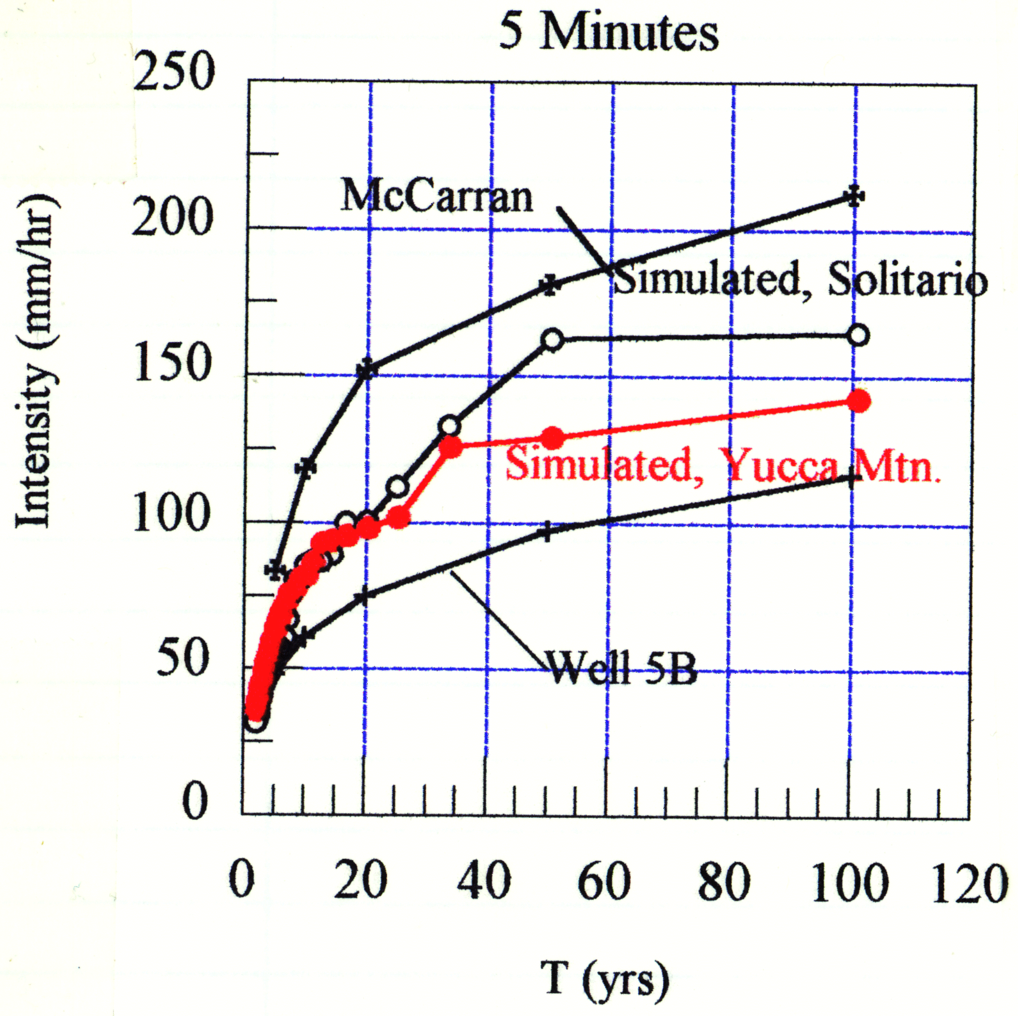
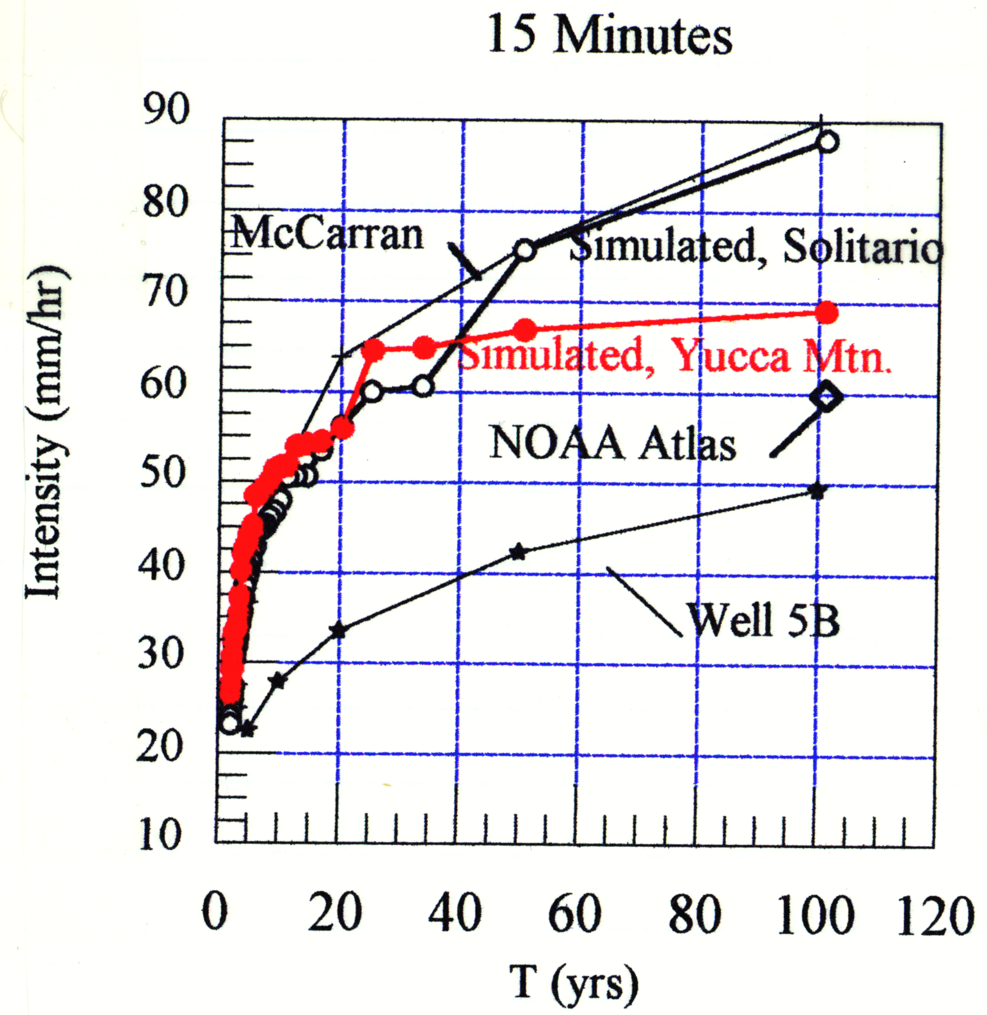
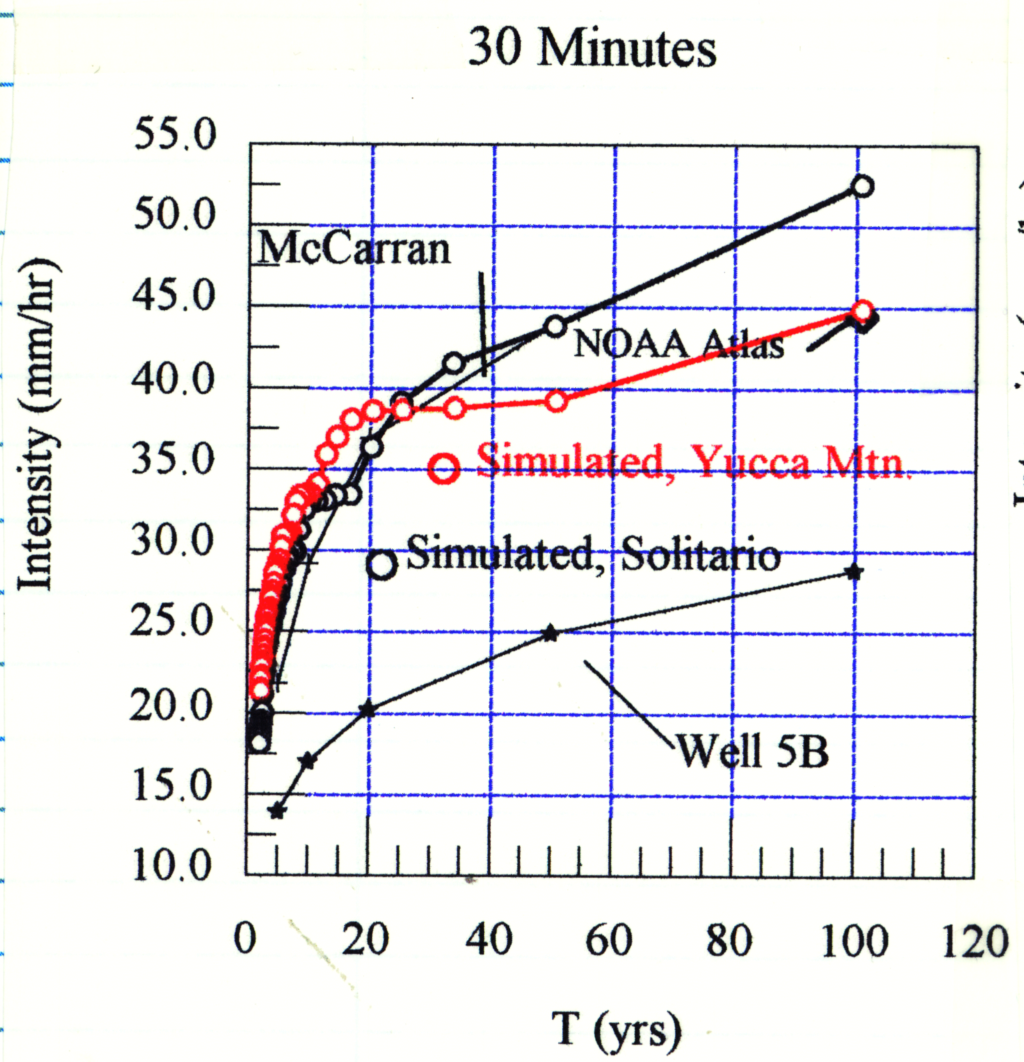
DAW 10-25-01



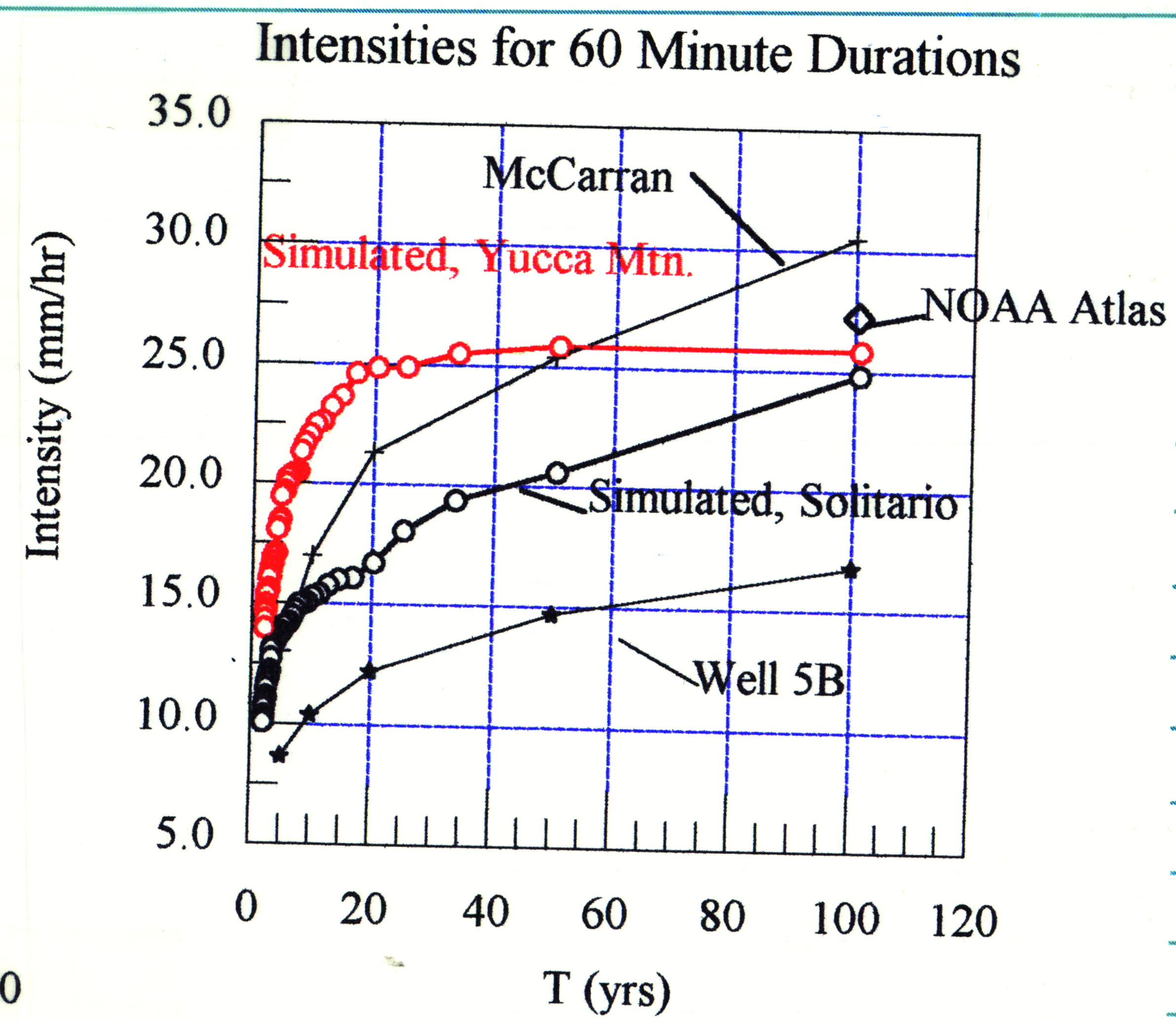
File:SWRI|NEWSPLIT2|RAINSTAT|YUC5MIN2.PGW
daw 10/17/01



File: NEWSPLIT2|RAINSTAT|YUC15MIN2.PGW
daw 10/25/01

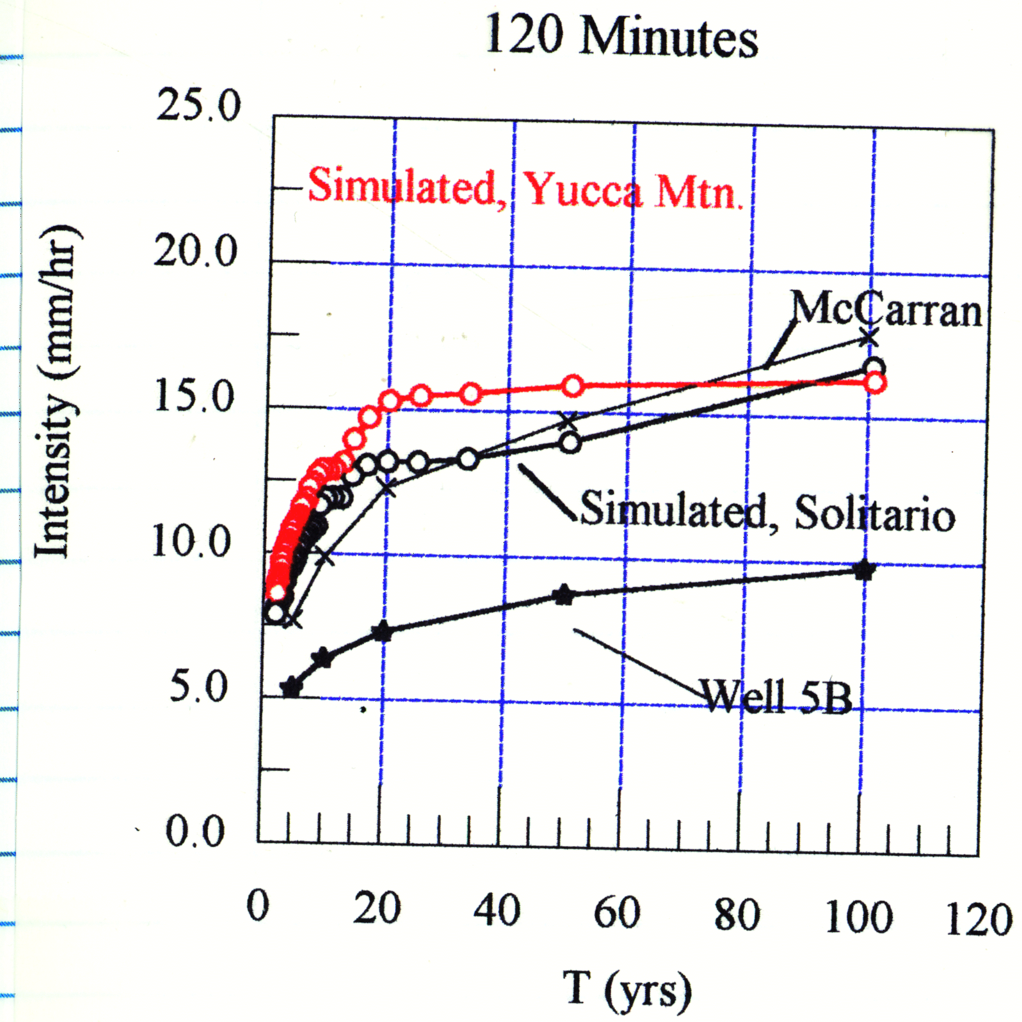


File:NEWSPL2|RAINSTAT|YUC30MIN2.PGW
daw 10-25-01



File:NEWSPL2|RAINSTAT|YUC60MIN2.PGW
daw 10-25-01

DAW 10-25-01



File: NEWSPL2|RAINSTAT|YUC120MIN2.PGW
daw 10-25-01

For 5 and 15 min durations, the intensities for the C and D series (100 yr) are between those for McCarran and Well 5B and the more infrequent events (T = 40-100 yrs) are also below those for the Solitario Canyon simulations. The 100 yr frequency values are very close to the NOAA Atlas values for 15, 30 and 60 minutes. The intensities for higher frequencies are higher than those for McCarran for 30, 60 and 120 minutes. This may be the result of greater mean daily precipitation at the higher elevation of Yucca Mtn. combined with the joint distribution of depth and duration obtained from records in Southern Arizona. The result of these differences will be a possible overestimate of Hortonian runoff for the months Apr - Oct.

DAW 10-29-01 Computer Runs for Upper Split Wash
Rainfall Series C.

strategy: Begin with "winter" storms and start with the largest. Continue until there is no saturated overland flow. There will be some Hortonian runoff from the disturbed areas. Examine this to see if it is significant. Summary information, as well as documentation of rainfall files, parameter files, dates, etc, and control files will be summarized on a run table.

For summer storms use plane 170 as a test case if runoff is less than 0.01 mm do not run with entire watershed.

Test parameter files; TESTm_j.PAR (May + June)
TESTJ_O.PAR (July - Oct)
TESTN.PAR (Nov)

DAW 11-19-01

Summary of computer runs for "winter" season simulated series C (50 yrs).

34 storms met the criterion of potential saturation-induced overland flow for the shallowest soils The program used previously, KIN00-7, has been modified by R.E. Smith to provide an output statement showing the total flux into the lower layer (bedrock) during a storm. The largest event (76.4 mm) occurred in a 3-day sequence (SW_C24) and resulted in surface runoff of 8.81 mm and channel infiltration of 0.61 mm. The second largest event, SW_C1, had 59.1 mm in 2 days. Surface runoff was 5.94 mm and channel infiltration was 0.57 mm.

output files → All output files are in SWRI\NEWSPL2\OUTC

DAW 11-21-01
Summary of storms for Dec - Apr for 50 year simulated series D.

46 storms met the criterion of potential saturation-induced runoff for the shallowest soils The largest event, Jan 4-30 was 57.8 mm for a 3-day sequence and resulted in surface runoff of 2.53 mm and channel infiltration of 0.52 mm.

output files → All output files are of the form SW_DXX.OUT and are in the directory SWRI\NEWSPL2\OUTD.

Summary of runs for 9-year period using tipping bucket rainfall data.

The 17 storms with runoff potential as described in Scientific Notebook 362 were used as input to the Upper Split Wash model with KINEROS version KIN01-1 to account for flux into bedrock as incorporated by R.E. Smith. The largest rainfall was 86.7 mm on Mar. 9-11, 1995. Simulated runoff was 10.6 mm and channel infiltration was 0.6 mm. It should be noted that Smith modified the coding where the flux from the soil through the soil-bedrock interface is calculated to make it more physically realistic. This resulted in less surface runoff and consequently less channel infiltration than in the runs documented in pages 108-109 in Scientific Notebook #362.

output files → All output files are in directory SWRI\NEWSPL2\OUTREAL

A table documenting the runs for the 9-yr period is shown on p 81.

DAW 11-26-01 Develop CDFs' for mean annual Infiltration excess and bedrock infiltration for tipping bucket rainfall data 1987-95.

Procedure:

1.) Modify program CDF2.BAS so it can read the new output line from KIN01_1. Revised program
CDF3.BAS is CDF3.BAS. This program can create CDFs for single events.

2) Modify program KINREAD3.BAS to read calculated bedrock infiltration for each plane and channel and to read the total precipitation depth for each storm
KINREAD4.BAS Revised program is KINREAD4.BAS.

This program reads a file, REAL.LST with a list of all the *.OUT files for the period of record. Associated with each *.OUT file is a season code (1 for Apr-Nov and 0 for Dec - Mar.). Each *.OUT file is read in sequence.

Total annual and seasonal precipitation is printed to the screen for input to another program.

Output files: 2 for each run file

xx.LSP list of file names, planes + season code
*x.LSC " " channels + season code

xx is the same as the run file name: ie REAL

Output files:

xx.DAT 2 cols for each plane.
Total plane infil (mm) Bedrock Infil. (mm)
xx.CHN 2 cols for each channel
Total channel infil (m3) Bedrock Infil (mm)

3) Create file with list of file names for each run

SWRI\NEWSPL2\REAL.LST

DAW 11-26-01 Develop CDFs for mean annual infiltration (con't)

4) Run KINREAD4.BAS with REAL.LST

Total storm precipitation = 643.73 mm
" summer " = 60 mm
" winter " = 583.73 mm

Note: These amounts are for the 17 possible runoff-producing storms for the period 1987-95.

5) RUN AVGCDF4.BAS

This program will create CDFs for 2 seasons

Input files:

1) DMODEL2.PRN
Element # Element area (m²) Topog Code { 0 - Ridge, 1 - slope, 2 - Toe-of-slope }

The areas for each topog. class are printed to the screen

2) Name of file with list of *.DAT files + season code

Program calls for rainfall depths (above)

Ridge Area = 77,458 m²	30%	Total Area = 256,795
Slope Area = 154,082	60%	= 0.257 Km²
Toe Area = 25,255	10%	

Rock Infiltration = ~~0.619~~ 6.88 mm/yr over entire area DAW 11-26-01
= 9.66 mm/yr over 0.71 of area

Daw 11-26-01

Output files in SWRI\NEWSPL2\CDF_FILE

1	A_NAVG.CDF	CDFs for Plane excess and Rock F Apr-Nov
2	D_MAVG.CDF	" " Dec-Mar
3	PL+RCAVG.CDF	" " " entire year
4	RIDGE.CDF	" " Plane + Rock for Ridge elements
5	RIDGE_DM.CDF	" " " " Dec-Mar
6	SLOPE.CDF	" " Slope
7	TOE.CDF	" " " toe-of-slope

Because there was such a small amount of potential runoff-producing storms in the summer for this period, the CDF's for entire year will not be greatly affected for the summer events.

Prepare figures for 9 year precipitation sequence.

1. Use PSIPLOT with files 3, 4, 6, 7 to prepare CDFs of Average annual precipitation excess.
   Fig. file for slides is NEWSPL2\CDF_FILE\EXCESS.PGW
   See p. 82 for print of Fig.

Daw 11-27-01

2. Use PSIPLOT with the same files to create CDF's of bedrock infiltration.
   File for slide is NEWSPL2\CDF-FILE\BEDF.PGW
   See p. 82

It is useful to examine the file RIDGE.CDF to see which elements have the greatest bedrock infiltration.

Daw 11-27-01

The plane elements from greatest (21.26 mm)

	87	54	167	181	175	170	133	80	15	2
Infiltration	21.26	21.25	21.23	18.74	18.73	18.72	17.03	16.33	16.32	16.32
Soil Depth	120	120	120	120	120	120	130	150	150	150 (mm)
Length (m)	14.9	18.7	60.9	34	57.4	85.9	27.4	9.6	~~19.2~~ 29.2	32.8
Slope	0.03	0.03	0.20	0.215	0.31	0.34	0.29	0.038	~~0.32~~ 0.033	0.037

Daw 11-27-01

The greatest bedrock infiltration depth during runoff events is associated with shallow soils and low slopes. Other plane elements have the same soil depth as the planes with the greatest bedrock infil (120 mm) but have steeper slopes and bedrock infiltration of 16.03 – 16.05 mm. This probably reflects more rapid recessions with steeper slopes.

The greatest bedrock infiltration for slope elements

	168	140	201	187	139	144	45
Infiltration	16.98	15.69	14.58	14.57	14.55	14.51	14.43 (mm)
Soil Depth	130	130	140	140	140	140	150
Slope	0.43	0.33	0.42	0.42	0.40	0.47	0.514
Up input	167	138-139	200	186	138	142-143	39-44

(Up input ← Plane elements contributing runoff)

It should be noted that the "optimum" soil depth may be greater than 120 mm, if drainage after the event is considered.

DAW 11-27-01

The greatest rainfall excess is for plane elements that lie downslope of disturbed areas or shallow soils.

DAW 11-28-01

Completed computer runs with C-series "summer" rainfall events. For the 50-year rainfall series there were 99 potential runoff events, 34 in DAW 11-28-01 the Dec-~~Apr.~~ Mar period and 65 in the Apr-Nov period. The events in the Apr-Nov period were first used as input to test runs with plane element 170. Of the 65 potential events, 35 caused runoff > 0.1 mm and were used as input to the appropriate parameter file representing Upper Split Wash. The table summarizing the computer runs for the 50-yr. C-Series is shown on pages 79-81.

DAW 11-29-01

Create CDF files and figures for C-Series rainfall

1. Create file SWRI\NEWSPL2\CSERIES.LST with list of file names of KIN01-1 output files and season code. ✓

2. Run KINREAD4.BAS with CSERIES.LST as input.
   Total Storm precipitation = 1869 mm
   Total Summer precipitation = 718.8 = 719 mm
   Total Winter " = 1150 mm

3. Run AVGCDF4.BAS
   Put CDF files in New subdirectory
   SWRI\NEWSPL2\CDF-FILC

DAW 11-29-01

Rock Infiltration = 2.15 mm/yr.
= 3.05 mm/yr over 0.70 of area

50yr C-Series Runs

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPL2\RunTableSW_C1
YUCSIMC simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_C1 ✓	KIN01_1 11-16-01	FEB18_3	DETJ_AF	SW_C1.FIL SW_C1.OUT		5.94 0.57	2.54 720
SW_C2 ✓	KIN01_1 11-16-01	FEB21_4	DETJ_AF	etc		0 0.0005	
SW_C3 ✓	KIN01_1 11-16-01	MAR 5_5	DETJ_AF			0 0.74	
SW_C4 ✓	"	DEC 6_7	DETDF			0.177 0.39	0.54 98
SW_C5 ✓	"	DEC21_9	DETDF			0 0.042	
SW_C6 ✓	"	MAR14_14	DETJ_AF			~~0.0005~~ 0.069	0 DAW 11-16-01
SW_C7 ✓	"	JAN 9_14	DETJ_AF			0 0	
SW_C8 ✓	11-17-01	MAR14_17	DETJ_AF			0 0.065	
SW_C9 ✓	"	DEC10_21	DETDF			0 0.0003	
SW_C10 ✓	"	MAR28_23	DETJ_AF		DAW 11-[illegible]	~~0.0004~~ ~~0.175~~	0 0.0005
SW_C11 ✓		JAN 8_23	DETJ_AF		0 0.215	~~2.002~~ ~~0.312~~	~~0.056~~ ~~470~~
SW_C12 ✓		FEB 7_24	DETJ_AF			0 0.083	
SW_C13 ✓		FEB20_25	DETJ_AF			0.46 0.44	
SW_C14 ✓		JAN29_28	DETJ_AF			0 0.059	
SW_C15 ✓		DEC13_32	DETDF			0.712 0.404	0.40 234
SW_C16 ✓		MAR15_34	DETJ_AF	SW-C16.FIL SW-C16.OUT		0 0.001	
SW_C17 ✓	KIN01_1 11-19-01	JAN 8_34	DETJ_AF	SW-C17.FIL SW-C17.OUT		0	
SW_C18 ✓	"	FEB16_35	DETJ_AF	etc		0	
SW_C19 ✓	"	JAN26_36	DETJ_AF			0	
SW_C20	"	DEC20_38	DETDF			0 0.007 ~~0.009~~	DAW 11-27-01
SW_C21 ✓	"	DEC14_39	DETDF		DAW 11-17-01	0.092 0.329	0.35 140
SW_C22 ✓	"	FEB23_40	DETJ_AF			0 0.217	
SW_C23 ✓	"	MAR 2_41	DETJ_AF			0 0.015	
SW_C24 ✓	"	FEB11_41	DETJ_AF			8.81 0.606	1.13 1130
SW_C25 ✓	KIN01_1 "	FEB18_41	DETJ_AF			0 0.16	
SW_C26 ✓	KIN01_1 "	DEC25_42	DETDF			0 0.204	
SW_C27 ✓	KIN01_1 "	JAN 3_42	DETJ_AF			0 0.193	
SW_C28 ✓	"	DEC12_46	DETDF			0 0.085	
SW_C29 ✓	"	FEB 1_47	DETJ_AF			0 0.0003	
SW_C30 ✓	"	FEB 9_47	DETJ_AF			0 0.0004	
SW_C31 ✓	"	FEB18_48	DETJ_AF			0 0.0183	
SW_C32 ✓	11-19-01	MAR11_49	DETJ_AF			0 0.00031	

All *.FIL (control) files in SWRI\NEWSPL2\

All *.OUT (output) files in SWRI\NEWSPL2\OUTC

All rainfall files in either SWRI\NEWSPL2\YUCP_C_W or " \YUCP_C_S

All *.PAR (Parameter) files in SWRI\NEWSPL2\

DAW 11-28-01 C-Series Runs (Cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPL2\RunTableSW_C1
YUCSIMC simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QP mm/h TP, min.
SW_C33 ✓	KIN01_1	DEC16_49	DETDF	SW_C33.FIL SW_C33.OUT ✓		0 0.017	
SW_C34 ✓	"	JAN28_49	DETJ_AF	etc		0 0.0003	
SW_C35 ✓		~~MAY18_7~~ APR17_18	DET DAW 11-28-01			*	
SW_C36 ✓		~~NOV9_1~~ AUG1_45				*	
SW_C37 ✓	11-28-01	~~JUL4_2~~ AUG4_4				2.67 0.49	6.36 60
SW_C38 ✓	"	AUG4_24				2.57 0.48	11.5 12
SW_C39 ✓	"	AUG7_10				2.83 0.47	13.05 28
SW_C40 ✓	"	AUG10_32				6.82 0.55	13.9 48
SW_C41 ✓		AUG11_47				*	
SW_C42 ✓		AUG15_23				*	~~2.36~~ ~~102~~ DAW 12-3-01
SW_C43	"	AUG16_40				0.71 0.45	2.36 102
SW_C44	"	AUG17_47				0 0.002	
SW_C45	"	AUG18_23				0.76 0.43	3.36 22
SW_C46		AUG20_20				5.90 0.51	28.5 28
SW_C47		AUG21_16				*	
SW_C48		AUG22_30		↓		*	
SW_C49	KIN01_1 11-28-01	AUG22_39	DETJ_OF	SW_C49.FIL SW_C49.OUT		3.88 0.50	9.81 30
SW_C50	"	AUG22_41	"	etc		9.45 0.55	44.05 46
SW_C51	"	AUG23_15	"			7.07 0.53	17.73 46
SW_C52		~~AUG27_4~~ DAW 11-28-01				*	
SW_C53	"	AUG27_4	DETJ_OF			0.12 0.43	0.35 26
SW_C54						*	
SW_C55						*	
SW_C56	"	AUG31_4	DETJ_OF			7.07 0.55	20.50 14
SW_C57	"	JUL4_2	"			0.35 0.44	1.02 96
SW_C58	"	JUL6_32	"			0.47 0.40	2.07 54
SW_C59	"	JUL11_25	"			1.58 0.48	6.47 20
SW_C60	KIN01_2 12-3-01	JUL13_37	"			1.64 0.47	7.01 24
SW_C61	11-28-01 KIN01_1	JUL14_18	"			0.07 0.42	0.26 74
SW_C62						*	
SW_C63						*	
SW_C64	11-28-01 KIN01_1	JUL16_42	DETJ_OF	↓		5.38 0.52	29.64 9
SW_C65	KIN01_1 11-28-01	JUL17_10	DETJ_OF	SW_C65.FIL SW_C65.OUT		4.32 0.52	10.90 14
SW_C66	"	JUL23_9	"	etc		0.07 0.35	0.32 56
SW_C67						*	
SW_C68		~~MAY17_17~~ DAW 11-28-01				*	
SW_C69	KIN01_1 11-28-01	JUL29_15	DETJ_OF			5.28 0.52	7.75 100
SW_C70			DAW 11-28-01			*	
SW_C71	"	~~APR17_18~~ JUL31_45	DETJ_OF			0.57 0.46	2.36 24
SW_C72	"	JUN8_41	DETM_JF			4.91 0.50	24.47 12
SW_C73						*	
SW_C74	"	JUN24_8	DETM_JF			0 0.19	0
SW_C75						*	
SW_C76		MAY17_17				*	
SW_C77		MAY18_1				*	
SW_C78		~~MAY22_22~~ MAY19_47	DAW 11-28-01			*	
SW_C79		~~MAY19_47~~ MAY22_27	DETM_JF			0.62 0.40	3.04 80
SW_C80		NOV5_35	DETNF	↓		2.78 0.50	6.80 38

Note: An * in the col. "RO Vol mm" means that there was no runoff for the single plane test with plane 170. Therefor no run was made for the complete Upper Split wash Watershed model.

DAW 11-28-01 C-Series Runs (Cont)

UPPER SPLIT WASH WATERSHED COMPUTER RUNS 100 yr. Present day climate. Files: NEWSPL2\RunTableSW_C1
YUCSIMC simulation.

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	QP mm/h TP, min.
SW_C81				DAW 11-28-01	~~SW_C81.FIL~~ ~~SW_~~	*	
SW_C82						*	
SW_C83	KIN01_1 11-28-01	NOV12_18	DETNF		SW_C83.FIL SW_C83.OUT	0.56 0.45	1.45 108
SW_C84	"	NOV17_14	"		etc	10.42 0.53	43.2 mm/h 34
SW_C85	"	NOV20_3	"			0.014 0.37	0.03 730
SW_C86						*	
SW_C87						*	
SW_C88						*	
SW_C89	KIN01_1 11-28-01	NOV27_14	DETNF			0.88 0.47	2.15 44
SW_C90						*	
SW_C91						*	
SW_C92						*	
SW_C93						*	
SW_C94		DAW 11-28-01				*	
SW_C95	KIN01_1 11-28-01	~~MAY14_33~~ SEP11_44	DETJ_OF			4.37 0.51	8.20 44
SW_C96	"	SEP14_6	"		↓	0 0.06	
SW_C97						*	
SW_C98	KIN01_1 11-28-01	SEP20_46	DETJ_OF	SW_C98.FIL SW_C98.OUT		0.38 0.46	0.64 112
SW_C99	"	SEP25_12	"	etc.	SW_C99.HYD	4.08 0.53	20.26 26

Tipping Bucket Runs 1987-95

Upper Split Wash KINEROS runs with tipping bucket rainfall data. File: NEWSPL2\REALTABLE

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.DAT & PRO File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_TB1	KIN01_1 11-19-01	G3_88_1	DETJ_AF			0.00083 0.34	0.005 1236
SW_TB2	KIN01_1 "	G3_~~99~~_1 DAW	DETJ_AF 11-19-01			0 0.00244	
SW_TB3	KIN01_1 "	G3_92_1	DETJ_AF			0 0.065	
SW_TB4	"	G3_92_2	DETJ_AF			0 0.0008	
SW_TB5	"	G3_92_3	DETJ_AF			0 0.010	
SW_TB6	"	G3_92_4	DETJ_AF			0 0.04	
✓ SW_TB7	"	G3_92_5	DETJ_AF			0 0.011	
✓ SW_TB8	"	G3_92_6	DETJ_AF			0 0.025	
✓ SW_TB9	"	G3_93_1	DETJ_AF			0 0.024	
✓ SW_TB10	"	G3_93_2	DETJ_AF			0 0.07	
✓ SW_TB11	"	S18_95_1	DETJ_AF			0 0.020	
✓ SW_TB12 36.7 mm	11-19-01	S18_95_2	DETJ_AF			10.63 0.60	2.63 7240
✓ SW_TB13	11-20-01	G3_87_1	DETJ_OF			0 0.01	
✓ SW_TB14	11-20-01	G3_87_2	DETNF			0 0.233	
✓ SW_TB15	11-19-01	G3_92_7	DETDF			3.62 0.55	2.66 2074
SW_TB16	11-20-01	S18_94_1	DETDF			0 0.072	
SW_TB17 80.3	11-16-01	S8_3995B	DETJ_AF			18.51 0.56	2.86 2050
SW_TB18							
SW_TB19							
SW_TB20							

2.63 = 0.29/yr

All *.FIL (Control) files in SWRI\NEWSPL2

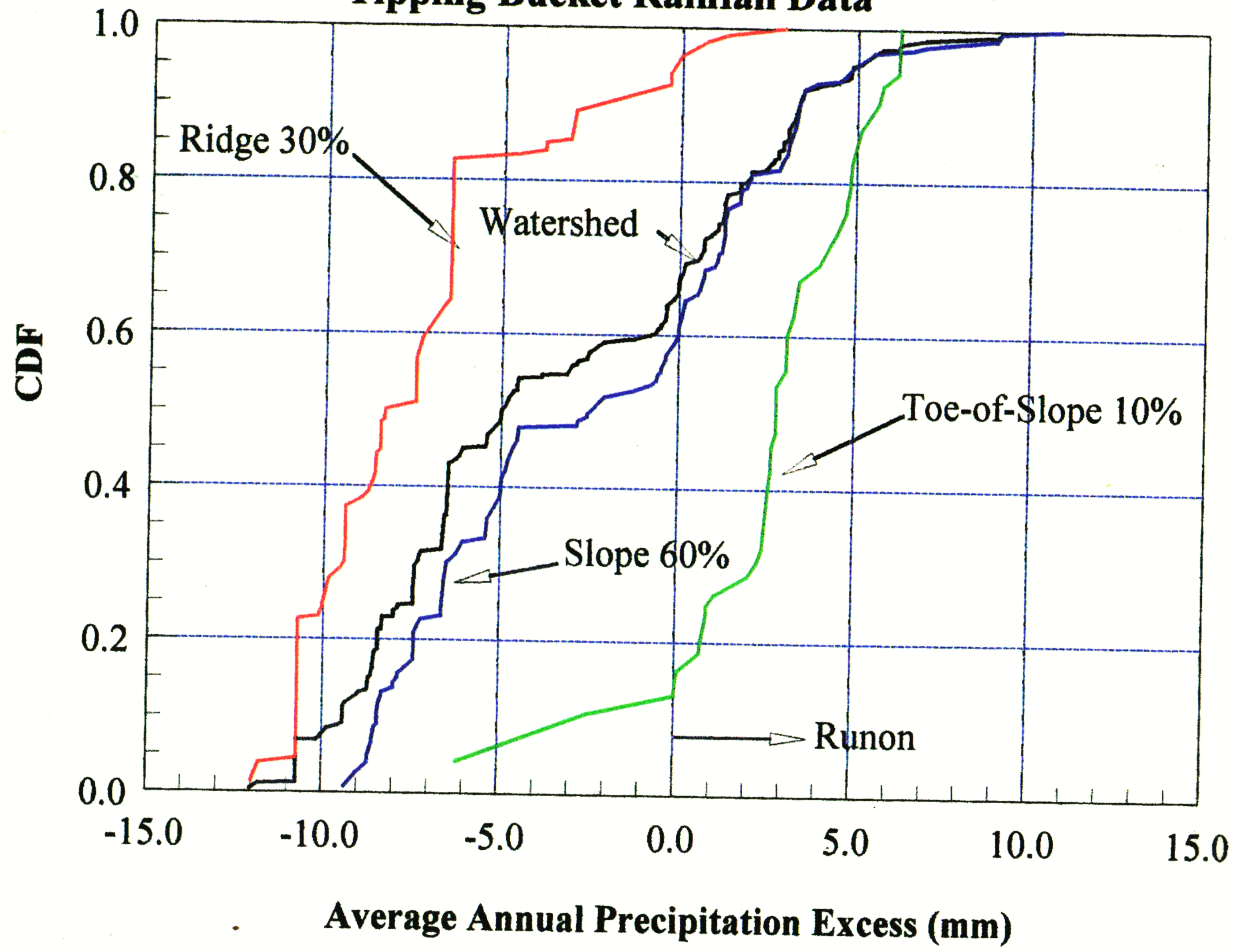
All rainfall files in SWRI\NEWSPL2\REALPRE

All *.OUT (OUTPUT) files in SWRI\NEWSPL2\OUTREAL

R.O. Vol = 3.08 mm/yr

Daw 12-4-01 CDF's for 9-YR Tipping-Bucket Series

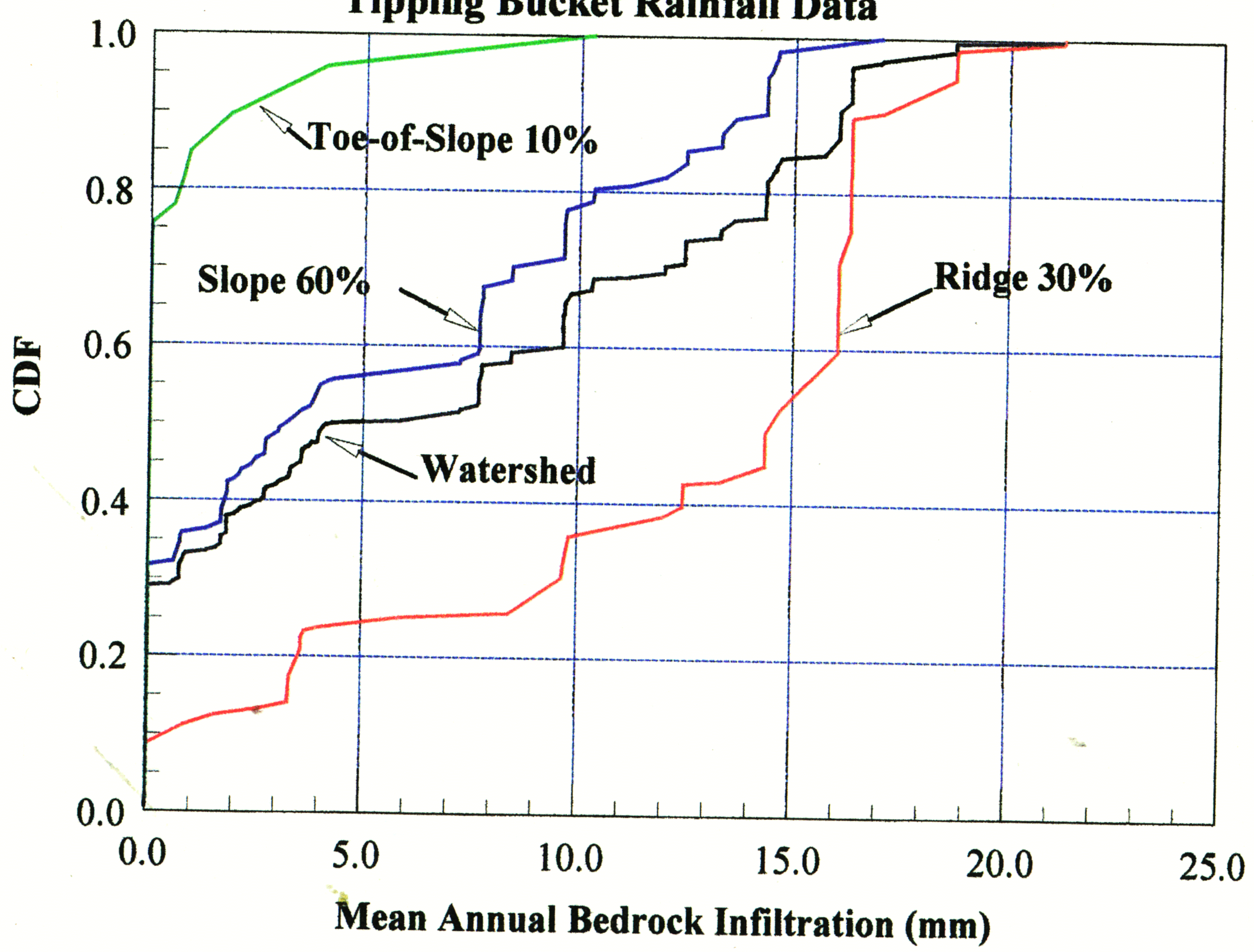
EXCESS PRECIPITATION UPPER SPLIT WASH - 1987-95
Tipping Bucket Rainfall Data



File: NEWSPL2|CDF_FILE|EXCESS.PGW
daw 11-26-01

Note:
See p 76

BEDROCK INFILTRATION, UPPER SPLIT WASH; 1987-95
Tipping Bucket Rainfall Data

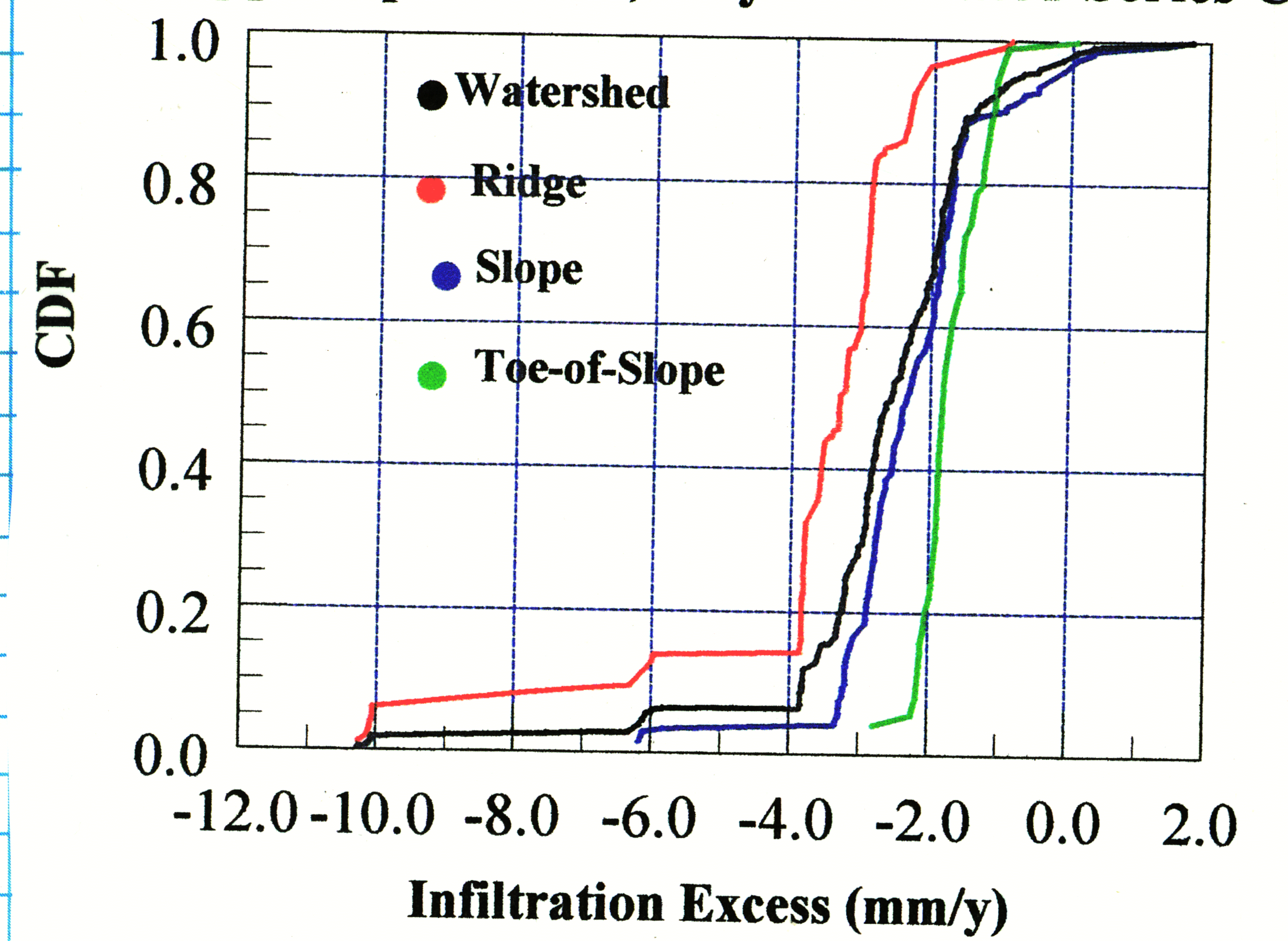


File: NEWSPL2|CDF_FILE|BEDF.PGW
daw 11-27-01

Note:
See p 76

Daw 12-4-01 CDF's for 50-yr C-Series

CDFs Of Average Infiltration Excess
Upper Split Wash, 50-yr Simulated Series C



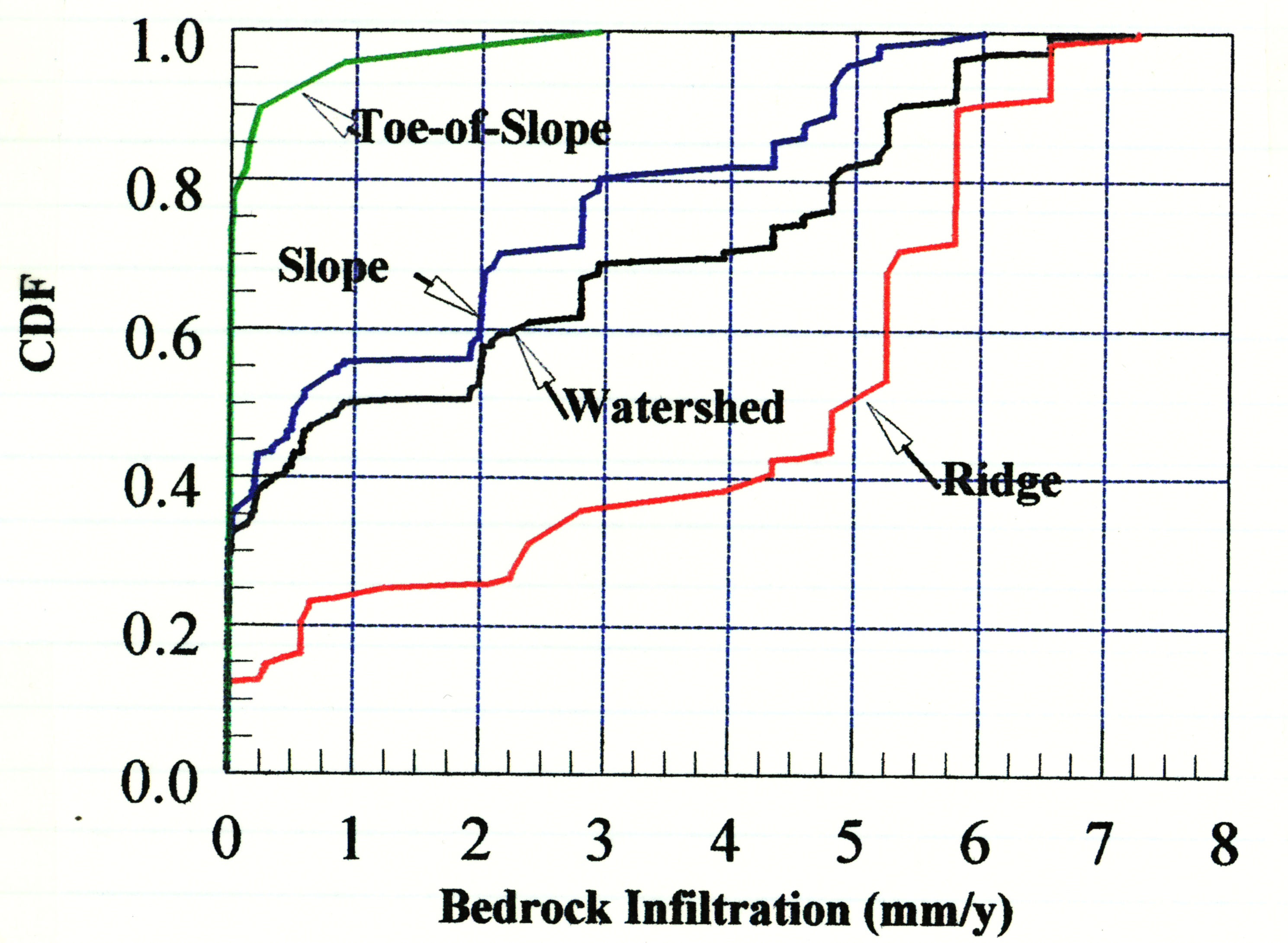
File: NEWSPL2|CDF_FILC|AVEXCESS.PGW
daw 11-29-01

It is of interest to compare this figure with that for the 9-yr series shown on the top of p 82. The CDF's for the C-series are shifted to the left, reflecting Hortonian surface runoff during Apr-Nov. Also there is a smaller difference between CDFs for the ridge and toe-of-slope elements. This shows that there were, on the average, fewer and smaller saturation-induced runoff events in the 50-yr. C-series than in the 9-yr. tipping bucket series Daw 12-4-01

The CDF's of bedrock infiltration for the C-series are shown on p 84. While there is a significant difference between slope classes, again the 50-yr sequence has smaller average infiltration amounts than the 9-yr sequence

Daw 12-4-01 C-Series (Cont)

CDFs of Average Annual Bedrock Infiltration
Upper Split Wash, 50-yr Simulated Series C



File: NEWSPL2|CDF_FILC|AVGBED.PGW
daw 11-29-01

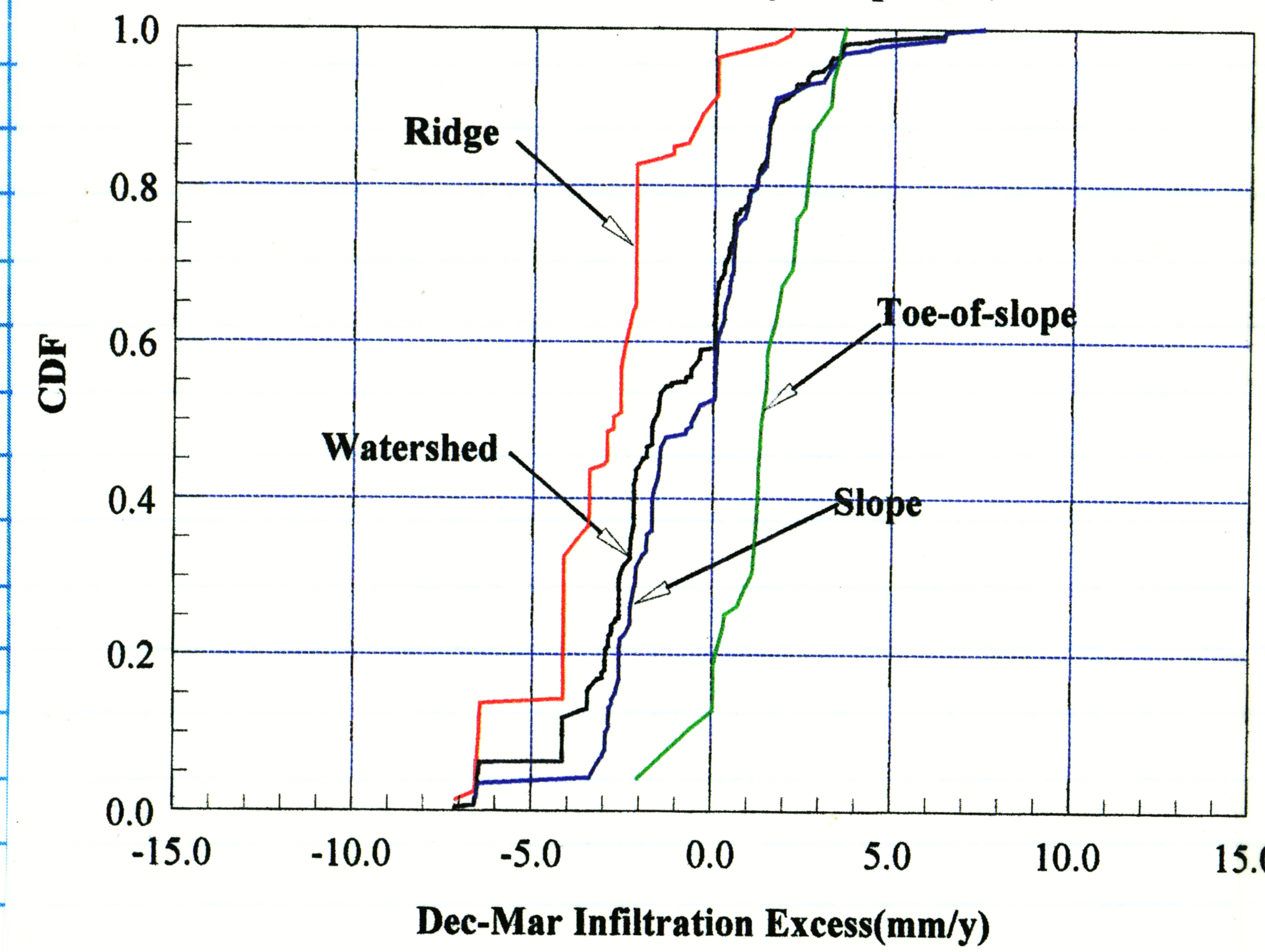
Specifically the C-Series CDF for the ridge elements shows 50% of the ridge area with > 5 mm/y while the CDF for the 9-yr sequence shows 50% with > 14 mm/yr.

One hypothesis to explain this difference is that although the 50 yr daily precipitation sequence is truly representative of the same process as the 9-yr sequence, the particular 9-yr sequence has a very small probability. To examine this possibility a 9 yr sequence was selected from the 50 yr series such that it included the wettest winter period.

Daw 12-5-01

The summer storms were omitted so that the comparison with the tipping bucket series (which had virtually no summer runoff) would be consistent.

CDFs Of Average Infiltration Excess
Upper Split Wash, Select 9-yr Sequence, Series C

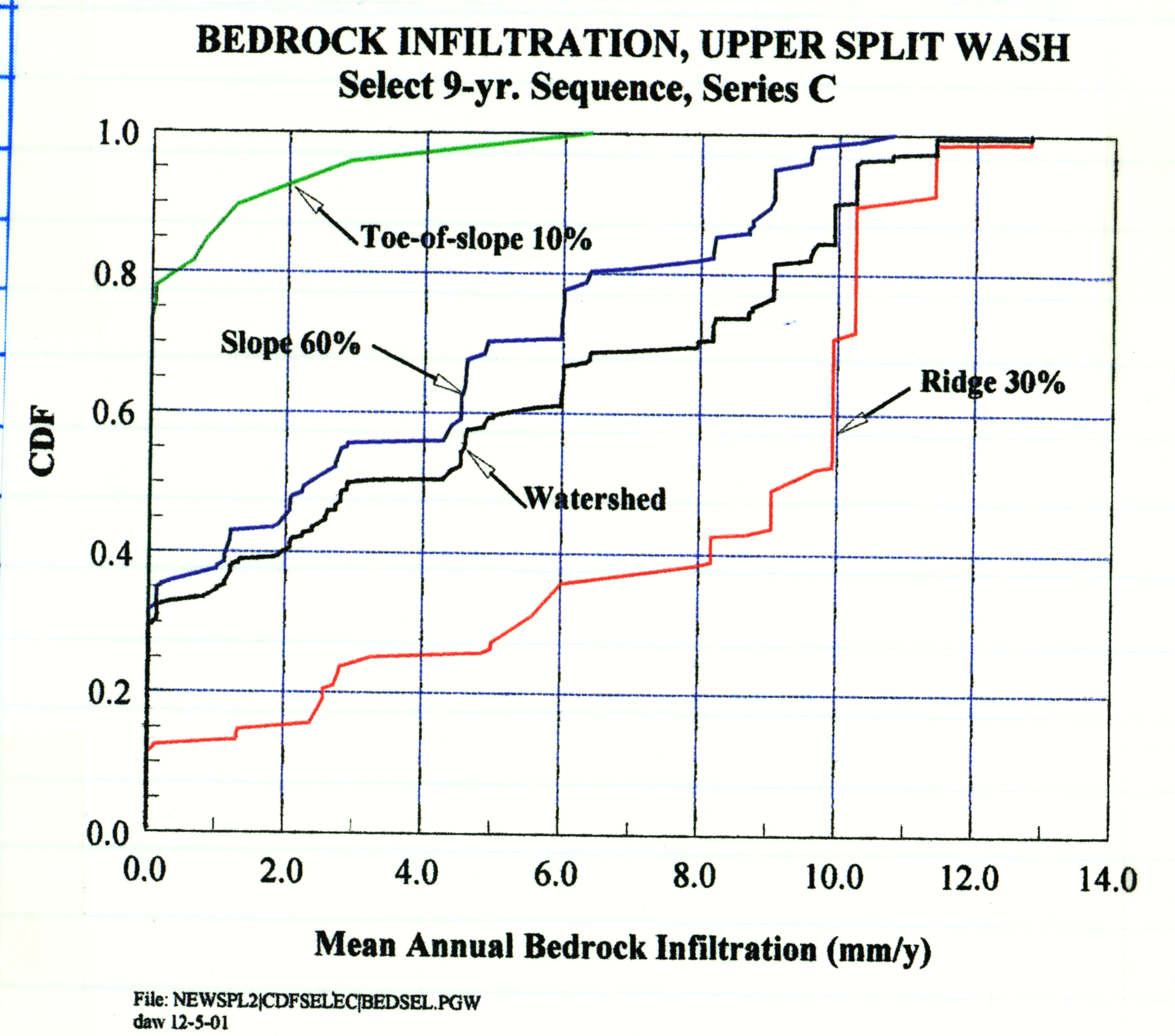


File: NEWSPL2|CDFSELEC|EXCESSDM.PGW
daw 11-29-01

In comparing the above figure with those on pp 82+83 we see that for this period there is more runoff-runon (on the average) than in the 50-yr simulation but less the 9-yr tipping bucket series.

The CDFs of bedrock infiltration for the selected 9-yr sequence are shown on p 86. For the watershed, 50% of the area had bedrock infiltration > 4 mm/yr. For the 50-yr sequence only 30% of the watershed had infiltration > 4 mm/yr. The CDFs on p 82 show 50% > 4 mm/yr but also show 20% > 14 mm/yr while the select series shows 20% > 9 mm/yr.

DAW 12-5-01



The results of the 9-yr tipping bucket (TB) simulation are dominated by the two very large events that occurred in 1995, 86.7 on 1-26-95 and 80.3 mm Mar 9-11. The largest events for the C-series simulation were 59.1 mm (FEB18_3) and 76.3 mm (FEB11_41). 85 DAW 12-5-01

An examination of the figures on p86-89 of Scientific Notebook 363 reveals that the C-series simulated data fall very close to measured averages for Yucca Dry Lake and 40 mile Canyon for monthly means, mean number of wet days per month, & mean depth of precipitation per wet day. Because these stations have mean annual precipitation above (40 mi canyon) and below (Yucca Dry Lake) the hypothesized mean annual precipitation (MAP) of 181 mm/yr at Yucca Mtn, this is desirable behavior. It appears, however, that the CVs of monthly precipitation may be biased low for the YUCSIMC simulated data.

DAW 12-5-01

This lower variance may be due to the fact that the precipitation process is not stationary from year to year. For example the Southern Oscillation Index (SOI) has been shown to affect precipitation in this area, especially in winter. The Pacific Decadal Oscillation (PDO), a much more persistent phenomenon, could also have an effect. I do have a program (FORTRAN 77) that can identify the effects of the SOI in perturbing the Markov Chain transition probabilities and the mean of the mixed exponential distribution. However this program ~~wtn~~ DAW 12-5-01 would have to be converted to FORTRAN 95. To my knowledge, there is no program that can use the PDO as a perturbing factor, either independently or in conjunction with the SOI, for a daily precipitation model.

12-7-01 DAW

Tentative Conclusions Regarding Linkage Between Upper Split Wash Model and the TPA Model

1. From the CDF's for excess precipitation on pp 82, 83 and 85, virtually all of the ridge elements show negative excess (runoff) so 1-D models that create runoff should give reasonably accurate estimates of bedrock infiltration and recharge. Watershed behavior under future wetter climates would be strongly affected by soil-forming processes and vegetation changes.

2. The CDFs for the 9-year tipping bucket precipitation data may be conservative predictors (ie over prediction) of bedrock infiltration for present climate because they are highly dependent on two rare events.

DAW 12-7-01 Split Wash - TPA (Con't)

3. One approach to handling the runon problem problem with TPA would be to add the excess precipitation (run-on) for TPA elements classified as slope or toe-of-slope. Because of non-linearities, this addition could be done randomly to approximate the appropriate CDF.

DAW 1-29-02 Effect of Rain-on-the-Channel option for KINEROS2 in estimating bedrock infiltration under channels.

Objective: 1) To compare channel infiltration and bedrock infiltration obtained by: a) no-rain-on-channel and b) rain-on-channel
2) Investigate interaction between WO option and rain-on-channel option

Procedure:
1. Parameter files

For Jan-Apr. Rain-on-channel:
SWRI\NEWSPL2\SWCHJ_AL.PAR ✓

without Rain-on-channel
SWRI\NEWSPL2\DETJ_AL2.PAR ✓

Note: For L series runs channels 131 and 137 are simple, not compound as in F series
See p95 of Scientific Notebook #362

Both of these files have WO=NO for channels.

DAW 1-29-02
Create file: ~~SWCJ_AN~~ SCJ_AYES.PAR with WO=YES and rain-on-channel option

DAW 1-29-02 Effect of Rain-on-Channel (ROC) (Con't)

Create new subdirectories for 2002

C:\CONSULT\SWRI\SPLIT_02

and

" " " \SPLIT_02\OUTCHTIP (Tipping Bucket; ROC)

Repeat tipping bucket runs

Run Number Designation:

SW_TBC1 (C = Rain on channel; 1 = Number)

All *.FIL CONTROL files in \SPLIT_02

All rainfall files in \SWRI\NEWSPL2\REALPRE

All output *.out files in \SPLIT_02\OUTCHTIP

TL 4/14/2008

DAW 1-30-02 Effect of ROC (Con't)

To examine the interaction of rain-on-channel and WO=YES, use parameter file SCJ_AYES.PAP with precip coord S8_3995B.PRE

Control file: STCYES17.FIL ✓
Run with KIN01_3 ✓
OUTPUT: \SPLIT_02\OUTCHTIP\STCYES17.OUT
For a complete comparison create a file with WO=YES and no rain-on-channel
Parameter file = SJ_AYES.PAP ✓
Run with S8_3995B.PRE
Control file STYES17.FIL
.OUT = OUTCHTIP\STYES17.OUT
DAW 1-31-02

Create CDF files of channel infiltration, Bedrock infiltration and potential bedrock infiltration for the above 3 cases.

Ref. See p116-121 of Scientific Notebook 362

Procedure:

1.) Run program KINREAD4.BAS with input List file \SPLIT02\ROCLIST.LST
Output files to SPLIT02\OUTCHTIP

In List file:

OUTCHTIP\STCYES17.OUT ✓
" \STYES17.OUT ✓
" \SW_TB17.OUT ✓
C

Run KINREAD4.BAS ✓
output files in OUTCHTIP

Left Blank DAW 8-13-03

DAW 3-22-02 Rain-on-channel effects for Upper Split Wash - Tipping Bucket Data

R.E. Smith revised the output format for KINEROS 2 so that a summary is written to the .OUT file as well as the element-by-element accounting and the desired hydrographs. This portion of the .OUT file is copied to a file with the extension .SUM(mary) for further analysis. A portion of a *.SUM file is shown below

ID	Element Type	Areas Element m^2	Areas Cumulated m^2	Inflow m^3	Rainfall m^3	Outflow m^3	Peak Flow mm/h	Total Infil m^3	Initial Water Content	Upper Layer: Max Stor mm	Upper Layer: Infil. mm	Subsoil Infil. mm
1	Plane	1787.4	1787.4	0.000	67.921	0.000	0.00	67.92	0.1356	187.43	38.00	0.00
3	Plane	840.9	2628.3	0.000	31.956	6.722	3.46	25.24	0.1375	92.73	30.01	0.00
5	Plane	1905.7	4534.0	6.715	72.417	24.849	6.11	54.27	0.1375	55.64	25.50	2.98
7	Plane	2592.6	7126.6	24.865	98.519	50.285	7.00	73.04	0.1375	148.37	28.17	0.00
9	Plane	3133.5	10260.1	50.327	119.072	33.702	4.14	135.71	0.1356	187.43	43.31	0.00
11	Plane	2398.8	12658.9	33.774	91.155	22.416	3.05	102.49	0.1356	281.14	42.73	0.00
2	Plane	2410.8	2410.8	0.000	91.610	1.288	1.36	90.32	0.1356	28.11	23.49	13.98
4	Plane	1026.4	3437.2	1.288	39.002	8.820	3.20	31.50	0.1375	46.37	26.78	3.91
6	Plane	1997.0	5434.2	8.813	75.888	27.475	5.61	57.22	0.1375	129.83	28.65	0.00
8	Plane	2092.7	7526.9	27.492	79.523	47.834	6.34	59.13	0.1375	185.46	28.25	0.00
10	Plane	1425.1	8952.0	47.873	54.152	36.955	4.77	65.04	0.1356	337.37	45.64	0.00
12	Plane	1435.2	10387.2	37.012	54.538	25.439	3.78	66.04	0.1356	337.37	46.02	0.00
13	Plane	1809.5	1809.5	0.000	68.761	0.000	0.00	68.76	0.1356	112.46	38.00	0.00
22	Channel	36.5	29791.0	52.545	1.386	53.272	2.85	0.66	0.0455			
34	Channel	57.5	39123.0	53.438	2.184	54.835	2.18	0.79	0.0455			
48	Channel	52.7	52420.9	60.087	2.002	61.276	1.63	0.81	0.0455			
64	Channel	101.0	75983.0	64.433	3.836	63.906	1.13	4.37	0.1004	31.76	31.96	11.33
72	Channel	114.1	91498.0	67.320	4.338	66.765	0.94	4.89	0.1004	31.76	31.97	10.90
98	Channel	36.8	29787.5	1.016	1.398	0.133	0.01	2.29	0.1004	63.51	55.75	6.45
106	Channel	41.1	36452.2	2.918	1.562	0.308	0.05	4.17	0.1004	158.78	98.93	2.64
115	Channel	57.2	43774.4	8.629	2.174	3.107	0.18	7.70	0.1004	158.78	125.76	8.82
123	Compound	136.0	47409.2	3.557	5.168	2.122	0.12	6.60	0.1004			
131	Channel	37.2	52354.3	4.616	1.414	1.916	0.12	4.11	0.1004	158.78	107.43	3.17
137	Channel	36.6	56786.2	2.471	1.391	0.960	0.07	2.90	0.1004	158.78	79.01	0.28
146	Channel	165.0	159795.3	105.184	6.270	99.399	0.59	12.06	0.1004	63.51	63.24	9.83
157	Channel	203.7	174025.7	110.830	7.741	103.813	0.51	14.78	0.1004	63.51	63.68	8.86
164	Channel	34.9	178686.1	109.272	1.326	107.968	0.51	2.64	0.1004	63.51	67.52	8.00
174	Channel	76.0	11698.4	16.963	2.886	17.789	1.42	2.06	0.1004	15.88	15.75	11.42
180	Channel	80.2	20269.0	21.592	3.046	22.472	0.97	2.17	0.1004	15.88	15.90	11.12
190	Channel	41.9	209735.8	140.783	1.592	139.263	0.55	3.12	0.1004	63.51	65.87	8.52
199	Channel	132.0	228940.7	166.820	5.016	161.881	0.54	9.97	0.1004	63.51	67.53	8.01
209	Channel	89.4	240743.4	175.273	3.397	171.871	0.52	6.81	0.1004	63.51	68.14	8.03
216	Channel	229.2	258551.2	188.229	8.710	172.379	0.46	24.57	0.1004	95.27	99.97	7.23

The program KIN02_1W was run for all tipping bucket rainfall events, with the rain-on-the channel option.

DAW 3-26-02

A brief summary of results and a documentation of file names is presented in the following table.

DAW 3-26-02 Rain-on-channel effects (con't)

Upper Split Wash - Tipping Bucket Runs 1987-95
Rain on channel option

Upper Split Wash KINEROS runs with tipping bucket rainfall data. File: NEWSPL2\REALTABLE2

Run Number	Program & Date	Rain File	.PAR File	.FIL and .OUT File	.SUM File	RO Vol mm Chan. F mm	Qp mm/h Tp, min.
SW_TBC1	KIN02_1W 3-25-02	G3_88_1	SWCHJ_AL	sw_TBC1.out	SW_TBC1. ✓	0.90 0.47	0.80 934
SW_TBC2	KIN02_1W	G3_91_1	SWCHJ_AL	etc	etc ✓	0.12 0.38	0.214 2192
SW_TBC3	KIN02_1W 3-25-02	G3_92_1	SWCHJ_AL		✓	0 0.27	—
SW_TBC4	"	G3_92_2	SWCHJ_AL		✓	0 0.20	—
SW_TBC5	KIN02_1W 3-26-02	G3_92_3	SWCHJ_AL		✓	0 0.21	—
SW_TBC6	3-25-02	G3_92_4	SWCHJ_AL		✓	0.04 0.32	0.045 2320
SW_TBC7	"	G3_92_5	SWCHJ_AL		✓	0 0.20	— 2612
SW_TBC8		G3_92_6	SWCHJ_AL		✓	0.01 0.26	0.007
SW_TBC9	KIN02_1W 3-25-02	G3_93_1	SWCHJ_AL		✓	0 0.21	—
SW_TBC10	"	G3_93_2	SWCHJ_AL		✓	0.28 0.34	0.22 1750
SW_TBC11	"	S18_95_1	SWCHJ_AL		✓	0 0.23	—
SW_TBC12	"	S18_95_2	SWCHJ_AL		✓	14.42 0.62	3.08 7240
SW_TBC13	"	G3_87_1	SWCHJ_OL		✓	0 0.35	—
SW_TBC14	"	G3_87_2	SWCHNL		✓	0.05 0.36	0.05 1448
SW_TBC15	"	G3_92_7	SWCHDL		✓	6.37 0.53	3.78 2064
SW_TBC16	3-26-02	S18_94_1	SWCHDL		✓	0 0.20	—
SW_TBC17	KIN02_1W 3-25-02	S8_3995B	SWCHJ_AL		SW_TBC17.sum ✓	18.04 0.56	3.33 2050

All files on COMPAQ computer.

Control (.fil) files:
C:\USW_02\

Precipitation (.PRE) files
C:\USW_02\REAL_PRE\

Output (.OUT) and summary (.SUM) in
C:\USW_02\OUTREAL\

R.O. vol. = 4.47 mm/y
Channel Infil = 0.62 mm/y

Comparing the results above with those on p 81 for runs without rain-on-channel, we see that both runoff volume and channel infiltration are increased with rain-on-channel. This is to be expected. R.O. vol. was increased from 3.08 mm/y to 4.47 mm/y while channel infiltration increased from 0.29 mm/y to 0.62 mm/y. Note: These depths are expressed over the entire watershed area. The increase of channel infiltration was for the smaller events which in many cases did not receive runoff for the no-rain on channel option. There was little difference for major runoff events because channel infiltration was constrained by bedrock conductivity and runoff duration.

DAW 3-26-02 Rain-on-channel (Con't)

Revise input of program AVGCDF4.BAS to accomodate format of *.SUM files.
New program will be called AVGCDF5.BAS

After reviewing the program, it appears advantageous to port it to FORTRAN 95.
New program will be called AVGCDF5.F95

CONTROL FILE is C:\USW_02\REALCDF.CON

```
TOPOFILE                                NO_ELEMENTS    NYRS
C:\USW_02\DMODEL3.PRN                      216           9
SUMFILE                          NUMFILES
C:\USW_02\REAL2.LST                 17
C:\USW_02\CDFREAL\USWANNUAL.CDF
C:\USW_02\CDFREAL\USWA_N.CDF
C:\USW_02\CDFREAL\USWD_M.CDF
C:\USW_02\CDFREAL\USWRIDGE.CDF
C:\USW_02\CDFREAL\RIDGEDM.CDF
C:\USW_02\CDFREAL\~~USWANNUAL~~.CDF   USWSLOPE.CDF  } DAW 4-1-02
C:\USW_02\CDFREAL\~~USWSLOPE~~.CDF    USWTOE.CDF    }
~~C:\USW_02\CDFREAL\USWTOE.CDF~~      DAW 4-1-02
C:\USW_02\CDFREAL\USWCHANNL.CDF
```

Pages (copies) 64–94 Sent to Fedors on 3-29-02

Contents of COMPAQ Dir. C:\USW_02
All files were copied to a CD

DAW 4-3-02 Rain-on-Channel (Con't)

Referring to the output table on p 92, the column Max stor is the saturated water content minus the initial water content multiplied by the thickness of the upper soil layer.

The parameter SAT in the parameter file is the relative saturation scaled between the residual saturation S_r and the max saturation S_{max}, set internally (in KINEROS) at 0.95 * POROSITY

The ~~relative~~ residual (DAW 4/3/02) saturation can be included in the parameter file. If it is not included the default value is

DAW 7-11-02

$$\theta_r\ (\text{~~}S_r\text{~~}) = \text{porosity}\left\{0.1 + 0.3/\left[1 + (1/G)^4\right]^{0.25}\right\}$$ water content, G in m

$= 0.039$ if $G = 50$ mm $= 0.05$ m

On p 116 of Scientific Notebook # 362 an equation for drainage into bedrock from the channel alluvium after the end of the computer run is given as:

Drainage = (0.95 − 0.29) * POROSITY * THICK

where 0.29 was the estimated "field capacity" and it was assumed that the channel alluvium was saturated at the end of the event. However it is possible with any case (and especially the rain-on-channel option) that the channel alluvium may not be saturated. An improvement in the output of KINEROS provides information on the water content in the channel alluvium (or upper soil layer) in the col. headed "Infil." R.E. Smith (personal communication) has provided estimates of "field capacity" based on values of K_s and G. These are water content at 1/3 bar (FC)

Disturbed plane elements	FC = 0.149
Plane "	FC = 0.140
Channel Alluvium	FC = 0.078

DAW 4/3/02 Potential Seepage

Thus the amount of water remaining in the channel alluvium or in the upper layer of soil is equal to the ~~quantity in col. 12~~ DAW 4/3/02 product of the field capacity and the soil depth. The amount of water that could drain into the bedrock would be the quantity in col 12 − FC*THICK.

At this stage the thickness of each element is not provided in the summary table. However a close approximation of the potential drainage can be obtained using information from the parameter file.

For Plane #1 THICK = 1000 mm

Therefore $(S_{max} - .1356) = 187.43/1000$

$S_{max} = 0.323$

$$d\,(S_{max} - S_i) = MAXSTOR$$

$$d = \frac{MAXSTOR}{S_{max} - S_i}$$

Water retained at field capacity = $FC \cdot d = \frac{FC \times MAXSTOR}{(S_{max} - S_i)}$

Now values of S_i and Maxstor are provided in the table. For the upland soils $S_{max} = 0.323$

DAW 4/3/02 → ~~Note: This indicates that the J-A soil water content~~ is

So $Stor_{FC} = \frac{0.14 * MAXSTOR}{0.323 - S_i}$ ~~at field capacity~~

The relation for the disturbed elements would be slightly different, but since their area is relatively small use FC = 0.14

DAW 4/3/02 Potential Seepage

Using a similar approach for channels, I find

$S_{max} = 0.4176$ say 0.42

Thus $Stor_{FC} = \frac{0.078 * MAXSTOR}{(0.42 - S_i)}$

If the quantity in col. "Infil" is greater than $STOR_{FC}$ the difference can be added to bedrock infiltration to get potential infiltration.

For channels it is possible that the quantity in the "Infil" col. is greater than MAXSTOR. This occurs because of the trapezoidal channel shape. However the min of the two colums will be used for potential infiltration calculations

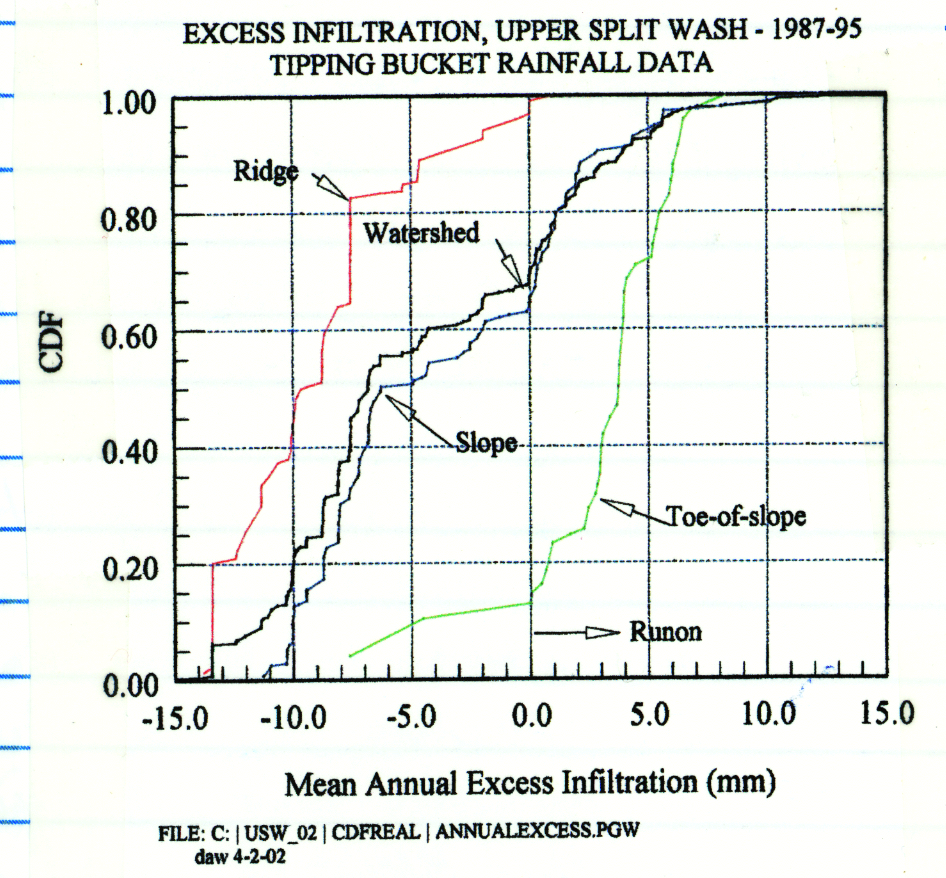
DAW 4/4/02

The potential seepage into bedrock from water stored at the end of the storm would be most significant for channel elements and ridge elements during the winter season.

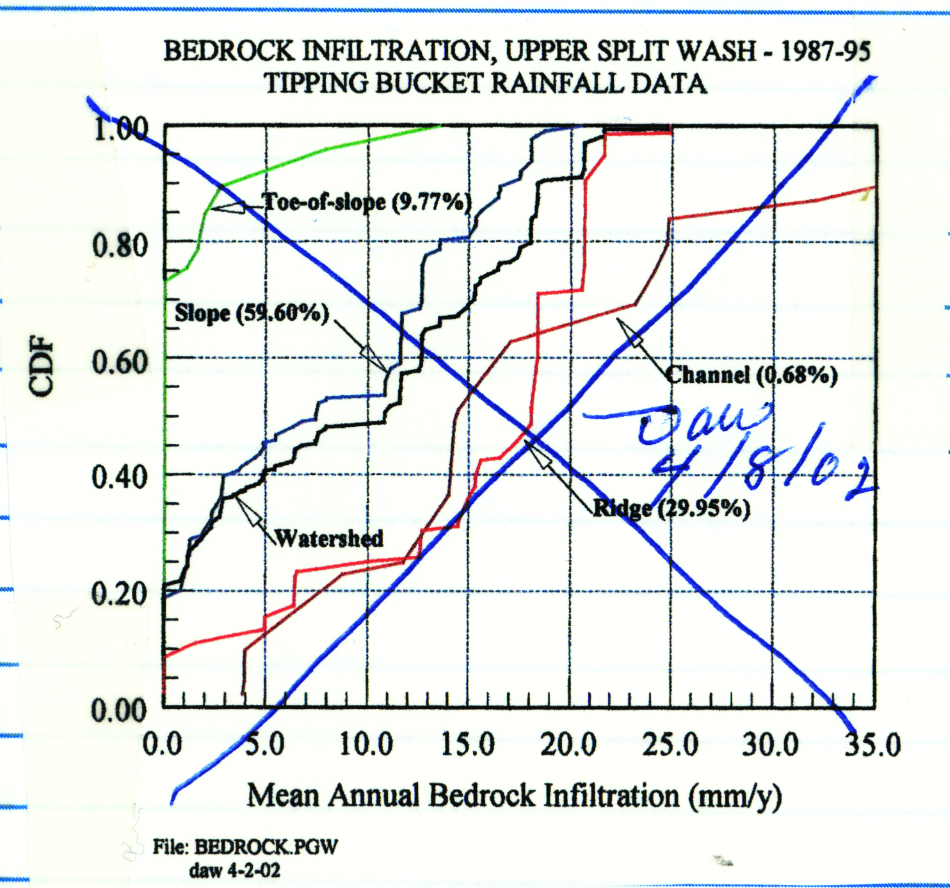
CDF's of the Potential Bedrock infiltration, as well as Infiltration excess and bedrock infiltration were printed out in the files USWANNUAL.CDF, USRIDGE.CDF USWD-M.CDF, USWCHANNL.CDF.

The PSIPLOT program was used to create the figures

DAW 4/4/02



There is very little difference between the above fig. and the fig. at the top of page 82. This is to be expected because the channel areas are included in calculating the CDFs for the rain-on-channel option, but are in fact, less than 1% of the watershed area.



See Correct Fig. p 101

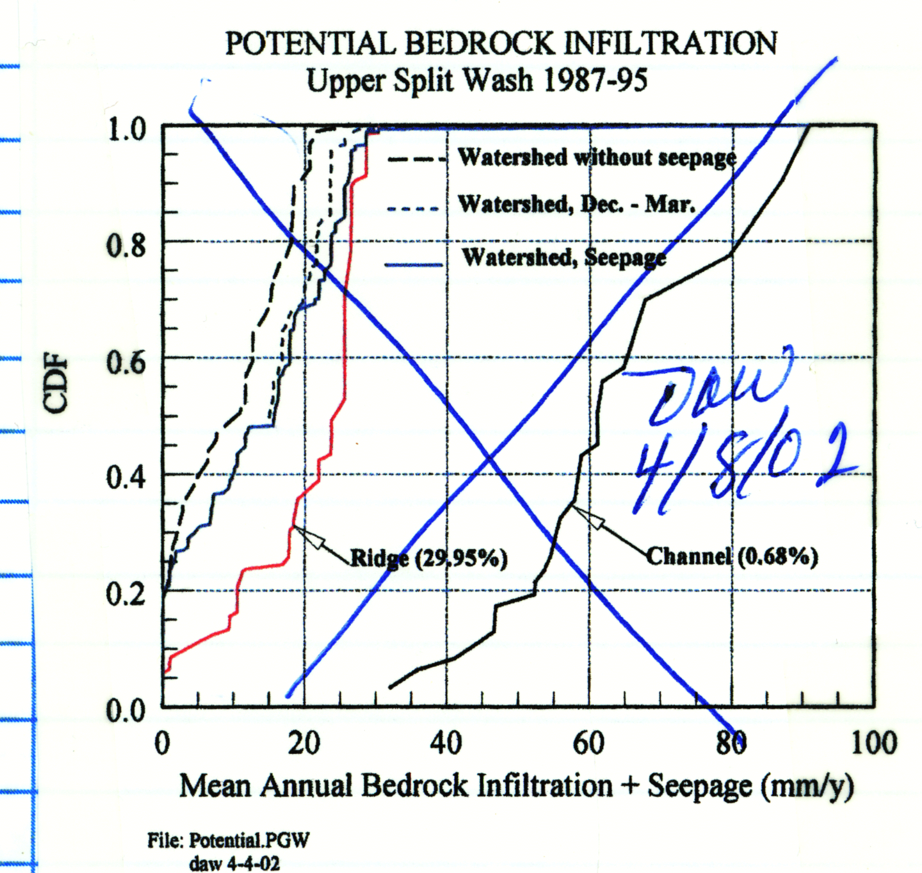
DAW 4/8/02 Note: The compound channel (123) was handled incorrectly and the program AVGCDFS.F95 treated it as a bedrock channel

DAW 4/4/02

The CDFs of bedrock infiltration shown on p 98 have greater values than those on p 82. For example 40% of the ridge area has bedrock infiltration (during the storm) greater than 18 mm while on p 82 the comparable figure is 16 mm. This is due to a more precise numerical integration of the flux at the interface in KINO2-1W than in KINO1-1.

DAW 4/5/02

When the procedures outlined in pp 97-97 are utilized to get estimates of "potential bedrock infiltration" we find that approximately 50% of the area has more than 15 mm/y as compared with about 11 mm/yr for bedrock infiltration during the storm. CDFs for potential bedrock infiltration F_{bp} are shown below. The concentrating effect due to runoff is



illustrated by the CDF for channels, with 50% of the channel area having $F_{bp} > 61$ mm/yr.

For this 9-yr period most of the F_{bp} occurs during the months Dec-Mar.

The ridge elements also have high values of potential infiltration, with 50% of the ridge area having potential bedrock infiltration > 25 mm/y. An unknown fraction of this infiltration could be evaporated or transpired by plants.