Whipple, John J., OSE

m: Whipple, John J., OSE **Sent:** Fri 3/3/2006 4:36 PM
To: scott@balcombgreen.com; ptyrre@seo.wyo.gov; larryanderson@utah.gov
Cc: rod.kuharich@state.co.us; randy.seaholm@state.co.us; jshiel@seo.wyo.gov; robertking@utah.gov; normanjohnson@utah.gov; hmcfad@state.wy.us; Dantonio, John, OSE; Lopez, Estevan, OSE
Subject: FW: Upper Basin Yield Study - February 2006 Draft
Attachments: Upper Basin Yield Study - February 2006 Draft.pdf(332KB)

Gentlemen,

John D'Antonio requested that I forward to you the attached spreadsheet showing the yield study discussed in New Mexico's proposal transmitted to you earlier today.

John Whipple

From: Nieto, Sabrina K., OSE
Sent: Fri 3/3/2006 1:49 PM
To: Whipple, John J., OSE
Subject: Upper Basin Yield Study - February 2006 Draft

don't
care

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PROPOSED HYDROLOGIC DETERMINATION

ALLOCATION

1. The amount of water available from the flow at Lee Ferry for use by the Upper Basin states is at least 5.75 maf, on average, excluding shared Colorado River Storage Project (CRSP) reservoir evaporation.

   The current yield study indicates that with a long-term average use demand in the Upper Basin states of 5.75 maf, excluding shared CRSP reservoir evaporation, there would be shortages to the demand in about 4 years of the 95-year period of record (see attachment). The computed total shortage to the demand would be about 8.3 maf, which averages less than 6 percent overall shortage for a 25-year period of critically severe hydrology and less than 2 percent overall shortage for the period of record.

   The annual shortages would be about 3.2 maf in 1964, 0.4 maf in 1967, 0.4 maf in 1968 and 4.3 maf in 1977. The aggregate amount of shortage during the 1960s is about 4.0 maf, which is less than the current CRSP power pool contents of about 4.2 maf and slightly more than the projected 2060 CRSP power pool contents of 3.6 maf, excluding about 0.66 maf of storage below the minimum operating level for the Navajo Indian Irrigation Project (NIIP) at Navajo Reservoir.

   Upper Basin consumptive uses would be expected to be below average under critical-period hydrology due to physical water supply shortages in the Upper Basin, thus resulting in anticipated shortages at Lake Powell of lesser magnitude than are computed in the yield study using long-term average depletions. In particular, the computed annual shortage is 4.3 maf in 1977, but the natural flow at Lee Ferry in 1977 was only 5.4 maf and significant physical water supply shortages in the Upper Basin that year cause actual use to be much less than the long-term average.

   The current yield study indicates that shared CRSP reservoir evaporation averages about 0.26 maf for a 25-year period of severe CRSP reservoir storage draw down (1953-1977). Adding the shared CRSP reservoir evaporation to 5.75 maf of use by the Upper Basin states, the total Upper Basin depletion including both Upper Basin uses and CRSP reservoir evaporation would average 6.01 maf for a 25-year critical draw down period. This total depletion is equivalent to the minimum Upper Basin yield of 6.0 maf determined for the critical period by the 1988 HD, with both yields computed for an overall shortage of about 6 percent.

   Although the total Upper Basin depletion for a critical 25-year period would remain unchanged from the 1988 HD, the current yield study reflects the fact that

Upper Basin Yield Study - February 2006 Draft

CY	CR Natural Flow (plus)	Total Carry-Over Storage (plus)	LB Delivery 8.25MAF (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	UB Drought Shortage (plus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,550,021	29,530,030	8,250,000	5,750,000	749,290	0	33,330,761	3,800,731	0	29,530,030
1907	21,201,694	29,530,030	8,250,000	5,750,000	749,290	0	35,982,434	6,452,404	0	29,530,030
1908	12,218,817	29,530,030	8,250,000	5,750,000	719,512	0	27,029,335	0	0	27,029,335
1909	22,356,301	27,029,335	8,250,000	5,750,000	719,512	0	34,666,124	5,136,093	0	29,530,030
1910	14,650,616	29,530,030	8,250,000	5,750,000	749,290	0	29,431,356	0	0	29,431,356
1911	15,499,729	29,431,356	8,250,000	5,750,000	749,290	0	30,181,795	651,765	0	29,530,030
1912	18,623,410	29,530,030	8,250,000	5,750,000	749,290	0	33,404,150	3,874,120	0	29,530,030
1913	14,536,373	29,530,030	8,250,000	5,750,000	747,907	0	29,318,497	0	0	29,318,497
1914	21,354,814	29,318,497	8,250,000	5,750,000	747,907	0	35,925,404	6,395,374	0	29,530,030
1915	13,623,277	29,530,030	8,250,000	5,750,000	736,720	0	28,416,588	0	0	28,416,588
1916	20,142,892	28,416,588	8,250,000	5,750,000	736,720	0	33,822,760	4,292,730	0	29,530,030
1917	22,942,804	29,530,030	8,250,000	5,750,000	749,290	0	37,723,544	8,193,514	0	29,530,030
1918	15,865,939	29,530,030	8,250,000	5,750,000	749,290	0	30,646,679	1,116,649	0	29,530,030
1919	12,651,369	29,530,030	8,250,000	5,750,000	724,812	0	27,456,587	0	0	27,456,587
1920	22,287,632	27,456,587	8,250,000	5,750,000	724,812	0	35,019,408	5,489,377	0	29,530,030
1921	22,526,781	29,530,030	8,250,000	5,750,000	749,290	0	37,307,521	7,777,491	0	29,530,030
1922	18,447,198	29,530,030	8,250,000	5,750,000	749,290	0	33,227,938	3,697,908	0	29,530,030
1923	19,024,046	29,530,030	8,250,000	5,750,000	749,290	0	33,804,786	4,274,756	0	29,530,030
1924	13,877,798	29,530,030	8,250,000	5,750,000	739,838	0	28,667,990	0	0	28,667,990
1925	14,430,701	28,667,990	8,250,000	5,750,000	727,939	0	28,370,752	0	0	28,370,752
1926	15,213,731	28,370,752	8,250,000	5,750,000	732,700	0	28,851,783	0	0	28,851,783
1927	19,539,212	28,851,783	8,250,000	5,750,000	744,598	0	33,646,397	4,116,367	0	29,530,030
1928	16,954,334	29,530,030	8,250,000	5,750,000	749,290	0	31,735,074	2,205,044	0	29,530,030
1929	21,829,585	29,530,030	8,250,000	5,750,000	749,290	0	36,610,325	7,080,295	0	29,530,030
1930	14,621,041	29,530,030	8,250,000	5,750,000	748,944	0	29,402,127	0	0	29,402,127
1931	8,474,134	29,402,127	8,250,000	5,750,000	672,949	0	23,203,312	0	0	23,203,312
1932	17,422,187	23,203,312	8,250,000	5,750,000	633,136	0	25,992,363	0	0	25,992,363
1933	12,183,500	25,992,363	8,250,000	5,750,000	639,745	0	23,536,119	0	0	23,536,119
1934	6,178,192	23,536,119	8,250,000	5,750,000	508,432	0	15,205,879	0	0	15,205,879
1935	12,630,349	15,205,879	8,250,000	5,750,000	385,811	0	13,450,417	0	0	13,450,417
1936	14,648,873	13,450,417	8,250,000	5,750,000	369,976	0	13,729,314	0	0	13,729,314
1937	14,306,056	13,729,314	8,250,000	5,750,000	375,061	0	13,660,309	0	0	13,660,309
1938	18,148,319	13,660,309	8,250,000	5,750,000	422,895	0	17,385,733	0	0	17,385,733
1939	11,164,059	17,385,733	8,250,000	5,750,000	431,062	0	14,118,730	0	0	14,118,730
1940	9,931,657	14,118,730	8,250,000	5,750,000	338,359	0	9,712,027	0	0	9,712,027
1941	20,116,678	9,712,027	8,250,000	5,750,000	357,615	0	15,471,091	0	0	15,471,091
1942	17,225,136	15,471,091	8,250,000	5,750,000	465,757	0	18,230,470	0	0	18,230,470
1943	13,731,401	18,230,470	8,250,000	5,750,000	493,018	0	17,468,853	0	0	17,468,853
1944	15,369,422	17,468,853	8,250,000	5,750,000	496,874	0	18,341,401	0	0	18,341,401
1945	14,140,528	18,341,401	8,250,000	5,750,000	505,649	0	17,976,280	0	0	17,976,280
1946	11,095,453	17,976,280	8,250,000	5,750,000	461,845	0	14,609,888	0	0	14,609,888
1947	16,439,486	14,609,888	8,250,000	5,750,000	447,280	0	16,602,094	0	0	16,602,094
1948	15,139,294	16,602,094	8,250,000	5,750,000	482,617	0	17,258,770	0	0	17,258,770
1949	16,933,584	17,258,770	8,250,000	5,750,000	523,142	0	19,669,212	0	0	19,669,212
1950	13,140,416	19,669,212	8,250,000	5,750,000	538,184	0	18,271,444	0	0	18,271,444
1951	12,505,894	18,271,444	8,250,000	5,750,000	498,610	0	16,278,728	0	0	16,278,728
1952	20,805,422	16,278,728	8,250,000	5,750,000	553,916	0	22,530,234	0	0	22,530,234
1953	11,165,419	22,530,234	8,250,000	5,750,000	591,444	0	19,104,209	0	0	19,104,209
1954	8,496,102	19,104,209	8,250,000	5,750,000	477,239	0	13,123,072	0	0	13,123,072
1955	9,413,908	13,123,072	8,250,000	5,750,000	344,374	0	8,192,606	0	0	8,192,606
1956	11,426,874	8,192,606	8,250,000	5,750,000	250,672	0	5,368,807	0	0	5,368,807
1957	21,500,963	5,368,807	8,250,000	5,750,000	307,356	0	12,562,415	0	0	12,562,415
1958	15,862,511	12,562,415	8,250,000	5,750,000	416,995	0	14,007,931	0	0	14,007,931
1959	9,598,169	14,007,931	8,250,000	5,750,000	378,116	0	9,227,984	0	0	9,227,984
1960	11,524,160	9,227,984	8,250,000	5,750,000	287,036	0	6,465,108	0	0	6,465,108
1961	10,010,259	6,465,108	8,250,000	5,750,000	203,238	0	2,272,129	0	0	2,272,129
1962	17,377,609	2,272,129	8,250,000	5,750,000	193,208	0	5,456,530	0	0	5,456,530
1963	8,840,900	5,456,530	8,250,000	5,750,000	183,412	0	114,018	0	0	114,018
1964	10,863,586	114,018	8,250,000	5,750,000	132,876	0	-3,155,272	0	3,155,272	0
1965	19,875,027	0	8,250,000	5,750,000	204,453	0	5,670,574	0	0	5,670,574
1966	10,679,844	5,670,574	8,250,000	5,750,000	233,196	0	2,117,222	0	0	2,117,222
1967	11,670,830	2,117,222	8,250,000	5,750,000	161,618	0	-373,567	0	373,567	0
1968	13,739,932	0	8,250,000	5,750,000	132,876	0	-392,944	0	392,944	0
1969	15,272,159	0	8,250,000	5,750,000	148,060	0	1,124,099	0	0	1,124,099
1970	15,344,136	1,124,099	8,250,000	5,750,000	178,936	0	2,289,299	0	0	2,289,299
1971	15,290,433	2,289,299	8,250,000	5,750,000	209,281	0	3,370,451	0	0	3,370,451
1972	12,959,652	3,370,451	8,250,000	5,750,000	209,667	0	2,120,436	0	0	2,120,436
1973	18,397,816	2,120,436	8,250,000	5,750,000	248,115	0	6,270,137	0	0	6,270,137
1974	13,089,042	6,270,137	8,250,000	5,750,000	287,206	0	5,071,973	0	0	5,071,973
1975	16,825,996	5,071,973	8,250,000	5,750,000	306,082	0	7,591,888	0	0	7,591,888
1976	11,140,311	7,591,888	8,250,000	5,750,000	300,619	0	4,431,580	0	0	4,431,580
1977	5,438,897	4,431,580	8,250,000	5,750,000	197,768	0	-4,327,291	0	4,327,291	0
1978	15,183,722	0	8,250,000	5,750,000	146,976	0	1,036,746	0	0	1,036,746
1979	17,671,870	1,036,746	8,250,000	5,750,000	205,315	0	4,503,300	0	0	4,503,300
1980	17,765,183	4,503,300	8,250,000	5,750,000	293,852	0	7,974,631	0	0	7,974,631
1981	9,015,200	7,974,631	8,250,000	5,750,000	274,160	0	2,715,671	0	0	2,715,671
1982	17,489,400	2,715,671	8,250,000	5,750,000	251,571	0	5,953,500	0	0	5,953,500
1983	24,361,989	5,953,500	8,250,000	5,750,000	417,562	0	15,897,927	0	0	15,897,927
1984	25,359,376	15,897,927	8,250,000	5,750,000	645,721	0	26,611,583	0	0	26,611,583
1985	21,246,109	26,611,583	8,250,000	5,750,000	749,290	0	33,108,401	3,578,371	0	29,530,030
1986	23,013,446	29,530,030	8,250,000	5,750,000	749,290	0	37,794,186	8,264,156	0	29,530,030
1987	15,640,478	29,530,030	8,250,000	5,750,000	749,290	0	30,421,219	891,188	0	29,530,030
1988	11,456,357	29,530,030	8,250,000	5,750,000	710,171	0	26,276,216	0	0	26,276,216
1989	9,921,847	26,276,216	8,250,000	5,750,000	614,090	0	21,583,973	0	0	21,583,973
1990	9,639,803	21,583,973	8,250,000	5,750,000	498,107	0	16,725,669	0	0	16,725,669
1991	12,170,021	16,725,669	8,250,000	5,750,000	412,511	0	14,483,179	0	0	14,483,179
1992	10,895,580	14,483,179	8,250,000	5,750,000	344,397	0	11,034,361	0	0	11,034,361
1993	18,160,118	11,034,361	8,250,000	5,750,000	351,343	0	14,843,136	0	0	14,843,136
1994	11,125,503	14,843,136	8,250,000	5,750,000	360,935	0	11,607,703	0	0	11,607,703
1995	20,047,166	11,607,703	8,250,000	5,750,000	393,413	0	17,261,457	0	0	17,261,457
1996	14,502,293	17,261,457	8,250,000	5,750,000	466,466	0	17,297,284	0	0	17,297,284
1997	21,622,438	17,297,284	8,250,000	5,750,000	557,030	0	24,362,692	0	0	24,362,692
1998	16,798,378	24,362,692	8,250,000	5,750,000	673,505	0	26,487,565	0	0	26,487,565
1999	15,934,210	26,487,565	8,250,000	5,750,000	717,435	0	27,704,340	0	0	27,704,340
2000	10,646,526	27,704,340	8,250,000	5,750,000	684,917	0	23,665,949	0	0	23,665,949
Total									8,249,074	
Averages:										
1953-1977	13,032,181		8,250,000	5,750,000	263,354	0		0	329,963	5,438,099
1931-1977	13,564,565		8,250,000	5,750,000	365,655	0		0	175,512	11,035,216
1906-2000	15,264,965		8,250,000	5,750,000	494,700	0		918,825	86,832	17,417,870

Variables	
Storage	30,167,576 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,530,030 af
UB Demand Level	5,750,000 af/yr
UB Drought Shortage Trigger	10,000,000 af/yr
UB Drought Shortage	0%
LB Delivery	8,250,000 af/yr
Results	
Critical Period CRSP Evap	263,354 af/yr
Average CRSP Evap	494,700 af/yr
Total Yield (w/ CRSP evap)	6,244,700 af/yr
NM allocation(w/o evap)	641,250 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	3,155,272 af
1967	373,567 af
1968	392,944 af
1977	4,327,291 af

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,013,354 af
1931-1977	6,115,655 af
1906-2000	6,244,700 af

APPENDIX B

SUMMARY OF AVAILABLE DOCUMENTATION ON THE USBR'S DEVELOPMENT OF HISTORIC IRRIGATION CONSUMPTIVE USES AND CRSS NATURAL FLOWS FOR THE UPPER BASIN

SUMMARY OF AVAILABLE DOCUMENTATION ON THE USBR'S DEVELOPMENT OF HISTORIC IRRIGATION CONSUMPTIVE USES AND CRSS NATURAL FLOWS FOR THE UPPER BASIN

(A selection of relevant quotes from the available documentation, followed by New Mexico's comments)

Colorado River System Consumptive Uses and Losses Reports

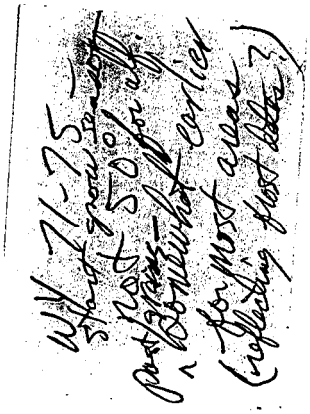
Colorado River System Consumptive Uses and Losses Report, 1971-1975, page 11:

> Methodology and Data Collection
> UPPER COLORADO RIVER
> Irrigation Consumptive Use:
>
> For the purpose of this report, the consumptive use rates were computed using the modified Blaney-Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates were determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation was computed using criteria described in the U.S. Department of Agriculture, Agricultural Research Service, Technical Bulletin No. 1275.
>
> Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use amounted to a magnitude ranging from 5 to 28 percent of the irrigation consumptive use depending upon location of the study area within the Upper Basin. Lacking an up-to-date inventory of incidental use lands, these percentage adjustments were retained for use in this study and applied against the annual estimates of irrigation consumptive uses.

New Mexico comments from review of the Colorado River System Consumptive Uses and Losses Report, 1971-1975, Technical Appendix, Crop Consumptive Use Data:

Comparisons of effective precipitation from the crop irrigation consumptive use computer program output files with the precipitation data from the computer input files verifies that effective precipitation for 1971-1975 was computed using USBR effective precipitation as described at page 11 of the Consumptive Uses and Losses Report.

Comparisons of growing season start dates for alfalfa, pasture grass and spring grain from the computer program output files with the average monthly temperatures from the computer input files verifies that for 1971-1975 the SCS recommended growth season start temperature for



alfalfa (50°) was used also for pasture grass and spring grain, instead of the SCS recommended growth season start temperature of 45° for the latter two crops. Further, review of the growing season end dates indicates that the growing season for full supply pasture grass for 1971-1975 was ended on the date of the fall 28°-degree frost as per alfalfa, not the typically later date of the 45°-degree mean temperature as recommended by the SCS. The growing season for spring grain for 1971-1975 also was ended on the date of the fall 28°-degree frost as per alfalfa if it had not previously reached the maturity season length of 130 days. The USBR's crop consumptive use calculations for 1971-1975 for pasture grass, and for spring grain in some areas, therefore included shortened growth seasons as compared to the USBR's crop consumptive use calculations for 1976-on that were made using the SCS recommended growth season start and end temperatures. These crops constitute a substantial portion of the crop pattern in the Upper Basin.

Colorado River System Consumptive Uses and Losses Report, 1976-1980, page 12:

Methodology and Data Adequacy
Colorado River Basin Tributaries
Agriculture:

For the purpose of this report, the consumptive use rates were computed using the modified Blaney-Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates were determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation was computed using criteria described in the U.S. Department of Agriculture, Agricultural Research Service, Technical Bulletin No. 1275.

Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use varied between 5 and 28 percent of the irrigation consumptive use depending upon location of the study area within the Colorado Basin. These percentages were used in the Upper Basin and an average value of 15 percent was used in the Lower Basin to adjust the calculated consumptive use.

New Mexico comments from review of the Colorado River System Consumptive Uses and Losses Report, 1976-1980, Technical Appendix, Irrigation Consumptive Use and Irrigation Summary:

Comparisons of effective precipitation from the crop irrigation consumptive use computer program output files with the precipitation data from the computer input files verifies that effective precipitation for

1976-1980 was computed using USBR effective precipitation as described at page 12 of the Consumptive Uses and Losses Report.

Comparisons of growing season start dates for alfalfa, pasture grass and small grains from the computer program output files with the average monthly temperatures from the computer input files verifies that the SCS recommended growth season start temperatures were used for 1976-1980 (50° for alfalfa and 45° for pasture grass and spring grain). In addition, review of the growing season end dates indicates that the growing season for full supply pasture grass for 1976-1980 was ended on the date of the 45°-degree mean temperature as recommended by the SCS, and the growing season for spring grain for 1976-1980 was ended on the date of the fall 32°-degree frost if it had not previously reached the maturity season length of 130 days.

The incidental irrigation depletion percentages for the irrigated areas in the Upper Basin given in the Technical Appendix range from 5.1 to 28.8 percent (not 5 to 28 percent as stated in the Consumptive Uses and Losses Report). Subsequent Consumptive Uses and Losses Reports state that the incidental depletion percentages for irrigated areas in the Upper Basin range from 5 to 29 percent.

Colorado River System Consumptive Uses and Losses Report, 1981-1985 (June 1991), page 10:

Methodology and Data Adequacy
Colorado River Basin Tributaries
Agriculture:

For the purpose of this report, the consumptive use rates were computed using the modified Blaney-Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates were determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation for the Upper Basin was computed using the Soil Conservation Service method. This method is referenced in "SCS Technical Release No. 21." (It should be noted that this method estimates less effective precipitation than the Reclamation method. Previous reports used the Reclamation method of computing effective precipitation.)

Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use varied between 5 and 29 percent of the irrigation consumptive use, depending upon location of the study area within the Colorado Basin. These percentages were used in the Upper Basin and an average value of 15 percent was used in the Lower Basin to adjust the calculated consumptive use.

76-80. SCS rec. dates for all states!

New Mexico comments:

According to this report, the USBR began using SCS effective precipitation for computing irrigation consumptive uses in the Upper Basin, excluding in New Mexico, for its Consumptive Uses and Losses reports beginning with the report for the 1981-1985 period. New Mexico was not provided the technical appendix for the Colorado River System Consumptive Uses and Losses Report, 1981-1985, or the technical appendices for subsequent reports in a timely manner for inclusion in this review. However, the USBR reports that since 1980, it has used SCS effective precipitation and the SCS recommended growth season start and end temperatures for pasture grass and spring grain to compute irrigation consumptive uses in the Upper Basin for its Consumptive Uses and Losses reports.

Plan of Study and Methods Manual for Colorado River System Consumptive Uses and Losses Report, 1985-1990 (July 1992), pages 1-3:

INTRODUCTION

The methods presented in this manual are applicable for only the 1985-1990 report.

AGRICULTURE
Irrigation
Upper Basin.-

Irrigation consumptive use is defined as the net irrigation requirement (NIR) plus incidental losses. The NIR is crop consumptive use (evapotranspiration or ET) minus effective precipitation. The NIR is found using Reclamation's XCONS2 computer program. This program is based upon the SCS Modified Blaney-Criddle ET estimation model as presented in the U.S. Department of Agriculture, Soil Conservation Service's *Irrigation Water Requirements Technical Release No. 21* (TR 21).

The guidelines in TR 21 for growing season temperatures and season lengths will be used.

The SCS effective precipitation method as explained in TR 21 will be used with a 3-inch application depth.

The incidental consumptive use percentages from the 1981-1985 report will be used. These percentages are applied to the NIR calculated by XCONS2 to calculate a total incidental consumptive use.

New Mexico.-

The past report used irrigation consumptive use values supplied by the State of New Mexico, but also developed another set of values for comparison. The State of New Mexico will again supply the values to be used in the report.

New Mexico comment:

Irrigation consumptive uses in New Mexico for 1981-1985 provided by the New Mexico Interstate Stream Commission were computed using the original Blaney-Criddle method with USBR effective precipitation.

Colorado River System Consumptive Uses and Losses Report, 1986-1990 (September 1998), pages 9-11:

Methodology and Data Adequacy
Colorado River Basin Tributaries

In the New Mexico portion of the Colorado River Basin, the annual consumptive use of water is reported by the New Mexico Interstate Stream Commission. For the Arizona, Colorado, Nevada, Utah and Wyoming portions of the Colorado River Basin, the annual consumptive use of water was estimated using the following methodologies.

Agriculture:

For the purpose of this report, the consumptive use rates were computed using the modified Blaney-Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates were determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation for the Upper Basin was computed using the Soil Conservation Service method. This method is referenced in "SCS Technical Release No. 21." (It should be noted that this method estimates less effective precipitation than the Reclamation method. Previous reports used the Reclamation method of computing effective precipitation.)

Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use varied between 5 and 29 percent of the irrigation consumptive use, depending upon location of the study area within the Colorado Basin. These percentages were used in the Upper Basin and an average value of 15 percent was used in the Lower Basin to adjust the calculated consumptive use.

New Mexico comment:

The irrigation consumptive uses in New Mexico for 1986-1990 provided by the New Mexico Interstate Stream Commission were computed using the original Blaney-Criddle method with USBR effective precipitation.

Colorado River System Consumptive Uses and Losses Report, 1991-1995 (September 2002), pages 9-11:

Methodology and Data Adequacy
Colorado River Basin Tributaries

In the New Mexico portion of the Colorado River Basin, the annual consumptive use of water is reported by the New Mexico Interstate Stream Commission. For the Arizona, Colorado, Nevada, Utah and Wyoming portions of the Colorado River Basin, the annual consumptive use of water was estimated using the following methodologies.

Agriculture:

For the purpose of this report, the consumptive use rates were computed using the modified Blaney-Criddle evapotranspiration formula in the version described in the Soil Conservation Service Technical Release No. 21, "Irrigation Water Requirements," revised September 1970. Irrigation consumptive use rates were determined by subtracting the effective precipitation from the consumptive use rates. Effective precipitation for the Upper Basin was computed using the Soil Conservation Service method. This method is referenced in "SCS Technical Release No. 21." (It should be noted that this method estimates less effective precipitation than the Reclamation method. Previous reports used the Reclamation method of computing effective precipitation.)

Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use varied between 5 and 29 percent of the irrigation consumptive use, depending upon location of the study area within the Colorado Basin. These percentages were used in the Upper Basin and an average value of 20 percent was used in the Lower Basin to adjust the calculated consumptive use.

New Mexico comment:

The irrigation consumptive uses in New Mexico for 1991-1995 provided by the New Mexico Interstate Stream Commission were computed using the original Blaney-Criddle method with USBR effective precipitation.

Colorado River System Consumptive Uses and Losses Report, 1996-2000 (Revised December 2004), pages 9-10:

Methodology and Data Adequacy

Colorado River Basin Tributaries

In the New Mexico portion of the Colorado River Basin, the annual consumptive use of water is reported by the New Mexico Interstate Stream Commission. For the Arizona, Colorado, Nevada, Utah and Wyoming portions of the Colorado River Basin, the annual consumptive use of water was estimated using the following methodologies.

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Comprehensive framework studies of the incidental consumptive use of water associated with irrigation indicated that this use varied between 5 and 29 percent of the irrigation consumptive use, depending upon location of the study area within the Colorado Basin. These percentages were used in the Upper Basin and an average value of 20 percent was used in the Lower Basin to adjust the calculated consumptive use.

New Mexico comment:

The irrigation consumptive uses in New Mexico for 1996-2000 provided by the New Mexico Interstate Stream Commission were computed using the original Blaney-Criddle method with USBR effective precipitation.

Documentation regarding Consumptive Uses for Developing CRSS Natural Flows

Draft Colorado River Simulation System Hydrology Data Base (June 1983), page 4:

1. Consumptive use – Monthly crop consumptive use was calculated by the Blaney-Criddle method. The Upper Colorado River Basin was broken into many small areas and the consumptive use was calculated for each area based on crop distribution patterns, growing seasons, and climate from 1906 to 1978.

Draft Colorado River Simulation System Hydrology Data Base (June 1983), Appendix A, Memorandum from John E. Redlinger on "Upper Colorado Consumptive Use Study for the Colorado River Simulation System Data Base dated May 16, 1978, pages 1-5:

> Numerous problems were encountered in developing the methodology.
>
> The primary factors considered were the availability of required data, the established acceptance of the final results, and the amount of expertise judgment required to interpret and adjust the variables.
>
> Using these criteria the Blaney Criddle method, as modified in the Soil Conservation Service's Technical Release No. 21, was adopted.
>
> Effective Rainfall
>
> The effective precipitation was determined using formulas provided in the SCS TR 21 manual and assuming a 3-inch net depth of application.
>
> Growing Season
>
> The growing season limits, except for alfalfa, grass, and grain, agree with the limits recommended from the SCS manual.
>
> The growing season for small grain was started at 50° rather than the recommended 45° producing average consumptive use estimates more in line with the 1965 Type I figures. The small grain growing season was ended at the recommended 32° frost.
>
> Alfalfa and grass were initially started at the recommended 50° and 45° temperature dates. However, these starting temperatures were adjusted so that the average consumptive use estimates were in general agreement with the 65 Type I and 48 Report estimates.
>
> The end of the growing season for both crops was set at the recommended SCS values.
>
> Frost Data
>
> Since, in most cases, only limited frost data existed, mean frost temperatures were calculated and used as limits for those years of either nonexisting or non-computer recorded data. These temperatures were sometimes altered if the average consumptive use rate or the average growing season length was not in general agreement with the 48 and 65 reports.
>
> The following limits for growing season were used:

Crop	Planting date (mean temperature)	Maturing date (mean temperature)	Growing season (days)
Alfalfa	50° or 28° frost	28°-frost	Variable
Grasses	45° or 28° frost	45°	Variable
Grain, spring	50°	32°-frost	130-max

Incidental Losses

The total depletion attributed to irrigation includes not only the direct use from irrigated crops but also other uses incidental to the irrigated crops, seeped areas, and phreatophytes. These losses, which were estimated in the '65 Type I study, were assumed to vary directly with irrigated acreage. The '65 depletions were used to estimate yearly incidental losses by comparing the yearly acreage to that of 1965.

Data Considered

The irrigated acreage was arrived at through considering estimates from several sources. These include:

> State Engineer reports, census data, the 1948 Engineering Advisory Commission's Report, 1965 Type I Study, 1948 Colorado River Storage Project's estimates, 1937 Jacobs-Stevens "Surplus Water of the Colorado River System," report, 1946 Bureau of Reclamation Colorado River Comprehensive Development report, State Agricultural Statistics, Colorado Water Conservation Board reports, Colorado Needs Inventory reports and others.

Because of inconsistencies involved in comparing the reports, primary emphasis was given to the census data, the '48 Engineering Advisory's report and the '65 Type I study. Curves were drawn and adjusted to estimate the acreage between census years and reflect the '48 and '65 estimates.

> *New Mexico comments:*
>
> ***The draft CRSS Hydrology Data Base report and the Redlinger memorandum appended thereto suggest that the documentation is for the computation of historic irrigation consumptive uses and CRSS natural flows for 1906-1978 or 1906-1974, respectively. However, the Draft Natural Flow and Salt Computation Methods, 1971-1995 (April 2005), and discussions with Jim Prairie, author of that document, indicate that CRSS natural flows for 1971-1995 were developed using Colorado River System Consumptive Uses and Losses reports irrigation consumptive use data, not irrigation consumptive use data derived using the procedures described by the Redlinger memorandum.***

The 1948 Engineering Advisory Committee Report to the Upper Colorado River Basin Compact Commission and the 1965 Type I Study both used the original Blaney-Criddle method with USBR effective precipitation to compute irrigation consumptive uses in the Upper Basin for the 1914-1945 period and for 1965 conditions, respectively. According to the draft CRSS Hydrology Data Base report and the Redlinger memorandum appended thereto, for the purpose of computing historic irrigation consumptive uses and CRSS natural flows for 1906-1970 the USBR made adjustments in the application of the modified Blaney-Criddle method to be in line with or in general agreement with previously accepted consumptive uses from both the 1948 EAC Report and the 1965 Type I Study. No numeric criteria are provided for determining that the computed irrigation consumptive uses were in general agreement with previously accepted consumptive use rates, and no quantitative comparisons are made to indicate the amount of difference between Upper Basin irrigation consumptive uses computed for the CRSS Hydrology Data Base and the previously accepted consumptive uses.

It is not clear from the Redlinger memorandum whether the adjustments to growth season start temperatures and mean frost temperatures were made to match crop consumptive uses to those of the 1948 EAC Report and the 1965 Type I Study before or after deduction of SCS effective precipitation. Nor does the Redlinger memorandum state that adjustments to growth season start temperatures for alfalfa and pasture grasses were made to every irrigated area in the Upper Basin. In any event, the resultant computed irrigation consumptive uses and natural flows in the Upper Basin overall are different than those that would have been computed using the modified Blaney-Criddle method with SCS effective precipitation and the SCS recommended growth start temperatures. Increasing the growing season start temperature for spring grain above the SCS recommended value results in a shorter growing season and smaller computed consumptive irrigation use in high elevation areas, as does adjusting the growth start temperatures for alfalfa and grass to be later than the stated limit for how early the growing season may begin, which stated limit is the SCS recommended start temperatures.

The Redlinger memorandum does not quantify the adjustments reportedly made to the growth start temperatures for alfalfa and pasture grass from the SCS recommended values, or the alterations made to mean frost temperatures. Differences between irrigated acreages and other parameters used in calculating irrigation depletions and natural flows for the 1906-1970 period and those used in calculating irrigation depletions in the 1948 EAC report or the 1965 Type I Study also are not

documented quantitatively. The USBR has reported to New Mexico that the irrigation consumptive use data, as well as the backup supporting data and calculations, that are the subject of the draft CRSS Hydrology Data Base report and the Redlinger memorandum appended thereto are not available. Consequently, the calculation of the Upper Basin consumptive irrigation uses that are included in the CRSS natural flows for 1906-1970 cannot be replicated or regenerated, and the amount of difference between irrigation consumptive uses and natural flows computed using the Redlinger memorandum methodology and those computed using the modified Blaney-Criddle method with the recommended growth season start temperatures and SCS effective precipitation, or any other method, cannot be calculated directly.

Draft Natural Flow and Salt Computation Methods, 1971-1995 (April 2005), pages 1-7:

Introduction

This paper documents the steps taken to compute natural flow and salt in the Upper and Lower Colorado River Basins from 1971-1995.

Upper Basin
Flow Methods

This section explains the methods used in the Upper Basin to compute natural flow.

Methodology

Natural flow is computed as

$$naturalFlow = historicFlow + totalDepletion \pm reservoirregulation$$

Consumptive Uses and Losses

The data required to represent historic consumptive uses and losses (CU&L) was derived from the source data used to develop the Consumptive Uses and Losses Reports. These reports were published every five years beginning in 1971. The reports state CU&L for the Colorado River Basin annually by tributary. A detailed account of how the data was distributed to a monthly temporal scale and HUC spatial scale for computation of natural flow is included in a companion report authored by R. Clayton (2004).

Irrigated Agriculture

Irrigated agriculture consumptive use is computed by the Bureau of Reclamation with the modified Blaney Criddle method for Upper Basin states except in New

Mexico. The state of New Mexico provides values for irrigated agriculture consumptive use using the original Blaney Criddle method.

New Mexico comments:

The Natural Flow and Salt Computation Methods documentation states that the irrigation consumptive uses from the Colorado River System Consumptive Uses and Losses reports for 1971-1995 were used to compute natural flows for the period 1971-1995. Based on the Consumptive Uses and Losses reports, this would indicate that the USBR's CRSS natural flows for the period 1971-1980 were calculated using Upper Basin irrigation depletions that were computed from the modified Blaney-Criddle method with USBR effective precipitation, and that the USBR natural flows for the period 1981-2000 were calculated using Upper Basin irrigation depletions that were computed from the modified Blaney-Criddle method with SCS effective precipitation. The Natural Flow and Salt Computation Methods work supersedes the draft CRSS Hydrology Data Base work beginning 1971. The USBR irrigation consumptive use computations for the Consumptive Uses and Losses reports have used the SCS recommended values for growth season start and end temperatures for alfalfa since 1971 and for pasture grass and spring grain since 1975.

NEW MEXICO'S CONCLUSIONS

Upper Basin irrigation depletions used to calculate the USBR's CRSS natural flows apparently were computed using five methods:

(1) the modified Blaney-Criddle method with SCS effective precipitation and with USBR adjusted growth season start temperatures for alfalfa, pasture grass and spring grain and SCS recommended growth season end temperatures for 1906-1970;
(2) the modified Blaney-Criddle method with USBR effective precipitation and with USBR adjusted growth season start and end temperatures for pasture grass and spring grain and SCS recommended growth season start and end temperatures for alfalfa for 1971-1975;
(3) the modified Blaney-Criddle method with USBR effective precipitation and with SCS recommended growth season start and end temperatures for 1976-1980;
(4) the modified Blaney-Criddle method with SCS effective precipitation and with SCS recommended growth season start and end temperatures for 1981-2000, except for uses in New Mexico; and
(5) the original Blaney-Criddle method with USBR effective precipitation and with SCS recommended growth season start and end temperatures for uses in New Mexico for 1981-2000.

APPENDIX C

US BUREAU OF RECLAMATION'S COMPUTED IRRIGATION DEPLETIONS FOR USE IN CALCULATING NATURAL FLOWS FOR THE UPPER BASIN FOR 1971-1980

Comparison of Upper Basin Irrigation Depletions for 1971-1980
Computed Using the Modified Blaney-Criddle Method with SCS Effective Precipitation
and with SCS Growth Season Start and End Temperatures
to Those Used in the Colorado River System Consumptive Uses and Losses Reports

APPENDIX D

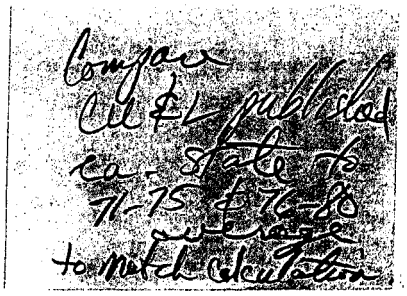
STATE OF NEW MEXICO'S COMPARISON OF METHODS FOR COMPUTING HISTORIC IRRIGATION DEPLETIONS AND NATURAL FLOWS FOR THE UPPER BASIN FOR 1971-1980

Upper Colorado River Basin Irrigation Depletions for 1971-1980
(Units: 1000 acre-feet)

State	Year	USBR's Colorado River System Consumptive Uses and Losses Reports (1)	Upper Basin Irrigation Depletions Computed by New Mexico (2) Modified Blaney-Criddle Method with USBR Effective Precipitation (3)	Modified Blaney-Criddle Method with SCS Effective Precipitation	Original Blaney-Criddle Method with USBR Effective Precipitation	Difference between Modified B-C Method with SCS Effective Precipitation and the USBR CU&L Report Incidental Depletions Amount of Difference	Ratio of Depletions	Difference between Modified B-C Method with SCS Effective Precipitation and the Original B-C Method with USBR precip Amount of Difference	Ratio of Depletions
Arizona (4)	1971	2.5							
	1972	2.9							
	1973	4.0							
	1974	4.3							
	1975	5.1							
	1976	2.7							
	1977	3.8							
	1978	4.3							
	1979	5.3							
	1980	6.3							
	Total	41.2							
	Average	4.1							
Colorado	1971	1184.0	1222.3	1299.7	1253.8	115.7	1.10	45.9	1.04
	1972	1186.9	1221.6	1295.0	1305.8	108.1	1.09	-10.8	0.99
	1973	996.6	1032.9	1138.9	1106.7	142.3	1.14	32.2	1.03
	1974	1251.3	1280.8	1340.6	1306.8	89.3	1.07	33.8	1.03
	1975	1122.6	1165.1	1239.0	1248.8	116.4	1.10	-9.8	0.99
	1976	1090.3	1098.0	1180.8	1145.6	90.5	1.08	35.2	1.03
	1977	977.6	981.2	1042.4	1022.2	64.8	1.07	20.2	1.02
	1978	1182.4	1187.7	1259.4	1251.8	77.0	1.07	7.6	1.01
	1979	1203.0	1209.3	1289.9	1302.7	86.9	1.07	-12.8	0.99
	1980	1213.7	1223.4	1296.3	1256.1	82.6	1.07	40.2	1.03
	Total	11408.4	11622.3	12382.0	12200.3	973.6	1.09	181.7	1.01
	Average	1140.8	1162.2	1238.2	1220.0	97.4	1.09	18.2	1.01
Utah	1971	549.2	557.1	577.8	564.4	28.6	1.05	13.4	1.02
	1972	547.3	558.9	578.7	587.3	31.4	1.06	-8.6	0.99
	1973	559.4	562.2	586.0	592.2	26.6	1.05	-6.2	0.99
	1974	575.4	583.4	594.0	573.4	18.6	1.03	20.6	1.04
	1975	439.4	455.0	486.3	493.2	46.9	1.11	-6.9	0.99
	1976	465.1	467.6	487.4	477.0	22.3	1.05	10.4	1.02
	1977	247.9	250.2	261.7	270.0	13.8	1.06	-8.3	0.97
	1978	493.4	496.3	516.6	531.6	23.2	1.05	-15.0	0.97
	1979	520.2	523.1	539.5	552.2	19.3	1.04	-12.7	0.98
	1980	484.1	483.6	513.4	494.4	29.3	1.06	19.0	1.04
	Total	4881.4	4937.4	5141.4	5135.7	260.0	1.05	5.7	1.00
	Average	488.1	493.7	514.1	513.6	26.0	1.05	0.6	1.00
Wyoming	1971	275.2	285.8	304.7	373.1	29.5	1.11	-68.4	0.82
	1972	238.2	257.7	286.7	346.7	48.5	1.20	-60.0	0.83
	1973	235.3	248.0	275.7	313.7	40.4	1.17	-38.0	0.88
	1974	288.5	323.7	337.0	372.5	48.5	1.17	-35.5	0.90
	1975	207.1	226.3	252.0	292.9	44.9	1.22	-40.9	0.86
	1976	204.0	204.2	234.7	230.1	30.7	1.15	4.6	1.02
	1977	133.1	133.6	147.0	144.7	13.9	1.10	2.3	1.02
	1978	244.8	245.2	265.2	291.8	20.4	1.08	-26.6	0.91
	1979	253.5	254.2	270.1	291.7	16.6	1.07	-21.6	0.93
	1980	239.3	239.5	258.0	264.3	18.7	1.08	-6.3	0.98
	Total	2319.0	2418.2	2631.1	2921.5	312.1	1.13	-290.4	0.90
	Average	231.9	241.8	263.1	292.2	31.2	1.13	-29.0	0.90

Upper Colorado River Basin Irrigation Depletions for 1971-1980
(Units: 1000 acre-feet)

State	Year	USBR's Colorado River System Consumptive Uses and Losses Reports (1)	Upper Basin Irrigation Depletions Computed by New Mexico (2) Modified Blaney-Criddle Method with USBR Effective Precipitation (3)	Modified Blaney-Criddle Method with SCS Effective Precipitation	Original Blaney-Criddle Method with USBR Effective Precipitation	Difference between Modified B-C Method with SCS Effective Precipitation and the USBR CU&L Report Incidental Depletions Amount of Difference	Ratio of Depletions	Difference between Modified B-C Method with SCS Effective Precipitation and the Original B-C Method with USBR precip Amount of Difference	Ratio of Depletions
New Mexico, exc. NIIP (5)	1971	80.9	83.1	86.1	76.1	5.2	1.06	10.0	1.13
	1972	93.3	94.6	96.5	90.2	3.2	1.03	6.3	1.07
	1973	87.8	89.9	93.6	89.0	5.8	1.07	4.6	1.05
	1974	96.5	99.2	101.7	92.0	5.2	1.05	9.7	1.11
	1975	89.0	91.0	94.1	88.0	5.1	1.06	6.1	1.07
	1976	107.6	108.1	111.3	101.2	3.7	1.03	10.1	1.10
	1977	100.1	100.5	102.4	88.7	2.3	1.02	13.7	1.15
	1978	115.2	115.6	120.3	106.5	5.1	1.04	13.8	1.13
	1979	112.5	113.0	116.4	108.6	3.9	1.03	7.8	1.07
	1980	115.1	115.3	119.2	106.5	4.1	1.04	12.7	1.12
	Total	998.0	1010.3	1041.6	946.8	43.6	1.04	94.8	1.10
	Average	99.8	101.0	104.2	94.7	4.4	1.04	9.5	1.10
New Mexico, NIIP only (6)	1971	0.0							
	1972	0.0							
	1973	0.0							
	1974	0.0							
	1975	0.0							
	1976	33.8							
	1977	31.8							
	1978	41.9							
	1979	62.3							
	1980	89.7							
	Total	259.5							
	Average	26.0							
Upper Basin (7)	1971	2091.8	2150.8	2270.8	2269.9	179.0	1.09	0.9	1.00
	1972	2068.6	2135.7	2259.8	2332.9	191.2	1.09	-73.1	0.97
	1973	1883.1	1937.0	2098.2	2105.6	215.1	1.11	-7.4	1.00
	1974	2216.0	2291.4	2377.6	2349.0	161.6	1.07	28.6	1.01
	1975	1863.2	1942.5	2076.5	2128.0	213.3	1.11	-51.5	0.98
	1976	1903.5	1914.4	2050.7	1990.4	147.2	1.08	60.3	1.03
	1977	1494.3	1501.1	1589.1	1561.2	94.8	1.06	27.9	1.02
	1978	2082.0	2091.0	2207.7	2227.9	125.7	1.06	-20.2	0.99
	1979	2156.8	2167.2	2283.5	2322.8	126.7	1.06	-39.3	0.98
	1980	2148.2	2157.8	2282.9	2217.3	134.7	1.06	65.6	1.03
	Total	19907.5	20288.9	21496.8	21505.0	1589.3	1.08	-8.2	1.00
	Average	1990.8	2028.9	2149.7	2150.5	158.9	1.08	-0.8	1.00



Notes:

(1) The USBR's Consumptive Uses and Losses (CU&L) report irrigation depletions for 1971-1980 were computed using the modified Blaney-Criddle method with USBR effective precipitation. For the 1971-1975 CU&L report, the USBR did not use the SCS recommended growth season start and end temperatures for pasture grass and spring grain. For the 1976-1980 CU&L report, the USBR did use the SCS recommended start and end temperatures.

(2) New Mexico's computations of irrigation depletions used the USBR Consumptive Uses and Losses Report Technical Appendix crop, climate and incidental depletions data, and used the SCS recommended growth season start and end temperatures for all years.

(3) For 1971-1975, the Upper Basin irrigation depletions reported by the USBR's CU&L report, excluding depletions in Arizona and by the Navajo Indian Irrigation Project (NIIP), averaged about 2.021 maf/yr and those computed by New Mexico using the modified Blaney-Criddle method with USBR effective precipitation and with the same irrigation season dates used in developing the CU&L report (not the SCS recommended growth season start and end temperatures) averaged about 2.006 maf/yr, a difference of about 0.7 percent. For 1976-1980, the Upper Basin irrigation depletions reported by the USBR's CU&L report, excluding depletions in Arizona and by the NIIP, averaged about 1.901 maf/yr and those computed by New Mexico using the modified Blaney-Criddle method with USBR effective precipitation averaged about 1.910 maf/yr, a difference of about 0.5 percent.

(4) New Mexico made computations for all states except Arizona.

(5) Excludes depletions on the NIIP in New Mexico.

(6) Diversion and use of water by the NIIP began in 1976. The USBR for the 1976-1980 CU&L report estimated NIIP depletions based on measured diversions less estimated returns that considered the build-up of ground water storage beneath NIIP lands. New Mexico did not make computations of irrigation depletions on the NIIP.

(7) All total Upper Basin irrigation depletions shown in this table include CU&L irrigation depletion amounts for Arizona and the NIIP.

APPENDIX E

UPPER BASIN YIELD STUDY RESULTS SUPPORTING THE HYDROLOGIC DETERMINATION

Upper Basin Yield Study - March 2006 Draft
Summary of Results

Study	Natural Flow Data	Upper Basin Use	Storage Capacity	Period	Average Annual Upper Basin Use (maf)	Average Annual Shared CRSP Evap (maf)	Total Annual Upper Basin Depletion, inc. CRSP Evap (maf)	Computed Annual Amounts of Shortage (maf) 1961	1963	1964	1967	1968	1977	Total Computed Shortage Amount (maf)	Percent Shortage over Period
A	CRSS	Constant	CRSP Active	1953-1977	5.65	0.26	5.91	0.00	1.17	3.17	0.07	0.29	3.43	8.13	5.8
				1931-1977	5.65	0.37	6.02								3.1
				1906-2000	5.65	0.49	6.14								1.5
B			CRSP Active	1953-1977	5.75	0.26	6.01	0.00	0.00	3.16	0.37	0.39	4.33	8.25	5.7
			+ Other UB	1931-1977	5.75	0.37	6.12								3.1
				1906-2000	5.75	0.49	6.24								1.5
1	CRSS	Constant	CRSP Active	1953-1977	5.70	0.25	5.95	0.32	2.03	3.22	0.22	0.34	3.84	9.97	7.0
				1931-1977	5.70	0.35	6.05								3.7
				1906-2000	5.70	0.49	6.19								1.8
2			CRSP Active	1953-1977	5.80	0.25	6.05	0.00	1.06	3.32	0.52	0.44	4.74	10.08	7.0
			+ Other UB	1931-1977	5.80	0.35	6.15								3.7
				1906-2000	5.80	0.49	6.29								1.8
3	Adjusted	Constant	CRSP Active	1953-1977	5.70	0.26	5.96	0.00	1.96	3.20	0.17	0.33	3.15	8.81	6.2
				1931-1977	5.70	0.36	6.06								3.3
				1906-2000	5.70	0.49	6.19								1.6
4			CRSP Active	1953-1977	5.80	0.26	6.06	0.00	0.68	3.30	0.47	0.43	4.05	8.93	6.2
			+ Other UB	1931-1977	5.80	0.36	6.16								3.3
				1906-2000	5.80	0.49	6.29								1.6
5	Adjusted	Variable	CRSP Active	1953-1977	5.29	0.36	5.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
				1931-1977	5.38	0.45	5.83								0.0
				1906-2000	5.70	0.55	6.25								0.0
6			CRSP Active	1953-1977	5.38	0.36	5.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
			+ Other UB	1931-1977	5.48	0.45	5.93								0.0
				1906-2000	5.80	0.55	6.35								0.0
7	Adjusted	Constant	CRSP Live	1953-1977	5.61	0.23	5.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
				1931-1977	5.61	0.35	5.96								0.0
				1906-2000	5.61	0.47	6.08								0.0
8			CRSP Live	1953-1977	5.71	0.23	5.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
			+ Other UB	1931-1977	5.71	0.35	6.06								0.0
				1906-2000	5.71	0.47	6.18								0.0

Adjust 5.80 to 5.77 or 5.78 to get to 6% shortage

Notes:

(1) The New Mexico Interstate Stream Commission staff prepared this table using the annual water balance spreadsheet and CRSP evaporation equations developed for the current yield study. The ISC and USBR jointly developed the spreadsheet and evaporation equations. The spreadsheets for each study and the historic CRSP evaporation correlations are attached. Study B corresponds to New Mexico's proposal transmitted to the other Upper Division states via letter dated March 3, 2006.

(2) The Upper Basin yields shown in this table assume a delivery of 8.25 maf per year to the Lower Basin at Lee Ferry. The yields can be increased by 0.1 maf for each 0.1 maf of decrease in the delivery at Lee Ferry. The yields would be 0.75 maf greater than those shown assuming a delivery to the Lower Basin of 7.5 maf per year.

(3) If CRSP live storage is used instead of CRSP active storage, either the Upper Basin demands can be increased or computed shortages can be reduced. Using CRSP live storage plus all other Upper Basin live storage, and also adjusting CRSS natural flows for 1906-1980 to natural flows that would have been computed if the historic irrigation depletions had been calculated using the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures for all crops consistent with 1981-2000 natural flows, a constant Upper Basin use of 5.71 maf/yr can be met without shortage (see Study 8). The evaporation amounts using CRSP live storage are less than the evaporation amounts using CRSP active storage due to storage draw downs below minimum power pools.

(4) The 1988 Hydrologic Determination concluded that the yield to the Upper Basin with tolerable shortages is at least 6.0 maf per year over a 25-year, 7-month critical period, including CRSP evaporation. In the current Upper Basin yield study, the draw down in reservoir storage from full storage conditions begins at the end of 1930, and full storage conditions are next attained in 1984 or 1985. In general, reservoir levels are drawn down from 1930 to 1940, recover to about 3/4-capacity by 1952, are drawn down again during the mid 1950s, are kept at very low levels from about 1956-1981, and then recover by 1984. Increasing the average annual Upper Basin demand above the firm yield demand first results in the occurrence of computed shortage in 1977, and further increases in demand cause shortages to also be computed in the 1960s. Although the critical period may differ from the 1988 Hydrologic Determination, the most significant difference between the current and 1988 studies is that the current studies recognize that CRSP reservoir evaporation changes with reservoir storage. CRSP reservoir storage is maintained at significantly lower levels, on average, during the 1953-1977 period as compared to the 1931-1964 period, primarily because CRSP active storage is maintained at under 10 maf for most of twenty years beginning the early 1960s. CRSP active storage rarely dips below 10 maf for the remainder of the period of record. The average annual evaporation amounts shown in this table for different periods illustrate the effects of storage on evaporation. To account for this, the current yield study segregates CRSP reservoir evaporation from the Upper Basin demand.

(5) Evaporation amounts were determined using CRSP storage only. For the CRSP plus all other Upper Basin storage condition, inclusion of the existing Upper Basin storage capacity in the yield studies generally increases the yield by 0.1 maf. Therefore, the evaporation amounts for the latter storage conditions and a given Upper Basin demand were assumed to be the same as the evaporation amounts for the CRSP only storage condition with an Upper Basin demand equal to 0.1 maf less than the given demand under the CRSP plus all other Upper Basin storage condition. The CRSP reservoirs will operate in about the same manner as they have historically operated regardless of whether all other Upper Basin storage is considered in the analysis, although other Upper Basin reservoirs are generally upstream from CRSP reservoirs and therefore will likely fill first. This upstream storage effect may cause the CRSP evaporation amounts to be slightly overstated for the CRSP plus all other Upper Basin storage condition. Sensitivity tests indicated that CRSP reservoir evaporation and computed yields are not sensitive to other storage assumptions (such as an assumption that CRSP storage and non-CRSP storage are approximately the same percent full each year). Studies A, 1, 3, 5 and 7 are thus used to determine the evaporation amounts for studies B, 2, 4, 6 and 8, respectively.

(6) The 1988 Hydrologic Determination assumed that a total shortage of 6 percent overall for a 25-year, 7-month critical period was tolerable. This table indicates that a constant Upper Basin use of 5.80 maf/yr would result in a total shortage of about 7 percent overall for the worst 25-year period of draw down if CRSS natural flows are used in the study, or a total shortage of about 6 percent overall for the worst 25-year period if CRSS natural flows for 1906-1980 are adjusted to natural flows that would have computed if the historic irrigation depletions used had been calculated using the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures for all crops (consistent with 1981-2000 natural flows). Prior to 1977, much of the shortages could be met from storage in the CRSP minimum power pools if the UCRC and USBR decided to do so. In 1977, the computed shortage of about 4 maf would not actually materialize because Upper Basin uses in that year would be substantially lower than the average Upper Basin demand of 5.80 maf. The natural flow of the Colorado River at Lee Ferry during 1977 was only about 5.5 maf. In below-average periods of runoff during which reservoir storage will be substantially drawn down, physical water supply shortages will cause Upper Basin uses to be less, on average, than the long-term average consumptive use of 5.80 maf by the Upper Basin states. Use of a constant Upper Basin consumptive use does not reflect, however, annual variations in consumptive uses caused by annual variations in water supply availability and physical water shortages in the Upper Basin. To this extent, the computed shortages are overstated as illustrated by studies 5 and 6. Also, if the yield studies were to include Upper Basin storage in excess of existing capacity as will be needed to fully develop the Upper Basin yield available for use by the states, either the computed yields could be increased or the computed shortages could be reduced (loss of existing storage capacity to sedimentation may be replaced).

(7) Studies 5 and 6 incorporate annual variations in Upper Basin consumptive uses about the long-term average consumptive use that result from annual variations in water supply and physical shortages. The following is an excerpt from "Water Supplies of the Colorado River Available for Use by the States of the Upper Division and for Use from the Main Stem by the States of Arizona, California and Nevada in the Lower Basin," Part I - Text, Tipton and Kalmbach, Inc., July 1965, page 15: "A depletion factor was used to modify the assumed basic depletions by the States of the upper division of the Colorado River Basin. The philosophy of the depletion factor is based on the fact that during periods of low water supply in the Upper Basin all projects in operation will not receive a full water supply. Most of them will not have reservoirs, and some that have reservoirs will not have water in some years to fill those reservoirs. No rational means have been derived for varying the estimated uses by the States of the upper division because of varying water supply. The means used by the U.S. Bureau of Reclamation in its past studies, which it is assumed it is still using, are based on the assumption that the uses would vary from the normal use in a particular year by one-half of the percent that the virgin flow at Lee Ferry in that particular year varies from a long-time average of virgin flow." Using this assumption, the sensitivity of the amount of computed shortages to possible annual variations in physical water supplies and actual uses in the Upper Basin is illustrated. Under this scenario, actual Upper Basin uses by the states exclusive of shared CRSP evaporation would average about 5.38 maf during 1953-1977, 5.48 maf during 1931-1977, and 5.80 maf for the period of record, and except for physical water supply shortages in the Upper Basin, no other shortages are computed.

Upper Basin Yield Study - March 2006 Draft

Study No. A: CRSS Natural Flows, CRSP Active Storage Only, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,550,021	24,847,704	8,250,000	5,650,000	749,290	28,748,435	3,900,731	0	24,847,704
1907	21,201,694	24,847,704	8,250,000	5,650,000	749,290	31,400,108	6,552,404	0	24,847,704
1908	12,218,817	24,847,704	8,250,000	5,650,000	719,512	22,447,009	0	0	22,447,009
1909	22,356,301	22,447,009	8,250,000	5,650,000	719,512	30,183,797	5,336,093	0	24,847,704
1910	14,650,616	24,847,704	8,250,000	5,650,000	749,290	24,849,030	1,326	0	24,847,704
1911	15,499,729	24,847,704	8,250,000	5,650,000	749,290	25,698,143	850,439	0	24,847,704
1912	18,623,410	24,847,704	8,250,000	5,650,000	749,290	28,821,824	3,974,120	0	24,847,704
1913	14,536,373	24,847,704	8,250,000	5,650,000	747,907	24,736,170	0	0	24,736,170
1914	21,354,814	24,736,170	8,250,000	5,650,000	747,907	31,443,077	6,595,374	0	24,847,704
1915	13,623,277	24,847,704	8,250,000	5,650,000	736,720	23,834,261	0	0	23,834,261
1916	20,142,892	23,834,261	8,250,000	5,650,000	736,720	29,340,434	4,492,730	0	24,847,704
1917	22,942,804	24,847,704	8,250,000	5,650,000	749,290	33,141,218	8,293,514	0	24,847,704
1918	15,865,939	24,847,704	8,250,000	5,650,000	749,290	26,064,353	1,216,649	0	24,847,704
1919	12,651,369	24,847,704	8,250,000	5,650,000	724,812	22,874,261	0	0	22,874,261
1920	22,287,632	22,874,261	8,250,000	5,650,000	724,812	30,537,081	5,689,377	0	24,847,704
1921	22,526,781	24,847,704	8,250,000	5,650,000	749,290	32,725,195	7,877,491	0	24,847,704
1922	18,447,198	24,847,704	8,250,000	5,650,000	749,290	28,645,612	3,797,908	0	24,847,704
1923	19,024,046	24,847,704	8,250,000	5,650,000	749,290	29,222,460	4,374,756	0	24,847,704
1924	13,877,798	24,847,704	8,250,000	5,650,000	739,838	24,085,664	0	0	24,085,664
1925	14,430,701	24,085,664	8,250,000	5,650,000	727,939	23,888,426	0	0	23,888,426
1926	15,213,731	23,888,426	8,250,000	5,650,000	732,700	24,469,457	0	0	24,469,457
1927	19,539,212	24,469,457	8,250,000	5,650,000	744,598	29,364,071	4,516,367	0	24,847,704
1928	16,954,334	24,847,704	8,250,000	5,650,000	749,290	27,152,748	2,305,044	0	24,847,704
1929	21,829,585	24,847,704	8,250,000	5,650,000	749,290	32,027,999	7,180,295	0	24,847,704
1930	14,621,041	24,847,704	8,250,000	5,650,000	748,944	24,819,801	0	0	24,819,801
1931	8,474,134	24,819,801	8,250,000	5,650,000	672,949	18,720,986	0	0	18,720,986
1932	17,422,187	18,720,986	8,250,000	5,650,000	633,136	21,610,037	0	0	21,610,037
1933	12,183,500	21,610,037	8,250,000	5,650,000	639,745	19,253,792	0	0	19,253,792
1934	6,178,192	19,253,792	8,250,000	5,650,000	508,432	11,023,553	0	0	11,023,553
1935	12,630,349	11,023,553	8,250,000	5,650,000	385,811	9,368,091	0	0	9,368,091
1936	14,648,873	9,368,091	8,250,000	5,650,000	369,976	9,746,987	0	0	9,746,987
1937	14,306,056	9,746,987	8,250,000	5,650,000	375,061	9,777,983	0	0	9,777,983
1938	18,148,319	9,777,983	8,250,000	5,650,000	422,895	13,603,406	0	0	13,603,406
1939	11,164,059	13,603,406	8,250,000	5,650,000	431,062	10,436,403	0	0	10,436,403
1940	9,931,657	10,436,403	8,250,000	5,650,000	338,359	6,129,701	0	0	6,129,701
1941	20,116,678	6,129,701	8,250,000	5,650,000	357,615	11,988,764	0	0	11,988,764
1942	17,225,136	11,988,764	8,250,000	5,650,000	465,757	14,848,143	0	0	14,848,143
1943	13,731,401	14,848,143	8,250,000	5,650,000	493,018	14,186,527	0	0	14,186,527
1944	15,369,422	14,186,527	8,250,000	5,650,000	496,874	15,159,075	0	0	15,159,075
1945	14,140,528	15,159,075	8,250,000	5,650,000	505,649	14,893,953	0	0	14,893,953
1946	11,095,453	14,893,953	8,250,000	5,650,000	461,845	11,627,562	0	0	11,627,562
1947	16,439,486	11,627,562	8,250,000	5,650,000	447,280	13,719,767	0	0	13,719,767
1948	15,139,294	13,719,767	8,250,000	5,650,000	482,617	14,476,444	0	0	14,476,444
1949	16,933,584	14,476,444	8,250,000	5,650,000	523,142	16,986,885	0	0	16,986,885
1950	13,140,416	16,986,885	8,250,000	5,650,000	538,184	15,689,117	0	0	15,689,117
1951	12,505,894	15,689,117	8,250,000	5,650,000	498,610	13,796,402	0	0	13,796,402
1952	20,805,422	13,796,402	8,250,000	5,650,000	553,916	20,147,908	0	0	20,147,908
1953	11,165,419	20,147,908	8,250,000	5,650,000	591,444	16,821,883	0	0	16,821,883
1954	8,496,102	16,821,883	8,250,000	5,650,000	477,239	10,940,746	0	0	10,940,746
1955	9,413,908	10,940,746	8,250,000	5,650,000	344,374	6,110,279	0	0	6,110,279
1956	11,426,874	6,110,279	8,250,000	5,650,000	250,672	3,386,481	0	0	3,386,481
1957	21,500,963	3,386,481	8,250,000	5,650,000	307,356	10,680,088	0	0	10,680,088
1958	15,862,511	10,680,088	8,250,000	5,650,000	416,995	12,225,605	0	0	12,225,605
1959	9,598,169	12,225,605	8,250,000	5,650,000	378,116	7,545,658	0	0	7,545,658
1960	11,524,160	7,545,658	8,250,000	5,650,000	287,036	4,882,782	0	0	4,882,782
1961	10,010,259	4,882,782	8,250,000	5,650,000	203,238	789,803	0	0	789,803
1962	17,377,609	789,803	8,250,000	5,650,000	193,208	4,074,203	0	0	4,074,203
1963	8,840,900	4,074,203	8,250,000	5,650,000	183,412	-1,168,309	0	1,168,309	0
1964	10,863,586	0	8,250,000	5,650,000	132,876	-3,169,290	0	3,169,290	0
1965	19,875,027	0	8,250,000	5,650,000	204,453	5,770,574	0	0	5,770,574
1966	10,679,844	5,770,574	8,250,000	5,650,000	233,196	2,317,222	0	0	2,317,222
1967	11,670,830	2,317,222	8,250,000	5,650,000	161,618	-73,567	0	73,567	0
1968	13,739,932	0	8,250,000	5,650,000	132,876	-292,944	0	292,944	0
1969	15,272,159	0	8,250,000	5,650,000	148,060	1,224,099	0	0	1,224,099
1970	15,344,136	1,224,099	8,250,000	5,650,000	178,936	2,489,299	0	0	2,489,299
1971	15,290,433	2,489,299	8,250,000	5,650,000	209,281	3,670,451	0	0	3,670,451
1972	12,959,652	3,670,451	8,250,000	5,650,000	209,667	2,520,436	0	0	2,520,436
1973	18,397,816	2,520,436	8,250,000	5,650,000	248,115	6,770,137	0	0	6,770,137
1974	13,089,042	6,770,137	8,250,000	5,650,000	287,206	5,671,973	0	0	5,671,973
1975	16,825,996	5,671,973	8,250,000	5,650,000	306,082	8,291,888	0	0	8,291,888
1976	11,140,311	8,291,888	8,250,000	5,650,000	300,619	5,231,580	0	0	5,231,580
1977	5,438,897	5,231,580	8,250,000	5,650,000	197,768	-3,427,291	0	3,427,291	0
1978	15,183,722	0	8,250,000	5,650,000	146,976	1,136,746	0	0	1,136,746
1979	17,671,870	1,136,746	8,250,000	5,650,000	205,315	4,703,300	0	0	4,703,300
1980	17,765,183	4,703,300	8,250,000	5,650,000	293,852	8,274,631	0	0	8,274,631
1981	9,015,200	8,274,631	8,250,000	5,650,000	274,160	3,115,671	0	0	3,115,671
1982	17,489,400	3,115,671	8,250,000	5,650,000	251,571	6,453,500	0	0	6,453,500
1983	24,361,989	6,453,500	8,250,000	5,650,000	417,562	16,497,927	0	0	16,497,927
1984	25,359,376	16,497,927	8,250,000	5,650,000	645,721	27,311,583	2,463,879	0	24,847,704
1985	21,246,109	24,847,704	8,250,000	5,650,000	749,290	31,444,522	6,596,818	0	24,847,704
1986	23,013,446	24,847,704	8,250,000	5,650,000	749,290	33,211,860	8,364,156	0	24,847,704
1987	15,640,478	24,847,704	8,250,000	5,650,000	749,290	25,838,892	991,188	0	24,847,704
1988	11,456,357	24,847,704	8,250,000	5,650,000	710,171	21,693,890	0	0	21,693,890
1989	9,921,847	21,693,890	8,250,000	5,650,000	614,090	17,101,646	0	0	17,101,646
1990	9,639,803	17,101,646	8,250,000	5,650,000	498,107	12,343,342	0	0	12,343,342
1991	12,170,021	12,343,342	8,250,000	5,650,000	412,511	10,200,852	0	0	10,200,852
1992	10,895,580	10,200,852	8,250,000	5,650,000	344,397	6,852,035	0	0	6,852,035
1993	18,160,118	6,852,035	8,250,000	5,650,000	351,343	10,760,810	0	0	10,760,810
1994	11,125,503	10,760,810	8,250,000	5,650,000	360,935	7,625,377	0	0	7,625,377
1995	20,047,166	7,625,377	8,250,000	5,650,000	393,413	13,379,130	0	0	13,379,130
1996	14,502,293	13,379,130	8,250,000	5,650,000	466,466	13,514,957	0	0	13,514,957
1997	21,622,438	13,514,957	8,250,000	5,650,000	557,030	20,680,366	0	0	20,680,366
1998	16,798,378	20,680,366	8,250,000	5,650,000	673,505	22,905,238	0	0	22,905,238
1999	15,934,210	22,905,238	8,250,000	5,650,000	717,435	24,222,013	0	0	24,222,013
2000	10,646,526	24,222,013	8,250,000	5,650,000	684,917	20,283,622	0	0	20,283,622
Total								8,131,400	
Averages:									
1953-1977	13,032,181	5,662,524	8,250,000	5,650,000	263,354		0	325,256	4,856,607
1931-1977	13,564,565	9,647,372	8,250,000	5,650,000	365,655		0	173,009	9,119,291
1906-2000	15,264,965	14,609,186	8,250,000	5,650,000	494,700		1,003,902	85,594	14,561,143

Variables

Storage	25,665,339 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	24,847,704 af
UB Demand Level	5,650,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	494,700 af/yr
Total Yield w/ CRSP evap	6,144,700 af/yr

Shortage Years	Shortage
1961	0 af
1963	1,168,309 af
1964	3,169,290 af
1967	73,567 af
1968	292,944 af
1977	3,427,291 af

NM allocation (w/o evap) 630,000 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	5,913,354 af/yr
1931-1977	6,015,655 af/yr
1906-2000	6,144,700 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. B: CRSS Natural Flows, CRSP Active plus All Other UB Live Storage, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,550,021	29,530,030	8,250,000	5,750,000	749,290	33,330,761	3,800,731	0	29,530,030
1907	21,201,694	29,530,030	8,250,000	5,750,000	749,290	35,982,434	6,452,404	0	29,530,030
1908	12,218,817	29,530,030	8,250,000	5,750,000	719,512	27,029,335	0	0	27,029,335
1909	22,356,301	27,029,335	8,250,000	5,750,000	719,512	34,666,124	5,136,093	0	29,530,030
1910	14,650,616	29,530,030	8,250,000	5,750,000	749,290	29,431,356	0	0	29,431,356
1911	15,499,729	29,431,356	8,250,000	5,750,000	749,290	30,181,795	651,765	0	29,530,030
1912	18,623,410	29,530,030	8,250,000	5,750,000	749,290	33,404,150	3,874,120	0	29,530,030
1913	14,536,373	29,530,030	8,250,000	5,750,000	747,907	29,318,497	0	0	29,318,497
1914	21,354,814	29,318,497	8,250,000	5,750,000	747,907	35,925,404	6,395,374	0	29,530,030
1915	13,623,277	29,530,030	8,250,000	5,750,000	736,720	28,416,588	0	0	28,416,588
1916	20,142,892	28,416,588	8,250,000	5,750,000	736,720	33,822,760	4,292,730	0	29,530,030
1917	22,942,804	29,530,030	8,250,000	5,750,000	749,290	37,723,544	8,193,514	0	29,530,030
1918	15,865,939	29,530,030	8,250,000	5,750,000	749,290	30,646,679	1,116,649	0	29,530,030
1919	12,651,369	29,530,030	8,250,000	5,750,000	724,812	27,456,587	0	0	27,456,587
1920	22,287,632	27,456,587	8,250,000	5,750,000	724,812	35,019,408	5,489,377	0	29,530,030
1921	22,526,781	29,530,030	8,250,000	5,750,000	749,290	37,307,521	7,777,491	0	29,530,030
1922	18,447,198	29,530,030	8,250,000	5,750,000	749,290	33,227,938	3,697,908	0	29,530,030
1923	19,024,046	29,530,030	8,250,000	5,750,000	749,290	33,804,786	4,274,756	0	29,530,030
1924	13,877,798	29,530,030	8,250,000	5,750,000	739,838	28,667,990	0	0	28,667,990
1925	14,430,701	28,667,990	8,250,000	5,750,000	727,939	28,370,752	0	0	28,370,752
1926	15,213,731	28,370,752	8,250,000	5,750,000	732,700	28,851,783	0	0	28,851,783
1927	19,539,212	28,851,783	8,250,000	5,750,000	744,598	33,646,397	4,116,367	0	29,530,030
1928	16,954,334	29,530,030	8,250,000	5,750,000	749,290	31,735,074	2,205,044	0	29,530,030
1929	21,829,585	29,530,030	8,250,000	5,750,000	749,290	36,610,325	7,080,295	0	29,530,030
1930	14,621,041	29,530,030	8,250,000	5,750,000	748,944	29,402,127	0	0	29,402,127
1931	8,474,134	29,402,127	8,250,000	5,750,000	672,949	23,203,312	0	0	23,203,312
1932	17,422,187	23,203,312	8,250,000	5,750,000	633,136	25,992,363	0	0	25,992,363
1933	12,183,500	25,992,363	8,250,000	5,750,000	639,745	23,536,119	0	0	23,536,119
1934	6,178,192	23,536,119	8,250,000	5,750,000	508,432	15,205,879	0	0	15,205,879
1935	12,630,349	15,205,879	8,250,000	5,750,000	385,811	13,450,417	0	0	13,450,417
1936	14,648,873	13,450,417	8,250,000	5,750,000	369,976	13,729,314	0	0	13,729,314
1937	14,306,056	13,729,314	8,250,000	5,750,000	375,061	13,660,309	0	0	13,660,309
1938	18,148,319	13,660,309	8,250,000	5,750,000	422,895	17,385,733	0	0	17,385,733
1939	11,164,059	17,385,733	8,250,000	5,750,000	431,062	14,118,730	0	0	14,118,730
1940	9,931,657	14,118,730	8,250,000	5,750,000	338,359	9,712,027	0	0	9,712,027
1941	20,116,678	9,712,027	8,250,000	5,750,000	357,615	15,471,091	0	0	15,471,091
1942	17,225,136	15,471,091	8,250,000	5,750,000	465,757	18,230,470	0	0	18,230,470
1943	13,731,401	18,230,470	8,250,000	5,750,000	493,018	17,468,853	0	0	17,468,853
1944	15,369,422	17,468,853	8,250,000	5,750,000	496,874	18,341,401	0	0	18,341,401
1945	14,140,528	18,341,401	8,250,000	5,750,000	505,649	17,976,280	0	0	17,976,280
1946	11,095,453	17,976,280	8,250,000	5,750,000	461,845	14,609,888	0	0	14,609,888
1947	16,439,486	14,609,888	8,250,000	5,750,000	447,280	16,602,094	0	0	16,602,094
1948	15,139,294	16,602,094	8,250,000	5,750,000	482,617	17,258,770	0	0	17,258,770
1949	16,933,584	17,258,770	8,250,000	5,750,000	523,142	19,669,212	0	0	19,669,212
1950	13,140,416	19,669,212	8,250,000	5,750,000	538,184	18,271,444	0	0	18,271,444
1951	12,505,894	18,271,444	8,250,000	5,750,000	498,610	16,278,728	0	0	16,278,728
1952	20,805,422	16,278,728	8,250,000	5,750,000	553,916	22,530,234	0	0	22,530,234
1953	11,165,419	22,530,234	8,250,000	5,750,000	591,444	19,104,209	0	0	19,104,209
1954	8,496,102	19,104,209	8,250,000	5,750,000	477,239	13,123,072	0	0	13,123,072
1955	9,413,908	13,123,072	8,250,000	5,750,000	344,374	8,192,606	0	0	8,192,606
1956	11,426,874	8,192,606	8,250,000	5,750,000	250,672	5,368,807	0	0	5,368,807
1957	21,500,963	5,368,807	8,250,000	5,750,000	307,356	12,562,415	0	0	12,562,415
1958	15,862,511	12,562,415	8,250,000	5,750,000	416,995	14,007,931	0	0	14,007,931
1959	9,598,169	14,007,931	8,250,000	5,750,000	378,116	9,227,984	0	0	9,227,984
1960	11,524,160	9,227,984	8,250,000	5,750,000	287,036	6,465,108	0	0	6,465,108
1961	10,010,259	6,465,108	8,250,000	5,750,000	203,238	2,272,129	0	0	2,272,129
1962	17,377,609	2,272,129	8,250,000	5,750,000	193,208	5,456,530	0	0	5,456,530
1963	8,840,900	5,456,530	8,250,000	5,750,000	183,412	114,018	0	0	114,018
1964	10,863,586	114,018	8,250,000	5,750,000	132,876	-3,155,272	0	3,155,272	0
1965	19,875,027	0	8,250,000	5,750,000	204,453	5,670,574	0	0	5,670,574
1966	10,679,844	5,670,574	8,250,000	5,750,000	233,196	2,117,222	0	0	2,117,222
1967	11,670,830	2,117,222	8,250,000	5,750,000	161,618	-373,567	0	373,567	0
1968	13,739,932	0	8,250,000	5,750,000	132,876	-392,944	0	392,944	0
1969	15,272,159	0	8,250,000	5,750,000	148,060	1,124,099	0	0	1,124,099
1970	15,344,136	1,124,099	8,250,000	5,750,000	178,936	2,289,299	0	0	2,289,299
1971	15,290,433	2,289,299	8,250,000	5,750,000	209,281	3,370,451	0	0	3,370,451
1972	12,959,652	3,370,451	8,250,000	5,750,000	209,667	2,120,436	0	0	2,120,436
1973	18,397,816	2,120,436	8,250,000	5,750,000	248,115	6,270,137	0	0	6,270,137
1974	13,089,042	6,270,137	8,250,000	5,750,000	287,206	5,071,973	0	0	5,071,973
1975	16,825,996	5,071,973	8,250,000	5,750,000	306,082	7,591,888	0	0	7,591,888
1976	11,140,311	7,591,888	8,250,000	5,750,000	300,619	4,431,580	0	0	4,431,580
1977	5,438,897	4,431,580	8,250,000	5,750,000	197,768	-4,327,291	0	4,327,291	0
1978	15,183,722	0	8,250,000	5,750,000	146,976	1,036,746	0	0	1,036,746
1979	17,671,870	1,036,746	8,250,000	5,750,000	205,315	4,503,300	0	0	4,503,300
1980	17,765,183	4,503,300	8,250,000	5,750,000	293,852	7,974,631	0	0	7,974,631
1981	9,015,200	7,974,631	8,250,000	5,750,000	274,160	2,715,671	0	0	2,715,671
1982	17,489,400	2,715,671	8,250,000	5,750,000	251,571	5,953,500	0	0	5,953,500
1983	24,361,989	5,953,500	8,250,000	5,750,000	417,562	15,897,927	0	0	15,897,927
1984	25,359,376	15,897,927	8,250,000	5,750,000	645,721	26,611,583	0	0	26,611,583
1985	21,246,109	26,611,583	8,250,000	5,750,000	749,290	33,108,401	3,578,371	0	29,530,030
1986	23,013,446	29,530,030	8,250,000	5,750,000	749,290	37,794,186	8,264,156	0	29,530,030
1987	15,640,478	29,530,030	8,250,000	5,750,000	749,290	30,421,219	891,188	0	29,530,030
1988	11,456,357	29,530,030	8,250,000	5,750,000	710,171	26,276,216	0	0	26,276,216
1989	9,921,847	26,276,216	8,250,000	5,750,000	614,090	21,583,973	0	0	21,583,973
1990	9,639,803	21,583,973	8,250,000	5,750,000	498,107	16,725,669	0	0	16,725,669
1991	12,170,021	16,725,669	8,250,000	5,750,000	412,511	14,483,179	0	0	14,483,179
1992	10,895,580	14,483,179	8,250,000	5,750,000	344,397	11,034,361	0	0	11,034,361
1993	18,160,118	11,034,361	8,250,000	5,750,000	351,343	14,843,136	0	0	14,843,136
1994	11,125,503	14,843,136	8,250,000	5,750,000	360,935	11,607,703	0	0	11,607,703
1995	20,047,166	11,607,703	8,250,000	5,750,000	393,413	17,261,457	0	0	17,261,457
1996	14,502,293	17,261,457	8,250,000	5,750,000	466,466	17,297,284	0	0	17,297,284
1997	21,622,438	17,297,284	8,250,000	5,750,000	557,030	24,362,692	0	0	24,362,692
1998	16,798,378	24,362,692	8,250,000	5,750,000	673,505	26,487,565	0	0	26,487,565
1999	15,934,210	26,487,565	8,250,000	5,750,000	717,435	27,704,340	0	0	27,704,340
2000	10,646,526	27,704,340	8,250,000	5,750,000	684,917	23,665,949	0	0	23,665,949
Total								8,249,074	
Averages:									
1953-1977	13,032,181		8,250,000	5,750,000	263,354		0	329,963	5,438,099
1931-1977	13,564,565		8,250,000	5,750,000	365,655		0	175,512	11,035,216
1906-2000	15,264,965		8,250,000	5,750,000	494,700		918,825	86,832	17,417,870

Variables	
Storage	30,167,576 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,530,030 af
UB Demand Level	5,750,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	494,700 af/yr
Total Yield w/ CRSP evap	6,244,700 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	3,155,272 af
1967	373,567 af
1968	392,944 af
1977	4,327,291 af

NM allocation(w/o evap) 641,250 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,013,354 af/yr
1931-1977	6,115,655 af/yr
1906-2000	6,244,700 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 1: CRSS Natural Flows, CRSP Active Storage Only, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,550,021	24,847,704	8,250,000	5,700,000	749,290	28,698,435	3,850,731	0	24,847,704
1907	21,201,694	24,847,704	8,250,000	5,700,000	749,290	31,350,108	6,502,404	0	24,847,704
1908	12,218,817	24,847,704	8,250,000	5,700,000	718,900	22,397,621	0	0	22,397,621
1909	22,356,301	22,397,621	8,250,000	5,700,000	718,900	30,085,022	5,237,319	0	24,847,704
1910	14,650,616	24,847,704	8,250,000	5,700,000	748,694	24,799,626	0	0	24,799,626
1911	15,499,729	24,799,626	8,250,000	5,700,000	748,694	25,600,661	752,957	0	24,847,704
1912	18,623,410	24,847,704	8,250,000	5,700,000	749,290	28,771,824	3,924,120	0	24,847,704
1913	14,536,373	24,847,704	8,250,000	5,700,000	747,294	24,686,783	0	0	24,686,783
1914	21,354,814	24,686,783	8,250,000	5,700,000	747,294	31,344,303	6,496,599	0	24,847,704
1915	13,623,277	24,847,704	8,250,000	5,700,000	736,107	23,784,874	0	0	23,784,874
1916	20,142,892	23,784,874	8,250,000	5,700,000	736,107	29,241,659	4,393,955	0	24,847,704
1917	22,942,804	24,847,704	8,250,000	5,700,000	749,290	33,091,218	8,243,514	0	24,847,704
1918	15,865,939	24,847,704	8,250,000	5,700,000	749,290	26,014,353	1,166,649	0	24,847,704
1919	12,651,369	24,847,704	8,250,000	5,700,000	724,199	22,824,874	0	0	22,824,874
1920	22,287,632	22,824,874	8,250,000	5,700,000	724,199	30,438,306	5,590,602	0	24,847,704
1921	22,526,781	24,847,704	8,250,000	5,700,000	749,290	32,675,195	7,827,491	0	24,847,704
1922	18,447,198	24,847,704	8,250,000	5,700,000	749,290	28,595,612	3,747,908	0	24,847,704
1923	19,024,046	24,847,704	8,250,000	5,700,000	749,290	29,172,460	4,324,756	0	24,847,704
1924	13,877,798	24,847,704	8,250,000	5,700,000	739,225	24,036,277	0	0	24,036,277
1925	14,430,701	24,036,277	8,250,000	5,700,000	726,116	23,790,861	0	0	23,790,861
1926	15,213,731	23,790,861	8,250,000	5,700,000	729,696	24,324,896	0	0	24,324,896
1927	19,539,212	24,324,896	8,250,000	5,700,000	742,805	29,171,302	4,323,598	0	24,847,704
1928	16,954,334	24,847,704	8,250,000	5,700,000	749,290	27,102,748	2,255,044	0	24,847,704
1929	21,829,585	24,847,704	8,250,000	5,700,000	749,290	31,977,999	7,130,295	0	24,847,704
1930	14,621,041	24,847,704	8,250,000	5,700,000	748,331	24,770,413	0	0	24,770,413
1931	8,474,134	24,770,413	8,250,000	5,700,000	671,126	18,623,421	0	0	18,623,421
1932	17,422,187	18,623,421	8,250,000	5,700,000	630,133	21,465,475	0	0	21,465,475
1933	12,183,500	21,465,475	8,250,000	5,700,000	635,590	19,063,386	0	0	19,063,386
1934	6,178,192	19,063,386	8,250,000	5,700,000	503,153	10,788,424	0	0	10,788,424
1935	12,630,349	10,788,424	8,250,000	5,700,000	379,437	9,089,337	0	0	9,089,337
1936	14,648,873	9,089,337	8,250,000	5,700,000	362,533	9,425,676	0	0	9,425,676
1937	14,306,056	9,425,676	8,250,000	5,700,000	366,575	9,415,158	0	0	9,415,158
1938	18,148,319	9,415,158	8,250,000	5,700,000	413,392	13,200,085	0	0	13,200,085
1939	11,164,059	13,200,085	8,250,000	5,700,000	420,567	9,993,577	0	0	9,993,577
1940	9,931,657	9,993,577	8,250,000	5,700,000	326,896	5,648,338	0	0	5,648,338
1941	20,116,678	5,648,338	8,250,000	5,700,000	345,207	11,469,809	0	0	11,469,809
1942	17,225,136	11,469,809	8,250,000	5,700,000	452,428	14,292,517	0	0	14,292,517
1943	13,731,401	14,292,517	8,250,000	5,700,000	478,790	13,595,128	0	0	13,595,128
1944	15,369,422	13,595,128	8,250,000	5,700,000	481,770	14,532,780	0	0	14,532,780
1945	14,140,528	14,532,780	8,250,000	5,700,000	489,690	14,233,618	0	0	14,233,618
1946	11,095,453	14,233,618	8,250,000	5,700,000	445,052	10,934,019	0	0	10,934,019
1947	16,439,486	10,934,019	8,250,000	5,700,000	429,673	12,993,832	0	0	12,993,832
1948	15,139,294	12,993,832	8,250,000	5,700,000	464,217	13,718,909	0	0	13,718,909
1949	16,933,584	13,718,909	8,250,000	5,700,000	503,967	16,198,526	0	0	16,198,526
1950	13,140,416	16,198,526	8,250,000	5,700,000	518,254	14,870,688	0	0	14,870,688
1951	12,505,894	14,870,688	8,250,000	5,700,000	477,943	12,948,640	0	0	12,948,640
1952	20,805,422	12,948,640	8,250,000	5,700,000	532,530	19,271,532	0	0	19,271,532
1953	11,165,419	19,271,532	8,250,000	5,700,000	569,357	15,917,594	0	0	15,917,594
1954	8,496,102	15,917,594	8,250,000	5,700,000	454,468	10,009,228	0	0	10,009,228
1955	9,413,908	10,009,228	8,250,000	5,700,000	320,936	5,152,200	0	0	5,152,200
1956	11,426,874	5,152,200	8,250,000	5,700,000	226,583	2,402,491	0	0	2,402,491
1957	21,500,963	2,402,491	8,250,000	5,700,000	282,632	9,670,822	0	0	9,670,822
1958	15,862,511	9,670,822	8,250,000	5,700,000	391,651	11,191,682	0	0	11,191,682
1959	9,598,169	11,191,682	8,250,000	5,700,000	352,168	6,487,683	0	0	6,487,683
1960	11,524,160	6,487,683	8,250,000	5,700,000	260,499	3,801,343	0	0	3,801,343
1961	10,010,259	3,801,343	8,250,000	5,700,000	180,027	-318,425	0	318,425	0
1962	17,377,609	0	8,250,000	5,700,000	173,243	3,254,366	0	0	3,254,366
1963	8,840,900	3,254,366	8,250,000	5,700,000	173,243	-2,027,976	0	2,027,976	0
1964	10,863,586	0	8,250,000	5,700,000	132,876	-3,219,290	0	3,219,290	0
1965	19,875,027	0	8,250,000	5,700,000	203,841	5,721,186	0	0	5,721,186
1966	10,679,844	5,721,186	8,250,000	5,700,000	231,373	2,219,657	0	0	2,219,657
1967	11,670,830	2,219,657	8,250,000	5,700,000	160,408	-219,921	0	219,921	0
1968	13,739,932	0	8,250,000	5,700,000	132,876	-342,944	0	342,944	0
1969	15,272,159	0	8,250,000	5,700,000	147,447	1,174,712	0	0	1,174,712
1970	15,344,136	1,174,712	8,250,000	5,700,000	177,114	2,391,734	0	0	2,391,734
1971	15,290,433	2,391,734	8,250,000	5,700,000	206,277	3,525,890	0	0	3,525,890
1972	12,959,652	3,525,890	8,250,000	5,700,000	205,512	2,330,029	0	0	2,330,029
1973	18,397,816	2,330,029	8,250,000	5,700,000	242,837	6,535,009	0	0	6,535,009
1974	13,089,042	6,535,009	8,250,000	5,700,000	280,832	5,393,219	0	0	5,393,219
1975	16,825,996	5,393,219	8,250,000	5,700,000	298,638	7,970,577	0	0	7,970,577
1976	11,140,311	7,970,577	8,250,000	5,700,000	292,133	4,868,755	0	0	4,868,755
1977	5,438,897	4,868,755	8,250,000	5,700,000	193,267	-3,835,616	0	3,835,616	0
1978	15,183,722	0	8,250,000	5,700,000	146,363	1,087,358	0	0	1,087,358
1979	17,671,870	1,087,358	8,250,000	5,700,000	203,492	4,605,735	0	0	4,605,735
1980	17,765,183	4,605,735	8,250,000	5,700,000	290,849	8,130,070	0	0	8,130,070
1981	9,015,200	8,130,070	8,250,000	5,700,000	270,005	2,925,265	0	0	2,925,265
1982	17,489,400	2,925,265	8,250,000	5,700,000	246,292	6,218,372	0	0	6,218,372
1983	24,361,989	6,218,372	8,250,000	5,700,000	411,188	16,219,173	0	0	16,219,173
1984	25,359,376	16,219,173	8,250,000	5,700,000	642,263	26,986,286	2,138,582	0	24,847,704
1985	21,246,109	24,847,704	8,250,000	5,700,000	749,290	31,394,522	6,546,818	0	24,847,704
1986	23,013,446	24,847,704	8,250,000	5,700,000	749,290	33,161,860	8,314,156	0	24,847,704
1987	15,640,478	24,847,704	8,250,000	5,700,000	749,290	25,788,892	941,188	0	24,847,704
1988	11,456,357	24,847,704	8,250,000	5,700,000	709,558	21,644,502	0	0	21,644,502
1989	9,921,847	21,644,502	8,250,000	5,700,000	612,267	17,004,082	0	0	17,004,082
1990	9,639,803	17,004,082	8,250,000	5,700,000	495,104	12,198,781	0	0	12,198,781
1991	12,170,021	12,198,781	8,250,000	5,700,000	408,356	10,010,446	0	0	10,010,446
1992	10,895,580	10,010,446	8,250,000	5,700,000	339,119	6,616,907	0	0	6,616,907
1993	18,160,118	6,616,907	8,250,000	5,700,000	344,969	10,482,056	0	0	10,482,056
1994	11,125,503	10,482,056	8,250,000	5,700,000	353,492	7,304,066	0	0	7,304,066
1995	20,047,166	7,304,066	8,250,000	5,700,000	384,927	13,016,305	0	0	13,016,305
1996	14,502,293	13,016,305	8,250,000	5,700,000	456,963	13,111,635	0	0	13,111,635
1997	21,622,438	13,111,635	8,250,000	5,700,000	546,534	20,237,539	0	0	20,237,539
1998	16,798,378	20,237,539	8,250,000	5,700,000	662,042	22,423,876	0	0	22,423,876
1999	15,934,210	22,423,876	8,250,000	5,700,000	705,027	23,703,058	0	0	23,703,058
2000	10,646,526	23,703,058	8,250,000	5,700,000	671,588	19,727,996	0	0	19,727,996
Total								9,964,172	
Averages:									
1953-1977	13,032,181	5,171,588	8,250,000	5,700,000	251,610		0	398,567	4,400,727
1931-1977	13,564,565	9,160,882	8,250,000	5,700,000	353,599		0	212,004	8,633,852
1906-2000	15,264,965	14,315,245	8,250,000	5,700,000	487,336		986,407	104,886	14,261,353

Variables	
Storage	25,665,339 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	24,847,704 af
UB Demand Level	5,700,000 af/yr
LB Delivery	8,250,000 af/yr
Results	
Average CRSP Evap	487,336 af/yr
Total Yield w/ CRSP evap	6,187,336 af/yr

Shortage Years	Shortage
1961	318,425 af
1963	2,027,976 af
1964	3,219,290 af
1967	219,921 af
1968	342,944 af
1977	3,835,616 af

NM allocation (w/o evap) 635,625 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	5,951,610 af/yr
1931-1977	6,053,599 af/yr
1906-2000	6,187,336 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 2: CRSS Natural Flows, CRSP Active plus All Other UB Live Storage, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,550,021	29,530,030	8,250,000	5,800,000	749,290	33,280,761	3,750,731	0	29,530,030
1907	21,201,694	29,530,030	8,250,000	5,800,000	749,290	35,932,434	6,402,404	0	29,530,030
1908	12,218,817	29,530,030	8,250,000	5,800,000	718,900	26,979,948	0	0	26,979,948
1909	22,356,301	26,979,948	8,250,000	5,800,000	718,900	34,567,349	5,037,319	0	29,530,030
1910	14,650,616	29,530,030	8,250,000	5,800,000	748,694	29,381,953	0	0	29,381,953
1911	15,499,729	29,381,953	8,250,000	5,800,000	748,694	30,082,988	552,957	0	29,530,030
1912	18,623,410	29,530,030	8,250,000	5,800,000	749,290	33,354,150	3,824,120	0	29,530,030
1913	14,536,373	29,530,030	8,250,000	5,800,000	747,294	29,269,109	0	0	29,269,109
1914	21,354,814	29,269,109	8,250,000	5,800,000	747,294	35,826,629	6,296,599	0	29,530,030
1915	13,623,277	29,530,030	8,250,000	5,800,000	736,107	28,367,200	0	0	28,367,200
1916	20,142,892	28,367,200	8,250,000	5,800,000	736,107	33,723,985	4,193,955	0	29,530,030
1917	22,942,804	29,530,030	8,250,000	5,800,000	749,290	37,673,544	8,143,514	0	29,530,030
1918	15,865,939	29,530,030	8,250,000	5,800,000	749,290	30,596,679	1,066,649	0	29,530,030
1919	12,651,369	29,530,030	8,250,000	5,800,000	724,199	27,407,200	0	0	27,407,200
1920	22,287,632	27,407,200	8,250,000	5,800,000	724,199	34,920,633	5,390,602	0	29,530,030
1921	22,526,781	29,530,030	8,250,000	5,800,000	749,290	37,257,521	7,727,491	0	29,530,030
1922	18,447,198	29,530,030	8,250,000	5,800,000	749,290	33,177,938	3,647,908	0	29,530,030
1923	19,024,046	29,530,030	8,250,000	5,800,000	749,290	33,754,786	4,224,756	0	29,530,030
1924	13,877,798	29,530,030	8,250,000	5,800,000	739,225	28,618,603	0	0	28,618,603
1925	14,430,701	28,618,603	8,250,000	5,800,000	726,116	28,273,188	0	0	28,273,188
1926	15,213,731	28,273,188	8,250,000	5,800,000	729,696	28,707,222	0	0	28,707,222
1927	19,539,212	28,707,222	8,250,000	5,800,000	742,805	33,453,629	3,923,598	0	29,530,030
1928	16,954,334	29,530,030	8,250,000	5,800,000	749,290	31,685,074	2,155,044	0	29,530,030
1929	21,829,585	29,530,030	8,250,000	5,800,000	749,290	36,560,325	7,030,295	0	29,530,030
1930	14,621,041	29,530,030	8,250,000	5,800,000	748,331	29,352,740	0	0	29,352,740
1931	8,474,134	29,352,740	8,250,000	5,800,000	671,126	23,105,747	0	0	23,105,747
1932	17,422,187	23,105,747	8,250,000	5,800,000	630,133	25,847,802	0	0	25,847,802
1933	12,183,500	25,847,802	8,250,000	5,800,000	635,590	23,345,712	0	0	23,345,712
1934	6,178,192	23,345,712	8,250,000	5,800,000	503,153	14,970,751	0	0	14,970,751
1935	12,630,349	14,970,751	8,250,000	5,800,000	379,437	13,171,663	0	0	13,171,663
1936	14,648,873	13,171,663	8,250,000	5,800,000	362,533	13,408,003	0	0	13,408,003
1937	14,306,056	13,408,003	8,250,000	5,800,000	366,575	13,297,484	0	0	13,297,484
1938	18,148,319	13,297,484	8,250,000	5,800,000	413,392	16,982,411	0	0	16,982,411
1939	11,164,059	16,982,411	8,250,000	5,800,000	420,567	13,675,903	0	0	13,675,903
1940	9,931,657	13,675,903	8,250,000	5,800,000	326,896	9,230,665	0	0	9,230,665
1941	20,116,678	9,230,665	8,250,000	5,800,000	345,207	14,952,136	0	0	14,952,136
1942	17,225,136	14,952,136	8,250,000	5,800,000	452,428	17,674,844	0	0	17,674,844
1943	13,731,401	17,674,844	8,250,000	5,800,000	478,790	16,877,455	0	0	16,877,455
1944	15,369,422	16,877,455	8,250,000	5,800,000	481,770	17,715,106	0	0	17,715,106
1945	14,140,528	17,715,106	8,250,000	5,800,000	489,690	17,315,944	0	0	17,315,944
1946	11,095,453	17,315,944	8,250,000	5,800,000	445,052	13,916,346	0	0	13,916,346
1947	16,439,486	13,916,346	8,250,000	5,800,000	429,673	15,876,159	0	0	15,876,159
1948	15,139,294	15,876,159	8,250,000	5,800,000	464,217	16,501,236	0	0	16,501,236
1949	16,933,584	16,501,236	8,250,000	5,800,000	503,967	18,880,853	0	0	18,880,853
1950	13,140,416	18,880,853	8,250,000	5,800,000	518,254	17,453,015	0	0	17,453,015
1951	12,505,894	17,453,015	8,250,000	5,800,000	477,943	15,430,966	0	0	15,430,966
1952	20,805,422	15,430,966	8,250,000	5,800,000	532,530	21,653,858	0	0	21,653,858
1953	11,165,419	21,653,858	8,250,000	5,800,000	569,357	18,199,921	0	0	18,199,921
1954	8,496,102	18,199,921	8,250,000	5,800,000	454,468	12,191,554	0	0	12,191,554
1955	9,413,908	12,191,554	8,250,000	5,800,000	320,936	7,234,526	0	0	7,234,526
1956	11,426,874	7,234,526	8,250,000	5,800,000	226,583	4,384,817	0	0	4,384,817
1957	21,500,963	4,384,817	8,250,000	5,800,000	282,632	11,553,149	0	0	11,553,149
1958	15,862,511	11,553,149	8,250,000	5,800,000	391,651	12,974,008	0	0	12,974,008
1959	9,598,169	12,974,008	8,250,000	5,800,000	352,168	8,170,009	0	0	8,170,009
1960	11,524,160	8,170,009	8,250,000	5,800,000	260,499	5,383,670	0	0	5,383,670
1961	10,010,259	5,383,670	8,250,000	5,800,000	180,027	1,163,901	0	0	1,163,901
1962	17,377,609	1,163,901	8,250,000	5,800,000	173,243	4,318,268	0	0	4,318,268
1963	8,840,900	4,318,268	8,250,000	5,800,000	173,243	-1,064,075	0	1,064,075	0
1964	10,863,586	0	8,250,000	5,800,000	132,876	-3,319,290	0	3,319,290	0
1965	19,875,027	0	8,250,000	5,800,000	203,841	5,621,186	0	0	5,621,186
1966	10,679,844	5,621,186	8,250,000	5,800,000	231,373	2,019,657	0	0	2,019,657
1967	11,670,830	2,019,657	8,250,000	5,800,000	160,408	-519,921	0	519,921	0
1968	13,739,932	0	8,250,000	5,800,000	132,876	-442,944	0	442,944	0
1969	15,272,159	0	8,250,000	5,800,000	147,447	1,074,712	0	0	1,074,712
1970	15,344,136	1,074,712	8,250,000	5,800,000	177,114	2,191,734	0	0	2,191,734
1971	15,290,433	2,191,734	8,250,000	5,800,000	206,277	3,225,890	0	0	3,225,890
1972	12,959,652	3,225,890	8,250,000	5,800,000	205,512	1,930,029	0	0	1,930,029
1973	18,397,816	1,930,029	8,250,000	5,800,000	242,837	6,035,009	0	0	6,035,009
1974	13,089,042	6,035,009	8,250,000	5,800,000	280,832	4,793,219	0	0	4,793,219
1975	16,825,996	4,793,219	8,250,000	5,800,000	298,638	7,270,577	0	0	7,270,577
1976	11,140,311	7,270,577	8,250,000	5,800,000	292,133	4,068,755	0	0	4,068,755
1977	5,438,897	4,068,755	8,250,000	5,800,000	193,267	-4,735,616	0	4,735,616	0
1978	15,183,722	0	8,250,000	5,800,000	146,363	987,358	0	0	987,358
1979	17,671,870	987,358	8,250,000	5,800,000	203,492	4,405,735	0	0	4,405,735
1980	17,765,183	4,405,735	8,250,000	5,800,000	290,849	7,830,070	0	0	7,830,070
1981	9,015,200	7,830,070	8,250,000	5,800,000	270,005	2,525,265	0	0	2,525,265
1982	17,489,400	2,525,265	8,250,000	5,800,000	246,292	5,718,372	0	0	5,718,372
1983	24,361,989	5,718,372	8,250,000	5,800,000	411,188	15,619,173	0	0	15,619,173
1984	25,359,376	15,619,173	8,250,000	5,800,000	642,263	26,286,286	0	0	26,286,286
1985	21,246,109	26,286,286	8,250,000	5,800,000	749,290	32,733,105	3,203,074	0	29,530,030
1986	23,013,446	29,530,030	8,250,000	5,800,000	749,290	37,744,186	8,214,156	0	29,530,030
1987	15,640,478	29,530,030	8,250,000	5,800,000	749,290	30,371,219	841,188	0	29,530,030
1988	11,456,357	29,530,030	8,250,000	5,800,000	709,558	26,226,829	0	0	26,226,829
1989	9,921,847	26,226,829	8,250,000	5,800,000	612,267	21,486,408	0	0	21,486,408
1990	9,639,803	21,486,408	8,250,000	5,800,000	495,104	16,581,108	0	0	16,581,108
1991	12,170,021	16,581,108	8,250,000	5,800,000	408,356	14,292,772	0	0	14,292,772
1992	10,895,580	14,292,772	8,250,000	5,800,000	339,119	10,799,233	0	0	10,799,233
1993	18,160,118	10,799,233	8,250,000	5,800,000	344,969	14,564,382	0	0	14,564,382
1994	11,125,503	14,564,382	8,250,000	5,800,000	353,492	11,286,392	0	0	11,286,392
1995	20,047,166	11,286,392	8,250,000	5,800,000	384,927	16,898,632	0	0	16,898,632
1996	14,502,293	16,898,632	8,250,000	5,800,000	456,963	16,893,962	0	0	16,893,962
1997	21,622,438	16,893,962	8,250,000	5,800,000	546,534	23,919,866	0	0	23,919,866
1998	16,798,378	23,919,866	8,250,000	5,800,000	662,042	26,006,202	0	0	26,006,202
1999	15,934,210	26,006,202	8,250,000	5,800,000	705,027	27,185,385	0	0	27,185,385
2000	10,646,526	27,185,385	8,250,000	5,800,000	671,588	23,110,323	0	0	23,110,323
Total								10,081,846	
Averages:									
1953-1977	13,032,181		8,250,000	5,800,000	251,610		0	403,274	4,952,184
1931-1977	13,564,565		8,250,000	5,800,000	353,599		0	214,507	10,533,801
1906-2000	15,264,965		8,250,000	5,800,000	487,336		901,330	106,125	17,106,738

Variables	
Storage	30,167,576 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,530,030 af
UB Demand Level	5,800,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	487,336 af/yr
Total Yield w/ CRSP evap	6,287,336 af/yr

Shortage Years	Shortage
1961	0 af
1963	1,064,075 af
1964	3,319,290 af
1967	519,921 af
1968	442,944 af
1977	4,735,616 af

NM allocation(w/o evap) 646,875 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,051,610 af/yr
1931-1977	6,153,599 af/yr
1906-2000	6,287,336 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 3: Natural Flows Adjusted for MBC Method with SCS Eff. Precip., CRSP Active Storage Only, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	24,847,704	8,250,000	5,700,000	749,290	28,714,235	3,866,531	0	24,847,704
1907	21,217,494	24,847,704	8,250,000	5,700,000	749,290	31,365,908	6,518,204	0	24,847,704
1908	12,234,617	24,847,704	8,250,000	5,700,000	719,093	22,413,228	0	0	22,413,228
1909	22,372,101	22,413,228	8,250,000	5,700,000	719,093	30,116,235	5,268,531	0	24,847,704
1910	14,666,416	24,847,704	8,250,000	5,700,000	748,887	24,815,232	0	0	24,815,232
1911	15,515,529	24,815,232	8,250,000	5,700,000	748,887	25,631,874	784,170	0	24,847,704
1912	18,639,210	24,847,704	8,250,000	5,700,000	749,290	28,787,624	3,939,920	0	24,847,704
1913	14,552,173	24,847,704	8,250,000	5,700,000	747,488	24,702,389	0	0	24,702,389
1914	21,370,614	24,702,389	8,250,000	5,700,000	747,488	31,375,515	6,527,812	0	24,847,704
1915	13,639,077	24,847,704	8,250,000	5,700,000	736,301	23,800,480	0	0	23,800,480
1916	20,158,692	23,800,480	8,250,000	5,700,000	736,301	29,272,872	4,425,168	0	24,847,704
1917	22,958,604	24,847,704	8,250,000	5,700,000	749,290	33,107,018	8,259,314	0	24,847,704
1918	15,881,739	24,847,704	8,250,000	5,700,000	749,290	26,030,153	1,182,449	0	24,847,704
1919	12,667,169	24,847,704	8,250,000	5,700,000	724,393	22,840,480	0	0	22,840,480
1920	22,303,432	22,840,480	8,250,000	5,700,000	724,393	30,469,519	5,621,815	0	24,847,704
1921	22,542,581	24,847,704	8,250,000	5,700,000	749,290	32,690,995	7,843,291	0	24,847,704
1922	18,462,998	24,847,704	8,250,000	5,700,000	749,290	28,611,412	3,763,708	0	24,847,704
1923	19,039,846	24,847,704	8,250,000	5,700,000	749,290	29,188,260	4,340,556	0	24,847,704
1924	13,893,598	24,847,704	8,250,000	5,700,000	739,419	24,051,883	0	0	24,051,883
1925	14,446,501	24,051,883	8,250,000	5,700,000	726,692	23,821,692	0	0	23,821,692
1926	15,229,531	23,821,692	8,250,000	5,700,000	730,645	24,370,577	0	0	24,370,577
1927	19,555,012	24,370,577	8,250,000	5,700,000	743,372	29,232,217	4,384,513	0	24,847,704
1928	16,970,134	24,847,704	8,250,000	5,700,000	749,290	27,118,548	2,270,844	0	24,847,704
1929	21,845,385	24,847,704	8,250,000	5,700,000	749,290	31,993,799	7,146,095	0	24,847,704
1930	14,636,841	24,847,704	8,250,000	5,700,000	748,525	24,786,020	0	0	24,786,020
1931	8,489,934	24,786,020	8,250,000	5,700,000	671,702	18,654,251	0	0	18,654,251
1932	17,437,987	18,654,251	8,250,000	5,700,000	631,082	21,511,157	0	0	21,511,157
1933	12,199,300	21,511,157	8,250,000	5,700,000	636,903	19,123,554	0	0	19,123,554
1934	6,193,992	19,123,554	8,250,000	5,700,000	504,821	10,862,725	0	0	10,862,725
1935	12,646,149	10,862,725	8,250,000	5,700,000	381,451	9,177,423	0	0	9,177,423
1936	14,664,673	9,177,423	8,250,000	5,700,000	364,885	9,527,211	0	0	9,527,211
1937	14,321,856	9,527,211	8,250,000	5,700,000	369,256	9,529,810	0	0	9,529,810
1938	18,164,119	9,529,810	8,250,000	5,700,000	416,395	13,327,534	0	0	13,327,534
1939	11,179,859	13,327,534	8,250,000	5,700,000	423,883	10,133,510	0	0	10,133,510
1940	9,947,457	10,133,510	8,250,000	5,700,000	330,518	5,800,449	0	0	5,800,449
1941	20,132,478	5,800,449	8,250,000	5,700,000	349,128	11,633,799	0	0	11,633,799
1942	17,240,936	11,633,799	8,250,000	5,700,000	456,640	14,468,095	0	0	14,468,095
1943	13,747,201	14,468,095	8,250,000	5,700,000	483,286	13,782,010	0	0	13,782,010
1944	15,385,222	13,782,010	8,250,000	5,700,000	486,543	14,730,689	0	0	14,730,689
1945	14,156,328	14,730,689	8,250,000	5,700,000	494,733	14,442,284	0	0	14,442,284
1946	11,111,253	14,442,284	8,250,000	5,700,000	450,358	11,153,179	0	0	11,153,179
1947	16,455,286	11,153,179	8,250,000	5,700,000	435,237	13,223,228	0	0	13,223,228
1948	15,155,094	13,223,228	8,250,000	5,700,000	470,031	13,958,290	0	0	13,958,290
1949	16,949,384	13,958,290	8,250,000	5,700,000	510,027	16,447,648	0	0	16,447,648
1950	13,156,216	16,447,648	8,250,000	5,700,000	524,552	15,129,312	0	0	15,129,312
1951	12,521,694	15,129,312	8,250,000	5,700,000	484,473	13,216,532	0	0	13,216,532
1952	20,821,222	13,216,532	8,250,000	5,700,000	539,288	19,548,466	0	0	19,548,466
1953	11,181,219	19,548,466	8,250,000	5,700,000	576,336	16,203,349	0	0	16,203,349
1954	8,511,902	16,203,349	8,250,000	5,700,000	461,664	10,303,587	0	0	10,303,587
1955	9,429,708	10,303,587	8,250,000	5,700,000	328,343	5,454,953	0	0	5,454,953
1956	11,442,674	5,454,953	8,250,000	5,700,000	234,195	2,713,432	0	0	2,713,432
1957	21,516,763	2,713,432	8,250,000	5,700,000	290,444	9,989,750	0	0	9,989,750
1958	15,878,311	9,989,750	8,250,000	5,700,000	399,660	11,518,401	0	0	11,518,401
1959	9,613,969	11,518,401	8,250,000	5,700,000	360,368	6,822,003	0	0	6,822,003
1960	11,539,960	6,822,003	8,250,000	5,700,000	268,885	4,143,078	0	0	4,143,078
1961	10,026,059	4,143,078	8,250,000	5,700,000	184,693	34,443	0	0	34,443
1962	17,393,409	34,443	8,250,000	5,700,000	174,280	3,303,572	0	0	3,303,572
1963	8,856,700	3,303,572	8,250,000	5,700,000	173,853	-1,963,581	0	1,963,581	0
1964	10,879,386	0	8,250,000	5,700,000	132,876	-3,203,490	0	3,203,490	0
1965	19,890,827	0	8,250,000	5,700,000	204,034	5,736,793	0	0	5,736,793
1966	10,695,644	5,736,793	8,250,000	5,700,000	231,949	2,250,488	0	0	2,250,488
1967	11,686,630	2,250,488	8,250,000	5,700,000	160,791	-173,673	0	173,673	0
1968	13,755,732	0	8,250,000	5,700,000	132,876	-327,144	0	327,144	0
1969	15,287,959	0	8,250,000	5,700,000	147,641	1,190,318	0	0	1,190,318
1970	15,359,936	1,190,318	8,250,000	5,700,000	177,690	2,422,565	0	0	2,422,565
1971	15,395,233	2,422,565	8,250,000	5,700,000	208,317	3,659,481	0	0	3,659,481
1972	13,064,452	3,659,481	8,250,000	5,700,000	210,069	2,563,863	0	0	2,563,863
1973	18,502,616	2,563,863	8,250,000	5,700,000	249,850	6,866,628	0	0	6,866,628
1974	13,193,842	6,866,628	8,250,000	5,700,000	290,242	5,820,229	0	0	5,820,229
1975	16,930,796	5,820,229	8,250,000	5,700,000	310,386	8,490,639	0	0	8,490,639
1976	11,256,711	8,490,639	8,250,000	5,700,000	306,303	5,491,048	0	0	5,491,048
1977	5,513,497	5,491,048	8,250,000	5,700,000	200,986	-3,146,442	0	3,146,442	0
1978	15,282,722	0	8,250,000	5,700,000	147,576	1,185,145	0	0	1,185,145
1979	17,770,170	1,185,145	8,250,000	5,700,000	207,093	4,798,222	0	0	4,798,222
1980	17,870,783	4,798,222	8,250,000	5,700,000	296,859	8,422,146	0	0	8,422,146
1981	9,015,200	8,422,146	8,250,000	5,700,000	277,162	3,210,184	0	0	3,210,184
1982	17,489,400	3,210,184	8,250,000	5,700,000	253,274	6,496,310	0	0	6,496,310
1983	24,361,989	6,496,310	8,250,000	5,700,000	417,998	16,490,300	0	0	16,490,300
1984	25,359,376	16,490,300	8,250,000	5,700,000	645,626	27,254,050	2,406,347	0	24,847,704
1985	21,246,109	24,847,704	8,250,000	5,700,000	749,290	31,394,522	6,546,818	0	24,847,704
1986	23,013,446	24,847,704	8,250,000	5,700,000	749,290	33,161,860	8,314,156	0	24,847,704
1987	15,640,478	24,847,704	8,250,000	5,700,000	749,290	25,788,892	941,188	0	24,847,704
1988	11,456,357	24,847,704	8,250,000	5,700,000	709,558	21,644,502	0	0	21,644,502
1989	9,921,847	21,644,502	8,250,000	5,700,000	612,267	17,004,082	0	0	17,004,082
1990	9,639,803	17,004,082	8,250,000	5,700,000	495,104	12,198,781	0	0	12,198,781
1991	12,170,021	12,198,781	8,250,000	5,700,000	408,356	10,010,446	0	0	10,010,446
1992	10,895,580	10,010,446	8,250,000	5,700,000	339,119	6,616,907	0	0	6,616,907
1993	18,160,118	6,616,907	8,250,000	5,700,000	344,969	10,482,056	0	0	10,482,056
1994	11,125,503	10,482,056	8,250,000	5,700,000	353,492	7,304,066	0	0	7,304,066
1995	20,047,166	7,304,066	8,250,000	5,700,000	384,927	13,016,305	0	0	13,016,305
1996	14,502,293	13,016,305	8,250,000	5,700,000	456,963	13,111,635	0	0	13,111,635
1997	21,622,438	13,111,635	8,250,000	5,700,000	546,534	20,237,539	0	0	20,237,539
1998	16,798,378	20,237,539	8,250,000	5,700,000	662,042	22,423,876	0	0	22,423,876
1999	15,934,210	22,423,876	8,250,000	5,700,000	705,027	23,703,058	0	0	23,703,058
2000	10,646,526	23,703,058	8,250,000	5,700,000	671,588	19,727,996	0	0	19,727,996
Total								8,814,330	
Averages:									
1953-1977	13,072,157	5,381,083	8,250,000	5,700,000	256,669		0	352,573	4,599,145
1931-1977	13,593,225	9,343,528	8,250,000	5,700,000	358,126		0	187,539	8,816,165
1906-2000	15,286,491	14,422,306	8,250,000	5,700,000	489,992		993,173	92,782	14,368,415

Variables

Storage	25,665,339 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	24,847,704 af
UB Demand Level	5,700,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	489,992 af/yr
Total Yield w/ CRSP evap	6,189,992 af/yr

Shortage Years	Shortage
1961	0 af
1963	1,963,581 af
1964	3,203,490 af
1967	173,673 af
1968	327,144 af
1977	3,146,442 af

NM allocation (w/o evap) 635,625 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	5,956,669 af/yr
1931-1977	6,058,126 af/yr
1906-2000	6,189,992 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 4: Flows Adjusted for MBC Method with SCS Precip., CRSP Active plus All Other UB Live Storage, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	29,530,030	8,250,000	5,800,000	749,290	33,296,561	3,766,531	0	29,530,030
1907	21,217,494	29,530,030	8,250,000	5,800,000	749,290	35,948,234	6,418,204	0	29,530,030
1908	12,234,617	29,530,030	8,250,000	5,800,000	719,093	26,995,554	0	0	26,995,554
1909	22,372,101	26,995,554	8,250,000	5,800,000	719,093	34,598,562	5,068,531	0	29,530,030
1910	14,666,416	29,530,030	8,250,000	5,800,000	748,887	29,397,559	0	0	29,397,559
1911	15,515,529	29,397,559	8,250,000	5,800,000	748,887	30,114,201	584,170	0	29,530,030
1912	18,639,210	29,530,030	8,250,000	5,800,000	749,290	33,369,950	3,839,920	0	29,530,030
1913	14,552,173	29,530,030	8,250,000	5,800,000	747,488	29,284,716	0	0	29,284,716
1914	21,370,614	29,284,716	8,250,000	5,800,000	747,488	35,857,842	6,327,812	0	29,530,030
1915	13,639,077	29,530,030	8,250,000	5,800,000	736,301	28,382,807	0	0	28,382,807
1916	20,158,692	28,382,807	8,250,000	5,800,000	736,301	33,755,198	4,225,168	0	29,530,030
1917	22,958,604	29,530,030	8,250,000	5,800,000	749,290	37,689,344	8,159,314	0	29,530,030
1918	15,881,739	29,530,030	8,250,000	5,800,000	749,290	30,612,479	1,082,449	0	29,530,030
1919	12,667,169	29,530,030	8,250,000	5,800,000	724,393	27,422,807	0	0	27,422,807
1920	22,303,432	27,422,807	8,250,000	5,800,000	724,393	34,951,846	5,421,815	0	29,530,030
1921	22,542,581	29,530,030	8,250,000	5,800,000	749,290	37,273,321	7,743,291	0	29,530,030
1922	18,462,998	29,530,030	8,250,000	5,800,000	749,290	33,193,738	3,663,708	0	29,530,030
1923	19,039,846	29,530,030	8,250,000	5,800,000	749,290	33,770,586	4,240,556	0	29,530,030
1924	13,893,598	29,530,030	8,250,000	5,800,000	739,419	28,634,209	0	0	28,634,209
1925	14,446,501	28,634,209	8,250,000	5,800,000	726,692	28,304,018	0	0	28,304,018
1926	15,229,531	28,304,018	8,250,000	5,800,000	730,645	28,752,904	0	0	28,752,904
1927	19,555,012	28,752,904	8,250,000	5,800,000	743,372	33,514,544	3,984,513	0	29,530,030
1928	16,970,134	29,530,030	8,250,000	5,800,000	749,290	31,700,874	2,170,844	0	29,530,030
1929	21,845,385	29,530,030	8,250,000	5,800,000	749,290	36,576,125	7,046,095	0	29,530,030
1930	14,636,841	29,530,030	8,250,000	5,800,000	748,525	29,368,346	0	0	29,368,346
1931	8,489,934	29,368,346	8,250,000	5,800,000	671,702	23,136,578	0	0	23,136,578
1932	17,437,987	23,136,578	8,250,000	5,800,000	631,082	25,893,483	0	0	25,893,483
1933	12,199,300	25,893,483	8,250,000	5,800,000	636,903	23,405,881	0	0	23,405,881
1934	6,193,992	23,405,881	8,250,000	5,800,000	504,821	15,045,051	0	0	15,045,051
1935	12,646,149	15,045,051	8,250,000	5,800,000	381,451	13,259,750	0	0	13,259,750
1936	14,664,673	13,259,750	8,250,000	5,800,000	364,885	13,509,537	0	0	13,509,537
1937	14,321,856	13,509,537	8,250,000	5,800,000	369,256	13,412,137	0	0	13,412,137
1938	18,164,119	13,412,137	8,250,000	5,800,000	416,395	17,109,861	0	0	17,109,861
1939	11,179,859	17,109,861	8,250,000	5,800,000	423,883	13,815,837	0	0	13,815,837
1940	9,947,457	13,815,837	8,250,000	5,800,000	330,518	9,382,775	0	0	9,382,775
1941	20,132,478	9,382,775	8,250,000	5,800,000	349,128	15,116,126	0	0	15,116,126
1942	17,240,936	15,116,126	8,250,000	5,800,000	456,640	17,850,422	0	0	17,850,422
1943	13,747,201	17,850,422	8,250,000	5,800,000	483,286	17,064,337	0	0	17,064,337
1944	15,385,222	17,064,337	8,250,000	5,800,000	486,543	17,913,016	0	0	17,913,016
1945	14,156,328	17,913,016	8,250,000	5,800,000	494,733	17,524,610	0	0	17,524,610
1946	11,111,253	17,524,610	8,250,000	5,800,000	450,358	14,135,505	0	0	14,135,505
1947	16,455,286	14,135,505	8,250,000	5,800,000	435,237	16,105,554	0	0	16,105,554
1948	15,155,094	16,105,554	8,250,000	5,800,000	470,031	16,740,617	0	0	16,740,617
1949	16,949,384	16,740,617	8,250,000	5,800,000	510,027	19,129,974	0	0	19,129,974
1950	13,156,216	19,129,974	8,250,000	5,800,000	524,552	17,711,638	0	0	17,711,638
1951	12,521,694	17,711,638	8,250,000	5,800,000	484,473	15,698,859	0	0	15,698,859
1952	20,821,222	15,698,859	8,250,000	5,800,000	539,288	21,930,793	0	0	21,930,793
1953	11,181,219	21,930,793	8,250,000	5,800,000	576,336	18,485,676	0	0	18,485,676
1954	8,511,902	18,485,676	8,250,000	5,800,000	461,664	12,485,914	0	0	12,485,914
1955	9,429,708	12,485,914	8,250,000	5,800,000	328,343	7,537,279	0	0	7,537,279
1956	11,442,674	7,537,279	8,250,000	5,800,000	234,195	4,695,758	0	0	4,695,758
1957	21,516,763	4,695,758	8,250,000	5,800,000	290,444	11,872,077	0	0	11,872,077
1958	15,878,311	11,872,077	8,250,000	5,800,000	399,660	13,300,728	0	0	13,300,728
1959	9,613,969	13,300,728	8,250,000	5,800,000	360,368	8,504,329	0	0	8,504,329
1960	11,539,960	8,504,329	8,250,000	5,800,000	268,885	5,725,404	0	0	5,725,404
1961	10,026,059	5,725,404	8,250,000	5,800,000	184,693	1,516,770	0	0	1,516,770
1962	17,393,409	1,516,770	8,250,000	5,800,000	174,280	4,685,899	0	0	4,685,899
1963	8,856,700	4,685,899	8,250,000	5,800,000	173,853	-681,254	0	681,254	0
1964	10,879,386	0	8,250,000	5,800,000	132,876	-3,303,490	0	3,303,490	0
1965	19,890,827	0	8,250,000	5,800,000	204,034	5,636,793	0	0	5,636,793
1966	10,695,644	5,636,793	8,250,000	5,800,000	231,949	2,050,488	0	0	2,050,488
1967	11,686,630	2,050,488	8,250,000	5,800,000	160,791	-473,673	0	473,673	0
1968	13,755,732	0	8,250,000	5,800,000	132,876	-427,144	0	427,144	0
1969	15,287,959	0	8,250,000	5,800,000	147,641	1,090,318	0	0	1,090,318
1970	15,359,936	1,090,318	8,250,000	5,800,000	177,690	2,222,565	0	0	2,222,565
1971	15,395,233	2,222,565	8,250,000	5,800,000	208,317	3,359,481	0	0	3,359,481
1972	13,064,452	3,359,481	8,250,000	5,800,000	210,069	2,163,863	0	0	2,163,863
1973	18,502,616	2,163,863	8,250,000	5,800,000	249,850	6,366,628	0	0	6,366,628
1974	13,193,842	6,366,628	8,250,000	5,800,000	290,242	5,220,229	0	0	5,220,229
1975	16,930,796	5,220,229	8,250,000	5,800,000	310,386	7,790,639	0	0	7,790,639
1976	11,256,711	7,790,639	8,250,000	5,800,000	306,303	4,691,048	0	0	4,691,048
1977	5,513,497	4,691,048	8,250,000	5,800,000	200,986	-4,046,442	0	4,046,442	0
1978	15,282,722	0	8,250,000	5,800,000	147,576	1,085,145	0	0	1,085,145
1979	17,770,170	1,085,145	8,250,000	5,800,000	207,093	4,598,222	0	0	4,598,222
1980	17,870,783	4,598,222	8,250,000	5,800,000	296,859	8,122,146	0	0	8,122,146
1981	9,015,200	8,122,146	8,250,000	5,800,000	277,162	2,810,184	0	0	2,810,184
1982	17,489,400	2,810,184	8,250,000	5,800,000	253,274	5,996,310	0	0	5,996,310
1983	24,361,989	5,996,310	8,250,000	5,800,000	417,998	15,890,300	0	0	15,890,300
1984	25,359,376	15,890,300	8,250,000	5,800,000	645,626	26,554,050	0	0	26,554,050
1985	21,246,109	26,554,050	8,250,000	5,800,000	749,290	33,000,869	3,470,838	0	29,530,030
1986	23,013,446	29,530,030	8,250,000	5,800,000	749,290	37,744,186	8,214,156	0	29,530,030
1987	15,640,478	29,530,030	8,250,000	5,800,000	749,290	30,371,219	841,188	0	29,530,030
1988	11,456,357	29,530,030	8,250,000	5,800,000	709,558	26,226,829	0	0	26,226,829
1989	9,921,847	26,226,829	8,250,000	5,800,000	612,267	21,486,408	0	0	21,486,408
1990	9,639,803	21,486,408	8,250,000	5,800,000	495,104	16,581,108	0	0	16,581,108
1991	12,170,021	16,581,108	8,250,000	5,800,000	408,356	14,292,772	0	0	14,292,772
1992	10,895,580	14,292,772	8,250,000	5,800,000	339,119	10,799,233	0	0	10,799,233
1993	18,160,118	10,799,233	8,250,000	5,800,000	344,969	14,564,382	0	0	14,564,382
1994	11,125,503	14,564,382	8,250,000	5,800,000	353,492	11,286,392	0	0	11,286,392
1995	20,047,166	11,286,392	8,250,000	5,800,000	384,927	16,898,632	0	0	16,898,632
1996	14,502,293	16,898,632	8,250,000	5,800,000	456,963	16,893,962	0	0	16,893,962
1997	21,622,438	16,893,962	8,250,000	5,800,000	546,534	23,919,866	0	0	23,919,866
1998	16,798,378	23,919,866	8,250,000	5,800,000	662,042	26,006,202	0	0	26,006,202
1999	15,934,210	26,006,202	8,250,000	5,800,000	705,027	27,185,385	0	0	27,185,385
2000	10,646,526	27,185,385	8,250,000	5,800,000	671,588	23,110,323	0	0	23,110,323
Total								8,932,003	
Averages:									
1953-1977	13,072,157		8,250,000	5,800,000	256,669		0	357,280	5,176,075
1931-1977	13,593,225		8,250,000	5,800,000	358,126		0	190,043	10,729,664
1906-2000	15,286,491		8,250,000	5,800,000	489,992		908,096	94,021	17,223,322

Variables

Storage	30,167,576 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,530,030 af
UB Demand Level	5,800,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	489,992 af/yr
Total Yield w/ CRSP evap	6,289,992 af/yr

Shortage Years	Shortage
1961	0 af
1963	681,254 af
1964	3,303,490 af
1967	473,673 af
1968	427,144 af
1977	4,046,442 af

NM allocation(w/o evap) 646,875 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,056,669 af/yr
1931-1977	6,158,126 af/yr
1906-2000	6,289,992 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 5: Natural Flows Adjusted for Modified B-C Method with SCS Eff. Precip., CRSP Active Storage Only, Variable Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Percent of Average CR Natural Flow	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Average Upper Basin Demand Level	Depletion Factor after Tipton-Kalmbach	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	1.215	24,847,704	8,250,000	5,700,000	1.107	6,311,396	749,290	28,102,839	3,255,135	0	24,847,704
1907	21,217,494	1.388	24,847,704	8,250,000	5,700,000	1.194	6,805,771	749,290	30,260,137	5,412,433	0	24,847,704
1908	12,234,617	0.800	24,847,704	8,250,000	5,700,000	0.900	5,131,011	726,065	22,975,245	0	0	22,975,245
1909	22,372,101	1.464	22,975,245	8,250,000	5,700,000	1.232	7,021,035	726,065	29,350,247	4,502,543	0	24,847,704
1910	14,666,416	0.959	24,847,704	8,250,000	5,700,000	0.980	5,584,394	749,290	24,930,436	82,732	0	24,847,704
1911	15,515,529	1.015	24,847,704	8,250,000	5,700,000	1.007	5,742,702	749,290	25,621,241	773,537	0	24,847,704
1912	18,639,210	1.219	24,847,704	8,250,000	5,700,000	1.110	6,325,078	749,290	28,162,546	3,314,842	0	24,847,704
1913	14,552,173	0.952	24,847,704	8,250,000	5,700,000	0.976	5,563,094	749,165	24,837,617	0	0	24,837,617
1914	21,370,614	1.398	24,837,617	8,250,000	5,700,000	1.199	6,834,319	749,165	30,374,748	5,527,044	0	24,847,704
1915	13,639,077	0.892	24,847,704	8,250,000	5,700,000	0.946	5,392,858	740,064	24,103,860	0	0	24,103,860
1916	20,158,692	1.319	24,103,860	8,250,000	5,700,000	1.159	6,608,369	740,064	28,664,119	3,816,415	0	24,847,704
1917	22,958,604	1.502	24,847,704	8,250,000	5,700,000	1.251	7,130,382	749,290	31,676,636	6,828,932	0	24,847,704
1918	15,881,739	1.039	24,847,704	8,250,000	5,700,000	1.019	5,810,978	749,290	25,919,175	1,071,471	0	24,847,704
1919	12,667,169	0.829	24,847,704	8,250,000	5,700,000	0.914	5,211,656	730,376	23,322,841	0	0	23,322,841
1920	22,303,432	1.459	23,322,841	8,250,000	5,700,000	1.230	7,008,232	730,376	29,637,664	4,789,961	0	24,847,704
1921	22,542,581	1.475	24,847,704	8,250,000	5,700,000	1.237	7,052,819	749,290	31,338,176	6,490,472	0	24,847,704
1922	18,462,998	1.208	24,847,704	8,250,000	5,700,000	1.104	6,292,225	749,290	28,019,186	3,171,483	0	24,847,704
1923	19,039,846	1.246	24,847,704	8,250,000	5,700,000	1.123	6,399,772	749,290	28,488,487	3,640,783	0	24,847,704
1924	13,893,598	0.909	24,847,704	8,250,000	5,700,000	0.954	5,440,310	742,601	24,308,391	0	0	24,308,391
1925	14,446,501	0.945	24,308,391	8,250,000	5,700,000	0.973	5,543,393	734,897	24,226,602	0	0	24,226,602
1926	15,229,531	0.996	24,226,602	8,250,000	5,700,000	0.998	5,689,381	740,697	24,776,055	0	0	24,776,055
1927	19,555,012	1.279	24,776,055	8,250,000	5,700,000	1.140	6,495,819	748,401	28,836,846	3,989,143	0	24,847,704
1928	16,970,134	1.110	24,847,704	8,250,000	5,700,000	1.055	6,013,897	749,290	26,804,651	1,956,947	0	24,847,704
1929	21,845,385	1.429	24,847,704	8,250,000	5,700,000	1.215	6,922,835	749,290	30,770,964	5,923,260	0	24,847,704
1930	14,636,841	0.958	24,847,704	8,250,000	5,700,000	0.979	5,578,880	749,290	24,906,375	58,671	0	24,847,704
1931	8,489,934	0.555	24,847,704	8,250,000	5,700,000	0.778	4,432,856	688,739	19,966,043	0	0	19,966,043
1932	17,437,987	1.141	19,966,043	8,250,000	5,700,000	1.070	6,101,123	658,311	22,394,596	0	0	22,394,596
1933	12,199,300	0.798	22,394,596	8,250,000	5,700,000	0.899	5,124,427	665,602	20,553,867	0	0	20,553,867
1934	6,193,992	0.405	20,553,867	8,250,000	5,700,000	0.703	4,004,802	560,639	13,932,418	0	0	13,932,418
1935	12,646,149	0.827	13,932,418	8,250,000	5,700,000	0.914	5,207,737	462,701	12,658,129	0	0	12,658,129
1936	14,664,673	0.959	12,658,129	8,250,000	5,700,000	0.980	5,584,069	451,596	13,037,137	0	0	13,037,137
1937	14,321,856	0.937	13,037,137	8,250,000	5,700,000	0.968	5,520,154	457,466	13,131,372	0	0	13,131,372
1938	18,164,119	1.188	13,131,372	8,250,000	5,700,000	1.094	6,236,503	498,074	16,310,915	0	0	16,310,915
1939	11,179,859	0.731	16,310,915	8,250,000	5,700,000	0.866	4,934,363	506,368	13,800,043	0	0	13,800,043
1940	9,947,457	0.651	13,800,043	8,250,000	5,700,000	0.825	4,704,595	432,558	10,360,347	0	0	10,360,347
1941	20,132,478	1.317	10,360,347	8,250,000	5,700,000	1.159	6,603,482	449,793	15,189,551	0	0	15,189,551
1942	17,240,936	1.128	15,189,551	8,250,000	5,700,000	1.064	6,064,385	539,305	17,576,797	0	0	17,576,797
1943	13,747,201	0.899	17,576,797	8,250,000	5,700,000	0.950	5,413,016	562,977	17,098,005	0	0	17,098,005
1944	15,385,222	1.006	17,098,005	8,250,000	5,700,000	1.003	5,718,407	567,572	17,947,247	0	0	17,947,247
1945	14,156,328	0.926	17,947,247	8,250,000	5,700,000	0.963	5,489,293	576,132	17,788,150	0	0	17,788,150
1946	11,111,253	0.727	17,788,150	8,250,000	5,700,000	0.863	4,921,572	541,882	15,185,949	0	0	15,185,949
1947	16,455,286	1.076	15,185,949	8,250,000	5,700,000	1.038	5,917,909	531,385	16,941,940	0	0	16,941,940
1948	15,155,094	0.991	16,941,940	8,250,000	5,700,000	0.996	5,675,503	561,454	17,610,078	0	0	17,610,078
1949	16,949,384	1.109	17,610,078	8,250,000	5,700,000	1.054	6,010,028	595,711	19,703,723	0	0	19,703,723
1950	13,156,216	0.861	19,703,723	8,250,000	5,700,000	0.930	5,302,833	609,204	18,697,901	0	0	18,697,901
1951	12,521,694	0.819	18,697,901	8,250,000	5,700,000	0.910	5,184,534	578,233	17,206,829	0	0	17,206,829
1952	20,821,222	1.362	17,206,829	8,250,000	5,700,000	1.181	6,731,891	624,423	22,421,738	0	0	22,421,738
1953	11,181,219	0.731	22,421,738	8,250,000	5,700,000	0.866	4,934,617	656,119	19,762,220	0	0	19,762,220
1954	8,511,902	0.557	19,762,220	8,250,000	5,700,000	0.778	4,436,952	564,344	15,022,827	0	0	15,022,827
1955	9,429,708	0.617	15,022,827	8,250,000	5,700,000	0.808	4,608,067	457,360	11,137,108	0	0	11,137,108
1956	11,442,674	0.749	11,137,108	8,250,000	5,700,000	0.874	4,983,362	382,210	8,964,210	0	0	8,964,210
1957	21,516,763	1.408	8,964,210	8,250,000	5,700,000	1.204	6,861,567	429,380	14,940,026	0	0	14,940,026
1958	15,878,311	1.039	14,940,026	8,250,000	5,700,000	1.019	5,810,338	519,608	16,238,390	0	0	16,238,390
1959	9,613,969	0.629	16,238,390	8,250,000	5,700,000	0.814	4,642,420	488,982	12,470,957	0	0	12,470,957
1960	11,539,960	0.755	12,470,957	8,250,000	5,700,000	0.877	5,001,500	415,864	10,343,553	0	0	10,343,553
1961	10,026,059	0.656	10,343,553	8,250,000	5,700,000	0.828	4,719,250	348,644	7,051,718	0	0	7,051,718
1962	17,393,409	1.138	7,051,718	8,250,000	5,700,000	1.069	6,092,812	341,417	9,760,898	0	0	9,760,898
1963	8,856,700	0.579	9,760,898	8,250,000	5,700,000	0.790	4,501,235	322,711	5,543,651	0	0	5,543,651
1964	10,879,386	0.712	5,543,651	8,250,000	5,700,000	0.856	4,878,343	239,534	3,055,160	0	0	3,055,160
1965	19,890,827	1.301	3,055,160	8,250,000	5,700,000	1.151	6,558,428	268,380	7,869,179	0	0	7,869,179
1966	10,695,644	0.700	7,869,179	8,250,000	5,700,000	0.850	4,844,087	294,687	5,176,049	0	0	5,176,049
1967	11,686,630	0.765	5,176,049	8,250,000	5,700,000	0.882	5,028,845	238,573	3,345,261	0	0	3,345,261
1968	13,755,732	0.900	3,345,261	8,250,000	5,700,000	0.950	5,414,607	214,336	3,222,050	0	0	3,222,050
1969	15,287,959	1.000	3,222,050	8,250,000	5,700,000	1.000	5,700,274	226,589	4,333,146	0	0	4,333,146
1970	15,359,936	1.005	4,333,146	8,250,000	5,700,000	1.002	5,713,693	254,533	5,474,856	0	0	5,474,856
1971	15,395,233	1.007	5,474,856	8,250,000	5,700,000	1.004	5,720,274	282,861	6,616,954	0	0	6,616,954
1972	13,064,452	0.855	6,616,954	8,250,000	5,700,000	0.927	5,285,725	287,614	5,858,066	0	0	5,858,066
1973	18,502,616	1.210	5,858,066	8,250,000	5,700,000	1.105	6,299,612	323,224	9,487,846	0	0	9,487,846
1974	13,193,842	0.863	9,487,846	8,250,000	5,700,000	0.932	5,309,849	359,252	8,762,588	0	0	8,762,588
1975	16,930,796	1.108	8,762,588	8,250,000	5,700,000	1.054	6,006,563	378,729	11,058,093	0	0	11,058,093
1976	11,256,711	0.736	11,058,093	8,250,000	5,700,000	0.868	4,948,691	378,420	8,737,693	0	0	8,737,693
1977	5,513,497	0.361	8,737,693	8,250,000	5,700,000	0.680	3,877,931	264,315	1,858,943	0	0	1,858,943
1978	15,282,722	1.000	1,858,943	8,250,000	5,700,000	1.000	5,699,297	193,136	2,999,231	0	0	2,999,231
1979	17,770,170	1.162	2,999,231	8,250,000	5,700,000	1.081	6,163,055	245,871	6,110,474	0	0	6,110,474
1980	17,870,783	1.169	6,110,474	8,250,000	5,700,000	1.085	6,181,813	323,111	9,226,333	0	0	9,226,333
1981	9,015,200	0.590	9,226,333	8,250,000	5,700,000	0.795	4,530,786	311,192	5,149,554	0	0	5,149,554
1982	17,489,400	1.144	5,149,554	8,250,000	5,700,000	1.072	6,110,708	295,764	7,982,482	0	0	7,982,482
1983	24,361,989	1.594	7,982,482	8,250,000	5,700,000	1.297	7,392,028	433,685	16,268,758	0	0	16,268,758
1984	25,359,376	1.659	16,268,758	8,250,000	5,700,000	1.329	7,577,980	642,878	25,157,276	309,572	0	24,847,704
1985	21,246,109	1.390	24,847,704	8,250,000	5,700,000	1.195	6,811,106	749,290	30,283,416	5,435,712	0	24,847,704
1986	23,013,446	1.505	24,847,704	8,250,000	5,700,000	1.253	7,140,607	749,290	31,721,253	6,873,549	0	24,847,704
1987	15,640,478	1.023	24,847,704	8,250,000	5,700,000	1.012	5,765,997	749,290	25,722,895	875,191	0	24,847,704
1988	11,456,357	0.749	24,847,704	8,250,000	5,700,000	0.875	4,985,913	718,307	22,349,840	0	0	22,349,840
1989	9,921,847	0.649	22,349,840	8,250,000	5,700,000	0.825	4,699,820	641,805	18,680,062	0	0	18,680,062
1990	9,639,803	0.631	18,680,062	8,250,000	5,700,000	0.815	4,647,237	549,070	14,873,558	0	0	14,873,558
1991	12,170,021	0.796	14,873,558	8,250,000	5,700,000	0.898	5,118,968	481,017	13,193,594	0	0	13,193,594
1992	10,895,580	0.713	13,193,594	8,250,000	5,700,000	0.856	4,881,362	427,148	10,530,664	0	0	10,530,664
1993	18,160,118	1.188	10,530,664	8,250,000	5,700,000	1.094	6,235,757	434,307	13,770,718	0	0	13,770,718
1994	11,125,503	0.728	13,770,718	8,250,000	5,700,000	0.864	4,924,229	443,582	11,278,410	0	0	11,278,410
1995	20,047,166	1.311	11,278,410	8,250,000	5,700,000	1.156	6,587,576	471,439	16,016,562	0	0	16,016,562
1996	14,502,293	0.949	16,016,562	8,250,000	5,700,000	0.974	5,553,795	532,272	16,182,788	0	0	16,182,788
1997	21,622,438	1.414	16,182,788	8,250,000	5,700,000	1.207	6,881,269	607,316	22,066,641	0	0	22,066,641
1998	16,798,378	1.099	22,066,641	8,250,000	5,700,000	1.049	5,981,875	703,408	23,929,736	0	0	23,929,736
1999	15,934,210	1.042	23,929,736	8,250,000	5,700,000	1.021	5,820,760	737,904	25,055,282	207,578	0	24,847,704
2000	10,646,526	0.696	24,847,704	8,250,000	5,700,000	0.848	4,834,929	710,235	21,699,066	0	0	21,699,066
Total											0	
Averages:												
1953-1977	13,072,157	0.855	9,466,170	8,250,000	5,700,000	0.928	5,287,162	357,508		0	0	8,643,658
1931-1977	13,593,225	0.889	12,948,787	8,250,000	5,700,000	0.945	5,384,309	448,039		0	0	12,459,664
1906-2000	15,286,491	1.000	16,643,254	8,250,000	5,700,000	1.000	5,700,000	545,346		824,288	0	16,610,110

Variables

Storage	25,665,339 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	24,847,704 af
UB Demand Level	5,700,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	545,346 af/yr
Total Yield w/ CRSP evap	6,245,346 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	0 af

NM allocation (w/o evap)	635,625 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,057,508 af/yr
1931-1977	6,148,039 af/yr
1906-2000	6,245,346 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 6: Natural Flows Adjusted for MBC Method with SCS Eff. Precip., CRSP Active plus All Other Upper Basin Live Storage, Variable Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Percent of Average CR Natural Flow	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Average Upper Basin Demand Level	Depletion Factor after Tipton-Kalmbach	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	1.215	29,530,030	8,250,000	5,800,000	1.107	6,422,122	749,290	32,674,439	3,144,409	0	29,530,030
1907	21,217,494	1.388	29,530,030	8,250,000	5,800,000	1.194	6,925,171	749,290	34,823,064	5,293,033	0	29,530,030
1908	12,234,617	0.800	29,530,030	8,250,000	5,800,000	0.900	5,221,029	726,065	27,567,554	0	0	27,567,554
1909	22,372,101	1.464	27,567,554	8,250,000	5,800,000	1.232	7,144,211	726,065	33,819,379	4,289,349	0	29,530,030
1910	14,666,416	0.959	29,530,030	8,250,000	5,800,000	0.980	5,682,366	749,290	29,514,791	0	0	29,514,791
1911	15,515,529	1.015	29,514,791	8,250,000	5,800,000	1.007	5,843,451	749,290	30,187,578	657,548	0	29,530,030
1912	18,639,210	1.219	29,530,030	8,250,000	5,800,000	1.110	6,436,044	749,290	32,733,906	3,203,875	0	29,530,030
1913	14,552,173	0.952	29,530,030	8,250,000	5,800,000	0.976	5,660,693	749,165	29,422,346	0	0	29,422,346
1914	21,370,614	1.398	29,422,346	8,250,000	5,800,000	1.199	6,954,219	749,165	34,839,576	5,309,545	0	29,530,030
1915	13,639,077	0.892	29,530,030	8,250,000	5,800,000	0.946	5,487,469	740,064	28,691,575	0	0	28,691,575
1916	20,158,692	1.319	28,691,575	8,250,000	5,800,000	1.159	6,724,305	740,064	33,135,898	3,605,867	0	29,530,030
1917	22,958,604	1.502	29,530,030	8,250,000	5,800,000	1.251	7,255,477	749,290	36,233,868	6,703,837	0	29,530,030
1918	15,881,739	1.039	29,530,030	8,250,000	5,800,000	1.019	5,912,925	749,290	30,499,555	969,524	0	29,530,030
1919	12,667,169	0.829	29,530,030	8,250,000	5,800,000	0.914	5,303,089	730,376	27,913,735	0	0	27,913,735
1920	22,303,432	1.459	27,913,735	8,250,000	5,800,000	1.230	7,131,184	730,376	34,105,607	4,575,576	0	29,530,030
1921	22,542,581	1.475	29,530,030	8,250,000	5,800,000	1.237	7,176,553	749,290	35,896,768	6,366,738	0	29,530,030
1922	18,462,998	1.208	29,530,030	8,250,000	5,800,000	1.104	6,402,615	749,290	32,591,123	3,061,093	0	29,530,030
1923	19,039,846	1.246	29,530,030	8,250,000	5,800,000	1.123	6,512,049	749,290	33,058,537	3,528,507	0	29,530,030
1924	13,893,598	0.909	29,530,030	8,250,000	5,800,000	0.954	5,535,754	742,601	28,895,273	0	0	28,895,273
1925	14,446,501	0.945	28,895,273	8,250,000	5,800,000	0.973	5,640,646	734,897	28,716,232	0	0	28,716,232
1926	15,229,531	0.996	28,716,232	8,250,000	5,800,000	0.998	5,789,194	740,697	29,165,872	0	0	29,165,872
1927	19,555,012	1.279	29,165,872	8,250,000	5,800,000	1.140	6,609,781	748,401	33,112,701	3,582,671	0	29,530,030
1928	16,970,134	1.110	29,530,030	8,250,000	5,800,000	1.055	6,119,404	749,290	31,381,470	1,851,440	0	29,530,030
1929	21,845,385	1.429	29,530,030	8,250,000	5,800,000	1.215	7,044,288	749,290	35,331,837	5,801,807	0	29,530,030
1930	14,636,841	0.958	29,530,030	8,250,000	5,800,000	0.979	5,676,755	749,290	29,490,826	0	0	29,490,826
1931	8,489,934	0.555	29,490,826	8,250,000	5,800,000	0.778	4,510,625	688,739	24,531,396	0	0	24,531,396
1932	17,437,987	1.141	24,531,396	8,250,000	5,800,000	1.070	6,208,160	658,311	26,852,912	0	0	26,852,912
1933	12,199,300	0.798	26,852,912	8,250,000	5,800,000	0.899	5,214,329	665,602	24,922,281	0	0	24,922,281
1934	6,193,992	0.405	24,922,281	8,250,000	5,800,000	0.703	4,075,062	560,639	18,230,572	0	0	18,230,572
1935	12,646,149	0.827	18,230,572	8,250,000	5,800,000	0.914	5,299,101	462,701	16,864,919	0	0	16,864,919
1936	14,664,673	0.959	16,864,919	8,250,000	5,800,000	0.980	5,682,035	451,596	17,145,961	0	0	17,145,961
1937	14,321,856	0.937	17,145,961	8,250,000	5,800,000	0.968	5,616,999	457,466	17,143,351	0	0	17,143,351
1938	18,164,119	1.188	17,143,351	8,250,000	5,800,000	1.094	6,345,915	498,074	20,213,482	0	0	20,213,482
1939	11,179,859	0.731	20,213,482	8,250,000	5,800,000	0.866	5,020,931	506,368	17,616,042	0	0	17,616,042
1940	9,947,457	0.651	17,616,042	8,250,000	5,800,000	0.825	4,787,132	432,558	14,093,810	0	0	14,093,810
1941	20,132,478	1.317	14,093,810	8,250,000	5,800,000	1.159	6,719,332	449,793	18,807,162	0	0	18,807,162
1942	17,240,936	1.128	18,807,162	8,250,000	5,800,000	1.064	6,170,778	539,305	21,088,016	0	0	21,088,016
1943	13,747,201	0.899	21,088,016	8,250,000	5,800,000	0.950	5,507,981	562,977	20,514,258	0	0	20,514,258
1944	15,385,222	1.006	20,514,258	8,250,000	5,800,000	1.003	5,818,730	567,572	21,263,178	0	0	21,263,178
1945	14,156,328	0.926	21,263,178	8,250,000	5,800,000	0.963	5,585,597	576,132	21,007,777	0	0	21,007,777
1946	11,111,253	0.727	21,007,777	8,250,000	5,800,000	0.863	5,007,916	541,882	18,319,233	0	0	18,319,233
1947	16,455,286	1.076	18,319,233	8,250,000	5,800,000	1.038	6,021,732	531,385	19,971,401	0	0	19,971,401
1948	15,155,094	0.991	19,971,401	8,250,000	5,800,000	0.996	5,775,073	561,454	20,539,968	0	0	20,539,968
1949	16,949,384	1.109	20,539,968	8,250,000	5,800,000	1.054	6,115,468	595,711	22,528,174	0	0	22,528,174
1950	13,156,216	0.861	22,528,174	8,250,000	5,800,000	0.930	5,395,866	609,204	21,429,321	0	0	21,429,321
1951	12,521,694	0.819	21,429,321	8,250,000	5,800,000	0.910	5,275,490	578,233	19,847,291	0	0	19,847,291
1952	20,821,222	1.362	19,847,291	8,250,000	5,800,000	1.181	6,849,994	624,423	24,944,097	0	0	24,944,097
1953	11,181,219	0.731	24,944,097	8,250,000	5,800,000	0.866	5,021,189	656,119	22,198,008	0	0	22,198,008
1954	8,511,902	0.557	22,198,008	8,250,000	5,800,000	0.778	4,514,793	564,344	17,380,772	0	0	17,380,772
1955	9,429,708	0.617	17,380,772	8,250,000	5,800,000	0.808	4,688,910	457,360	13,414,211	0	0	13,414,211
1956	11,442,674	0.749	13,414,211	8,250,000	5,800,000	0.874	5,070,790	382,210	11,153,886	0	0	11,153,886
1957	21,516,763	1.408	11,153,886	8,250,000	5,800,000	1.204	6,981,945	429,380	17,009,323	0	0	17,009,323
1958	15,878,311	1.039	17,009,323	8,250,000	5,800,000	1.019	5,912,274	519,608	18,205,752	0	0	18,205,752
1959	9,613,969	0.629	18,205,752	8,250,000	5,800,000	0.814	4,723,866	488,982	14,356,872	0	0	14,356,872
1960	11,539,960	0.755	14,356,872	8,250,000	5,800,000	0.877	5,089,246	415,864	12,141,723	0	0	12,141,723
1961	10,026,059	0.656	12,141,723	8,250,000	5,800,000	0.828	4,802,044	348,644	8,767,094	0	0	8,767,094
1962	17,393,409	1.138	8,767,094	8,250,000	5,800,000	1.069	6,199,703	341,417	11,369,382	0	0	11,369,382
1963	8,856,700	0.579	11,369,382	8,250,000	5,800,000	0.790	4,580,204	322,711	7,073,167	0	0	7,073,167
1964	10,879,386	0.712	7,073,167	8,250,000	5,800,000	0.856	4,963,928	239,534	4,499,090	0	0	4,499,090
1965	19,890,827	1.301	4,499,090	8,250,000	5,800,000	1.151	6,673,489	268,380	9,198,049	0	0	9,198,049
1966	10,695,644	0.700	9,198,049	8,250,000	5,800,000	0.850	4,929,071	294,687	6,419,935	0	0	6,419,935
1967	11,686,630	0.765	6,419,935	8,250,000	5,800,000	0.882	5,117,070	238,573	4,500,922	0	0	4,500,922
1968	13,755,732	0.900	4,500,922	8,250,000	5,800,000	0.950	5,509,600	214,336	4,282,718	0	0	4,282,718
1969	15,287,959	1.000	4,282,718	8,250,000	5,800,000	1.000	5,800,279	226,589	5,293,809	0	0	5,293,809
1970	15,359,936	1.005	5,293,809	8,250,000	5,800,000	1.002	5,813,933	254,533	6,335,279	0	0	6,335,279
1971	15,395,233	1.007	6,335,279	8,250,000	5,800,000	1.004	5,820,629	282,861	7,377,021	0	0	7,377,021
1972	13,064,452	0.855	7,377,021	8,250,000	5,800,000	0.927	5,378,457	287,614	6,525,401	0	0	6,525,401
1973	18,502,616	1.210	6,525,401	8,250,000	5,800,000	1.105	6,410,131	323,224	10,044,662	0	0	10,044,662
1974	13,193,842	0.863	10,044,662	8,250,000	5,800,000	0.932	5,403,004	359,252	9,226,249	0	0	9,226,249
1975	16,930,796	1.108	9,226,249	8,250,000	5,800,000	1.054	6,111,941	378,729	11,416,375	0	0	11,416,375
1976	11,256,711	0.736	11,416,375	8,250,000	5,800,000	0.868	5,035,511	378,420	9,009,156	0	0	9,009,156
1977	5,513,497	0.361	9,009,156	8,250,000	5,800,000	0.680	3,945,965	264,315	2,062,372	0	0	2,062,372
1978	15,282,722	1.000	2,062,372	8,250,000	5,800,000	1.000	5,799,285	193,136	3,102,672	0	0	3,102,672
1979	17,770,170	1.162	3,102,672	8,250,000	5,800,000	1.081	6,271,179	245,871	6,105,792	0	0	6,105,792
1980	17,870,783	1.169	6,105,792	8,250,000	5,800,000	1.085	6,290,266	323,111	9,113,198	0	0	9,113,198
1981	9,015,200	0.590	9,113,198	8,250,000	5,800,000	0.795	4,610,273	311,192	4,956,932	0	0	4,956,932
1982	17,489,400	1.144	4,956,932	8,250,000	5,800,000	1.072	6,217,914	295,764	7,682,654	0	0	7,682,654
1983	24,361,989	1.594	7,682,654	8,250,000	5,800,000	1.297	7,521,713	433,685	15,839,245	0	0	15,839,245
1984	25,359,376	1.659	15,839,245	8,250,000	5,800,000	1.329	7,710,927	642,878	24,594,816	0	0	24,594,816
1985	21,246,109	1.390	24,594,816	8,250,000	5,800,000	1.195	6,930,599	749,290	29,911,035	381,005	0	29,530,030
1986	23,013,446	1.505	29,530,030	8,250,000	5,800,000	1.253	7,265,881	749,290	36,278,306	6,748,275	0	29,530,030
1987	15,640,478	1.023	29,530,030	8,250,000	5,800,000	1.012	5,867,155	749,290	30,304,064	774,033	0	29,530,030
1988	11,456,357	0.749	29,530,030	8,250,000	5,800,000	0.875	5,073,385	718,307	26,944,695	0	0	26,944,695
1989	9,921,847	0.649	26,944,695	8,250,000	5,800,000	0.825	4,782,273	641,805	23,192,463	0	0	23,192,463
1990	9,639,803	0.631	23,192,463	8,250,000	5,800,000	0.815	4,728,767	549,070	19,304,429	0	0	19,304,429
1991	12,170,021	0.796	19,304,429	8,250,000	5,800,000	0.898	5,208,775	481,017	17,534,659	0	0	17,534,659
1992	10,895,580	0.713	17,534,659	8,250,000	5,800,000	0.856	4,967,000	427,148	14,786,090	0	0	14,786,090
1993	18,160,118	1.188	14,786,090	8,250,000	5,800,000	1.094	6,345,156	434,307	17,916,746	0	0	17,916,746
1994	11,125,503	0.728	17,916,746	8,250,000	5,800,000	0.864	5,010,619	443,582	15,338,048	0	0	15,338,048
1995	20,047,166	1.311	15,338,048	8,250,000	5,800,000	1.156	6,703,148	471,439	19,960,627	0	0	19,960,627
1996	14,502,293	0.949	19,960,627	8,250,000	5,800,000	0.974	5,651,230	532,272	20,029,419	0	0	20,029,419
1997	21,622,438	1.414	20,029,419	8,250,000	5,800,000	1.207	7,001,993	607,316	25,792,548	0	0	25,792,548
1998	16,798,378	1.099	25,792,548	8,250,000	5,800,000	1.049	6,086,820	703,408	27,550,698	0	0	27,550,698
1999	15,934,210	1.042	27,550,698	8,250,000	5,800,000	1.021	5,922,879	737,904	28,574,125	0	0	28,574,125
2000	10,646,526	0.696	28,574,125	8,250,000	5,800,000	0.848	4,919,752	710,235	25,340,664	0	0	25,340,664
Total											0	
Averages:												
1953-1977	13,072,157	0.855	10,885,718	8,250,000	5,800,000	0.928	5,379,919	357,508		0	0	9,970,449
1931-1977	13,593,225	0.889	15,416,261	8,250,000	5,800,000	0.945	5,478,771	448,039		0	0	14,832,677
1906-2000	15,286,491	1.000	19,741,416	8,250,000	5,800,000	1.000	5,800,000	545,346		735,244	0	19,697,317

Variables	
Storage	30,167,576 af
Sedimentation Rate (Active)	24,292 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,530,030 af
UB Demand Level	5,800,000 af/yr
LB Delivery	8,250,000 af/yr
Results	
Average CRSP Evap	545,346 af/yr
Total Yield w/ CRSP evap	6,345,346 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	0 af

NM allocation (w/o evap) 646,875 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	6,157,508 af/yr
1931-1977	6,248,039 af/yr
1906-2000	6,345,346 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 7: Natural Flows Adjusted for MBC Method with SCS Eff. Precip., CRSP Live Storage Only, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	29,151,263	8,250,000	5,610,000	725,390	33,131,695	3,980,431	0	29,151,263
1907	21,217,494	29,151,263	8,250,000	5,610,000	725,390	35,783,368	6,632,104	0	29,151,263
1908	12,234,617	29,151,263	8,250,000	5,610,000	696,698	26,829,182	0	0	26,829,182
1909	22,372,101	26,829,182	8,250,000	5,610,000	696,698	34,644,585	5,493,321	0	29,151,263
1910	14,666,416	29,151,263	8,250,000	5,610,000	725,390	29,232,290	81,026	0	29,151,263
1911	15,515,529	29,151,263	8,250,000	5,610,000	725,390	30,081,403	930,139	0	29,151,263
1912	18,639,210	29,151,263	8,250,000	5,610,000	725,390	33,205,084	4,053,820	0	29,151,263
1913	14,552,173	29,151,263	8,250,000	5,610,000	724,984	29,118,452	0	0	29,118,452
1914	21,370,614	29,118,452	8,250,000	5,610,000	724,984	35,904,082	6,752,819	0	29,151,263
1915	13,639,077	29,151,263	8,250,000	5,610,000	713,840	28,216,501	0	0	28,216,501
1916	20,158,692	28,216,501	8,250,000	5,610,000	713,840	33,801,353	4,650,089	0	29,151,263
1917	22,958,604	29,151,263	8,250,000	5,610,000	725,390	37,524,478	8,373,214	0	29,151,263
1918	15,881,739	29,151,263	8,250,000	5,610,000	725,390	30,447,613	1,296,349	0	29,151,263
1919	12,667,169	29,151,263	8,250,000	5,610,000	701,978	27,256,455	0	0	27,256,455
1920	22,303,432	27,256,455	8,250,000	5,610,000	701,978	34,997,909	5,846,646	0	29,151,263
1921	22,542,581	29,151,263	8,250,000	5,610,000	725,390	37,108,455	7,957,191	0	29,151,263
1922	18,462,998	29,151,263	8,250,000	5,610,000	725,390	33,028,872	3,877,608	0	29,151,263
1923	19,039,846	29,151,263	8,250,000	5,610,000	725,390	33,605,720	4,454,456	0	29,151,263
1924	13,893,598	29,151,263	8,250,000	5,610,000	716,946	28,467,915	0	0	28,467,915
1925	14,446,501	28,467,915	8,250,000	5,610,000	707,014	28,347,402	0	0	28,347,402
1926	15,229,531	28,347,402	8,250,000	5,610,000	713,629	29,003,304	0	0	29,003,304
1927	19,555,012	29,003,304	8,250,000	5,610,000	723,561	33,974,755	4,823,491	0	29,151,263
1928	16,970,134	29,151,263	8,250,000	5,610,000	725,390	31,536,008	2,384,744	0	29,151,263
1929	21,845,385	29,151,263	8,250,000	5,610,000	725,390	36,411,259	7,259,995	0	29,151,263
1930	14,636,841	29,151,263	8,250,000	5,610,000	725,390	29,202,715	51,451	0	29,151,263
1931	8,489,934	29,151,263	8,250,000	5,610,000	650,995	23,130,203	0	0	23,130,203
1932	17,437,987	23,130,203	8,250,000	5,610,000	613,232	26,094,958	0	0	26,094,958
1933	12,199,300	26,094,958	8,250,000	5,610,000	621,663	23,812,595	0	0	23,812,595
1934	6,193,992	23,812,595	8,250,000	5,610,000	492,656	15,653,930	0	0	15,653,930
1935	12,646,149	15,653,930	8,250,000	5,610,000	372,252	14,067,827	0	0	14,067,827
1936	14,664,673	14,067,827	8,250,000	5,610,000	358,172	14,514,329	0	0	14,514,329
1937	14,321,856	14,514,329	8,250,000	5,610,000	364,887	14,611,298	0	0	14,611,298
1938	18,164,119	14,611,298	8,250,000	5,610,000	414,148	18,501,269	0	0	18,501,269
1939	11,179,859	18,501,269	8,250,000	5,610,000	423,860	15,397,269	0	0	15,397,269
1940	9,947,457	15,397,269	8,250,000	5,610,000	333,050	11,151,676	0	0	11,151,676
1941	20,132,478	11,151,676	8,250,000	5,610,000	353,723	17,070,431	0	0	17,070,431
1942	17,240,936	17,070,431	8,250,000	5,610,000	462,908	19,988,459	0	0	19,988,459
1943	13,747,201	19,988,459	8,250,000	5,610,000	491,496	19,384,164	0	0	19,384,164
1944	15,385,222	19,384,164	8,250,000	5,610,000	496,737	20,412,649	0	0	20,412,649
1945	14,156,328	20,412,649	8,250,000	5,610,000	506,844	20,202,133	0	0	20,202,133
1946	11,111,253	20,202,133	8,250,000	5,610,000	464,540	16,988,846	0	0	16,988,846
1947	16,455,286	16,988,846	8,250,000	5,610,000	451,328	19,132,804	0	0	19,132,804
1948	15,155,094	19,132,804	8,250,000	5,610,000	487,793	19,940,105	0	0	19,940,105
1949	16,949,384	19,940,105	8,250,000	5,610,000	529,398	22,500,091	0	0	22,500,091
1950	13,156,216	22,500,091	8,250,000	5,610,000	545,592	21,250,715	0	0	21,250,715
1951	12,521,694	21,250,715	8,250,000	5,610,000	507,350	19,405,059	0	0	19,405,059
1952	20,821,222	19,405,059	8,250,000	5,610,000	563,593	25,802,687	0	0	25,802,687
1953	11,181,219	25,802,687	8,250,000	5,610,000	602,103	22,521,803	0	0	22,521,803
1954	8,511,902	22,521,803	8,250,000	5,610,000	489,438	16,684,267	0	0	16,684,267
1955	9,429,708	16,684,267	8,250,000	5,610,000	358,146	11,895,829	0	0	11,895,829
1956	11,442,674	11,895,829	8,250,000	5,610,000	265,829	9,212,674	0	0	9,212,674
1957	21,516,763	9,212,674	8,250,000	5,610,000	323,287	16,546,150	0	0	16,546,150
1958	15,878,311	16,546,150	8,250,000	5,610,000	433,480	18,130,981	0	0	18,130,981
1959	9,613,969	18,130,981	8,250,000	5,610,000	395,709	13,489,241	0	0	13,489,241
1960	11,539,960	13,489,241	8,250,000	5,610,000	305,911	10,863,290	0	0	10,863,290
1961	10,026,059	10,863,290	8,250,000	5,610,000	223,335	6,806,014	0	0	6,806,014
1962	17,393,409	6,806,014	8,250,000	5,610,000	214,215	10,125,208	0	0	10,125,208
1963	8,856,700	10,125,208	8,250,000	5,610,000	191,046	4,930,861	0	0	4,930,861
1964	10,879,386	4,930,861	8,250,000	5,610,000	88,939	1,861,308	0	0	1,861,308
1965	19,890,827	1,861,308	8,250,000	5,610,000	123,996	7,768,139	0	0	7,768,139
1966	10,695,644	7,768,139	8,250,000	5,610,000	155,955	4,447,828	0	0	4,447,828
1967	11,686,630	4,447,828	8,250,000	5,610,000	87,001	2,187,457	0	0	2,187,457
1968	13,755,732	2,187,457	8,250,000	5,610,000	57,079	2,026,110	0	0	2,026,110
1969	15,287,959	2,026,110	8,250,000	5,610,000	71,841	3,382,228	0	0	3,382,228
1970	15,359,936	3,382,228	8,250,000	5,610,000	105,822	4,776,341	0	0	4,776,341
1971	15,395,233	4,776,341	8,250,000	5,610,000	140,283	6,171,291	0	0	6,171,291
1972	13,064,452	6,171,291	8,250,000	5,610,000	145,887	5,229,855	0	0	5,229,855
1973	18,502,616	5,229,855	8,250,000	5,610,000	189,279	9,683,192	0	0	9,683,192
1974	13,193,842	9,683,192	8,250,000	5,610,000	233,191	8,783,843	0	0	8,783,843
1975	16,930,796	8,783,843	8,250,000	5,610,000	256,848	11,597,791	0	0	11,597,791
1976	11,256,711	11,597,791	8,250,000	5,610,000	256,284	8,738,219	0	0	8,738,219
1977	5,513,497	8,738,219	8,250,000	5,610,000	116,386	275,329	0	0	275,329
1978	15,282,722	275,329	8,250,000	5,610,000	29,041	1,669,010	0	0	1,669,010
1979	17,770,170	1,669,010	8,250,000	5,610,000	93,420	5,485,760	0	0	5,485,760
1980	17,870,783	5,485,760	8,250,000	5,610,000	187,814	9,308,729	0	0	9,308,729
1981	9,015,200	9,308,729	8,250,000	5,610,000	173,051	4,290,878	0	0	4,290,878
1982	17,489,400	4,290,878	8,250,000	5,610,000	153,993	7,766,285	0	0	7,766,285
1983	24,361,989	7,766,285	8,250,000	5,610,000	322,707	17,945,567	0	0	17,945,567
1984	25,359,376	17,945,567	8,250,000	5,610,000	583,355	28,861,588	0	0	28,861,588
1985	21,246,109	28,861,588	8,250,000	5,610,000	721,810	35,525,886	6,374,623	0	29,151,263
1986	23,013,446	29,151,263	8,250,000	5,610,000	725,390	37,579,320	8,428,057	0	29,151,263
1987	15,640,478	29,151,263	8,250,000	5,610,000	725,390	30,206,352	1,055,089	0	29,151,263
1988	11,456,357	29,151,263	8,250,000	5,610,000	687,200	26,060,420	0	0	26,060,420
1989	9,921,847	26,060,420	8,250,000	5,610,000	593,024	21,529,243	0	0	21,529,243
1990	9,639,803	21,529,243	8,250,000	5,610,000	478,976	16,830,070	0	0	16,830,070
1991	12,170,021	16,830,070	8,250,000	5,610,000	395,151	14,744,940	0	0	14,744,940
1992	10,895,580	14,744,940	8,250,000	5,610,000	328,698	11,451,822	0	0	11,451,822
1993	18,160,118	11,451,822	8,250,000	5,610,000	336,977	15,414,963	0	0	15,414,963
1994	11,125,503	15,414,963	8,250,000	5,610,000	347,860	12,332,606	0	0	12,332,606
1995	20,047,166	12,332,606	8,250,000	5,610,000	381,508	18,138,264	0	0	18,138,264
1996	14,502,293	18,138,264	8,250,000	5,610,000	455,549	18,325,008	0	0	18,325,008
1997	21,622,438	18,325,008	8,250,000	5,610,000	547,008	25,540,438	0	0	25,540,438
1998	16,798,378	25,540,438	8,250,000	5,610,000	664,259	27,814,557	0	0	27,814,557
1999	15,934,210	27,814,557	8,250,000	5,610,000	708,874	29,179,893	28,630	0	29,151,263
2000	10,646,526	29,151,263	8,250,000	5,610,000	677,316	25,260,474	0	0	25,260,474
Total								0	
Averages:									
1953-1977	13,072,157	9,746,504	8,250,000	5,610,000	233,252		0	0	8,725,410
1931-1977	13,593,225	14,170,738	8,250,000	5,610,000	347,607		0	0	13,556,356
1906-2000	15,286,491	18,825,023	8,250,000	5,610,000	469,706		997,740	0	18,784,067

Variables	
Storage	30,731,061 af
Sedimentation Rate (Active)	37,000 af/yr
Bank Storage	4%
Adjusted Storage (2060)	29,151,263 af
UB Demand Level	5,610,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	469,706 af/yr
Total Yield w/ CRSP evap	6,079,706 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	0 af

NM allocation (w/o evap)	625,500 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	5,843,252 af/yr
1931-1977	5,957,607 af/yr
1906-2000	6,079,706 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

Upper Basin Yield Study - March 2006 Draft

Study No. 8: Flows Adjusted for MBC Method with SCS Precip., CRSP Live plus All Other UB Live Storage, Constant Upper Basin Use

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	Lower Basin Delivery (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)
1906	18,565,821	33,833,590	8,250,000	5,710,000	725,390	37,714,021	3,880,431	0	33,833,590
1907	21,217,494	33,833,590	8,250,000	5,710,000	725,390	40,365,694	6,532,104	0	33,833,590
1908	12,234,617	33,833,590	8,250,000	5,710,000	696,698	31,411,508	0	0	31,411,508
1909	22,372,101	31,411,508	8,250,000	5,710,000	696,698	39,126,911	5,293,321	0	33,833,590
1910	14,666,416	33,833,590	8,250,000	5,710,000	725,390	33,814,616	0	0	33,814,616
1911	15,515,529	33,814,616	8,250,000	5,710,000	725,390	34,644,756	811,166	0	33,833,590
1912	18,639,210	33,833,590	8,250,000	5,710,000	725,390	37,787,410	3,953,820	0	33,833,590
1913	14,552,173	33,833,590	8,250,000	5,710,000	724,984	33,700,779	0	0	33,700,779
1914	21,370,614	33,700,779	8,250,000	5,710,000	724,984	40,386,409	6,552,819	0	33,833,590
1915	13,639,077	33,833,590	8,250,000	5,710,000	713,840	32,798,827	0	0	32,798,827
1916	20,158,692	32,798,827	8,250,000	5,710,000	713,840	38,283,679	4,450,089	0	33,833,590
1917	22,958,604	33,833,590	8,250,000	5,710,000	725,390	42,106,804	8,273,214	0	33,833,590
1918	15,881,739	33,833,590	8,250,000	5,710,000	725,390	35,029,939	1,196,349	0	33,833,590
1919	12,667,169	33,833,590	8,250,000	5,710,000	701,978	31,838,781	0	0	31,838,781
1920	22,303,432	31,838,781	8,250,000	5,710,000	701,978	39,480,235	5,646,646	0	33,833,590
1921	22,542,581	33,833,590	8,250,000	5,710,000	725,390	41,690,781	7,857,191	0	33,833,590
1922	18,462,998	33,833,590	8,250,000	5,710,000	725,390	37,611,198	3,777,608	0	33,833,590
1923	19,039,846	33,833,590	8,250,000	5,710,000	725,390	38,188,046	4,354,456	0	33,833,590
1924	13,893,598	33,833,590	8,250,000	5,710,000	716,946	33,050,242	0	0	33,050,242
1925	14,446,501	33,050,242	8,250,000	5,710,000	707,014	32,829,729	0	0	32,829,729
1926	15,229,531	32,829,729	8,250,000	5,710,000	713,629	33,385,631	0	0	33,385,631
1927	19,555,012	33,385,631	8,250,000	5,710,000	723,561	38,257,081	4,423,491	0	33,833,590
1928	16,970,134	33,833,590	8,250,000	5,710,000	725,390	36,118,334	2,284,744	0	33,833,590
1929	21,845,385	33,833,590	8,250,000	5,710,000	725,390	40,993,585	7,159,995	0	33,833,590
1930	14,636,841	33,833,590	8,250,000	5,710,000	725,390	33,785,041	0	0	33,785,041
1931	8,489,934	33,785,041	8,250,000	5,710,000	650,995	27,663,981	0	0	27,663,981
1932	17,437,987	27,663,981	8,250,000	5,710,000	613,232	30,528,736	0	0	30,528,736
1933	12,199,300	30,528,736	8,250,000	5,710,000	621,663	28,146,373	0	0	28,146,373
1934	6,193,992	28,146,373	8,250,000	5,710,000	492,656	19,887,708	0	0	19,887,708
1935	12,646,149	19,887,708	8,250,000	5,710,000	372,252	18,201,605	0	0	18,201,605
1936	14,664,673	18,201,605	8,250,000	5,710,000	358,172	18,548,107	0	0	18,548,107
1937	14,321,856	18,548,107	8,250,000	5,710,000	364,887	18,545,076	0	0	18,545,076
1938	18,164,119	18,545,076	8,250,000	5,710,000	414,148	22,335,047	0	0	22,335,047
1939	11,179,859	22,335,047	8,250,000	5,710,000	423,860	19,131,046	0	0	19,131,046
1940	9,947,457	19,131,046	8,250,000	5,710,000	333,050	14,785,454	0	0	14,785,454
1941	20,132,478	14,785,454	8,250,000	5,710,000	353,723	20,604,209	0	0	20,604,209
1942	17,240,936	20,604,209	8,250,000	5,710,000	462,908	23,422,237	0	0	23,422,237
1943	13,747,201	23,422,237	8,250,000	5,710,000	491,496	22,717,942	0	0	22,717,942
1944	15,385,222	22,717,942	8,250,000	5,710,000	496,737	23,646,427	0	0	23,646,427
1945	14,156,328	23,646,427	8,250,000	5,710,000	506,844	23,335,911	0	0	23,335,911
1946	11,111,253	23,335,911	8,250,000	5,710,000	464,540	20,022,624	0	0	20,022,624
1947	16,455,286	20,022,624	8,250,000	5,710,000	451,328	22,066,582	0	0	22,066,582
1948	15,155,094	22,066,582	8,250,000	5,710,000	487,793	22,773,883	0	0	22,773,883
1949	16,949,384	22,773,883	8,250,000	5,710,000	529,398	25,233,869	0	0	25,233,869
1950	13,156,216	25,233,869	8,250,000	5,710,000	545,592	23,884,493	0	0	23,884,493
1951	12,521,694	23,884,493	8,250,000	5,710,000	507,350	21,938,836	0	0	21,938,836
1952	20,821,222	21,938,836	8,250,000	5,710,000	563,593	28,236,465	0	0	28,236,465
1953	11,181,219	28,236,465	8,250,000	5,710,000	602,103	24,855,581	0	0	24,855,581
1954	8,511,902	24,855,581	8,250,000	5,710,000	489,438	18,918,045	0	0	18,918,045
1955	9,429,708	18,918,045	8,250,000	5,710,000	358,146	14,029,607	0	0	14,029,607
1956	11,442,674	14,029,607	8,250,000	5,710,000	265,829	11,246,452	0	0	11,246,452
1957	21,516,763	11,246,452	8,250,000	5,710,000	323,287	18,479,928	0	0	18,479,928
1958	15,878,311	18,479,928	8,250,000	5,710,000	433,480	19,964,759	0	0	19,964,759
1959	9,613,969	19,964,759	8,250,000	5,710,000	395,709	15,223,019	0	0	15,223,019
1960	11,539,960	15,223,019	8,250,000	5,710,000	305,911	12,497,068	0	0	12,497,068
1961	10,026,059	12,497,068	8,250,000	5,710,000	223,335	8,339,792	0	0	8,339,792
1962	17,393,409	8,339,792	8,250,000	5,710,000	214,215	11,558,986	0	0	11,558,986
1963	8,856,700	11,558,986	8,250,000	5,710,000	191,046	6,264,639	0	0	6,264,639
1964	10,879,386	6,264,639	8,250,000	5,710,000	88,939	3,095,086	0	0	3,095,086
1965	19,890,827	3,095,086	8,250,000	5,710,000	123,996	8,901,917	0	0	8,901,917
1966	10,695,644	8,901,917	8,250,000	5,710,000	155,955	5,481,606	0	0	5,481,606
1967	11,686,630	5,481,606	8,250,000	5,710,000	87,001	3,121,235	0	0	3,121,235
1968	13,755,732	3,121,235	8,250,000	5,710,000	57,079	2,859,888	0	0	2,859,888
1969	15,287,959	2,859,888	8,250,000	5,710,000	71,841	4,116,006	0	0	4,116,006
1970	15,359,936	4,116,006	8,250,000	5,710,000	105,822	5,410,119	0	0	5,410,119
1971	15,395,233	5,410,119	8,250,000	5,710,000	140,283	6,705,069	0	0	6,705,069
1972	13,064,452	6,705,069	8,250,000	5,710,000	145,887	5,663,633	0	0	5,663,633
1973	18,502,616	5,663,633	8,250,000	5,710,000	189,279	10,016,970	0	0	10,016,970
1974	13,193,842	10,016,970	8,250,000	5,710,000	233,191	9,017,621	0	0	9,017,621
1975	16,930,796	9,017,621	8,250,000	5,710,000	256,848	11,731,569	0	0	11,731,569
1976	11,256,711	11,731,569	8,250,000	5,710,000	256,284	8,771,997	0	0	8,771,997
1977	5,513,497	8,771,997	8,250,000	5,710,000	116,386	209,107	0	0	209,107
1978	15,282,722	209,107	8,250,000	5,710,000	29,041	1,502,788	0	0	1,502,788
1979	17,770,170	1,502,788	8,250,000	5,710,000	93,420	5,219,537	0	0	5,219,537
1980	17,870,783	5,219,537	8,250,000	5,710,000	187,814	8,942,507	0	0	8,942,507
1981	9,015,200	8,942,507	8,250,000	5,710,000	173,051	3,824,656	0	0	3,824,656
1982	17,489,400	3,824,656	8,250,000	5,710,000	153,993	7,200,063	0	0	7,200,063
1983	24,361,989	7,200,063	8,250,000	5,710,000	322,707	17,279,345	0	0	17,279,345
1984	25,359,376	17,279,345	8,250,000	5,710,000	583,355	28,095,366	0	0	28,095,366
1985	21,246,109	28,095,366	8,250,000	5,710,000	721,810	34,659,664	826,074	0	33,833,590
1986	23,013,446	33,833,590	8,250,000	5,710,000	725,390	42,161,647	8,328,057	0	33,833,590
1987	15,640,478	33,833,590	8,250,000	5,710,000	725,390	34,788,679	955,089	0	33,833,590
1988	11,456,357	33,833,590	8,250,000	5,710,000	687,200	30,642,747	0	0	30,642,747
1989	9,921,847	30,642,747	8,250,000	5,710,000	593,024	26,011,569	0	0	26,011,569
1990	9,639,803	26,011,569	8,250,000	5,710,000	478,976	21,212,397	0	0	21,212,397
1991	12,170,021	21,212,397	8,250,000	5,710,000	395,151	19,027,267	0	0	19,027,267
1992	10,895,580	19,027,267	8,250,000	5,710,000	328,698	15,634,148	0	0	15,634,148
1993	18,160,118	15,634,148	8,250,000	5,710,000	336,977	19,497,289	0	0	19,497,289
1994	11,125,503	19,497,289	8,250,000	5,710,000	347,860	16,314,933	0	0	16,314,933
1995	20,047,166	16,314,933	8,250,000	5,710,000	381,508	22,020,591	0	0	22,020,591
1996	14,502,293	22,020,591	8,250,000	5,710,000	455,549	22,107,335	0	0	22,107,335
1997	21,622,438	22,107,335	8,250,000	5,710,000	547,008	29,222,764	0	0	29,222,764
1998	16,798,378	29,222,764	8,250,000	5,710,000	664,259	31,396,883	0	0	31,396,883
1999	15,934,210	31,396,883	8,250,000	5,710,000	708,874	32,662,220	0	0	32,662,220
2000	10,646,526	32,662,220	8,250,000	5,710,000	677,316	28,671,430	0	0	28,671,430
Total								0	
Averages:									
1953-1977	13,072,157	10,980,282	8,250,000	5,710,000	233,252		0	0	9,859,188
1931-1977	13,593,225	16,504,516	8,250,000	5,710,000	347,607		0	0	15,790,134
1906-2000	15,286,491	21,823,554	8,250,000	5,710,000	469,706		911,123	0	21,769,216

Variables

Storage	35,233,298 af
Sedimentation Rate (Active)	37,000 af/yr
Bank Storage	4%
Adjusted Storage (2060)	33,833,590 af
UB Demand Level	5,710,000 af/yr
LB Delivery	8,250,000 af/yr

Results

Average CRSP Evap	469,706 af/yr
Total Yield w/ CRSP evap	6,179,706 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	0 af

NM allocation (w/o evap) 636,750 af/yr

Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.

Total Upper Basin depletion, inc. CRSP evap:

1953-1977	5,943,252 af/yr
1931-1977	6,057,607 af/yr
1906-2000	6,179,706 af/yr

Flow Adjustments:

1906-1970	15,800 af/yr
1971-1975	104,800 af/yr
1976	116,400 af/yr
1977	74,600 af/yr
1978	99,000 af/yr
1979	98,300 af/yr
1980	105,600 af/yr

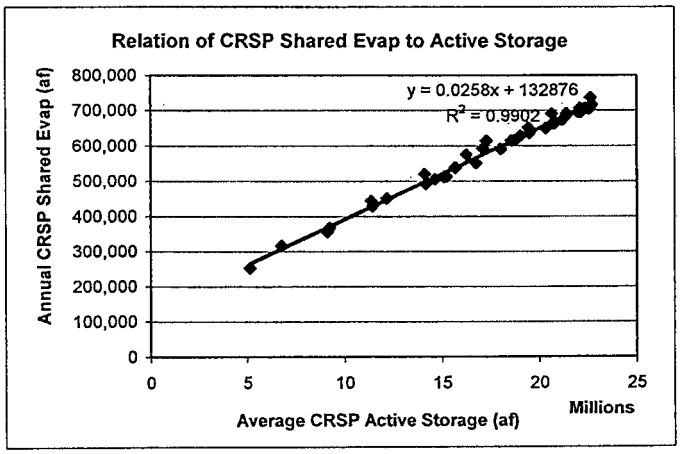
	Upper Colorado River Basin Reservoirs	Complete	Live Capacity 35,233,298	CRSP Live 30,731,061	CRSP Active 25,665,339	CRSP Active +Other 30,167,576	State	Major Basin	Hydromet	Source
1	Big Sandy	X	38,300			38,300	WY	GR	BGRW	Hydromet
2	Blue Mesa	X	829,500	829,500	748,500	748,500	CO	CR	BMDC	Hydromet
3	Boulder Lake	X	22,280			22,280	WY	GR		Jade Henderson Superintendent for Region IV
4	Bottle Hollow		11,779			11,779	UT	GR	BHRU	
5	Crawford	X	13,970			13,970	CO	CR	CFRC	Erik Knight from GJ office
6	Crystal	X	17,536	17,536	13,000	13,000	CO	CR	CRRC	Hydromet
7	Currant Creek	X	15,460			15,460	UT	GR	CURU	Hydromet
8	Dillon	X	252,678			252,678	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html NRCS Website
9	Eden		13,164			13,164	WY	GR	EDRU	
10	Electric Lake - Utah Power a	X	31,500			31,500	UT	GR		Connely Baldwin at Pacific Corp. Connely.Baldwin@pacificorp.com or 801-220-4636
11	Elkhead	X	10,400			10,400	CO	GR		Bill Earley with the City of Craig Public Works Dept. 970-826-2014
12	Flaming Gorge	X	3,749,000	3,749,000	3,515,700	3,515,700	UT	GR	FGRU	Hydromet
13	Fontenelle	X	344,800			344,800	WY	GR	FTRW	Hydromet
14	Fremont Lake	X	30,899			30,899	WY	GR		Jade Henderson Superintendent for Region IV
15	Gould	X	10,380			10,380	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dwr.state.co.us
16	Fruitgrowers	X	4,460			4,460	CO	CR	FGRC	Hydromet
17	Granby	X	540,033			540,033	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html
18	Green Mountain	X	153,678			153,678	CO	CR	GMRC	NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html
19	Groundhog	X	27,500			27,500	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html
20	Gurley	X	12,035			12,035	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dwr.state.co.us
21	Homestake	X	42,882			42,882	CO	CR		NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html
22	Jackson Gulch	X	9,951			9,951	CO	CR	JGRC	Hydromet
23	Joe's Valley	X	61,590			61,590	UT	GR	JVRU	Hydromet
24	Johnson		15,300			15,300	CO	CR???		
25	Kenny Reservoir (Taylor Dra	X	9,400			9,400	CO	CR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
26	Lake Powell	X	24,322,000	24,322,000	20,309,919	20,309,919	AZ	CR	GLDA	Hydromet
27	Lake Viva Naughton	X	69,645			69,645	WY	GR		Connely Baldwin at Pacific Corp. Connely.Baldwin@pacificorp.com or 801-220-4636
28	Lemon	X	39,792			39,792	CO	SJR	LMRC	Hydromet
29	Long Park		14,600			14,600	UT	GR		
30	McPhee	X	247,400			247,400	CO	CR	MCRC	Hydromet
31	Meeks Cabin	X	29,870			29,870	WY	GR	MERW	Hydromet
32	Millsite		20,000			20,000	UT	GR		
33	Miramonte	X	11,620			11,620	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dwr.state.co.us
34	Moon Lake	X	49,500			49,500	UT	GR	MNLU	Hydromet
35	Morgan Lake Dam		42,800			42,800	NM	SJR		
36	Morrow Point	X	117,025	117,025	42,120	42,120	CO	CR	MPRC	Hydromet
37	Narraguinnep	X	22,700			22,700	CO	SJR		NRCS Website http://www.wcc.nrcs.usda.gov/wsf/reservoir/resv_rpt.html
38	Navajo	X	1,696,000	1,696,000	1,036,100	1,036,100	NM	SJR	NVRN	Hydromet
39	New Fork Lake	X	20,340			20,340	WY	GR		Jade Henderson Superintendent for Region IV
40	Paonia	X	16,703			16,703	CO	CR	PARC	Hydromet
41	Pelican Lake		15,850			15,850	UT	GR???		
42	Pleasant Valley (Lake Catan	X	7,275			7,275	CO	CR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
43	Recapture Creek		16,000			16,000	UT	GR???		
44	Redfleet	X	25,700			25,700	UT	GR	RFRU	Hydromet
45	Ridgway	X	82,980			82,980	CO	CR	RWRC	Hydromet
46	Rifle Gap	X	12,708			12,708	CO	CR	RGRC	Hydromet
47	Ruedi	X	102,330			102,330	CO	CR	RURC	Great Planes Region Website
48	Scofield	X	65,800			65,800	UT	GR	SFRU	Hydromet
49	Shadow Mountain	X	18,368			18,368	CO	CR	SMRC	Great Planes Region Website
50	Silver Jack	X	13,000			13,000	CO	CR	SJRC	Hydromet
51	Soldier Creek	X	1,105,910			1,105,910	UT	GR	SCRU	Hydromet
52	Stagecoach	X	33,275			33,275	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
53	Starvation	X	165,320			165,320	UT	GR	SVRU	Hydromet
54	Stateline	X	13,880			13,880	WY	GR	SLRW	Hydromet
55	Steamboat Lake	X	25,400			25,400	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
56	Steinaker	X	34,455			34,455	UT	GR	STRU	Hydromet
57	Taylor Park	X	106,210			106,210	CO	CR	TPRC	Hydromet
58	Upper Stillwater	X	31,382			31,382	UT	GR	USRU	Hydromet
59	Vallecito	X	125,400			125,400	CO	SJR	VCRC	Hydromet
60	Vega	X	33,311			33,311	CO	CR	VGRU	Erik Knight from GJ office
61	Williams Creek	X	10,084			10,084	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dwr.state.co.us
62	Williams Fork	X	96,824			96,824	CO	CR	WFRC	Great Planes Region Website
63	Willow Lake	X	18,816			18,816	WY	GR		Jade Henderson Superintendent for Region IV
64	Willow Creek	X	10,550			10,550	CO	CR	WCRC	Great Planes Region Website
65	Wolford Mountain	X	66,000			66,000	CO	CR		George Wear with Colorado Division of Water Resources george.wear@dwr.state.co.us
66	Yamcolo	X	8,000			8,000	CO	GR		Erin.Light@state.co.us Division 6 Water Resources for State of Colorado
		Total Capacity	35,233,298	30,731,061	25,665,339	30,167,576				

Relationships of CRSP Shared Reservoir Evaporation to Total CRSP Storage

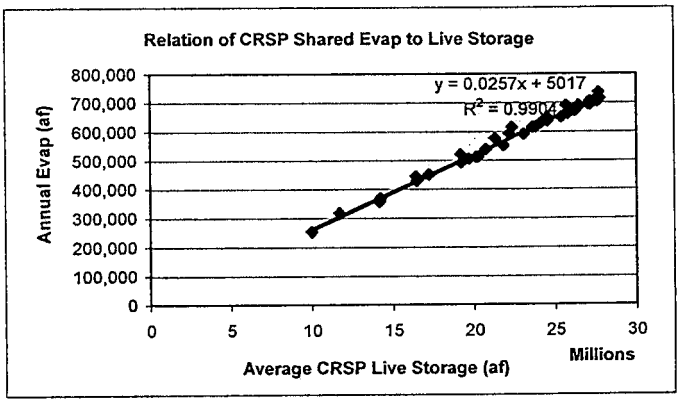
Year	Average CRSP Live Storage (af)	Average CRSP Active Storage (af)	CRSP Shared Evap (af)
1968	10,006,534	5,123,250	251,646
1969	11,701,142	6,764,000	315,083
1970	14,222,401	9,231,741	367,164
1971	16,417,858	11,354,088	442,260
1972	17,229,715	12,165,945	449,544
1973	19,703,066	14,639,296	504,409
1974	22,158,563	17,094,793	590,940
1975	23,634,096	18,570,326	613,612
1976	24,105,743	19,041,973	626,694
1977	20,730,592	15,672,536	537,406
1978	19,158,480	14,106,380	519,065
1979	22,336,514	17,284,414	612,639
1980	25,709,770	20,657,670	688,502
1981	25,392,305	20,340,205	648,525
1982	25,835,729	20,783,629	666,691
1983	27,692,454	22,640,354	734,416
1984	27,759,568	22,707,468	714,727
1985	27,619,938	22,567,838	702,973
1986	27,414,909	22,362,809	706,131
1987	27,153,464	22,101,364	705,172
1988	26,465,639	21,413,539	689,455
1989	24,540,351	19,488,251	634,821
1990	21,806,134	16,754,034	549,702
1991	20,141,572	15,089,472	510,689
1992	19,208,740	14,156,640	491,352
1993	21,297,564	16,245,464	573,884
1994	23,080,796	18,028,696	589,440
1995	24,500,724	19,448,624	649,206
1996	26,252,053	21,199,953	671,123
1997	26,416,641	21,364,541	681,115
1998	27,174,302	22,122,202	693,294
1999	27,050,819	21,998,719	694,007
2000	25,830,330	20,778,230	660,675
2001	23,802,258	18,750,158	614,593
2002	20,256,954	15,204,854	512,030
2003	16,472,537	11,420,437	427,526
2004	14,160,551	9,108,451	355,545

Regression Analyses

Active Storage:



Live Storage:



Notes:

(1) Historic calendar year data from Bureau of Reclamation. Average storage values are based on the average of the end-of-year storage amounts for the year indicated and for the previous year. Storage amounts include storage in all CRSP units, including Lake Powell, Flaming Gorge Reservoir, Navajo Reservoir and the Aspinall Unit (Blue Mesa, Morrow Point and Crystal reservoirs).

(2) CRSP shared evaporation includes lake evaporation for Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs, and is shared between the Upper Division States in proportions to their Upper Colorado River Basin Compact Article III(a) apportionments. CRSP shared evaporation is approximately 10,000 af at zero live CRSP storage (5,000 af based on the regression analyses) and approximately 130,000 af if storage in all CRSP reservoirs were at the top of the inactive pools (133,000 af based on the regression analysis). Lake evaporation for Navajo Reservoir is not included in CRSP shared evaporation.

(3) Data for the period 1968-2004 were used in the regression analyses. Data prior to 1968 do not reflect a normal distribution of storage between CRSP unit reservoirs under future operational conditions (for example, Navajo Reservoir storage remained below the top of the inactive pool required for operation of the Navajo Indian Irrigation Project diversion from 1962 when it began storing water until 1968, and Morrow Point Reservoir began operation in 1968). For the period 1968-1977, the historic average end-of-year CRSP storage and annual CRSP evaporation amount were increased to reflect the average storage of 15,670 af and average evaporation amount of 340 af occurring at Crystal Reservoir after its initial filling in 1978.

Historic Storage and Evaporation at Colorado River Storage Project Reservoirs

	Lake Powell		Flaming Gorge Reservoir		Navajo Reservoir		Blue Mesa Reservoir		Morrow Point Reservoir		Crystal Reservoir		Total All CRSP Reservoirs			
Year	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	Annual Evap Amount (af)	EOY Live Storage (af)	EOY Active Storage (af)	Total Annual Evap (af)	Annual Shared Evap (af)
1961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	13,000	200	57,000	700	0	0	0	0	0	0	70,000	0	900	200
1963	970,000	25,000	883,500	20,000	331,834	8,323	0	0	0	0	0	0	2,185,334	650,500	53,323	45,000
1964	4,226,877	76,171	1,097,900	42,320	382,320	10,647	0	0	0	0	0	0	5,707,097	1,199,800	129,137	118,490
1965	6,755,838	144,900	2,395,300	47,402	404,111	14,630	0	100	0	0	0	0	9,555,248	5,026,100	207,031	192,401
1966	5,892,764	181,801	2,243,300	65,869	400,389	10,730	248,900	2,500	0	0	0	0	8,785,352	4,178,900	260,900	250,170
1967	6,237,331	158,145	2,288,300	66,614	588,132	13,048	321,500	4,500	0	0	0	0	9,435,263	4,641,100	242,308	229,259
1968	7,039,300	185,829	1,912,939	59,077	973,592	18,631	511,900	6,000	108,735	400	0	0	10,546,465	5,605,400	269,937	251,306
1969	9,527,661	252,105	1,565,599	54,074	1,043,002	22,326	652,343	8,064	35,875	500	0	0	12,824,480	7,922,600	337,068	314,743
1970	12,014,346	305,979	1,761,250	51,442	1,049,190	22,564	647,667	8,804	116,528	600	0	0	15,588,982	10,540,682	389,389	366,824
1971	12,973,499	365,252	2,704,322	68,523	991,296	20,505	431,077	7,297	115,200	848	0	0	17,215,394	12,167,294	462,425	441,920
1972	12,611,547	362,114	3,086,584	79,091	982,869	19,991	415,961	7,155	115,736	845	0	0	17,212,697	12,164,597	469,195	449,204
1973	17,397,040	417,269	2,938,138	77,932	1,112,631	28,408	598,694	8,028	115,592	839	0	0	22,162,095	17,113,995	532,477	504,069
1974	17,298,382	498,708	3,262,393	83,468	970,485	21,646	476,431	7,586	116,000	837	0	0	22,123,690	17,075,590	612,246	590,600
1975	19,846,968	521,418	3,430,797	83,664	1,185,693	26,432	533,575	7,360	116,128	831	0	0	25,113,161	20,065,061	639,704	613,272
1976	18,139,140	533,869	3,129,279	83,640	1,205,201	25,255	478,276	7,980	115,088	845	0	0	23,066,984	18,018,884	651,609	626,354
1977	15,050,697	467,624	1,990,703	62,883	979,918	22,439	235,328	5,729	113,928	832	7,714	100	18,378,288	13,326,188	559,605	537,166
1978	15,343,792	443,338	2,673,304	66,716	1,195,470	24,307	594,351	7,871	115,688	840	16,068	300	19,938,673	14,886,573	543,372	519,065
1979	20,395,402	536,289	2,397,144	67,120	1,233,240	27,623	579,788	8,040	111,536	840	17,244	349	24,734,354	19,682,254	640,261	612,639
1980	21,602,374	606,694	3,013,072	72,311	1,382,000	28,916	558,000	8,314	113,305	836	16,435	348	26,685,186	21,633,086	717,417	688,502
1981	19,610,804	566,573	2,783,198	74,001	1,234,201	26,237	340,276	6,763	114,242	839	16,703	349	24,099,424	19,047,324	674,762	648,525
1982	22,052,326	579,638	3,307,239	78,299	1,475,159	28,337	607,227	7,570	113,713	836	16,369	348	27,572,033	22,519,933	695,028	666,691
1983	22,095,450	638,987	3,451,988	85,654	1,545,720	30,691	593,402	8,583	113,018	842	13,297	350	27,812,875	22,760,775	765,108	734,416
1984	21,991,934	621,218	3,379,535	84,057	1,536,197	31,194	666,201	8,256	115,379	844	17,015	351	27,706,261	22,654,161	745,921	714,727
1985	22,324,682	613,050	3,116,556	80,358	1,392,531	31,206	567,471	8,373	115,476	842	16,900	350	27,533,616	22,481,516	734,179	702,973
1986	21,900,656	615,398	3,257,068	81,239	1,429,801	30,200	576,633	8,304	115,023	841	17,021	350	27,296,202	22,244,102	736,331	706,131
1987	22,041,008	613,810	3,216,414	81,897	1,075,143	24,350	547,283	8,279	113,913	839	16,965	349	27,010,726	21,958,626	729,523	705,172
1988	21,223,202	603,875	2,958,441	77,191	1,149,810	24,336	458,550	7,206	114,808	836	15,742	348	25,920,552	20,868,452	713,791	689,455
1989	18,292,024	551,911	2,943,401	73,516	1,230,357	26,906	563,467	8,217	114,531	832	16,369	346	23,160,150	18,108,050	661,727	634,821
1990	15,246,718	464,809	3,049,072	75,352	1,381,613	26,704	647,094	8,362	110,936	832	16,686	346	20,452,119	15,400,019	576,406	549,702
1991	14,251,955	420,198	3,328,132	80,305	1,551,852	30,621	571,167	9,008	111,922	831	15,997	346	19,831,025	14,778,925	541,310	510,689
1992	13,334,385	403,360	3,013,793	78,487	1,528,220	31,554	580,946	8,354	113,617	812	15,495	338	18,586,456	13,534,356	522,907	491,352
1993	18,402,436	483,699	3,317,500	80,461	1,567,023	30,954	594,902	8,546	112,000	832	14,811	346	24,008,671	18,956,571	604,838	573,884
1994	17,220,702	504,284	2,835,277	75,469	1,391,103	30,450	579,329	8,525	110,880	821	15,629	342	22,152,920	17,100,820	619,890	589,440
1995	21,392,360	560,150	3,285,793	79,319	1,461,480	30,153	586,169	8,569	109,120	825	13,607	343	26,848,529	21,796,429	679,359	649,206
1996	20,497,896	582,091	3,248,287	79,159	1,187,295	27,184	601,723	8,707	105,401	823	14,976	343	25,655,578	20,603,478	698,308	671,123
1997	21,595,054	592,707	3,323,228	78,851	1,558,033	28,612	578,393	8,392	108,842	823	14,154	342	27,177,704	22,125,604	709,727	681,115
1998	21,654,054	605,297	3,399,837	78,646	1,412,077	29,148	577,927	8,180	110,739	827	16,265	344	27,170,899	22,118,799	722,442	693,294
1999	21,443,640	605,738	3,269,090	78,352	1,500,893	27,969	589,147	8,749	112,771	825	15,198	343	26,930,739	21,878,639	721,976	694,007
2000	19,823,236	576,898	2,991,270	74,194	1,288,792	26,850	504,611	8,409	107,722	829	14,289	345	24,729,920	19,677,820	687,525	660,675
2001	17,995,952	532,968	2,876,393	72,363	1,334,015	26,563	544,265	8,102	109,410	819	14,561	341	22,874,596	17,822,496	641,156	614,593
2002	13,773,841	436,496	2,631,819	67,919	826,816	20,891	283,191	6,507	109,636	783	14,009	326	17,639,312	12,587,212	532,921	512,030
2003	11,486,774	352,779	2,606,058	67,223	710,076	17,085	376,564	6,359	111,708	823	14,582	343	15,305,762	10,253,662	444,611	427,526
2004	8,663,616	278,349	2,742,643	68,248	991,373	20,353	491,453	7,778	109,666	826	16,589	344	13,015,340	7,963,240	375,898	355,545

Notes:

(1) Lake Powell statistics: Dead storage 1,893,000 af at elevation 3370; Live storage capacity 24,322,000 af between elevations 3370 and 3700; Active storage capacity 20,325,000 af between elevations 3490 and 3700. Storage began March 1963.

(2) Flaming Gorge Reservoir statistics: Dead storage 39,700 af at elevation 5740; Live storage capacity 3,749,500 af between elevations 5740 and 6040; Active storage capacity 3,516,000 af between elevations 5871 and 6040. Storage began November 1962.

(3) Navajo Reservoir statistics: Dead storage 12,600 af at elevation 5775; Live storage capacity 1,701,300 af between elevations 5775 and 6085; Active storage capacity 1,039,500 af between elevations 5990 and 6085. Storage began June 1962.

(4) Aspinall Unit statistics:
Blue Mesa Reservoir - Dead storage 111,200 af at elevation 7358; Live storage capacity 829,600 af between elevations 7358 and 7519; Active storage capacity 748,800 af between elevations 7393 and 7519. Storage began October 1965. End-of-year 1965 total storage for Blue Mesa Reservoir was 85,240 af (0 live storage).
Morrow Point Reservoir - Dead storage 165 af at elevation 6808; Live storage capacity 117,000 af between elevations 6808 and 7160; Active storage capacity 42,000 af between elevations 7100 and 7160. Storage began January 1968.
Crystal Reservoir - Dead storage 8,000 af at elevation 6670; Live storage capacity 17,000 af between elevations 6670 and 6755; Active storage capacity 13,000 af between elevations 6700 and 6755. Storage began March 1977.

(5) Total CRSP Live storage capacity is 30,736,400 af, and total CRSP Active storage capacity is 25,684,300 af. The total CRSP inactive storage capacity is 5,052,100 af.

(6) Evaporation amounts were computed using the method and coefficients described in Historical Inflows, Colorado River Storage Project, Bureau of Reclamation (Tom Ryan), October 1993.

(7) The following evaporation amounts are estimated from calculated evaporation for other years and relative total storage amounts: Lake Powell for 1963, Flaming Gorge Reservoir for 1962-63, Navajo Reservoir for 1962, Blue Mesa Reservoir for 1966-68, Morrow Point Reservoir for 1968-70, and Crystal Reservoir for 1977-78. These evaporation amounts for Flaming Gorge, Navajo and Blue Mesa reservoirs also were reduced for when storage began. Crystal Reservoir evaporation for 1979-2004 was estimated based on the evaporation amounts at Morrow Point Reservoir and the ratio of the surface area of Crystal Reservoir to the surface area of Morrow Point Reservoir at full capacity.

(8) CRSP shared evaporation includes lake evaporation for Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs, and is shared between the Upper Division States in proportion to their Upper Colorado River Basin Compact Article III(a) apportionments. Lake evaporation for Navajo Reservoir is accounted separately.

APPENDIX F

NEW MEXICO'S ALTERNATE PROPOSED HYDROLOGIC DETERMINATION TO ADDRESS USE OF THE MODIFIED BLANEY-CRIDDLE METHOD WITH SCS EFFECTIVE PRECIPITATION AND WITH SCS GROWTH SEASON START AND END TEMPERATURES TO COMPUTE IRRIGATION CONSUMPTIVE USES FOR THE UPPER BASIN

ALTERNATE PROPOSED HYDROLOGIC DETERMINATION

ALLOCATION

1. The amount of water available from the flow at Lee Ferry for use by the Upper Basin states is at least 5.80 maf, on average, excluding shared Colorado River Storage Project (CRSP) reservoir evaporation.

   The current yield study indicates that with a long-term average use demand in the Upper Basin states of 5.80 maf, excluding shared CRSP reservoir evaporation, there would be shortages to the demand in about 5 years of the 95-year period of record (see Upper Basin Yield Study). The total shortage to the demand that is computed using the CRSS model natural flows would be about 10.1 maf, which averages about 7 percent overall shortage for the worst 25-year period of critically severe hydrology and less than 2 percent overall shortage for the period of record. However, the CRSS model natural flows, which were computed as gaged flows plus upstream depletions, are less than the natural flows that would have been computed had the USBR historically used the modified Blaney-Criddle method with SCS effective precipitation and SCS growth season start temperatures to determine the historic irrigation depletions (see item 3). Consequently, if natural flows are adjusted to reflect historic irrigation depletions computed using that methodology consistent with the evaluation of future irrigation depletions as proposed in item 3, the overall shortage can be computed to be about 8.9 maf or about 6 percent overall for the worst 25-year period.

   The computed annual shortages using adjusted CRSS model natural flows with an Upper Basin demand of 5.80 maf would be about 0.7 maf in 1963, 3.3 maf in 1964, 0.5 maf in 1967, 0.4 maf in 1968 and 4.0 maf in 1977. The aggregate amount of shortage during the 1960s is about 4.9 maf. The CRSP power pool contents is about 4.2 maf currently, and is projected to be about 3.6 maf by 2060, excluding about 0.66 maf of storage below the minimum operating level for the Navajo Indian Irrigation Project (NIIP) at Navajo Reservoir. Therefore, should the annual shortages occur, the UCRC and the USBR could decide to address a substantial portion of the shortage through use of the power pools as well as by use curtailments in the Upper Basin or reduced releases to the Lower Basin. Also, although the computed annual shortage is about 4.0 maf in 1977, the adjusted natural flow at Lee Ferry in 1977 was only 5.5 maf and significant physical water supply shortages in the Upper Basin that year cause actual use to be much less than the long-term average, thus resulting in less actual shortage.

   Upper Basin consumptive uses would be expected to be below average under critical-period hydrology due to physical water supply shortages in the Upper Basin, thus resulting in anticipated or actual shortages at Lake Powell of lesser frequency and magnitude than are computed in the yield study using the long-term average depletion each year. Annual variations in Upper Basin consumptive

uses both above and below the long-term average demand of 5.80 maf would result from annual variations in water supply availability, and such variations should be considered to avoid overstating risk of shortages. While a relationship between Upper Basin uses and natural flows at Lee Ferry has not been verified by technical study, application of an historic USBR planning assumption regarding such relationship results in no computed shortages.

The current yield study indicates that shared CRSP reservoir evaporation averages about 0.25 maf for a 25-year period of severe CRSP reservoir storage draw down (1953-1977). Adding the shared CRSP reservoir evaporation to 5.80 maf of use by the Upper Basin states, the total Upper Basin depletion including both Upper Basin uses and CRSP reservoir evaporation would average 6.05 maf for a 25-year critical draw down period. This total depletion is similar to the minimum Upper Basin yield of 6.0 maf determined for the critical period by the 1988 HD, with both yields considering an overall computed shortage of about 6 percent.

The current yield study reflects the fact that shared CRSP reservoir evaporation during a period of critical draw down of reservoir storage is substantially reduced from the long-term average evaporation. The 1988 HD did not take this into account when allocating Upper Basin uses and long-term average shared CRSP reservoir evaporation to the states. Thus, the current study results in an increase in the portion of the Upper Basin critical-period yield that is available for uses by the Upper Basin states.

For the period of record, the current yield study indicates that CRSP shared reservoir evaporation would average about 0.49 maf, as compared to the long-term average CRSP shared reservoir evaporation of 0.52 maf determined by the 1988 HD. Thus, the total Upper Basin depletion including both Upper Basin uses of 5.80 maf and CRSP reservoir evaporation would average about 6.29 maf for the period of record.

2. New Mexico's share of the Upper Basin allocation is at least 646,875 af, excluding New Mexico's share of evaporation from CRSP reservoirs other than Navajo Reservoir.

Based on item 1, at least 5.80 maf can be made available, on average, for uses by the Upper Basin states. Assuming a long-term average of 5.80 maf for uses by the Upper Basin states, the allocation for uses by New Mexico, exclusive of CRSP shared reservoir evaporation, is computed as:

(5.80 maf - 0.05 maf) x 0.1125 = 0.6469 maf

The allocation represents long-term average annual depletions, not limitations on annual or short-duration uses. A long-term average Upper Basin consumptive use of 5.80 maf per year is the annual amount used each year in the current Upper Basin yield study, excluding shared CRSP reservoir evaporation; and therefore, schedules of future depletions for planning purposes will use long-term average

depletions. This is a conservative approach from a planning standpoint in that the average depletions during a critical period will be less than the long-term average depletions due to below-average water supply overall for the period and physical water supply shortages. The allocation is measured as depletion at Lee Ferry.

DEPLETIONS

3. The modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures is to be used to compute irrigation depletions in the Upper Basin; provided, that in some instances accounting of future irrigation depletions may be made using measured diversions less estimated returns (see item 4).

   Under this proposal, the USBR would use the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures for developing its Consumptive Uses and Losses reports and for developing its CRSS natural flows. The USBR and the Upper Division states also would use the SCS modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures for computing Upper Basin irrigation depletions for compact administration and for water planning and operations purposes.

4. NIIP depletions are to be determined based on diversions minus estimated returns.

   The NIIP Biological Assessment sets forth a water budget procedure for estimating return flows from NIIP that takes into account the build-up of ground water storage underneath the project and the consequent delay in return flows reaching the San Juan River. As part of the water budget, the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures would be used for estimating crop consumptive uses on the NIIP provided that the State of New Mexico, the Navajo Nation and the United States may later develop an alternative method for estimating the crop consumptive uses, if appropriate, based on site-specific research on the project.

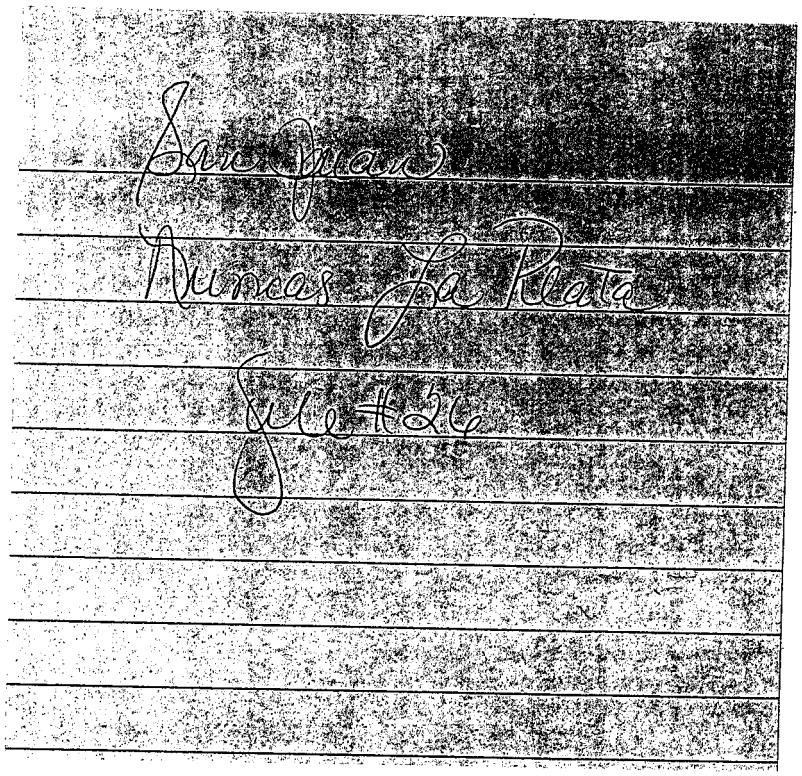
5. Evaporation from CRSP reservoirs is to be accounted as net evaporation after salvage of pre-reservoir losses.

   The USBR computes net evaporation, reduced for precipitation and salvage of pre-reservoir losses, to account mainstream evaporation at CRSP reservoirs in its Consumptive Uses and Losses reports. The USBR also uses the net evaporation to estimate inflows, lake evaporation and depletions of natural flows at CRSP reservoirs for water planning studies, including in the CRSS model and the San Juan River Basin Hydrology Model.

6. Uses on certain ephemeral tributaries and from tributary ground water are to be accounted only to the extent that such uses affect the flow of perennial or mainstream

rivers, and return flows to the ephemeral tributaries are to be accounted only to the extent that they return to mainstream rivers.

The Upper Basin allocation is from the flow available at Lee Ferry. Under this proposal, small amounts of consumptive use on ephemeral tributaries and from tributary ground water within the Chaco River drainage, the Chinle Wash drainage, and other drainages tributary to the San Juan River would be accounted based on their depletion impacts to the San Juan River. The USBR and the UCRC may account additional ephemeral tributary or ground water uses in the Upper Basin in a similar manner. Estimates of return flows to otherwise ephemeral tributaries, such as by the NIIP, would be reduced for channel losses in said tributaries that are incident to the use of water.



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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

UPPER COLORADO REGION

NEWS RELEASE

San Juan - 3
ALP

Western Colorado Area Office
Durango, Colorado
Patrick J. Schumacher (970) 385-6590
For Release October 17, 2001

Animas-La Plata Project
Notice of Public Meeting

The Bureau of Reclamation (Reclamation) is holding a public workshop and meeting at the Durango Arts Center, 802 East 2nd Avenue, Durango, CO 81301 from 7:00 p.m. until 9:00 p.m. on Wednesday, November 14, 2001. The purpose of the meeting is to provide information to the public and to gather comments from the public about the proposed relocation of three pipelines from Ridges Basin as an initial step in the construction of the Animas-La Plata Project.

The relocation of the pipelines was considered as part of the July 2000 Final Supplemental Environmental Impact Statement (FSEIS) prepared by Reclamation. Additional details about the relocations have been developed since the FSEIS, and Reclamation is preparing an Environmental Assessment (EA) to address them as part of its compliance with the National Environmental Policy Act (NEPA). The EA will tier off the information and analysis in the FSEIS and will describe and present the environmental effects of the pipeline relocations.

Written comments from those unable to attend the public meeting or wishing to supplement their oral presentations may be sent to Reclamation at the below address.

- Mr. Rob Waldman
- Bureau of Reclamation
- 835 East 2nd Avenue, Suite 300
- Durango, Colorado 81301
- Telephone: (970) 385-6567
- Fax: (970) 385-6539
- E-Mail: rwaldman@uc.usbr.gov

Supplementary Information

On July 14, 2000, the Department of Interior (Interior), through Reclamation, and in cooperation with the U.S. Environmental Protection Agency (EPA), and the Ute Mountain Ute and Southern Ute Indian Tribes (Colorado Ute Tribes), released the FSEIS. The FSEIS evaluated the potential impacts of implementing the Colorado Ute Indian Water Rights Settlement Act of 1988 (Public Law 100-585) in order to provide the Colorado Ute Tribes an assured long-term water supply in order to satisfy their senior water rights claims. The FSEIS responded to comments made by the public, agencies, and stakeholders on the Draft Supplemental Environmental Impact Statement (DSEIS) which had been released in January. The FSEIS also supplemented the environmental documents prepared by Reclamation in 1980 and 1996 for the Animas-La Plata Project (ALP), as well as provide an environmental evaluation for the Administration, other involved parties, and the public in reaching a final settlement of the water rights claims of the Colorado Ute Tribes.

The Secretary of the Interior subsequently issued a Record of Decision (ROD) on September 25, 2000, that adopted Reclamation's recommended alternative, Refined Alternative 4. Because the ROD determined that the preferred alternative provides the Tribes with benefits not envisioned under the Colorado Ute Indian Water Rights Settlement Act of 1988 (Public Law 100-585; 102 Stat. 2973), legislation amending the Act would be necessary in order to implement the activities approved by the ROD.

The Colorado Ute Settlement Act Amendments of 2000, (Public Law 106-554, Title III) (Amendments) were signed into law by President Clinton on December 19, 2000. The Act implements the ROD by authorizing a scaled down ALP. Specifically, the Amendments authorize construction of a reservoir, pumping plant, inlet conduit, and appurtenant facilities to allow for an average annual depletion of 57,100 acre-feet. The Amendments also establish a Colorado Ute Settlement Fund to complete the construction of ALP structural components within seven years of the date of enactment (i.e., 2008). It also establishes a $40 million Resource Fund for the Ute Mountain Ute and Southern Ute Indian Tribes for municipal or rural water development, and resource acquisition and enhancement.

Construction of the ALP Project is scheduled for a seven-year period beginning October 1, 2001. Prior to construction of the Ridges Basin Dam and Outlet Works, the existing pipelines across Ridges Basin must be relocated.

A copy of the FSEIS is available as a downloadable PDF file at Reclamation's website (http://www.uc.usbr.gov/special/alp/), or copies may be requested from Mr. Waldman at the above address in Durango.

San Juan-3
ALP

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

UPPER COLORADO REGION

NEWS RELEASE

Western Colorado Area Office
Durango, Colorado
Patrick Schumacher (970) 385-6590
For Release October 16, 2001

Reclamation Continues Animas-La Plata Project Repayment Contract Negotiations with San Juan Water Commission

The next meeting in a series of negotiation sessions will be held to discuss the terms of an amendatory repayment contract for the Animas-La Plata Project. The meeting, between the San Juan Water Commission and the Bureau of Reclamation, is scheduled for Tuesday, October 23, 2001, at 1:00 p.m. in the Executive Conference Room in the Farmington Municipal Building, 800 Municipal Drive, Farmington, New Mexico.

The San Juan Water Commission's 1990 Repayment Contract is being amended because of changes to the Animas-La Plata Project as a result of the Colorado Ute Settlement Act Amendments of 2000. The amendatory contract will:

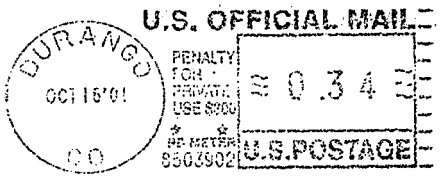
- Provide for storage and delivery of project water
- Identify the amount of construction costs the Commission will pay the Federal Government
- Provide for operation and maintenance of the project

The negotiation meetings are open to the public as observers, and questions pertaining to the contract may be asked during a 30 minute public comment period at the end of each negotiation session.

Copies of the proposed contract and other pertinent documents will be available at these meetings, or they can be obtained from the Animas-La Plata Project web site at http://www.uc.usbr.gov/progact/animas/index.html Copies are also available by contacting Dick Gjere of the Bureau of Reclamation, 835 East Second Avenue, Suite 300, Durango, Colorado, 81301, telephone (970) 385-6531. Any changes of time and place of the negotiation meetings will be announced on the above web site and on Reclamation's toll-free phone number at **(866) 720-0918**. After negotiation of a final draft amendatory contract, Reclamation will provide an opportunity for the public to submit written comments on the draft amendatory contract.

# # #

Bureau of Reclamation
Western Colorado Area Office
835 E 2nd Ave, Suite 300
Durango CO 81301



JOHN WHIPPLE
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NEW MEXICO INTERSTATE STREAM COMMISSION
PO BOX 25102
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San Juan -> ALP

STATE OF NEW MEXICO

OFFICE OF THE STATE ENGINEER

Thomas C. Turney
State Engineer

LEGAL SERVICES DIVISION
130 South Capitol
Santa Fe, New Mexico 87501

Mailing Address:
P.O. Box 25102
Santa Fe, NM 87504-5102
Telephone: (505) 827-6150
Fax: (505) 827-3887

October 15, 2001

Mark Duncan, Chairman
San Juan Water Commission
800 Municipal Drive
Farmington, New Mexico 87401

Re: Draft Amendatory Funding Agreement and Repayment Contract between The United States and The San Juan Water Commission—Revised 9/28/01 Draft

Dear Mr. Duncan;
The subject draft Agreement was transmitted to us for review by e-mail from your office. Our comments follow:

- The draft includes a label for all water to be delivered to the San Juan Water Commission (SJWC) ie: "M&I Water Allocation". With such a designation, the water being contracted is identifiable for protection in the administration of the river with the project in operation. It is most important that such a designation be included in your contract with the United States.

- The SJWC would contract for only 3025 acre-feet of storage in Ridges Basin Reservoir, which amount we understand is sufficient under the assumption that the Colorado Ute tribes will take all their allocation from the reservoir. Also the draft would afford the SJWC "the opportunity to purchase excess storage". We understand that excess storage is not now available. It is suggested that the SJWC seek language in the contract that would provide more assurance for future ability to contract than the language quoted above.

- The draft does not specify the amount of water for diversion by the Contractor. The draft does provide that sufficient water will be delivered to ensure that the SJWC annually receives the M&I Allocation available for diversion at approved points of diversion. Accordingly, the water supply necessary for the M&I Allocation to be available for diversion would be determined in the future, by the Operator of the Project works.

Comments specific to sections of the draft follow:

Pg. 1, last line continued onto pg. 2, line 1. After "River" delete the comma and change the remainder of the sentence to read "to furnish water for municipal, industrial, domestic and other beneficial purposes." As written the sentence refers to the project authorized by the 1968 Act, which includes uses other than those listed on page 2.

Pg. 2,(e), next to last line. Change "capacity" to "capability".

Pg. 3(j). The third sentence beginning with "The absence" is not clear; it appears that the language "that was originally contained in Contract 0-07-40-R1080" is not needed.

Pg 3(k), line 1. Delete "its"; not needed. Also, the document would flow better if the order of sections (j) and (k) were reversed.

Pg. 3. In the second and third lines of "NOW THEREFORE", delete "amends" and "modifies"; not needed.

Pg. 4, Sec.1.©. In the first line change "participating" to "Participating", and in the second line, after "Project" insert "authorized by Title V of the Colorado River Basin Project Act, approved September 30, 1968".

Pg. 4,Sec.1.(e), lines 1 and 2. After "106-554" insert " to be constructed under the Project" and delete this phrase as it appears later in the sentence.

Pg. 5,Sec.1.(h), line 3. Change "State" to "States", and after "Colorado" insert "New Mexico".

Pg. 8. Sec 3(b). The words "has notified" do not flow with the remainder of the phrase, and the last phrase "or policy promulgated pursuant thereto" appears overly broad.

Pg. 9,Sec.5(a), next to last line. Before "their" insert "the water supply necessary for", before "available" insert "to be" and change "any" to "all".

Pg. 10,Sec.6(a). Delete the second sentence as it seems repetitive. If the sentence is to be retained, change the first part of the sentence to read; "This allocation is to be met by a combination of direct flow diversion from the San Juan River System and water ...".

Pg. 11, Sec.6(b). Delete the section as it does not appear to be germane to this contract. If the section is to be retained, in the second line change "put to" to "diverted for"; the referenced permits are permits only to divert.

Pg. 11, Sec.6©, third line. After "supplement" insert "the amount of" and change "amounts" to "as". In the next line delete the second "of".

Pg. 12, Sec.7(b). Change the first and second sentences to read; "Upon assignment as described in (a) above, the Commission shall work diligently to put the water to beneficial use under New Mexico State law. The Commission will protect the Project water rights and in case a dispute arises as to the character, extent, priority or validity of these rights, the Commission shall promptly bring and diligently prosecute and/or defend judicial proceedings for the determination of such dispute and shall take all other measures necessary toward the defense and protection of the Project water rights."

Pg 13. Sec 8(a) fourth sentence. Delete "in the May 2001 Interim Cost Allocation'; not needed.

Pg. 15, seventh line. Move "only" to follow "warranted". In the first full paragraph, second line, delete "those".

Pg. 17, Sec 8(h), first line. Move "annually' to follow "consult"

Pg 22, first two lines. Change to read;", the Commission may use the M&I Water allocation to the extent available by direct flow diversion from the Animas River,"

Pg. 23, second line. After "Plata" insert "Project".

Pg. 23, Sec.18(a), second sentence. After "subject" insert "to and not inconsistent with State law and applicable Federal law and interstate compacts and".

Please let us know if additional information or discussion would be useful.

Sincerely,

Thomas C. Turney
State Engineer

San Juan-3
ALP

San Juan Water Commission

800 Municipal Drive
Farmington NM 87401
505-599-1462
Fax: 505-599-1463

COPY

MEMO

Date: *Friday, September 21, 2001 (2:51PM)*

To: *Tom Turney, Norm Gaume, Richard Cheney, and Members of the Interstate Stream Commission*

Subject: *A-LP Cost Sharing Agreement Meeting*

Sender: *L. Randy Kirkpatrick*
Executive Director

Members of the Interstate Stream Commission:

A meeting of all signatories of the 'draft' *Amended And Restated Agreement in Principle Concerning The Colorado Ute Indian Water Rights Settlement And Binding Agreement For Animas La Plata Cost Sharing* has been scheduled for **Thursday, October 4, 2001**. The meeting will be held at the **Bureau of Reclamation office, 835 E. 2nd Avenue, Durango, Colorado beginning at 3:00 P.M.** Because the meeting could continue into the evening hours, a set time for the meeting to end has not been established.

As a signatory, your participation in this meeting is critical and the San Juan Water Commission urges you to attend.

Please call me if you have not received a copy of the 'draft' document or if you have any questions.

Sincerely,

L. Randy Kirkpatrick
Executive Director

United States Department of the Interior
BUREAU OF RECLAMATION
Upper Colorado Region
Western Colorado Area Office

2764 Compass Drive, Suite 106
Grand Junction CO 81506-8785

835 E 2nd Avenue, Suite 300
Durango CO 81302-5475

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Mr. Norm Gaume
Interstate Stream Engineer
New Mexico Interstate Stream Commission
PO Box 25102
Santa Fe NM 87504-5102

Subject: Purpose Amendment to the 1986 Cost Share Agreement, Animas-La Plata Project, Colorado and New Mexico

Dear Mr. Gaume:

The Colorado Ute Settlement Act of 2000 (2000 Amendments), Public Law 106-554, authorizes the Secretary of the Interior to construct, operate and maintain the Animas-La Plata Project in Southwestern Colorado. Reclamation is currently involved in certain preconstruction activities in anticipation of a construction start on November 9 later this year. As part of this preconstruction process, we are reviewing all documents executed either in anticipation of, or pursuant to, the Colorado Ute Indian Water Rights Settlement Act of 1988, Public Law 100-585, in order to determine whether such documents should be amended in light of the 2000 Amendments. One such document we have identified is the *Agreement in Principle Concerning the Colorado Ute Indian Water Rights Settlement and Binding Agreement for Animas-La Plata Project Cost Sharing*, (1986 Cost Sharing Agreement) which was executed June 30, 1986. Your organization was one of the signatories to this document.

Certain signatories to the 1986 Cost Sharing Agreement are currently negotiating obligations different than those envisioned in 1986, while other signatories who anticipated being part of the Animas-La Plata Project are no longer involved. We, therefore, believe it is necessary to amend the 1986 Cost Sharing Agreement. A first draft of an amendment to the 1986 Cost Sharing Agreement is being developed which provides an initial attempt to reflect the current status of each of the original signatories in light of the 2000 Amendments. This draft will be forwarded to you in the near future for your review and comment on the form and content. Once we have a satisfactory document, we will pursue getting the amendment properly executed.

Please do not hesitate to contact me directly if you have any questions or concerns about the 1986 Cost Sharing Agreement or any other issue involving the Animas-La Plata Project. I can be reached in Durango at (970) 385-6590.

Sincerely,

Patrick J. Schumacher
Manager, Four Corners Division

cc: John Bezdek
Office of the Solicitor
Main Interior RM 7060-MIB
1849 C Street NW
Washington, D.C. 20240-0001

Area Manager, Grand Junction CO