Hydro Det. –

1.90 MAF ≤ 3440 at Powell
0.66 MAF ≤ 3490 at Navajo

2.56 MAF min storage to protect 8.23 MOR to Lower Basin & NIIP intake (protect UB uses, but not UB hydropower)

Use min PP alts. →

Don – email 5.79?

Live storage analyses w/o shortages OK → schedule releases in late 1960s & late 1970s during spring RO. – OR – can still meet 7.5 or 8.25 averaged during any 10 years.

| Comment/page | P | Sent. | |
|---|---|---|---|
| 1. 1 | 1 | 4 | NM apt. under 1988 HD is 669.4, but correcting for res. evap. during crit. period for crit. period 6.0 yield gives 642.4 w/o CRSP res. evap. |
| 2. 1 | 1 | last | Perpetual Contract (same as Jicarilla per '88 HD) |
| 3. 2 | 1 | last | See comment 1. |
| 4. 2 | 5 | 1 | 6% shortage overall for crit. period used in 88 HD (6% short. to UB use + CRSP evap. total |
| 5. 2 | 5 | last. | Other UB deliveries & Live CRSP storage also considered in making conclusion of yield of at least 6.0 MAF. The depletion schedules allocated the long-term ave. CRSP evap of 546.0 to the states, instead of the crit. period evap. The CRSS probability of risk (frequency/magnitude of shortages) varied CRSP evap with CRSP storage levels (see Appendix to 88 HD). |
| 6. 2 | 6 | 2nd bullet | Other UB storage reflects actual flow impacts of storing water to support UB use |
| 7. 2 | 6 | 3rd bullet | See comments 1 & 5 |
| 8. 3 | 1 | 2 | Critical period yield is unchanged at 5.76 MAF for use by UB states (6.02 MAF if maintain PP, 5.95 MAF if use PP — vs. 6.00 MAF 1988 HD. all inc. CRSP res. evap.) |
| 9. 4 | 2 | 2 | unclear |
| ~~10. 4 | 3 | last~~ | ~~unclear~~ |

OSE-0207

CRSS –
Full development depletion schedule (Jan, 2000)
– constant demand = dep. sched. #
– physical shortage = shortage to constant demand if water not available

CO, NM dep. schedules – long-term average uses

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Sensitivity – 7.5 MAF LB delivery } w/ & w/o
Use of PPools } shortages

(1988 Table 2 Summary Table)

OSE-0208

You forwarded this message on 4/21/2006 3:13 PM.
Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

**Wh 'e, John J., OSE**

**From:** Whipple, John J., OSE **Sent:** Fri 4/21/2006 2:09 PM
**To:** scott@balcombgreen.com; rod.kuharich@state.co.us; harold.simpson@dwr.state.co.us; randy.seaholm@state.co.us
**Cc:** dostler@uc.usbr.gov; dennisstrong@utah.gov; robertking@utah.gov; ptyrre@seo.wyo.gov; jshiel@seo.wyo.gov; Lopez, Estevan, OSE; Whipple, John J., OSE
**Subject:** FW: hydro determination
**Attachments:** Navset.COresponse3.doc(36KB)

Gentlemen:

John D'Antonio requested me to email to you for your consideration the attached document that provides New Mexico's response to Randy Seaholm's April 17 email (below).

John Whipple

---

**From:** Seaholm, Randy [mailto:Randy.Seaholm@state.co.us]
**Sent:** Mon 4/17/2006 9:22 AM
**To:** Dave Trueman; Whipple, John J., OSE
**Cc:** jshiel@seo.wyo.gov; Seaholm, Randy; Lopez, Estevan, OSE; Don Ostler; robertking@utah.gov; Balcomb, Scott (Balcomb, Scott); dmerritt@crwcd.gov; Kuhn,Eric (kuhn,eric); bspear@mbssllp.com; Steve Harris (Steve Harris); Kuharich, Rod; Brown, Rick; George, Russell; McNulty, Frank; Kowalski, Ted; Shpall, Casey; Angel, Carol
**Subject:** RE: hydro determination

Da\ ıd John

ɹased on discussions that I have recently had with several representatives of Colorado's water users concerning the proposed hydrologic determination, I offer the following comments, which comments also include several requests for additional information. I want to be very clear that these are my thoughts at this point and are advanced for further discussion so that I can present them along with the proposed determination and any additional comments from others to my Board in May with the goal of having Colorado's Commissioner prepared to address the determination at the Upper Colorado River Commission in June.

1. It is our understanding that Jim Prairie's updated natural flows were used for the determination and we would like to verify that all his work was incorporated.
2. While we understand that the "shortages" shown are to represent a "tolerable shortage" of 6% over the 25-year period, we are concerned that the spreadsheet portrayal of "tolerable shortage" implies that it may be necessary for the Upper Basin to curtail uses in the four years identified. We believe this would not be the case and are of the opinion that the more appropriate way to portray the situation would be to reduce the releases to the lower basin. Towards this end we ask the following:

a) That the determination shows no upper basin shortages.

b) That during those years when the available water supply is not able to meet all the demands identified, releases to the lower basin be reduced rather than showing a shortage to the upper basin. (We would ob' 'e that during drought conditions the upper basin is already exp .encing shortages naturally and therefore it is not necessary to impose any additional shortages in the determination process. We also would note that through water right administration some shortage likely occurs every year, but for purposes of the determination it is not

OSE-0209

necessary to identify such.)

c) When releases to the lower basin are reduced, it will become nec ary to add a column showing the 10-year running average of deliveries to the lower basin.

d) We believe it would be helpful to also add a column showing when carryover storage plus inflow to Powell is less than 8.23 maf and thus make it easier to identify when Powell could not actually make releases of 8.23 maf to the lower basin. This would also help identify when Powell would drop below minimum power pool.

e) We would request that appropriate data (mainly evaporation) be incorporated in to the 602(a) storage computation to show how the 602(a) storage requirements would be impacted.

f) We are generally supportive of the following assumptions, but would reserve final judgment until after reviewing the results of the above.

* Attempting to protect minimum power pool at Powell, FG, and Aspinall is acceptable while using live storage at other reservoirs.
* It appears that by reducing reservoir evaporation to be more reflective of what may actually be experienced during the 25-year drought used in the determination is an adequate reduction to produce the increase in yield to meet New Mexico's desire of fitting the Gallup-Navajo project within their compact apportionment.
* The use of net reservoir evaporation is appropriate.

The increase in hydrologic determination will have some minor impacts on Colorado's water users in the San Juan Basin (Most of the water in the Sar an originates in Colorado, therefore, New Mexico's gains in the Sar an come at the expense of Colorado's water users in the San Juan.). Therefore, we believe that water use accounting, at least among water users in the San Juan, be done on a uniform basis. Such accounting should include: 1) use of the modified Blaney-Criddle method, utilizing SCS effective precipitation, for determining crop consumptive uses, 2) no salvage by use determinations, 3) the proposed accounting of tributary groundwater and ephemeral streams is inconsistent with current consumptive use accounting practices and with water right administration in Colorado, therefore we believe such should be excluded from the proposal.

Again, I would note that these are my thoughts at present. I would appreciate further thoughts from others. I intend to present the proposal, the additional information, and comments from others to my Board for further consideration in May.

Randy Seaholm
Chief, Water Supply Protection
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver, Colorado 80203
303-866-3441
303-866-4474 FAX
randy.seaholm@state.co.us

-----Original Message-----
From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]
Se. Wednesday, February 15, 2006 11:42 AM
To: john.whipple@state.nm.us
Cc: jshiel@seo.wyo.gov; Seaholm, Randy; estevan.lopez@state.nm.us; Don Ostler; robertking@utah.gov

OSE-0210

Subject: Re: hydro determination

Joh '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 1988 HD), provided that the Upper Colorado River Commission would not object 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 pro 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

MEMORANDUM
April 21, 2006

To: Scott Balcomb
Rod Kuharich
Hal Simpson
Randy Seaholm

From: John D'Antonio

Copy: Don Ostler
Dennis Strong
Robert King
Patrick Tyrrell
John Shields
Estevan Lopez
John Whipple

Subject: Response to Randy Seaholm's April 17, 2006, Email regarding the Update to the 1988 Hydrologic Determination

---

1. The draft 2006 Hydrologic Determination uses the same CRSS natural flows at Lee Ferry as Reclamation uses in the Colorado River system flow and salt modeling for Colorado River operations and salinity analyses; except, that the natural flows for 1971-1980 will be revised to reflect recalculation of Upper Basin irrigation depletions using the modified Blaney-Criddle method with SCS effective precipitation.[1] The flow revisions are needed to: (1) reflect application of a standard methodology for computing natural flows so that the 1971-1980 natural flows are generally consistent with those for the rest of the period of record; and (2) evaluate water supply using the same method as proposed to evaluate future water demands. It is our understanding that Reclamation in the near future also will incorporate the revised Upper Basin irrigation depletions and natural flows for 1971-1980 into the flow and salt modeling for Colorado River operations and salinity analyses.

2. The 1988 Hydrologic Determination assumed the minimum objective release of 8.23 maf annually from Lake Powell, and used an assumption that a 6 percent overall shortage to the Upper Basin yield during a 25-year critical period is tolerable. The Upper Colorado River Commission via resolutions dated June 2, 1987, and October 22, 1987, supported the conclusion that the Upper Basin yield is at least 6.0 maf annually while also stating that: (1) the Commission does not endorse the projected Upper Basin depletions, study assumptions, or analytical methodologies set forth in the draft 1987 Hydrologic Determination; and (2) the Commission specifically disagrees with the

[1] As of the date of this response, revisions to the natural flows at Lee Ferry for 1971-1980 are pending review by Reclamation.

assumption of a minimum Upper Basin delivery of 8.23 maf annually from Lake Powell. The draft 2006 Hydrologic Determination, consistent with the 1988 Hydrologic Determination, assumes the minimum objective release of 8.23 maf annually from Lake Powell, and uses a 6 percent tolerable basin-wide shortage over any period of 25 years computed as a percentage of the Upper Basin use excluding shared CRSP reservoir evaporation. New Mexico's draft Resolution regarding the availability of water for a Navajo Reservoir supply contract for Navajo Nation uses in New Mexico that was transmitted via email dated April 6, 2006, from Estevan Lopez to the Commission contains similar language that the Commission supports a determination that at least ____ maf annually is available for use by the Upper Basin states, excluding shared CRSP reservoir evaporation, while also stating that: (1) the Commission does not endorse the study assumptions used by Reclamation in the draft 2006 Hydrologic Determination; and (2) the Commission specifically disagrees with the assumption of a minimum Upper Basin delivery of 8.25 maf annually at Lee Ferry.[2]

The draft 2006 Hydrologic Determination explains that actual shortages measured at Lee Ferry will be less than the computed shortages because Upper Basin uses through a period of critical hydrology would be below average due to physical water supply shortages in the Upper Basin. However, the draft 2006 Hydrologic Determination will not include a determination or statement by the Department of the Interior as to how an actual shortage will be handled. If the Upper Basin challenges the 8.23 maf minimum objective release in the draft 2006 Hydrologic Determination, it is likely to upset the Seven Basin States agreement now under consideration. Further, an assumed reduction in the release from Lake Powell below the minimum objective release could result in a reduction in 602(a) storage. If the Secretary were to approve a deviation from the minimum objective release, it would be done through development of the annual operating plan with consultation with affected interests, and/or through adoption of coordinated reservoir operating criteria such as those proposed by the Seven Basin States via letter to the Secretary dated March 3, 2006. The outcomes of such annual operating plan consultations are unknown as there is no operational experience under such conditions, and the Seven Basin States proposal includes an agreement that adoption of the interim coordinated reservoir operating criteria proposed would not affect the determination of the amount of water available for development in the Upper Basin.

The States of Colorado, Utah and Wyoming previously indicated that the 2006 Hydrologic Determination should not show use of the minimum power pools of CRSP reservoirs to make deliveries to the Lower Basin or to prevent possible calls against Upper Basin uses under Article IV of the Upper Colorado River Basin Compact. The Commission will address how an actual shortage should be handled at the appropriate time.

---

[2] New Mexico's draft Resolution leaves blank the amount of water available for use by the Upper Basin, pending final review by Reclamation of the natural flows at Lee Ferry for 1971-1980. New Mexico anticipates that the draft 2006 Hydrologic Determination will conclude that at least 5.77 maf/yr, on average, is available for use by the Upper Basin, excluding shared CRSP reservoir evaporation.

3. Engineering staff of the Upper Division States as early as October 2005 agreed with the segregation of shared CRSP reservoir evaporation from Upper Basin use and the representation of shared CRSP reservoir evaporation fluctuating with CRSP reservoir storage levels in the current update of the 1988 Hydrologic Determination. The draft yield study spreadsheets since then have shown the annual variability in shared CRSP reservoir evaporation while maintaining constant Upper Basin uses and the minimum objective releases from Lake Powell.

The determination of 602(a) storage in Lake Powell is independent of the 1988 Hydrologic Determination and the 2006 Hydrologic Determination. The reservoir evaporation used in the 602(a) storage algorithm should reflect the expected shared CRSP reservoir evaporation that would occur during the period used in the algorithm as CRSP reservoir storage is drawn down from the 602(a) storage level to the minimum active storage level. When CRSP reservoir storage is above or below average, reservoir evaporation will be above or below average, respectively. Thus, evaporation for the first part of the draw down period could be greater than average, while evaporation for the second part of the draw down period could be less than average. The average CRSP reservoir evaporation for the period of draw down used in the algorithm should be similar to the long-term average shared CRSP reservoir evaporation when development in the Upper Basin approaches the Upper Basin yield and the 602(a) storage needed to protect that development approaches CRSP reservoir capacity.

4. Article III(a) of the Upper Colorado River Basin Compact makes an apportionment of water to New Mexico from the Upper Basin, and Article XIV of the compact sets forth the allocation of the waters of the San Juan River and its tributaries as between Colorado and New Mexico. The extent to which water might be shared during future droughts pursuant to Article XIV of the compact is dependent upon unspecified future water development in the San Juan River Basin in Colorado and cannot be determined at this time. Nevertheless, New Mexico cannot obtain its Upper Basin water from any source other than the San Juan River Basin. The Upper Colorado River Commission by Resolution dated June 19, 2003, stated support for such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project. The San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement, dated April 19, 2005, provides the Navajo Nation with rights to receive, divert and use water from the San Juan River under the project for municipal, industrial and domestic uses. The Settlement Agreement also provides that project uses are subject to administration as necessary for New Mexico to meet its compact obligations.

The proposed agreement of the Seven Basin States transmitted to the Secretary via letter dated March 3, 2006, would provide that each of the Seven Basin States supports the other states' rights to develop their compact apportionments. Colorado via email dated January 17, 2006, from Hal Simpson, Colorado State Engineer, to me stated that if I sent a letter by February 1, 2006, supporting Long Hollow Reservoir in the La Plata River drainage of the San Juan River Basin in Colorado, Colorado will support the update to the 1988 Hydrologic Determination. The Long Hollow Reservoir project will physically use water in Colorado that is now available for use in New Mexico by users who typically have less than a full supply already. As I indicated in my March 24, 2006, memorandum to Scott Balcomb responding to Colorado's then-stated concerns regarding the update to the 1988 Hydrologic Determination, I sent the requested letter to Hal Simpson dated January 31, 2006. As recently as March 23, Hal told me that the letter satisfies Colorado's request. The update to the 1988 Hydrologic Determination is required by Congress before Congress acts on approval of the Settlement Agreement and authorization of the project.

5. New Mexico has agreed with the other Upper Division States that if the 2006 Hydrologic Determination determines that at least 5.77 maf/yr, on average, is available at Lee Ferry for use by the Upper Basin, excluding shared CRSP reservoir evaporation, and that New Mexico's Upper Basin allocation is thus at least 643,500 af/yr, on average, excluding shared CRSP reservoir evaporation, the hydrologic determination also would include a revised schedule of anticipated Upper Basin depletions in New Mexico to compare against New Mexico's allocation that incorporates irrigation depletion estimates made using the modified Blaney-Criddle method with SCS effective precipitation. Further, the Upper Colorado River Commission's Engineering Advisors in their March 30 conference call agreed that the Commission at this time will not take any action regarding the accounting of salvage by use either on the mainstream rivers or ephemeral tributaries. New Mexico's draft Resolution regarding the availability of water for a Navajo Reservoir supply contract for Navajo Nation uses in New Mexico that was transmitted via email dated April 6, 2006, from Estevan Lopez to the Commission is silent as to how Upper Basin depletions will be accounted in the future. Article VI of the Upper Colorado River Basin Compact provides: "The commission shall determine the quantity of the consumptive use of water, which use is apportioned by Article III hereof, for the upper basin and for each state of the upper basin by the inflow-outflow method in terms of man-made depletions of the virgin flow at Lee Ferry, unless the commission, by unanimous action, shall adopt a different method of determination." The Commission has not adopted a method different than the inflow-outflow method for accounting actual uses in the Upper Basin.

Neither has the Commission determined that water right administration within the State of Colorado is a standard that applies to water rights administration throughout the Upper Basin. The State of New Mexico will administer its water rights based on New Mexico water law. As for the suggestion that consistency with current consumptive use accounting practices in the San Juan River Basin should be maintained, Colorado's StateMod model for the San Juan River Basin and the Bureau of Reclamation's Riverware model of the basin, which are conjunctively used to perform hydrologic investigations for National Environmental Policy Act and Endangered Species Act compliance activities for federal water development and water management in the basin in both Colorado and New Mexico, do not model "off-river" ephemeral tributary and ground water uses in New Mexico. Rather, the depletion impacts on San Juan River flows of "off-river" uses, including irrigation, stock and domestic uses in the Chaco River drainage, are assumed to be reflected in the calculated net gains or losses between San

Juan River stream flow gages. Also, the baseline depletions tables associated with the environmental compliance activities include scattered stockpond evaporation and livestock depletions in New Mexico that are reduced by 50 percent of the on-site uses to reflect their impact on San Juan River flows after salvage of losses on ephemeral tributaries. Further, the State of Colorado and the Bureau of Reclamation, in cooperation with the San Juan River Basin Recovery Implementation Program, currently are revising the models to use natural flows and irrigation depletions in New Mexico computed using crop consumptive uses calculated with the original Blaney-Criddle method. Reclamation's Colorado River System Consumptive Uses and Losses reports beginning 1981 also have included for irrigation uses in New Mexico other than NIIP crop consumptive uses calculated using the original Blaney-Criddle method with USBR effective precipitation. In addition, past Consumptive Uses and Losses reports did not include incidental depletions on certain return flows in the ephemeral tributaries in New Mexico. New Mexico has evaluated channel conveyance losses on Four Corners Power Plant discharges into the Chaco River, and has provided to Reclamation for use in the modeling revised historic depletions of San Juan River flows by the power plant that include the conveyance losses. If losses on return flows to ephemeral tributaries, such as from the NIIP and the Four Corners Power Plant, are to be accounted in the future as depletions incident to the uses, consistency demands that reductions in losses on the same ephemeral tributaries as a result of other uses should be considered in accounting depletions measured at Lee Ferry as required by Article VI of the compact.

New Mexico will use its best judgment to estimate its anticipated future depletions for inclusion in its depletions schedule, just as the other Upper Division States use their best judgment to estimate their future anticipated depletions for their depletions schedules. Each state will determine the amounts of depletion that are appropriate for particular uses within their state. Colorado, Utah and Wyoming are not agreeing to any particular depletion estimate in New Mexico's Upper Basin depletions schedule, nor will New Mexico be agreeing to any particular depletion estimate in the other states' depletions schedules. The Commission's Engineering Advisors in their March 30 conference call agreed that New Mexico in its Upper Basin depletions schedule will not explicitly note how the depletion amounts were derived or that some depletions may be estimates of depletions of San Juan River flows that differ from on-site consumptive uses due to salvage of losses on ephemeral tributaries, delayed impacts of ground water uses, or use of non-tributary ground water.



OSE-0217

**Whipple, John J., OSE**

**Fro·** Don Ostler [dostler@uc.usbr.gov] **Sent:** Mon 4/17/2006 5:59 PM
**To:** Randy.Seaholm@state.co.us
**Cc:** scott@balcombgreen.com; jshiel@seo.wyo.gov; carol.angel@state.co.us; Rod.Kuharich@state.co.us; Ted.Kowalski@state.co.us; Lopez, Estevan, OSE; Whipple, John J., OSE; Dave Trueman; robertking@utah.gov
**Subject:** RE: hydro determination2
**Attachments:**

Randy:
Thank you for getting some issues out on the table on the hydrologic determination. Hopefully this will allow us to work through them to get an agreement on the Determination. I have the following thoughts for your consideration:

1. I think I understand your concern that you do not want the hydrologic determination assumptions to imply that we are bound to curtail upper basin uses when in fact there may be other means to avoid or reduce the shortage. As I understand it, this is why you proposed completely eliminating the tolerable shortage that has been used in the proposed hydrologic determination as well as previous ones over several decades. However, to introduce this very sensitive issue of reducing Powell releases below 8.23 will undoubtably be very controversial and may result in active opposition from the lower basin for the Determination as well as any legislative action for New Mexico. In the past, drafters of the Determinations have avoided this issue because they were able to establish a sufficient yield for the upper basin to meet long term needs without invoking this fundamental controversial issu etween the upper and lower basins. I think we are still in this same situation. It appears very possible to meet New Mexico's needs at this time without adding this controversy. This is done in large part by using more accurate estimates of evaporation and continuing to use the same tolerable shortage that has been used since the 1988 hydrologic determination. We have all discussed that there are other assumptions that we can use at the time of shortage implementation to avoid or eliminate the 6% tolerable shortage. These include using the power pool volume to meet lower basin release requirements, taking into account the shortages that always occur in upper basin tributaries during drought that has not now been counted in the hydrologic determination, and invoking the need for strict compact accounting to determine the required release from Powell. All of these assumptions we have available to us in our back pocket (not written into the hydro determination) as options that we might use in lieu of the 6% tolerable shortage. We have traditionally worded our resolution on the hydrologic determination to preserve all of our options by stating we do not object to the determination; we believe the yield is at least what the Bureau has stated; that we do not agree with all the assumptions used in the determination; and we specifically do not agree with a MOR of 8.23. I suppose we could be more explicit to your concern by also specifically mentioning that we do not agree with the assumption of 6% tolerable shortage as the only means to provide upper basin uses and meet mandated release requirements. Undoubtably this will draw the attention of the lower basin, but maybe not so strongly as boldly showing reduced rele--es below 8.23.

I think we might be wise to avoid the release issue if possible for the present time. We are on the verge of signing the 7 state agreement on coordinated operations and securing 602a through 2025. Upper Basin uses are not up so high yet that we can show immediate injury etc...The other

OSE-0218

items on the San Juan issues appear to be things that New Mexico and Colorado should meet on to resolve. Where we left them in the eng ring committee was that 1) New Mexico would go to modified Blaney-Criddle and SCS effective precip. 2) there would be no salvage by use in the determination except for net reservoir evap (however New Mexico would make whatever assumptions they felt were appropriate in computing their depletions, as do all the other states, and these assumptions were not being signed off on by the other states or the Commission and; 3) the proposed accounting of ephemeral tributaries would not be in the hydro determination but would be handled the same way as described in item 2 above for salvage;

I will work on some specific language for the resolution that says we are not necessarily committed to, or bound by, the hydrologic determination assumption of a 6% shortage, as such things must be determined at the time when they are needed based upon analysis of all possible assumptions to meet upper basin uses and statutory delivery requirements.

Let me know if I can be of assistance..Consider these as just brainstorming thoughts for consideration..
Don Ostler
Upper Colorado River Commission

>>> "Seaholm, Randy" <Randy.Seaholm@state.co.us> 04/17 9:22 AM >>>
Dave and John

Based on discussions that I have recently had with several repr ntatives of Colorado's water users concerning the proposed hyd gic determination, I offer the following comments, which comments
also include several requests for additional information. I want to be
very clear that these are my thoughts at this point and are advanced for
further discussion so that I can present them along with the proposed determination and any additional comments from others to my Board in May
with the goal of having Colorado's Commissioner prepared to address the
determination at the Upper Colorado River Commission in June.

1. It is our understanding that Jim Prairie's updated natural flows
were used for the determination and we would like to verify that all his
work was incorporated.
2. While we understand that the "shortages" shown are to represent a "tolerable shortage" of 6% over the 25-year period, we are concerned that the spreadsheet portrayal of "tolerable shortage" implies that it may be necessary for the Upper Basin to curtail uses in the four years identified. We believe this would not be the case and are of the opinion that the more appropriate way to portray the situation would be
to ice the releases to the lower basin. Towards this end we ask the
following:
    a) That the determination shows no upper basin shortages.
    b) That during those years when the available water supply is

OSE-0219

not able to meet all the demands identified, releases to the lower
basin
be ced rather than showing a shortage to the upper basin. (We
would
observe that during drought conditions the upper basin is already experiencing shortages naturally and therefore it is not necessary to impose any additional shortages in the determination process. We also would note that through water right administration some shortage
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occurs every year, but for purposes of the determination it is not necessary to identify such.)

c) When releases to the lower basin are reduced, it will become necessary to add a column showing the 10-year running average of deliveries to the lower basin.

d) We believe it would be helpful to also add a column showing when carryover storage plus inflow to Powell is less than 8.23 maf and thus make it easier to identify when Powell could not actually make releases of 8.23 maf to the lower basin. This would also help
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e) We would request that appropriate data (mainly evaporation) be incorporated in to the 602(a) storage computation to show how the 602(a) storage requirements would be impacted.

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FG, d Aspinall is acceptable while using live storage at other
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The increase in hydrologic determination will have some minor impacts
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Colorado's water users in the San Juan Basin (Most of the water in the San Juan originates in Colorado, therefore, New Mexico's gains in the San Juan come at the expense of Colorado's water users in the San Juan.). Therefore, we believe that water use accounting, at least
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uses, 2) no salvage by use determinations, 3) the proposed accounting
of
tributary groundwater and ephemeral streams is inconsistent with
c t
consumptive use accounting practices and with water right
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in Colorado, therefore we believe such should be excluded from the
proposal.

OSE-0220

Agai~ I would note that these are my thoughts at present. I would app ate further thoughts from others. I intend to present the proposal, the additional information, and comments from others to my Board for further consideration in May.

Randy Seaholm
Chief, Water Supply Protection
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver, Colorado 80203
303-866-3441
303-866-4474 FAX
randy.seaholm@state.co.us

-----Original Message-----
From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]
Sent: Wednesday, February 15, 2006 11:42 AM
To: john.whipple@state.nm.us
Cc: jshiel@seo.wyo.gov; Seaholm, Randy; estevan.lopez@state.nm.us; Don Ostler; robertking@utah.gov
Subject: Re: hydro determination

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:? 4 PM >>>
Dav_.

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 1988 HD), provided that the Upper Colorado River Commission would not object 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 p ɔt response will be greatly appreciated.

John, Robert, Randy:

Can your states support a determination of at least 5.75 maf for use

OSE-0221

by
the Unper 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

You forwarded this message on 4/21/2006 1:56 PM.

**Whipple, John J., OSE**

**From:** Seaholm, Randy [Randy.Seaholm@state.co.us] **Sent:** Mon 4/17/2006 9:22 AM
**To:** Dave Trueman; Whipple, John J., OSE
**Cc:** jshiel@seo.wyo.gov; Seaholm, Randy; Lopez, Estevan, OSE; Don Ostler; robertking@utah.gov; Balcomb, Scott (Balcomb, Scott); dmerritt@crwcd.gov; Kuhn,Eric (kuhn,eric); bspear@mbssllp.com; Steve Harris (Steve Harris); Kuharich, Rod; Brown, Rick; George, Russell; McNulty, Frank; Kowalski, Ted; Shpall, Casey; Angel, Carol
**Subject:** RE: hydro determination
**Attachments:**

Dave and John

Based on discussions that I have recently had with several representatives of Colorado's water users concerning the proposed hydrologic determination, I offer the following comments, which comments also include several requests for additional information. I want to be very clear that these are my thoughts at this point and are advanced for further discussion so that I can present them along with the proposed determination and any additional comments from others to my Board in May with the goal of having Colorado's Commissioner prepared to address the determination at the Upper Colorado River Commission in June.

1. It is our understanding that Jim Prairie's updated natural flows were used for the determination and we would like to verify that all his work was incorporated.
2. While we understand that the "shortages" shown are to represent a "tolerable shortage" of 6% over the 25-year period, we are concerned that the spreadsheet portrayal of "tolerable shortage" implies that it may necessary for the Upper Basin to curtail uses in the four years identified. We believe this would not be the case and are of the opinion that the more appropriate way to portray the situation would be to reduce the releases to the lower basin. Towards this end we ask the following:

a) That the determination shows no upper basin shortages.

b) That during those years when the available water supply is not able to meet all the demands identified, releases to the lower basin be reduced rather than showing a shortage to the upper basin. (We would observe that during drought conditions the upper basin is already experiencing shortages naturally and therefore it is not necessary to impose any additional shortages in the determination process. We also would note that through water right administration some shortage likely occurs every year, but for purposes of the determination it is not necessary to identify such.)

c) When releases to the lower basin are reduced, it will become necessary to add a column showing the 10-year running average of deliveries to the lower basin.

d) We believe it would be helpful to also add a column showing when carryover storage plus inflow to Powell is less than 8.23 maf and thus make it easier to identify when Powell could not actually make releases of 8.23 maf to the lower basin. This would also help identify when Powell would drop below minimum power pool.

e) We would request that appropriate data (mainly evaporation) be incorporated in to the 602(a) storage computation to show how the 602(a) storage requirements would be impacted.

We are generally supportive of the following assumptions, but would reserve final judgment until after reviewing the results of the above.

* Attempting to protect minimum power pool at Powell, FG, and Aspinall is acceptable while using live storage at other

OSE-0223

eservoirs.

* It appears that by reducing reservoir evaporation to be e reflective of what may actually be experienced during the 25-year drought used in the determination is an adequate reduction to produce the increase in yield to meet New Mexico's desire of fitting the Gallup-Navajo project within their compact apportionment.

* The use of net reservoir evaporation is appropriate.

The increase in hydrologic determination will have some minor impacts on Colorado's water users in the San Juan Basin (Most of the water in the San Juan originates in Colorado, therefore, New Mexico's gains in the San Juan come at the expense of Colorado's water users in the San Juan.). Therefore, we believe that water use accounting, at least among water users in the San Juan, be done on a uniform basis. Such accounting should include: 1) use of the modified Blaney-Criddle method, utilizing SCS effective precipitation, for determining crop consumptive uses, 2) no salvage by use determinations, 3) the proposed accounting of tributary groundwater and ephemeral streams is inconsistent with current consumptive use accounting practices and with water right administration in Colorado, therefore we believe such should be excluded from the proposal.

Again, I would note that these are my thoughts at present. I would appreciate further thoughts from others. I intend to present the proposal, the additional information, and comments from others to my Board for further consideration in May.

Ran··· Seaholm
Chi /ater Supply Protection
Colorado Water Conservation Board
1313 Sherman Street, Suite 721
Denver, Colorado 80203
303-866-3441
303-866-4474 FAX
randy.seaholm@state.co.us
-----Original Message-----
From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]
Sent: Wednesday, February 15, 2006 11:42 AM
To: john.whipple@state.nm.us
Cc: jshiel@seo.wyo.gov; Seaholm, Randy; estevan.lopez@state.nm.us; Don Ostler; robertking@utah.gov
Subject: Re: hydro determination

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 eva' tion assumption (evap with CRSP+Other storage is the same as evap with ..SP 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 elative 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 ner Basin states to use at least 5.75 maf, on average excluding CRS. nared reservoir evaporation, with the computed shortages indicated (less than 6 percent overall shortage for a critical period as per the 1988 HD), provided that the Upper Colorado River Commission would not object 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.

Joh

NEW MEXICO PROVISIONAL

## Upper Basin Yield St[illegible] - April 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 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 |
| 2 | | | CRSP Active + Other UB | 1953-1977 | 5.75 | 0.26 | 6.01 | 0.00 | 0.00 | 3.16 | 0.37 | 0.39 | 4.33 | 8.25 | 5.7 |
| | | | | 1931-1977 | 5.75 | 0.37 | 6.12 | | | | | | | | 3.1 |
| | | | | 1906-2000 | 5.75 | 0.49 | 6.24 | | | | | | | | 1.5 |
| 3 | Adjusted | Constant | CRSP Active | 1953-1977 | 5.69 | 0.26 | 5.95 | 0.09 | 2.01 | 3.21 | 0.19 | 0.33 | 2.63 | 8.46 | 5.9 |
| | | | | 1931-1977 | 5.69 | 0.36 | 6.05 | | | | | | | | 3.2 |
| | | | | 1906-2000 | 5.69 | 0.49 | 6.18 | | | | | | | | 1.6 |
| 4 | | | CRSP Active + Other UB | 1953-1977 | 5.79 | 0.26 | 6.05 | 0.00 | 0.82 | 3.31 | 0.49 | 0.43 | 3.53 | 8.58 | 5.9 |
| | | | | 1931-1977 | 5.79 | 0.36 | 6.15 | | | | | | | | 3.2 |
| | | | | 1906-2000 | 5.79 | 0.49 | 6.28 | | | | | | | | 1.6 |
| 5 | Adjusted | Variable | CRSP Active | 1953-1977 | 5.28 | 0.36 | 5.64 | 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 | 5.69 | 0.55 | 6.24 | | | | | | | | 0.0 |
| 6 | | | CRSP Active + Other UB | 1953-1977 | 5.37 | 0.36 | 5.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | | | 1931-1977 | 5.47 | 0.45 | 5.92 | | | | | | | | 0.0 |
| | | | | 1906-2000 | 5.79 | 0.55 | 6.34 | | | | | | | | 0.0 |
| 7 | Adjusted | Constant | CRSP Live | 1953-1977 | 5.62 | 0.22 | 5.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | | | 1931-1977 | 5.62 | 0.34 | 5.96 | | | | | | | | 0.0 |
| | | | | 1906-2000 | 5.62 | 0.46 | 6.08 | | | | | | | | 0.0 |
| 8 | | | CRSP Live + Other UB | 1953-1977 | 5.72 | 0.22 | 5.94 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| | | | | 1931-1977 | 5.72 | 0.34 | 6.06 | | | | | | | | 0.0 |
| | | | | 1906-2000 | 5.72 | 0.46 | 6.18 | | | | | | | | 0.0 |
| 9 | CRSS | Constant | CRSP Active + Other UB (same % full) | 1953-1977 | 5.75 | 0.25 | 6.00 | 0.00 | 0.17 | 3.27 | 0.34 | 0.39 | 4.12 | 8.29 | 5.8 |
| | | | | 1931-1977 | 5.75 | 0.37 | 6.12 | | | | | | | | 3.1 |
| | | | | 1906-2000 | 5.75 | 0.50 | 6.25 | | | | | | | | 1.5 |
| 10 | Adjusted | Constant | CRSP Active + Other UB (same % full) | 1953-1977 | 5.79 | 0.25 | 6.04 | 0.00 | 1.15 | 3.31 | 0.45 | 0.43 | 3.32 | 8.66 | 6.0 |
| | | | | 1931-1977 | 5.79 | 0.36 | 6.15 | | | | | | | | 3.2 |
| | | | | 1906-2000 | 5.79 | 0.49 | 6.28 | | | | | | | | 1.6 |

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.

(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 1971-1980 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 1, 3, 5 and 7 are thus used to determine the evaporation amounts for studies 2, 4, 6 and 8, respectively. Studies 9 and 10 assume that CRSP and other reservoirs are the same percent full.

(6) The 1988 Hydrologic Determination assumed that a total shortage of 6 percent overall for a 25-year, 7-month critical period was tolerable (with the shortage measured against the total Upper Basin depletion including shared CRSP reservoir evaporation). In this yield study, a 6 percent overall shortage limitation is applied for the worst 25-year period of reservoir draw down (with the shortage measured against the Upper Basin use exclusive of shared CRSP reservoir evaporation). CRSS natural flows for 1971-1980 are adjusted to reflect historic irrigation depletions recalculated using the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures (consistent with 1981-2000 natural flows). Use of the water stored in CRSP minimum power pools to meet demands is not considered except in studies 7 and 8. 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 use demand. 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 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 5.37 maf during 1953-1977, 5.47 maf during 1931-1977, and 5.79 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 - April 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 | 5,650,000 | 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 |

OSE-0228

## Upper Basin Yield Study - April 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 | 5,750,000 | 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 |

OSE-0229

## Upper Basin Yield Study - April 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 | 18,550,021 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 28,708,435 | 3,860,731 | 0 | 24,847,704 |
| 1907 | 21,201,694 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 31,360,108 | 6,512,404 | 0 | 24,847,704 |
| 1908 | 12,218,817 | 24,847,704 | 8,250,000 | 5,690,000 | 719,022 | 22,407,499 | 0 | 0 | 22,407,499 |
| 1909 | 22,356,301 | 22,407,499 | 8,250,000 | 5,690,000 | 719,022 | 30,104,777 | 5,257,073 | 0 | 24,847,704 |
| 1910 | 14,650,616 | 24,847,704 | 8,250,000 | 5,690,000 | 748,816 | 24,809,504 | 0 | 0 | 24,809,504 |
| 1911 | 15,499,729 | 24,809,504 | 8,250,000 | 5,690,000 | 748,816 | 25,620,416 | 772,712 | 0 | 24,847,704 |
| 1912 | 18,623,410 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 28,781,824 | 3,934,120 | 0 | 24,847,704 |
| 1913 | 14,536,373 | 24,847,704 | 8,250,000 | 5,690,000 | 747,417 | 24,696,660 | 0 | 0 | 24,696,660 |
| 1914 | 21,354,814 | 24,696,660 | 8,250,000 | 5,690,000 | 747,417 | 31,364,058 | 6,516,354 | 0 | 24,847,704 |
| 1915 | 13,623,277 | 24,847,704 | 8,250,000 | 5,690,000 | 736,230 | 23,794,751 | 0 | 0 | 23,794,751 |
| 1916 | 20,142,892 | 23,794,751 | 8,250,000 | 5,690,000 | 736,230 | 29,261,414 | 4,413,710 | 0 | 24,847,704 |
| 1917 | 22,942,804 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 33,101,218 | 8,253,514 | 0 | 24,847,704 |
| 1918 | 15,865,939 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 26,024,353 | 1,176,649 | 0 | 24,847,704 |
| 1919 | 12,651,369 | 24,847,704 | 8,250,000 | 5,690,000 | 724,322 | 22,834,751 | 0 | 0 | 22,834,751 |
| 1920 | 22,287,632 | 22,834,751 | 8,250,000 | 5,690,000 | 724,322 | 30,458,061 | 5,610,357 | 0 | 24,847,704 |
| 1921 | 22,526,781 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 32,685,195 | 7,837,491 | 0 | 24,847,704 |
| 1922 | 18,447,198 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 28,605,612 | 3,757,908 | 0 | 24,847,704 |
| 1923 | 19,024,046 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 29,182,460 | 4,334,756 | 0 | 24,847,704 |
| 1924 | 13,877,798 | 24,847,704 | 8,250,000 | 5,690,000 | 739,348 | 24,046,154 | 0 | 0 | 24,046,154 |
| 1925 | 14,430,701 | 24,046,154 | 8,250,000 | 5,690,000 | 726,481 | 23,810,374 | 0 | 0 | 23,810,374 |
| 1926 | 15,213,731 | 23,810,374 | 8,250,000 | 5,690,000 | 730,297 | 24,353,808 | 0 | 0 | 24,353,808 |
| 1927 | 19,539,212 | 24,353,808 | 8,250,000 | 5,690,000 | 743,164 | 29,209,856 | 4,362,152 | 0 | 24,847,704 |
| 1928 | 16,954,334 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 27,112,748 | 2,265,044 | 0 | 24,847,704 |
| 1929 | 21,829,585 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 31,987,999 | 7,140,295 | 0 | 24,847,704 |
| 1930 | 14,621,041 | 24,847,704 | 8,250,000 | 5,690,000 | 748,454 | 24,780,291 | 0 | 0 | 24,780,291 |
| 1931 | 8,474,134 | 24,780,291 | 8,250,000 | 5,690,000 | 671,491 | 18,642,934 | 0 | 0 | 18,642,934 |
| 1932 | 17,422,187 | 18,642,934 | 8,250,000 | 5,690,000 | 630,733 | 21,494,388 | 0 | 0 | 21,494,388 |
| 1933 | 12,183,500 | 21,494,388 | 8,250,000 | 5,690,000 | 636,421 | 19,101,467 | 0 | 0 | 19,101,467 |
| 1934 | 6,178,192 | 19,101,467 | 8,250,000 | 5,690,000 | 504,209 | 10,835,450 | 0 | 0 | 10,835,450 |
| 1935 | 12,630,349 | 10,835,450 | 8,250,000 | 5,690,000 | 380,712 | 9,145,088 | 0 | 0 | 9,145,088 |
| 1936 | 14,648,873 | 9,145,088 | 8,250,000 | 5,690,000 | 364,022 | 9,489,939 | 0 | 0 | 9,489,939 |
| 1937 | 14,306,056 | 9,489,939 | 8,250,000 | 5,690,000 | 368,272 | 9,487,723 | 0 | 0 | 9,487,723 |
| 1938 | 18,148,319 | 9,487,723 | 8,250,000 | 5,690,000 | 415,293 | 13,280,749 | 0 | 0 | 13,280,749 |
| 1939 | 11,164,059 | 13,280,749 | 8,250,000 | 5,690,000 | 422,666 | 10,082,142 | 0 | 0 | 10,082,142 |
| 1940 | 9,931,657 | 10,082,142 | 8,250,000 | 5,690,000 | 329,189 | 5,744,611 | 0 | 0 | 5,744,611 |
| 1941 | 20,116,678 | 5,744,611 | 8,250,000 | 5,690,000 | 347,688 | 11,573,600 | 0 | 0 | 11,573,600 |
| 1942 | 17,225,136 | 11,573,600 | 8,250,000 | 5,690,000 | 455,094 | 14,403,643 | 0 | 0 | 14,403,643 |
| 1943 | 13,731,401 | 14,403,643 | 8,250,000 | 5,690,000 | 481,636 | 13,713,408 | 0 | 0 | 13,713,408 |
| 1944 | 15,369,422 | 13,713,408 | 8,250,000 | 5,690,000 | 484,791 | 14,658,039 | 0 | 0 | 14,658,039 |
| 1945 | 14,140,528 | 14,658,039 | 8,250,000 | 5,690,000 | 492,882 | 14,365,685 | 0 | 0 | 14,365,685 |
| 1946 | 11,095,453 | 14,365,685 | 8,250,000 | 5,690,000 | 448,410 | 11,072,728 | 0 | 0 | 11,072,728 |
| 1947 | 16,439,486 | 11,072,728 | 8,250,000 | 5,690,000 | 433,195 | 13,139,019 | 0 | 0 | 13,139,019 |
| 1948 | 15,139,294 | 13,139,019 | 8,250,000 | 5,690,000 | 467,897 | 13,870,416 | 0 | 0 | 13,870,416 |
| 1949 | 16,933,584 | 13,870,416 | 8,250,000 | 5,690,000 | 507,802 | 16,356,198 | 0 | 0 | 16,356,198 |
| 1950 | 13,140,416 | 16,356,198 | 8,250,000 | 5,690,000 | 522,240 | 15,034,374 | 0 | 0 | 15,034,374 |
| 1951 | 12,505,894 | 15,034,374 | 8,250,000 | 5,690,000 | 482,076 | 13,118,192 | 0 | 0 | 13,118,192 |
| 1952 | 20,805,422 | 13,118,192 | 8,250,000 | 5,690,000 | 536,807 | 19,446,807 | 0 | 0 | 19,446,807 |
| 1953 | 11,165,419 | 19,446,807 | 8,250,000 | 5,690,000 | 573,774 | 16,098,452 | 0 | 0 | 16,098,452 |
| 1954 | 8,496,102 | 16,098,452 | 8,250,000 | 5,690,000 | 459,023 | 10,195,531 | 0 | 0 | 10,195,531 |
| 1955 | 9,413,908 | 10,195,531 | 8,250,000 | 5,690,000 | 325,624 | 5,343,816 | 0 | 0 | 5,343,816 |
| 1956 | 11,426,874 | 5,343,816 | 8,250,000 | 5,690,000 | 231,401 | 2,599,289 | 0 | 0 | 2,599,289 |
| 1957 | 21,500,963 | 2,599,289 | 8,250,000 | 5,690,000 | 287,576 | 9,872,675 | 0 | 0 | 9,872,675 |
| 1958 | 15,862,511 | 9,872,675 | 8,250,000 | 5,690,000 | 396,720 | 11,398,466 | 0 | 0 | 11,398,466 |
| 1959 | 9,598,169 | 11,398,466 | 8,250,000 | 5,690,000 | 357,358 | 6,699,278 | 0 | 0 | 6,699,278 |
| 1960 | 11,524,160 | 6,699,278 | 8,250,000 | 5,690,000 | 265,807 | 4,017,631 | 0 | 0 | 4,017,631 |
| 1961 | 10,010,259 | 4,017,631 | 8,250,000 | 5,690,000 | 182,710 | -94,820 | 0 | 94,820 | 0 |
| 1962 | 17,377,609 | 0 | 8,250,000 | 5,690,000 | 173,365 | 3,264,244 | 0 | 0 | 3,264,244 |
| 1963 | 8,840,900 | 3,264,244 | 8,250,000 | 5,690,000 | 173,365 | -2,008,221 | 0 | 2,008,221 | 0 |
| 1964 | 10,863,586 | 0 | 8,250,000 | 5,690,000 | 132,876 | -3,209,290 | 0 | 3,209,290 | 0 |
| 1965 | 19,875,027 | 0 | 8,250,000 | 5,690,000 | 203,963 | 5,731,064 | 0 | 0 | 5,731,064 |
| 1966 | 10,679,844 | 5,731,064 | 8,250,000 | 5,690,000 | 231,738 | 2,239,170 | 0 | 0 | 2,239,170 |
| 1967 | 11,670,830 | 2,239,170 | 8,250,000 | 5,690,000 | 160,650 | -190,650 | 0 | 190,650 | 0 |
| 1968 | 13,739,932 | 0 | 8,250,000 | 5,690,000 | 132,876 | -332,944 | 0 | 332,944 | 0 |
| 1969 | 15,272,159 | 0 | 8,250,000 | 5,690,000 | 147,569 | 1,184,590 | 0 | 0 | 1,184,590 |
| 1970 | 15,344,136 | 1,184,590 | 8,250,000 | 5,690,000 | 177,478 | 2,411,247 | 0 | 0 | 2,411,247 |
| 1971 | 15,468,912 | 2,411,247 | 8,250,000 | 5,690,000 | 209,065 | 3,731,094 | 0 | 0 | 3,731,094 |
| 1972 | 13,151,441 | 3,731,094 | 8,250,000 | 5,690,000 | 213,012 | 2,729,522 | 0 | 0 | 2,729,522 |
| 1973 | 18,614,466 | 2,729,522 | 8,250,000 | 5,690,000 | 255,403 | 7,148,586 | 0 | 0 | 7,148,586 |
| 1974 | 13,251,347 | 7,148,586 | 8,250,000 | 5,690,000 | 297,978 | 6,161,955 | 0 | 0 | 6,161,955 |
| 1975 | 17,052,625 | 6,161,955 | 8,250,000 | 5,690,000 | 320,375 | 8,954,206 | 0 | 0 | 8,954,206 |
| 1976 | 11,287,441 | 8,954,206 | 8,250,000 | 5,690,000 | 318,161 | 5,983,486 | 0 | 0 | 5,983,486 |
| 1977 | 5,533,636 | 5,983,486 | 8,250,000 | 5,690,000 | 207,094 | -2,629,972 | 0 | 2,629,972 | 0 |
| 1978 | 15,309,549 | 0 | 8,250,000 | 5,690,000 | 148,028 | 1,221,521 | 0 | 0 | 1,221,521 |
| 1979 | 17,798,627 | 1,221,521 | 8,250,000 | 5,690,000 | 208,455 | 4,871,692 | 0 | 0 | 4,871,692 |
| 1980 | 17,899,896 | 4,871,692 | 8,250,000 | 5,690,000 | 299,139 | 8,532,450 | 0 | 0 | 8,532,450 |
| 1981 | 9,015,200 | 8,532,450 | 8,250,000 | 5,690,000 | 279,987 | 3,327,663 | 0 | 0 | 3,327,663 |
| 1982 | 17,489,400 | 3,327,663 | 8,250,000 | 5,690,000 | 256,275 | 6,620,787 | 0 | 0 | 6,620,787 |
| 1983 | 24,361,989 | 6,620,787 | 8,250,000 | 5,690,000 | 421,171 | 16,621,605 | 0 | 0 | 16,621,605 |
| 1984 | 25,359,376 | 16,621,605 | 8,250,000 | 5,690,000 | 647,255 | 27,393,726 | 2,546,022 | 0 | 24,847,704 |
| 1985 | 21,246,109 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 31,404,522 | 6,556,818 | 0 | 24,847,704 |
| 1986 | 23,013,446 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 33,171,860 | 8,324,156 | 0 | 24,847,704 |
| 1987 | 15,640,478 | 24,847,704 | 8,250,000 | 5,690,000 | 749,290 | 25,798,892 | 951,188 | 0 | 24,847,704 |
| 1988 | 11,456,357 | 24,847,704 | 8,250,000 | 5,690,000 | 709,681 | 21,654,380 | 0 | 0 | 21,654,380 |
| 1989 | 9,921,847 | 21,654,380 | 8,250,000 | 5,690,000 | 612,632 | 17,023,595 | 0 | 0 | 17,023,595 |
| 1990 | 9,639,803 | 17,023,595 | 8,250,000 | 5,690,000 | 495,704 | 12,227,693 | 0 | 0 | 12,227,693 |
| 1991 | 12,170,021 | 12,227,693 | 8,250,000 | 5,690,000 | 409,187 | 10,048,527 | 0 | 0 | 10,048,527 |
| 1992 | 10,895,580 | 10,048,527 | 8,250,000 | 5,690,000 | 340,175 | 6,663,932 | 0 | 0 | 6,663,932 |
| 1993 | 18,160,118 | 6,663,932 | 8,250,000 | 5,690,000 | 346,244 | 10,537,806 | 0 | 0 | 10,537,806 |
| 1994 | 11,125,503 | 10,537,806 | 8,250,000 | 5,690,000 | 354,981 | 7,368,328 | 0 | 0 | 7,368,328 |
| 1995 | 20,047,166 | 7,368,328 | 8,250,000 | 5,690,000 | 386,624 | 13,088,870 | 0 | 0 | 13,088,870 |
| 1996 | 14,502,293 | 13,088,870 | 8,250,000 | 5,690,000 | 458,864 | 13,192,300 | 0 | 0 | 13,192,300 |
| 1997 | 21,622,438 | 13,192,300 | 8,250,000 | 5,690,000 | 548,633 | 20,326,104 | 0 | 0 | 20,326,104 |
| 1998 | 16,798,378 | 20,326,104 | 8,250,000 | 5,690,000 | 664,334 | 22,520,148 | 0 | 0 | 22,520,148 |
| 1999 | 15,934,210 | 22,520,148 | 8,250,000 | 5,690,000 | 707,509 | 23,806,849 | 0 | 0 | 23,806,849 |
| 2000 | 10,646,526 | 23,806,849 | 8,250,000 | 5,690,000 | 674,254 | 19,839,121 | 0 | 0 | 19,839,121 |
| Total | | | | | | | | 8,465,898 | |
| Averages: | | | | | | | | | |
| 1953-1977 | 13,080,890 | 5,408,444 | 8,250,000 | 5,690,000 | 257,398 | | 0 | 338,636 | 4,630,572 |
| 1931-1977 | 13,590,474 | 9,331,940 | 8,250,000 | 5,690,000 | 357,840 | | 0 | 180,125 | 8,804,700 |
| 1906-2000 | 15,281,860 | 14,429,587 | 8,250,000 | 5,690,000 | 490,187 | | 993,510 | 89,115 | 14,376,865 |

**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 | 5,690,000 | af/yr |
| LB Delivery | 8,250,000 | af/yr |

**Results**

| | | |
|---|---|---|
| Average CRSP Evap | 490,187 | af/yr |
| Total Yield w/ CRSP evap | 6,180,187 | af/yr |

| Shortage Years | Shortage | |
|---|---|---|
| 1961 | 94,820 | af |
| 1963 | 2,008,221 | af |
| 1964 | 3,209,290 | af |
| 1967 | 190,650 | af |
| 1968 | 332,944 | af |
| 1977 | 2,629,972 | af |

NM allocation (w/o evap) 634,500 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 | 5,947,398 | af/yr |
| 1931-1977 | 6,047,840 | af/yr |
| 1906-2000 | 6,180,187 | af/yr |

Flow Adjustments:

| | | |
|---|---|---|
| 1971 | 178,479 | af |
| 1972 | 191,789 | af |
| 1973 | 216,650 | af |
| 1974 | 162,305 | af |
| 1975 | 226,629 | af |
| 1976 | 147,130 | af |
| 1977 | 94,739 | af |
| 1978 | 125,827 | af |
| 1979 | 126,757 | af |
| 1980 | 134,713 | af |

## Upper Basin Yield Study - April 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 | 18,550,021 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 33,290,761 | 3,760,731 | 0 | 29,530,030 |
| 1907 | 21,201,694 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 35,942,434 | 6,412,404 | 0 | 29,530,030 |
| 1908 | 12,218,817 | 29,530,030 | 8,250,000 | 5,790,000 | 719,022 | 26,989,825 | 0 | 0 | 26,989,825 |
| 1909 | 22,356,301 | 26,989,825 | 8,250,000 | 5,790,000 | 719,022 | 34,587,104 | 5,057,073 | 0 | 29,530,030 |
| 1910 | 14,650,616 | 29,530,030 | 8,250,000 | 5,790,000 | 748,816 | 29,391,830 | 0 | 0 | 29,391,830 |
| 1911 | 15,499,729 | 29,391,830 | 8,250,000 | 5,790,000 | 748,816 | 30,102,743 | 572,712 | 0 | 29,530,030 |
| 1912 | 18,623,410 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 33,364,150 | 3,834,120 | 0 | 29,530,030 |
| 1913 | 14,536,373 | 29,530,030 | 8,250,000 | 5,790,000 | 747,417 | 29,278,987 | 0 | 0 | 29,278,987 |
| 1914 | 21,354,814 | 29,278,987 | 8,250,000 | 5,790,000 | 747,417 | 35,846,384 | 6,316,354 | 0 | 29,530,030 |
| 1915 | 13,623,277 | 29,530,030 | 8,250,000 | 5,790,000 | 736,230 | 28,377,078 | 0 | 0 | 28,377,078 |
| 1916 | 20,142,892 | 28,377,078 | 8,250,000 | 5,790,000 | 736,230 | 33,743,740 | 4,213,710 | 0 | 29,530,030 |
| 1917 | 22,942,804 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 37,683,544 | 8,153,514 | 0 | 29,530,030 |
| 1918 | 15,865,939 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 30,606,679 | 1,076,649 | 0 | 29,530,030 |
| 1919 | 12,651,369 | 29,530,030 | 8,250,000 | 5,790,000 | 724,322 | 27,417,078 | 0 | 0 | 27,417,078 |
| 1920 | 22,287,632 | 27,417,078 | 8,250,000 | 5,790,000 | 724,322 | 34,940,388 | 5,410,357 | 0 | 29,530,030 |
| 1921 | 22,526,781 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 37,267,521 | 7,737,491 | 0 | 29,530,030 |
| 1922 | 18,447,198 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 33,187,938 | 3,657,908 | 0 | 29,530,030 |
| 1923 | 19,024,046 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 33,764,786 | 4,234,756 | 0 | 29,530,030 |
| 1924 | 13,877,798 | 29,530,030 | 8,250,000 | 5,790,000 | 739,348 | 28,628,481 | 0 | 0 | 28,628,481 |
| 1925 | 14,430,701 | 28,628,481 | 8,250,000 | 5,790,000 | 726,481 | 28,292,700 | 0 | 0 | 28,292,700 |
| 1926 | 15,213,731 | 28,292,700 | 8,250,000 | 5,790,000 | 730,297 | 28,736,134 | 0 | 0 | 28,736,134 |
| 1927 | 19,539,212 | 28,736,134 | 8,250,000 | 5,790,000 | 743,164 | 33,492,182 | 3,962,152 | 0 | 29,530,030 |
| 1928 | 16,954,334 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 31,695,074 | 2,165,044 | 0 | 29,530,030 |
| 1929 | 21,829,585 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 36,570,325 | 7,040,295 | 0 | 29,530,030 |
| 1930 | 14,621,041 | 29,530,030 | 8,250,000 | 5,790,000 | 748,454 | 29,362,617 | 0 | 0 | 29,362,617 |
| 1931 | 8,474,134 | 29,362,617 | 8,250,000 | 5,790,000 | 671,491 | 23,125,260 | 0 | 0 | 23,125,260 |
| 1932 | 17,422,187 | 23,125,260 | 8,250,000 | 5,790,000 | 630,733 | 25,876,714 | 0 | 0 | 25,876,714 |
| 1933 | 12,183,500 | 25,876,714 | 8,250,000 | 5,790,000 | 636,421 | 23,383,793 | 0 | 0 | 23,383,793 |
| 1934 | 6,178,192 | 23,383,793 | 8,250,000 | 5,790,000 | 504,209 | 15,017,777 | 0 | 0 | 15,017,777 |
| 1935 | 12,630,349 | 15,017,777 | 8,250,000 | 5,790,000 | 380,712 | 13,227,414 | 0 | 0 | 13,227,414 |
| 1936 | 14,648,873 | 13,227,414 | 8,250,000 | 5,790,000 | 364,022 | 13,472,265 | 0 | 0 | 13,472,265 |
| 1937 | 14,306,056 | 13,472,265 | 8,250,000 | 5,790,000 | 368,272 | 13,370,049 | 0 | 0 | 13,370,049 |
| 1938 | 18,148,319 | 13,370,049 | 8,250,000 | 5,790,000 | 415,293 | 17,063,075 | 0 | 0 | 17,063,075 |
| 1939 | 11,164,059 | 17,063,075 | 8,250,000 | 5,790,000 | 422,666 | 13,764,469 | 0 | 0 | 13,764,469 |
| 1940 | 9,931,657 | 13,764,469 | 8,250,000 | 5,790,000 | 329,189 | 9,326,937 | 0 | 0 | 9,326,937 |
| 1941 | 20,116,678 | 9,326,937 | 8,250,000 | 5,790,000 | 347,688 | 15,055,927 | 0 | 0 | 15,055,927 |
| 1942 | 17,225,136 | 15,055,927 | 8,250,000 | 5,790,000 | 455,094 | 17,785,969 | 0 | 0 | 17,785,969 |
| 1943 | 13,731,401 | 17,785,969 | 8,250,000 | 5,790,000 | 481,636 | 16,995,734 | 0 | 0 | 16,995,734 |
| 1944 | 15,369,422 | 16,995,734 | 8,250,000 | 5,790,000 | 484,791 | 17,840,365 | 0 | 0 | 17,840,365 |
| 1945 | 14,140,528 | 17,840,365 | 8,250,000 | 5,790,000 | 492,882 | 17,448,012 | 0 | 0 | 17,448,012 |
| 1946 | 11,095,453 | 17,448,012 | 8,250,000 | 5,790,000 | 448,410 | 14,055,054 | 0 | 0 | 14,055,054 |
| 1947 | 16,439,486 | 14,055,054 | 8,250,000 | 5,790,000 | 433,195 | 16,021,346 | 0 | 0 | 16,021,346 |
| 1948 | 15,139,294 | 16,021,346 | 8,250,000 | 5,790,000 | 467,897 | 16,652,743 | 0 | 0 | 16,652,743 |
| 1949 | 16,933,584 | 16,652,743 | 8,250,000 | 5,790,000 | 507,802 | 19,038,524 | 0 | 0 | 19,038,524 |
| 1950 | 13,140,416 | 19,038,524 | 8,250,000 | 5,790,000 | 522,240 | 17,616,701 | 0 | 0 | 17,616,701 |
| 1951 | 12,505,894 | 17,616,701 | 8,250,000 | 5,790,000 | 482,076 | 15,600,519 | 0 | 0 | 15,600,519 |
| 1952 | 20,805,422 | 15,600,519 | 8,250,000 | 5,790,000 | 536,807 | 21,829,133 | 0 | 0 | 21,829,133 |
| 1953 | 11,165,419 | 21,829,133 | 8,250,000 | 5,790,000 | 573,774 | 18,380,778 | 0 | 0 | 18,380,778 |
| 1954 | 8,496,102 | 18,380,778 | 8,250,000 | 5,790,000 | 459,023 | 12,377,858 | 0 | 0 | 12,377,858 |
| 1955 | 9,413,908 | 12,377,858 | 8,250,000 | 5,790,000 | 325,624 | 7,426,142 | 0 | 0 | 7,426,142 |
| 1956 | 11,426,874 | 7,426,142 | 8,250,000 | 5,790,000 | 231,401 | 4,581,615 | 0 | 0 | 4,581,615 |
| 1957 | 21,500,963 | 4,581,615 | 8,250,000 | 5,790,000 | 287,576 | 11,755,002 | 0 | 0 | 11,755,002 |
| 1958 | 15,862,511 | 11,755,002 | 8,250,000 | 5,790,000 | 396,720 | 13,180,793 | 0 | 0 | 13,180,793 |
| 1959 | 9,598,169 | 13,180,793 | 8,250,000 | 5,790,000 | 357,358 | 8,381,604 | 0 | 0 | 8,381,604 |
| 1960 | 11,524,160 | 8,381,604 | 8,250,000 | 5,790,000 | 265,807 | 5,599,957 | 0 | 0 | 5,599,957 |
| 1961 | 10,010,259 | 5,599,957 | 8,250,000 | 5,790,000 | 182,710 | 1,387,506 | 0 | 0 | 1,387,506 |
| 1962 | 17,377,609 | 1,387,506 | 8,250,000 | 5,790,000 | 173,365 | 4,551,750 | 0 | 0 | 4,551,750 |
| 1963 | 8,840,900 | 4,551,750 | 8,250,000 | 5,790,000 | 173,365 | -820,715 | 0 | 820,715 | 0 |
| 1964 | 10,863,586 | 0 | 8,250,000 | 5,790,000 | 132,876 | -3,309,290 | 0 | 3,309,290 | 0 |
| 1965 | 19,875,027 | 0 | 8,250,000 | 5,790,000 | 203,963 | 5,631,064 | 0 | 0 | 5,631,064 |
| 1966 | 10,679,844 | 5,631,064 | 8,250,000 | 5,790,000 | 231,738 | 2,039,170 | 0 | 0 | 2,039,170 |
| 1967 | 11,670,830 | 2,039,170 | 8,250,000 | 5,790,000 | 160,650 | -490,650 | 0 | 490,650 | 0 |
| 1968 | 13,739,932 | 0 | 8,250,000 | 5,790,000 | 132,876 | -432,944 | 0 | 432,944 | 0 |
| 1969 | 15,272,159 | 0 | 8,250,000 | 5,790,000 | 147,569 | 1,084,590 | 0 | 0 | 1,084,590 |
| 1970 | 15,344,136 | 1,084,590 | 8,250,000 | 5,790,000 | 177,478 | 2,211,247 | 0 | 0 | 2,211,247 |
| 1971 | 15,468,912 | 2,211,247 | 8,250,000 | 5,790,000 | 209,065 | 3,431,094 | 0 | 0 | 3,431,094 |
| 1972 | 13,151,441 | 3,431,094 | 8,250,000 | 5,790,000 | 213,012 | 2,329,522 | 0 | 0 | 2,329,522 |
| 1973 | 18,614,466 | 2,329,522 | 8,250,000 | 5,790,000 | 255,403 | 6,648,586 | 0 | 0 | 6,648,586 |
| 1974 | 13,251,347 | 6,648,586 | 8,250,000 | 5,790,000 | 297,978 | 5,561,955 | 0 | 0 | 5,561,955 |
| 1975 | 17,052,625 | 5,561,955 | 8,250,000 | 5,790,000 | 320,375 | 8,254,206 | 0 | 0 | 8,254,206 |
| 1976 | 11,287,441 | 8,254,206 | 8,250,000 | 5,790,000 | 318,161 | 5,183,486 | 0 | 0 | 5,183,486 |
| 1977 | 5,533,636 | 5,183,486 | 8,250,000 | 5,790,000 | 207,094 | -3,529,972 | 0 | 3,529,972 | 0 |
| 1978 | 15,309,549 | 0 | 8,250,000 | 5,790,000 | 148,028 | 1,121,521 | 0 | 0 | 1,121,521 |
| 1979 | 17,798,627 | 1,121,521 | 8,250,000 | 5,790,000 | 208,455 | 4,671,692 | 0 | 0 | 4,671,692 |
| 1980 | 17,899,896 | 4,671,692 | 8,250,000 | 5,790,000 | 299,139 | 8,232,450 | 0 | 0 | 8,232,450 |
| 1981 | 9,015,200 | 8,232,450 | 8,250,000 | 5,790,000 | 279,987 | 2,927,663 | 0 | 0 | 2,927,663 |
| 1982 | 17,489,400 | 2,927,663 | 8,250,000 | 5,790,000 | 256,275 | 6,120,787 | 0 | 0 | 6,120,787 |
| 1983 | 24,361,989 | 6,120,787 | 8,250,000 | 5,790,000 | 421,171 | 16,021,605 | 0 | 0 | 16,021,605 |
| 1984 | 25,359,376 | 16,021,605 | 8,250,000 | 5,790,000 | 647,255 | 26,693,726 | 0 | 0 | 26,693,726 |
| 1985 | 21,246,109 | 26,693,726 | 8,250,000 | 5,790,000 | 749,290 | 33,150,545 | 3,620,514 | 0 | 29,530,030 |
| 1986 | 23,013,446 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 37,754,186 | 8,224,156 | 0 | 29,530,030 |
| 1987 | 15,640,478 | 29,530,030 | 8,250,000 | 5,790,000 | 749,290 | 30,381,219 | 851,188 | 0 | 29,530,030 |
| 1988 | 11,456,357 | 29,530,030 | 8,250,000 | 5,790,000 | 709,681 | 26,236,706 | 0 | 0 | 26,236,706 |
| 1989 | 9,921,847 | 26,236,706 | 8,250,000 | 5,790,000 | 612,632 | 21,505,921 | 0 | 0 | 21,505,921 |
| 1990 | 9,639,803 | 21,505,921 | 8,250,000 | 5,790,000 | 495,704 | 16,610,020 | 0 | 0 | 16,610,020 |
| 1991 | 12,170,021 | 16,610,020 | 8,250,000 | 5,790,000 | 409,187 | 14,330,854 | 0 | 0 | 14,330,854 |
| 1992 | 10,895,580 | 14,330,854 | 8,250,000 | 5,790,000 | 340,175 | 10,846,259 | 0 | 0 | 10,846,259 |
| 1993 | 18,160,118 | 10,846,259 | 8,250,000 | 5,790,000 | 346,244 | 14,620,133 | 0 | 0 | 14,620,133 |
| 1994 | 11,125,503 | 14,620,133 | 8,250,000 | 5,790,000 | 354,981 | 11,350,655 | 0 | 0 | 11,350,655 |
| 1995 | 20,047,166 | 11,350,655 | 8,250,000 | 5,790,000 | 386,624 | 16,971,197 | 0 | 0 | 16,971,197 |
| 1996 | 14,502,293 | 16,971,197 | 8,250,000 | 5,790,000 | 458,864 | 16,974,626 | 0 | 0 | 16,974,626 |
| 1997 | 21,622,438 | 16,974,626 | 8,250,000 | 5,790,000 | 548,633 | 24,008,431 | 0 | 0 | 24,008,431 |
| 1998 | 16,798,378 | 24,008,431 | 8,250,000 | 5,790,000 | 664,334 | 26,102,475 | 0 | 0 | 26,102,475 |
| 1999 | 15,934,210 | 26,102,475 | 8,250,000 | 5,790,000 | 707,509 | 27,289,176 | 0 | 0 | 27,289,176 |
| 2000 | 10,646,526 | 27,289,176 | 8,250,000 | 5,790,000 | 674,254 | 23,221,448 | 0 | 0 | 23,221,448 |
| **Total** | | | | | | | | 8,583,572 | |
| **Averages:** | | | | | | | | | |
| **1953-1977** | 13,080,890 | | 8,250,000 | 5,790,000 | 257,398 | | 0 | 343,343 | 5,199,917 |
| **1931-1977** | 13,590,474 | | 8,250,000 | 5,790,000 | 357,840 | | 0 | 182,629 | 10,714,164 |
| **1906-2000** | 15,281,860 | | 8,250,000 | 5,790,000 | 490,187 | | 908,433 | 90,353 | 17,231,246 |

| 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 | 5,790,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 490,187 af/yr |
| Total Yield w/ CRSP evap | 6,280,187 af/yr |

| Shortage Years | Shortage |
|---|---|
| 1961 | 0 af |
| 1963 | 820,715 af |
| 1964 | 3,309,290 af |
| 1967 | 490,650 af |
| 1968 | 432,944 af |
| 1977 | 3,529,972 af |

NM allocation(w/o evap) 645,750 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 | 6,047,398 af/yr |
| 1931-1977 | 6,147,840 af/yr |
| 1906-2000 | 6,280,187 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

## Upper Basin Yield Study - April 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 | 18,550,021 | 1.214 | 24,847,704 | 8,250,000 | 5,690,000 | 1.107 | 6,298,428 | 749,290 | 28,100,006 | 3,252,302 | 0 | 24,847,704 |
| 1907 | 21,201,694 | 1.387 | 24,847,704 | 8,250,000 | 5,690,000 | 1.194 | 6,792,086 | 749,290 | 30,258,022 | 5,410,318 | 0 | 24,847,704 |
| 1908 | 12,218,817 | 0.800 | 24,847,704 | 8,250,000 | 5,690,000 | 0.900 | 5,119,758 | 726,009 | 22,970,754 | 0 | 0 | 22,970,754 |
| 1909 | 22,356,301 | 1.463 | 22,970,754 | 8,250,000 | 5,690,000 | 1.231 | 7,007,038 | 726,009 | 29,344,009 | 4,496,305 | 0 | 24,847,704 |
| 1910 | 14,650,616 | 0.959 | 24,847,704 | 8,250,000 | 5,690,000 | 0.979 | 5,572,482 | 749,290 | 24,926,547 | 78,844 | 0 | 24,847,704 |
| 1911 | 15,499,729 | 1.014 | 24,847,704 | 8,250,000 | 5,690,000 | 1.007 | 5,730,560 | 749,290 | 25,617,582 | 769,879 | 0 | 24,847,704 |
| 1912 | 18,623,410 | 1.219 | 24,847,704 | 8,250,000 | 5,690,000 | 1.109 | 6,312,091 | 749,290 | 28,159,733 | 3,312,029 | 0 | 24,847,704 |
| 1913 | 14,536,373 | 0.951 | 24,847,704 | 8,250,000 | 5,690,000 | 0.976 | 5,551,214 | 749,117 | 24,833,746 | 0 | 0 | 24,833,746 |
| 1914 | 21,354,814 | 1.397 | 24,833,746 | 8,250,000 | 5,690,000 | 1.199 | 6,820,592 | 749,117 | 30,368,851 | 5,521,147 | 0 | 24,847,704 |
| 1915 | 13,623,277 | 0.891 | 24,847,704 | 8,250,000 | 5,690,000 | 0.946 | 5,381,224 | 740,013 | 24,099,744 | 0 | 0 | 24,099,744 |
| 1916 | 20,142,892 | 1.318 | 24,099,744 | 8,250,000 | 5,690,000 | 1.159 | 6,594,971 | 740,013 | 28,657,653 | 3,809,949 | 0 | 24,847,704 |
| 1917 | 22,942,804 | 1.501 | 24,847,704 | 8,250,000 | 5,690,000 | 1.251 | 7,116,226 | 749,290 | 31,674,992 | 6,827,288 | 0 | 24,847,704 |
| 1918 | 15,865,939 | 1.038 | 24,847,704 | 8,250,000 | 5,690,000 | 1.019 | 5,798,737 | 749,290 | 25,915,616 | 1,067,912 | 0 | 24,847,704 |
| 1919 | 12,651,369 | 0.828 | 24,847,704 | 8,250,000 | 5,690,000 | 0.914 | 5,200,286 | 730,322 | 23,318,466 | 0 | 0 | 23,318,466 |
| 1920 | 22,287,632 | 1.458 | 23,318,466 | 8,250,000 | 5,690,000 | 1.229 | 6,994,254 | 730,322 | 29,631,522 | 4,783,818 | 0 | 24,847,704 |
| 1921 | 22,526,781 | 1.474 | 24,847,704 | 8,250,000 | 5,690,000 | 1.237 | 7,038,776 | 749,290 | 31,336,419 | 6,488,715 | 0 | 24,847,704 |
| 1922 | 18,447,198 | 1.207 | 24,847,704 | 8,250,000 | 5,690,000 | 1.104 | 6,279,286 | 749,290 | 28,016,326 | 3,168,622 | 0 | 24,847,704 |
| 1923 | 19,024,046 | 1.245 | 24,847,704 | 8,250,000 | 5,690,000 | 1.122 | 6,386,677 | 749,290 | 28,485,783 | 3,638,079 | 0 | 24,847,704 |
| 1924 | 13,877,798 | 0.908 | 24,847,704 | 8,250,000 | 5,690,000 | 0.954 | 5,428,608 | 742,550 | 24,304,344 | 0 | 0 | 24,304,344 |
| 1925 | 14,430,701 | 0.944 | 24,304,344 | 8,250,000 | 5,690,000 | 0.972 | 5,531,541 | 734,749 | 24,218,754 | 0 | 0 | 24,218,754 |
| 1926 | 15,213,731 | 0.996 | 24,218,754 | 8,250,000 | 5,690,000 | 0.998 | 5,677,316 | 740,459 | 24,764,710 | 0 | 0 | 24,764,710 |
| 1927 | 19,539,212 | 1.279 | 24,764,710 | 8,250,000 | 5,690,000 | 1.139 | 6,482,585 | 748,261 | 28,823,076 | 3,975,372 | 0 | 24,847,704 |
| 1928 | 16,954,334 | 1.109 | 24,847,704 | 8,250,000 | 5,690,000 | 1.055 | 6,001,362 | 749,290 | 26,801,386 | 1,953,682 | 0 | 24,847,704 |
| 1929 | 21,829,585 | 1.428 | 24,847,704 | 8,250,000 | 5,690,000 | 1.214 | 6,908,980 | 749,290 | 30,769,019 | 5,921,315 | 0 | 24,847,704 |
| 1930 | 14,621,041 | 0.957 | 24,847,704 | 8,250,000 | 5,690,000 | 0.978 | 5,566,976 | 749,290 | 24,902,478 | 54,774 | 0 | 24,847,704 |
| 1931 | 8,474,134 | 0.555 | 24,847,704 | 8,250,000 | 5,690,000 | 0.777 | 4,422,616 | 688,671 | 19,960,551 | 0 | 0 | 19,960,551 |
| 1932 | 17,422,187 | 1.140 | 19,960,551 | 8,250,000 | 5,690,000 | 1.070 | 6,088,461 | 658,138 | 22,386,139 | 0 | 0 | 22,386,139 |
| 1933 | 12,183,500 | 0.797 | 22,386,139 | 8,250,000 | 5,690,000 | 0.899 | 5,113,183 | 665,339 | 20,541,117 | 0 | 0 | 20,541,117 |
| 1934 | 6,178,192 | 0.404 | 20,541,117 | 8,250,000 | 5,690,000 | 0.702 | 3,995,184 | 560,250 | 13,913,874 | 0 | 0 | 13,913,874 |
| 1935 | 12,630,349 | 0.826 | 13,913,874 | 8,250,000 | 5,690,000 | 0.913 | 5,196,372 | 462,192 | 12,635,658 | 0 | 0 | 12,635,658 |
| 1936 | 14,648,873 | 0.959 | 12,635,658 | 8,250,000 | 5,690,000 | 0.979 | 5,572,158 | 450,998 | 13,011,376 | 0 | 0 | 13,011,376 |
| 1937 | 14,306,056 | 0.936 | 13,011,376 | 8,250,000 | 5,690,000 | 0.968 | 5,508,336 | 456,786 | 13,102,309 | 0 | 0 | 13,102,309 |
| 1938 | 18,148,319 | 1.188 | 13,102,309 | 8,250,000 | 5,690,000 | 1.094 | 6,223,644 | 497,325 | 16,279,659 | 0 | 0 | 16,279,659 |
| 1939 | 11,164,059 | 0.731 | 16,279,659 | 8,250,000 | 5,690,000 | 0.865 | 4,923,395 | 505,543 | 13,764,780 | 0 | 0 | 13,764,780 |
| 1940 | 9,931,657 | 0.650 | 13,764,780 | 8,250,000 | 5,690,000 | 0.825 | 4,693,961 | 431,630 | 10,320,845 | 0 | 0 | 10,320,845 |
| 1941 | 20,116,678 | 1.316 | 10,320,845 | 8,250,000 | 5,690,000 | 1.158 | 6,590,090 | 448,796 | 15,148,637 | 0 | 0 | 15,148,637 |
| 1942 | 17,225,136 | 1.127 | 15,148,637 | 8,250,000 | 5,690,000 | 1.064 | 6,051,777 | 538,263 | 17,533,734 | 0 | 0 | 17,533,734 |
| 1943 | 13,731,401 | 0.899 | 17,533,734 | 8,250,000 | 5,690,000 | 0.949 | 5,401,353 | 561,871 | 17,051,910 | 0 | 0 | 17,051,910 |
| 1944 | 15,369,422 | 1.006 | 17,051,910 | 8,250,000 | 5,690,000 | 1.003 | 5,706,301 | 566,397 | 17,898,634 | 0 | 0 | 17,898,634 |
| 1945 | 14,140,528 | 0.925 | 17,898,634 | 8,250,000 | 5,690,000 | 0.963 | 5,477,520 | 574,892 | 17,736,750 | 0 | 0 | 17,736,750 |
| 1946 | 11,095,453 | 0.726 | 17,736,750 | 8,250,000 | 5,690,000 | 0.863 | 4,910,623 | 540,563 | 15,131,017 | 0 | 0 | 15,131,017 |
| 1947 | 16,439,486 | 1.076 | 15,131,017 | 8,250,000 | 5,690,000 | 1.038 | 5,905,513 | 529,998 | 16,884,992 | 0 | 0 | 16,884,992 |
| 1948 | 15,139,294 | 0.991 | 16,884,992 | 8,250,000 | 5,690,000 | 0.995 | 5,663,459 | 560,012 | 17,550,815 | 0 | 0 | 17,550,815 |
| 1949 | 16,933,584 | 1.108 | 17,550,815 | 8,250,000 | 5,690,000 | 1.054 | 5,997,499 | 594,218 | 19,642,682 | 0 | 0 | 19,642,682 |
| 1950 | 13,140,416 | 0.860 | 19,642,682 | 8,250,000 | 5,690,000 | 0.930 | 5,291,331 | 607,655 | 18,634,112 | 0 | 0 | 18,634,112 |
| 1951 | 12,505,894 | 0.818 | 18,634,112 | 8,250,000 | 5,690,000 | 0.909 | 5,173,203 | 576,615 | 17,140,188 | 0 | 0 | 17,140,188 |
| 1952 | 20,805,422 | 1.361 | 17,140,188 | 8,250,000 | 5,690,000 | 1.181 | 6,718,313 | 622,762 | 22,354,535 | 0 | 0 | 22,354,535 |
| 1953 | 11,165,419 | 0.731 | 22,354,535 | 8,250,000 | 5,690,000 | 0.865 | 4,923,649 | 654,413 | 19,691,892 | 0 | 0 | 19,691,892 |
| 1954 | 8,496,102 | 0.556 | 19,691,892 | 8,250,000 | 5,690,000 | 0.778 | 4,426,706 | 562,553 | 14,948,735 | 0 | 0 | 14,948,735 |
| 1955 | 9,413,908 | 0.616 | 14,948,735 | 8,250,000 | 5,690,000 | 0.808 | 4,597,573 | 455,479 | 11,059,591 | 0 | 0 | 11,059,591 |
| 1956 | 11,426,874 | 0.748 | 11,059,591 | 8,250,000 | 5,690,000 | 0.874 | 4,972,323 | 380,252 | 8,883,890 | 0 | 0 | 8,883,890 |
| 1957 | 21,500,963 | 1.407 | 8,883,890 | 8,250,000 | 5,690,000 | 1.203 | 6,847,801 | 427,387 | 14,859,665 | 0 | 0 | 14,859,665 |
| 1958 | 15,862,511 | 1.038 | 14,859,665 | 8,250,000 | 5,690,000 | 1.019 | 5,798,099 | 517,596 | 16,156,481 | 0 | 0 | 16,156,481 |
| 1959 | 9,598,169 | 0.628 | 16,156,481 | 8,250,000 | 5,690,000 | 0.814 | 4,631,876 | 486,911 | 12,385,863 | 0 | 0 | 12,385,863 |
| 1960 | 11,524,160 | 0.754 | 12,385,863 | 8,250,000 | 5,690,000 | 0.877 | 4,990,435 | 413,721 | 10,255,868 | 0 | 0 | 10,255,868 |
| 1961 | 10,010,259 | 0.655 | 10,255,868 | 8,250,000 | 5,690,000 | 0.828 | 4,708,594 | 346,433 | 6,961,100 | 0 | 0 | 6,961,100 |
| 1962 | 17,377,609 | 1.137 | 6,961,100 | 8,250,000 | 5,690,000 | 1.069 | 6,080,162 | 339,158 | 9,669,389 | 0 | 0 | 9,669,389 |
| 1963 | 8,840,900 | 0.579 | 9,669,389 | 8,250,000 | 5,690,000 | 0.789 | 4,490,897 | 320,402 | 5,448,990 | 0 | 0 | 5,448,990 |
| 1964 | 10,863,586 | 0.711 | 5,448,990 | 8,250,000 | 5,690,000 | 0.855 | 4,867,457 | 237,155 | 2,957,965 | 0 | 0 | 2,957,965 |
| 1965 | 19,875,027 | 1.301 | 2,957,965 | 8,250,000 | 5,690,000 | 1.150 | 6,545,103 | 265,968 | 7,771,921 | 0 | 0 | 7,771,921 |
| 1966 | 10,679,844 | 0.699 | 7,771,921 | 8,250,000 | 5,690,000 | 0.849 | 4,833,250 | 292,243 | 5,076,272 | 0 | 0 | 5,076,272 |
| 1967 | 11,670,830 | 0.764 | 5,076,272 | 8,250,000 | 5,690,000 | 0.882 | 5,017,740 | 236,071 | 3,243,292 | 0 | 0 | 3,243,292 |
| 1968 | 13,739,932 | 0.899 | 3,243,292 | 8,250,000 | 5,690,000 | 0.950 | 5,402,942 | 211,787 | 3,118,495 | 0 | 0 | 3,118,495 |
| 1969 | 15,272,159 | 0.999 | 3,118,495 | 8,250,000 | 5,690,000 | 1.000 | 5,688,194 | 224,006 | 4,228,454 | 0 | 0 | 4,228,454 |
| 1970 | 15,344,136 | 1.004 | 4,228,454 | 8,250,000 | 5,690,000 | 1.002 | 5,701,594 | 251,922 | 5,369,074 | 0 | 0 | 5,369,074 |
| 1971 | 15,468,912 | 1.012 | 5,369,074 | 8,250,000 | 5,690,000 | 1.006 | 5,724,823 | 281,116 | 6,582,047 | 0 | 0 | 6,582,047 |
| 1972 | 13,151,441 | 0.861 | 6,582,047 | 8,250,000 | 5,690,000 | 0.930 | 5,293,383 | 287,731 | 5,902,373 | 0 | 0 | 5,902,373 |
| 1973 | 18,614,466 | 1.218 | 5,902,373 | 8,250,000 | 5,690,000 | 1.109 | 6,310,426 | 325,548 | 9,630,865 | 0 | 0 | 9,630,865 |
| 1974 | 13,251,347 | 0.867 | 9,630,865 | 8,250,000 | 5,690,000 | 0.934 | 5,311,983 | 363,434 | 8,956,796 | 0 | 0 | 8,956,796 |
| 1975 | 17,052,625 | 1.116 | 8,956,796 | 8,250,000 | 5,690,000 | 1.058 | 6,019,661 | 384,820 | 11,354,941 | 0 | 0 | 11,354,941 |
| 1976 | 11,287,441 | 0.739 | 11,354,941 | 8,250,000 | 5,690,000 | 0.869 | 4,946,365 | 386,099 | 9,059,918 | 0 | 0 | 9,059,918 |
| 1977 | 5,533,636 | 0.362 | 9,059,918 | 8,250,000 | 5,690,000 | 0.681 | 3,875,188 | 272,491 | 2,195,874 | 0 | 0 | 2,195,874 |
| 1978 | 15,309,549 | 1.002 | 2,195,874 | 8,250,000 | 5,690,000 | 1.001 | 5,695,155 | 201,772 | 3,358,496 | 0 | 0 | 3,358,496 |
| 1979 | 17,798,627 | 1.165 | 3,358,496 | 8,250,000 | 5,690,000 | 1.082 | 6,158,542 | 255,079 | 6,493,502 | 0 | 0 | 6,493,502 |
| 1980 | 17,899,896 | 1.171 | 6,493,502 | 8,250,000 | 5,690,000 | 1.086 | 6,177,396 | 332,908 | 9,633,095 | 0 | 0 | 9,633,095 |
| 1981 | 9,015,200 | 0.590 | 9,633,095 | 8,250,000 | 5,690,000 | 0.795 | 4,523,346 | 321,251 | 5,553,698 | 0 | 0 | 5,553,698 |
| 1982 | 17,489,400 | 1.144 | 5,553,698 | 8,250,000 | 5,690,000 | 1.072 | 6,100,974 | 305,786 | 8,386,338 | 0 | 0 | 8,386,338 |
| 1983 | 24,361,989 | 1.594 | 8,386,338 | 8,250,000 | 5,690,000 | 1.297 | 7,380,433 | 443,723 | 16,674,170 | 0 | 0 | 16,674,170 |
| 1984 | 25,359,376 | 1.659 | 16,674,170 | 8,250,000 | 5,690,000 | 1.330 | 7,566,115 | 647,907 | 25,569,524 | 721,820 | 0 | 24,847,704 |
| 1985 | 21,246,109 | 1.390 | 24,847,704 | 8,250,000 | 5,690,000 | 1.195 | 6,800,355 | 749,290 | 30,294,168 | 5,446,464 | 0 | 24,847,704 |
| 1986 | 23,013,446 | 1.506 | 24,847,704 | 8,250,000 | 5,690,000 | 1.253 | 7,129,377 | 749,290 | 31,732,483 | 6,884,779 | 0 | 24,847,704 |
| 1987 | 15,640,478 | 1.023 | 24,847,704 | 8,250,000 | 5,690,000 | 1.012 | 5,756,763 | 749,290 | 25,732,129 | 884,425 | 0 | 24,847,704 |
| 1988 | 11,456,357 | 0.750 | 24,847,704 | 8,250,000 | 5,690,000 | 0.875 | 4,977,812 | 718,406 | 22,357,842 | 0 | 0 | 22,357,842 |
| 1989 | 9,921,847 | 0.649 | 22,357,842 | 8,250,000 | 5,690,000 | 0.825 | 4,692,135 | 642,095 | 18,695,459 | 0 | 0 | 18,695,459 |
| 1990 | 9,639,803 | 0.631 | 18,695,459 | 8,250,000 | 5,690,000 | 0.815 | 4,639,627 | 549,540 | 14,896,095 | 0 | 0 | 14,896,095 |
| 1991 | 12,170,021 | 0.796 | 14,896,095 | 8,250,000 | 5,690,000 | 0.898 | 5,110,674 | 481,670 | 13,223,771 | 0 | 0 | 13,223,771 |
| 1992 | 10,895,580 | 0.713 | 13,223,771 | 8,250,000 | 5,690,000 | 0.856 | 4,873,413 | 427,985 | 10,567,953 | 0 | 0 | 10,567,953 |
| 1993 | 18,160,118 | 1.188 | 10,567,953 | 8,250,000 | 5,690,000 | 1.094 | 6,225,841 | 435,342 | 13,816,888 | 0 | 0 | 13,816,888 |
| 1994 | 11,125,503 | 0.728 | 13,816,888 | 8,250,000 | 5,690,000 | 0.864 | 4,916,217 | 444,811 | 11,331,363 | 0 | 0 | 11,331,363 |
| 1995 | 20,047,166 | 1.312 | 11,331,363 | 8,250,000 | 5,690,000 | 1.156 | 6,577,150 | 472,864 | 16,078,515 | 0 | 0 | 16,078,515 |
| 1996 | 14,502,293 | 0.949 | 16,078,515 | 8,250,000 | 5,690,000 | 0.974 | 5,544,869 | 533,899 | 16,252,040 | 0 | 0 | 16,252,040 |
| 1997 | 21,622,438 | 1.415 | 16,252,040 | 8,250,000 | 5,690,000 | 1.207 | 6,870,415 | 609,146 | 22,144,916 | 0 | 0 | 22,144,916 |
| 1998 | 16,798,378 | 1.099 | 22,144,916 | 8,250,000 | 5,690,000 | 1.050 | 5,972,328 | 705,443 | 24,015,524 | 0 | 0 | 24,015,524 |
| 1999 | 15,934,210 | 1.043 | 24,015,524 | 8,250,000 | 5,690,000 | 1.021 | 5,811,447 | 738,968 | 25,149,319 | 301,615 | 0 | 24,847,704 |
| 2000 | 10,646,526 | 0.697 | 24,847,704 | 8,250,000 | 5,690,000 | 0.848 | 4,827,047 | 710,332 | 21,706,851 | 0 | 0 | 21,706,851 |
| Total | | | | | | | | | | | 0 | |
| Averages: | | | | | | | | | | | | |
| 1953-1977 | 13,080,890 | 0.856 | 9,437,136 | 8,250,000 | 5,690,000 | 0.928 | 5,280,249 | 356,988 | | 0 | 0 | 8,630,790 |
| 1931-1977 | 13,590,474 | 0.889 | 12,915,870 | 8,250,000 | 5,690,000 | 0.945 | 5,375,117 | 447,311 | | 0 | 0 | 12,433,916 |
| 1906-2000 | 15,281,860 | 1.000 | 16,660,307 | 8,250,000 | 5,690,000 | 1.000 | 5,690,000 | 545,770 | | 829,152 | 0 | 16,627,245 |

**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 | 5,690,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 545,770 af/yr |
| Total Yield w/ CRSP evap | 6,235,770 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) 634,500 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 | 6,046,988 af/yr |
| 1931-1977 | 6,137,311 af/yr |
| 1906-2000 | 6,235,770 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

# Upper Basin Yield Study - April 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 | 18,550,021 | 1.214 | 29,530,030 | 8,250,000 | 5,790,000 | 1.107 | 6,409,121 | 749,290 | 32,671,640 | 3,141,609 | 0 | 29,530,030 |
| 1907 | 21,201,694 | 1.387 | 29,530,030 | 8,250,000 | 5,790,000 | 1.194 | 6,911,455 | 749,290 | 34,820,979 | 5,290,949 | 0 | 29,530,030 |
| 1908 | 12,218,817 | 0.800 | 29,530,030 | 8,250,000 | 5,790,000 | 0.900 | 5,209,736 | 726,009 | 27,563,102 | 0 | 0 | 27,563,102 |
| 1909 | 22,356,301 | 1.463 | 27,563,102 | 8,250,000 | 5,790,000 | 1.231 | 7,130,184 | 726,009 | 33,813,210 | 4,283,180 | 0 | 29,530,030 |
| 1910 | 14,650,616 | 0.959 | 29,530,030 | 8,250,000 | 5,790,000 | 0.979 | 5,670,417 | 749,290 | 29,510,939 | 0 | 0 | 29,510,939 |
| 1911 | 15,499,729 | 1.014 | 29,510,939 | 8,250,000 | 5,790,000 | 1.007 | 5,831,273 | 749,290 | 30,180,105 | 650,075 | 0 | 29,530,030 |
| 1912 | 18,623,410 | 1.219 | 29,530,030 | 8,250,000 | 5,790,000 | 1.109 | 6,423,024 | 749,290 | 32,731,126 | 3,201,096 | 0 | 29,530,030 |
| 1913 | 14,536,373 | 0.951 | 29,530,030 | 8,250,000 | 5,790,000 | 0.976 | 5,648,775 | 749,117 | 29,418,512 | 0 | 0 | 29,418,512 |
| 1914 | 21,354,814 | 1.397 | 29,418,512 | 8,250,000 | 5,790,000 | 1.199 | 6,940,462 | 749,117 | 34,833,746 | 5,303,716 | 0 | 29,530,030 |
| 1915 | 13,623,277 | 0.891 | 29,530,030 | 8,250,000 | 5,790,000 | 0.946 | 5,475,798 | 740,013 | 28,687,497 | 0 | 0 | 28,687,497 |
| 1916 | 20,142,892 | 1.318 | 28,687,497 | 8,250,000 | 5,790,000 | 1.159 | 6,710,875 | 740,013 | 33,129,501 | 3,599,471 | 0 | 29,530,030 |
| 1917 | 22,942,804 | 1.501 | 29,530,030 | 8,250,000 | 5,790,000 | 1.251 | 7,241,291 | 749,290 | 36,232,253 | 6,702,222 | 0 | 29,530,030 |
| 1918 | 15,865,939 | 1.038 | 29,530,030 | 8,250,000 | 5,790,000 | 1.019 | 5,900,648 | 749,290 | 30,496,031 | 966,001 | 0 | 29,530,030 |
| 1919 | 12,651,369 | 0.828 | 29,530,030 | 8,250,000 | 5,790,000 | 0.914 | 5,291,679 | 730,322 | 27,909,399 | 0 | 0 | 27,909,399 |
| 1920 | 22,287,632 | 1.458 | 27,909,399 | 8,250,000 | 5,790,000 | 1.229 | 7,117,175 | 730,322 | 34,099,533 | 4,569,503 | 0 | 29,530,030 |
| 1921 | 22,526,781 | 1.474 | 29,530,030 | 8,250,000 | 5,790,000 | 1.237 | 7,162,480 | 749,290 | 35,895,041 | 6,365,011 | 0 | 29,530,030 |
| 1922 | 18,447,198 | 1.207 | 29,530,030 | 8,250,000 | 5,790,000 | 1.104 | 6,389,643 | 749,290 | 32,588,296 | 3,058,265 | 0 | 29,530,030 |
| 1923 | 19,024,046 | 1.245 | 29,530,030 | 8,250,000 | 5,790,000 | 1.122 | 6,498,921 | 749,290 | 33,055,865 | 3,525,835 | 0 | 29,530,030 |
| 1924 | 13,877,798 | 0.908 | 29,530,030 | 8,250,000 | 5,790,000 | 0.954 | 5,524,014 | 742,550 | 28,891,264 | 0 | 0 | 28,891,264 |
| 1925 | 14,430,701 | 0.944 | 28,891,264 | 8,250,000 | 5,790,000 | 0.972 | 5,628,756 | 734,749 | 28,708,460 | 0 | 0 | 28,708,460 |
| 1926 | 15,213,731 | 0.996 | 28,708,460 | 8,250,000 | 5,790,000 | 0.998 | 5,777,094 | 740,459 | 29,154,638 | 0 | 0 | 29,154,638 |
| 1927 | 19,539,212 | 1.279 | 29,154,638 | 8,250,000 | 5,790,000 | 1.139 | 6,596,514 | 748,261 | 33,099,075 | 3,569,045 | 0 | 29,530,030 |
| 1928 | 16,954,334 | 1.109 | 29,530,030 | 8,250,000 | 5,790,000 | 1.055 | 6,106,834 | 749,290 | 31,378,240 | 1,848,210 | 0 | 29,530,030 |
| 1929 | 21,829,585 | 1.428 | 29,530,030 | 8,250,000 | 5,790,000 | 1.214 | 7,030,403 | 749,290 | 35,329,922 | 5,799,892 | 0 | 29,530,030 |
| 1930 | 14,621,041 | 0.957 | 29,530,030 | 8,250,000 | 5,790,000 | 0.978 | 5,664,814 | 749,290 | 29,486,967 | 0 | 0 | 29,486,967 |
| 1931 | 8,474,134 | 0.555 | 29,486,967 | 8,250,000 | 5,790,000 | 0.777 | 4,500,342 | 688,671 | 24,522,088 | 0 | 0 | 24,522,088 |
| 1932 | 17,422,187 | 1.140 | 24,522,088 | 8,250,000 | 5,790,000 | 1.070 | 6,195,464 | 658,138 | 26,840,673 | 0 | 0 | 26,840,673 |
| 1933 | 12,183,500 | 0.797 | 26,840,673 | 8,250,000 | 5,790,000 | 0.899 | 5,203,046 | 665,339 | 24,905,788 | 0 | 0 | 24,905,788 |
| 1934 | 6,178,192 | 0.404 | 24,905,788 | 8,250,000 | 5,790,000 | 0.702 | 4,065,398 | 560,250 | 18,208,331 | 0 | 0 | 18,208,331 |
| 1935 | 12,630,349 | 0.826 | 18,208,331 | 8,250,000 | 5,790,000 | 0.913 | 5,287,697 | 462,192 | 16,838,791 | 0 | 0 | 16,838,791 |
| 1936 | 14,648,873 | 0.959 | 16,838,791 | 8,250,000 | 5,790,000 | 0.979 | 5,670,087 | 450,998 | 17,116,579 | 0 | 0 | 17,116,579 |
| 1937 | 14,306,056 | 0.936 | 17,116,579 | 8,250,000 | 5,790,000 | 0.968 | 5,605,143 | 456,786 | 17,110,706 | 0 | 0 | 17,110,706 |
| 1938 | 18,148,319 | 1.188 | 17,110,706 | 8,250,000 | 5,790,000 | 1.094 | 6,333,023 | 497,325 | 20,178,677 | 0 | 0 | 20,178,677 |
| 1939 | 11,164,059 | 0.731 | 20,178,677 | 8,250,000 | 5,790,000 | 0.865 | 5,009,923 | 505,543 | 17,577,271 | 0 | 0 | 17,577,271 |
| 1940 | 9,931,657 | 0.650 | 17,577,271 | 8,250,000 | 5,790,000 | 0.825 | 4,776,456 | 431,630 | 14,050,841 | 0 | 0 | 14,050,841 |
| 1941 | 20,116,678 | 1.316 | 14,050,841 | 8,250,000 | 5,790,000 | 1.158 | 6,705,909 | 448,796 | 18,762,814 | 0 | 0 | 18,762,814 |
| 1942 | 17,225,136 | 1.127 | 18,762,814 | 8,250,000 | 5,790,000 | 1.064 | 6,158,135 | 538,263 | 21,041,553 | 0 | 0 | 21,041,553 |
| 1943 | 13,731,401 | 0.899 | 21,041,553 | 8,250,000 | 5,790,000 | 0.949 | 5,496,281 | 561,871 | 20,464,802 | 0 | 0 | 20,464,802 |
| 1944 | 15,369,422 | 1.006 | 20,464,802 | 8,250,000 | 5,790,000 | 1.003 | 5,806,588 | 566,397 | 21,211,239 | 0 | 0 | 21,211,239 |
| 1945 | 14,140,528 | 0.925 | 21,211,239 | 8,250,000 | 5,790,000 | 0.963 | 5,573,786 | 574,892 | 20,953,090 | 0 | 0 | 20,953,090 |
| 1946 | 11,095,453 | 0.726 | 20,953,090 | 8,250,000 | 5,790,000 | 0.863 | 4,996,926 | 540,563 | 18,261,054 | 0 | 0 | 18,261,054 |
| 1947 | 16,439,486 | 1.076 | 18,261,054 | 8,250,000 | 5,790,000 | 1.038 | 6,009,301 | 529,998 | 19,911,241 | 0 | 0 | 19,911,241 |
| 1948 | 15,139,294 | 0.991 | 19,911,241 | 8,250,000 | 5,790,000 | 0.995 | 5,762,992 | 560,012 | 20,477,531 | 0 | 0 | 20,477,531 |
| 1949 | 16,933,584 | 1.108 | 20,477,531 | 8,250,000 | 5,790,000 | 1.054 | 6,102,903 | 594,218 | 22,463,993 | 0 | 0 | 22,463,993 |
| 1950 | 13,140,416 | 0.860 | 22,463,993 | 8,250,000 | 5,790,000 | 0.930 | 5,384,324 | 607,655 | 21,362,430 | 0 | 0 | 21,362,430 |
| 1951 | 12,505,894 | 0.818 | 21,362,430 | 8,250,000 | 5,790,000 | 0.909 | 5,264,120 | 576,615 | 19,777,589 | 0 | 0 | 19,777,589 |
| 1952 | 20,805,422 | 1.361 | 19,777,589 | 8,250,000 | 5,790,000 | 1.181 | 6,836,385 | 622,762 | 24,873,863 | 0 | 0 | 24,873,863 |
| 1953 | 11,165,419 | 0.731 | 24,873,863 | 8,250,000 | 5,790,000 | 0.865 | 5,010,180 | 654,413 | 22,124,688 | 0 | 0 | 22,124,688 |
| 1954 | 8,496,102 | 0.556 | 22,124,688 | 8,250,000 | 5,790,000 | 0.778 | 4,504,504 | 562,553 | 17,303,733 | 0 | 0 | 17,303,733 |
| 1955 | 9,413,908 | 0.616 | 17,303,733 | 8,250,000 | 5,790,000 | 0.808 | 4,678,373 | 455,479 | 13,333,789 | 0 | 0 | 13,333,789 |
| 1956 | 11,426,874 | 0.748 | 13,333,789 | 8,250,000 | 5,790,000 | 0.874 | 5,059,710 | 380,252 | 11,070,700 | 0 | 0 | 11,070,700 |
| 1957 | 21,500,963 | 1.407 | 11,070,700 | 8,250,000 | 5,790,000 | 1.203 | 6,968,149 | 427,387 | 16,926,127 | 0 | 0 | 16,926,127 |
| 1958 | 15,862,511 | 1.038 | 16,926,127 | 8,250,000 | 5,790,000 | 1.019 | 5,899,999 | 517,596 | 18,121,044 | 0 | 0 | 18,121,044 |
| 1959 | 9,598,169 | 0.628 | 18,121,044 | 8,250,000 | 5,790,000 | 0.814 | 4,713,280 | 486,911 | 14,269,022 | 0 | 0 | 14,269,022 |
| 1960 | 11,524,160 | 0.754 | 14,269,022 | 8,250,000 | 5,790,000 | 0.877 | 5,078,140 | 413,721 | 12,051,322 | 0 | 0 | 12,051,322 |
| 1961 | 10,010,259 | 0.655 | 12,051,322 | 8,250,000 | 5,790,000 | 0.828 | 4,791,346 | 346,433 | 8,673,802 | 0 | 0 | 8,673,802 |
| 1962 | 17,377,609 | 1.137 | 8,673,802 | 8,250,000 | 5,790,000 | 1.069 | 6,187,019 | 339,158 | 11,275,233 | 0 | 0 | 11,275,233 |
| 1963 | 8,840,900 | 0.579 | 11,275,233 | 8,250,000 | 5,790,000 | 0.789 | 4,569,823 | 320,402 | 6,975,909 | 0 | 0 | 6,975,909 |
| 1964 | 10,863,586 | 0.711 | 6,975,909 | 8,250,000 | 5,790,000 | 0.855 | 4,953,001 | 237,155 | 4,399,339 | 0 | 0 | 4,399,339 |
| 1965 | 19,875,027 | 1.301 | 4,399,339 | 8,250,000 | 5,790,000 | 1.150 | 6,660,131 | 265,968 | 9,098,268 | 0 | 0 | 9,098,268 |
| 1966 | 10,679,844 | 0.699 | 9,098,268 | 8,250,000 | 5,790,000 | 0.849 | 4,918,193 | 292,243 | 6,317,676 | 0 | 0 | 6,317,676 |
| 1967 | 11,670,830 | 0.764 | 6,317,676 | 8,250,000 | 5,790,000 | 0.882 | 5,105,925 | 236,071 | 4,396,510 | 0 | 0 | 4,396,510 |
| 1968 | 13,739,932 | 0.899 | 4,396,510 | 8,250,000 | 5,790,000 | 0.950 | 5,497,897 | 211,787 | 4,176,759 | 0 | 0 | 4,176,759 |
| 1969 | 15,272,159 | 0.999 | 4,176,759 | 8,250,000 | 5,790,000 | 1.000 | 5,788,162 | 224,006 | 5,186,749 | 0 | 0 | 5,186,749 |
| 1970 | 15,344,136 | 1.004 | 5,186,749 | 8,250,000 | 5,790,000 | 1.002 | 5,801,798 | 251,922 | 6,227,165 | 0 | 0 | 6,227,165 |
| 1971 | 15,468,912 | 1.012 | 6,227,165 | 8,250,000 | 5,790,000 | 1.006 | 5,825,435 | 281,116 | 7,339,526 | 0 | 0 | 7,339,526 |
| 1972 | 13,151,441 | 0.861 | 7,339,526 | 8,250,000 | 5,790,000 | 0.930 | 5,386,413 | 287,731 | 6,566,823 | 0 | 0 | 6,566,823 |
| 1973 | 18,614,466 | 1.218 | 6,566,823 | 8,250,000 | 5,790,000 | 1.109 | 6,421,330 | 325,548 | 10,184,411 | 0 | 0 | 10,184,411 |
| 1974 | 13,251,347 | 0.867 | 10,184,411 | 8,250,000 | 5,790,000 | 0.934 | 5,405,339 | 363,434 | 9,416,985 | 0 | 0 | 9,416,985 |
| 1975 | 17,052,625 | 1.116 | 9,416,985 | 8,250,000 | 5,790,000 | 1.058 | 6,125,454 | 384,820 | 11,709,336 | 0 | 0 | 11,709,336 |
| 1976 | 11,287,441 | 0.739 | 11,709,336 | 8,250,000 | 5,790,000 | 0.869 | 5,033,296 | 386,099 | 9,327,383 | 0 | 0 | 9,327,383 |
| 1977 | 5,533,636 | 0.362 | 9,327,383 | 8,250,000 | 5,790,000 | 0.681 | 3,943,294 | 272,491 | 2,395,233 | 0 | 0 | 2,395,233 |
| 1978 | 15,309,549 | 1.002 | 2,395,233 | 8,250,000 | 5,790,000 | 1.001 | 5,795,245 | 201,772 | 3,457,765 | 0 | 0 | 3,457,765 |
| 1979 | 17,798,627 | 1.165 | 3,457,765 | 8,250,000 | 5,790,000 | 1.082 | 6,266,777 | 255,079 | 6,484,536 | 0 | 0 | 6,484,536 |
| 1980 | 17,899,896 | 1.171 | 6,484,536 | 8,250,000 | 5,790,000 | 1.086 | 6,285,962 | 332,908 | 9,515,563 | 0 | 0 | 9,515,563 |
| 1981 | 9,015,200 | 0.590 | 9,515,563 | 8,250,000 | 5,790,000 | 0.795 | 4,602,842 | 321,251 | 5,356,670 | 0 | 0 | 5,356,670 |
| 1982 | 17,489,400 | 1.144 | 5,356,670 | 8,250,000 | 5,790,000 | 1.072 | 6,208,197 | 305,786 | 8,082,087 | 0 | 0 | 8,082,087 |
| 1983 | 24,361,989 | 1.594 | 8,082,087 | 8,250,000 | 5,790,000 | 1.297 | 7,510,142 | 443,723 | 16,240,211 | 0 | 0 | 16,240,211 |
| 1984 | 25,359,376 | 1.659 | 16,240,211 | 8,250,000 | 5,790,000 | 1.330 | 7,699,088 | 647,907 | 25,002,593 | 0 | 0 | 25,002,593 |
| 1985 | 21,246,109 | 1.390 | 25,002,593 | 8,250,000 | 5,790,000 | 1.195 | 6,919,869 | 749,290 | 30,329,542 | 799,512 | 0 | 29,530,030 |
| 1986 | 23,013,446 | 1.506 | 29,530,030 | 8,250,000 | 5,790,000 | 1.253 | 7,254,674 | 749,290 | 36,289,513 | 6,759,482 | 0 | 29,530,030 |
| 1987 | 15,640,478 | 1.023 | 29,530,030 | 8,250,000 | 5,790,000 | 1.012 | 5,857,937 | 749,290 | 30,313,282 | 783,251 | 0 | 29,530,030 |
| 1988 | 11,456,357 | 0.750 | 29,530,030 | 8,250,000 | 5,790,000 | 0.875 | 5,065,295 | 718,406 | 26,952,685 | 0 | 0 | 26,952,685 |
| 1989 | 9,921,847 | 0.649 | 26,952,685 | 8,250,000 | 5,790,000 | 0.825 | 4,774,597 | 642,095 | 23,207,839 | 0 | 0 | 23,207,839 |
| 1990 | 9,639,803 | 0.631 | 23,207,839 | 8,250,000 | 5,790,000 | 0.815 | 4,721,167 | 549,540 | 19,326,935 | 0 | 0 | 19,326,935 |
| 1991 | 12,170,021 | 0.796 | 19,326,935 | 8,250,000 | 5,790,000 | 0.898 | 5,200,492 | 481,670 | 17,564,793 | 0 | 0 | 17,564,793 |
| 1992 | 10,895,580 | 0.713 | 17,564,793 | 8,250,000 | 5,790,000 | 0.856 | 4,959,062 | 427,985 | 14,823,326 | 0 | 0 | 14,823,326 |
| 1993 | 18,160,118 | 1.188 | 14,823,326 | 8,250,000 | 5,790,000 | 1.094 | 6,335,258 | 435,342 | 17,962,844 | 0 | 0 | 17,962,844 |
| 1994 | 11,125,503 | 0.728 | 17,962,844 | 8,250,000 | 5,790,000 | 0.864 | 5,002,618 | 444,811 | 15,390,917 | 0 | 0 | 15,390,917 |
| 1995 | 20,047,166 | 1.312 | 15,390,917 | 8,250,000 | 5,790,000 | 1.156 | 6,692,741 | 472,864 | 20,022,479 | 0 | 0 | 20,022,479 |
| 1996 | 14,502,293 | 0.949 | 20,022,479 | 8,250,000 | 5,790,000 | 0.974 | 5,642,319 | 533,899 | 20,098,554 | 0 | 0 | 20,098,554 |
| 1997 | 21,622,438 | 1.415 | 20,098,554 | 8,250,000 | 5,790,000 | 1.207 | 6,991,161 | 609,146 | 25,870,685 | 0 | 0 | 25,870,685 |
| 1998 | 16,798,378 | 1.099 | 25,870,685 | 8,250,000 | 5,790,000 | 1.050 | 6,077,290 | 705,443 | 27,636,330 | 0 | 0 | 27,636,330 |
| 1999 | 15,934,210 | 1.043 | 27,636,330 | 8,250,000 | 5,790,000 | 1.021 | 5,913,581 | 738,968 | 28,667,991 | 0 | 0 | 28,667,991 |
| 2000 | 10,646,526 | 0.697 | 28,667,991 | 8,250,000 | 5,790,000 | 0.848 | 4,911,881 | 710,332 | 25,442,305 | 0 | 0 | 25,442,305 |
| Total | | | | | | | | | | | 0 | |
| Averages: | | | | | | | | | | | | |
| 1953-1977 | 13,080,890 | 0.856 | 10,853,846 | 8,250,000 | 5,790,000 | 0.928 | 5,373,048 | 356,988 | | 0 | 0 | 9,954,701 |
| 1931-1977 | 13,590,474 | 0.889 | 15,380,217 | 8,250,000 | 5,790,000 | 0.945 | 5,469,583 | 447,311 | | 0 | 0 | 14,803,797 |
| 1906-2000 | 15,281,860 | 1.000 | 19,761,839 | 8,250,000 | 5,790,000 | 1.000 | 5,790,000 | 545,770 | | 739,119 | 0 | 19,718,810 |

### Variables

| 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 | 5,790,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 545,770 af/yr |
| Total Yield w/ CRSP evap | 6,335,770 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) 645,750 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 | 6,146,988 af/yr |
| 1931-1977 | 6,237,311 af/yr |
| 1906-2000 | 6,335,770 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

OSE-0233

## Upper Basin Yield Study - April 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 | 18,550,021 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 33,105,895 | 3,954,631 | 0 | 29,151,263 |
| 1907 | 21,201,694 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 35,757,568 | 6,606,304 | 0 | 29,151,263 |
| 1908 | 12,218,817 | 29,151,263 | 8,250,000 | 5,620,000 | 696,384 | 26,803,697 | 0 | 0 | 26,803,697 |
| 1909 | 22,356,301 | 26,803,697 | 8,250,000 | 5,620,000 | 696,384 | 34,593,614 | 5,442,351 | 0 | 29,151,263 |
| 1910 | 14,650,616 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 29,206,490 | 55,226 | 0 | 29,151,263 |
| 1911 | 15,499,729 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 30,055,603 | 904,339 | 0 | 29,151,263 |
| 1912 | 18,623,410 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 33,179,284 | 4,028,020 | 0 | 29,151,263 |
| 1913 | 14,536,373 | 29,151,263 | 8,250,000 | 5,620,000 | 724,669 | 29,092,967 | 0 | 0 | 29,092,967 |
| 1914 | 21,354,814 | 29,092,967 | 8,250,000 | 5,620,000 | 724,669 | 35,853,112 | 6,701,848 | 0 | 29,151,263 |
| 1915 | 13,623,277 | 29,151,263 | 8,250,000 | 5,620,000 | 713,525 | 28,191,015 | 0 | 0 | 28,191,015 |
| 1916 | 20,142,892 | 28,191,015 | 8,250,000 | 5,620,000 | 713,525 | 33,750,383 | 4,599,119 | 0 | 29,151,263 |
| 1917 | 22,942,804 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 37,498,678 | 8,347,414 | 0 | 29,151,263 |
| 1918 | 15,865,939 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 30,421,813 | 1,270,549 | 0 | 29,151,263 |
| 1919 | 12,651,369 | 29,151,263 | 8,250,000 | 5,620,000 | 701,663 | 27,230,970 | 0 | 0 | 27,230,970 |
| 1920 | 22,287,632 | 27,230,970 | 8,250,000 | 5,620,000 | 701,663 | 34,946,939 | 5,795,675 | 0 | 29,151,263 |
| 1921 | 22,526,781 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 37,082,655 | 7,931,391 | 0 | 29,151,263 |
| 1922 | 18,447,198 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 33,003,072 | 3,851,808 | 0 | 29,151,263 |
| 1923 | 19,024,046 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 33,579,920 | 4,428,656 | 0 | 29,151,263 |
| 1924 | 13,877,798 | 29,151,263 | 8,250,000 | 5,620,000 | 716,631 | 28,442,430 | 0 | 0 | 28,442,430 |
| 1925 | 14,430,701 | 28,442,430 | 8,250,000 | 5,620,000 | 706,077 | 28,297,054 | 0 | 0 | 28,297,054 |
| 1926 | 15,213,731 | 28,297,054 | 8,250,000 | 5,620,000 | 712,085 | 28,928,700 | 0 | 0 | 28,928,700 |
| 1927 | 19,539,212 | 28,928,700 | 8,250,000 | 5,620,000 | 722,640 | 33,875,272 | 4,724,009 | 0 | 29,151,263 |
| 1928 | 16,954,334 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 31,510,208 | 2,358,944 | 0 | 29,151,263 |
| 1929 | 21,829,585 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 36,385,459 | 7,234,195 | 0 | 29,151,263 |
| 1930 | 14,621,041 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 29,176,915 | 25,651 | 0 | 29,151,263 |
| 1931 | 8,474,134 | 29,151,263 | 8,250,000 | 5,620,000 | 650,680 | 23,104,718 | 0 | 0 | 23,104,718 |
| 1932 | 17,422,187 | 23,104,718 | 8,250,000 | 5,620,000 | 612,295 | 26,044,610 | 0 | 0 | 26,044,610 |
| 1933 | 12,183,500 | 26,044,610 | 8,250,000 | 5,620,000 | 620,119 | 23,737,991 | 0 | 0 | 23,737,991 |
| 1934 | 6,178,192 | 23,737,991 | 8,250,000 | 5,620,000 | 490,520 | 15,555,662 | 0 | 0 | 15,555,662 |
| 1935 | 12,630,349 | 15,555,662 | 8,250,000 | 5,620,000 | 369,539 | 13,946,473 | 0 | 0 | 13,946,473 |
| 1936 | 14,648,873 | 13,946,473 | 8,250,000 | 5,620,000 | 354,894 | 14,370,451 | 0 | 0 | 14,370,451 |
| 1937 | 14,306,056 | 14,370,451 | 8,250,000 | 5,620,000 | 361,060 | 14,445,448 | 0 | 0 | 14,445,448 |
| 1938 | 18,148,319 | 14,445,448 | 8,250,000 | 5,620,000 | 409,785 | 18,313,982 | 0 | 0 | 18,313,982 |
| 1939 | 11,164,059 | 18,313,982 | 8,250,000 | 5,620,000 | 418,973 | 15,189,068 | 0 | 0 | 15,189,068 |
| 1940 | 9,931,657 | 15,189,068 | 8,250,000 | 5,620,000 | 327,653 | 10,923,072 | 0 | 0 | 10,923,072 |
| 1941 | 20,116,678 | 10,923,072 | 8,250,000 | 5,620,000 | 347,828 | 16,821,922 | 0 | 0 | 16,821,922 |
| 1942 | 17,225,136 | 16,821,922 | 8,250,000 | 5,620,000 | 456,527 | 19,720,531 | 0 | 0 | 19,720,531 |
| 1943 | 13,731,401 | 19,720,531 | 8,250,000 | 5,620,000 | 484,641 | 19,097,291 | 0 | 0 | 19,097,291 |
| 1944 | 15,369,422 | 19,097,291 | 8,250,000 | 5,620,000 | 489,420 | 20,107,293 | 0 | 0 | 20,107,293 |
| 1945 | 14,140,528 | 20,107,293 | 8,250,000 | 5,620,000 | 499,075 | 19,878,746 | 0 | 0 | 19,878,746 |
| 1946 | 11,095,453 | 19,878,746 | 8,250,000 | 5,620,000 | 456,331 | 16,647,868 | 0 | 0 | 16,647,868 |
| 1947 | 16,439,486 | 16,647,868 | 8,250,000 | 5,620,000 | 442,690 | 18,774,664 | 0 | 0 | 18,774,664 |
| 1948 | 15,139,294 | 18,774,664 | 8,250,000 | 5,620,000 | 478,736 | 19,565,222 | 0 | 0 | 19,565,222 |
| 1949 | 16,933,584 | 19,565,222 | 8,250,000 | 5,620,000 | 519,933 | 22,108,874 | 0 | 0 | 22,108,874 |
| 1950 | 13,140,416 | 22,108,874 | 8,250,000 | 5,620,000 | 535,727 | 20,843,562 | 0 | 0 | 20,843,562 |
| 1951 | 12,505,894 | 20,843,562 | 8,250,000 | 5,620,000 | 497,097 | 18,982,360 | 0 | 0 | 18,982,360 |
| 1952 | 20,805,422 | 18,982,360 | 8,250,000 | 5,620,000 | 552,961 | 25,364,821 | 0 | 0 | 25,364,821 |
| 1953 | 11,165,419 | 25,364,821 | 8,250,000 | 5,620,000 | 591,100 | 22,069,140 | 0 | 0 | 22,069,140 |
| 1954 | 8,496,102 | 22,069,140 | 8,250,000 | 5,620,000 | 478,074 | 16,217,168 | 0 | 0 | 16,217,168 |
| 1955 | 9,413,908 | 16,217,168 | 8,250,000 | 5,620,000 | 346,429 | 11,414,647 | 0 | 0 | 11,414,647 |
| 1956 | 11,426,874 | 11,414,647 | 8,250,000 | 5,620,000 | 253,768 | 8,717,753 | 0 | 0 | 8,717,753 |
| 1957 | 21,500,963 | 8,717,753 | 8,250,000 | 5,620,000 | 310,891 | 16,037,824 | 0 | 0 | 16,037,824 |
| 1958 | 15,862,511 | 16,037,824 | 8,250,000 | 5,620,000 | 420,757 | 17,609,579 | 0 | 0 | 17,609,579 |
| 1959 | 9,598,169 | 17,609,579 | 8,250,000 | 5,620,000 | 382,667 | 12,955,081 | 0 | 0 | 12,955,081 |
| 1960 | 11,524,160 | 12,955,081 | 8,250,000 | 5,620,000 | 292,558 | 10,316,683 | 0 | 0 | 10,316,683 |
| 1961 | 10,010,259 | 10,316,683 | 8,250,000 | 5,620,000 | 209,677 | 6,247,265 | 0 | 0 | 6,247,265 |
| 1962 | 17,377,609 | 6,247,265 | 8,250,000 | 5,620,000 | 200,261 | 9,554,613 | 0 | 0 | 9,554,613 |
| 1963 | 8,840,900 | 9,554,613 | 8,250,000 | 5,620,000 | 176,803 | 4,348,709 | 0 | 0 | 4,348,709 |
| 1964 | 10,863,586 | 4,348,709 | 8,250,000 | 5,620,000 | 74,414 | 1,267,881 | 0 | 0 | 1,267,881 |
| 1965 | 19,875,027 | 1,267,881 | 8,250,000 | 5,620,000 | 109,196 | 7,163,712 | 0 | 0 | 7,163,712 |
| 1966 | 10,679,844 | 7,163,712 | 8,250,000 | 5,620,000 | 140,886 | 3,832,671 | 0 | 0 | 3,832,671 |
| 1967 | 11,670,830 | 3,832,671 | 8,250,000 | 5,620,000 | 71,670 | 1,561,830 | 0 | 0 | 1,561,830 |
| 1968 | 13,739,932 | 1,561,830 | 8,250,000 | 5,620,000 | 41,492 | 1,390,270 | 0 | 0 | 1,390,270 |
| 1969 | 15,272,159 | 1,390,270 | 8,250,000 | 5,620,000 | 56,005 | 2,736,423 | 0 | 0 | 2,736,423 |
| 1970 | 15,344,136 | 2,736,423 | 8,250,000 | 5,620,000 | 89,743 | 4,120,816 | 0 | 0 | 4,120,816 |
| 1971 | 15,468,912 | 4,120,816 | 8,250,000 | 5,620,000 | 125,059 | 5,594,668 | 0 | 0 | 5,594,668 |
| 1972 | 13,151,441 | 5,594,668 | 8,250,000 | 5,620,000 | 132,751 | 4,743,357 | 0 | 0 | 4,743,357 |
| 1973 | 18,614,466 | 4,743,357 | 8,250,000 | 5,620,000 | 178,647 | 9,309,177 | 0 | 0 | 9,309,177 |
| 1974 | 13,251,347 | 9,309,177 | 8,250,000 | 5,620,000 | 224,642 | 8,465,883 | 0 | 0 | 8,465,883 |
| 1975 | 17,052,625 | 8,465,883 | 8,250,000 | 5,620,000 | 250,451 | 11,398,056 | 0 | 0 | 11,398,056 |
| 1976 | 11,287,441 | 11,398,056 | 8,250,000 | 5,620,000 | 251,662 | 8,563,836 | 0 | 0 | 8,563,836 |
| 1977 | 5,533,636 | 8,563,836 | 8,250,000 | 5,620,000 | 112,253 | 115,218 | 0 | 0 | 115,218 |
| 1978 | 15,309,549 | 115,218 | 8,250,000 | 5,620,000 | 25,338 | 1,529,429 | 0 | 0 | 1,529,429 |
| 1979 | 17,798,627 | 1,529,429 | 8,250,000 | 5,620,000 | 90,238 | 5,367,818 | 0 | 0 | 5,367,818 |
| 1980 | 17,899,896 | 5,367,818 | 8,250,000 | 5,620,000 | 185,169 | 9,212,546 | 0 | 0 | 9,212,546 |
| 1981 | 9,015,200 | 9,212,546 | 8,250,000 | 5,620,000 | 170,581 | 4,187,165 | 0 | 0 | 4,187,165 |
| 1982 | 17,489,400 | 4,187,165 | 8,250,000 | 5,620,000 | 151,339 | 7,655,225 | 0 | 0 | 7,655,225 |
| 1983 | 24,361,989 | 7,655,225 | 8,250,000 | 5,620,000 | 319,874 | 17,827,341 | 0 | 0 | 17,827,341 |
| 1984 | 25,359,376 | 17,827,341 | 8,250,000 | 5,620,000 | 580,347 | 28,736,369 | 0 | 0 | 28,736,369 |
| 1985 | 21,246,109 | 28,736,369 | 8,250,000 | 5,620,000 | 720,263 | 35,392,215 | 6,240,951 | 0 | 29,151,263 |
| 1986 | 23,013,446 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 37,569,320 | 8,418,057 | 0 | 29,151,263 |
| 1987 | 15,640,478 | 29,151,263 | 8,250,000 | 5,620,000 | 725,390 | 30,196,352 | 1,045,089 | 0 | 29,151,263 |
| 1988 | 11,456,357 | 29,151,263 | 8,250,000 | 5,620,000 | 687,078 | 26,050,542 | 0 | 0 | 26,050,542 |
| 1989 | 9,921,847 | 26,050,542 | 8,250,000 | 5,620,000 | 592,661 | 21,509,728 | 0 | 0 | 21,509,728 |
| 1990 | 9,639,803 | 21,509,728 | 8,250,000 | 5,620,000 | 478,377 | 16,801,154 | 0 | 0 | 16,801,154 |
| 1991 | 12,170,021 | 16,801,154 | 8,250,000 | 5,620,000 | 394,323 | 14,706,852 | 0 | 0 | 14,706,852 |
| 1992 | 10,895,580 | 14,706,852 | 8,250,000 | 5,620,000 | 327,646 | 11,404,785 | 0 | 0 | 11,404,785 |
| 1993 | 18,160,118 | 11,404,785 | 8,250,000 | 5,620,000 | 335,707 | 15,359,197 | 0 | 0 | 15,359,197 |
| 1994 | 11,125,503 | 15,359,197 | 8,250,000 | 5,620,000 | 346,376 | 12,268,323 | 0 | 0 | 12,268,323 |
| 1995 | 20,047,166 | 12,268,323 | 8,250,000 | 5,620,000 | 379,817 | 18,065,672 | 0 | 0 | 18,065,672 |
| 1996 | 14,502,293 | 18,065,672 | 8,250,000 | 5,620,000 | 453,655 | 18,244,310 | 0 | 0 | 18,244,310 |
| 1997 | 21,622,438 | 18,244,310 | 8,250,000 | 5,620,000 | 544,916 | 25,451,832 | 0 | 0 | 25,451,832 |
| 1998 | 16,798,378 | 25,451,832 | 8,250,000 | 5,620,000 | 661,974 | 27,718,236 | 0 | 0 | 27,718,236 |
| 1999 | 15,934,210 | 27,718,236 | 8,250,000 | 5,620,000 | 706,750 | 29,075,696 | 0 | 0 | 29,075,696 |
| 2000 | 10,646,526 | 29,075,696 | 8,250,000 | 5,620,000 | 675,349 | 25,176,873 | 0 | 0 | 25,176,873 |
| Total | | | | | | | | 0 | |
| Averages: | | | | | | | | | |
| 1953-1977 | 13,080,890 | 9,240,075 | 8,250,000 | 5,620,000 | 220,874 | | 0 | 0 | 8,230,090 |
| 1931-1977 | 13,590,474 | 13,794,318 | 8,250,000 | 5,620,000 | 338,263 | | 0 | 0 | 13,176,530 |
| 1906-2000 | 15,281,860 | 18,618,776 | 8,250,000 | 5,620,000 | 464,599 | | 989,097 | 0 | 18,576,941 |

**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 | 5,620,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 464,599 af/yr |
| Total Yield w/ CRSP evap | 6,084,599 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) 626,625 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 | 5,840,874 af/yr |
| 1931-1977 | 5,958,263 af/yr |
| 1906-2000 | 6,084,599 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

OSE-0234

## Upper Basin Yield Study - April 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 | 18,550,021 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 37,688,221 | 3,854,631 | 0 | 33,833,590 |
| 1907 | 21,201,694 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 40,339,894 | 6,506,304 | 0 | 33,833,590 |
| 1908 | 12,218,817 | 33,833,590 | 8,250,000 | 5,720,000 | 696,384 | 31,386,023 | 0 | 0 | 31,386,023 |
| 1909 | 22,356,301 | 31,386,023 | 8,250,000 | 5,720,000 | 696,384 | 39,075,941 | 5,242,351 | 0 | 33,833,590 |
| 1910 | 14,650,616 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 33,788,816 | 0 | 0 | 33,788,816 |
| 1911 | 15,499,729 | 33,788,816 | 8,250,000 | 5,720,000 | 725,390 | 34,593,156 | 759,566 | 0 | 33,833,590 |
| 1912 | 18,623,410 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 37,761,610 | 3,928,020 | 0 | 33,833,590 |
| 1913 | 14,536,373 | 33,833,590 | 8,250,000 | 5,720,000 | 724,669 | 33,675,294 | 0 | 0 | 33,675,294 |
| 1914 | 21,354,814 | 33,675,294 | 8,250,000 | 5,720,000 | 724,669 | 40,335,438 | 6,501,848 | 0 | 33,833,590 |
| 1915 | 13,623,277 | 33,833,590 | 8,250,000 | 5,720,000 | 713,525 | 32,773,342 | 0 | 0 | 32,773,342 |
| 1916 | 20,142,892 | 32,773,342 | 8,250,000 | 5,720,000 | 713,525 | 38,232,709 | 4,399,119 | 0 | 33,833,590 |
| 1917 | 22,942,804 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 42,081,004 | 8,247,414 | 0 | 33,833,590 |
| 1918 | 15,865,939 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 35,004,139 | 1,170,549 | 0 | 33,833,590 |
| 1919 | 12,651,369 | 33,833,590 | 8,250,000 | 5,720,000 | 701,663 | 31,813,296 | 0 | 0 | 31,813,296 |
| 1920 | 22,287,632 | 31,813,296 | 8,250,000 | 5,720,000 | 701,663 | 39,429,265 | 5,595,675 | 0 | 33,833,590 |
| 1921 | 22,526,781 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 41,664,981 | 7,831,391 | 0 | 33,833,590 |
| 1922 | 18,447,198 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 37,585,398 | 3,751,808 | 0 | 33,833,590 |
| 1923 | 19,024,046 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 38,162,246 | 4,328,656 | 0 | 33,833,590 |
| 1924 | 13,877,798 | 33,833,590 | 8,250,000 | 5,720,000 | 716,631 | 33,024,757 | 0 | 0 | 33,024,757 |
| 1925 | 14,430,701 | 33,024,757 | 8,250,000 | 5,720,000 | 706,077 | 32,779,381 | 0 | 0 | 32,779,381 |
| 1926 | 15,213,731 | 32,779,381 | 8,250,000 | 5,720,000 | 712,085 | 33,311,026 | 0 | 0 | 33,311,026 |
| 1927 | 19,539,212 | 33,311,026 | 8,250,000 | 5,720,000 | 722,640 | 38,157,599 | 4,324,009 | 0 | 33,833,590 |
| 1928 | 16,954,334 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 36,092,534 | 2,258,944 | 0 | 33,833,590 |
| 1929 | 21,829,585 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 40,967,785 | 7,134,195 | 0 | 33,833,590 |
| 1930 | 14,621,041 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 33,759,241 | 0 | 0 | 33,759,241 |
| 1931 | 8,474,134 | 33,759,241 | 8,250,000 | 5,720,000 | 650,680 | 27,612,696 | 0 | 0 | 27,612,696 |
| 1932 | 17,422,187 | 27,612,696 | 8,250,000 | 5,720,000 | 612,295 | 30,452,588 | 0 | 0 | 30,452,588 |
| 1933 | 12,183,500 | 30,452,588 | 8,250,000 | 5,720,000 | 620,119 | 28,045,968 | 0 | 0 | 28,045,968 |
| 1934 | 6,178,192 | 28,045,968 | 8,250,000 | 5,720,000 | 490,520 | 19,763,640 | 0 | 0 | 19,763,640 |
| 1935 | 12,630,349 | 19,763,640 | 8,250,000 | 5,720,000 | 369,539 | 18,054,451 | 0 | 0 | 18,054,451 |
| 1936 | 14,648,873 | 18,054,451 | 8,250,000 | 5,720,000 | 354,894 | 18,378,429 | 0 | 0 | 18,378,429 |
| 1937 | 14,306,056 | 18,378,429 | 8,250,000 | 5,720,000 | 361,060 | 18,353,426 | 0 | 0 | 18,353,426 |
| 1938 | 18,148,319 | 18,353,426 | 8,250,000 | 5,720,000 | 409,785 | 22,121,960 | 0 | 0 | 22,121,960 |
| 1939 | 11,164,059 | 22,121,960 | 8,250,000 | 5,720,000 | 418,973 | 18,897,046 | 0 | 0 | 18,897,046 |
| 1940 | 9,931,657 | 18,897,046 | 8,250,000 | 5,720,000 | 327,653 | 14,531,050 | 0 | 0 | 14,531,050 |
| 1941 | 20,116,678 | 14,531,050 | 8,250,000 | 5,720,000 | 347,828 | 20,329,900 | 0 | 0 | 20,329,900 |
| 1942 | 17,225,136 | 20,329,900 | 8,250,000 | 5,720,000 | 456,527 | 23,128,509 | 0 | 0 | 23,128,509 |
| 1943 | 13,731,401 | 23,128,509 | 8,250,000 | 5,720,000 | 484,641 | 22,405,269 | 0 | 0 | 22,405,269 |
| 1944 | 15,369,422 | 22,405,269 | 8,250,000 | 5,720,000 | 489,420 | 23,315,271 | 0 | 0 | 23,315,271 |
| 1945 | 14,140,528 | 23,315,271 | 8,250,000 | 5,720,000 | 499,075 | 22,986,724 | 0 | 0 | 22,986,724 |
| 1946 | 11,095,453 | 22,986,724 | 8,250,000 | 5,720,000 | 456,331 | 19,655,846 | 0 | 0 | 19,655,846 |
| 1947 | 16,439,486 | 19,655,846 | 8,250,000 | 5,720,000 | 442,690 | 21,682,642 | 0 | 0 | 21,682,642 |
| 1948 | 15,139,294 | 21,682,642 | 8,250,000 | 5,720,000 | 478,736 | 22,373,200 | 0 | 0 | 22,373,200 |
| 1949 | 16,933,584 | 22,373,200 | 8,250,000 | 5,720,000 | 519,933 | 24,816,852 | 0 | 0 | 24,816,852 |
| 1950 | 13,140,416 | 24,816,852 | 8,250,000 | 5,720,000 | 535,727 | 23,451,540 | 0 | 0 | 23,451,540 |
| 1951 | 12,505,894 | 23,451,540 | 8,250,000 | 5,720,000 | 497,097 | 21,490,337 | 0 | 0 | 21,490,337 |
| 1952 | 20,805,422 | 21,490,337 | 8,250,000 | 5,720,000 | 552,961 | 27,772,799 | 0 | 0 | 27,772,799 |
| 1953 | 11,165,419 | 27,772,799 | 8,250,000 | 5,720,000 | 591,100 | 24,377,118 | 0 | 0 | 24,377,118 |
| 1954 | 8,496,102 | 24,377,118 | 8,250,000 | 5,720,000 | 478,074 | 18,425,146 | 0 | 0 | 18,425,146 |
| 1955 | 9,413,908 | 18,425,146 | 8,250,000 | 5,720,000 | 346,429 | 13,522,625 | 0 | 0 | 13,522,625 |
| 1956 | 11,426,874 | 13,522,625 | 8,250,000 | 5,720,000 | 253,768 | 10,725,730 | 0 | 0 | 10,725,730 |
| 1957 | 21,500,963 | 10,725,730 | 8,250,000 | 5,720,000 | 310,891 | 17,945,802 | 0 | 0 | 17,945,802 |
| 1958 | 15,862,511 | 17,945,802 | 8,250,000 | 5,720,000 | 420,757 | 19,417,557 | 0 | 0 | 19,417,557 |
| 1959 | 9,598,169 | 19,417,557 | 8,250,000 | 5,720,000 | 382,667 | 14,663,059 | 0 | 0 | 14,663,059 |
| 1960 | 11,524,160 | 14,663,059 | 8,250,000 | 5,720,000 | 292,558 | 11,924,661 | 0 | 0 | 11,924,661 |
| 1961 | 10,010,259 | 11,924,661 | 8,250,000 | 5,720,000 | 209,677 | 7,755,243 | 0 | 0 | 7,755,243 |
| 1962 | 17,377,609 | 7,755,243 | 8,250,000 | 5,720,000 | 200,261 | 10,962,591 | 0 | 0 | 10,962,591 |
| 1963 | 8,840,900 | 10,962,591 | 8,250,000 | 5,720,000 | 176,803 | 5,656,687 | 0 | 0 | 5,656,687 |
| 1964 | 10,863,586 | 5,656,687 | 8,250,000 | 5,720,000 | 74,414 | 2,475,859 | 0 | 0 | 2,475,859 |
| 1965 | 19,875,027 | 2,475,859 | 8,250,000 | 5,720,000 | 109,196 | 8,271,690 | 0 | 0 | 8,271,690 |
| 1966 | 10,679,844 | 8,271,690 | 8,250,000 | 5,720,000 | 140,886 | 4,840,648 | 0 | 0 | 4,840,648 |
| 1967 | 11,670,830 | 4,840,648 | 8,250,000 | 5,720,000 | 71,670 | 2,469,808 | 0 | 0 | 2,469,808 |
| 1968 | 13,739,932 | 2,469,808 | 8,250,000 | 5,720,000 | 41,492 | 2,198,248 | 0 | 0 | 2,198,248 |
| 1969 | 15,272,159 | 2,198,248 | 8,250,000 | 5,720,000 | 56,005 | 3,444,401 | 0 | 0 | 3,444,401 |
| 1970 | 15,344,136 | 3,444,401 | 8,250,000 | 5,720,000 | 89,743 | 4,728,794 | 0 | 0 | 4,728,794 |
| 1971 | 15,468,912 | 4,728,794 | 8,250,000 | 5,720,000 | 125,059 | 6,102,646 | 0 | 0 | 6,102,646 |
| 1972 | 13,151,441 | 6,102,646 | 8,250,000 | 5,720,000 | 132,751 | 5,151,335 | 0 | 0 | 5,151,335 |
| 1973 | 18,614,466 | 5,151,335 | 8,250,000 | 5,720,000 | 178,647 | 9,617,155 | 0 | 0 | 9,617,155 |
| 1974 | 13,251,347 | 9,617,155 | 8,250,000 | 5,720,000 | 224,642 | 8,673,860 | 0 | 0 | 8,673,860 |
| 1975 | 17,052,625 | 8,673,860 | 8,250,000 | 5,720,000 | 250,451 | 11,506,034 | 0 | 0 | 11,506,034 |
| 1976 | 11,287,441 | 11,506,034 | 8,250,000 | 5,720,000 | 251,662 | 8,571,814 | 0 | 0 | 8,571,814 |
| 1977 | 5,533,636 | 8,571,814 | 8,250,000 | 5,720,000 | 112,253 | 23,196 | 0 | 0 | 23,196 |
| 1978 | 15,309,549 | 23,196 | 8,250,000 | 5,720,000 | 25,338 | 1,337,407 | 0 | 0 | 1,337,407 |
| 1979 | 17,798,627 | 1,337,407 | 8,250,000 | 5,720,000 | 90,238 | 5,075,796 | 0 | 0 | 5,075,796 |
| 1980 | 17,899,896 | 5,075,796 | 8,250,000 | 5,720,000 | 185,169 | 8,820,523 | 0 | 0 | 8,820,523 |
| 1981 | 9,015,200 | 8,820,523 | 8,250,000 | 5,720,000 | 170,581 | 3,695,143 | 0 | 0 | 3,695,143 |
| 1982 | 17,489,400 | 3,695,143 | 8,250,000 | 5,720,000 | 151,339 | 7,063,203 | 0 | 0 | 7,063,203 |
| 1983 | 24,361,989 | 7,063,203 | 8,250,000 | 5,720,000 | 319,874 | 17,135,319 | 0 | 0 | 17,135,319 |
| 1984 | 25,359,376 | 17,135,319 | 8,250,000 | 5,720,000 | 580,347 | 27,944,347 | 0 | 0 | 27,944,347 |
| 1985 | 21,246,109 | 27,944,347 | 8,250,000 | 5,720,000 | 720,263 | 34,500,193 | 666,603 | 0 | 33,833,590 |
| 1986 | 23,013,446 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 42,151,647 | 8,318,057 | 0 | 33,833,590 |
| 1987 | 15,640,478 | 33,833,590 | 8,250,000 | 5,720,000 | 725,390 | 34,778,679 | 945,089 | 0 | 33,833,590 |
| 1988 | 11,456,357 | 33,833,590 | 8,250,000 | 5,720,000 | 687,078 | 30,632,869 | 0 | 0 | 30,632,869 |
| 1989 | 9,921,847 | 30,632,869 | 8,250,000 | 5,720,000 | 592,661 | 25,992,054 | 0 | 0 | 25,992,054 |
| 1990 | 9,639,803 | 25,992,054 | 8,250,000 | 5,720,000 | 478,377 | 21,183,480 | 0 | 0 | 21,183,480 |
| 1991 | 12,170,021 | 21,183,480 | 8,250,000 | 5,720,000 | 394,323 | 18,989,178 | 0 | 0 | 18,989,178 |
| 1992 | 10,895,580 | 18,989,178 | 8,250,000 | 5,720,000 | 327,646 | 15,587,112 | 0 | 0 | 15,587,112 |
| 1993 | 18,160,118 | 15,587,112 | 8,250,000 | 5,720,000 | 335,707 | 19,441,523 | 0 | 0 | 19,441,523 |
| 1994 | 11,125,503 | 19,441,523 | 8,250,000 | 5,720,000 | 346,376 | 16,250,649 | 0 | 0 | 16,250,649 |
| 1995 | 20,047,166 | 16,250,649 | 8,250,000 | 5,720,000 | 379,817 | 21,947,999 | 0 | 0 | 21,947,999 |
| 1996 | 14,502,293 | 21,947,999 | 8,250,000 | 5,720,000 | 453,655 | 22,026,637 | 0 | 0 | 22,026,637 |
| 1997 | 21,622,438 | 22,026,637 | 8,250,000 | 5,720,000 | 544,916 | 29,134,158 | 0 | 0 | 29,134,158 |
| 1998 | 16,798,378 | 29,134,158 | 8,250,000 | 5,720,000 | 661,974 | 31,300,562 | 0 | 0 | 31,300,562 |
| 1999 | 15,934,210 | 31,300,562 | 8,250,000 | 5,720,000 | 706,750 | 32,558,023 | 0 | 0 | 32,558,023 |
| 2000 | 10,646,526 | 32,558,023 | 8,250,000 | 5,720,000 | 675,349 | 28,559,199 | 0 | 0 | 28,559,199 |
| Total | | | | | | | | 0 | |
| Averages: | | | | | | | | | |
| 1953-1977 | 13,080,890 | 10,448,052 | 8,250,000 | 5,720,000 | 220,874 | | 0 | 0 | 9,338,068 |
| 1931-1977 | 13,590,474 | 16,102,296 | 8,250,000 | 5,720,000 | 338,263 | | 0 | 0 | 15,384,508 |
| 1906-2000 | 15,281,860 | 21,601,798 | 8,250,000 | 5,720,000 | 464,599 | | 902,781 | 0 | 21,546,278 |

**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 | 5,720,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 464,599 af/yr |
| Total Yield w/ CRSP evap | 6,184,599 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) 637,875 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 | 5,940,874 af/yr |
| 1931-1977 | 6,058,263 af/yr |
| 1906-2000 | 6,184,599 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

OSE-0235

## Upper Basin Yield Study - April 2006 Draft

### Study No. 9: CRSS Natural Flows, CRSP Active plus All Other UB Live Storage (assumed same percent full), Constant Upper Basin Use

| CY | CR Natural Flow at Lee Ferry (plus) | Total Carry-Over Storage (plus) | CRSP Carry-Over Storage | 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) | CRSP Year-end Storage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1906 | 18,550,021 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 33,330,761 | 3,800,731 | 0 | 29,530,030 | 24,847,704 |
| 1907 | 21,201,694 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 35,982,434 | 6,452,404 | 0 | 29,530,030 | 24,847,704 |
| 1908 | 12,218,817 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 723,152 | 27,025,695 | 0 | 0 | 27,025,695 | 22,740,460 |
| 1909 | 22,356,301 | 27,025,695 | 22,740,460 | 8,250,000 | 5,750,000 | 723,152 | 34,658,844 | 5,128,813 | 0 | 29,530,030 | 24,847,704 |
| 1910 | 14,650,616 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 748,271 | 29,432,375 | 0 | 0 | 29,432,375 | 24,765,533 |
| 1911 | 15,499,729 | 29,432,375 | 24,765,533 | 8,250,000 | 5,750,000 | 748,271 | 30,183,833 | 653,803 | 0 | 29,530,030 | 24,847,704 |
| 1912 | 18,623,410 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 33,404,150 | 3,874,120 | 0 | 29,530,030 | 24,847,704 |
| 1913 | 14,536,373 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 747,091 | 29,319,312 | 0 | 0 | 29,319,312 | 24,670,398 |
| 1914 | 21,354,814 | 29,319,312 | 24,670,398 | 8,250,000 | 5,750,000 | 747,091 | 35,927,036 | 6,397,005 | 0 | 29,530,030 | 24,847,704 |
| 1915 | 13,623,277 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 737,659 | 28,415,648 | 0 | 0 | 28,415,648 | 23,910,020 |
| 1916 | 20,142,892 | 28,415,648 | 23,910,020 | 8,250,000 | 5,750,000 | 737,659 | 33,820,881 | 4,290,850 | 0 | 29,530,030 | 24,847,704 |
| 1917 | 22,942,804 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 37,723,544 | 8,193,514 | 0 | 29,530,030 | 24,847,704 |
| 1918 | 15,865,939 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 30,646,679 | 1,116,649 | 0 | 29,530,030 | 24,847,704 |
| 1919 | 12,651,369 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 727,620 | 27,453,779 | 0 | 0 | 27,453,779 | 23,100,666 |
| 1920 | 22,287,632 | 27,453,779 | 23,100,666 | 8,250,000 | 5,750,000 | 727,620 | 35,013,791 | 5,483,761 | 0 | 29,530,030 | 24,847,704 |
| 1921 | 22,526,781 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 37,307,521 | 7,777,491 | 0 | 29,530,030 | 24,847,704 |
| 1922 | 18,447,198 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 33,227,938 | 3,697,908 | 0 | 29,530,030 | 24,847,704 |
| 1923 | 19,024,046 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 33,804,786 | 4,274,756 | 0 | 29,530,030 | 24,847,704 |
| 1924 | 13,877,798 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 740,288 | 28,667,540 | 0 | 0 | 28,667,540 | 24,121,971 |
| 1925 | 14,430,701 | 28,667,540 | 24,121,971 | 8,250,000 | 5,750,000 | 728,182 | 28,370,059 | 0 | 0 | 28,370,059 | 23,871,660 |
| 1926 | 15,213,731 | 28,370,059 | 23,871,660 | 8,250,000 | 5,750,000 | 730,124 | 28,853,666 | 0 | 0 | 28,853,666 | 24,278,585 |
| 1927 | 19,539,212 | 28,853,666 | 24,278,585 | 8,250,000 | 5,750,000 | 742,231 | 33,650,647 | 4,120,617 | 0 | 29,530,030 | 24,847,704 |
| 1928 | 16,954,334 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 31,735,074 | 2,205,044 | 0 | 29,530,030 | 24,847,704 |
| 1929 | 21,829,585 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 36,610,325 | 7,080,295 | 0 | 29,530,030 | 24,847,704 |
| 1930 | 14,621,041 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 747,965 | 29,403,106 | 0 | 0 | 29,403,106 | 24,740,905 |
| 1931 | 8,474,134 | 29,403,106 | 24,740,905 | 8,250,000 | 5,750,000 | 681,850 | 23,195,390 | 0 | 0 | 23,195,390 | 19,517,493 |
| 1932 | 17,422,187 | 23,195,390 | 19,517,493 | 8,250,000 | 5,750,000 | 646,035 | 25,971,542 | 0 | 0 | 25,971,542 | 21,853,455 |
| 1933 | 12,183,500 | 25,971,542 | 21,853,455 | 8,250,000 | 5,750,000 | 649,274 | 23,505,767 | 0 | 0 | 23,505,767 | 19,778,657 |
| 1934 | 6,178,192 | 23,505,767 | 19,778,657 | 8,250,000 | 5,750,000 | 536,305 | 15,147,655 | 0 | 0 | 15,147,655 | 12,745,820 |
| 1935 | 12,630,349 | 15,147,655 | 12,745,820 | 8,250,000 | 5,750,000 | 430,284 | 13,347,719 | 0 | 0 | 13,347,719 | 11,231,285 |
| 1936 | 14,648,873 | 13,347,719 | 11,231,285 | 8,250,000 | 5,750,000 | 413,950 | 13,582,642 | 0 | 0 | 13,582,642 | 11,428,958 |
| 1937 | 14,306,056 | 13,582,642 | 11,428,958 | 8,250,000 | 5,750,000 | 415,262 | 13,473,436 | 0 | 0 | 13,473,436 | 11,337,068 |
| 1938 | 18,148,319 | 13,473,436 | 11,337,068 | 8,250,000 | 5,750,000 | 452,694 | 17,169,061 | 0 | 0 | 17,169,061 | 14,446,709 |
| 1939 | 11,164,059 | 17,169,061 | 14,446,709 | 8,250,000 | 5,750,000 | 456,898 | 13,876,222 | 0 | 0 | 13,876,222 | 11,675,987 |
| 1940 | 9,931,657 | 13,876,222 | 11,675,987 | 8,250,000 | 5,750,000 | 376,143 | 9,431,736 | 0 | 0 | 9,431,736 | 7,936,226 |
| 1941 | 20,116,678 | 9,431,736 | 7,936,226 | 8,250,000 | 5,750,000 | 389,530 | 15,158,884 | 0 | 0 | 15,158,884 | 12,755,268 |
| 1942 | 17,225,136 | 15,158,884 | 12,755,268 | 8,250,000 | 5,750,000 | 477,977 | 17,906,043 | 0 | 0 | 17,906,043 | 15,066,834 |
| 1943 | 13,731,401 | 17,906,043 | 15,066,834 | 8,250,000 | 5,750,000 | 498,642 | 17,138,802 | 0 | 0 | 17,138,802 | 14,421,248 |
| 1944 | 15,369,422 | 17,138,802 | 14,421,248 | 8,250,000 | 5,750,000 | 499,711 | 18,008,513 | 0 | 0 | 18,008,513 | 15,153,056 |
| 1945 | 14,140,528 | 18,008,513 | 15,153,056 | 8,250,000 | 5,750,000 | 504,984 | 17,644,057 | 0 | 0 | 17,644,057 | 14,846,388 |
| 1946 | 11,095,453 | 17,644,057 | 14,846,388 | 8,250,000 | 5,750,000 | 466,002 | 14,273,508 | 0 | 0 | 14,273,508 | 12,010,279 |
| 1947 | 16,439,486 | 14,273,508 | 12,010,279 | 8,250,000 | 5,750,000 | 451,571 | 16,261,423 | 0 | 0 | 16,261,423 | 13,682,987 |
| 1948 | 15,139,294 | 16,261,423 | 13,682,987 | 8,250,000 | 5,750,000 | 479,209 | 16,921,508 | 0 | 0 | 16,921,508 | 14,238,408 |
| 1949 | 16,933,584 | 16,921,508 | 14,238,408 | 8,250,000 | 5,750,000 | 511,379 | 19,343,713 | 0 | 0 | 19,343,713 | 16,276,545 |
| 1950 | 13,140,416 | 19,343,713 | 16,276,545 | 8,250,000 | 5,750,000 | 522,237 | 17,961,892 | 0 | 0 | 17,961,892 | 15,113,827 |
| 1951 | 12,505,894 | 17,961,892 | 15,113,827 | 8,250,000 | 5,750,000 | 487,137 | 15,980,649 | 0 | 0 | 15,980,649 | 13,446,733 |
| 1952 | 20,805,422 | 15,980,649 | 13,446,733 | 8,250,000 | 5,750,000 | 531,935 | 22,254,136 | 0 | 0 | 22,254,136 | 18,725,486 |
| 1953 | 11,165,419 | 22,254,136 | 18,725,486 | 8,250,000 | 5,750,000 | 561,962 | 18,857,593 | 0 | 0 | 18,857,593 | 15,867,504 |
| 1954 | 8,496,102 | 18,857,593 | 15,867,504 | 8,250,000 | 5,750,000 | 464,222 | 12,889,472 | 0 | 0 | 12,889,472 | 10,845,698 |
| 1955 | 9,413,908 | 12,889,472 | 10,845,698 | 8,250,000 | 5,750,000 | 350,410 | 7,952,970 | 0 | 0 | 7,952,970 | 6,691,935 |
| 1956 | 11,426,874 | 7,952,970 | 6,691,935 | 8,250,000 | 5,750,000 | 269,222 | 5,110,622 | 0 | 0 | 5,110,622 | 4,300,274 |
| 1957 | 21,500,963 | 5,110,622 | 4,300,274 | 8,250,000 | 5,750,000 | 314,561 | 12,297,024 | 0 | 0 | 12,297,024 | 10,347,190 |
| 1958 | 15,862,511 | 12,297,024 | 10,347,190 | 8,250,000 | 5,750,000 | 404,780 | 13,754,755 | 0 | 0 | 13,754,755 | 11,573,780 |
| 1959 | 9,598,169 | 13,754,755 | 11,573,780 | 8,250,000 | 5,750,000 | 370,189 | 8,982,735 | 0 | 0 | 8,982,735 | 7,558,419 |
| 1960 | 11,524,160 | 8,982,735 | 7,558,419 | 8,250,000 | 5,750,000 | 291,500 | 6,215,395 | 0 | 0 | 6,215,395 | 5,229,873 |
| 1961 | 10,010,259 | 6,215,395 | 5,229,873 | 8,250,000 | 5,750,000 | 218,693 | 2,006,961 | 0 | 0 | 2,006,961 | 1,688,734 |
| 1962 | 17,377,609 | 2,006,961 | 1,688,734 | 8,250,000 | 5,750,000 | 207,853 | 5,176,717 | 0 | 0 | 5,176,717 | 4,355,889 |
| 1963 | 8,840,900 | 5,176,717 | 4,355,889 | 8,250,000 | 5,750,000 | 186,906 | -169,288 | 0 | 169,288 | 0 | 0 |
| 1964 | 10,863,586 | 0 | 0 | 8,250,000 | 5,750,000 | 132,876 | -3,269,290 | 0 | 3,269,290 | 0 | 0 |
| 1965 | 19,875,027 | 0 | 0 | 8,250,000 | 5,750,000 | 192,188 | 5,682,839 | 0 | 0 | 5,682,839 | 4,781,759 |
| 1966 | 10,679,844 | 5,682,839 | 4,781,759 | 8,250,000 | 5,750,000 | 214,608 | 2,148,075 | 0 | 0 | 2,148,075 | 1,807,473 |
| 1967 | 11,670,830 | 2,148,075 | 1,807,473 | 8,250,000 | 5,750,000 | 155,296 | -336,391 | 0 | 336,391 | 0 | 0 |
| 1968 | 13,739,932 | 0 | 0 | 8,250,000 | 5,750,000 | 132,876 | -392,944 | 0 | 392,944 | 0 | 0 |
| 1969 | 15,272,159 | 0 | 0 | 8,250,000 | 5,750,000 | 144,644 | 1,127,515 | 0 | 0 | 1,127,515 | 948,735 |
| 1970 | 15,344,136 | 1,127,515 | 948,735 | 8,250,000 | 5,750,000 | 168,680 | 2,302,971 | 0 | 0 | 2,302,971 | 1,937,808 |
| 1971 | 15,290,433 | 2,302,971 | 1,937,808 | 8,250,000 | 5,750,000 | 192,409 | 3,400,995 | 0 | 0 | 3,400,995 | 2,861,728 |
| 1972 | 12,959,652 | 3,400,995 | 2,861,728 | 8,250,000 | 5,750,000 | 191,017 | 2,169,629 | 0 | 0 | 2,169,629 | 1,825,609 |
| 1973 | 18,397,816 | 2,169,629 | 1,825,609 | 8,250,000 | 5,750,000 | 221,751 | 6,345,694 | 0 | 0 | 6,345,694 | 5,339,511 |
| 1974 | 13,089,042 | 6,345,694 | 5,339,511 | 8,250,000 | 5,750,000 | 253,187 | 5,181,550 | 0 | 0 | 5,181,550 | 4,359,955 |
| 1975 | 16,825,996 | 5,181,550 | 4,359,955 | 8,250,000 | 5,750,000 | 267,737 | 7,739,809 | 0 | 0 | 7,739,809 | 6,512,573 |
| 1976 | 11,140,311 | 7,739,809 | 6,512,573 | 8,250,000 | 5,750,000 | 261,858 | 4,618,262 | 0 | 0 | 4,618,262 | 3,885,983 |
| 1977 | 5,438,897 | 4,618,262 | 3,885,983 | 8,250,000 | 5,750,000 | 181,077 | -4,123,919 | 0 | 4,123,919 | 0 | 0 |
| 1978 | 15,183,722 | 0 | 0 | 8,250,000 | 5,750,000 | 143,730 | 1,039,991 | 0 | 0 | 1,039,991 | 875,089 |
| 1979 | 17,671,870 | 1,039,991 | 875,089 | 8,250,000 | 5,750,000 | 190,916 | 4,520,945 | 0 | 0 | 4,520,945 | 3,804,097 |
| 1980 | 17,765,183 | 4,520,945 | 3,804,097 | 8,250,000 | 5,750,000 | 263,791 | 8,022,337 | 0 | 0 | 8,022,337 | 6,750,303 |
| 1981 | 9,015,200 | 8,022,337 | 6,750,303 | 8,250,000 | 5,750,000 | 245,744 | 2,791,793 | 0 | 0 | 2,791,793 | 2,349,122 |
| 1982 | 17,489,400 | 2,791,793 | 2,349,122 | 8,250,000 | 5,750,000 | 225,221 | 6,055,972 | 0 | 0 | 6,055,972 | 5,095,728 |
| 1983 | 24,361,989 | 6,055,972 | 5,095,728 | 8,250,000 | 5,750,000 | 363,643 | 16,054,318 | 0 | 0 | 16,054,318 | 13,508,721 |
| 1984 | 25,359,376 | 16,054,318 | 13,508,721 | 8,250,000 | 5,750,000 | 580,496 | 26,833,198 | 0 | 0 | 26,833,198 | 22,578,485 |
| 1985 | 21,246,109 | 26,833,198 | 22,578,485 | 8,250,000 | 5,750,000 | 721,143 | 33,358,163 | 3,828,133 | 0 | 29,530,030 | 24,847,704 |
| 1986 | 23,013,446 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 37,794,186 | 8,264,156 | 0 | 29,530,030 | 24,847,704 |
| 1987 | 15,640,478 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 749,290 | 30,421,219 | 891,188 | 0 | 29,530,030 | 24,847,704 |
| 1988 | 11,456,357 | 29,530,030 | 24,847,704 | 8,250,000 | 5,750,000 | 715,277 | 26,271,110 | 0 | 0 | 26,271,110 | 22,105,523 |
| 1989 | 9,921,847 | 26,271,110 | 22,105,523 | 8,250,000 | 5,750,000 | 632,102 | 21,560,855 | 0 | 0 | 21,560,855 | 18,142,133 |
| 1990 | 9,639,803 | 21,560,855 | 18,142,133 | 8,250,000 | 5,750,000 | 531,881 | 16,668,777 | 0 | 0 | 16,668,777 | 14,025,750 |
| 1991 | 12,170,021 | 16,668,777 | 14,025,750 | 8,250,000 | 5,750,000 | 456,954 | 14,381,844 | 0 | 0 | 14,381,844 | 12,101,437 |
| 1992 | 10,895,580 | 14,381,844 | 12,101,437 | 8,250,000 | 5,750,000 | 396,545 | 10,880,879 | 0 | 0 | 10,880,879 | 9,155,590 |
| 1993 | 18,160,118 | 10,880,879 | 9,155,590 | 8,250,000 | 5,750,000 | 399,257 | 14,641,739 | 0 | 0 | 14,641,739 | 12,320,123 |
| 1994 | 11,125,503 | 14,641,739 | 12,320,123 | 8,250,000 | 5,750,000 | 404,289 | 11,362,953 | 0 | 0 | 11,362,953 | 9,561,226 |
| 1995 | 20,047,166 | 11,362,953 | 9,561,226 | 8,250,000 | 5,750,000 | 428,708 | 16,981,411 | 0 | 0 | 16,981,411 | 14,288,813 |
| 1996 | 14,502,293 | 16,981,411 | 14,288,813 | 8,250,000 | 5,750,000 | 487,503 | 16,996,201 | 0 | 0 | 16,996,201 | 14,301,258 |
| 1997 | 21,622,438 | 16,996,201 | 14,301,258 | 8,250,000 | 5,750,000 | 561,354 | 24,057,285 | 0 | 0 | 24,057,285 | 20,242,725 |
| 1998 | 16,798,378 | 24,057,285 | 20,242,725 | 8,250,000 | 5,750,000 | 657,397 | 26,198,266 | 0 | 0 | 26,198,266 | 22,044,229 |
| 1999 | 15,934,210 | 26,198,266 | 22,044,229 | 8,250,000 | 5,750,000 | 692,700 | 27,439,776 | 0 | 0 | 27,439,776 | 23,088,883 |
| 2000 | 10,646,526 | 27,439,776 | 23,088,883 | 8,250,000 | 5,750,000 | 663,730 | 23,422,572 | 0 | 0 | 23,422,572 | 19,708,653 |
| Total | | | | | | | | | 8,291,832 | | |
| Averages: | | | | | | | | | | | |
| 1953-1977 | 13,032,181 | | | 8,250,000 | 5,750,000 | 254,020 | | 0 | 331,673 | 5,358,463 | 4,508,817 |
| 1931-1977 | 13,564,565 | | | 8,250,000 | 5,750,000 | 366,585 | | 0 | 176,422 | 10,883,317 | 9,157,641 |
| 1906-2000 | 15,264,965 | | | 8,250,000 | 5,750,000 | 495,155 | | 921,381 | 87,282 | 17,323,262 | 14,576,459 |

**Variables**

| 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**

| Results | |
|---|---|
| Average CRSP Evap | 495,155 af/yr |
| Total Yield w/ CRSP evap | 6,245,155 af/yr |

| Shortage Years | Shortage |
|---|---|
| 1961 | 0 af |
| 1963 | 169,288 af |
| 1964 | 3,269,290 af |
| 1967 | 336,391 af |
| 1968 | 392,944 af |
| 1977 | 4,123,919 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 | 6,004,020 af/yr |
| 1931-1977 | 6,116,585 af/yr |
| 1906-2000 | 6,245,155 af/yr |

## Upper Basin Yield Study - April 2006 Draft

### Study No. 10: Flows Adjusted for MBC with SCS Precip., CRSP Active plus All Other UB Live Storage (assumed same percent full), Constant Upper Basin Use

| CY | CR Natural Flow at Lee Ferry (plus) | Total Carry-Over Storage (plus) | CRSP Carry-Over Storage | 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) | CRSP Year-end Storage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1906 | 18,550,021 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 33,290,761 | 3,760,731 | 0 | 29,530,030 | 24,847,704 |
| 1907 | 21,201,694 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 35,942,434 | 6,412,404 | 0 | 29,530,030 | 24,847,704 |
| 1908 | 12,218,817 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 722,739 | 26,986,108 | 0 | 0 | 26,986,108 | 22,707,150 |
| 1909 | 22,356,301 | 26,986,108 | 22,707,150 | 8,250,000 | 5,790,000 | 722,739 | 34,579,670 | 5,049,640 | 0 | 29,530,030 | 24,847,704 |
| 1910 | 14,650,616 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 747,858 | 29,392,789 | 0 | 0 | 29,392,789 | 24,732,223 |
| 1911 | 15,499,729 | 29,392,789 | 24,732,223 | 8,250,000 | 5,790,000 | 747,858 | 30,104,660 | 574,629 | 0 | 29,530,030 | 24,847,704 |
| 1912 | 18,623,410 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 33,364,150 | 3,834,120 | 0 | 29,530,030 | 24,847,704 |
| 1913 | 14,536,373 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 746,678 | 29,279,726 | 0 | 0 | 29,279,726 | 24,637,088 |
| 1914 | 21,354,814 | 29,279,726 | 24,637,088 | 8,250,000 | 5,790,000 | 746,678 | 35,847,862 | 6,317,832 | 0 | 29,530,030 | 24,847,704 |
| 1915 | 13,623,277 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 737,246 | 28,376,061 | 0 | 0 | 28,376,061 | 23,876,710 |
| 1916 | 20,142,892 | 28,376,061 | 23,876,710 | 8,250,000 | 5,790,000 | 737,246 | 33,741,707 | 4,211,677 | 0 | 29,530,030 | 24,847,704 |
| 1917 | 22,942,804 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 37,683,544 | 8,153,514 | 0 | 29,530,030 | 24,847,704 |
| 1918 | 15,865,939 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 30,606,679 | 1,076,649 | 0 | 29,530,030 | 24,847,704 |
| 1919 | 12,651,369 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 727,207 | 27,414,192 | 0 | 0 | 27,414,192 | 23,067,356 |
| 1920 | 22,287,632 | 27,414,192 | 23,067,356 | 8,250,000 | 5,790,000 | 727,207 | 34,934,617 | 5,404,587 | 0 | 29,530,030 | 24,847,704 |
| 1921 | 22,526,781 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 37,267,521 | 7,737,491 | 0 | 29,530,030 | 24,847,704 |
| 1922 | 18,447,198 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 33,187,938 | 3,657,908 | 0 | 29,530,030 | 24,847,704 |
| 1923 | 19,024,046 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 33,764,786 | 4,234,756 | 0 | 29,530,030 | 24,847,704 |
| 1924 | 13,877,798 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 739,875 | 28,627,953 | 0 | 0 | 28,627,953 | 24,088,662 |
| 1925 | 14,430,701 | 28,627,953 | 24,088,662 | 8,250,000 | 5,790,000 | 726,951 | 28,291,704 | 0 | 0 | 28,291,704 | 23,805,728 |
| 1926 | 15,213,731 | 28,291,704 | 23,805,728 | 8,250,000 | 5,790,000 | 728,092 | 28,737,342 | 0 | 0 | 28,737,342 | 24,180,706 |
| 1927 | 19,539,212 | 28,737,342 | 24,180,706 | 8,250,000 | 5,790,000 | 741,017 | 33,495,537 | 3,965,507 | 0 | 29,530,030 | 24,847,704 |
| 1928 | 16,954,334 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 31,695,074 | 2,165,044 | 0 | 29,530,030 | 24,847,704 |
| 1929 | 21,829,585 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 36,570,325 | 7,040,295 | 0 | 29,530,030 | 24,847,704 |
| 1930 | 14,621,041 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 747,552 | 29,363,519 | 0 | 0 | 29,363,519 | 24,707,595 |
| 1931 | 8,474,134 | 29,363,519 | 24,707,595 | 8,250,000 | 5,790,000 | 680,619 | 23,117,034 | 0 | 0 | 23,117,034 | 19,451,562 |
| 1932 | 17,422,187 | 23,117,034 | 19,451,562 | 8,250,000 | 5,790,000 | 644,003 | 25,855,218 | 0 | 0 | 25,855,218 | 21,755,575 |
| 1933 | 12,183,500 | 25,855,218 | 21,755,575 | 8,250,000 | 5,790,000 | 646,458 | 23,352,260 | 0 | 0 | 23,352,260 | 19,649,490 |
| 1934 | 6,178,192 | 23,352,260 | 19,649,490 | 8,250,000 | 5,790,000 | 532,720 | 14,957,731 | 0 | 0 | 14,957,731 | 12,586,011 |
| 1935 | 12,630,349 | 14,957,731 | 12,586,011 | 8,250,000 | 5,790,000 | 425,948 | 13,122,133 | 0 | 0 | 13,122,133 | 11,041,468 |
| 1936 | 14,648,873 | 13,122,133 | 11,041,468 | 8,250,000 | 5,790,000 | 408,877 | 13,322,129 | 0 | 0 | 13,322,129 | 11,209,752 |
| 1937 | 14,306,056 | 13,322,129 | 11,209,752 | 8,250,000 | 5,790,000 | 409,467 | 13,178,718 | 0 | 0 | 13,178,718 | 11,089,080 |
| 1938 | 18,148,319 | 13,178,718 | 11,089,080 | 8,250,000 | 5,790,000 | 446,192 | 16,840,844 | 0 | 0 | 16,840,844 | 14,170,535 |
| 1939 | 11,164,059 | 16,840,844 | 14,170,535 | 8,250,000 | 5,790,000 | 449,704 | 13,515,199 | 0 | 0 | 13,515,199 | 11,372,209 |
| 1940 | 9,931,657 | 13,515,199 | 11,372,209 | 8,250,000 | 5,790,000 | 368,272 | 9,038,585 | 0 | 0 | 9,038,585 | 7,605,413 |
| 1941 | 20,116,678 | 9,038,585 | 7,605,413 | 8,250,000 | 5,790,000 | 380,995 | 14,734,268 | 0 | 0 | 14,734,268 | 12,397,980 |
| 1942 | 17,225,136 | 14,734,268 | 12,397,980 | 8,250,000 | 5,790,000 | 468,792 | 17,450,612 | 0 | 0 | 17,450,612 | 14,683,616 |
| 1943 | 13,731,401 | 17,450,612 | 14,683,616 | 8,250,000 | 5,790,000 | 488,820 | 16,653,193 | 0 | 0 | 16,653,193 | 14,012,637 |
| 1944 | 15,369,422 | 16,653,193 | 14,012,637 | 8,250,000 | 5,790,000 | 489,266 | 17,493,349 | 0 | 0 | 17,493,349 | 14,719,577 |
| 1945 | 14,140,528 | 17,493,349 | 14,719,577 | 8,250,000 | 5,790,000 | 493,929 | 17,099,948 | 0 | 0 | 17,099,948 | 14,388,554 |
| 1946 | 11,095,453 | 17,099,948 | 14,388,554 | 8,250,000 | 5,790,000 | 454,348 | 13,701,053 | 0 | 0 | 13,701,053 | 11,528,593 |
| 1947 | 16,439,486 | 13,701,053 | 11,528,593 | 8,250,000 | 5,790,000 | 439,332 | 15,661,207 | 0 | 0 | 15,661,207 | 13,177,942 |
| 1948 | 15,139,294 | 15,661,207 | 13,177,942 | 8,250,000 | 5,790,000 | 466,396 | 16,294,105 | 0 | 0 | 16,294,105 | 13,710,487 |
| 1949 | 16,933,584 | 16,294,105 | 13,710,487 | 8,250,000 | 5,790,000 | 498,004 | 18,689,684 | 0 | 0 | 18,689,684 | 15,726,220 |
| 1950 | 13,140,416 | 18,689,684 | 15,726,220 | 8,250,000 | 5,790,000 | 508,313 | 17,281,788 | 0 | 0 | 17,281,788 | 14,541,561 |
| 1951 | 12,505,894 | 17,281,788 | 14,541,561 | 8,250,000 | 5,790,000 | 472,674 | 15,275,008 | 0 | 0 | 15,275,008 | 12,852,979 |
| 1952 | 20,805,422 | 15,275,008 | 12,852,979 | 8,250,000 | 5,790,000 | 516,945 | 21,523,485 | 0 | 0 | 21,523,485 | 18,110,689 |
| 1953 | 11,165,419 | 21,523,485 | 18,110,689 | 8,250,000 | 5,790,000 | 546,455 | 18,102,449 | 0 | 0 | 18,102,449 | 15,232,098 |
| 1954 | 8,496,102 | 18,102,449 | 15,232,098 | 8,250,000 | 5,790,000 | 448,209 | 12,110,342 | 0 | 0 | 12,110,342 | 10,190,108 |
| 1955 | 9,413,908 | 12,110,342 | 10,190,108 | 8,250,000 | 5,790,000 | 333,901 | 7,150,349 | 0 | 0 | 7,150,349 | 6,016,579 |
| 1956 | 11,426,874 | 7,150,349 | 6,016,579 | 8,250,000 | 5,790,000 | 252,228 | 4,284,996 | 0 | 0 | 4,284,996 | 3,605,560 |
| 1957 | 21,500,963 | 4,284,996 | 3,605,560 | 8,250,000 | 5,790,000 | 297,091 | 11,448,867 | 0 | 0 | 11,448,867 | 9,633,517 |
| 1958 | 15,862,511 | 11,448,867 | 9,633,517 | 8,250,000 | 5,790,000 | 386,845 | 12,884,533 | 0 | 0 | 12,884,533 | 10,841,542 |
| 1959 | 9,598,169 | 12,884,533 | 10,841,542 | 8,250,000 | 5,790,000 | 351,798 | 8,090,903 | 0 | 0 | 8,090,903 | 6,807,998 |
| 1960 | 11,524,160 | 8,090,903 | 6,807,998 | 8,250,000 | 5,790,000 | 272,663 | 5,302,401 | 0 | 0 | 5,302,401 | 4,461,644 |
| 1961 | 10,010,259 | 5,302,401 | 4,461,644 | 8,250,000 | 5,790,000 | 199,419 | 1,073,241 | 0 | 0 | 1,073,241 | 903,066 |
| 1962 | 17,377,609 | 1,073,241 | 903,066 | 8,250,000 | 5,790,000 | 188,150 | 4,222,699 | 0 | 0 | 4,222,699 | 3,553,142 |
| 1963 | 8,840,900 | 4,222,699 | 3,553,142 | 8,250,000 | 5,790,000 | 176,949 | -1,153,349 | 0 | 1,153,349 | 0 | 0 |
| 1964 | 10,863,586 | 0 | 0 | 8,250,000 | 5,790,000 | 132,876 | -3,309,290 | 0 | 3,309,290 | 0 | 0 |
| 1965 | 19,875,027 | 0 | 0 | 8,250,000 | 5,790,000 | 191,775 | 5,643,252 | 0 | 0 | 5,643,252 | 4,748,449 |
| 1966 | 10,679,844 | 5,643,252 | 4,748,449 | 8,250,000 | 5,790,000 | 213,377 | 2,069,719 | 0 | 0 | 2,069,719 | 1,741,541 |
| 1967 | 11,670,830 | 2,069,719 | 1,741,541 | 8,250,000 | 5,790,000 | 154,478 | -453,929 | 0 | 453,929 | 0 | 0 |
| 1968 | 13,739,932 | 0 | 0 | 8,250,000 | 5,790,000 | 132,876 | -432,944 | 0 | 432,944 | 0 | 0 |
| 1969 | 15,272,159 | 0 | 0 | 8,250,000 | 5,790,000 | 144,231 | 1,087,928 | 0 | 0 | 1,087,928 | 915,425 |
| 1970 | 15,344,136 | 1,087,928 | 915,425 | 8,250,000 | 5,790,000 | 167,449 | 2,224,615 | 0 | 0 | 2,224,615 | 1,871,877 |
| 1971 | 15,468,912 | 2,224,615 | 1,871,877 | 8,250,000 | 5,790,000 | 192,220 | 3,461,306 | 0 | 0 | 3,461,306 | 2,912,476 |
| 1972 | 13,151,441 | 3,461,306 | 2,912,476 | 8,250,000 | 5,790,000 | 193,831 | 2,378,916 | 0 | 0 | 2,378,916 | 2,001,711 |
| 1973 | 18,614,466 | 2,378,916 | 2,001,711 | 8,250,000 | 5,790,000 | 227,899 | 6,725,483 | 0 | 0 | 6,725,483 | 5,659,080 |
| 1974 | 13,251,347 | 6,725,483 | 5,659,080 | 8,250,000 | 5,790,000 | 262,296 | 5,674,534 | 0 | 0 | 5,674,534 | 4,774,771 |
| 1975 | 17,052,625 | 5,674,534 | 4,774,771 | 8,250,000 | 5,790,000 | 279,849 | 8,407,310 | 0 | 0 | 8,407,310 | 7,074,234 |
| 1976 | 11,287,441 | 8,407,310 | 7,074,234 | 8,250,000 | 5,790,000 | 276,754 | 5,377,997 | 0 | 0 | 5,377,997 | 4,525,254 |
| 1977 | 5,533,636 | 5,377,997 | 4,525,254 | 8,250,000 | 5,790,000 | 189,007 | -3,317,374 | 0 | 3,317,374 | 0 | 0 |
| 1978 | 15,309,549 | 0 | 0 | 8,250,000 | 5,790,000 | 144,617 | 1,124,932 | 0 | 0 | 1,124,932 | 946,561 |
| 1979 | 17,798,627 | 1,124,932 | 946,561 | 8,250,000 | 5,790,000 | 193,567 | 4,689,991 | 0 | 0 | 4,689,991 | 3,946,339 |
| 1980 | 17,899,896 | 4,689,991 | 3,946,339 | 8,250,000 | 5,790,000 | 268,262 | 8,281,626 | 0 | 0 | 8,281,626 | 6,968,479 |
| 1981 | 9,015,200 | 8,281,626 | 6,968,479 | 8,250,000 | 5,790,000 | 250,687 | 3,006,139 | 0 | 0 | 3,006,139 | 2,529,481 |
| 1982 | 17,489,400 | 3,006,139 | 2,529,481 | 8,250,000 | 5,790,000 | 229,236 | 6,226,302 | 0 | 0 | 6,226,302 | 5,239,051 |
| 1983 | 24,361,989 | 6,226,302 | 5,239,051 | 8,250,000 | 5,790,000 | 366,748 | 16,181,543 | 0 | 0 | 16,181,543 | 13,615,773 |
| 1984 | 25,359,376 | 16,181,543 | 13,615,773 | 8,250,000 | 5,790,000 | 582,711 | 26,918,208 | 0 | 0 | 26,918,208 | 22,650,016 |
| 1985 | 21,246,109 | 26,918,208 | 22,650,016 | 8,250,000 | 5,790,000 | 722,030 | 33,402,286 | 3,872,256 | 0 | 29,530,030 | 24,847,704 |
| 1986 | 23,013,446 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 37,754,186 | 8,224,156 | 0 | 29,530,030 | 24,847,704 |
| 1987 | 15,640,478 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 749,290 | 30,381,219 | 851,188 | 0 | 29,530,030 | 24,847,704 |
| 1988 | 11,456,357 | 29,530,030 | 24,847,704 | 8,250,000 | 5,790,000 | 714,863 | 26,231,523 | 0 | 0 | 26,231,523 | 22,072,213 |
| 1989 | 9,921,847 | 26,231,523 | 22,072,213 | 8,250,000 | 5,790,000 | 630,871 | 21,482,499 | 0 | 0 | 21,482,499 | 18,076,202 |
| 1990 | 9,639,803 | 21,482,499 | 18,076,202 | 8,250,000 | 5,790,000 | 529,850 | 16,552,453 | 0 | 0 | 16,552,453 | 13,927,871 |
| 1991 | 12,170,021 | 16,552,453 | 13,927,871 | 8,250,000 | 5,790,000 | 454,137 | 14,228,336 | 0 | 0 | 14,228,336 | 11,972,270 |
| 1992 | 10,895,580 | 14,228,336 | 11,972,270 | 8,250,000 | 5,790,000 | 392,960 | 10,690,956 | 0 | 0 | 10,690,956 | 8,995,781 |
| 1993 | 18,160,118 | 10,690,956 | 8,995,781 | 8,250,000 | 5,790,000 | 394,921 | 14,416,153 | 0 | 0 | 14,416,153 | 12,130,306 |
| 1994 | 11,125,503 | 14,416,153 | 12,130,306 | 8,250,000 | 5,790,000 | 399,215 | 11,102,440 | 0 | 0 | 11,102,440 | 9,342,020 |
| 1995 | 20,047,166 | 11,102,440 | 9,342,020 | 8,250,000 | 5,790,000 | 422,913 | 16,686,693 | 0 | 0 | 16,686,693 | 14,040,825 |
| 1996 | 14,502,293 | 16,686,693 | 14,040,825 | 8,250,000 | 5,790,000 | 481,001 | 16,667,984 | 0 | 0 | 16,667,984 | 14,025,084 |
| 1997 | 21,622,438 | 16,667,984 | 14,025,084 | 8,250,000 | 5,790,000 | 554,161 | 23,696,262 | 0 | 0 | 23,696,262 | 19,938,947 |
| 1998 | 16,798,378 | 23,696,262 | 19,938,947 | 8,250,000 | 5,790,000 | 649,526 | 25,805,114 | 0 | 0 | 25,805,114 | 21,713,416 |
| 1999 | 15,934,210 | 25,805,114 | 21,713,416 | 8,250,000 | 5,790,000 | 684,165 | 27,015,159 | 0 | 0 | 27,015,159 | 22,731,595 |
| 2000 | 10,646,526 | 27,015,159 | 22,731,595 | 8,250,000 | 5,790,000 | 654,545 | 22,967,140 | 0 | 0 | 22,967,140 | 19,325,436 |
| Total | | | | | | | | | 8,666,886 | | |
| Averages: | | | | | | | | | | | |
| 1953-1977 | 13,080,890 | | | 8,250,000 | 5,790,000 | 248,505 | | 0 | 346,675 | 5,108,874 | 4,298,803 |
| 1931-1977 | 13,590,474 | | | 8,250,000 | 5,790,000 | 359,632 | | 0 | 184,402 | 10,550,625 | 8,877,702 |
| 1906-2000 | 15,281,860 | | | 8,250,000 | 5,790,000 | 491,180 | | 910,993 | 91,230 | 17,130,430 | 14,414,203 |

**Variables**

| 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 | 5,790,000 af/yr |
| LB Delivery | 8,250,000 af/yr |

**Results**

| | |
|---|---|
| Average CRSP Evap | 491,180 af/yr |
| Total Yield w/ CRSP evap | 6,281,180 af/yr |

| Shortage Years | Shortage |
|---|---|
| 1961 | 0 af |
| 1963 | 1,153,349 af |
| 1964 | 3,309,290 af |
| 1967 | 453,929 af |
| 1968 | 432,944 af |
| 1977 | 3,317,374 af |

NM allocation(w/o evap) 645,750 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 | 6,038,505 af/yr |
| 1931-1977 | 6,149,632 af/yr |
| 1906-2000 | 6,281,180 af/yr |

Flow Adjustments:

| | |
|---|---|
| 1971 | 178,479 af |
| 1972 | 191,789 af |
| 1973 | 216,650 af |
| 1974 | 162,305 af |
| 1975 | 226,629 af |
| 1976 | 147,130 af |
| 1977 | 94,739 af |
| 1978 | 125,827 af |
| 1979 | 126,757 af |
| 1980 | 134,713 af |

| # | 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 | | | | |

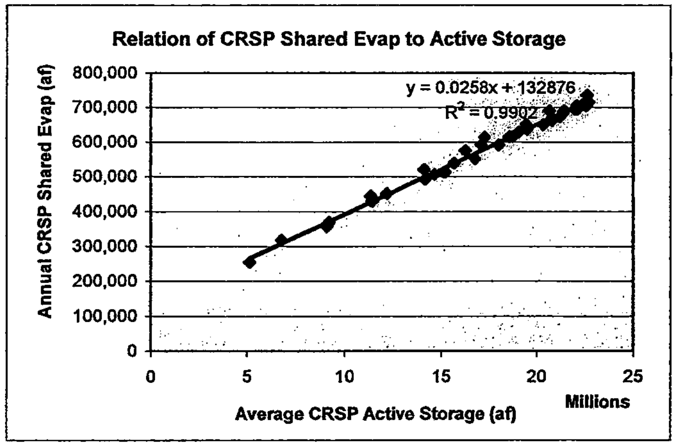
OSE-0238

Relationships of CRSP Shared Reservoir Evaporation to Total CRSP Storage

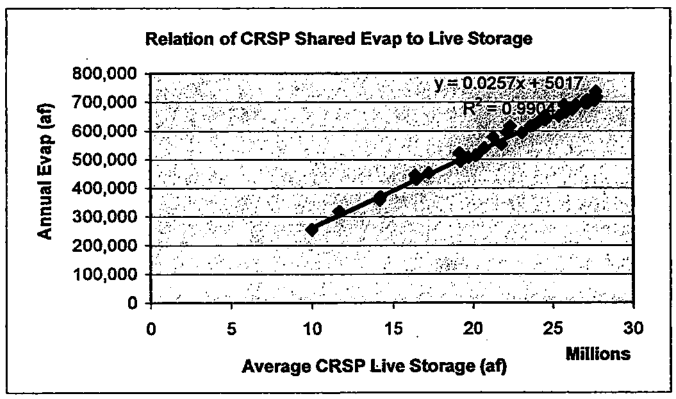
| Year | Average CRSP Live Storage (af) | Average CRSP Active Storage (af) | CRSP Shared Evap (af) |
|---|---|---|---|
| 1968 | 10,006,534 | 5,123,250 | 251,646 |
| 1969 | 11,701,142 | 6,764,000 | 315,083 |
| 1970 | 14,222,401 | 9,231,741 | 367,164 |
| 1971 | 16,417,858 | 11,354,088 | 442,260 |
| 1972 | 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 | 10,540,882 | 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 | 533,889 | 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.

OSE-0240

## Upper Colorado Basin CU+L Comparisons 1971-1980

w/ 1976-1980 Incidental Depletion Percentages Applied

| State | Year | CU +L (acre-feet) | Modified Blaney-Criddle USBR eff. Precip (af) (CU+L match) | Modified Blaney-Criddle USBR eff. precip (af) (scs rec.temp) | Modified Blaney-Criddle SCS eff. precip (af) (scs rec.temp) | Original Blaney-Criddle USBR eff.precip (af) (scs rec.temp) | Modified USBR/ Original USBR | Modified SCS/ Original USBR |
|---|---|---|---|---|---|---|---|---|
| New Mexico | | | | | | | | |
| Note 1. | 1971 | 80339 | 80739 | 83089 | 86122 | 76090 | 1.09 | 1.13 |
| | 1972 | 92664 | 93215 | 94625 | 96532 | 90151 | 1.05 | 1.07 |
| | 1973 | 87156 | 88033 | 89889 | 93562 | 89042 | 1.01 | 1.05 |
| | 1974 | 95962 | 96971 | 99245 | 101689 | 91966 | 1.08 | 1.11 |
| | 1975 | 88326 | 89014 | 91010 | 94062 | 88017 | 1.03 | 1.07 |
| | 1976 | 107600 | | 108146 | 111276 | 101176 | 1.07 | 1.10 |
| | 1977 | 100100 | | 100547 | 102404 | 88667 | 1.13 | 1.15 |
| | 1978 | 115200 | | 115629 | 120307 | 106467 | 1.09 | 1.13 |
| | 1979 | 112500 | | 113001 | 116420 | 108576 | 1.04 | 1.07 |
| | 1980 | 115100 | | 115340 | 119189 | 106491 | 1.08 | 1.12 |
| | Average | 99495 | | 101052 | 104156 | 94664 | 1.07 | 1.10 |
| | | | | | | | | |
| Wyoming | | | | | | | | |
| | 1971 | 275214 | 275619 | 285108 | 304012 | 372339 | 0.77 | 0.82 |
| | 1972 | 238165 | 238619 | 256802 | 285738 | 345706 | 0.74 | 0.83 |
| | 1973 | 235305 | 235571 | 247427 | 275103 | 313119 | 0.79 | 0.88 |
| | 1974 | 288455 | 288691 | 322808 | 336112 | 371542 | 0.87 | 0.90 |
| | 1975 | 207112 | 205621 | 225609 | 251287 | 292182 | 0.77 | 0.86 |
| | 1976 | 204000 | | 204199 | 234707 | 230116 | 0.89 | 1.02 |
| | 1977 | 133100 | | 133594 | 146958 | 144703 | 0.92 | 1.02 |
| | 1978 | 244800 | | 245172 | 265247 | 291813 | 0.84 | 0.91 |
| | 1979 | 253500 | | 254184 | 270137 | 291664 | 0.87 | 0.93 |
| | 1980 | 239300 | | 239489 | 258015 | 264302 | 0.91 | 0.98 |
| | Average | 231895 | | 241439 | 262732 | 291749 | 0.83 | 0.90 |
| | | | | | | | | |
| Utah | | | | | | | | |
| | 1971 | 549094 | 547471 | 557083 | 577843 | 564438 | 0.99 | 1.02 |
| | 1972 | 547185 | 545399 | 558923 | 578698 | 587334 | 0.95 | 0.99 |
| | 1973 | 559199 | 557569 | 562215 | 586039 | 592193 | 0.95 | 0.99 |
| | 1974 | 575241 | 574339 | 583391 | 593975 | 573446 | 1.02 | 1.04 |
| | 1975 | 439300 | 438796 | 455034 | 486342 | 493240 | 0.92 | 0.99 |
| | 1976 | 465100 | | 467642 | 487366 | 477002 | 0.98 | 1.02 |
| | 1977 | 247900 | | 250175 | 261674 | 270026 | 0.93 | 0.97 |
| | 1978 | 493400 | | 496271 | 516626 | 531587 | 0.93 | 0.97 |
| | 1979 | 520200 | | 523109 | 539536 | 552242 | 0.95 | 0.98 |
| | 1980 | 484100 | | 483553 | 513406 | 494357 | 0.98 | 1.04 |
| | Average | 488072 | | 493740 | 514151 | 513587 | 0.96 | 1.00 |

**Upper Colorado Basin CU+L Comparisons 1971-1980**

w/ 1976-1980 Incidental Depletion Percentages Applied

| State | Year | CU +L (acre-feet) | Modified Blaney-Criddle USBR eff. Precip (af) (CU+L match) | Modified Blaney-Criddle USBR eff. precip (af) (scs rec.temp) | Modified Blaney-Criddle SCS eff. precip (af) (scs rec.temp) | Original Blaney-Criddle USBR eff.precip (af) (scs rec.temp) | Modified USBR/ Original USBR | Modified SCS/ Original USBR |
|---|---|---|---|---|---|---|---|---|
| Colorado | 1971 | 1185221 | 1179862 | 1222288 | 1299668 | 1253759 | 0.97 | 1.04 |
| Note 2. | 1972 | 1187033 | 1178694 | 1221555 | 1294950 | 1305764 | 0.94 | 0.99 |
| | 1973 | 995874 | 984117 | 1032943 | 1138864 | 1106708 | 0.93 | 1.03 |
| | 1974 | 1251302 | 1228502 | 1280763 | 1340613 | 1306845 | 0.98 | 1.03 |
| | 1975 | 1109953 | 1105556 | 1165082 | 1238956 | 1248848 | 0.93 | 0.99 |
| | 1976 | 1090300 | | 1098042 | 1180771 | 1145551 | 0.96 | 1.03 |
| | 1977 | 977600 | | 981164 | 1042403 | 1022231 | 0.96 | 1.02 |
| | 1978 | 1182400 | | 1187737 | 1259447 | 1251849 | 0.95 | 1.01 |
| | 1979 | 1203000 | | 1209304 | 1289864 | 1302663 | 0.93 | 0.99 |
| | 1980 | 1213700 | | 1223411 | 1296303 | 1256086 | 0.97 | 1.03 |
| | Average | 1139638 | | 1162229 | 1238184 | 1220030 | 0.95 | 1.01 |
| | | | | | | | | |
| Upper Basin Total | | | | | | | | |
| | 1971 | 2089868 | 2083691 | 2148231 | 2268347 | 2267377 | 0.95 | 1.00 |
| | 1972 | 2065047 | 2055927 | 2132798 | 2256836 | 2329947 | 0.92 | 0.97 |
| | 1973 | 1877534 | 1865290 | 1933027 | 2094184 | 2101661 | 0.92 | 1.00 |
| | 1974 | 2210960 | 2188503 | 2287072 | 2373265 | 2344713 | 0.98 | 1.01 |
| | 1975 | 1844691 | 1838987 | 1937399 | 2071320 | 2123053 | 0.91 | 0.98 |
| | 1976 | 1867000 | | 1878029 | 2014120 | 1953845 | 0.96 | 1.03 |
| | 1977 | 1458700 | | 1465480 | 1553439 | 1525627 | 0.96 | 1.02 |
| | 1978 | 2035800 | | 2044809 | 2161627 | 2181716 | 0.94 | 0.99 |
| | 1979 | 2089200 | | 2099598 | 2215957 | 2255145 | 0.93 | 0.98 |
| | 1980 | 2052200 | | 2061793 | 2186913 | 2121236 | 0.97 | 1.03 |
| | Average | 1959100 | | 1998824 | 2119601 | 2120432 | 0.94 | 1.00 |

Note 1. New Mexico totals do not include NIIP

Note 2. Some Colorado CU+L to CU+L match differences explained by USBR tabulation errors.