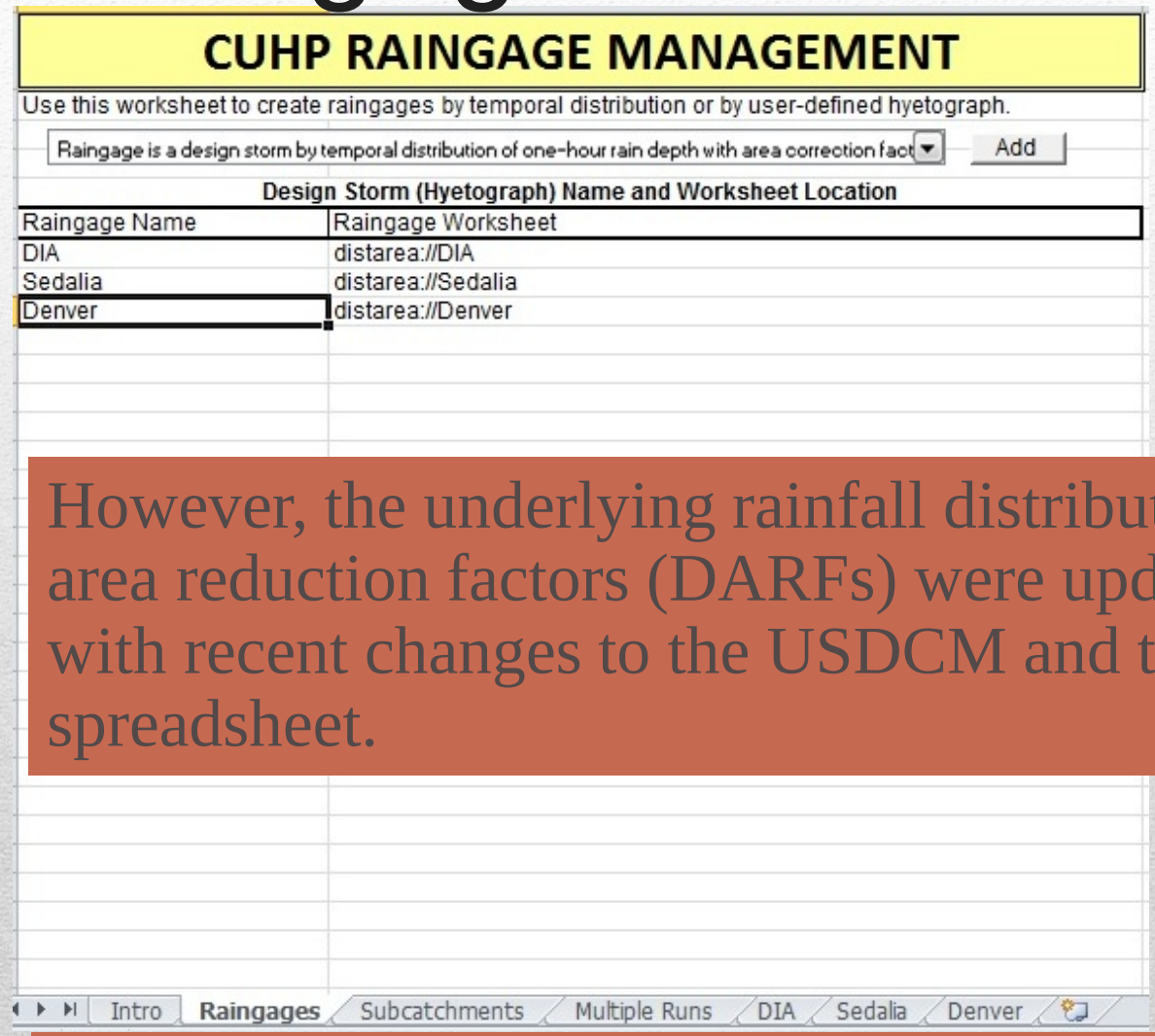

CUHP RAINGAGE MANAGEMENT

Use this worksheet to create raingages by temporal distribution or by user-defined hyetograph.

Raingage is a design storm by temporal distribution of one-hour rain depth with area correction fact | Add

Design Storm (Hyetograph) Name and Worksheet Location

Raingage Name	Raingage Worksheet
DIA	distarea://DIA
Sedalia	distarea://Sedalia
Denver	distarea://Denver

Intro | **Raingages** | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

However, the underlying rainfall distributions and depth-area reduction factors (DARFs) were updated consistent with recent changes to the USDCM and the UD-Rain spreadsheet.

Subcatchments Sheet

CUHP SUBCATCHMENTS

Click Here For Explanation Of Input Checks

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

Click Here for Recommended Value Tables

Check Subcatchment Inputs | Check SWMM Nodes | Units are in miles and square miles (click to change)

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
CC100	100	DIA	0.00625	0.056818182	0.1136364	0.025	10	0.35	0.1	4.5	0.0018	0.6	2
CC101	101	DIA	0.08125	0.473484848	0.4924242	0.03	40	0.35	0.1	4.5	0.0018	0.6	2
CC102	102	DIA	0.171875	0.151515152	0.3030303	0.0047	35	0.35	0.1	4.5	0.0018	0.6	0
CC103	103	DIA	0.0578125	0.047348485	0.4852273	0.044	80	0.35	0.1	4.5	0.0018	0.6	1
CC201	201	Denver	0.09375	0.4875	0.7575758	0.052	60	0.35	0.1	3	0.0018	0.5	1
CC202	202	Denver	0.0859375	0.319507576	0.5350379	0.007	15	0.35	0.1	3	0.0018	0.5	2
CC301	301	Denver	0.053125	0.083333333	0.4314394	0.087	2	0.35	0.1	3	0.0018	0.5	0
CC302	302	Denver	0.1671875	0.265151515	0.5443182	0.04	40	0.35	0.1	3	0.0018	0.5	1
CC303	303	Denver	6.21	2.272727273	4.0621212	0.04	2	0.35	0.1	3	0.0018	0.5	0
CC401	4001	Sedalia	0.09375	0.09469697	0.5089015	0.025	55	0.35	0.1	6	0.0007	1	1

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Subcatchments Sheet

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CC103	103	DIA	0.0578125	0.047348485	0.4852273	0.044	80	0.35	0.1	4.5	0.0018	0.6	1
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CC301	301	Denver	0.053125	0.083333333	0.4314394	0.087	2	0.35	0.1	3	0.0018	0.5	0
CC302	302	Denver	0.1671875	0.265151515	0.5443182	0.04	40	0.35	0.1	3	0.0018	0.5	1
CC303	303	Denver	6.21	2.272727273	4.0621212	0.04	2	0.35	0.1	3	0.0018	0.5	0
CC401	4001	Sedalia	0.09375	0.09469697	0.5089015	0.025	55	0.35	0.1	6	0.0007	1	1

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

The SWMM Node corresponding to the Subcatchment Name has been has been moved into this worksheet. The Print Mode option has been removed and all subcatchments now use the old Option 3.

Subcatchments Sheet

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CC201	201	Denver	0.09375	0.4875	0.7575758	0.052	60	0.35	0.1	3	0.0018	0.5	1
[illegible]	[illegible]	[illegible]	0.0859375	0.319507576	0.5350379	0.007	15	0.35	0.1	3	0.0018	0.5	2
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			6.21	2.272727273	4.0621212	0.04					0.0018	0.5	0
CC401	4001	Sedalia	0.09375	0.09469697	0.5089015	0.025					0.0007	1	1

Feet and Sq. Ft.

Feet and Acres

Units are in feet and square feet (click to change)

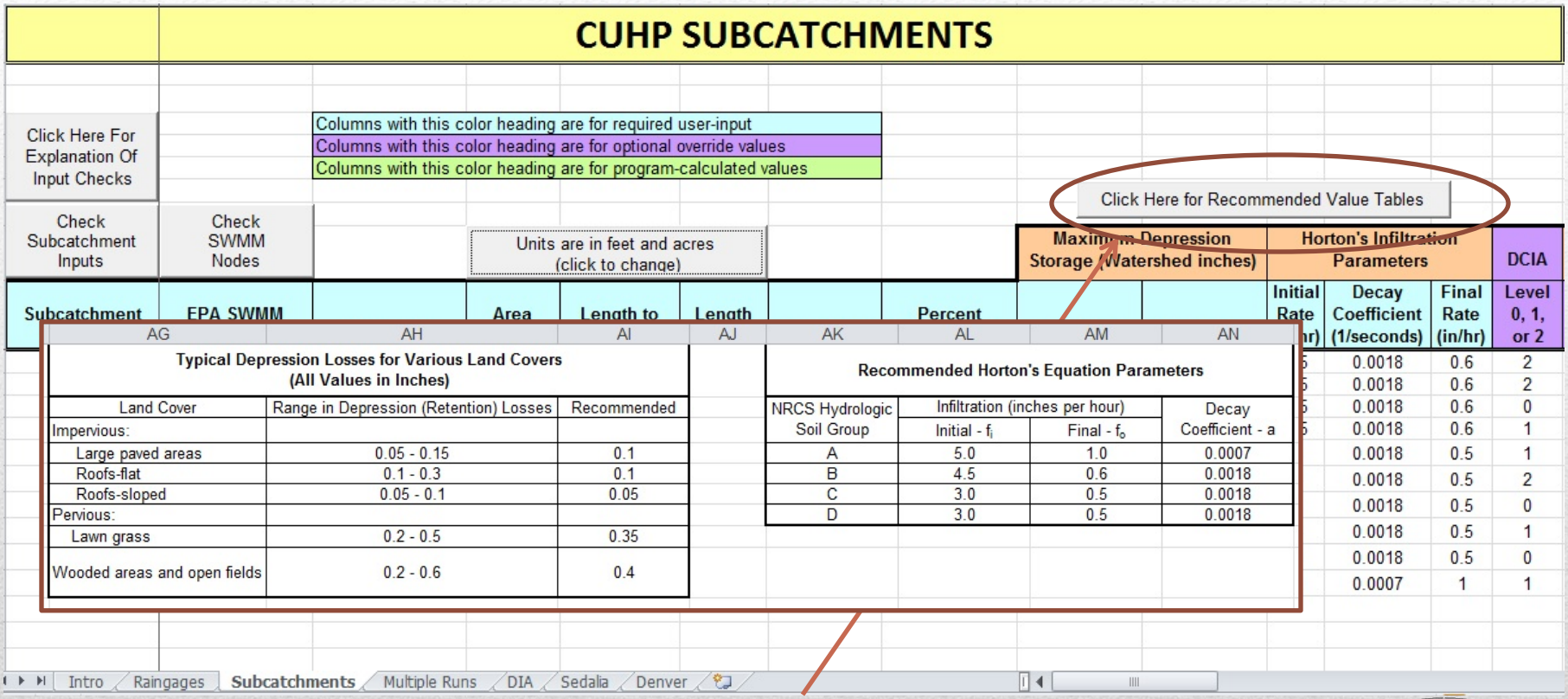
Area (ft^2)	Length to Centroid (ft)	Length (ft)
174240	300	600
2265120	2500	2600
4791600	800	1600
1611720	250	2562
2613600	2574	4000
2395800	1687	2825
1481040	440	2278
4660920	1400	2874
173124864	12000	21448
2613600	500	2687

User can change units for input length and area

Units are in feet and acres (click to change)

Area (acre)	Length to Centroid (ft)	Length (ft)
4	300	600
52	2500	2600
110	800	1600
37	250	2562
60	2574	4000
55	1687	2825
34	440	2278
107	1400	2874
3974.4	12000	21448
60	500	2687

Subcatchments Sheet



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Check Subcatchment Inputs | Check SWMM Nodes | Units are in feet and acres (click to change)

Subcatchment	EPA SWMM		Area	Length to	Length		Percent	Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA
										Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2
										5	0.0018	0.6	2
										5	0.0018	0.6	2
										5	0.0018	0.6	0
										5	0.0018	0.6	1
											0.0018	0.5	1
											0.0018	0.5	2
											0.0018	0.5	0
											0.0018	0.5	1
											0.0018	0.5	0
											0.0007	1	1

AG AH AI AJ AK AL AM AN

Typical Depression Losses for Various Land Covers (All Values in Inches)

Land Cover	Range in Depression (Retention) Losses	Recommended
Impervious:		
Large paved areas	0.05 - 0.15	0.1
Roofs-flat	0.1 - 0.3	0.1
Roofs-sloped	0.05 - 0.1	0.05
Pervious:		
Lawn grass	0.2 - 0.5	0.35
Wooded areas and open fields	0.2 - 0.6	0.4

Recommended Horton's Equation Parameters

NRCS Hydrologic Soil Group	Infiltration (inches per hour)		Decay Coefficient - a
	Initial - f_i	Final - f_o	
A	5.0	1.0	0.0007
B	4.5	0.6	0.0018
C	3.0	0.5	0.0018
D	3.0	0.5	0.0018

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Recommended values are provided on this worksheet to save the user from having to check the USDCM

Subcatchments Sheet

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CC101	101	DIA	52	2500	2600	0.03	40	0.35	0.1	4.5	0.0018	0.6	2
CC102	102	DIA	110	800	1600	0.0047	35	0.35	0.1	4.5	0.0018	0.6	0
CC103	103	DIA	37	250	2562	0.044	80	0.35	0.1	4.5	0.0018	0.6	1
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CC202	202	Denver	55	1687	2825	0.007	15	0.35	0.1	3	0.0018	0.5	2
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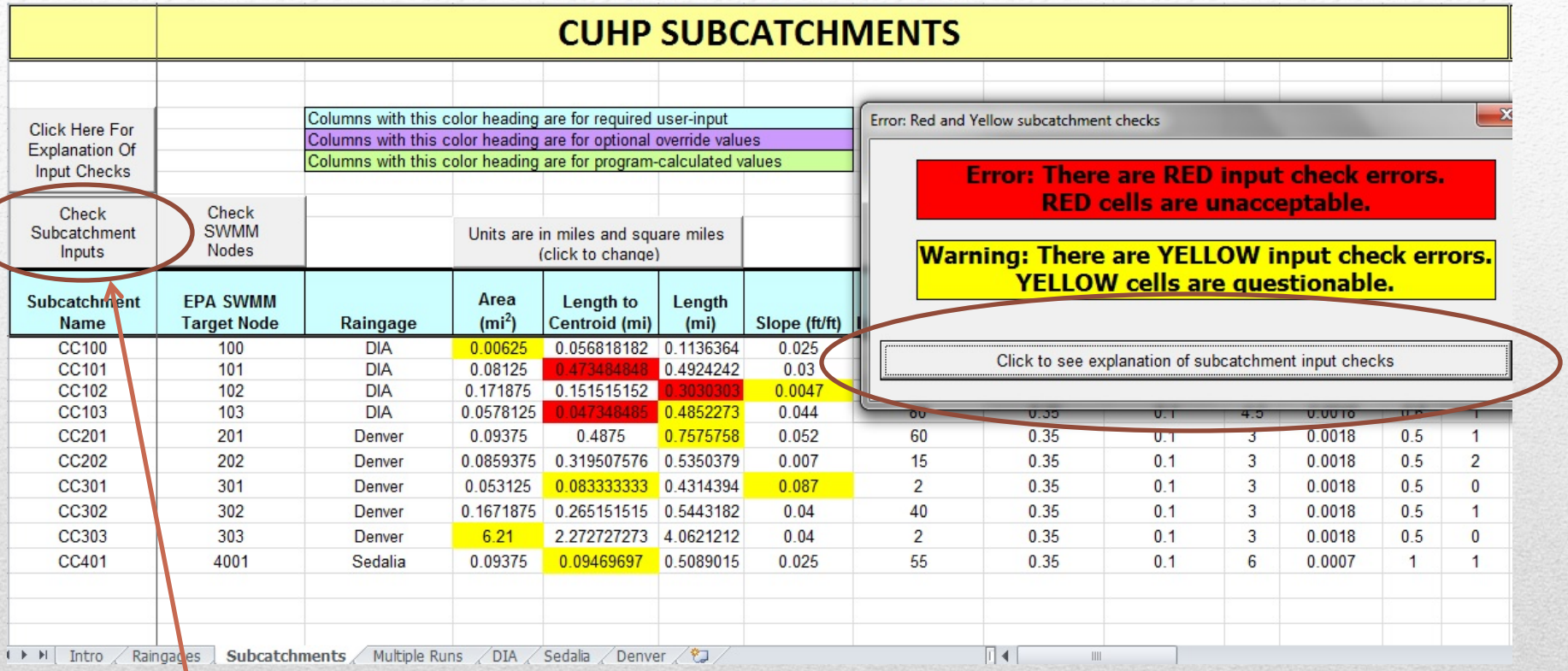
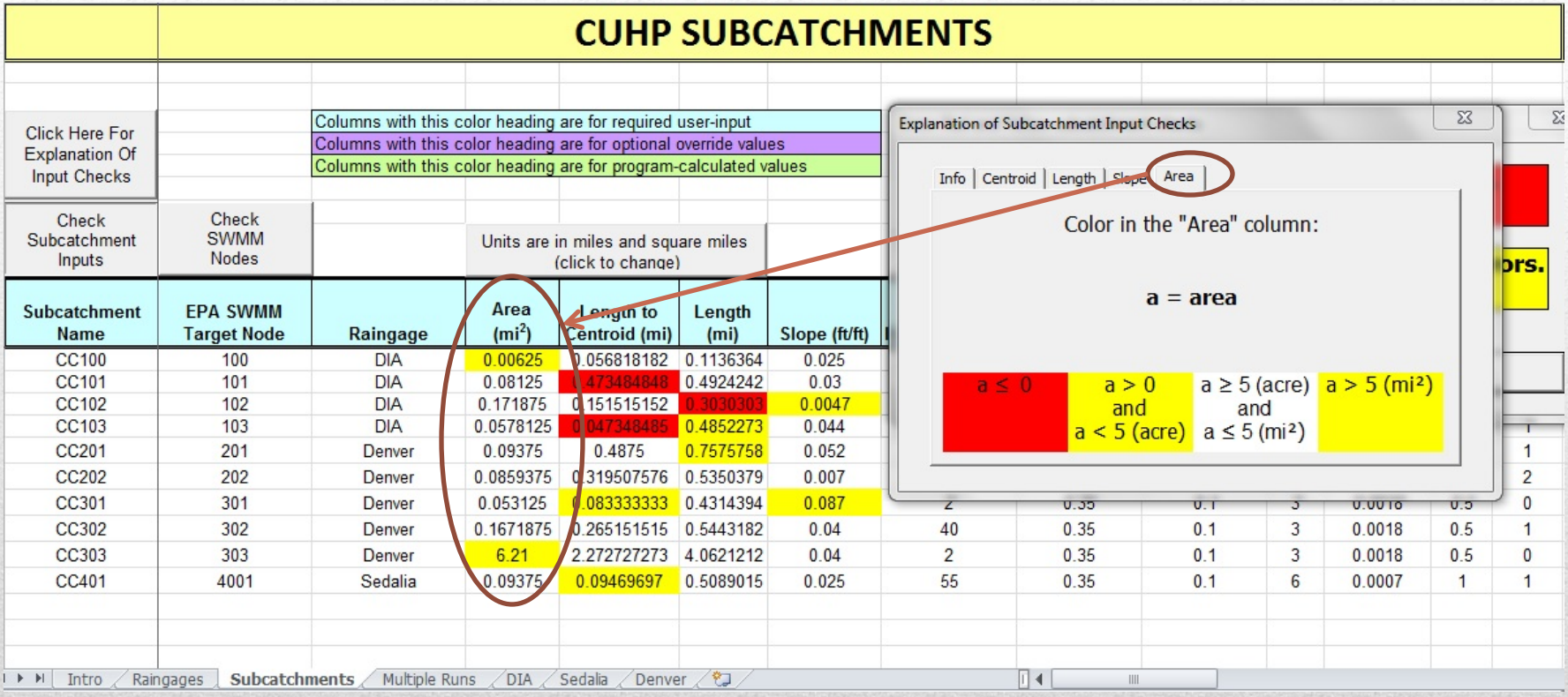
User can check their inputs for reasonableness

Subcatchments Sheet



User can check their inputs for reasonableness

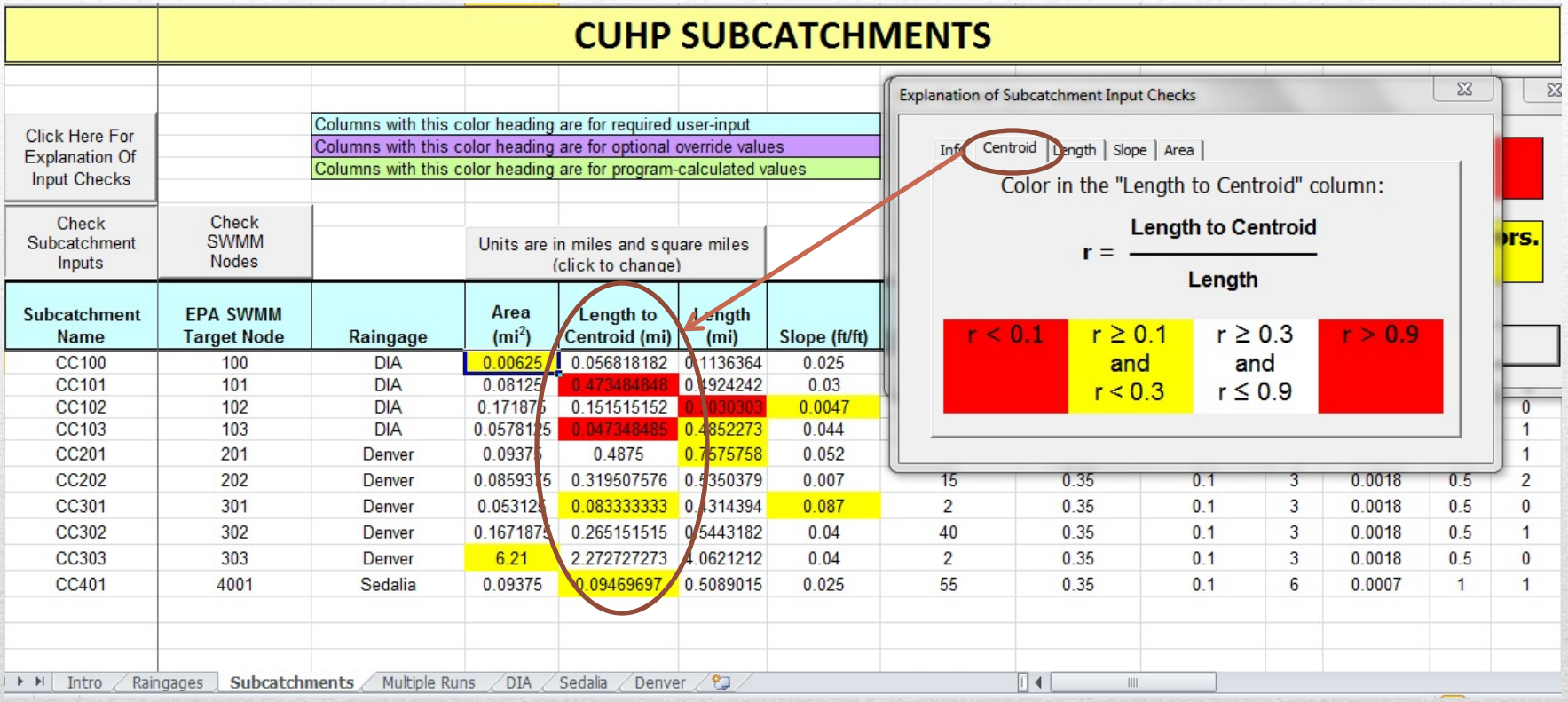
Subcatchments Sheet



Highlights: A < 5 acres & A > 5 sq.mi.

In these ranges, special guidelines apply.

Subcatchments Sheet



CUHP SUBCATCHMENTS

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Check Subcatchment Inputs | Check SWMM Nodes | Units are in miles and square miles (click to change)

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CC101	101	DIA	0.08125	0.473484848	0.4924242	0.03						
CC102	102	DIA	0.171875	0.151515152	0.1030303	0.0047						0
CC103	103	DIA	0.0578125	0.047348485	0.4852273	0.044						1
CC201	201	Denver	0.09375	0.4875	0.7575758	0.052						1
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Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Explanation of Subcatchment Input Checks

Info | Centroid | Length | Slope | Area

Color in the "Length to Centroid" column:

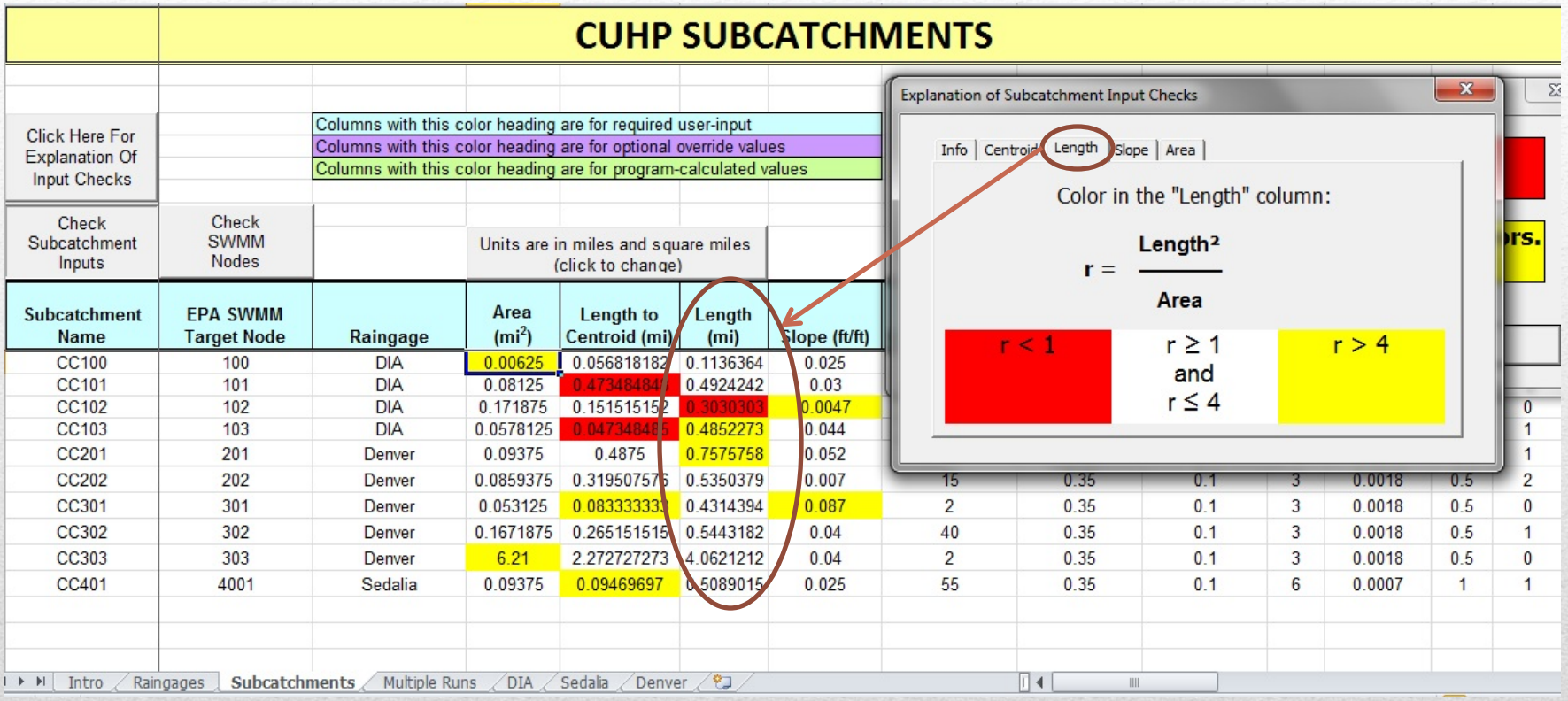
$$r = \frac{\text{Length to Centroid}}{\text{Length}}$$

$r < 0.1$	$r \geq 0.1$ and $r < 0.3$	$r \geq 0.3$ and $r \leq 0.9$	$r > 0.9$

Acceptable Range is: $0.1 \leq \frac{L_{centroid}}{L} < 0.9$

Values less than 0.3 are questionable

Subcatchments Sheet



CUHP SUBCATCHMENTS

Click Here For Explanation Of Input Checks

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

Check Subcatchment Inputs | Check SWMM Nodes | Units are in miles and square miles (click to change)

Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)						
CC100	100	DIA	0.00625	0.056818182	0.1136364	0.025						
CC101	101	DIA	0.08125	0.47348484	0.4924242	0.03						
CC102	102	DIA	0.171875	0.151515152	0.3030303	0.0047						0
CC103	103	DIA	0.0578125	0.047348485	0.4852273	0.044						1
CC201	201	Denver	0.09375	0.4875	0.7575758	0.052						1
CC202	202	Denver	0.0859375	0.319507576	0.5350379	0.007	15	0.35	0.1	3	0.0018	0.5	2
CC301	301	Denver	0.053125	0.083333333	0.4314394	0.087	2	0.35	0.1	3	0.0018	0.5	0
CC302	302	Denver	0.1671875	0.265151515	0.5443182	0.04	40	0.35	0.1	3	0.0018	0.5	1
CC303	303	Denver	6.21	2.272727273	4.0621212	0.04	2	0.35	0.1	3	0.0018	0.5	0
CC401	4001	Sedalia	0.09375	0.09469697	0.5089015	0.025	55	0.35	0.1	6	0.0007	1	1

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Explanation of Subcatchment Input Checks

Info | Centroid | Length | Slope | Area

Color in the "Length" column:

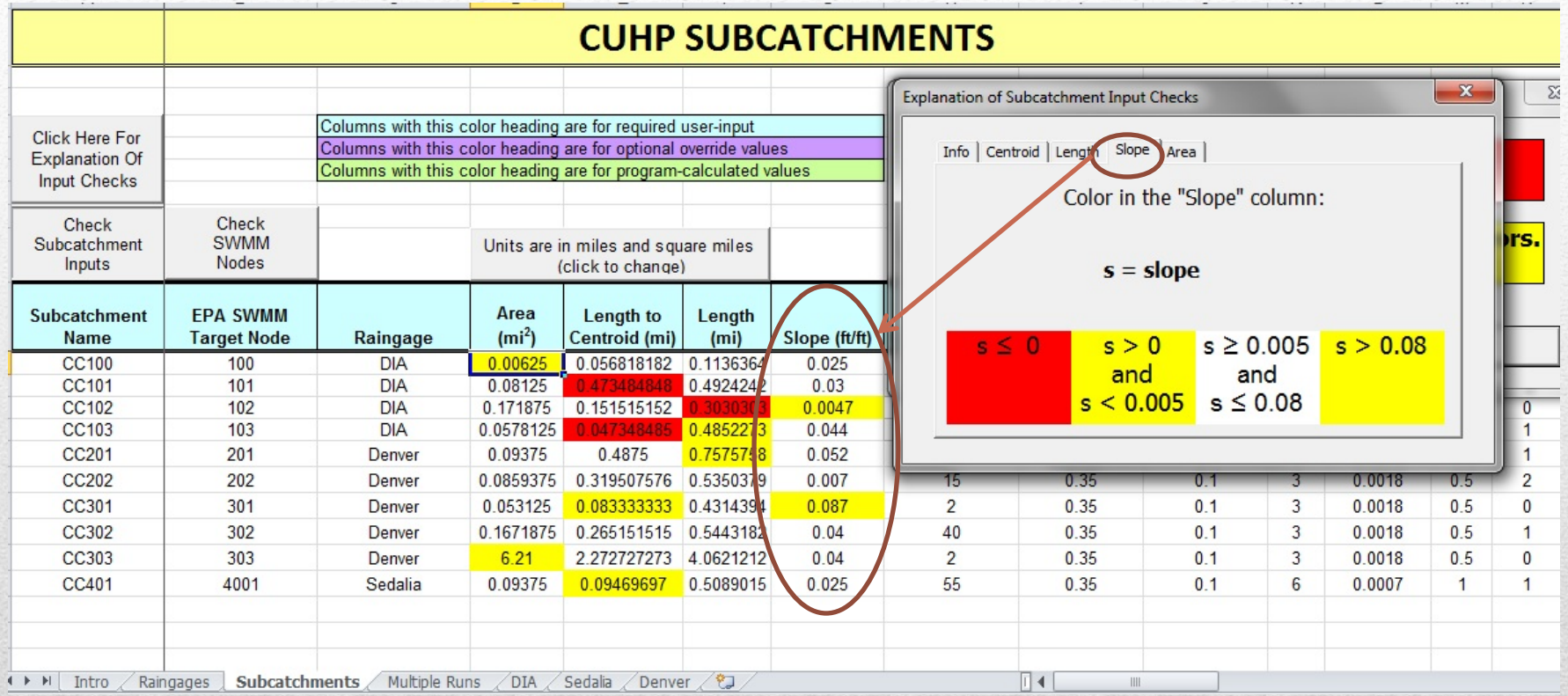
$$r = \frac{\text{Length}^2}{\text{Area}}$$

r < 1	r ≥ 1 and r ≤ 4	r > 4

Acceptable Range is: $\frac{L^2}{Area} \geq 1$;

values greater than 4 are questionable

Subcatchments Sheet



CUHP SUBCATCHMENTS

Click Here For Explanation Of Input Checks

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

Check Subcatchment Inputs | Check SWMM Nodes | Units are in miles and square miles (click to change)

Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)						
CC100	100	DIA	0.00625	0.056818182	0.1136364	0.025						
CC101	101	DIA	0.08125	0.473484848	0.4924242	0.03						
CC102	102	DIA	0.171875	0.151515152	0.3030303	0.0047						0
CC103	103	DIA	0.0578125	0.047348485	0.4852273	0.044						1
CC201	201	Denver	0.09375	0.4875	0.7575758	0.052						1
CC202	202	Denver	0.0859375	0.319507576	0.5350379	0.007	15	0.35	0.1	3	0.0018	0.5	2
CC301	301	Denver	0.053125	0.083333333	0.4314394	0.087	2	0.35	0.1	3	0.0018	0.5	0
CC302	302	Denver	0.1671875	0.265151515	0.5443182	0.04	40	0.35	0.1	3	0.0018	0.5	1
CC303	303	Denver	6.21	2.272727273	4.0621212	0.04	2	0.35	0.1	3	0.0018	0.5	0
CC401	4001	Sedalia	0.09375	0.09469697	0.5089015	0.025	55	0.35	0.1	6	0.0007	1	1

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Explanation of Subcatchment Input Checks

Info | Centroid | Length | Slope | Area

Color in the "Slope" column:

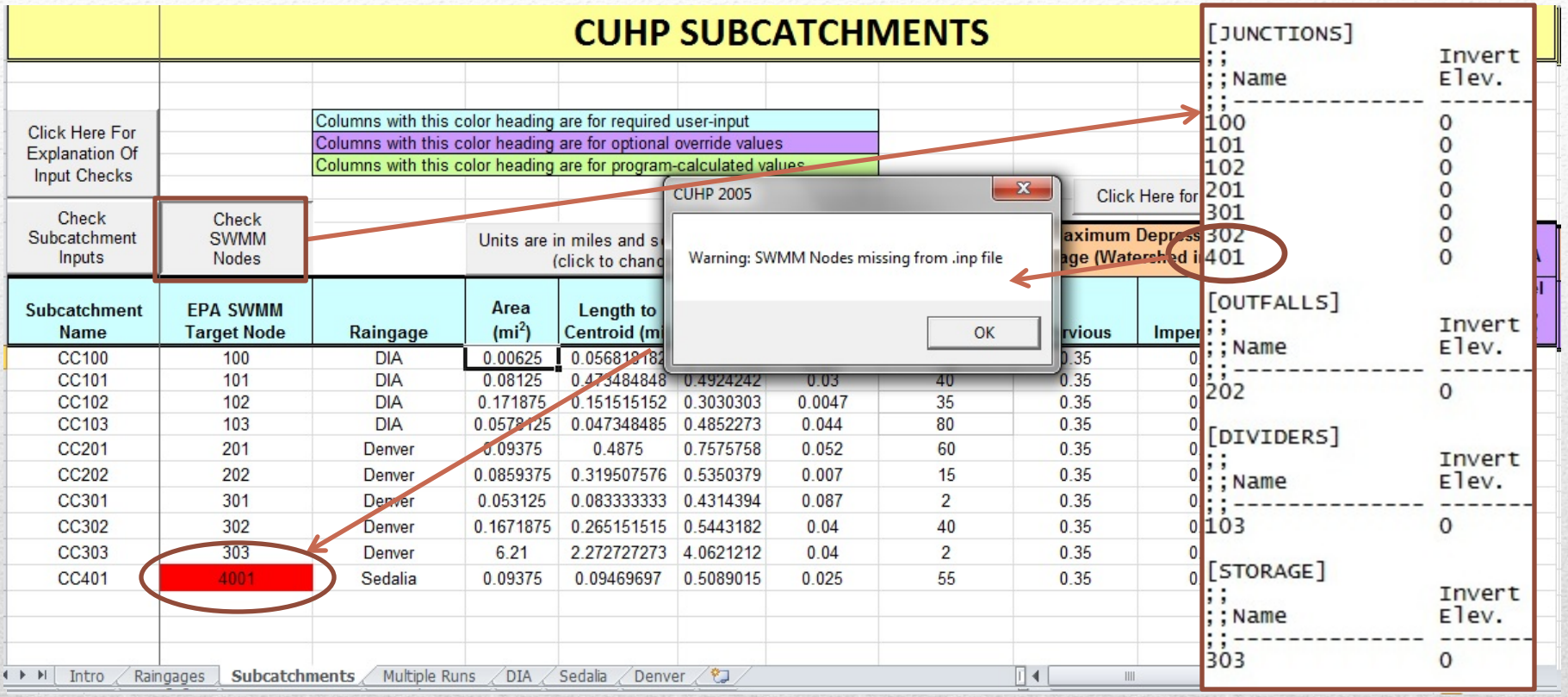
s = slope

$s \le 0$	$s > 0$ and $s < 0.005$	$s \ge 0.005$ and $s \le 0.08$	$s > 0.08$

Highlights: S < 0.005 & S > 0.08 ft/ft

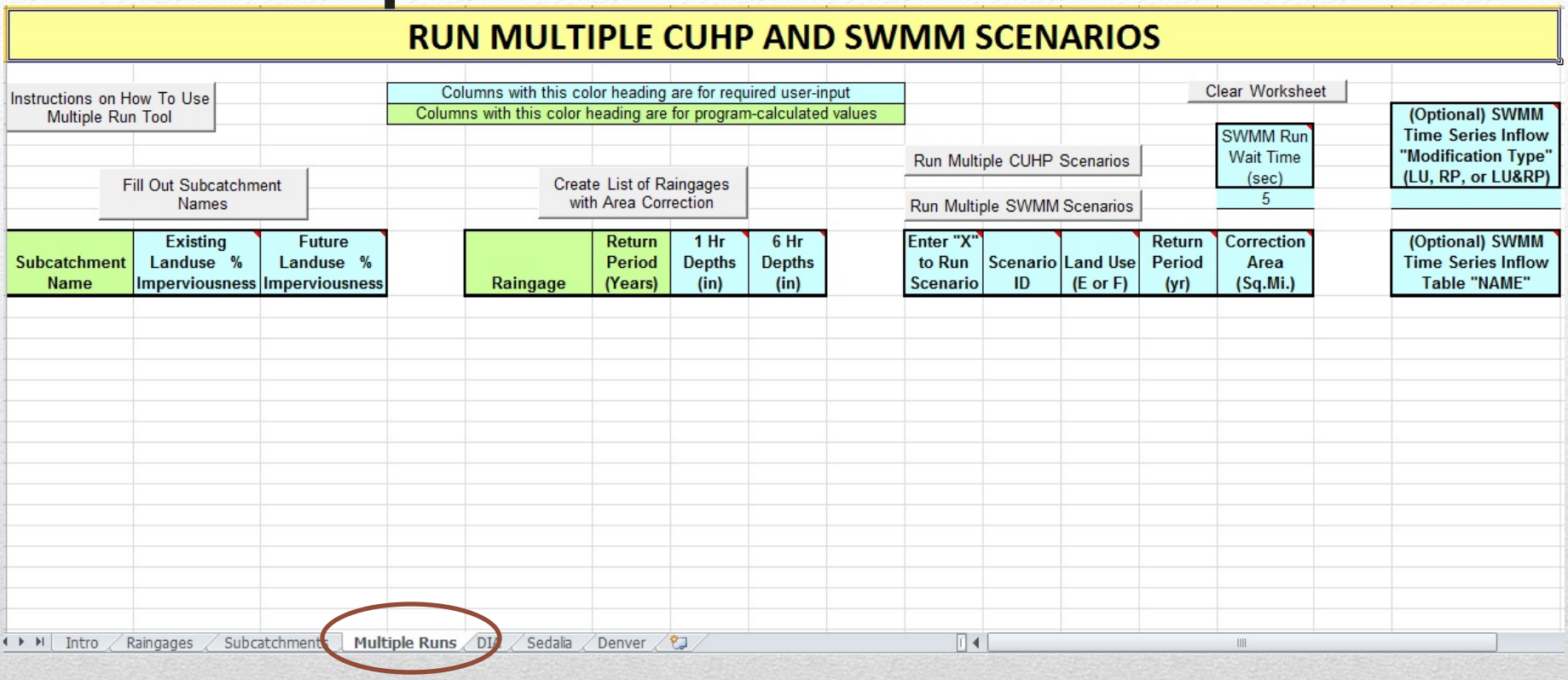
In these ranges, results may not be accurate

Subcatchments Sheet



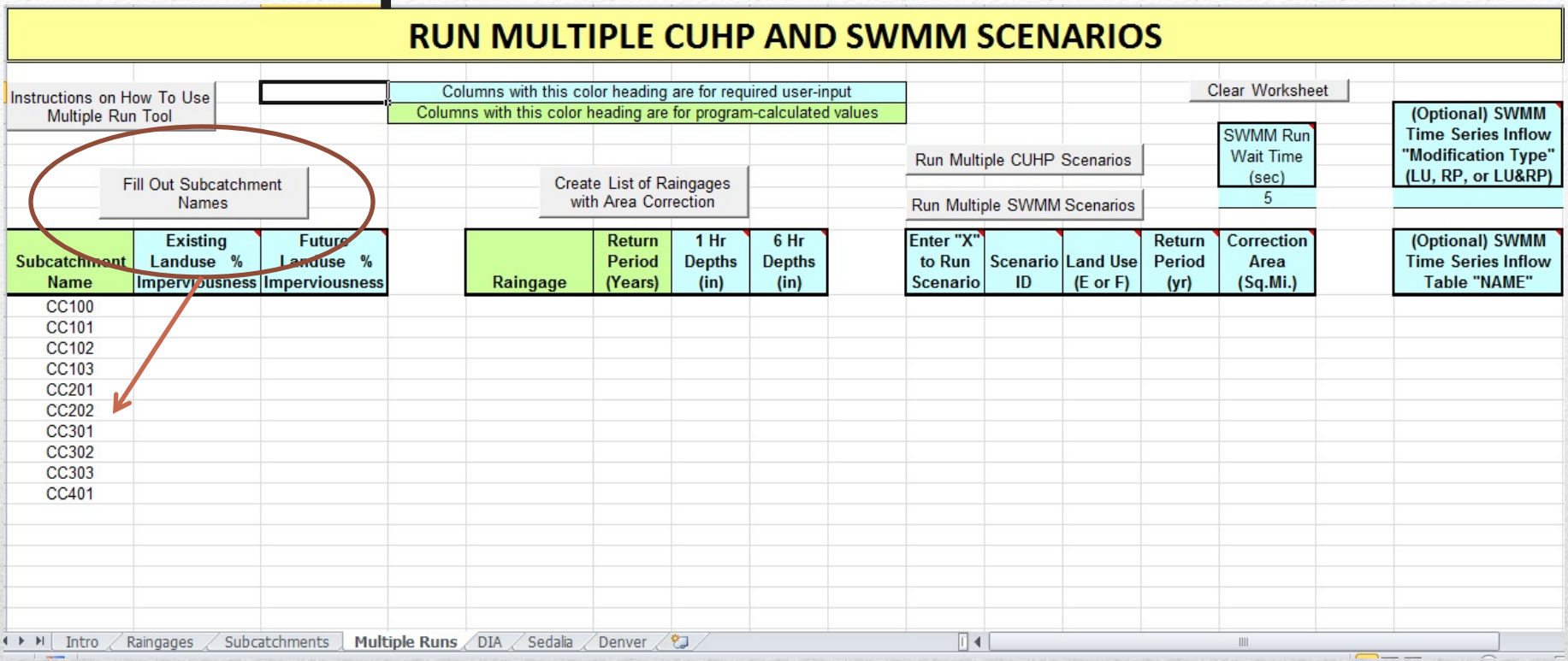
When checking SWMM nodes for consistency, any nodes not found in the SWMM input file (.inp) will be highlighted

Multiple Runs Sheet



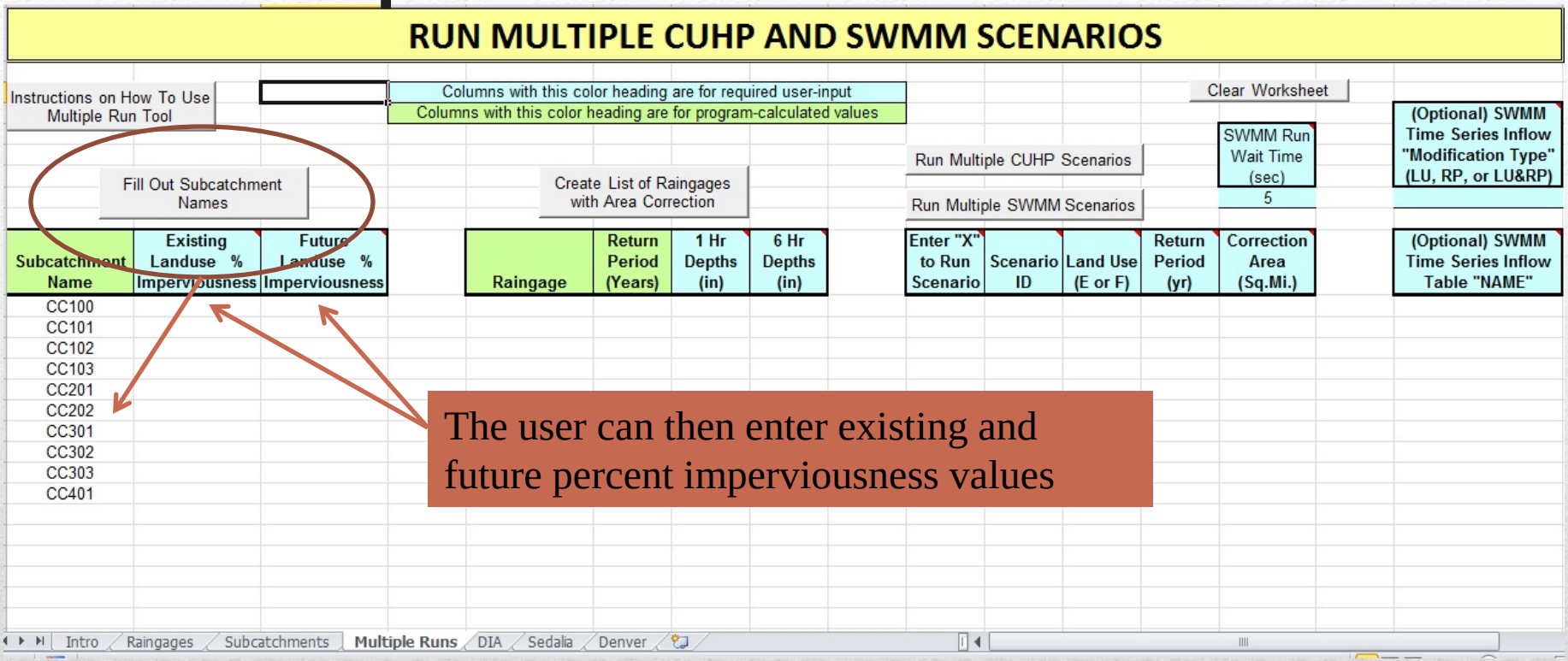
Allows the user to create a single input file that will run several different scenarios and create multiple output files

Multiple Runs Sheet



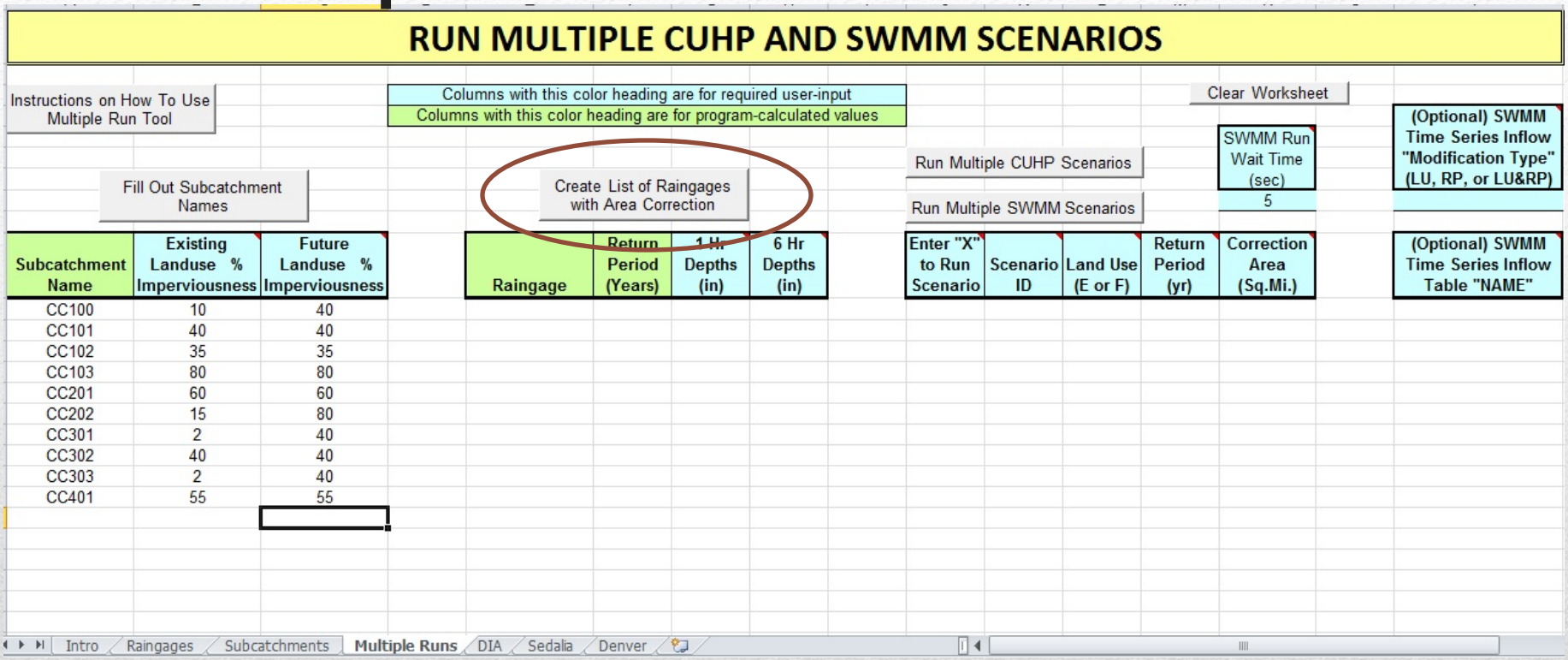
Automatically copies all subcatchment names from the Subcatchments sheet to this column

Multiple Runs Sheet



Imperviousness values from one of these columns will be copied and pasted to the subcatchments sheet for each scenario.

Multiple Runs Sheet



RUN MULTIPLE CUHP AND SWMM SCENARIOS

Instructions on How To Use Multiple Run Tool

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

Clear Worksheet

Fill Out Subcatchment Names

Create List of Raingages with Area Correction

Run Multiple CUHP Scenarios

Run Multiple SWMM Scenarios

SWMM Run Wait Time (sec): 5

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CC100	10	40
CC101	40	40
CC102	35	35
CC103	80	80
CC201	60	60
CC202	15	80
CC301	2	40
CC302	40	40
CC303	2	40
CC401	55	55

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)

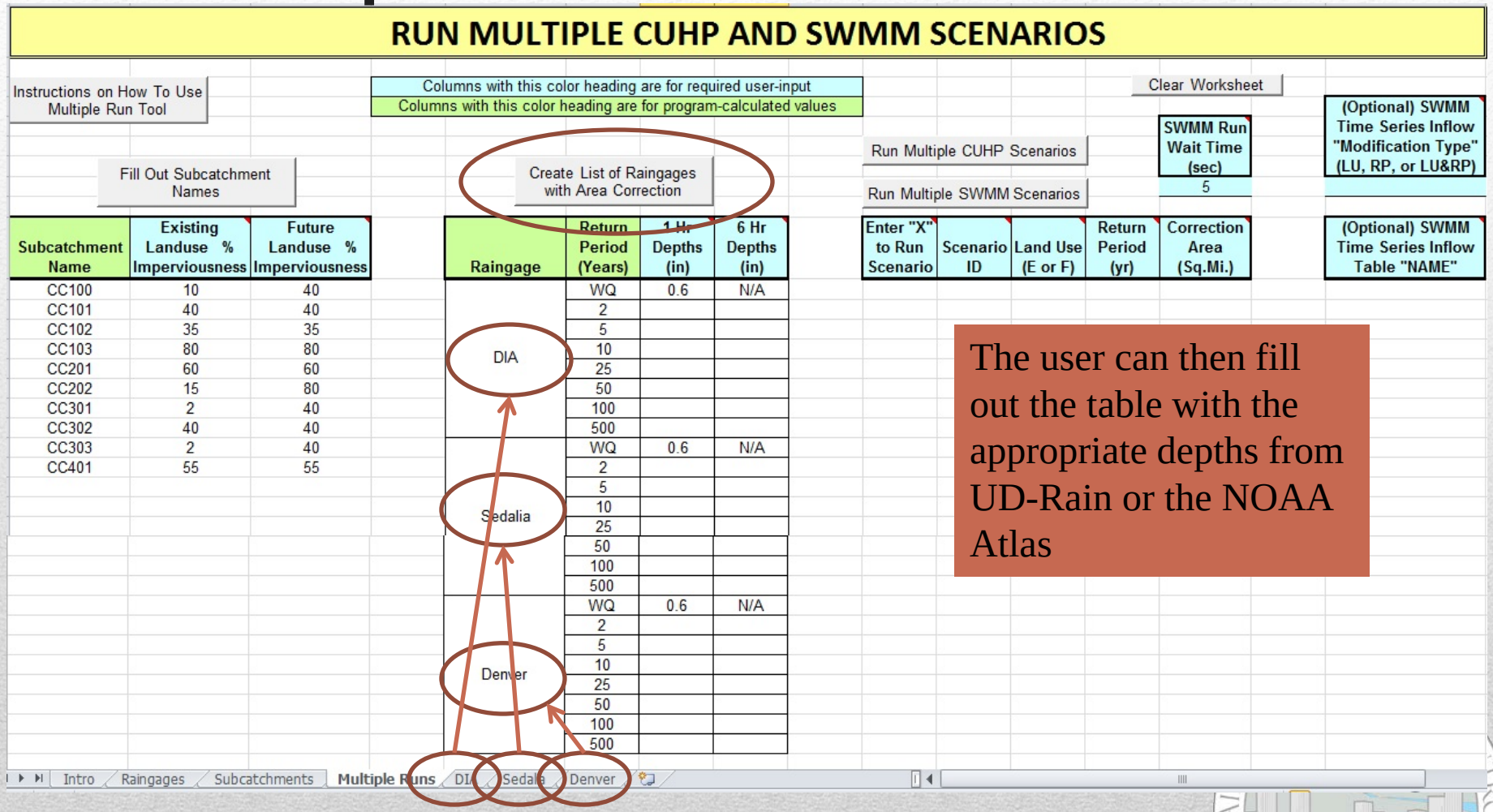
Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)

(Optional) SWMM Time Series Inflow Table "NAME"

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

The next step is to create a table of the available raingages with area correction

Multiple Runs Sheet



The user can then fill out the table with the appropriate depths from UD-Rain or the NOAA Atlas

Multiple Runs Sheet

RUN MULTIPLE CUHP AND SWMM SCENARIOS

Instructions on How To Use Multiple Run Tool

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

Clear Worksheet

Fill Out Subcatchment Names

Create List of Raingages with Area Correction

Run Multiple CUHP Scenarios

Run Multiple SWMM Scenarios

SWMM Run Wait Time (sec): 5

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CC100	10	40
CC101	40	40
CC102	35	35
CC103	80	80
CC201	60	60
CC202	15	80
CC301	2	40
CC302	40	40
CC303	2	40
CC401	55	55

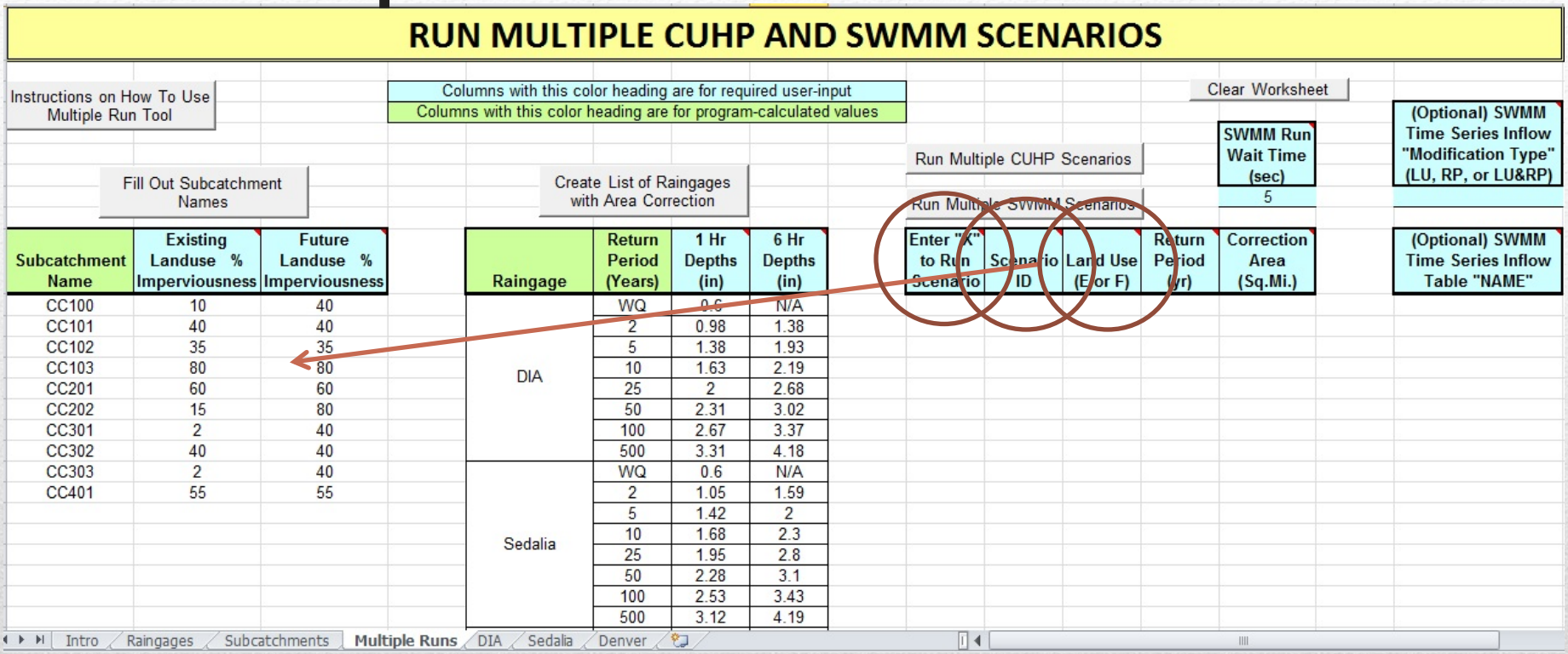
Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
DIA	WQ	0.6	N/A
	2	0.98	1.38
	5	1.38	1.93
	10	1.63	2.19
	25	2	2.68
	50	2.31	3.02
	100	2.67	3.37
	500	3.31	4.18
Sedalia	WQ	0.6	N/A
	2	1.05	1.59
	5	1.42	2
	10	1.68	2.3
	25	1.95	2.8
	50	2.28	3.1
	100	2.53	3.43
	500	3.12	4.19
Denver	WQ	0.6	N/A
	2	0.95	1.46
	5	1.35	1.97
	10	1.55	2.32
	25	2	2.84
	50	2.24	3.14
	100	2.58	3.51
	500	3.22	4.36

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)	(Optional) SWMM Time Series Inflow Table "NAME"

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

The user can then fill out the table with the appropriate depths from UD-Rain or the NOAA Atlas

Multiple Runs Sheet



RUN MULTIPLE CUHP AND SWMM SCENARIOS

Instructions on How To Use Multiple Run Tool

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

Clear Worksheet

Fill Out Subcatchment Names

Create List of Raingages with Area Correction

Run Multiple CUHP Scenarios

Run Multiple SWMM Scenarios

SWMM Run Wait Time (sec): 5

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

(Optional) SWMM Time Series Inflow Table "NAME"

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CC100	10	40
CC101	40	40
CC102	35	35
CC103	80	80
CC201	60	60
CC202	15	80
CC301	2	40
CC302	40	40
CC303	2	40
CC401	55	55

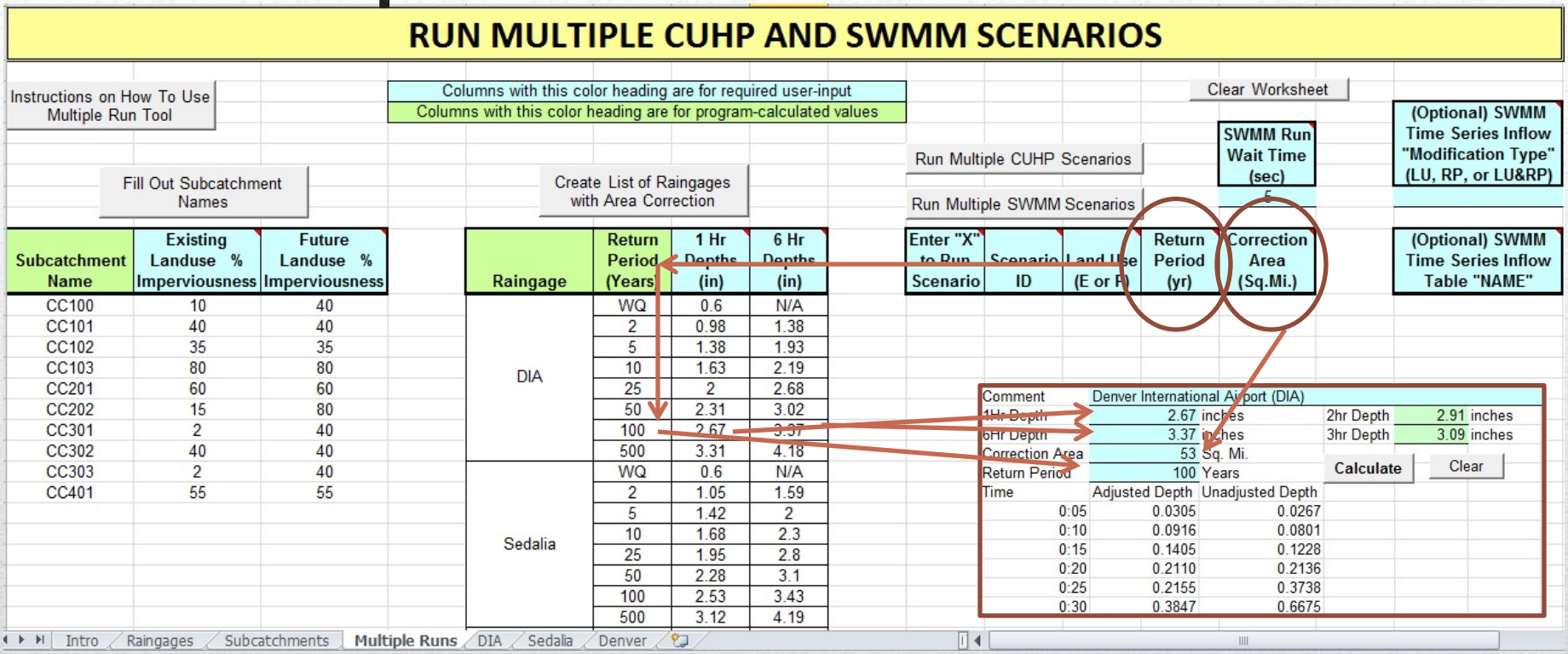
Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
DIA	WQ	0.6	N/A
	2	0.98	1.38
	5	1.38	1.93
	10	1.63	2.19
	25	2	2.68
	50	2.31	3.02
	100	2.67	3.37
	500	3.31	4.18
Sedalia	WQ	0.6	N/A
	2	1.05	1.59
	5	1.42	2
	10	1.68	2.3
	25	1.95	2.8
	50	2.28	3.1
	100	2.53	3.43
	500	3.12	4.19

Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

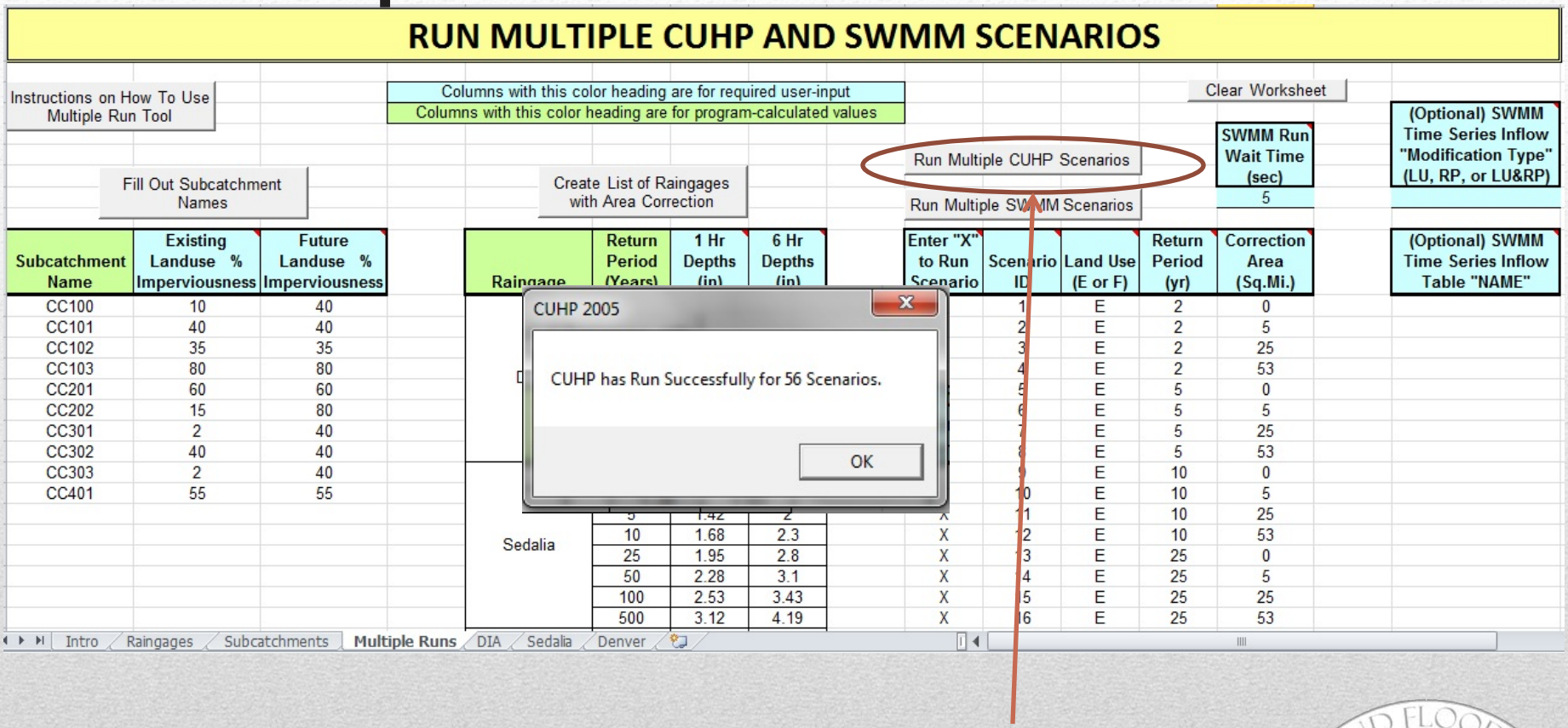
The final step is create input file scenarios by selecting an ID, Landuse, return period and correction area for each scenario.

Multiple Runs Sheet



The final step is create input file scenarios by selecting an ID, Landuse, return period and correction area for each scenario.

Multiple Runs Sheet



Once all input scenarios are created, a push of the top button creates all of the CUHP output files.

Multiple Run Summary Results

Subcatchment CC100

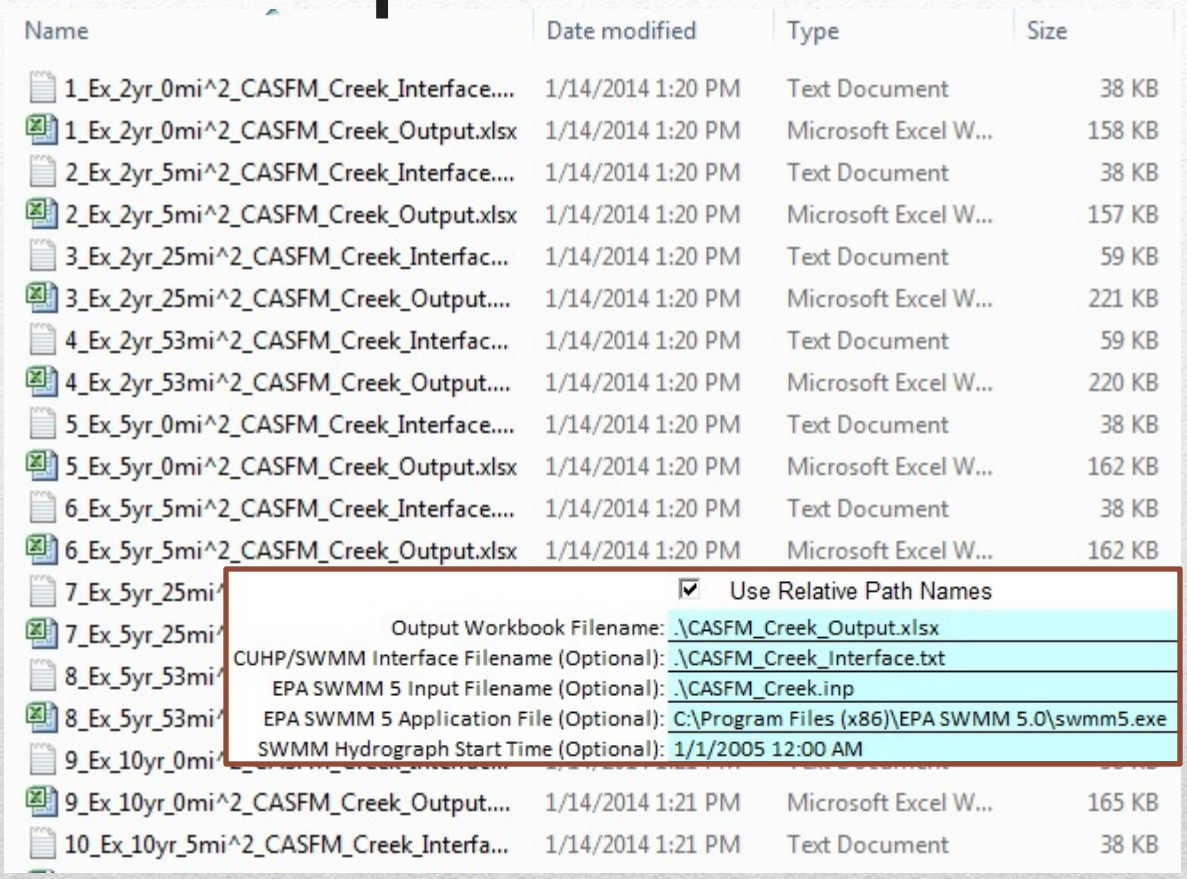
flow in cfs

time in minutes	1_Ex_2yr_0mi^2	2_Ex_2yr_5mi^2	3_Ex_2yr_25mi^2	4_Ex_2yr_53mi^2	5_Ex_5yr_0mi^2	6_Ex_5yr_5mi^2	7_Ex_5yr_25mi^2	8_Ex_5yr_53mi^2	9_Ex_10yr_0mi^2	10_Ex_10yr_5mi^2	11_Ex_10yr_25mi^2	12_Ex_10yr_53mi^2	13_Ex_25yr_0mi^2	14_Ex_25yr_5mi^2	15_Ex_25yr_25mi^2	16_Ex_25yr_53mi^2
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
4	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.0
5	0.02	0.01	0.01	0.00	0.39	0.17	0.01	0.01	0.90	0.44	0.01	0.01	0.13	0.13	0.01	0.0
6	0.17	0.04	0.01	0.01	1.06	0.50	0.01	0.01	1.77	1.07	0.11	0.01	2.11	2.11	0.89	0.4
7	0.24	0.07	0.01	0.01	1.29	0.67	0.02	0.01	2.02	1.32	0.20	0.01	3.45	3.45	1.60	0.9
8	0.25	0.09	0.01	0.01	1.25	0.68	0.05	0.01	1.93	1.32	0.25	0.01	4.00	4.00	2.17	1.3
9	0.22	0.08	0.01	0.01	1.11	0.62	0.07	0.01	1.76	1.23	0.27	0.01	3.91	3.91	2.43	1.6
10	0.19	0.07	0.01	0.01	0.98	0.56	0.09	0.01	1.57	1.11	0.28	0.01	3.75	3.75	2.59	1.8
11	0.16	0.06	0.01	0.01	0.86	0.50	0.10	0.01	1.39	1.00	0.28	0.03	3.41	3.41	2.50	1.8
12	0.14	0.05	0.01	0.01	0.75	0.44	0.09	0.01	1.25	0.90	0.28	0.06	3.06	3.06	2.35	1.7
13	0.12	0.05	0.01	0.01	0.67	0.39	0.09	0.01	1.14	0.84	0.28	0.09	2.79	2.79	2.21	1.7
14	0.11	0.04	0.01	0.01	0.59	0.35	0.09	0.01	1.03	0.77	0.28	0.12	2.48	2.48	2.01	1.5
15	0.10	0.04	0.01	0.01	0.51	0.31	0.08	0.01	0.92	0.71	0.29	0.14	2.17	2.17	1.80	1.4
16	0.08	0.03	0.01	0.01	0.43	0.26	0.07	0.01	0.79	0.62	0.27	0.14	1.85	1.85	1.56	1.2

Multiple CUHP Run Summary | Sub_CC100 | Sub_CC101 | Sub_CC102 | Sub_CC103 | Sub_CC201 | Sub_CC202 | Su

CUHP summary workbook provides the Storm Hydrograph for each scenario for all Subcatchments

Multiple Runs Sheet



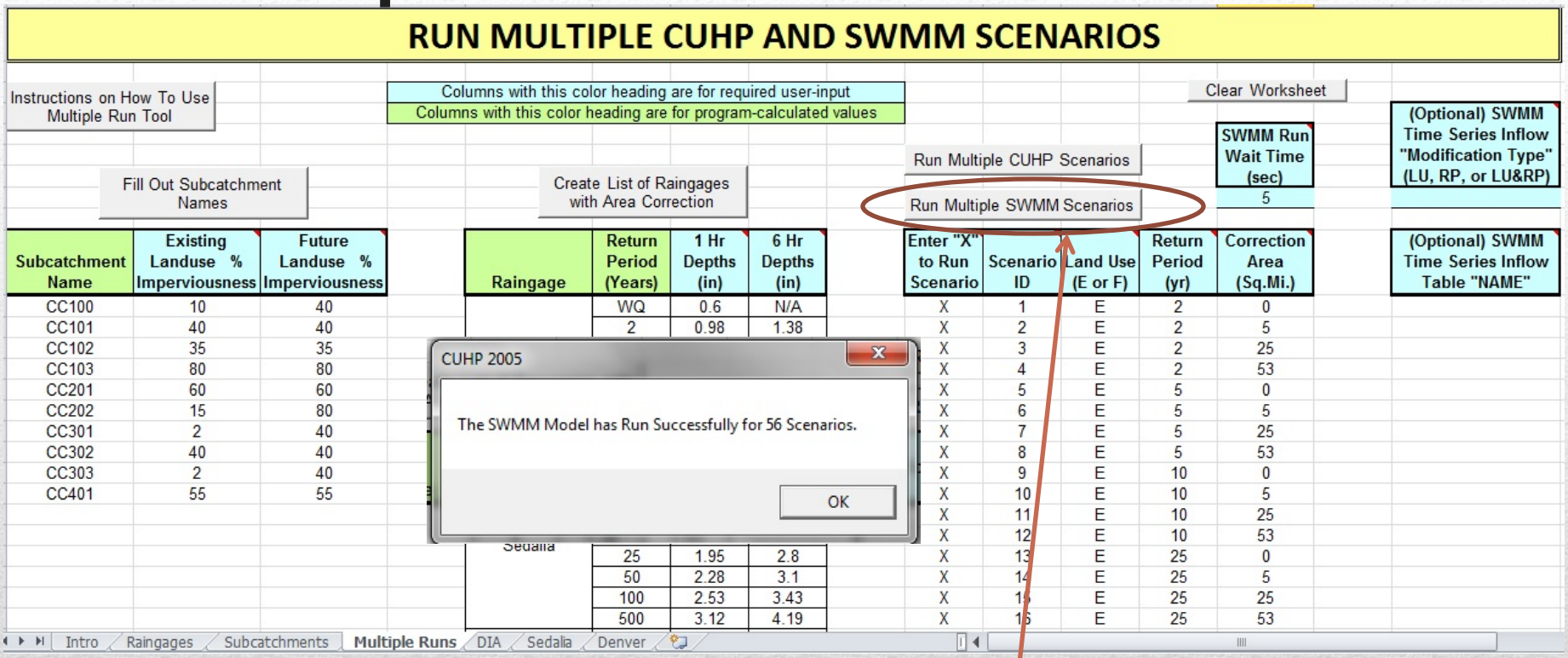
For each scenario CUHP creates the following files:

- Output Summary Workbook (.xlsx)
- SWMM Interface Inflow hydrographs (.txt)

A prefix is added to each output file in the form of:

RunID_Landuse_RetPeriod_CorrectionArea

Multiple Runs Sheet



Once all CUHP scenarios have run successfully, a push of the bottom button creates all of the SWMM output files.

Multiple Run Summary Results

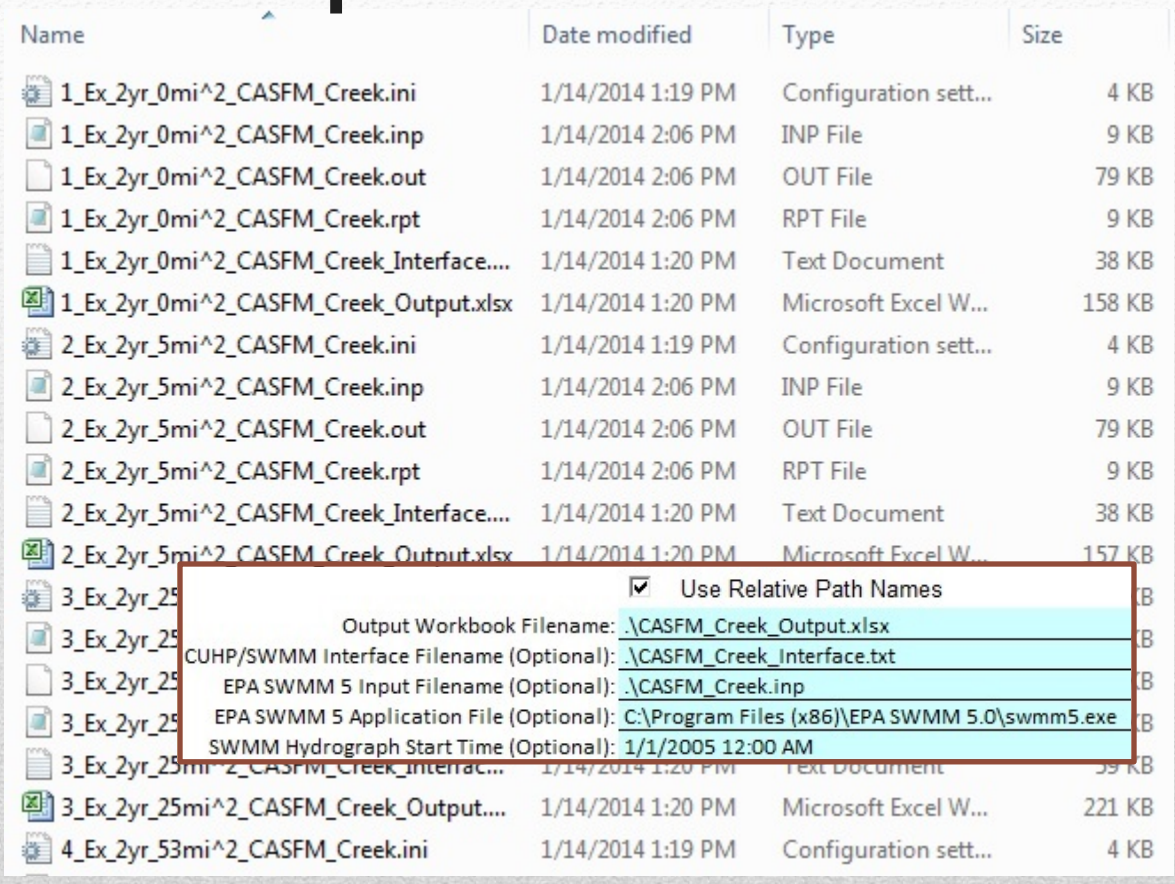
EPA	STORM	WATER	MANAGEMENT	MODEL	-	VERSION	5 (Build	5.0.022)

Scenario	ID	=	1_Ex_2yr_0mi^2_CASFM_Creek					
**********								
NOTE:	The	summary	statistics	displayed	in	this	report	are
based	on	results	found	at	every	computational	time	step,
not	just	on	results	from	each	reporting	time	step.
**********								
**********								
Analysis	Options							
**********								
Flow	Units	.....	CFS					
Process	Models:							
Rainfall/Run	.....	NO						
Snowmelt	.....	NO						
Groundwate	.....	NO						
Flow	Routing	.....	YES					
Ponding	Allowed	.....	NO					
Water	Quality	.....	NO					
Flow	Routing	Method	.....	KINWAVE				
Starting	Date	.....	JAN-01-2005	0:00:00				

Multiple SWMM Run Summary | 1_Ex_2yr_0mi^2_ | 2_Ex_2yr_5mi^2_ | 3_Ex_2yr_25mi^2_ | 4_Ex_2yr_53mi^2_

SWMM summary workbook copies SWMM report files into a blank spreadsheet

Multiple Runs Sheet



Name	Date modified	Type	Size
1_Ex_2yr_0mi^2_CASFM_Creek.ini	1/14/2014 1:19 PM	Configuration sett...	4 KB
1_Ex_2yr_0mi^2_CASFM_Creek.inp	1/14/2014 2:06 PM	INP File	9 KB
1_Ex_2yr_0mi^2_CASFM_Creek.out	1/14/2014 2:06 PM	OUT File	79 KB
1_Ex_2yr_0mi^2_CASFM_Creek.rpt	1/14/2014 2:06 PM	RPT File	9 KB
1_Ex_2yr_0mi^2_CASFM_Creek_Interface....	1/14/2014 1:20 PM	Text Document	38 KB
1_Ex_2yr_0mi^2_CASFM_Creek_Output.xlsx	1/14/2014 1:20 PM	Microsoft Excel W...	158 KB
2_Ex_2yr_5mi^2_CASFM_Creek.ini	1/14/2014 1:19 PM	Configuration sett...	4 KB
2_Ex_2yr_5mi^2_CASFM_Creek.inp	1/14/2014 2:06 PM	INP File	9 KB
2_Ex_2yr_5mi^2_CASFM_Creek.out	1/14/2014 2:06 PM	OUT File	79 KB
2_Ex_2yr_5mi^2_CASFM_Creek.rpt	1/14/2014 2:06 PM	RPT File	9 KB
2_Ex_2yr_5mi^2_CASFM_Creek_Interface....	1/14/2014 1:20 PM	Text Document	38 KB
2_Ex_2yr_5mi^2_CASFM_Creek_Output.xlsx	1/14/2014 1:20 PM	Microsoft Excel W...	157 KB
3_Ex_2yr_25			KB
3_Ex_2yr_25			KB
3_Ex_2yr_25			KB
3_Ex_2yr_25			KB
3_Ex_2yr_25mi^2_CASFM_Creek_Interfac...	1/14/2014 1:20 PM	Text Document	39 KB
3_Ex_2yr_25mi^2_CASFM_Creek_Output....	1/14/2014 1:20 PM	Microsoft Excel W...	221 KB
4_Ex_2yr_53mi^2_CASFM_Creek.ini	1/14/2014 1:19 PM	Configuration sett...	4 KB

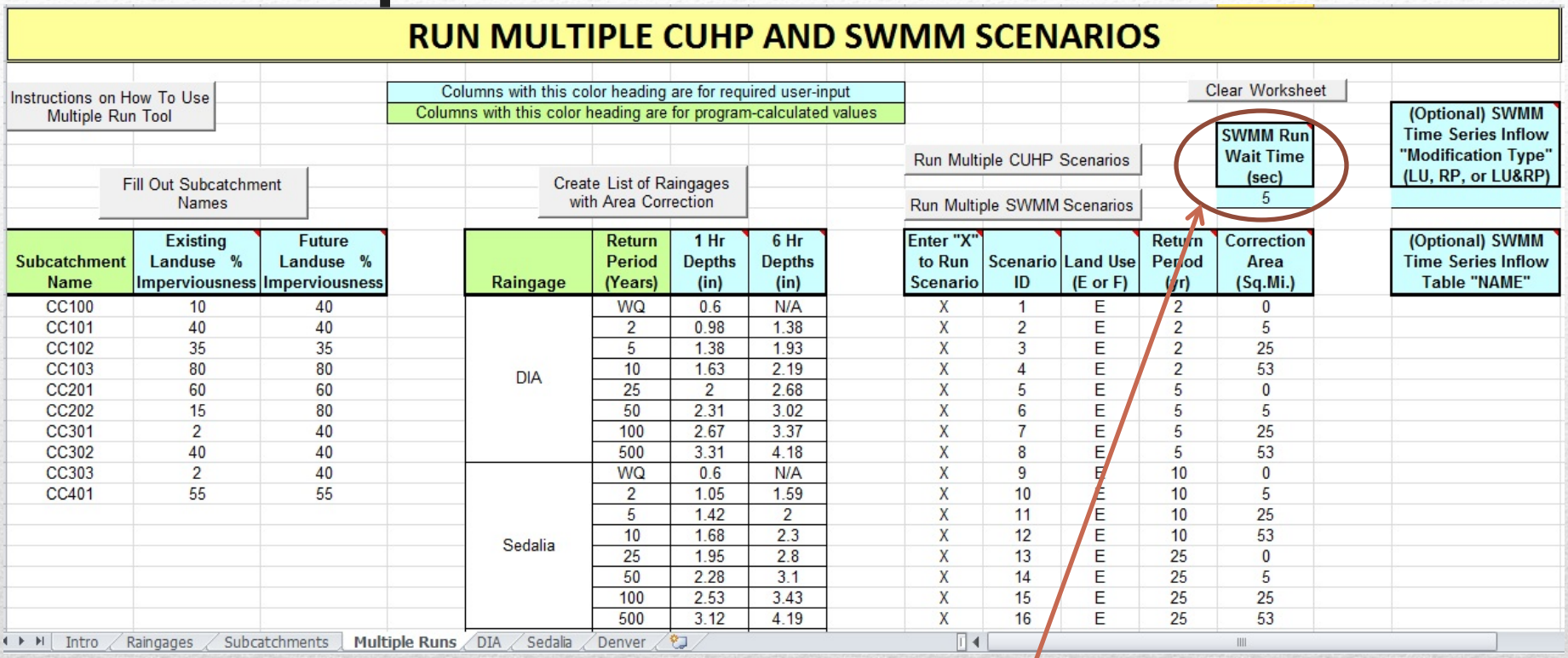
For each scenario SWMM creates the following files:

- Input (.inp)
- Settings (.ini)
- Output (.out)
- Report (.rpt)

A prefix is added to each output file in the form of:

RunID_Landuse_RetPeriod_CorrectionArea

Multiple Runs Sheet



RUN MULTIPLE CUHP AND SWMM SCENARIOS

Instructions on How To Use Multiple Run Tool

Columns with this color heading are for required user-input
Columns with this color heading are for program-calculated values

Clear Worksheet

Run Multiple CUHP Scenarios

Run Multiple SWMM Scenarios

SWMM Run Wait Time (sec): 5

(Optional) SWMM Time Series Inflow "Modification Type" (LU, RP, or LU&RP)

Fill Out Subcatchment Names

Create List of Raingages with Area Correction

Subcatchment Name	Existing Landuse % Imperviousness	Future Landuse % Imperviousness
CC100	10	40
CC101	40	40
CC102	35	35
CC103	80	80
CC201	60	60
CC202	15	80
CC301	2	40
CC302	40	40
CC303	2	40
CC401	55	55

Raingage	Return Period (Years)	1 Hr Depths (in)	6 Hr Depths (in)
DIA	WQ	0.6	N/A
	2	0.98	1.38
	5	1.38	1.93
	10	1.63	2.19
	25	2	2.68
	50	2.31	3.02
	100	2.67	3.37
	500	3.31	4.18
Sedalia	WQ	0.6	N/A
	2	1.05	1.59
	5	1.42	2
	10	1.68	2.3
	25	1.95	2.8
	50	2.28	3.1
	100	2.53	3.43
	500	3.12	4.19

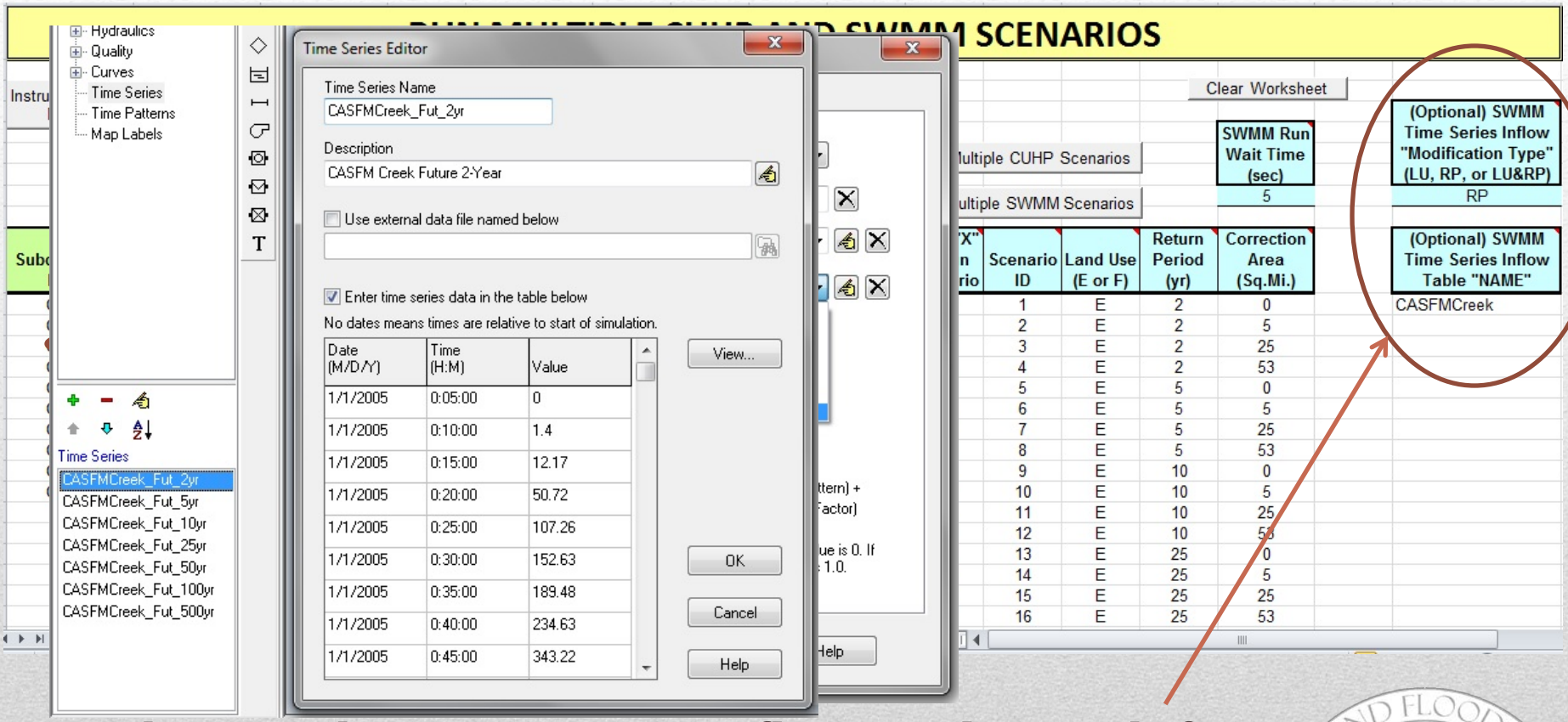
Enter "X" to Run Scenario	Scenario ID	Land Use (E or F)	Return Period (yr)	Correction Area (Sq.Mi.)
X	1	E	2	0
X	2	E	2	5
X	3	E	2	25
X	4	E	2	53
X	5	E	5	0
X	6	E	5	5
X	7	E	5	25
X	8	E	5	53
X	9	E	10	0
X	10	E	10	5
X	11	E	10	25
X	12	E	10	53
X	13	E	25	0
X	14	E	25	5
X	15	E	25	25
X	16	E	25	53

(Optional) SWMM Time Series Inflow Table "NAME"

Intro | Raingages | Subcatchments | Multiple Runs | DIA | Sedalia | Denver

Wait Time ensures that the entire SWMM report file is copied to the summary workbook prior to starting the next scenario.

Multiple Runs Sheet



Changes the Time Series Inflow Hydrograph for each scenario depending on either Landuse, Return Period, or Both

Summary

- Standalone Excel spreadsheet that can be opened and run without installing software
- Simplified user interface with new tools to check for reasonableness of inputs
- Updated code to be consistent with USDCM
- Tool to check consistency between SWMM nodes and SWMM input file
- Running multiple scenarios from a single input file enhances file management and prevents repetitive input mistakes for large watershed studies

Questions ?
or
Comments !