

# Thoughts on Intermittent Streams

Nueces BBEST May 20, 2011

# Salient Gages

- Intermittent gages have HEFR outputs that need additional consideration.
- The following slides includes those gages that Dan Opdyke thought were good candidates for this discussion. It is not necessarily comprehensive or definitive.
- Only full POR HEFR outputs are included herein

# WNRBrackettville Draft HEFR Output

Overbank Flows	Qp: 11,200 cfs with Average Frequency 1 per 5 years Regressed Volume is 33,622 to 136,090 (67,644) Regressed Duration is 18 to 92 (41)											
	Qp: 4,090 cfs with Average Frequency 1 per 2 years Regressed Volume is 12,504 to 50,535 (25,138) Regressed Duration is 15 to 75 (33)											
High Flow Pulses	Qp: 1,020 cfs with Average Frequency 1 per year Regressed Volume is 3,197 to 12,899 (6,422) Regressed Duration is 11 to 57 (26)											
	Qp: 1 cfs with Average Frequency 1 per season Regressed Volume is 3 to 13 (6) Regressed Duration is 3 to 14 (6)			Qp: 3 cfs with Average Frequency 1 per season Regressed Volume is 12 to 43 (23) Regressed Duration is 4 to 17 (8)			Qp: 2 cfs with Average Frequency 1 per season Regressed Volume is 29 (15) Regressed Duration is 3 to 19 (8)			Qp: 1 cfs with Average Frequency 1 per season Regressed Volume is 1 to 4 (2) Regressed Duration is 1 to 4 (2)		
	Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 1 (0) Regressed Duration is 2 to 8 (3)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 1 to 3 (1) Regressed Duration is 2 to 10 (5)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 0 (0) Regressed Duration is 2 to 9 (4)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 0 (0) Regressed Duration is 2 to 9 (4)		
	Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 1 (0) Regressed Duration is 2 to 8 (3)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 1 to 3 (1) Regressed Duration is 2 to 10 (5)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 0 (0) Regressed Duration is 2 to 9 (4)			Qp: 0 cfs with Average Frequency 2 per season Regressed Volume is 0 to 0 (0) Regressed Duration is 2 to 9 (4)		
Base Flows (cfs)	0.57 (30.3%)			0.67 (31.3%)			0.6 (36.5%)			0.52 (43.0%)		
	0.3 (39.7%)			0.36 (39.2%)			0.23 (42.7%)			0.23 (51.2%)		
	0.12 (49.3%)			0.15 (46.7%)			0.1 (48.9%)			0.13 (58.2%)		
Subsistence Flows (cfs)	0 (100.0%)			0 (100.0%)			0 (100.0%)			0 (100.0%)		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	Winter				Spring			Summer			Fall	

Very small HFPs

41% zero  
90% <10cfs  
Only 135 HFPs > 10cfs in 64 years

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some/all base flow levels and subsistence flows

Notes:  
1. Period of Record used : 1/1/1946 to 12/31/2009.  
2. Volumes are in acre-feet and durations are in days.

# NRCotulla Draft HEFR Output

<b>Overbank Flows</b>	Qp: 15,100 cfs with Average Frequency 1 per 5 years Regressed Volume is 83,509 to 271,431 (150,555) Regressed Duration is 10 to 42 (21)											
	Qp: 8,410 cfs with Average Frequency 1 per 2 years Regressed Volume is 44,768 to 145,466 (80,699) Regressed Duration is 9 to 38 (19)											
<b>High Flow Pulses</b>	Qp: 4,460 cfs with Average Frequency 1 per year Regressed Volume is 22,779 to 73,993 (41,055) Regressed Duration is 8 to 34 (17)											
	Qp: 96 cfs with Average Frequency 1 per season Regressed Volume is 438 to 1,572 (830) Regressed Duration is 5 to 20 (10)			Qp: 1,180 cfs with Average Frequency 1 per season Regressed Volume is 5,654 to 17,154 (9,848) Regressed Duration is 7 to 24 (13)			Qp: 103 cfs with Average Frequency 1 per season Regressed Volume is 376 to 1,027 (622)			Qp: 644 cfs with Average Frequency 1 per season Regressed Volume is 2,952 to 8,609 (5,041)		
	Qp: 8 cfs with Average Frequency 2 per season Regressed Volume is 29 to 104 (55) Regressed Duration is 3 to 13 (6)			Qp: 192 cfs with Average Frequency 2 per season Regressed Volume is 782 to 2,370 (1,361) Regressed Duration is 5 to 17 (9)						Qp: 35 cfs with Average Frequency 2 per season Regressed Volume is 123 to 358 (210)		
<b>Base Flows (cfs)</b>	38 (29.9%)			30 (36.4%)			32 (30.5%)			42 (38.7%)		
	6.2 (39.6%)			10 (44.2%)			6.9 (37.3%)			15 (46.7%)		
	0.33 (52.2%)			1.3 (53.3%)			0.49 (43.5%)			1.3 (56.2%)		
<b>Subsistence Flows (cfs)</b>	0 (100.0%)			0 (100.0%)			0 (100.0%)			0 (100.0%)		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer		Fall	

Somewhat small HFPs



<b>Flow Levels</b>	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some base flow levels and subsistence flows

Notes:  
 1. Period of Record used : 1/1/1927 to 12/31/2009.  
 2. Volumes are in acre-feet and durations are in days.

# NRTilden Draft HEFR Output

<b>Overbank Flows</b>	Qp: 24,500 cfs with Average Frequency 1 per 5 years Regressed Volume is 146,267 to 466,188 (261,128) Regressed Duration is 12 to 44 (23)											
	Qp: 10,700 cfs with Average Frequency 1 per 2 years Regressed Volume is 59,966 to 191,027 (107,029) Regressed Duration is 10 to 38 (20)											
<b>High Flow Pulses</b>	Qp: 4,610 cfs with Average Frequency 1 per year Regressed Volume is 24,227 to 77,142 (43,231) Regressed Duration is 9 to 33 (17)											
	Qp: 298 cfs with Average Frequency 1 per season Regressed Volume is 1,408 to 4,606 (2,547) Regressed Duration is 6 to 22 (12)				Qp: 881 cfs with Average Frequency 1 per season Regressed Volume is 4,285 to 12,219 (7,236) Regressed Duration is 6 to 22 (12)			Qp: 322 cfs with Average Frequency 1 per season Regressed Volume is 1,396 to 4,392 (2,476)			Qp: 836 cfs with Average Frequency 1 per season Regressed Volume is 3,877 to 10,884 (6,496)	
	Qp: 87 cfs with Average Frequency 2 per season Regressed Volume is 384 to 1,255 (694) Regressed Duration is 5 to 18 (9)				Qp: 279 cfs with Average Frequency 2 per season Regressed Volume is 1,180 to 3,362 (1,992) Regressed Duration is 5 to 18 (9)			Qp: 11 cfs with Average Frequency 2 per season Regressed Volume is 30 to 96 (54)			Qp: 218 cfs with Average Frequency 2 per season Regressed Volume is 851 to 2,386 (1,425)	
								Regressed				
<b>Base Flows (cfs)</b>	42 (34.3%)				25 (45.0%)			14 (40.1%)			42 (47.9%)	
	1.1 (55.8%)				3.3 (59.7%)			0.83 (56.1%)			12 (60.0%)	
	0.2 (74.4%)				0.1 (75.2%)			0.17 (64.4%)			0.34 (77.3%)	
<b>Subsistence Flows (cfs)</b>	0 (100.0%)				0 (100.0%)			0 (100.0%)			0 (100.0%)	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter				Spring			Summer			Fall	

<b>Flow Levels</b>	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some base flow levels and subsistence flows

Notes:

1. Period of Record used : 1/1/1943 to 12/31/2009.
2. Volumes are in acre-feet and durations are in days.

# FRDerby Draft HEFR Output

Overbank Flows		Qp: 16,400 cfs with Average Frequency 1 per 5 years Regressed Volume is 51,477 to 180,512 (96,396) Regressed Duration is 8 to 36 (17)											
Somewhat small HFPs		Qp: 7,200 cfs with Average Frequency 1 per 2 years Regressed Volume is 22,777 to 79,827 (42,640) Regressed Duration is 7 to 31 (15)											
High Flow Pulses		Qp: 4,010 cfs with Average Frequency 1 per year Regressed Volume is 12,756 to 44,691 (23,876) Regressed Duration is 7 to 29 (14)											
		Qp: 87 cfs with Average Frequency 1 per season Regressed Volume is 350 to 1,446 (711) Regressed Duration is 4 to 20 (9)			Qp: 902 cfs with Average Frequency 1 per season Regressed Volume is 3,061 to 7,936 (4,926) Regressed Duration is 5 to 17 (9)			Qp: 58 cfs with Average Frequency 1 per season Regressed Volume is 177 to 513 (301)			Qp: 348 cfs with Average Frequency 1 per season Regressed Volume is 1,072 to 4,340 (2,157)		
		Qp: 12 cfs with Average Frequency 2 per season Regressed Volume is 47 to 193 (95) Regressed Duration is 3 to 15 (7)			Qp: 209 cfs with Average Frequency 2 per season Regressed Volume is 699 to 1,812 (1,126) Regressed Duration is 4 to 14 (7)						Qp: 7 cfs with Average Frequency 2 per season Regressed Volume is 24 to 97 (48) Regressed		
Base Flows (cfs)		26 (34.8%)			22 (38.3%)			16 (30.7%)			24 (34.9%)		
		17 (43.9%)			11 (49.2%)			6.8 (38.0%)			12 (43.2%)		
		7.9 (53.1%)			2.8 (59.7%)			2.2 (46.2%)			5 (51.1%)		
Subsistence Flows (cfs)		0 (100.0%)			0 (100.0%)			0 (100.0%)			0 (100.0%)		
		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
		Winter					Spring			Summer		Fall	

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Notes:

1. Period of Record used : 1/1/1916 to 12/31/2009.

# FRTilden Draft HEFR Output

<b>Overbank Flows</b>	Qp: 12,600 cfs with Average Frequency 1 per 5 years Regressed Volume is 58,521 to 167,583 (99,031) Regressed Duration is 9 to 34 (18)											
	Qp: 7,320 cfs with Average Frequency 1 per 2 years Regressed Volume is 32,879 to 94,115 (55,627) Regressed Duration is 8 to 31 (16)											
<b>High Flow Pulses</b>	Qp: 4,140 cfs with Average Frequency 1 per year Regressed Volume is 17,953 to 51,369 (30,368) Regressed Duration is 7 to 27 (14)											
	Qp: 385 cfs with Average Frequency 1 per season Regressed Volume is 1,502 to 5,322 (2,827) Regressed Duration is 5 to 20 (10)					Qp: 1,489 cfs with Average Frequency 1 per season Regressed Volume is 6,323 to 15,730 (9,973) Regressed Duration is 5 to 18 (10)			Qp: 271 cfs with Average Frequency 1 per season Regressed Volume is 981 to 2,440 (1,547)		Qp: 961 cfs with Average Frequency 1 per season Regressed Volume is 3,719 to 10,368 (6,209)	
	Qp: 86 cfs with Average Frequency 2 per season Regressed Volume is 302 to 1,070 (569) Regressed Duration is 3 to 13 (7)					Qp: 455 cfs with Average Frequency 2 per season Regressed Volume is 1,797 to 4,468 (2,834) Regressed Duration is 4 to 14 (8)			Qp: 36 cfs with Average Frequency 2 per season Regressed Volume is 111 to 276 (175)		Qp: 117 cfs with Average Frequency 2 per season Regressed Volume is 388 to 1,079 (647)	
<b>Base Flows (cfs)</b>	29 (41.9%)					25 (49.9%)			14 (42.5%)		21 (48.2%)	
	12 (60.6%)					7.3 (68.6%)			2 (61.5%)		3.2 (67.7%)	
	1.1 (81.7%)					1.1 (83.1%)			0.26 (71.4%)		0.62 (79.9%)	
<b>Subsistence Flows (cfs)</b>	0 (100.0%)					0 (100.0%)			0 (100.0%)		0 (100.0%)	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer		Fall	

<b>Flow Levels</b>	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some base flow levels and subsistence flows

**Notes:**

1. Period of Record used : 1/1/1933 to 12/31/2009.
2. Volumes are in acre-feet and durations are in days.

# SRSabinalBEO Draft HEFR Output

	Qp: 5,040 cfs with Average Frequency 1 per 5 years Regressed Volume is 17,410 to 80,590 (37,457) Regressed Duration is 14 to 74 (32)											
	Qp: 2,210 cfs with Average Frequency 1 per 2 years Regressed Volume is 7,306 to 33,757 (15,704) Regressed Duration is 11 to 57 (25)											
High Flow Pulses	Qp: 1,050 cfs with Average Frequency 1 per year Regressed Volume is 3,336 to 15,391 (7,165) Regressed Duration is 8 to 46 (20)											
	Qp: 9 cfs with Average Frequency 1 per season Regressed Volume is 31 to 163 (71) Regressed Duration is 3 to 15 (6)			Qp: 21 cfs with Average Frequency 1 per season Regressed Volume is 52 to 192 (100) Regressed Duration is 2 to 11 (5)			Qp: 2 cfs with Average Frequency 1 per season Regressed Volume is 5 to 20 (10) Regressed Duration is 1 to 5 (3)			Qp: 11 cfs with Average Frequency 1 per season Regressed Volume is 26 to 96 (50) Regressed Duration is 1 to 6 (3)		
	Qp: 2 cfs with Average Frequency 2 per season Regressed Volume is 4 to 22 (10) Regressed Duration is 1 to 8 (3)			Qp: 2 cfs with Average Frequency 2 per season Regressed Volume is 5 to 17 (9) Regressed Duration is 1 to 6 (3)						Qp: 1 cfs with Average Frequency 2 per season Regressed Volume is 2 to 6 (3) Regressed Duration is 1 to 6 (3)		
Base Flows (cfs)	2.3 (42.0%)			2.2 (41.7%)			2.1 (41.8%)			2.5 (44.5%)		
	1.3 (60.1%)			1.1 (59.9%)			0.93 (59.0%)			1.5 (59.9%)		
	0.86 (75.8%)			0.52 (76.1%)			0.52 (73.5%)			0.78 (76.3%)		
Subsistence Flows (cfs)	0 (100.0%)			0 (100.0%)			0 (100.0%)			0 (100.0%)		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer		Fall	

Small HFPs

Meaningless difference among some base flow levels and subsistence flows

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

- Notes:
1. Period of Record used : 1/1/1953 to 12/31/2009.
  2. Volumes are in acre-feet and durations are in days.

# SCUtopia Draft HEFR Output

Overbank Flows	Qp: 1,600 cfs with Average Frequency 1 per 5 years Regressed Volume is 9,382 to 32,741 (17,527) Regressed Duration is 16 to 62 (32)											
	Qp: 698 cfs with Average Frequency 1 per 2 years Regressed Volume is 3,641 to 12,676 (6,794) Regressed Duration is 12 to 44 (22)											
High Flow Pulses	Qp: 313 cfs with Average Frequency 1 per year Regressed Volume is 1,458 to 5,066 (2,718) Regressed Duration is 8 to 31 (16)											
	Qp: 11 cfs with Average Frequency 1 per season Regressed Volume is 82 to 291 (155) Regressed Duration is 3 to 12 (6)			Qp: 91 cfs with Average Frequency 1 per season Regressed Volume is 347 to 1,137 (628) Regressed Duration is 4 to 17 (8)			Qp: 38 cfs with Average Frequency 1 per season Regressed Volume is 122 to 360 (210) Regressed Duration is 4 to 11 (6)			Qp: 23 cfs with Average Frequency 1 per season Regressed Volume is 69 to 270 (136)		
	Qp: 9 cfs with Average Frequency 2 per season Regressed Volume is 29 to 100 (54) Regressed Duration is 2 to 8 (4)			Qp: 33 cfs with Average Frequency 2 per season Regressed Volume is 111 to 364 (201) Regressed Duration is 3 to 12 (6)			Qp: 11 cfs with Average Frequency 2 per season Regressed Volume is 31 to 93 (54) Regressed Duration is 2 to 7 (4)			Qp: 7 cfs with Average Frequency 2 per season Regressed Volume is 17 to 65 (33) Regressed		
Base Flows (cfs)	6.1 (41.4%)			6.7 (50.7%)			6.4 (40.8%)			6.8 (44.9%)		
	3.6 (60.3%)			2.8 (68.2%)			2.8 (57.6%)			3.6 (64.1%)		
	2 (80.2%)			1.2 (83.6%)			1.3 (73.2%)			1.3 (81.7%)		
Subsistence Flows (cfs)	0.05 (98.7%)			0.06 (97.7%)			0.02 (92.9%)			0.05 (98.6%)		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	Winter			Spring			Summer			Fall		

Somewhat small HFPs

Meaningless difference among some base flow levels and subsistence flows

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Notes:  
 1. Period of Record used : 1/1/1962 to 12/31/2009.  
 2. Volumes are in acre-feet and durations are in days.

# SMCTilden Draft HEFR Output

<b>Overbank Flows</b>	Qp: 8,180 cfs with Average Frequency 1 per 5 years Regressed Volume is 19,800 to 55,895 (33,268) Regressed Duration is 6 to 23 (12)											
	Qp: 3,970 cfs with Average Frequency 1 per 2 years Regressed Volume is 9,882 to 27,880 (16,598) Regressed Duration is 6 to 21 (11)											
<b>High Flow Pulses</b>	Qp: 2,210 cfs with Average Frequency 1 per year Regressed Volume is 5,627 to 15,868 (9,449) Regressed Duration is 5 to 20 (11)											
	Qp: 162 cfs with Average Frequency 1 per season Regressed Volume is 480 to 1,577 (870) Regressed Duration is 4 to 19 (9)				Qp: 685 cfs with Average Frequency 1 per season Regressed Volume is 2,058 to 4,940 (3,188) Regressed Duration is 5 to 16 (9)			Qp: 156 cfs with Average Frequency 1 per season Regressed Volume is 439 to 1,036 (675)		Qp: 303 cfs with Average Frequency 1 per season Regressed Volume is 802 to 2,006 (1,268)		
	Qp: 45 cfs with Average Frequency 2 per season Regressed Volume is 145 to 474 (262) Regressed Duration is 4 to 16 (8)				Qp: 218 cfs with Average Frequency 2 per season Regressed Volume is 652 to 1,564 (1,010) Regressed Duration is 4 to 14 (8)			Qp: 16 cfs with Average Frequency 2 per season Regressed Volume is 48 to 112 (73) Regressed		Qp: 44 cfs with Average Frequency 2 per season Regressed Volume is 122 to 306 (193)		
<b>Base Flows (cfs)</b>	3.4 (36.2%)			4.4 (44.2%)			2.6 (36.2%)		3.6 (37.0%)			
	2 (48.7%)			2 (54.1%)			1.3 (43.6%)		1.8 (45.7%)			
	0.95 (60.2%)			0.36 (64.6%)			0.22 (52.2%)		0.23 (55.4%)			
<b>Subsistence Flows (cfs)</b>	0 (100.0%)			0 (100.0%)			0 (100.0%)		0 (100.0%)			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer		Fall	

<b>Flow Levels</b>	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some base flow levels and subsistence flows

**Notes:**

1. Period of Record used : 1/1/1965 to 12/31/2009.
2. Volumes are in acre-feet and durations are in days.

# OCCorpus Draft HEFR Output

Somewhat small HFPs

Overbank Flows	Qp: 3,550 cfs with Average Frequency 1 per 5 years Regressed Volume is 10,380 to 23,790 (15,714) Regressed Duration is 10 to 28 (17)																							
	Qp: 2,500 cfs with Average Frequency 1 per 2 years Regressed Volume is 7,362 to 16,866 (11,143) Regressed Duration is 9 to 26 (15)																							
High Flow Pulses	Qp: 1,320 cfs with Average Frequency 1 per year Regressed Volume is 3,937 to 9,015 (5,958) Regressed Duration is 8 to 23 (13)																							
	Qp: 220 cfs with Average Frequency 1 per season Regressed Volume is 691 to 1,601 (1,052) Regressed Duration is 6 to 17 (10)			Qp: 227 cfs with Average Frequency 1 per season Regressed Volume is 676 to 1,479 (1,000) Regressed Duration is 5 to 13 (8)			Qp: 21 cfs with Average Frequency 1 per season Regressed Volume is 62 to 155 (98) Regressed			Qp: 364 cfs with Average Frequency 1 per season Regressed Volume is 1,148 to 2,450 (1,677)														
	Qp: 59 cfs with Average Frequency 2 per season Regressed Volume is 196 to 453 (298) Regressed Duration is 4 to 13 (7)			Qp: 48 cfs with Average Frequency 2 per season Regressed Volume is 149 to 325 (220) Regressed Duration is 4 to 9 (6)			Qp: 6 cfs with Average Frequency 2 per season Regressed Volume is 15 to 39 (24) Regressed			Qp: 64 cfs with Average Frequency 2 per season Regressed Volume is 211 to 449 (308)														
	Base Flows (cfs)																							
Subsistence Flows (cfs)	2.4 (46.9%)			2.3 (48.3%)			2.1 (42.1%)			2.1 (63.6%)														
	1.8 (67.1%)			1.7 (64.3%)			1.5 (61.7%)			1.6 (79.0%)														
	1.4 (85.5%)			1.3 (80.3%)			1.2 (76.5%)			1.3 (87.9%)														
0.79 (99.1%)																								
0.74 (94.8%)																								
0.74 (93.9%)																								
0.8 (98.6%)																								
Nov			Dec		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct	
Winter						Spring						Summer						Fall						

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Meaningless difference among some base flow levels and subsistence flows

Notes:  
 1. Period of Record used : 1/1/1973 to 12/31/2009.  
 2. Volumes are in acre-feet and durations are in days.

# SFCALice Draft HEFR Output

<b>Overbank Flows</b>	Qp: 3,350 cfs with Average Frequency 1 per 5 years Regressed Volume is 8,258 to 26,778 (14,871) Regressed Duration is 10 to 36 (19)											
	Qp: 1,380 cfs with Average Frequency 1 per 2 years Regressed Volume is 3,473 to 11,234 (6,246) Regressed Duration is 8 to 28 (15)											
<b>High Flow Pulses</b>	Qp: 544 cfs with Average Frequency 1 per year Regressed Volume is 1,398 to 4,515 (2,513) Regressed Duration is 6 to 22 (12)											
	Qp: 15 cfs with Average Frequency 1 per season Regressed Volume is 49 to 166 (90) Regressed Duration is 3 to 12 (6)			Qp: 87 cfs with Average Frequency 1 per season Regressed Volume is 223 to 634 (376) Regressed Duration is 4 to 11 (6)			Qp: 18 cfs with Average Frequency 1 per season Regressed Volume is 47 to 151 (84) Regressed			Qp: 17 cfs with Average Frequency 1 per season Regressed Volume is 48 to 166 (89) Regressed		
	Qp: 8 cfs with Average Frequency 2 per season Regressed Volume is 26 to 88 (48) Regressed Duration is 3 to 9 (5)			Qp: 17 cfs with Average Frequency 2 per season Regressed Volume is 46 to 129 (77) Regressed Duration is 2 to 8 (4)			Qp: 3 cfs with Average Frequency 2 per season Regressed Volume is 9 to 28 (16) Regressed			Qp: 6 cfs with Average Frequency 2 per season Regressed Volume is 18 to 62 (34) Regressed		
<b>Base Flows (cfs)</b>	2.1 (45.0%)			2 (45.9%)			1.9 (47.8%)			2.1 (51.0%)		
	1.6 (68.3%)			1.6 (65.4%)			1.5 (64.0%)			1.5 (69.4%)		
	1.3 (82.4%)			1.2 (82.5%)			1.1 (79.9%)			1.2 (82.4%)		
<b>Subsistence Flows (cfs)</b>	0.59 (98.5%)			0.49 (96.2%)			0.52 (94.5%)			0.6 (97.1%)		
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	Winter					Spring			Summer			Fall

Somewhat small HFPs

Meaningless difference among some base flow levels and subsistence flows

<b>Flow Levels</b>	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Notes:  
 1. Period of Record used : 1/1/1965 to 12/31/1997.  
 2. Volumes are in acre-feet and durations are in days.

# Cause of Anomalies

- Many zero flow and very low flow days
- Many jumps in flow triggering HFPs, even if flows are arguably low (e.g.,  $< 1$  cfs)
- Could tweak IHA and HEFR to improve results
- OR – could work with information available and make modifications based on biological, etc. information

# Brainstorm Ideas

- Reduce 3 levels of base flow and one level of subsistence flow to 1 or 2 levels total (~1 cfs?)
- Eliminate negligible HFPs.
- Identify a Biological/Geomorph/WatQual need for passage of flows between smallest reasonable HFP (e.g., WNRB 1/year event: 1020 cfs) and base flows (~1 cfs).
- Establish means to trigger passage of such flows when they occur.
  - “traditional” hydrologic condition concepts like reservoir storage or annual flow volume?
  - “new” concepts like duration of zero flow?