Colorado River 15-Mile Reach Programmatic Biological Opinion Depletion Accounting Report Period 2016-2020

September 2022

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

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Executive Summary

The 1999 Colorado River 15-Mile Reach Programmatic Biological Opinion (PBO) addresses impacts to federally listed endangered fish associated with water depletions that occur in the Colorado River Basin above the Gunnison River and the recovery actions designed to offset those impacts. Depletions are estimated periodically to identify new depletions relative to the 1995 level of demand evaluated in the PBO. Colorado has completed depletion estimates for 2016-2020. Based on five-year means, the 2016-2020 estimates show a decrease in depletions of 53,958 acre-feet per year (AF/yr) below the baseline 1971-1995 run. In terms of ten-year running averages, depletions were 109,910 AF/yr less in 2020 than in 1995.

Under this analysis, new depletions in this basin upstream of the 15-Mile Reach have not reached the 120,000 AF/yr maximum allowed under the PBO, nor the 60,000 AF/yr "first block".

Background

The Upper Colorado River Endangered Fish Recovery Program (Recovery Program) was established in 1988 with the signing of a cooperative agreement by the Governors of Colorado, Utah, and Wyoming; the Secretary of the Interior; and the Administrator of Western Area Power Administration. The Recovery Program provides Endangered Species Act (ESA) compliance for continued operation of federal water and power projects and other new and existing water development projects in compliance with federal and state law and interstate compacts.

The Recovery Program's Section 7 Agreement[1] establishes a framework for conducting Section 7 consultations on depletion impacts related to new projects and impacts associated with existing projects in the Upper Basin. The Recovery Implementation Program Recovery Action Plan (RIPRAP)[2] identifies specific actions and timeframes that the Recovery Program believes will achieve sufficient progress toward recovery of the endangered fishes.

On March 11, 1996, the Recovery Program's Implementation Committee directed the Management Committee to develop a strategy to provide and protect flows in the 15-Mile Reach of the Colorado River upstream of the Gunnison River confluence. In late 1996, a Management Committee workgroup recommended the development of a programmatic biological opinion on depletions occurring in and above the 15-Mile Reach and Recovery Program activities to offset

[1] U.S. Fish and Wildlife Service. 1993. Section 7 Consultation, Sufficient Progress, and Historic Projects Agreement.
[2] 2019 Recovery Action Plan, Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, Colorado.

the impacts of those depletions. The 15-Mile Reach PBO represents the U.S. Fish and Wildlife Service's (Service) consideration of federal actions upstream of the Gunnison confluence.

While the current list of new and historical consultations (https://coloradoriverrecovery.org/uc/section-7-consultations/consultation-list/) reflects more than 465,000 AF/yr of depletions from these projects, the list is not an accurate reflection of the depletions that are actually occurring. Many of the depletions consulted on have not yet been developed or fully utilized.

Scope of the 15-Mile Reach Programmatic Biological Opinion

The PBO addresses impacts related to water depletions in the Colorado River subbasin upstream of the Gunnison River, and the recovery actions designed to offset those impacts to critical habitat from Rifle, Colorado, to Lake Powell. Issuance of the PBO does not create an administrative priority concerning Upper Colorado River Basin depletions. The PBO neither prejudices nor determines the amount of depletions allowable under the 1922 Colorado River Compact, the 1948 Upper Colorado River Compact, or in other subbasins of the Upper Colorado River Basin.

Depletions and Depletion Accounting

The PBO estimated a 'baseline' level of existing basin depletions to establish a basis for identifying and quantifying net new depletions as basin water development occurs. The PBO estimated existing depletions as of September 30, 1995 using models from the Colorado River Decision Support System (CRDSS), which is part of Colorado's Decision Support Systems (CDSS).

The current accounting report modeled baseline depletions from the 1971-1995 period as described in the Methods section of this report. This revised quantification (compared to the 1975-1991 study period used in the PBO) of the baseline depletions was necessary to make an accurate comparison to current 2016-2020 depletions. The study period of 1971 – 1995 replicates the baseline evaluation period in Colorado's report on depletions through 2005 (Colorado, 2008). This longer 25-year period incorporates updated CRDSS data and is considered more representative of variability in hydrologic conditions than the 17-year period evaluated in the PBO.

Model results show existing baseline depletions (1971-1995) averaged 1.096 million AF/yr (MAF/yr) using the backcasting methodology as outlined in Appendix F of the PBO.[3] This estimate is the average annual depletion value for water years 1971-1995 with backcasted 1995 demands. During the 1971-1995 baseline study period, the minimum depletion value in the run was 939,963 AF/yr during water year 1984, and the maximum was 1,258,322 AF/yr during water year 1978.

[3] As described in Appendix F of the PBO, 'backcasting' refers to applying the 1995 level of basin water demands to all modeled years in the pre-1995 period.

The Final PBO for the 15-Mile Reach provides ESA compliance for 120,000 AF/yr of additional future depletions and states that "the 120,000 AF/yr of new depletions represents the amount of additional Reclamation and non-Reclamation water that the Service believes could be depleted from the Upper Colorado River Basin above the confluence with the Gunnison River using new or existing facilities (including depletions that have already occurred since September 1995) and not result in the likelihood of jeopardy or adverse modification of critical habitat so long as the recovery actions are implemented as described herein [in the PBO]"[4].

The PBO (Appendix B) requires that an accounting of depletions occurring in the Colorado River above the Gunnison River confluence be made every five years beginning in 2005 to determine changes in water depletions. The 2001-2005 depletion accounting report was submitted in December 2008 and the 2006-2015 depletion accounting report was submitted in February 2018. This report provides a depletion accounting report for the last period of 2016-2020 and fulfills that reporting requirement. As stated in the PBO Appendix B, "Data collected would include irrigated acres, climatic data needed to run the Modified Blaney-Criddle consumptive use model, as well as data on evaporation, municipal and industrial uses, and other consumptive uses identified in Bureau of Reclamation's consumptive uses and losses report."

Methods

The modeling for this accounting report included use of StateCU to estimate depletions, an elevation adjustment to the Modified Blaney-Criddle method of estimating crop ET, use of a variable efficiency method of crop irrigation, and a study period of 1971-1995. This study period was first used in the 2005 depletion accounting report.

Appendix B of the PBO outlined two different modeling methods using CDSS modeling tools that can be used to evaluate whether there have been increased depletions over the intervening period since the last accounting update. The first method uses the CDSS water rights planning model, StateMod. The second uses the CDSS consumptive use model, StateCU. The methods share common elements, including the use of irrigated acreage, crop types, and actual diversions associated with those irrigated lands, as well as municipal, industrial, and other types of demands.

Appendix B of the PBO indicates that "the [accounting and reporting] process specified above is subject to change with the agreement of the Recovery Program's participants through the current management process." The modeling methodology was the focus of extensive discussions of a Recovery Program technical workgroup in 2008 (see Attachment A, the summary notes from that workgroup dated September 4, 2008), which resulted in the workgroup endorsing the use of the StateCU model for the 2001-2005 15-Mile Reach depletions analysis, for

[4] Final Programmatic Biological Opinion for Bureau of Reclamation's Operations and Depletions, Other Depletions, and Funding and Implementation of Recovery Program Actions in the Upper Colorado River above the Confluence with the Gunnison River, December 1999.

several practical reasons documented in those meeting notes. For similar reasons, StateCU was selected for use in developing the consumptive use estimates reported here. For the 15-Mile Reach PBO depletion accounting, StateCU is a more appropriate model for this application, as described in Attachment B of this report, which provides a summary of the advantages and disadvantages of both StateMod and StateCU.

Colorado has adopted use of an elevation adjustment for crop coefficients for the Modified Blaney-Criddle method of estimating crop evapotranspiration. This approach is recommended in American Society of Civil Engineers Manual 70 "Evaporation, Evapotranspiration, and Irrigation Water Requirements" when using modified Blaney-Criddle at higher elevations, and was adopted and approved for the 2006-2015 15 Mile Reach PBO Depletion Report. Elevation adjustments in the Colorado River Basin StateCU model were applied to all crops above 6,500 ft. Elevation adjustment increases evapotranspiration (ET) estimates and better reflects ET data collected locally in high-altitude agricultural areas. A variable efficiency algorithm was also implemented in StateCU that reads crop irrigation requirements and allows irrigation efficiency to change with water supply, more accurately reflecting actual irrigation practices. Although not used in the original 1999 analysis of depletions using the StateMod backcasted C_1 run (as described in Appendix F of the PBO), standard elevation adjustments represent a more accurate accounting method and were used in the 2001-2005 and 2006-2015 depletion accounting reports comparing then-current depletions to the PBO baseline level of depletions. Since the C_1 run was not re-modeled for this analysis and did not originally use standard elevation adjustments, the same non-crop depletions values from the C_1 run were combined with the new elevation-adjusted crop consumption modeled from 1971-1995 to effectively update the C_1 run with elevation-adjusted crop consumptive use. This re-calculated C_1 run is referenced in the results section below as the baseline run. In the future, depletion numbers from StateCU will be reported using a standard elevation adjustment.

Finally, the PBO states: "In recognition of the extreme variability of hydrology and water use demand patterns, the 120,000 acre-feet of new depletions will be calculated as a 10 year moving average as determined by the Colorado Water Conservation Board in consultation with Reclamation and concurred with by the Service". In recognition of this, the results section below reports both mean depletions over the referenced study periods as well as 10-year averages at the end of each referenced study period.

Results

This depletion accounting update reports consumptive use indicated by using the StateCU approach as set forth above. This analysis surveys the reporting period 2016-2020. The results show that the level of depletions in the Colorado River Basin above the 15-Mile Reach decreased by an average of 53,958 AF/yr compared to the baseline 1971-1995 run during the accounting period. The 10-year running average in 1995 was 1,109,434 AF/yr and in 2020 was 999,524 AF/yr, a decrease of 109,910 AF/yr compared to the baseline run. Colorado has therefore not reached

the 60,000 AF/yr or the 120,000 AF/yr thresholds of new depletions above the 15-Mile Reach under either of these metrics (the five-year mean or the ten-year running average).

Total Depletions

Figure 1 shows the total depletions for water years 1971-2020. The 10-year running average, 1971-1995 baseline average, and 2016-2020 averages are indicated on the graph.

During the entire model period from 1971-2020, the maximum annual depletion of 1,237,992 AF/yr occurred in 1978, and the minimum was 762,572 AF/yr in 2015. It should be noted that the 1978 depletion value uses backcasted 1995 demands. Most of the annual fluctuations in the total depletion level are due to transmountain diversions, which tend to vary more significantly than other depletion sectors, as described in more detail in the transmountain diversions section. Although there were four years below the baseline average during 2016-2020, there has been a trend of increasing total depletions in the last five years compared to the previous reporting period of 2011-2015. The baseline 1971-1995 run average total depletion (backcasted as described earlier) was 1,096,005 AF/yr. The average depletion from 2016-2020 was 1,042,047 AF/yr, which is 53,958 AF/yr less than the baseline run average.

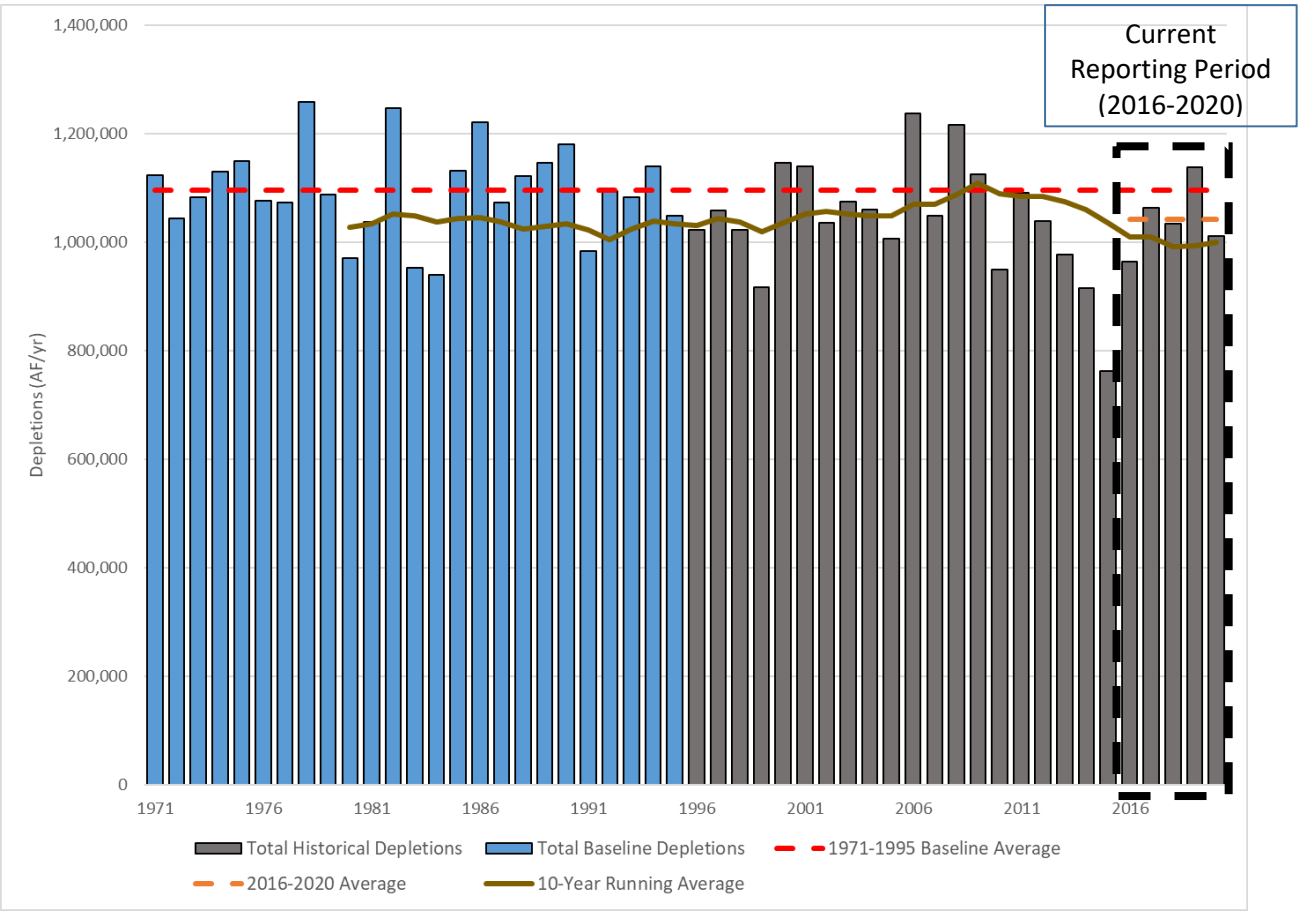

Figure 1. Colorado River Basin Total Depletions above the Gunnison Confluence for 1971 – 2020. Depletions for 1971 through 1995 are backcasted estimates.

Table 1 shows the 10-year running average at the end of the years corresponding to the end of the baseline period and the end of the accounting period 2016-2020. The maximum 10-year running average during the baseline period was 1,117,713 AF/yr (in 1994); the minimum was 1,077,437 AF/yr (in 1985). The 10-year running average in 1995 was 1,109,434 AF/yr and in 2020 was 999,524 AF/yr, a decrease of 109,910 AF/yr compared to the baseline run. Under this metric, Colorado has not reached the 120,000 AF/yr threshold of new depletions above the 15-Mile Reach, and in fact shows a reduction in total basin depletions since 1995.

Table 1. 10-Year Running Average Colorado River Basin Depletions above the Gunnison Confluence for Select Accounting Period Years

10-Year period ending in:	10-Year Running Average (AF/yr)
1995	1,109,434
2020	999,524

Depletions by Sector

Table 2 shows that crop consumptive use and transmountain diversions are the two largest depletion sectors in the Colorado River Basin above the 15-Mile Reach. These two depletion sectors account for 90% of the total depletions.

Table 2. Colorado River Basin Depletions by Sector above the Gunnison Confluence for 1971-2020

Use Sector Depletion	1971-1995 Baseline Run Average (AF/yr)	2016-2020 Average (AF)
Transmountain Diversions	555,186	508,296
Crop	469,731	444,659
Reservoir Evaporation	52,296	54,847
Minerals	2,318	1,793
Municipal	14,597	31,357
Livestock	1,879	1,095
Total	**1,096,005**	**1,042,047**
Difference from 1971-1995 Baseline		**- 53,958**

The remaining depletion sectors, in order of decreasing magnitude, include reservoir evaporation, municipal, mineral, and livestock. These categorized depletions for the baseline run and 2016-2020 average are shown in Table 2 and Figure 2. Reservoir evaporation has remained relatively constant over the period, while municipal use has steadily increased, from about 20,000 AF/yr in 1995 to about 32,000 AF/yr in 2020 (based on population estimates and per capita use estimates). Mineral and livestock depletions each vary between about 1,000 and 2,000 AF/yr. Crop depletions have generally decreased since the 1971-1995 baseline run study period, decreasing by 25,072 AF/yr in the 2016-2020 study period compared to the baseline run.

Figure 2 shows the annual depletions for the 1971-2020 time period broken out by use type. As mentioned previously, four of the ten years during 2016-2020 have depletions less than the baseline run average.

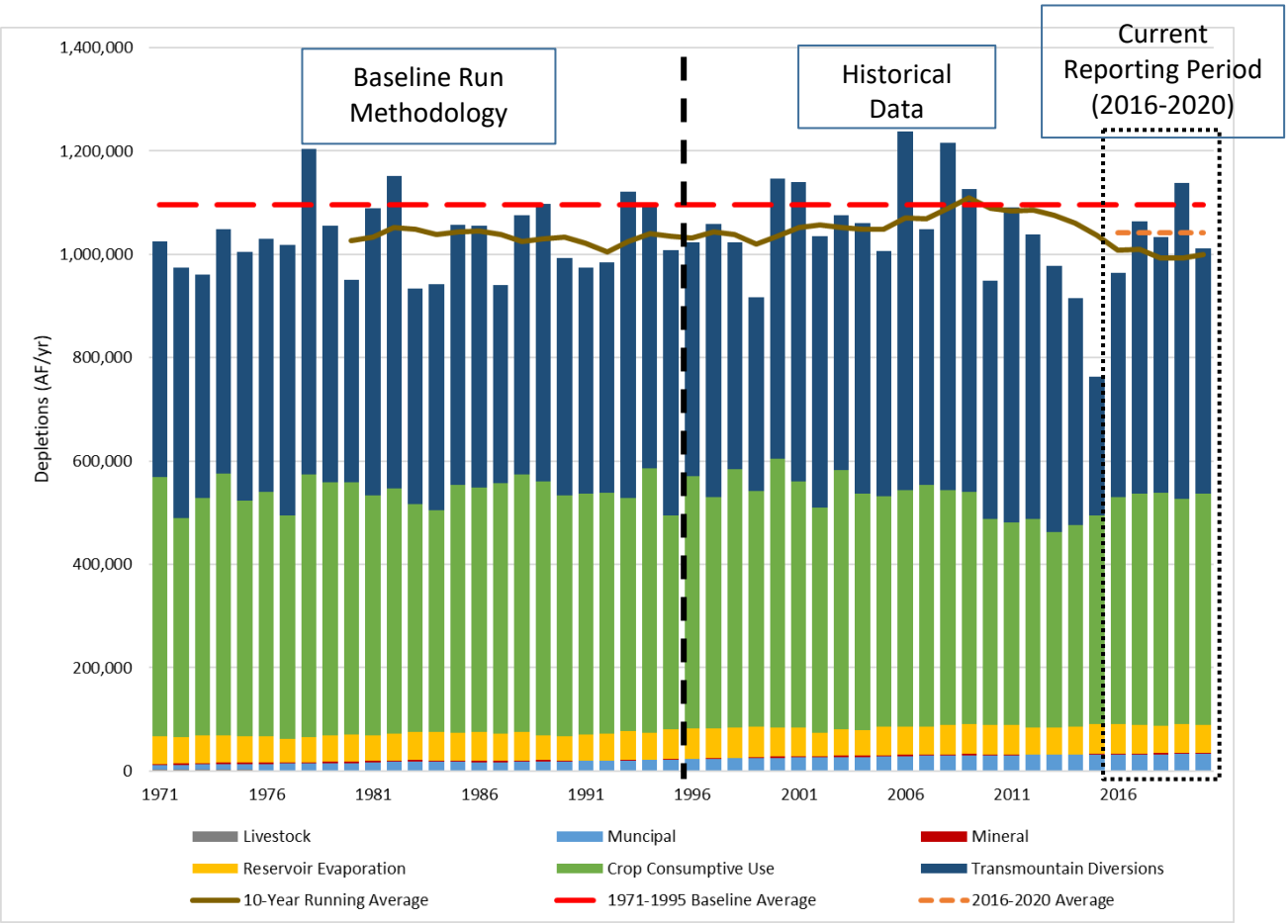

Figure 2. Colorado River Basin Depletions by Sector above the Gunnison Confluence for 1971-2020

Transmountain Diversions

Transmountain diversions vary from year to year, depending on hydrologic conditions on the West Slope, reservoir storage capacity, and water demand from the East Slope. Note that the transmountain diversions numbers represent the diversions in that year to the East Slope and not necessarily when the depletion occurred to the basin; i.e., if the transmountain diversion was from West Slope storage, then the depletion to the basin would have occurred in the prior year or years when there was a diversion into storage. This is one of the reasons why it is appropriate to look for trends in the 10-year running average for total depletions rather than at the year-to-year fluctuations.

The baseline run average depletion for the transmountain diversions sector is 555,186 AF/yr. The average for 2016-2020 is 508,296 AF/yr (46,890 AF/yr, or 8 percent lower than the baseline run average). Only one year between 2016 and 2020 (2019) shows above-average transmountain diversion values.

Crop Consumptive Use

Crop consumptive use varies substantially from year to year based on irrigated acreage, crop typing, irrigation efficiency, and climate, all of which affect irrigation water requirement, and physical and legal water availability, which affects supply. From 1971-1995, crop consumptive use remained close to the long-term average, varying from 45,017 AF/yr below the average to 53,220 AF/yr above the average. From 2016-2020 crop consumptive use stayed below the long-term average, averaging 13,194 AF/yr below the average. This can be seen in the decline of the 10-year average, which in 1995 was 471,902 AF/yr and in 2020 was 419,110 AF/yr. The 1971-1995 baseline run average depletions for crop consumptive use was 469,731 AF/yr. From 2016-2020 the average crop consumptive use was 444,659 AF/yr, or 25,072 AF/yr less than the baseline run average.

Conclusions

This report documents the depletion accounting in the Colorado River Basin above the Gunnison River confluence for the 2016-2020 period. The average overall depletions above the 15-Mile Reach during the 2016-2020 period were 1,042,047 AF/yr compared to the 1971-1995 baseline run average of 1,096,005 AF/yr (Table 2). The 10-year running average at the end of the accounting period has not increased above the 10-year running average at the end of the baseline run period, as seen in Table 1. The 10-year running average at the end of the baseline run period in 1995 was 1,109,434 and at the end of 2020 was 999,524. Based on these metrics (average depletion and 10-year running average at the end of the period), new depletions in Colorado have not approached the 60,000 AF/yr “first block” nor the 120,000 AF/yr maximum of new depletions above the 15-Mile Reach allowed under the PBO.

Although depletions increased in some sectors, such as municipal and reservoir evaporation compared to the PBO accounting period, these areas are very minor compared to the sectors of transmountain diversions and crop consumptive use. From 2016-2020, transmountain diversions and crop consumptive use both decreased dramatically compared to the baseline run (transmountain diversions decreased by 46,890 AF/yr and crop consumptive use decreased by 25,072 AF/yr) for a total decrease of almost 54,000 AF/yr compared to the baseline run.

Attachment A: Water Acquisition Committee Meeting Summary September 4, 2008

Water Acquisition Committee Meeting Summary
September 4, 2008
(Summary revised and made final on October 27, 2008)

Participants: Dan Luecke, Jana Mohrman, Robert Muth, Angela Kantola, Andy Moore, Tom Pitts, Randy Seaholm, and Ray Tenney.

Assignments indicated by a > and at the end of the document.

Convene: 9:00 a.m.

1. 15-Mile Reach PBO Depletion Accounting Report, 2001-2005 (including discussion of future depletion accounting) – CWCB has revised the draft report based on comments provided by Tom Pitts and Dan Luecke. Tom said he would like an opportunity for water users to review a draft revised after this meeting. Any remaining comments on this draft are due to Randy Seaholm by September 17; Randy will provide a revised, final draft by September 30. Committee members will send that final draft out to their colleagues for review, with final comments due back to Randy and the Committee by October 15. Randy will finalize the report and provide a pdf version to the Recovery Program to post on the web. >Angela will send the revised consultation list (through June '08) to Andy Moore for inclusion in the report.

Tom noted that in several places in the report, it's not made clear that we're talking about new, net depletions (which account both for reductions in depletions and additional depletions [whether they are consulted on or not]). Dan agreed, but suggested that the report use the exact language in the PBO to reflect that. The group agreed. >Tom will find the appropriate language in the PBO and provide that to Randy.

With regard to recommendation b, Tom noted that this report answers the question about what's been consulted on versus what's actually being depleted. Dan asked how to address the situation that may be developing where the 60,000/yr depletion ceiling is not reached in terms of actual depletions until considerably more depletions have been consulted on (and projects permitted). For example, what if 150,000 – 200,000 af/yr of new depletions are permitted (but not actually depleted) before we reach 60,000 af/yr of actual depletions? Tom pointed out that one safeguard is that the review of the status of the fish will begin when actual depletions reach 50,000 or the year 2015, whichever comes first (see pages 75-77 of the PBO). This addresses the concern raised in the initial discussions of the PBO re: depletions occurring which are not consulted on. These are the depletions accounted for in the 5 year PBO depletion report. >Angela will split out the consultation table by opinions occurring on or before September 30 1995 (all of which are Category 1 depletions) and those after (which are Category 2 and whose actual depletions will be included in the 60,000 and 120,000 AF ceilings). > Randy will reference the reinitiation clause and Appendix B where the report talks about the depletion accounting.

Ray Tenney asked how the population assessment contemplated in the PBO differs from the Service's population assessment as part of the annual sufficient progress assessment. Bob

Muth said it may not differ much at all, and would be based on the Program's ongoing population monitoring efforts.

Ray revisited the issue of depletions vs. demands discussed at the last meeting: demands are what is expected or otherwise allowed or permitted to occur. When ample water is available on the East slope, depletions (diversions from the West slope) should be less than the actual needs or the uses allowed or permitted. When the demands are modeled, they may vary considerably, resulting in more or less depletion. Therefore, as we get better information, we need to look at both the demands or actual needs and the actual amount of transmountain diversion required to meet those needs or demands, rather than assuming that transmountain diversion depletions equal their demands. Andy said that demand (e.g., in the case of Denver Water) is demand at the tunnel. Ray said all we have at this point are tunnel diversion records; as more information is available on actual use, that information needs to be reflected in back casting to historic hydrology (as our modeling tools improve)

Dan expressed concern about the language "two methods may be used," which is not what the PBO says. Tom suggested revising the report to say something like "In this case, only the CU model was used since it showed there was no significant or identifiable increase in depletions. In fact it showed there was a small decline. As actual new depletions approach the 50,000 AFY target in the PBO, the need to run both models will be required…" >Dan will provide recommended language to the group by the end of the week. (Note: Dan provided suggested report language, which Randy did not fully incorporate into the report. The report as revised by Randy left open the question of when it would be necessary to run StateMod for depletion accounting.

>Randy also will revise the recommendations at the end of the report, since they've been addressed in these discussions.

2. Future depletion accounting

a. *Review Appendix B; update as appropriate*: The group agreed that it was not appropriate to revise or update Appendix B. This meeting summary will serve to answer the questions raised about the procedures described in Appendix B of the PBO.

b. *PBO, Appendix B, Paragraph 1, 2nd to last sentence: Should this sentence be modified to also reflect that the Technical Group (TG) will review the accounting report for consistency with the procedures spelled out in Appendix B and for accuracy? As discussed in* item 2a above, this was deemed inappropriate and unnecessary. The report should describe exactly what the TG did in its review and this certainly should be part of that review.

c. *Clarify in Appendix B which model will be used, the consumptive use model (StateCU) or the CRDSS Colorado River Mainstem Water Right Planning Model (StateMod). It is unclear whether or not both must be run for each reporting period or if only one or the other can be used. Are there circumstances under which only*

one needs to be run? What if sufficient data cannot be obtained from the entities or otherwise to run a model? Dan is still concerned about the need for data from all transmountain diverters, thus he wants to be sure the report does not imply that they are not required to provide the data and as noted above will provide recommended language. Tom suggested appending this meeting summary to the report. The Committee agreed. >When Jana posts the summary to the Water Acquisition Committee, she will ask for comments on the meeting summary by a date certain, after which the summary will be finalized so that it can be appended to the report. >By the September 17 report comment deadline, Dan Luecke will propose language for this report regarding the models, and also propose how we deal with this in the future. (Note: Proposed language was received and incorporated in the report.)

d. *Should the USFWS require an annual report from a permitted project describing progress in development and use to assist in assessing actual depletions by new projects? Is the water to be used a new depletion or a change of existing use?* The group agreed that NO such report should be required. The group again made reference to discussions in item #1 above regarding "net depletions" and the "reinitiation process".

e. *Consider a contingency provision in each Section 7 consultation, such as; This permit is being issued after 60 KAF of new depletions have already been previously consulted on, pursuant to the PBO and _____, you many be asked to curtail uses if depletions consulted on previously exceed 60,000 AF and _____*. The group agreed that NO such contingency was necessary and again referenced the "Net Depletion" and reinitiation language and process discussed in item #1.

f. *If the model accounting costs become too high would the Recovery Program's participants make changes? Perhaps increase monitoring of transmountain diversions and other M&I projects and uses as opposed to obtaining increased back casted demands for the StateMod approach. Can the Service, in consultation with the Management Committee, make changes to Appendix B through that process?* As for increased accounting costs, the group agreed to wait and see how the modeling process goes in future years. As for modifying Appendix B, again the group agreed the answer should be NO.

g. *How do we factor the New Depletions into the accounting process in the future? The significance of the number of new depletions that have been consulted on is recognized. What happens if more than 60,000 AF is consulted on but that 60,000 AF of depletion doesn't materialize for a number of years and as a result consultations continue and become significantly more than 60,000 AF and then all are subsequently developed resulting in depletions to the 15-Mile Reach significantly in excess of 60,000 AF? While the accounting procedures have been followed, the opportunity for problems in the future may be significant.* The group again agreed that this is addressed in the PBO and more specifically in the re-initiation provisions.

h. *Consider double checking the New Depletion accounting system for duplications.* The Group again agreed this was NOT necessary. Project proponents identify whether a depletion should be considered new or historic. The Service will review the information provided, but usually the consultation is based on the information provided to them. Randy said that if a project proponent has identified the depletions as new depletions but the project is in fact relying on an augmentation plan that is utilizing historic (pre-1988) water rights, then the depletions should not be considered new but rather should be identified as historic. The group agreed that there is no reference to augmentation plans in the PBO. The group agreed it's the responsibility of the project proponent to describe historic and/or new depletions in their project description in accordance with the definitions in the 15MRPBO. The Group recognizes that the Service's Section 7 Consultation List (which explicitly states it is "NOT a depletion accounting" in the heading over the average annual depletion columns) is not an accounting of actual or current project depletions. It is a listing of depletions consulted on that may be depleted by the project at full development, whenever that occurs.

3. The Yampa PBO states we are required to "quantify annual water demand from the Yampa River Basin in Colorado and Wyoming, and estimate average annual depletions." Specifically, Appendix D of the PBO (which may be found at http://www.coloradoriverrecovery.org/documents-publications/section-7-consultation/yampaPBO/YPBOAppendixD.pdf) says: "Every 5 years, beginning in water year (WY) 2010, the States of Colorado and Wyoming will report to the Program estimated average annual volumes of depletions from the Yampa and Little Snake rivers and their tributaries. The reports are to be completed by July 1 every 5 years beginning in 2010. Currently there is no mention of this in a scope of work. >By September 30, Randy will amend CWCB's FY 09 CRDSS scope of work to address the work that will begin on this task in FY 09. (Note: Wyoming's quantification and reporting may still need to be addressed. Need to bring this up with John Shields and define how this will be done. If a scope of work is needed for Wyoming portion, need to state here, like Colorado.)

4. Next meeting: The Committee will need to meet or hold a conference call or web conference in mid-February to provide comments on draft FY 2010-2011 Program guidance, RIPRAP revisions, and RIPRAP assessment. >Jana will work with Committee members to schedule this meeting after the beginning of the year.

Adjourn: 12:00 p.m.

ASSIGNMENTS

1. Angela Kantola will split out the consultation table by opinions occurring on or before September 30 1995 (all of which are Category 1 depletions) and those after (which are category 2 and whose actual depletions will be included in the 60,000 and 120,000 AF ceilings). Angela will send the revised consultation list (through June '08) to Andy Moore for inclusion in the report.

2. Tom Pitts will find the appropriate language in the PBO to refer to “additional depletions” and provide that to Randy.

3. Where the report talks about the depletion accounting, Randy Seaholm will reference the reinitiation clause and Appendix B.

4. Dan Luecke will provide recommended language to the group regarding use of the two modeling approaches by the end of the week. By the September 17 report comment deadline, Dan Luecke will propose language for this report regarding the models, and also propose how we deal with this in the future.

5. Randy Seaholm will revise the recommendations at the end of the report, since they’ve been addressed in these discussions.

6. When Jana Mohrman posts the meeting summary to the Water Acquisition Committee, she will ask for comments on the meeting summary by a date certain, after which the summary will be finalized so that it can be appended to the report.

7. By September 30, Randy Seaholm will amend CWCB’s FY 09 CRDSS scope of work to address the work that will begin on this task in FY 09.

8. Jana Mohrman will work with Water Acquisition Committee members to schedule the next meeting (or conference call or web conference) for mid-February.

Attachment B: CDSS Water Rights Planning Model (StateMod) and CDSS Consumptive Use Model (StateCU)

CDSS Water Rights Planning Model (StateMod)

This accounting method using StateMod was considered but was not used in developing the 2020 depletion estimates reported herein.

StateMod is discussed here because it is part of the accounting procedures described in Appendix B of the Colorado River 15-Mile Reach Programmatic Biological Opinion (1999). The purpose of this section is to describe certain changes made to StateMod and some of the data limitations encountered during the consideration of whether or not to use StateMod. StateMod, the State of Colorado's Stream Simulation Model, is a water allocation and accounting model capable of making comparative analyses for the assessment of various historical and future water management policies in a river basin. It can be run on either monthly or daily time steps and is designed for application to any river basin with appropriate input data. StateMod's operation, like the stream itself, is governed by its hydrology, water rights, and the associated structures and operating rules. It recognizes five types of water rights: direct flow rights, instream flow rights, reservoir storage rights, well rights, and operational rights. Each of the water rights is given an administration number (rank) and location in the stream system. The model then sorts the water rights by rank and simulates their operation by priority using the Prior Appropriation Doctrine (first in time, first in right). The water right categories are self-explanatory with the possible exception of the operational rights, which generally pertain to reservoir operating policies, exchanges, and carrier ditch systems. Please see the CDSS website for more information: http://cdss.state.co.us.

Changes in StateMod Since the Original PBO

StateMod has been revised since it was implemented in the PBO in 1998. Key changes include the following:

- Model platform has gone through eight version enhancements; the most significant being the revision from the direct solution algorithm to the "variable efficiency" algorithm that reads crop irrigation requirements and allows irrigation efficiency to change with water supply, more accurately reflecting actual irrigation practices.
- The end of the period of record has been extended to 2015.
- Irrigated acreage to diversion structure association has been updated three times.

Changes in Natural Flow Data

In additional to adding the variable efficiency algorithm, which more accurately determines depletions return flows in the generation of natural flows, the Colorado River basin StateMod model was enhanced and updated to incorporate additional stream gages, diversion records and basin operations. The modifications resulted in changes to the natural flow data set, which is calculated from the gage records by removing the depletive effects caused by man. For example, diversions and reservoir evaporation are added back to the gage records, return flows and basin imports are subtracted, and changes in storage are added or subtracted depending on whether they are a positive or negative change. StateCU, on the

other hand, does not include natural flows as a component of the modeling process. However, for purposes of depletion accounting, natural flow generation is not necessary as consumptive use is accurately captured without modeling natural flows. For the 15-Mile Reach PBO depletion accounting, StateCU is a more appropriate model for this application. The modeling methodology was the focus of extensive discussions of a Recovery Program technical workgroup in 2008 (see Attachment A, the summary notes from that workgroup dated September 4, 2008), and it resulted in that workgroup endorsing the use of the StateCU model for that 15-Mile Reach depletions analysis, for several practical reasons documented in those meeting notes

CDSS Consumptive Use Model (StateCU)

The StateCU model was selected for use in developing the consumptive use estimates reported herein.

StateCU, the State of Colorado's consumptive use model, was developed to estimate crop consumptive uses within the state. It consists of a FORTRAN-based computer program and an associated graphical user interface. The crop consumptive use methods employed in the program and the interface are the modified Blaney-Criddle, the original Blaney-Criddle, and the Pochop (for bluegrass only) (http://www.ids.colostate.edu/projects/idscu/files/pochop.pdf) consumptive use methods with calculations on a monthly basis and the ASCE Standardized Penman-Monteith, Penman-Monteith, and Modified Hargreaves methods with calculations on a daily basis. Please see the CDSS website for more information: http://cdss.state.co.us.

StateCU performs an historical agricultural consumptive use analysis for the basin using irrigated acreage, crop types, available water supply via diversion records, and temperature and precipitation data from neighboring climate stations. For PBO accounting purposes, the modified Blaney-Criddle method is used on a monthly basis with the incorporation of an elevation adjustment to TR-21 crop coefficients, as recommended in ASCE Manual 70. Irrigated acreage is determined from satellite imagery; updates are made approximately every five years. Potential consumptive use is calculated for the crop type, effective precipitation is taken into account, and the irrigation water requirement is calculated. Ditch conveyance loss, irrigation application method (flood or sprinkler), and soil moisture balance are taken into account in order to determine how much of the irrigation water requirement is met.

The other non-crop consumptive use components are obtained from other information: transmountain diversions and mineral use are obtained from relevant diversion records; municipal and livestock use are calculated from population estimates and daily water usage estimates; and stockpond and reservoir evaporation are determined from estimated surface area and monthly evaporation rates.