

Ann Bleed

From: Barfield, Dave [DBARFIELD@KDA.STATE.KS.US]
Sent: Wednesday, August 21, 2002 3:08 PM
To: 'ableed@dnr.state.ne.us'; 'Knox Ken'; 'Allacher Dennis'; 'Swanda Marv'; 'Aycock Gordon'; 'Edward E Parker (E-mail)'
Cc: 'Dale Book (E-mail)'; Pope, David L.
Subject: RRCL Settlement - flood flows



HowMuchToRemove1

993.xls

As we agreed last meeting, below and attached are my initial estimates of the volume of flood flows in 1993 that I believe should be deducted from the long-term allocations if a flood like 1993 occurred again.

I have not tried to determine how the change in storage accounting might impact these estimates. Perhaps we can discuss this tomorrow. For this example with our historic methods, all the flood waters appeared as VWS and allocations in 1993. With the revised storage accounting, flood waters are included when they are released which may not be in the same compact year.

Attached is a spreadsheet which provides my analysis. As you will see, I borrowed data from Ann and the Bureau.

Here my preliminary conclusions for discussion at our meeting.

1) I conclude there is on the order of 350,000 AF of flood waters at Hardy in calendar year 1993 that should not be included in the long-term allocations. This includes approx. 150,000 AF in July 1993 that originated in the reach below HC (this is approx. the difference in the Hardy flow for the month and the long term mean) and approx. 200,000 AF during September to December when HC was spilling. This is again the excess vs. the long-term monthly means for these months. I have not considered what to do about the spills in 1994.

2) This value generally agrees with excesses in VWS in the basin for 1993, the great majority of which occurred in the mainstem reach. For 1993, the mainstem VWS was 286% of average, 678,900 AF vs. 237,300 AF. This is an excess of 440,000 AF in the MS only. There may be some excess in Medicine Creek as well. I believe Medicine spilled and, if so, contributed to the HC spill. Prairie Dog VWS was higher than average but I do not believe Norton spilled. I don't see anything higher in the basin.

See many of you tomorrow.

David Barfield

Ann Bleed

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Subject: RRCL Settlement - flood flows



res-splll.xls

Attached is what we believe are the upstream flood releases from the reservoirs above HCL during the 93-94 period.

Marv

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Summary	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Arikaree													
1971-2000													
Average	273	486	805	1,143	1,380	1,119	588	458	430	396	274	181	7,532
Median	99	375	719	780	1,199	631	234	240	282	393	187	77	6,956
STD	339.83	421.06	509.08	889.71	858.58	1,256.19	702.76	615.89	386.43	176.57	239.86	215.54	3,492.84
% Rank													
98%	1,074	1,449	1,987	3,360	3,351	4,863	2,396	2,178	1,440	725	787	729	16,598
95%	1,001	1,275	1,738	2,928	2,794	3,148	1,788	1,583	1,026	656	709	642	14,943
90%	872	1,062	1,377	2,674	2,335	2,183	1,341	1,053	738	626	632	542	11,640
85%	758	916	1,271	1,917	2,166	1,622	1,160	850	668	567	565	446	9,991
80%	453	691	1,190	1,588	2,105	1,491	1,017	584	620	549	501	340	9,721
No Fork													
1971-2000													
Average	3,313	3,160	3,536	3,139	2,103	1,500	821	855	1,137	2,051	2,998	3,236	27,851
Median	3,253	3,131	3,494	3,152	1,811	1,319	621	701	934	2,040	3,029	3,228	29,126
STD	531.85	428.53	440.59	956.24	1,058.28	776.39	452.01	450.72	564.36	763.34	638.47	462.92	4,260.33
% Rank													
98%	4,274	3,856	4,204	4,897	3,867	3,477	1,872	2,131	2,114	3,463	4,168	4,053	35,662
95%	4,217	3,806	4,183	4,636	3,617	2,668	1,604	1,785	2,055	3,217	3,956	4,043	33,798
90%	4,108	3,712	4,159	4,379	3,445	2,512	1,427	1,388	2,011	3,048	3,660	4,030	32,063
85%	3,866	3,593	4,128	4,038	3,396	1,920	1,382	1,249	1,942	2,780	3,576	3,797	30,996
80%	3,730	3,509	4,112	3,931	3,342	1,766	1,165	1,033	1,886	2,716	3,532	3,602	30,783
Buffalo													
1971-2000													
Average	428	415	466	461	419	224	52	59	166	343	380	395	3,800
Median	432	432	457	455	441	219	28	26	151	330	382	399	3,817
STD	105	122	123	129	136	138	65	76	107	90	98	101	783
% Rank													
98%	618	609	640	730	653	484	232	234	410	527	533	553	4,961
95%	577	569	633	665	624	418	177	165	377	493	517	545	4,785
90%	547	539	626	599	568	399	133	163	304	456	500	525	4,697
85%	533	522	611	586	540	378	106	127	250	449	488	511	4,518
0.8	498	508	572	563	518	342	75	117	241	443	467	491	4,451

Rock													
1971-2000													
Average	733	673	730	725	759	686	615	621	608	667	682	702	8,201
Median	728	654	738	695	786	668	628	632	612	682	676	706	8,237
STD	103	103	133	138	154	147	93	96	92	111	129	126	1,145
% Rank													
98%	908	843	942	964	958	978	756	798	763	877	928	930	9,961
95%	890	834	897	958	940	888	715	779	740	822	849	892	9,753
90%	873	826	875	929	923	881	699	729	706	789	828	882	9,607
85%	848	778	869	888	911	848	685	698	696	781	815	850	9,522
0.8	825	765	855	837	906	804	679	678	690	773	804	808	9,149

South Fork													
1971-2000													
Average	1,134	1,794	2,290	2,308	2,662	2,282	1,365	984	580	592	816	874	16,393
Median	1,131	1,724	1,914	1,645	1,833	1,526	421	532	69	357	788	901	15,545
STD	537	956	1,130	1,383	2,125	3,222	1,988	1,367	1,157	635	443	492	7,306
% Rank													
98%	2,037	4,193	4,858	5,564	7,963	12,420	6,520	4,595	3,549	2,095	1,629	1,845	32,166
95%	1,804	3,365	4,488	5,120	6,235	7,018	5,186	2,637	2,478	1,897	1,358	1,674	29,724
90%	1,717	2,671	3,899	4,642	5,719	3,752	3,913	2,190	1,399	1,453	1,342	1,458	28,415
85%	1,656	2,508	3,793	3,872	4,888	2,761	3,426	2,041	1,144	972	1,307	1,234	24,579
80%	1,634	2,308	3,183	3,676	4,376	2,330	2,718	1,457	676	774	1,250	1,219	22,097

Frenchman													
1971-2000													
Average	4,038	4,443	5,233	3,474	2,311	2,342	1,452	1,542	2,330	3,216	3,734	3,943	38,060
Median	3,859	4,251	5,063	3,179	2,023	1,622	1,346	1,226	1,874	3,038	3,442	3,892	36,073
STD	792	850	1,114	1,293	1,087	1,673	1,036	1,622	1,519	1,225	832	705	8,641
% Rank													
98%	5,488	6,029	7,327	5,868	5,202	6,155	3,648	5,096	5,186	6,050	5,895	5,271	53,352
95%	5,304	5,835	7,126	5,683	4,334	5,569	2,582	3,115	4,832	4,928	5,643	5,056	51,684
90%	5,140	5,644	6,776	5,482	3,493	4,957	2,447	3,070	4,272	4,613	4,794	4,954	51,341
85%	5,005	5,427	6,625	4,991	3,420	4,693	2,339	2,981	3,882	4,118	4,492	4,910	48,579
80%	4,873	5,243	6,543	4,663	3,118	3,609	2,257	2,815	3,612	4,082	4,127	4,659	45,127

Driftwood													
1971-2000													
Average	330	370	369	361	498	863	1,020	831	517	352	329	331	6,172
Median	322	333	360	335	358	502	820	780	364	349	338	327	5,678
STD	54	140	96	120	326	812	584	347	437	94	61	58	1,822
% Rank													
98%	435	745	675	734	1,398	3,018	2,544	1,643	1,848	547	450	430	9,846
95%	396	679	579	589	1,157	2,483	2,125	1,343	1,695	490	437	410	9,137
90%	394	537	420	451	1,016	1,946	1,866	1,322	739	453	397	402	8,757
85%	378	434	407	421	690	1,709	1,357	1,109	611	428	385	393	8,294
80%	373	407	394	415	626	1,323	1,300	949	591	416	377	380	7,630

Red Willow													
1971-2000													
Average	555	545	666	628	663	1,050	1,148	1,371	597	466	498	528	8,715
Median	571	542	609	600	575	876	896	1,221	469	455	472	520	8,387
STD	130	79	301	223	371	737	599	1,024	358	103	104	100	2,435
% Rank													
98%	794	729	1,447	1,221	1,826	2,848	2,400	4,128	1,481	651	717	687	15,514
95%	739	653	838	833	1,227	2,361	2,212	2,707	1,200	622	645	686	13,315
90%	709	619	728	742	861	2,242	2,040	1,948	1,067	602	625	654	11,002
85%	660	605	695	699	819	1,814	1,886	1,890	951	591	605	642	10,601
80%	640	598	691	661	672	1,246	1,795	1,758	903	560	596	629	10,147

Medicine Creek													
1971-2000													
Average	747	1,058	1,944	1,601	2,008	4,569	11,450	9,255	1,299	387	548	719	35,583
Median	60	86	941	1,470	1,697	4,166	12,269	9,726	795	78	50	53	35,749
STD	1,289	1,748	2,793	1,329	1,632	2,379	4,406	2,492	1,427	1,011	1,506	1,525	11,252
% Rank													
98%	3,739	5,060	10,821	4,143	5,404	9,495	19,481	13,201	5,130	3,891	4,830	5,107	62,805
95%	3,479	4,561	8,105	3,646	5,162	8,059	18,515	12,352	3,954	2,542	3,000	4,080	52,275
90%	2,895	3,734	4,159	3,229	4,593	7,178	16,676	11,768	2,760	581	1,858	2,931	44,539
85%	2,618	3,385	3,188	2,979	3,532	6,726	15,841	11,209	2,521	178	138	1,639	42,863
80%	2,064	2,746	2,980	2,691	3,428	6,503	14,670	10,907	2,310	135	96	444	42,024

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Beaver Creek

1971-2000	76	89	144	144	242	1,104	250	411	200	70	61	74	2,859
Average	33	58	81	81	103	95	72	59	16	19	32	41	1,556
Median	157	147	210	173	293	3,799	314	1,062	611	232	149	163	4,666
STD													
% Rank													
98%	477	504	771	588	941	10,614	1,006	3,702	2,206	600	425	472	17,643
95%	172	233	450	378	927	2,862	925	1,708	1,187	95	111	147	10,639
90%	128	164	309	302	728	1,494	691	730	296	64	65	94	6,176
85%	75	102	215	272	603	938	646	526	111	53	51	75	4,351
80%	69	90	147	201	346	738	482	383	39	43	46	61	2,539

Sappa Creek

1971-2000	684	712	1,129	1,183	1,640	2,456	1,707	1,390	688	510	678	721	11,117
Average	324	412	783	1,013	1,161	815	1,501	367	125	287	426	326	7,691
Median	792	791	1,438	935	1,594	4,339	1,763	3,039	1,554	1,004	913	882	11,949
STD													
% Rank													
98%	2,575	2,644	5,155	3,066	5,793	15,188	6,151	9,962	5,089	3,248	2,969	2,843	39,961
95%	1,861	1,943	3,476	2,595	4,331	10,079	4,201	4,564	3,013	1,833	2,077	2,209	26,291
90%	1,523	1,708	2,532	2,500	3,097	5,634	3,448	3,164	2,567	894	1,368	1,767	25,386
85%	1,346	1,240	1,878	2,127	3,006	3,457	3,007	2,342	536	612	1,217	1,493	20,686
80%	1,079	1,218	1,492	1,820	2,540	3,159	2,817	1,695	407	527	906	942	18,344

Prairie Dog

1971-2000	268	358	639	371	886	649	989	985	620	219	219	237	6,440
Average	63	294	367	259	326	189	621	269	22	34	68	107	3,705
Median	375	378	1,061	404	1,912	1,318	1,019	2,166	2,006	341	326	334	6,360
STD													
% Rank													
98%	1,160	1,165	4,175	1,510	6,028	4,598	2,998	7,254	5,787	1,145	1,110	1,144	21,556
95%	988	1,042	2,823	1,157	2,517	2,529	2,920	4,295	1,683	1,001	896	890	15,634
90%	897	891	1,298	684	1,670	1,485	2,659	2,587	981	628	631	571	14,298
85%	646	748	801	609	1,043	1,197	2,428	1,181	688	546	492	515	12,716
80%	502	652	756	584	1,022	771	1,896	892	570	412	340	406	11,289

Guide Rock
1971-2000

Average	7,542	9,235	14,769	15,240	18,973	12,843	17,156	11,430	10,204	10,111	9,458	8,240	145,201
Median	6,572	7,512	9,313	9,019	14,402	7,315	8,718	8,726	3,784	5,437	6,847	7,299	110,539
STD	4,107	7,002	14,284	14,446	18,789	16,283	27,935	11,930	15,256	17,286	13,498	8,469	102,778
% Rank													
98%	18,225	27,808	50,389	51,857	68,541	65,473	97,708	50,464	54,718	67,261	50,229	28,711	419,681
95%	14,827	18,424	42,302	44,176	55,411	49,233	49,745	38,798	46,177	48,399	23,914	12,651	319,816
90%	12,468	15,600	37,002	36,242	42,459	27,037	27,968	22,188	35,207	16,890	12,713	11,822	228,367
85%	10,847	13,303	30,391	32,993	35,562	21,149	24,002	14,363	20,793	10,762	9,505	9,366	199,795
80%	9,505	11,240	21,390	24,427	31,408	15,673	18,784	12,378	11,816	8,457	8,705	8,180	187,662

Hardy
1971-2000

Average	10,971	13,666	22,038	20,458	25,833	19,209	24,297	17,002	17,015	15,768	12,816	11,467	210,540
Median	8,857	10,999	13,316	14,344	21,619	12,321	15,284	13,285	6,369	6,858	8,958	9,379	184,456
STD	6,952	8,982	21,985	17,086	23,203	18,955	34,876	13,027	23,415	23,265	15,429	9,854	136,007
% Rank													
98%	29,825	35,243	81,334	61,776	87,262	69,690	116,095	55,255	80,664	77,484	63,698	35,779	541,838
95%	26,496	29,062	64,370	55,062	77,861	67,686	50,473	47,699	73,418	73,786	40,994	19,777	393,972
90%	19,817	24,815	49,904	46,652	46,768	47,390	36,939	31,127	49,890	66,830	16,826	18,457	366,468
85%	15,862	23,199	42,702	37,435	42,631	28,361	31,641	20,705	36,899	20,352	14,163	16,717	315,676
80%	14,933	19,888	34,947	33,319	38,489	21,891	30,039	19,091	23,391	13,494	12,225	12,953	262,369