Hydrologic Workgroup Preliminary Recommendations

Colorado Lavaca BBEST

May 9, 2010

Hydrologic Methods Decision Points for Preliminary Analysis

- Baseflow Separation (Method and Parameters)
- Hydrologic Period of Record
- Assignment Period
- Number of Instream Flow Regime Components
- Hydrologic/Climatic Condition
- Subsistence Flows Less Than 7Q2
- Flow Regime Component Characteristics Delineated
- Overbank Recommendations

Baseflow Separation (Method and Parameters)

- Objective
  - Traditional (Runoff-Groundwater source)
  - Ecological Function
- Tools
  - MBFIT
  - IHA
- Parameters
  - Magnitude Thresholds
  - Rate of Change

Baseflow Separation HydroGroup Recommendation

- Recommendation
  - Ecological function
  - Magnitude Threshold – separates high from low flows
  - IHA (although they are identical when using only magnitude thresholds)
- Questions for BBEST
  - At what flow magnitude are you confident that flows above that level are predominately providing pulse functions (sediment transport, spawning/migratory cues, lateral connectivity, etc.)?
  - Below what flow level are function primarily instream habitat functions?
  - Is there a level you can identify below which available habitats are getting crowded and water quality is the dominate concern?

Period of Record

Region	Gage	Name	DAY1	DAYN	US_ALT	ALT_DATE	START	END	YEARS	Action to address pre impact POR problems	Pre POR?
		Colorado Silver	10/1/1956	9/30/2009	LAKE J B THOMAS	7/31/1952	1956	1952	-3	Ignore Lake Thomas effect	
	8126380	Colorado Rv nr Ballinger	6/1/1907	9/30/2009	E V SPENCE RESERVOIR	12/15/1968	1907	1968	62		
Upper	8127000	Elm Ck at Ballinger	4/1/1932	9/30/2009	LAKE WINTERS	1/1/1929	1932	1929	-2	Ignore Lake Winters effect	1930-1950
	8128000	S Concho Rv at Christoval	3/1/1930	9/30/2009			1930	2009	80		
	8136500	Concho Rv at Paint Rock	10/1/1915	9/30/2009	LAKE NASWORTHY	3/28/1930	1915	1930	16	Ingnore Nasworthy, Fisher comes in 1952	
		Pecan Bayou	11/1/1923	9/30/2009	LAKE BROWNWOOD	7/31/1933	1923	1933	11	Ignore Brownwood effect	
	8144500	San Saba Rv at Menard	10/1/1915	9/30/2009			1915	2009	95		
	8146000	San Saba Rv at San Saba	10/1/1915	9/30/2009			1915	2009	95		
	8147000	Colorado Rv nr San Saba	11/1/1915	9/30/2009	O H IVIE RESERVOIR	3/16/1990	1915	1990	76		
Middle		Colorado Rv at Bend			O H IVIE RESERVOIR	3/17/1990				DA adjust San Saba or drop	1940-1990
	8150000	Llano Rv nr Junction	10/1/1915	9/30/2009			1915	2009	95		
	8150700	Llano Rv nr Mason	3/7/1968	9/30/2009			1968	2009	42	DA adjust Junction	
	8151500	Llano Rv at Llano	9/17/1939	9/30/2009			1939	2009	71		
	8152900	Pedernales Rv nr Fredericksburg	6/28/1979	9/30/2009			1979	2009	31	DA adjust Johnson City	
	8153500	Pedernales Rv nr Johnson City	5/4/1939	9/30/2009			1939	2009	71		
	8158000	Colorado Rv at Austin	1898	9/30/2009	LAKE BUCHANAN	5/20/1937	1898	1937	40		
	8159200	Colorado Rv at Bastrop	3/1/1960	9/30/2009	LAKE BUCHANAN	5/20/1937	1960	1937	-22	DA adjust Austin	
Lower	8161000	Colorado Rv at Columbus	6/1/1916	9/30/2009	LAKE BUCHANAN	5/20/1937	1916	1937	22		1920-1940
	8162000	Colorado Rv at Wharton	10/1/1938	9/30/2009	LAKE BUCHANAN	5/20/1937	1938	1937	0	DA adjust Columbus	
	8162500	Colorado Rv nr Bay City	5/1/1948	9/30/2009	LAKE BUCHANAN	5/20/1937	1948	1937	-10	DA adjust Columbus	
		Navidad Rv	6/1/1939	9/30/2009			1939	2009	71		
	8164000	Lavaca Rv nr Edna	9/1/1938	9/30/2009			1938	2009	72		
Lavaca	8164503	W Mustang Ck nr Ganado	10/1/1977	9/30/2009			1977	2009	33		1979-2009
	8164504	E Mustang Ck nr Louise	10/1/1996	9/30/2009			1996	2009	14	consider dropping insuffiecient POR	
	8164450	Sandy Ck nr Ganado	10/1/1977	9/30/2009			1977	2009	33		
	8162600	Tres Palacios Rv nr Midfield	6/17/1970	9/30/2009			1970	2009	40		
Coastal	8164600	Garcitas Ck nr Inez	6/15/1970	9/30/2009			1970	2009	40		1970 -2009
	8164800	Placedo Ck nr Placedo	6/16/1970	9/30/2009			1970	2009	40		

Period of Record HydroGroup Recommendation

- Recommendation
  - Entire (gage specific)
  - PreImpact (before major upstream impoundment)
  - PostImpact (1970-2009)

HDF Name	Entire		Pre		Post	
	Begin	End	Begin	End	Begin	End
08126380 Colorado Rv nr Ballinger	1908	2009	1908	1967	1970	2009
08147000 Colorado Rv nr San Saba	1924	2009	1924	1989	1970	2009
08151500 Llano Rv at Llano	1940	2009	1940	2009	1970	2009
08153500 Pedernales Rv nr Johnson City	1940	2009	1940	2009	1970	2009
08161000 Colorado Rv at Columbus	1917	2009	1917	1936	1970	2009
08164000 Lavaca Rv nr Edna	1939	2009	1939	2009	1970	2009
08164600 Garcitas Ck nr Inez	1971	2009	1971	2009	1971	2009

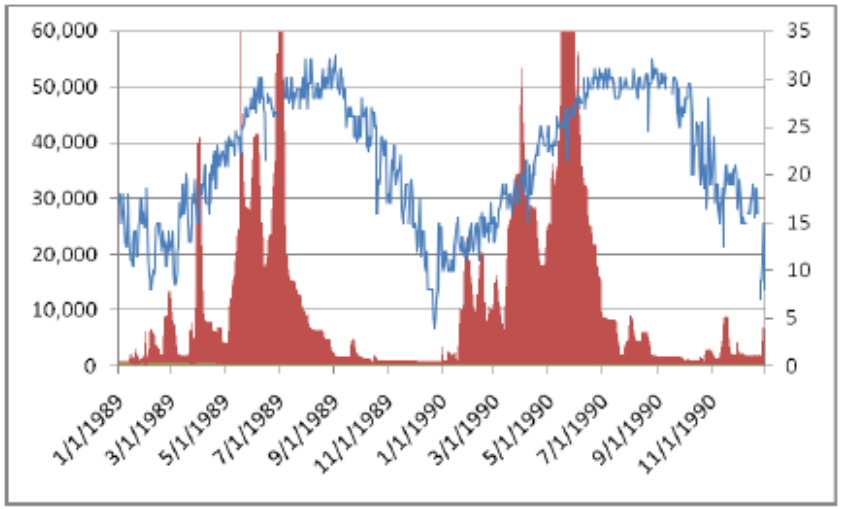
- Questions for BBEST
  - Representative periods
  - Consistency/flow balance
  - Are the differences significant and if so, what does this imply ecologically?

	Colorado_Ballinger			Colorado_San Saba			Llano_Llano			Pedernales_Johnson City			Colorado_Columbus			Lavaca_Edna			Garcitas_Inez		
	Entire	Pre	Post	Entire	Pre	Post	Entire	Pre	Post	Entire	Pre	Post	Entire	Pre	Post	Entire	Pre	Post	Entire	Pre	Post
25%																					
Jan	4	6	6	117	127	115	119	119	138	23	23	38	565	513	557	30	30	35	2	2	2
Feb	5	5	5	117	126	109	104	104	133	29	29	43	609	686	516	32	32	33	2	2	2
Mar	4	5	4	100	102	101	103	103	139	22	22	34	616	560	708	33	33	36	1	1	1
Apr	2	4	2	102	103	86	98	98	112	29	29	33	972	610	1,144	31	31	36	1	1	1
May	4	3	4	137	161	129	104	104	118	26	26	51	1,584	969	1,723	34	34	36	1	1	1
Jun	5	3	3	145	161	122	75	75	96	17	17	31	1,750	1,125	1,980	27	27	27	1	1	1
Jul	3	2	2	90	112	81	64	64	74	12	12	16	1,460	680	1,690	19	19	20	1	1	1
Aug	3	2	2	86	99	76	58	58	59	10	10	16	1,213	411	1,390	15	15	14	1	1	1
Sep	5	5	4	100	100	101	70	70	95	12	12	24	1,200	650	1,349	19	19	24	1	1	1
Oct	5	6	6	91	99	86	91	91	115	18	18	26	693	589	752	19	19	25	1	1	1
Nov	6	7	6	118	120	99	95	95	137	19	19	32	470	762	430	20	20	21	2	2	2
Dec	6	7	6	115	125	112	104	104	141	22	22	31	512	589	465	22	22	27	1	1	1
50%																					
Jan	11	11	11	181	206	190	149	149	176	53	53	72	1,040	926	886	53	53	63	4	4	4
Feb	9	9	9	189	205	187	156	156	172	52	52	70	880	975	722	58	58	65	3	3	3
Mar	8	9	9	185	188	185	152	152	173	48	48	62	969	992	877	62	62	72	3	3	3
Apr	7	10	8	161	180	149	142	142	176	56	56	85	1,340	1,390	1,465	56	56	65	3	3	3
May	10	10	9	241	249	224	141	141	153	75	75	83	1,815	1,430	1,950	56	56	61	3	3	3
Jun	9	7	6	216	269	174	122	122	145	43	43	67	2,070	1,750	2,260	55	55	73	3	3	3
Jul	7	5	4	143	181	98	101	101	105	24	24	39	1,830	900	1,893	38	38	52	2	2	2
Aug	7	4	5	127	143	105	96	96	97	23	23	31	1,630	743	1,665	29	29	34	2	2	2
Sep	9	11	8	144	163	125	108	108	135	28	28	37	1,535	1,115	1,565	32	32	36	2	2	2
Oct	10	10	10	155	164	141	136	136	159	32	32	33	957	986	943	29	29	34	2	2	2
Nov	12	11	11	175	187	164	146	146	181	42	42	52	772	1,090	557	37	37	39	3	3	3
Dec	10	11	11	179	185	173	160	160	174	50	50	57	755	956	639	47	47	53	3	3	3
75%																					
Jan	17	18	18	286	322	263	206	206	220	95	95	105	1,721	1,798	1,479	81	81	81	5	5	5
Feb	16	17	19	308	325	289	191	191	198	91	91	102	1,715	1,673	1,290	90	90	97	6	6	6
Mar	16	15	16	327	326	317	203	203	208	84	84	101	1,726	1,820	1,580	97	97	107	5	5	5
Apr	15	14	14	273	260	274	189	189	205	94	94	102	1,845	2,230	1,881	91	91	97	5	5	5
May	16	17	16	351	379	312	183	183	199	97	97	108	2,248	2,166	2,245	90	90	108	5	5	5
Jun	16	12	12	373	389	302	164	164	170	80	80	97	2,500	2,050	2,635	90	90	98	4	4	4
Jul	14	10	10	300	317	266	144	144	146	56	56	66	2,160	1,440	2,265	75	75	91	5	5	5
Aug	15	9	8	193	207	179	141	141	149	44	44	81	1,966	1,120	1,915	49	49	60	3	3	3
Sep	13	14	13	247	288	217	165	165	171	50	50	68	1,825	1,825	1,833	60	60	67	4	4	4
Oct	16	14	14	275	304	186	183	183	189	56	56	58	1,415	1,543	1,216	60	60	73	4	4	4
Nov	16	18	18	304	310	282	202	202	230	67	67	85	1,633	1,965	875	68	68	76	4	4	4
Dec	16	17	21	265	311	229	199	199	223	87	87	88	1,520	1,583	1,268	78	78	94	5	5	5
10th (per)	1	1	1	44	44	44	36	36	36	3	3	3	321	321	321	7	7	7	0	0	0
75th (pre)	29	29	29	615	615	615	275	275	275	131	131	131	3,390	3,390	3,390	140	140	140	10	10	10
2 year (pre)	1,215	1,215	1,215	21,350	21,350	21,350	9,045	9,045	9,045	5,980	5,980	5,980	47,250	47,250	47,250	10,700	10,700	10,700	3,080	3,080	3,080

Assignment Period Monthly/Seasonal

- HEFR outputs monthly and seasonal results
- Trying for Parsimony based on review
- Need define seasons (i.e. Winter means Dec-Jan-Feb)

	Trinity at Oakwood		Trinity at Romayor	
	Number of Days <12%tile flow	Number of Peaks in Flow	Number of Days <10%tile flow	Number of Peaks in Flow
January	32	65	71	41
February	19	66	28	39
March	21	67	20	33
April	23	75	33	29
May	0	75	3	50
June	56	66	24	33
July	148	56	193	26
August	295	43	388	22
September	308	49	408	31
October	297	59	416	26
November	141	63	193	34
December	107	51	109	42



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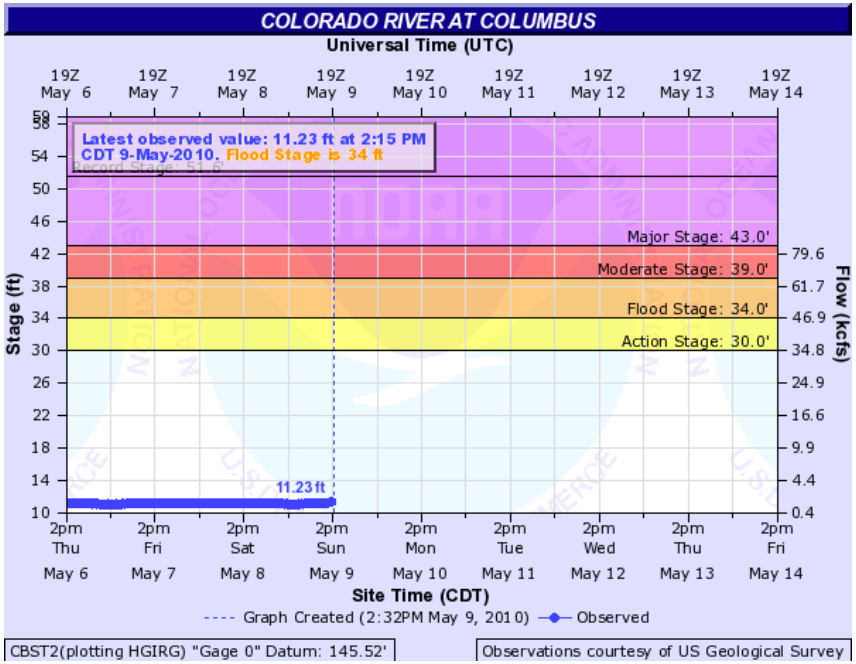
- Subsistence Flows Less Than 7Q2
- Flow Regime Component Characteristics Delineated
- Overbank Recommendations

Overbank Recommendations



Gage	Name	Action Stage	Flood Stage
8126380	Colorado Rv nr Ballinger	3,400	4,900
8147000	Colorado Rv nr San Saba	30,000	43,500
8151500	Llano Rv at Llano	19,150	19,150
8153500	Pedernales Rv nr Johnson City	7,000	11,350
8161000	Colorado Rv at Columbus	34,800	46,900
8164000	Lavaca Rv nr Edna	5,400	6,400
8164600	Garcitas Ck nr Inez	400	3,700

Calibrate to LSWP

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AUSTIN REACH												
Subsistence	50	50	50	50	50	50	50	50	50	50	50	50
BASTROP REACH												
Subsistence	208	274	274	184	275	202	137	123	123	127	180	186
Base-DRY	313	317	274	287	579	418	347	194	236	245	283	311
Base-AVERAGE	433	497	497	635	824	733	610	381	423	433	424	450
COLUMBUS REACH												
Subsistence	340	375	375	299	425	534	342	190	279	190	202	301
Base-DRY	487	590	525	554	966	967	570	310	405	356	480	464
Base-AVERAGE	828	895	1,020	977	1,316	1,440	895	516	610	741	755	737
WHARTON REACH												
Subsistence	315	303	204	270	304	371	212	107	188	147	173	202
Base-DRY	492	597	531	561	985	984	577	314	410	360	486	470
Base-AVERAGE	838	906	1,036	1,011	1,397	1,512	906	522	617	749	764	746

COLORADO RIVER DOWNSTREAM OF AUSTIN

PULSE FLOWS	
Base	MAGNITUDE (2,000 to 3,000 cfs); FREQUENCY (8–10 times annually); DURATION (3–5 days)
High	MAGNITUDE (@ 8,000 cfs); FREQUENCY (2 Events in 3 year period); DURATION (2–3 days)
CHANNEL MAINTENANCE	MAGNITUDE (27,000 - 30,000 cfs); FREQUENCY (1 Event in 3 years); DURATION (3 days)
OVERBANK	MAGNITUDE (> 30,000 cfs); FREQUENCY and DURATION (Naturally Driven)

Overbank Flows	Qp: 34,800 cfs with Frequency 1 per 2 years Volume is 306,715 to 774,192 (540,453) Duration is 10 to 30 (17)											
High Flow Pulses	Qp: 24,800 cfs with Frequency 2 per year Volume is 117,873 to 584,688 (351,281) Duration is 7 to 21 (12)											
	Qp: 11,000 cfs with Frequency 1 per season Volume is #N/A to 199,332 (82,853)			Qp: 19,000 cfs with Frequency 1 per season Volume is 32,234 to 424,246 (228,240)			Qp: 5,580 cfs with Frequency 1 per season Volume is #N/A to 296,184 (19,241)			Qp: 10,200 cfs with Frequency 1 per season Volume is #N/A to 325,519 (77,785)		
	Qp: 4,350 cfs with Frequency 2 per season Volume is #N/A to 129,001 (11,728)			Qp: 6,700 cfs with Frequency 2 per season Volume is #N/A to 237,265 (40,972)			Qp: 5,000 cfs with Frequency 2 per season Volume is #N/A to 276,958 (#N/A)			Qp: 3,550 cfs with Frequency 2 per season Volume is #N/A to 233,322 (#N/A)		
Base Flows (cfs)	1360	1395	1860	1850	2230	2320	1630	1340	1640	1703	1630	1325
	869	884	1130	1080	1415	1630	989	812	827	1025	1030	882
	501	590	615	620	959	986	633	489	520	607	610	590
Subsistence Flows (cfs)	311	305	282	293	304	N/A	258	225	271	223	190	220
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Winter			Spring			Summer			Fall		

Hydrologic Conditions	
	Wet (75th %ile)
	Average (50th %ile)
	Dry (25th %ile)
	Subsistence

High Flow Pulse Characteristics	
	F = Frequency (per season)
	D = Duration (days)
	Q = Peak Flows (cfs)
	V = Volume (ac-ft)