Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Wed 2/15/2006 11:41 AM
To: Whipple, John J., OSE
Cc: jshiel@seo.wyo.gov; randy.seaholm@state.co.us; Lopez, Estevan, OSE; Don Ostler; robertking@utah.gov
Subject: Re: hydro determination
Attachments:

John, I've run a comparison of the HD model against CRSS and found it quite accurate. I'll share the results as soon as I can pull the info together later this week. - Dave

>>> "Whipple, John J., OSE" <john.whipple@state.nm.us> 2/14/2006 1:31:34 PM >>>
Dave:

Attached are two versions of HD_v9. The summary in JW_v2 looks at impacts of different storage and use assumptions with the HD_v9 CRSP evaporation assumption (evap with CRSP+Other storage is the same as evap with CRSP storage only). The summary in JW_v3 includes impacts for a range of storage, use and shortage combinations that might be considered sellable at this time considering Upper Basin and Lower Basin interests, and includes also a sensitivity analysis assuming CRSP and non-CRSP relative storage is the same in terms of percent of capacity. Based on JW_v2 and JW_v3, would the USBR determine that water is available for the Upper Basin states to use at least 5.75 maf, on average excluding CRSP shared reservoir evaporation, with the computed shortages indicated (less than 6 percent overall shortage for a critical period as per the 198)), provided that the Upper Colorado River Commission would not objec to the determination? The total Upper Basin depletion would be about 6.0 maf during the most critical period (similar to the critical-period yield of the 1988 HD). Do you need to refine the analysis by using CRSS with monthly time steps to check this determination or is the annual spreadsheet analysis sufficient? Your prompt response will be greatly appreciated.

John, Robert, Randy:

Can your states support a determination of at least 5.75 maf for use by the Upper Basin states with the shortages indicated?

All:

Can you support higher amounts of use with greater shortages that might be considered tolerable? You can experiment with the spreadsheets for various combinations of use and shortages.

New Mexico anticipates transmitting by the end of February for your consideration a package proposal for resolving hydrologic determination issues, including both supply and depletion schedule issues.

John

OSE-0304

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Whipple, John J., OSE

From: Lochhead, James S. [JLochhead@BHF-Law.com] **Sent:** Tue 2/14/2006 12:05 PM
To: Don Ostler; scott@balcombgreen.com; rbratton@bratton-mcclow.com; ekuhn@crwcd.org; Lopez, Estevan, OSE; Dantonio, John, OSE; Whipple, John J., OSE; Mutz, Phil, OSE; jshiel@seo.wyo.gov; ptyrre@seo.wyo.gov; hal.simpson@state.co.us; Randy.Seaholm@state.co.us; Rod.Kuharich@state.co.us; Castillo, Candise, OSE; Brown, Jayne R., OSE; JERRYOLDS@utah.gov; LARRYANDERSON@utah.gov; RobertKing@utah.gov
Cc: SFARRIS@ago.state.nm.us; djensen@pblutah.com; carol.angel@state.co.us; ted.kowalski@state.co.us; Trujillo, Tanya, OSE; Hmcfad@state.wy.us; Jane Bird; NORMANJOHNSON@utah.gov
Subject: RE: Hydrologic Determination
Attachments:

The "tradition" for the hydrologic determination, if memory serves, has been that the BOR does it, and the Commission expresses that it "does not object," while making the usual historic objections for the record. I suggest this remains the best way to handle it. Jim

---

From: Don Ostler [mailto:DOSTLER@uc.usbr.gov]
Sent: Tue 2/14/2006 9:57 AM
To: scott@balcombgreen.com; rbratton@bratton-mcclow.com; ekuhn@crwcd.org; elopez@ose.state.nm.us; jdantonio@ose.state.nm.us; jwhipple@ose.state.nm.us; pmutz@ose.state.nm.us; jshiel@seo.wyo.gov; ptyrre@seo.wyo.gov; hal.simpson@state.co.us; Randy.Seaholm@state.co.us; Rod.Kuharich@state.co.us; candise.castillo@state.nm.us; jayne.brown@state.nm.us; Don Ostler; JERRYOLDS@utah.gov; LARRYANDERSON@utah.gov; RobertKing@utah.gov
Cc: SFARRIS@ago.state.nm.us; Lochhead, James S.; djensen@pblutah.com; carol.angel@state.co.us; ted.kowalski@state.co.us; tanya.trujillo@state.nm.us; Hmcfad@state.wy.us; Jane Bird; NORMANJOHNSON@utah.gov
Subject: Hydrologic Determination

Hello All:

With the recent lull in 7 Basin State Agreement issues it has allowed us to consider some of the other issues that have been delayed with this work load. As you may recall, Dave Trueman of the Bureau has modeled a number of possible changes to the hydrologic determination assumptions that might increase the yield sufficient to meet New Mexico's Navajo settlement requirements. John Whipple has indicated he will complete his work on a proposal by Feb 28th. We will then need to schedule a meeting of the engineering committee or a conference call to see if we can get agreement.

Will the members of the engineering committee who need to be involved in this, please give me your availability for a possible meeting on March 20, 21, 27, 28, 29, 30 and 31. If it turns out we can get by with a conference call, we will still hold it on the set aside day....

Commissioners decision:
Another matter related to this that the Commissioners will have to decide is how we react to Rick Gold's proposal that the Commission make the decision on the hydrologic determination and formally send it to the Bureau. In the past the determination has been made by the Bureau and we have commented on it. By law it is a responsibility of the Secretary to do this. The problem with the Commission formally forwarding the determination to the Secretary is that it makes it more difficult for us to object to the assumption used in the determination of a release of 8.23 maf. The Commission also has different natural flow data than the Bureau and it would be more difficult to submit a determination to the Secretary that did not use our own natural flow data. Our data would hurt in the Hydrologic determination and help us in the 602a calculation. To date the differences have not been made an issue...For both of these reasons, I recommend that we not change the process of who does the determination. I am sure Rick wants us to take some of

OSE-0306

the legal risk of defending the revised determination. I would think the Bureau could go ahead with a determination based upon informal conc ence from us that we would not oppose it, even though we do not agree with the 8.23 assumption as we have always done.

We also need to plan how the Commission may take action on this. It would be nice to deal with this before our June 5 Commission meeting in Jackson. To do that it would require the Commission holding a Commission meeting/work meeting this spring or at least holding a Commission meeting by conference call. I am guessing there will be issues with the 7 Basin States agreement on Coordinated operations/shortage that will crop up by then as well (such as the Arizona proposal that was deferred and the details of how the strategy might actually be implemented by the Bureau), so we might be ahead to just plan a Commission/Work meeting in early April....

Other things that we need to consider in an engineering committee meeting could include further discussions on our procedures to implement a curtailment of use in the upper basin and the need to revise and approve a new depletion schedule...

Chairman Bratton has also indicated his interest to have a retreat to discuss Commission goals .

I would appreciate it if the engineering committee would give me their availability for a meeting on the dates indicated. I would also like feedback from the Commissioners (and others) about the strategy for deal with the Bureau on the hydrologic determination mentioned in paragraph 3 of this e mail as well as your interest in scheduling a work meeting/Commission meeting in the early Spring..

Thank you,
Don Ostler

Whipple, John J., OSE

From: Lopez, Estevan, OSE **Sent:** Fri 2/10/2006 6:45 PM
To: Scott Balcomb
Cc: Hal Simpson; Russell George Esq.; Rod Kuharich; Ted Kowalski; Dantonio, John, OSE; Whipple, John J., OSE; Trujillo, Tanya, OSE; Farris, Stephen
Subject: RE: Long Hollow
Attachments:

Scott,

Thanks for getting back to me on this. We are indeed interested in moving this issue forward as quickly as possible. Unfortunately we're nearing the end of the NM legislative session (we're approaching critical mass) and we'll probably have to wait for at least another week before we can get together internally to flesh out a proposal. As soon as we've done that, we'll be in contact with you to get some feedback from CO.

Additionally, we'll likely ask Don Ostler about setting up a meeting of the UB Commission in relatively short order as well. At this point, I don't know if mid to late March would be a possiblity, but we may want to try for something in that timeframe.

Again, thanks for getting back on this. We look forward to working with you on this issue.

Best regards,
Estevan López

From: Scott Balcomb [mailto:scott@balcombgreen.com]
Sent: Thursday, February 09, 2006 8:21 AM
To: Lopez, Estevan, OSE
Cc: Hal Simpson; Russell George Esq.; Rod Kuharich; Ted Kowalski
Subject: Long Hollow

Dear Estevan:

I have had an opportunity to talk to Hal Simpson, and consider your request about whether Colorado is ready to proceed with a new hydrologic determination. Briefly, it seems that we are, but we would like to look at a specific proposal from New Mexico if you think that is appropriate. It would seem to me that the best way to get "this ball rolling" is for N.M. to make a proposal.

Please let me know how you would like to proceed.

Very truly yours,

Scott Balcomb

Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Wed 12/7/2005 4:49 PM
To: Don Ostler
Cc: jshiel@seo.wyo.gov; randy.seaholm@state.co.us; Whipple, John J., OSE; robertking@utah.gov
Subject: Hydrologic Determination v10
Attachments: HD v10.xls(461KB)

Don,

I've compared the HD spreadsheet and CRSS runs and they compare pretty favorably. Using CRSS with development at 5.429 maf (existing 2060 demand file), no equalization, no sedimentation, CRSS shows a minimum CRSP storage of 5.0 maf at the end of 1977. By comparison, the HD spreadsheet shows 5.2 maf. That equates to a CRSS yield of 6.03 maf without going below minimum power pools... just barely. One could get the two methods to match more exactly by minor changes in the bank storage assumption (currently 4%).

Now when we add on the effects of sedimentation at 2060, one would expect to dip a little deeper into the reservoirs. The HD v10 shows that effect for various levels of demands and assumptions about additional storage.

Regards - Dave

David Trueman
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Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Mon 11/28/2005 10:10 AM
To: Don Ostler
Cc: Whipple, John J., OSE
Subject: Re: Hydro Determination
Attachments:

Don, Having looked over John's method that averages storage levels at the beginning and end of the year, I find it is a technical improvement over using just year-end storage. R-squareds improve in the regression. I'll include them in v10 if you find that helpful. Nicely done. -
Dave

>>> Don Ostler 11/22/2005 3:22:16 PM >>>
Dave:
This looks good..John was telling me that there may be some problems with the evaporation data in these runs...Have you talked with him about this? Does this data reflect a resolution of any problems with Evap data??
Thank you..
Don

>>> Dave Trueman 11/17/2005 11:59:42 AM >>>
Don and John,

I was not satisfied with the previous presentation of data and had inspiration overnight. See if this simplifies things and if it is helpful, please forward it to the others.

- Dave

David Trueman
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dtrueman@uc.usbr.gov

Whipple, John J., OSE

From: Whipple, John J., OSE **Sent:** Mon 11/28/2005 8:07 AM
To: Ron Bliesner
Cc:
Subject: RE: Navajo Evaporation
Attachments:

Ron: I could not open and read the attachment. See you Thursday perhaps at the SJRIP Coordination Committee meeting. Thanks for your help. John

---

From: Ron Bliesner [mailto:bliesner@kelbli.com]
Sent: Tue 11/22/2005 6:02 PM
To: Whipple, John J., OSE
Subject: RE: Navajo Evaporation

John,

Attached is a little paper that Andy Keller did for internal discussion about approach to reservoir evaporation for your reference. Unless the Reclamation net coefficients include adjustment for pre-dam phreatic area (area 1 in the paper) then you may be able to get some more water out. Our recollection of the situation from 1994 is that the coefficients are sufficiently low to cover the pre-reservoir salvaged losses, but Tom will have the definitive answer (I hope). I'll be interested in his response.

Ron Bliesner, P.E.

President

Keller-Bliesner Engineering, LLC

78 E. Center

Logan, UT 84321

Office (435)753-5651

Fax (435)753-6139

Cell (435)757-9354

From: Whipple, John J., OSE [mailto:john.whipple@state.nm.us]
Sent: Tuesday, November 22, 2005 4:25 PM
To: Ron Bliesner
Subject: RE: Navajo Evaporation

Ron:

Thanks for the data. The monthly net evap coefficients are those from the USBR hydromet database and represent the difference between post-dam and pre-dam evaporation according to "Historical Inflows, Colorado River Storage Project," Tom Ryan, October 1993. I left a message for Tom to call me to verify whether pre-dam evaporation includes vegetation consumptive use within the reservoir pool in addition to river channel surface evaporation.

John Whipple

From: Ron Bliesner [mailto:bliesner@kelbli.com]
Sent: Tue 11/22/2005 3:49 PM
To: Whipple, John J., OSE
Subject: FW: Navajo Evaporation

John,

The attached spreadsheet contains the reservoir surface area with time for the full Navajo-Gallup model run (no depletion guarantee) and includes the evaporation coefficients used in the model.

The model does not include any specific value for salvage. Any accounting for salvage would have to be included in the calculation of net evaporation, which the documentation suggests is not done. The sentence equating salvage with pre-reservoir loss does not make sense to us in the way the documentation intends it. Brian and I believe they meant that sentence as justification to ignore salvage, but that is not what the sentence says. The documentation just is not very good in actually explaining what is done.

I hope this information helps. Let me know if you need anything else.

Ron Bliesner, P.E.
President
Keller-Bliesner Engineering, LLC
78 E. Center
Logan, UT 84321

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Fax (435)753-6139
Cell (435)757-9354

addressee(s). If you have received this transmission in error, you are advised that any disclosure, copying, distribution, or the taking of any action in reliance upon it is strictly prohibited. Moreover, any such inadvertent disclosure shall not compromise or waive the attorney-client privilege as to this communication or otherwise. If you have received this communication in error, please immediately delete it and contact us by telephone at 435-753-5651. Thank you, Keller-Bliesner Engineering, LLC.

-----Original Message-----
From: Brian Westfall [mailto:bw@kelbli.net]
Sent: Tuesday, November 22, 2005 2:05 PM
To: Ron Bliesner (Ron Bliesner)
Subject: Navajo Evaporation

Ron,

Call me if you need something else.

Thanks

Brian

Whipple, John J., OSE

From: Whipple, John J., OSE **Sent:** Tue 11/22/2005 12:45 PM
To: randy.seaholm@state.co.us; robertking@utah.gov; jshiel@seo.wyo.gov
Cc: dostler@uc.usbr.gov; Lopez, Estevan, OSE; Dantonio, John, OSE
Subject: hydro determination
Attachments:

All:

I have been informed that some or all of you may not be able to provide or generate the requested original and modified Blaney-Criddle methods estimates of crop consumptive uses in the Upper Basin for your states for the 1953-1970 period. John Shields informed me yesterday that Wyoming may be able to estimate crop consumptive uses in its state using both the original and modified B-C method for a point in time (for example, 1965 or 1970), or to determine what percentage difference occurs, either for a particular year or on average, by using the modified versus original B-C method to estimate uses in Wyoming. Please let me know within the next two weeks what data or information, if any, you can provide in response to my request and how long it may take to provide it. Also, if you can develop an estimate of the difference in crop consumptive uses in the Upper Basin in your state between methods, whether for one or more years, please provide a description of the derivation or bases for your data or estimates.

Thank you for your attention to this matter, John Whipple

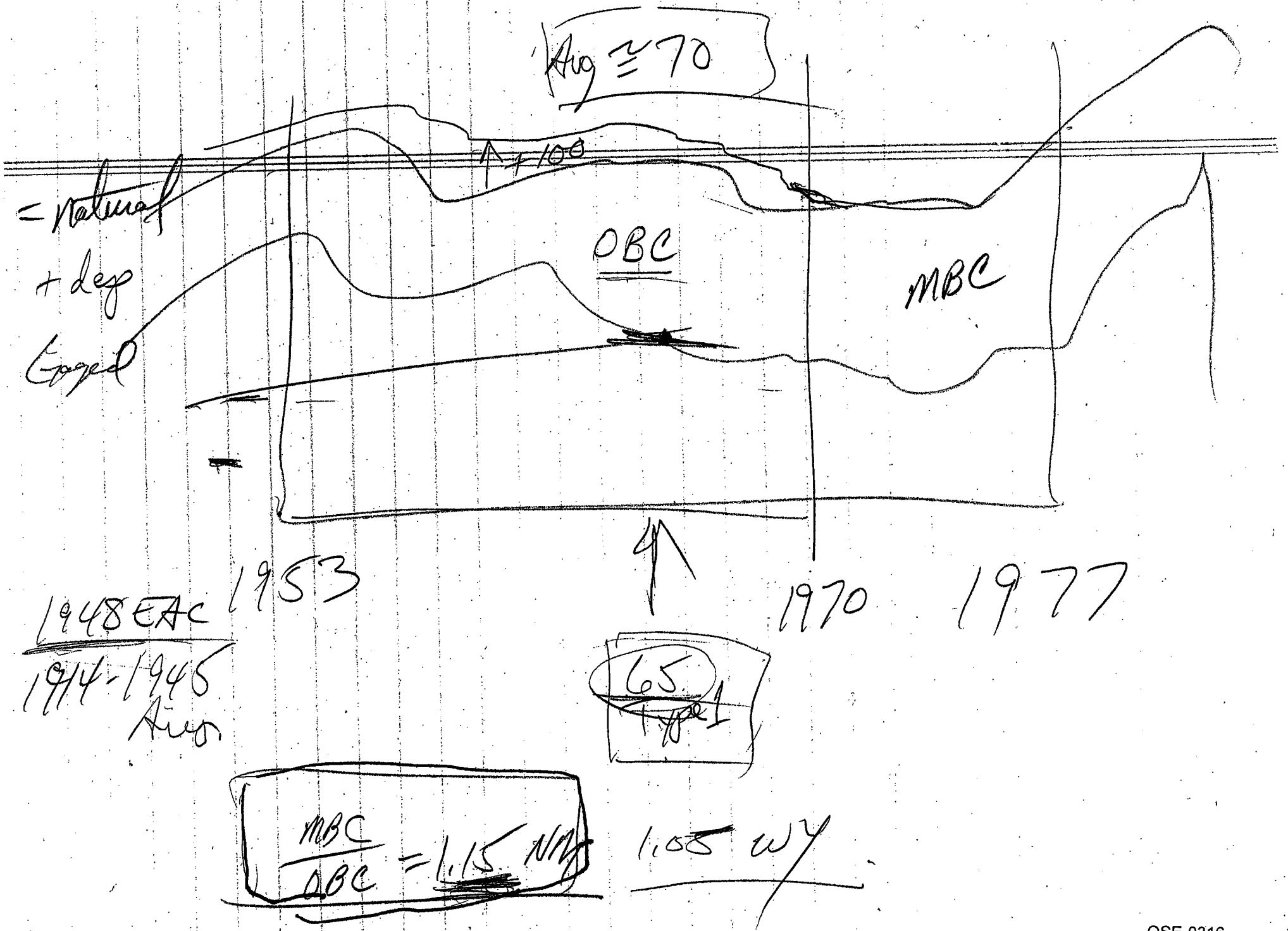
Whipple, John J., OSE

From: Whipple, John J., OSE **Sent:** Thu 11/17/2005 7:10 AM
To: dtrueman@uc.usbr.gov
Cc: dostler@uc.usbr.gov; randy.seaholm@state.co.us; robertking@utah.gov; jshiel@seo.wyo.gov
Subject: hydro determination
Attachments:

Dave:

Would you be able to provide for the period 1953-1977 the amounts of consumptive uses in the Upper Basin for each state that were used to derive the CRSS natural flows for those years? I am looking for both crop consumptive use amounts and total depletion amounts for all uses by state for the critical period, if you can get them from the backup data that is available.

John Whipple


Avg ≅ 70
+100
= natural
+ dep
Exped
OBC
MBC
1948 EAC
1944-1945
Avg
1953
1970
1977
65
MBC / OBC = 1.15 NAP
1.08 WY

Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Fri 11/18/2005 9:54 AM
To: Whipple, John J., OSE
Cc:
Subject: RE: Evap on V9
Attachments:

Everything is on CY basis. - D

>>> "Whipple, John J., OSE" <john.whipple@state.nm.us> 11/17/2005 6:06:24 PM >>>
Dave:

The evap equations are based on calendar year data. Is the annual spreadsheet water budget based on calendar year or water year flows? There may be bias between end of September and end of December storage depending upon normal reservoir operations.

John

From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]
Sent: Thu 11/17/2005 8:42 AM
To: Whipple, John J., OSE
Subject: Evap on V9

John,

If you let the regression find the net evap at zero af of Live Storage,
the regression shows net evap going to essentially about zero (only 3,472 af) at the top of the dead pool. I presume that is about where gross = salvage. I chose to use the simpler equation, setting the evap
to 0 at the top of dead pool. The regression R-square remains the same.

- Dave

Whipple, John J., OSE

From:	Whipple, John J., OSE	**Sent:**	Wed 11/9/2005 3:05 PM
To:	Don Ostler; ekuhn@crwcd.org; jshiel@seo.wyo.gov; hal.simpson@state.co.us; randy.seaholm@state.co.us; Brown, Jayne R., OSE; jerryolds@utah.gov; RobertKing@utah.gov		
Cc:	Dave Trueman		
Subject:	RE: Hydro Determination Spreadsheet (version 8)		
Attachments:			

All:
I have discussed with Dave a problem in the evaporation calculations in the spreadsheet, and he will be sending out a revision when he gets a chance.
John Whipple

From: Don Ostler [mailto:DOSTLER@uc.usbr.gov]
Sent: Wed 11/9/2005 2:05 PM
To: ekuhn@crwcd.org; Whipple, John J., OSE; jshiel@seo.wyo.gov; hal.simpson@state.co.us; randy.seaholm@state.co.us; Brown, Jayne R., OSE; jerryolds@utah.gov; RobertKing@utah.gov
Cc: Dave Trueman
Subject: Fwd: Hydro Determination Spreadsheet (version 8)

Hello All:
Dave Trueman has done some additional work on the hydrologic determination for our conference call scheduled for tomorrow, November 10th at 10:00am....Thanks very much to Dave for all the effort he has put into this issue. We will discuss the results of Dave's spreadsheet (attached) and the other matters included on the agenda previously sent to you...
The call in information has been provided to you previously and is repeated here for your convenience:

call in number 801-524-3640
passcode 5240
time: 10:00am November 10th Thursday

Draft Agenda:
1. Use of CRSP storage only or all Upper Basin Storage?
2. Can we agree in principle to salvage by use and discuss how to quantify it (ie. use previously determined salvage percentages or re-evaluate them using new river surface area/evap rate studies)
3. What is the basis for depletion schedules(anticipated actual average depletions or nominal non-shorted average depletions?
4. What other assumptions doe you want to have modeled?
5. What is our schedule for getting to a decision? December 14th Commission meeting, or other??
6. Status of Update of Upper Basin Depletion schedules
7. other

We look forward to a productive discussion and progress on resolving the issues New Mexico is facing now... Please read Dave Trueman' comments on the spreadsheet model and look at the spreadsheet...below..

thanks
Don Ostler

OSE-0318

>>> Dave Trueman 11/9/2005 9:54:38 AM >>>
Don,

Here is the latest spreadsheet. It narrows down the options and is hopefully a bit simpler to understand. As you look over the spreadsheet, one will need to adjust our way to viewing the upper basin yield. There is considerable water to be had if one models CRSP reservoir evap which drops considerably during the critical period of drought. This allows higher uses in each of the states. I've shown NM's allocation in this version and will add the other states later. The effect is profound (about 200kaf/yr).

This version has 2 sheets: one for CRSP Active Storage and another which uses CRSP Active plus all other small storage in the UC Basin. Both versions allow the user to increase the UC demands and view shortages in a small table below. One can also explore the use of a drought shortage trigger (0% to 10% might be reasonable). This is currently set at 0%.

NM-ISC letter dated May 3, 2005 shows NM depletions in 2060 at 609,000 af/yr (exclusive of shared CRSP evap). CRSP Active (blue tab) with virtually no shortages shows 602,000 af/yr available to meet this need. If one adds in the other small reservoirs (salmon colored tab), that number increases to 621,000 af/yr.

I'll be discussing this spreadsheet in our call Thursday.

Regards - Dave

David Trueman
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dtrueman@uc.usbr.gov

Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Wed 11/9/2005 9:54 AM
To: Don Ostler
Cc: Whipple, John J., OSE
Subject: Hydro Determination Spreadsheet (version 8)
Attachments: HD v8.xls(401KB)

Don,

Here is the latest spreadsheet. It narrows down the options and is hopefully a bit simpler to understand. As you look over the spreadsheet, one will need to adjust our way to viewing the upper basin yield. There is considerable water to be had if one models CRSP reservoir evap which drops considerably during the critical period of drought. This allows higher uses in each of the states. I've shown NM's allocation in this version and will add the other states later. The effect is profound (about 200kaf/yr).

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I'll be discussing this spreadsheet in our call Thursday.

Regards - Dave

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dtrueman@uc.usbr.gov

Upper Basin Yield Study - Draft 11/9/05

1906	18,550,021	24,847,704	8,250,000	5,400,000	794,988	0	28,952,737	4,105,033	0	24,847,704
1907	21,201,694	24,847,704	8,250,000	5,400,000	794,988	0	31,604,410	6,756,706	0	24,847,704
1908	12,218,817	24,847,704	8,250,000	5,400,000	794,988	0	22,621,533	0	0	22,621,533
1909	22,356,301	22,621,533	8,250,000	5,400,000	735,095	0	30,592,739	5,745,035	0	24,847,704
1910	14,650,616	24,847,704	8,250,000	5,400,000	794,988	0	25,053,332	205,628	0	24,847,704
1911	15,499,729	24,847,704	8,250,000	5,400,000	794,988	0	25,902,445	1,054,741	0	24,847,704
1912	18,623,410	24,847,704	8,250,000	5,400,000	794,988	0	29,026,126	4,178,422	0	24,847,704
1913	14,536,373	24,847,704	8,250,000	5,400,000	794,988	0	24,939,089	91,385	0	24,847,704
1914	21,354,814	24,847,704	8,250,000	5,400,000	794,988	0	31,757,530	6,909,826	0	24,847,704
1915	13,623,277	24,847,704	8,250,000	5,400,000	794,988	0	24,025,993	0	0	24,025,993
1916	20,142,892	24,025,993	8,250,000	5,400,000	772,881	0	29,746,004	4,898,301	0	24,847,704
1917	22,942,804	24,847,704	8,250,000	5,400,000	794,988	0	33,345,520	8,497,816	0	24,847,704
1918	15,865,939	24,847,704	8,250,000	5,400,000	794,988	0	26,268,655	1,420,951	0	24,847,704
1919	12,651,369	24,847,704	8,250,000	5,400,000	794,988	0	23,054,085	0	0	23,054,085
1920	22,287,632	23,054,085	8,250,000	5,400,000	746,733	0	30,944,985	6,097,281	0	24,847,704
1921	22,526,781	24,847,704	8,250,000	5,400,000	794,988	0	32,929,497	8,081,793	0	24,847,704
1922	18,447,198	24,847,704	8,250,000	5,400,000	794,988	0	28,849,914	4,002,210	0	24,847,704
1923	19,024,046	24,847,704	8,250,000	5,400,000	794,988	0	29,426,762	4,579,058	0	24,847,704
1924	13,877,798	24,847,704	8,250,000	5,400,000	794,988	0	24,280,514	0	0	24,280,514
1925	14,430,701	24,280,514	8,250,000	5,400,000	779,728	0	24,281,487	0	0	24,281,487
1926	15,213,731	24,281,487	8,250,000	5,400,000	779,754	0	25,065,464	217,760	0	24,847,704
1927	19,539,212	24,847,704	8,250,000	5,400,000	794,988	0	29,941,928	5,094,224	0	24,847,704
1928	16,954,334	24,847,704	8,250,000	5,400,000	794,988	0	27,357,050	2,509,346	0	24,847,704
1929	21,829,585	24,847,704	8,250,000	5,400,000	794,988	0	32,232,301	7,384,597	0	24,847,704
1930	14,621,041	24,847,704	8,250,000	5,400,000	794,988	0	25,023,757	176,053	0	24,847,704
1931	8,474,134	24,847,704	8,250,000	5,400,000	794,988	0	18,876,850	0	0	18,876,850
1932	17,422,187	18,876,850	8,250,000	5,400,000	634,349	0	22,014,688	0	0	22,014,688
1933	12,183,500	22,014,688	8,250,000	5,400,000	718,769	0	19,829,419	0	0	19,829,419
1934	6,178,192	19,829,419	8,250,000	5,400,000	659,977	0	11,697,635	0	0	11,697,635
1935	12,630,349	11,697,635	8,250,000	5,400,000	441,200	0	10,236,783	0	0	10,236,783
1936	14,648,873	10,236,783	8,250,000	5,400,000	401,898	0	10,833,759	0	0	10,833,759
1937	14,306,056	10,833,759	8,250,000	5,400,000	417,959	0	11,071,856	0	0	11,071,856
1938	18,148,319	11,071,856	8,250,000	5,400,000	424,365	0	15,145,810	0	0	15,145,810
1939	11,164,059	15,145,810	8,250,000	5,400,000	533,970	0	12,125,900	0	0	12,125,900
1940	9,931,657	12,125,900	8,250,000	5,400,000	452,722	0	7,954,834	0	0	7,954,834
1941	20,116,678	7,954,834	8,250,000	5,400,000	340,505	0	14,081,008	0	0	14,081,008
1942	17,225,136	14,081,008	8,250,000	5,400,000	505,322	0	17,150,822	0	0	17,150,822
1943	13,731,401	17,150,822	8,250,000	5,400,000	587,912	0	16,644,310	0	0	16,644,310
1944	15,369,422	16,644,310	8,250,000	5,400,000	574,285	0	17,789,447	0	0	17,789,447
1945	14,140,528	17,789,447	8,250,000	5,400,000	605,094	0	17,674,882	0	0	17,674,882
1946	11,095,453	17,674,882	8,250,000	5,400,000	602,011	0	14,518,324	0	0	14,518,324
1947	16,439,486	14,518,324	8,250,000	5,400,000	517,088	0	16,790,722	0	0	16,790,722
1948	15,139,294	16,790,722	8,250,000	5,400,000	578,224	0	17,701,792	0	0	17,701,792
1949	16,933,584	17,701,792	8,250,000	5,400,000	602,735	0	20,382,641	0	0	20,382,641
1950	13,140,416	20,382,641	8,250,000	5,400,000	674,860	0	19,198,196	0	0	19,198,196
1951	12,505,894	19,198,196	8,250,000	5,400,000	642,994	0	17,411,096	0	0	17,411,096
1952	20,805,422	17,411,096	8,250,000	5,400,000	594,914	0	23,971,603	0	0	23,971,603
1953	11,165,419	23,971,603	8,250,000	5,400,000	771,417	0	20,715,605	0	0	20,715,605
1954	8,496,102	20,715,605	8,250,000	5,400,000	683,818	0	14,877,889	0	0	14,877,889
1955	9,413,908	14,877,889	8,250,000	5,400,000	526,761	0	10,115,035	0	0	10,115,035
1956	11,426,874	10,115,035	8,250,000	5,400,000	398,622	0	7,493,287	0	0	7,493,287
1957	21,500,963	7,493,287	8,250,000	5,400,000	328,087	0	15,016,163	0	0	15,016,163
1958	15,862,511	15,016,163	8,250,000	5,400,000	530,482	0	16,698,192	0	0	16,698,192
1959	9,598,169	16,698,192	8,250,000	5,400,000	575,735	0	12,070,626	0	0	12,070,626
1960	11,524,160	12,070,626	8,250,000	5,400,000	451,235	0	9,493,551	0	0	9,493,551
1961	10,010,259	9,493,551	8,250,000	5,400,000	381,902	0	5,471,908	0	0	5,471,908
1962	17,377,609	5,471,908	8,250,000	5,400,000	273,704	0	8,925,813	0	0	8,925,813
1963	8,840,900	8,925,813	8,250,000	5,400,000	366,628	0	3,750,085	0	0	3,750,085
1964	10,863,586	3,750,085	8,250,000	5,400,000	227,381	0	736,290	0	0	736,290
1965	19,875,027	736,290	8,250,000	5,400,000	146,298	0	6,815,019	0	0	6,815,019
1966	10,679,844	6,815,019	8,250,000	5,400,000	309,839	0	3,535,024	0	0	3,535,024
1967	11,670,830	3,535,024	8,250,000	5,400,000	221,595	0	1,334,259	0	0	1,334,259
1968	13,739,932	1,334,259	8,250,000	5,400,000	162,386	0	1,261,806	0	0	1,261,806
1969	15,272,159	1,261,806	8,250,000	5,400,000	160,436	0	2,723,528	0	0	2,723,528
1970	15,344,136	2,723,528	8,250,000	5,400,000	199,762	0	4,217,902	0	0	4,217,902
1971	15,290,433	4,217,902	8,250,000	5,400,000	239,967	0	5,618,368	0	0	5,618,368
1972	12,959,652	5,618,368	8,250,000	5,400,000	277,645	0	4,650,374	0	0	4,650,374
1973	18,397,816	4,650,374	8,250,000	5,400,000	251,602	0	9,146,589	0	0	9,146,589
1974	13,089,042	9,146,589	8,250,000	5,400,000	372,567	0	8,213,064	0	0	8,213,064
1975	16,825,996	8,213,064	8,250,000	5,400,000	347,452	0	11,041,608	0	0	11,041,608
1976	11,140,311	11,041,608	8,250,000	5,400,000	423,551	0	8,108,368	0	0	8,108,368
1977	5,438,897	8,108,368	8,250,000	5,400,000	344,635	0	-447,371	0	0	0
1978	15,183,722	0	8,250,000	5,400,000	126,489	0	1,407,233	0	0	1,407,233
1979	17,671,870	1,407,233	8,250,000	5,400,000	164,349	0	5,264,753	0	0	5,264,753
1980	17,765,183	5,264,753	8,250,000	5,400,000	268,131	0	9,111,805	0	0	9,111,805
1981	9,015,200	9,111,805	8,250,000	5,400,000	371,632	0	4,105,374	0	0	4,105,374
1982	17,489,400	4,105,374	8,250,000	5,400,000	236,939	0	7,707,834	0	0	7,707,834
1983	24,361,989	7,707,834	8,250,000	5,400,000	333,859	0	18,085,963	0	0	18,085,963
1984	25,359,376	18,085,963	8,250,000	5,400,000	613,071	0	29,182,269	4,334,565	0	24,847,704
1985	21,246,109	24,847,704	8,250,000	5,400,000	794,988	0	31,648,825	6,801,121	0	24,847,704
1986	23,013,446	24,847,704	8,250,000	5,400,000	794,988	0	33,416,162	8,568,458	0	24,847,704
1987	15,640,478	24,847,704	8,250,000	5,400,000	794,988	0	26,043,195	1,195,491	0	24,847,704
1988	11,456,357	24,847,704	8,250,000	5,400,000	794,988	0	21,859,073	0	0	21,859,073
1989	9,921,847	21,859,073	8,250,000	5,400,000	714,582	0	17,416,337	0	0	17,416,337
1990	9,639,803	17,416,337	8,250,000	5,400,000	595,055	0	12,811,085	0	0	12,811,085
1991	12,170,021	12,811,085	8,250,000	5,400,000	471,156	0	10,859,949	0	0	10,859,949
1992	10,895,580	10,859,949	8,250,000	5,400,000	418,663	0	7,686,865	0	0	7,686,865
1993	18,160,118	7,686,865	8,250,000	5,400,000	333,295	0	11,863,688	0	0	11,863,688
1994	11,125,503	11,863,688	8,250,000	5,400,000	445,668	0	8,893,523	0	0	8,893,523
1995	20,047,166	8,893,523	8,250,000	5,400,000	365,759	0	14,924,930	0	0	14,924,930
1996	14,502,293	14,924,930	8,250,000	5,400,000	528,027	0	15,249,196	0	0	15,249,196
1997	21,622,436	15,249,196	8,250,000	5,400,000	536,751	0	22,684,883	0	0	22,684,883
1998	16,798,378	22,684,883	8,250,000	5,400,000	736,800	0	25,096,461	248,757	0	24,847,704
1999	15,934,210	24,847,704	8,250,000	5,400,000	794,988	0	26,336,926	1,489,222	0	24,847,704
2000	10,646,526	24,847,704	8,250,000	5,400,000	794,988	0	21,049,242	0	0	21,049,242

HD 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	~~5,400,000 af~~
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	350,000 af/yr
NM allocation(w/o evap)	[redacted]

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	447,371 af

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

Upper Basin Yield Study - Draft 11/9/05

	CRN Natural Flow (plus)	Initial Carry Over Storage (plus)	UB Delivery 8.23 MAF (minus)	Upper Basin Demand Level (minus)	Shared CRSP Evap (minus)	UB Drought Shortage (plus)	Available to Store/(Use)	Spill to LB (minus)	Shortage (plus)	UC Basin Year-End Storage (plus)
1906	18,550,021	29,530,030	8,250,000	5,570,000	794,988	0	33,465,063	3,935,033	0	29,530,030
1907	21,201,694	29,530,030	8,250,000	5,570,000	794,988	0	36,116,736	6,586,706	0	29,530,030
1908	12,218,817	29,530,030	8,250,000	5,570,000	794,988	0	27,133,859	0	0	27,133,859
1909	22,356,301	27,133,859	8,250,000	5,570,000	730,522	0	34,939,638	5,409,607	0	29,530,030
1910	14,650,616	29,530,030	8,250,000	5,570,000	794,988	0	29,565,658	35,628	0	29,530,030
1911	15,499,729	29,530,030	8,250,000	5,570,000	794,988	0	30,414,771	884,741	0	29,530,030
1912	18,623,410	29,530,030	8,250,000	5,570,000	794,988	0	33,538,452	4,008,422	0	29,530,030
1913	14,536,373	29,530,030	8,250,000	5,570,000	794,988	0	29,451,415	0	0	29,451,415
1914	21,354,814	29,451,415	8,250,000	5,570,000	792,873	0	36,193,356	6,663,325	0	29,530,030
1915	13,623,277	29,530,030	8,250,000	5,570,000	794,988	0	28,538,319	0	0	28,538,319
1916	20,142,892	28,538,319	8,250,000	5,570,000	768,308	0	34,092,903	4,562,873	0	29,530,030
1917	22,942,804	29,530,030	8,250,000	5,570,000	794,988	0	37,857,846	8,327,816	0	29,530,030
1918	15,865,939	29,530,030	8,250,000	5,570,000	794,988	0	30,780,981	1,250,951	0	29,530,030
1919	12,651,369	29,530,030	8,250,000	5,570,000	794,988	0	27,566,411	0	0	27,566,411
1920	22,287,632	27,566,411	8,250,000	5,570,000	742,159	0	35,291,884	5,761,853	0	29,530,030
1921	22,526,781	29,530,030	8,250,000	5,570,000	794,988	0	37,441,823	7,911,793	0	29,530,030
1922	18,447,198	29,530,030	8,250,000	5,570,000	794,988	0	33,362,240	3,832,210	0	29,530,030
1923	19,024,046	29,530,030	8,250,000	5,570,000	794,988	0	33,939,088	4,409,058	0	29,530,030
1924	13,877,798	29,530,030	8,250,000	5,570,000	794,988	0	28,792,840	0	0	28,792,840
1925	14,430,701	28,792,840	8,250,000	5,570,000	775,155	0	28,628,386	0	0	28,628,386
1926	15,213,731	28,628,386	8,250,000	5,570,000	770,731	0	29,251,386	0	0	29,251,386
1927	19,539,212	29,251,386	8,250,000	5,570,000	787,492	0	34,183,106	4,653,076	0	29,530,030
1928	16,954,334	29,530,030	8,250,000	5,570,000	794,988	0	31,869,376	2,339,346	0	29,530,030
1929	21,829,585	29,530,030	8,250,000	5,570,000	794,988	0	36,744,627	7,214,597	0	29,530,030
1930	14,621,041	29,530,030	8,250,000	5,570,000	794,988	0	29,536,083	6,053	0	29,530,030
1931	8,474,134	29,530,030	8,250,000	5,570,000	794,988	0	23,389,176	0	0	23,389,176
1932	17,422,187	23,389,176	8,250,000	5,570,000	629,776	0	26,361,587	0	0	26,361,587
1933	12,183,500	26,361,587	8,250,000	5,570,000	709,745	0	24,015,342	0	0	24,015,342
1934	6,178,192	24,015,342	8,250,000	5,570,000	646,622	0	15,726,912	0	0	15,726,912
1935	12,630,349	15,726,912	8,250,000	5,570,000	423,631	0	14,113,630	0	0	14,113,630
1936	14,648,873	14,113,630	8,250,000	5,570,000	380,228	0	14,562,275	0	0	14,562,275
1937	14,306,056	14,562,275	8,250,000	5,570,000	392,298	0	14,656,033	0	0	14,656,033
1938	18,148,319	14,656,033	8,250,000	5,570,000	394,821	0	18,589,531	0	0	18,589,531
1939	11,164,059	18,589,531	8,250,000	5,570,000	500,647	0	15,432,943	0	0	15,432,943
1940	9,931,657	15,432,943	8,250,000	5,570,000	415,723	0	11,128,877	0	0	11,128,877
1941	20,116,678	11,128,877	8,250,000	5,570,000	299,927	0	17,125,629	0	0	17,125,629
1942	17,225,136	17,125,629	8,250,000	5,570,000	461,262	0	20,069,503	0	0	20,069,503
1943	13,731,401	20,069,503	8,250,000	5,570,000	540,464	0	19,440,440	0	0	19,440,440
1944	15,369,422	19,440,440	8,250,000	5,570,000	523,540	0	20,466,322	0	0	20,466,322
1945	14,140,528	20,466,322	8,250,000	5,570,000	551,140	0	20,235,710	0	0	20,235,710
1946	11,095,453	20,235,710	8,250,000	5,570,000	544,935	0	16,966,228	0	0	16,966,228
1947	16,439,486	16,966,228	8,250,000	5,570,000	456,974	0	19,128,740	0	0	19,128,740
1948	15,139,294	19,128,740	8,250,000	5,570,000	515,154	0	19,932,880	0	0	19,932,880
1949	16,933,584	19,932,880	8,250,000	5,570,000	536,788	0	22,509,676	0	0	22,509,676
1950	13,140,416	22,509,676	8,250,000	5,570,000	606,114	0	21,223,978	0	0	21,223,978
1951	12,505,894	21,223,978	8,250,000	5,570,000	571,524	0	19,338,349	0	0	19,338,349
1952	20,805,422	19,338,349	8,250,000	5,570,000	520,793	0	25,802,978	0	0	25,802,978
1953	11,165,419	25,802,978	8,250,000	5,570,000	694,716	0	22,453,680	0	0	22,453,680
1954	8,496,102	22,453,680	8,250,000	5,570,000	604,607	0	16,525,175	0	0	16,525,175
1955	9,413,908	16,525,175	8,250,000	5,570,000	445,108	0	11,673,975	0	0	11,673,975
1956	11,426,874	11,673,975	8,250,000	5,570,000	314,592	0	8,966,258	0	0	8,966,258
1957	21,500,963	8,966,258	8,250,000	5,570,000	241,744	0	16,405,477	0	0	16,405,477
1958	15,862,511	16,405,477	8,250,000	5,570,000	441,887	0	18,006,100	0	0	18,006,100
1959	9,598,169	18,006,100	8,250,000	5,570,000	484,950	0	13,299,319	0	0	13,299,319
1960	11,524,160	13,299,319	8,250,000	5,570,000	358,320	0	10,645,159	0	0	10,645,159
1961	10,010,259	10,645,159	8,250,000	5,570,000	286,913	0	6,548,505	0	0	6,548,505
1962	17,377,609	6,548,505	8,250,000	5,570,000	176,697	0	9,929,417	0	0	9,929,417
1963	8,840,900	9,929,417	8,250,000	5,570,000	267,657	0	4,682,661	0	0	4,682,661
1964	10,863,586	4,682,661	8,250,000	5,570,000	126,499	0	1,599,748	0	0	1,599,748
1965	19,875,027	1,599,748	8,250,000	5,570,000	43,556	0	7,611,219	0	0	7,611,219
1966	10,879,844	7,611,219	8,250,000	5,570,000	205,288	0	4,265,775	0	0	4,265,775
1967	11,670,830	4,265,775	8,250,000	5,570,000	115,283	0	2,001,322	0	0	2,001,322
1968	13,739,932	2,001,322	8,250,000	5,570,000	54,360	0	1,866,894	0	0	1,866,894
1969	15,272,159	1,866,894	8,250,000	5,570,000	50,744	0	3,268,309	0	0	3,268,309
1970	15,344,136	3,268,309	8,250,000	5,570,000	88,447	0	4,703,998	0	0	4,703,998
1971	15,290,433	4,703,998	8,250,000	5,570,000	127,073	0	6,047,358	0	0	6,047,358
1972	12,959,652	6,047,358	8,250,000	5,570,000	163,214	0	5,023,795	0	0	5,023,795
1973	18,397,816	5,023,795	8,250,000	5,570,000	135,676	0	9,465,935	0	0	9,465,935
1974	13,089,042	9,465,935	8,250,000	5,570,000	255,187	0	8,479,790	0	0	8,479,790
1975	16,825,996	8,479,790	8,250,000	5,570,000	228,656	0	11,257,130	0	0	11,257,130
1976	11,140,311	11,257,130	8,250,000	5,570,000	303,377	0	8,274,065	0	0	8,274,065
1977	5,438,897	8,274,065	8,250,000	5,570,000	223,121	0	-330,160	0	-330,160	0
1978	15,183,722	0	8,250,000	5,570,000	517	0	1,363,205	0	0	1,363,205
1979	17,671,870	1,363,205	8,250,000	5,570,000	37,192	0	5,177,882	0	0	5,177,882
1980	17,765,183	5,177,882	8,250,000	5,570,000	139,822	0	8,983,243	0	0	8,983,243
1981	9,015,200	8,983,243	8,250,000	5,570,000	242,201	0	3,936,242	0	0	3,936,242
1982	17,489,400	3,936,242	8,250,000	5,570,000	108,417	0	7,499,225	0	0	7,499,225
1983	24,361,989	7,499,225	8,250,000	5,570,000	202,275	0	17,838,939	0	0	17,838,939
1984	25,359,376	17,838,939	8,250,000	5,570,000	480,453	0	28,897,862	0	0	28,897,862
1985	21,246,109	28,897,862	8,250,000	5,570,000	777,981	0	35,545,990	6,015,959	0	29,530,030
1986	23,013,446	29,530,030	8,250,000	5,570,000	794,988	0	37,928,488	8,398,458	0	29,530,030
1987	15,640,478	29,530,030	8,250,000	5,570,000	794,988	0	30,555,520	1,025,490	0	29,530,030
1988	11,456,357	29,530,030	8,250,000	5,570,000	794,988	0	26,371,399	0	0	26,371,399
1989	9,921,847	26,371,399	8,250,000	5,570,000	710,009	0	21,763,236	0	0	21,763,236
1990	9,639,803	21,763,236	8,250,000	5,570,000	586,032	0	16,997,007	0	0	16,997,007
1991	12,170,021	16,997,007	8,250,000	5,570,000	457,802	0	14,889,226	0	0	14,889,226
1992	10,895,580	14,889,226	8,250,000	5,570,000	401,094	0	11,563,712	0	0	11,563,712
1993	18,160,118	11,563,712	8,250,000	5,570,000	311,625	0	15,592,204	0	0	15,592,204
1994	11,125,503	15,592,204	8,250,000	5,570,000	420,007	0	12,477,699	0	0	12,477,699
1995	20,047,166	12,477,699	8,250,000	5,570,000	336,215	0	18,368,650	0	0	18,368,650
1996	14,502,293	18,368,650	8,250,000	5,570,000	494,704	0	18,556,239	0	0	18,556,239
1997	21,622,438	18,556,239	8,250,000	5,570,000	499,751	0	25,858,926	0	0	25,858,926
1998	16,798,378	25,858,926	8,250,000	5,570,000	696,222	0	28,141,082	0	0	28,141,082
1999	15,934,210	28,141,082	8,250,000	5,570,000	757,620	0	29,497,672	0	0	29,497,672
2000	10,646,526	29,497,672	8,250,000	5,570,000	794,118	0	25,530,080	0	0	25,530,080

Variable	
HD 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	5,570,000 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	247,623 af/yr
NM allocation(w/o evap)	521,000 af/yr

Shortage Years	Shortage
1961	0 af
1963	0 af
1964	0 af
1967	0 af
1968	0 af
1977	330,160 af

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

- inc. Nav. + UB

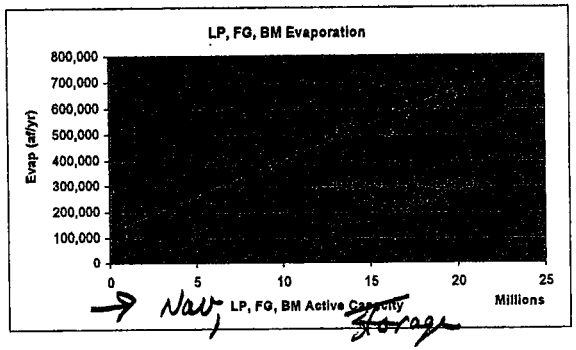
CRSP (LP N FG Asp)		30,731,061	25,665,339		5,065,722				

	Upper Colorado River Basin Reservoirs	Complete	Live Capacity AF	Active	HD	State	Major Basin	Hydromet	Source
1	Big Sandy	X	38,300		38,300	WY	GR	BGRW	Hydromet
2	Blue Mesa	X	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	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	3,515,700	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	20,309,919	20,309,919	AZ	CR	GLDA	Hydromet
27	Lake Viva Naughton	X	69,845		69,845	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	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	1,036,100	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		30,167,576				

	Lake Powell		Flaming Gorge			Blue Mesa		
	Live Stor	Evap		Live Stor	Evap		Live Stor	Evap
Dec-64	4,226,877	76,171	Dec-63	883,500	21,007	Dec-69	652,343	8,064
Dec-65	6,755,838	144,900	Dec-64	1,097,900	42,320	Dec-70	647,667	8,804
Dec-66	5,892,764	181,801	Dec-65	2,395,300	47,402	Dec-71	431,077	7,297
Dec-67	6,237,331	158,145	Dec-66	2,243,300	65,869	Dec-72	415,961	7,155
Dec-68	7,039,300	185,829	Dec-67	2,288,300	66,614	Dec-73	598,694	8,028
Dec-69	9,527,661	252,105	Dec-68	1,912,939	59,077	Dec-74	476,431	7,586
Dec-70	12,014,346	305,979	Dec-69	1,565,599	54,074	Dec-75	533,575	7,360
Dec-71	12,973,499	365,252	Dec-70	1,761,250	51,442	Dec-76	478,276	7,980
Dec-72	12,611,547	362,114	Dec-71	2,704,322	68,523	Dec-77	235,328	5,729
Dec-73	17,397,040	417,269	Dec-72	3,086,584	79,091	Dec-78	594,351	7,871
Dec-74	17,298,382	498,708	Dec-73	2,938,138	77,932	Dec-79	579,788	8,040
Dec-75	19,846,968	521,418	Dec-74	3,262,393	83,468	Dec-80	558,000	8,314
Dec-76	18,139,140	533,889	Dec-75	3,430,797	83,664	Dec-81	340,276	6,763
Dec-77	15,050,697	467,624	Dec-76	3,129,279	83,640	Dec-82	607,227	7,570
Dec-78	15,343,792	443,338	Dec-77	1,990,703	62,883	Dec-83	593,402	8,583
Dec-79	20,395,402	536,289	Dec-78	2,673,304	66,716	Dec-84	666,201	8,256
Dec-80	21,602,374	606,694	Dec-79	2,397,144	67,120	Dec-85	567,471	8,373
Dec-81	19,610,804	566,573	Dec-80	3,013,072	72,311	Dec-86	576,633	8,304
Dec-82	22,052,326	579,638	Dec-81	2,783,198	74,001	Dec-87	547,283	8,279
Dec-83	22,095,450	638,987	Dec-82	3,307,239	78,299	Dec-88	458,550	7,206
Dec-84	21,991,934	621,218	Dec-83	3,451,988	85,654	Dec-89	563,467	8,217
Dec-85	22,324,682	613,050	Dec-84	3,379,535	84,057	Dec-90	647,094	8,362
Dec-86	21,900,656	615,398	Dec-85	3,116,556	80,358	Dec-91	571,167	9,008
Dec-87	22,041,008	613,810	Dec-86	3,257,068	81,239	Dec-92	580,946	8,354
Dec-88	21,223,202	603,875	Dec-87	3,216,414	81,897	Dec-93	594,902	8,546
Dec-89	18,292,024	551,911	Dec-88	2,958,441	77,191	Dec-94	579,329	8,525
Dec-90	15,246,718	464,809	Dec-89	2,943,401	73,516	Dec-95	586,169	8,569
Dec-91	14,251,955	420,198	Dec-90	3,049,072	75,352	Dec-96	601,723	8,707
Dec-92	13,334,385	403,360	Dec-91	3,328,132	80,305	Dec-97	578,393	8,392
Dec-93	18,402,436	483,699	Dec-92	3,013,793	78,487	Dec-98	577,927	8,180
Dec-94	17,220,702	504,284	Dec-93	3,317,500	80,461	Dec-99	589,147	8,749
Dec-95	21,392,360	560,150	Dec-94	2,835,277	75,469	Dec-00	504,611	8,409
Dec-96	20,497,896	582,091	Dec-95	3,285,793	79,319	Dec-01	544,265	8,102
Dec-97	21,595,054	592,707	Dec-96	3,248,287	79,159	Dec-02	283,191	6,507
Dec-98	21,654,054	605,297	Dec-97	3,323,228	78,851	Dec-03	376,564	6,359
Dec-99	21,443,640	605,738	Dec-98	3,399,837	78,646	Dec-04	491,453	7,778
Dec-00	19,823,236	576,898	Dec-99	3,269,090	78,352			
Dec-01	17,995,952	532,968	Dec-00	2,991,270	74,194			
Dec-02	13,773,841	436,496	Dec-01	2,876,393	72,363			
Dec-03	11,486,774	352,779	Dec-02	2,631,819	67,919			
Dec-04	8,663,616	278,349	Dec-03	2,606,058	67,223			
			Dec-04	2,742,643	68,248			

Total Live Storage	Total Active	Total Evap
5,762,720	696,998	105,241
8,501,404	3,435,682	196,023
8,719,141	3,653,419	238,499
8,896,592	3,830,870	231,169
9,926,294	4,860,572	260,471
11,917,031	6,851,309	318,768
14,113,520	9,047,798	367,413
15,213,025	10,147,303	424,674
15,551,197	10,485,475	436,365
21,077,974	16,012,252	504,232
20,816,308	15,750,586	584,681
23,667,361	18,601,639	613,200
21,910,213	16,844,491	624,316
18,787,203	13,721,481	558,833
17,927,896	12,862,174	514,804
23,734,907	18,669,185	611,261
24,566,989	19,501,267	682,187
23,200,510	18,134,788	647,188
25,382,807	20,317,085	661,918
25,861,240	20,795,518	724,492
26,007,389	20,941,667	715,089
26,351,311	21,285,589	705,469
25,588,378	20,522,656	704,764
25,879,021	20,813,299	703,402
25,034,518	19,968,796	694,318
21,829,794	16,764,072	637,627
18,776,288	13,710,566	546,894
17,902,750	12,837,028	504,258
17,240,910	12,175,188	492,058
21,994,156	16,928,434	570,366
21,127,349	16,061,627	593,493
24,732,248	19,666,526	644,028
24,327,954	19,262,232	669,511
25,126,532	20,060,810	678,373
25,353,846	20,288,124	690,507
25,334,930	20,269,208	692,162

Max Evap
724,492



	Navajo	
	Live Stor	Evap
Dec-63	331,834	8,323
Dec-64	382,320	10,647
Dec-65	404,111	14,630
Dec-66	400,389	10,730
Dec-67	588,132	13,048
Dec-68	973,592	18,631
Dec-69	1,043,002	22,326
Dec-70	1,049,190	22,564
Dec-71	991,296	20,505
Dec-72	982,889	19,991
Dec-73	1,112,631	28,408
Dec-74	970,485	21,646
Dec-75	1,185,693	26,432
Dec-76	1,205,201	25,255
Dec-77	979,918	22,439
Dec-78	1,195,470	24,307
Dec-79	1,233,240	27,623
Dec-80	1,382,000	28,916
Dec-81	1,234,201	26,237
Dec-82	1,475,159	28,337
Dec-83	1,545,720	30,691
Dec-84	1,536,197	31,194
Dec-85	1,392,531	31,206
Dec-86	1,429,801	30,200
Dec-87	1,075,143	24,350
Dec-88	1,149,810	24,336
Dec-89	1,230,357	26,906
Dec-90	1,381,613	26,704
Dec-91	1,551,852	30,621
Dec-92	1,528,220	31,554
Dec-93	1,567,023	30,954
Dec-94	1,391,103	30,450
Dec-95	1,461,480	30,153
Dec-96	1,187,295	27,184
Dec-97	1,558,033	28,612
Dec-98	1,412,077	29,148
Dec-99	1,500,893	27,969
Dec-00	1,288,792	26,850
Dec-01	1,334,015	26,563
Dec-02	826,816	20,891
Dec-03	710,076	17,085
Dec-04	991,373	20,353

Whipple, John J., OSE

From:	Dave Trueman [DTRUEMAN@uc.usbr.gov]	**Sent:**	Thu 10/27/2005 4:31 PM
To:	Whipple, John J., OSE		
Cc:	jshiel@seo.wyo.gov; randy.seaholm@state.co.us; Don Ostler; robertking@utah.gov		
Subject:	Re: upper basin hydro determination		
Attachments:			

Many regrets but there is an error in the all basin evap. The CRSP active and live alternative are ok. I'm working on it. - Dave

>>> "Whipple, John J., OSE" <john.whipple@state.nm.us> 10/20/2005 11:45:01 AM >>>
Dave:

Can you run your latest upper basin yield spreadsheet with the variations in storage and release indicated in the attached file and fill in the storage data and resultant shortages in the attached (entries in yellow now are just placeholders)? Please show the maximum yield with no shortages, then the yields increased in approximately 0.1 MAF increments (showing about 2 years and 4 years of shortage, maybe add also 6 years of shortage if the shortage amounts don't get too large to consider as possibly reasonable). Call me with any questions/discussion at 505-827-6172.

Thanks, John Whipple

Whipple, John J., OSE

From: Dave Trueman [DTRUEMAN@uc.usbr.gov] **Sent:** Thu 10/27/2005 3:22 PM
To: Whipple, John J., OSE
Cc: jshiel@seo.wyo.gov; randy.seaholm@state.co.us; Don Ostler; robertking@utah.gov
Subject: Re: upper basin hydro determination
Attachments: HD v6.xls(749KB)

John, I've put together version 6 of the spreadsheet showing the requested summary. Note that I've been out of the office and pulled this together in a couple of precious spare hours today. I've attempted to be careful, but as always please take a look and see if I've missed something. As one can see that the assumptions regarding irrigation/supply-side shortages during droughts really helped previous determinations. Regards - Dave

>>> "Whipple, John J., OSE" <john.whipple@state.nm.us> 10/20/2005 11:45:01 AM >>>
Dave:

Can you run your latest upper basin yield spreadsheet with the variations in storage and release indicated in the attached file and fill in the storage data and resultant shortages in the attached (entries in yellow now are just placeholders)? Please show the maximum yield with no shortages, then the yields increased in approximately 0.1 MAF increments (showing about 2 years and 4 years of shortage, maybe add also 6 years of shortage if the shortage amounts don't get too large to consider as possibly reasonable). Call me with any questions/discussion at 505-827-6172.

Thanks, John Whipple

Trueman Draft 10/27/05

2005 Upper Basin Yield Study Summary

Storage Capacities (MAF):

	Active Capacity	Live Capacity	
Lake Powell	18,536,603	21,621,000	- 2060 sedimentation condition
Flaming Gorge Res.	3,515,700	3,749,000	- orgininal survey
Aspinall Unit	803,620	964,061	- orgininal survey
Navajo Reservoir	1,036,100	1,696,000	- orgininal survey
Subtotal	23,892,023	28,030,061	
Bank storage (4%)	955,681	1,121,202	
CRSP Total	24,847,704	29,151,263	
Non-CRSP reservoirs	4,502,237	4,502,237	
Bank storage (4%)	180,089	180,089	
Total all reservoirs	29,530,030	33,833,590	

Yields computed using CRSS/Riverware natural flows for the period 1906-2000 (MAF)
Assumes no reduction in consumptive uses in drought years

Storage	Minimum Release	Yield	Shortages Year	Shortages Amount	Storage	Minimum Release	Yield	Shortages Year	Shortages Amount
CRSP Active	8.23	5.40	0	0	CRSP Live	8.23	5.50	0	0
		5.50	1977	1,557,385			5.60	1977	114,479
		5.60	1964	2,258,767			5.70	1964	319,794
			1968	42,640				1968	37,347
			1977	2,726,749				1977	2,715,512
		5.70	1963	1,470,200			5.80	1964	2,721,901
			1964	3,187,785				1967	116,101
			1967	120,118				1968	310,068
			1968	311,439				1977	3,535,213
			1977	3,546,450					
	7.48	6.10	0	0		7.48	6.30	0	0
		6.20	1977	127,058			6.40	1977	1,544,806
		6.30	1964	1,079,946			6.50	1964	1,520,848
			1977	2,195,534				1968	230,391
All Active	8.23	5.50	1977	30,153	All Live	8.23	5.60	0	0
		5.60	1964	188,271			5.70	1977	2,235,763
			1968	42,640			5.80	1964	1,308,942
			1977	2,726,749				1967	191,726
		5.70	1964	2,590,378				1968	335,879
			1967	120,118				1977	3,746,789
			1968	311,439					
			1977	3,546,450					
	7.48	6.20	0	0		7.48	6.30	0	0
		6.30	1977	1,460,480			6.40	1977	789,128
		6.40	1964	1,389,325			6.50	1964	107,889
			1968	235,683				1967	45,231
			1977	3,136,600				1968	285,879
								1977	3,336,939

Upper Colorado Basin Hydrologic Determination - draft 8/4/05 Trueman

Assumptions	B1	B2	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Lake Powell Active	x															
Lake Powell Live		x														
CRSP Active Storage (2060)			x		x		x		x		x		x		x	
CRSP Active + LP Live Storage (2060)				x		x		x		x		x		x		x
Bank Storage (CRSP)					4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
UB Natural Flow Drought Shortage Trigger (maf/yr)							10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
UB Drought Shortage (percent of UB normal uses)							10%	10%	20%	20%	10%	10%	10%	10%	10%	10%
Frequency of UB Drought Shortage							12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
CRSP Storage Conservation Trigger (maf)											5.0	5.0	10.0	10.0	10.0	10.0
UB Conservation Reduction (reduced UB uses)											10%	10%	10%	10%	10%	10%
Frequency of Conservation Reduction											11%	9%	28%	25%	28%	25%
LB Delivery (maf/yr)			8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
LB Delivery Reduction Trigger (maf CRSP storage)															4.0	4.0
LB Delivery Reduction (maf/yr)															0.75	0.75
Frequency of LB Reduction															9%	9%
Yield (maf)	5.56	5.80	5.90	5.99	5.93	6.01	6.02	6.11	6.12	6.20	6.12	6.19	6.27	6.34	6.39	6.47

Upper Colorado Basin Hydrologic Determination - draft 9/8/05 Trueman

Assumptions	B1	B2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Lake Powell Active	x																									
Lake Powell Live		x																								
CRSP Active Storage (2060)			x				x				x				x			x			x			x		
CRSP Active + LP Live Storage (2060)				x				x				x				x			x			x			x	
CRSP Live (2060)					x				x				x				x			x			x			x
UB Basin Live (2060)						x				x				x												
Bank Storage (CRSP)							4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
UB Natural Flow Drought Shortage Trigger (maf/yr)											10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
UB Drought Shortage (percent of UB normal uses)											10%	10%	10%	10%	20%	20%	20%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Frequency of UB Drought Shortage											12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
CRSP Storage Conservation Trigger (maf)																		5.0	5.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0
UB Conservation Reduction (reduced UB uses)																		10%	10%	10%	10%	10%	10%	10%	10%	10%
Frequency of Conservation Reduction																		11%	9%		28%	25%		28%	25%	
LB Delivery (maf/yr)			8.25	8.25	8.25		8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
LB Delivery Reduction Trigger (maf CRSP storage)																								4.0	4.0	4.0
LB Delivery Reduction (maf/yr)																								0.75	0.75	0.75
Frequency of LB Reduction																								9%	9%	
Yield (maf)	5.56	5.80	5.90	5.99	6.01	6.12	5.93	6.01	6.04	6.15	6.02	6.11	6.14	6.23	6.12	6.20	6.23	6.12	6.19	6.26	6.27	6.34	6.38	6.39	6.47	6.48

1988-89 UCRC meeting minutes/transcripts
- water salvage discussions relating to 1988 Hydro. Determination ?

1999 - irrig. dep. methods re: 12/99 deliv. schedules

Proposed alternatives for NM's Hydro. Determination for NGP

- protect or use min PF ?
- use non-CRSP res. ?
- ↓ 8.23 ↓ 7.48/8.0/8.1 ?
- inc. salvage
- MBC v. OBC & incidental dep's.
- NIIP reductions
- non-Navajo reductions ?
- other states unused apportionments

Engr. Committee - evaluate deficiency in supply for Mexican Treaty deliveries

Upper Colorado Basin Hydrologic Determination - draft 8/4/05 Trueman

Assumptions	B1	B2	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Lake Powell Active	x															
Lake Powell Live		x														
CRSP Active Storage (2060)			x		x		x		x		x		x		x	
CRSP Active + LP Live Storage (2060)				x		x		x		x		x		x		x
Bank Storage (CRSP)					4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
UB Natural Flow Drought Shortage Trigger (maf/yr)							10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
UB Drought Shortage (percent of UB normal uses)							10%	10%	20%	20%	10%	10%	10%	10%	10%	10%
Frequency of UB Drought Shortage							12%	12%	12%	12%	12%	12%	12%	12%	12%	12%
CRSP Storage Conservation Trigger (maf)											5.0	5.0	10.0	10.0	10.0	10.0
UB Conservation Reduction (reduced UB uses)											10%	10%	10%	10%	10%	10%
Frequency of Conservation Reduction											11%	9%	28%	25%	28%	25%
LB Delivery (maf/yr)			8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
LB Delivery Reduction Trigger (maf CRSP storage)															4.0	4.0
LB Delivery Reduction (maf/yr)															0.75	0.75
Frequency of LB Reduction															9%	9%
Yield (maf)	5.56	5.80	5.90	5.99	5.93	6.01	6.02	6.11	6.12	6.20	6.12	6.19	6.27	6.34	6.39	6.47