San Juan River Environmental Flows Workshop 1
Draft Meeting Notes

February 12th and 13th, 2015

Prepared For:
San Juan River Recovery Implementation Program

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Read Aheads and Preparatory Documents

In advance of the San Juan River Environmental Flows Workshop #1, read aheads and preparatory documents were posted on the San Juan River Recovery Implementation Program webpage. Additional information may be found there as well: **http://www.fws.gov/southwest/sjrip/**

- **Specific Workshop #1 documents included:**
  - *Modeling Analysis of Navajo Reservoir Operations (Behery, January 2015)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/1-Modeling_Analysis_Navajo_Reservoir_Operations_Jan-2015.pdf
  - *Proposed Modification of Available Water Calculation for Determining Spring Peak Releases on the San Juan River (Reclamation/Service Sept. 9, 2014)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/2-Proposed_Modification_SJR_flow_Recommendations_Sept-9-2014.pdf
  - *Draft memo recommending Operating Rules change BC to CC (May 16 2007)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/3-Draft_flow_recommendation_memo_BC_to_CC_May-17-2007.pdf
  - *Memo regarding New Op Rules Model Runs Keller-Bliesner to Hydrology Committee (Oct 9 2006)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/4-Model_Runs_New_Operating_Rules_K-B_HC_Oct-9-2006.pdf
  - *SJR Draft Final Integration Report (Miller 2005)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/5-SJR_Draft_Final_Integration_Report_Miller_2005.pdf
  - *SJR Flow Recommendations (Holden 1999)*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/6-Flow_Recommendations_San_Juan_River_Holden_1999.pdf
  - *Gen2 and Gen3 model run flow statistics spreadsheet (Run_Comparisons_G3.xls)*
    - www.fws.gov/southwest/sjrip/pdf/workshop/7-Gen2_Gen3_Run_Comparisons.xls
  - *Information relevant to the Flaming Gorge process*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/8-Links_Flaming_Gorge_Process_Information.pdf
  - *Summary Report For The San Juan River Basin Recovery Implementation Program Habitat Monitoring Workshop, January 11 – 12, 2012*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/9-Summary_Report_SJRRIP_Habitat_Workshop_SWCA_Feb-8-2012.pdf
  - *KB Response to Revision of Available Water Calculation*
    - http://www.fws.gov/southwest/sjrip/pdf/workshop/KB_Response_Revision_Available_Water_Calcuation_January-2015.pdf

Acronyms and Abbreviations List

Ac-ft	Acre-feet
BO	Biological Opinion
CBRFC	Colorado Basin River Forecast Center
CC	Coordination Committee
cfs	Cubic feet per second
EIS	Environmental Impact Statement
EOWYST	End of Water Year Storage Target
ET	Evapotranspiration
FY	Fiscal Year
HR	Habitat Restoration
LTP	Long-term Plan
LTSP	Larval Trigger Study Plan
NEPA	National Environmental Policy Act
NIPP	National Infrastructure Protection Plan
Pike Minnow or PM	Colorado Pike Minnow
Program	San Juan River Recovery Implementation Program
Reclamation	U.S. Bureau of Reclamation
RERI	River Ecosystem Restoration Initiative
RIP	Recovery Implementation Program
ROD	Record of Decision
RM	River Mile
SJR	San Juan River
Sucker or RZB	Razorback Sucker
USFWS or Service	U.S. Fish and Wildlife Service

DAY ONE: February 12th, 2015

1.0 Opening and Introductions:

- Jim Brooks opened the workshop and welcomed everyone. He explained meeting logistics and introductions were made. The purpose of this two-day workshop is to "initiate processes to reduce risk of water shortage in the San Juan River Basin and increase effectiveness of implementing the 1999 San Juan River Flow Recommendations."
- The agenda was reviewed and the Flaming Gorge Environmental Releases Experiment Presentation was moved to earlier on Day 1.
- Sharon Whitmore briefly shared the background on the San Juan River (SJR) Recovery Implementation Program (RIP) and Flow Recommendations:
    - The San Juan River Recovery Implementation Program (Program) was established in 1992 with the goals to: (1) recover listed endangered species and (2) allow for continued water development in the basin. In 1999, the Program developed flow recommendations for Navajo Dam releases – these flows were intended to mimic natural flow releases. In the 2006 Record of Decisions (ROD), an alternative 250,000 acre-feet (ac-ft) was selected as a way to implement the flow recommendations.
    - With improved science, data collections, and changing hydrology, it has since been recognized that the 1999 Flow Recommendations need to be revisited and revised. The changing hydrology and system constraints have made meeting the flow recommendation challenging.
    - The Bureau of Reclamation (Reclamation) has put forward a proposal to modify the current Decision Tree process (under the 2006 ROD) as a way to reduce the risk of shortages as well as improve the ability to meet the flow recommendations.
    - This workshop was convened to work on the release process and flow recommendations for 2015. The 2015 process is an interim process while the flow recommendation revision process continues. Additional objectives include discussing possible future workshops.

2.0 PRESENTATION: Background on 1999 Flow Recommendations and Reservoir Operating Procedures

- Brian Westfall and Ron Bliesner, with Keller-Bliesner Engineering, LLC, were introduced. They began a background presentation on the 1999 Flow Recommendations and reservoir operating procedures. This presentation covered review of the background and history of the flow recommendations and discussion of some of the current challenges.
- Attendees were reminded that the goals of the Program and the flow recommendations are to: (1) conserve populations of the Colorado Pike Minnow (pike minnow or PM) and Razorback Sucker (sucker or RZB) and (2) proceed with water development.
- During a 7-year research period, the fish populations and habitat response to reregulation of Navajo Dam has been analyzed and data has been collected.
- *Foundations:* The foundation of the 1999 Flow Recommendations included the "mimicry of statistical parameters of flow based on flow/geomorphic/habitat linkages and the statistical

variability of the pre-dam hydrology rather than mimicry of each annual hydrograph." Therefore, the resulting flows will not mimic a natural hydrology in all years, but will mimic the variation and dynamic nature of the 65-year record of the San Juan River.

- *Basin Model:* Using the operations of Navajo Dam under various scenarios, the San Juan Basin Model was developed as a modeling tool to explore the relationship(s) of flow along the river. Hydrographs from 1929 through 1993 were used to simulate flow in the river at various gaging points. Post-processing was utilized to derive daily flow from monthly data for evaluation of the flow statistics.
    - The results identified specific flow of particular benefit to the biology and habitat (see handout Table S.1.). These translated into the hydrologic recommendations and ultimately the Decision Tree that influences the operations of Navajo Dam.

- *Assumptions:* The underlying assumption is that over a long period of time, history will repeat itself; if the conditions were met during the past 65-years, they will be met in the future. To the extent that the water supply is different in the future, then the natural conditions would also be altered and the conditions of mimicry would be maintained, although the exact flow recommendations statistics may not be met.
    - What has been observed is that historic conditions will eventually be met, but the "patterns" have shifted. The revised recommendations would still mimic nature, but "nature" may be different. The flow recommendations are doing what they are supposed to do – but they are mimicking a different system compared to what it was in the past.

- *Elements of the Flow Recommendations:* The flow recommendations specify flow magnitude, duration, and frequency targets. The runoff period extends from March 1st through July 31st. The 5,000 cfs maximum release out of Navajo Dam cannot meet the high flow statistics alone.
    - *High Flow:* The High Flow criteria are 10,000 cfs for 5-days. A high flow must occur once in a 10-year period. The intended purposes of the high flows are to (1) overbank the river; (2) generate new cobble sources and spawning habitat; (3) increase habitat complexity; (4) nutrient loading to improve habitat productivity; and (5) provide flow and habitat deemed important to the pike minnow and sucker. We may determine some of this criterion is no longer accurate or attainable for today.
    - *Medium Flow:* One of the middle-range flow criteria are 8,000 cfs for 10 days. This type of flow must occur once every 6 years. In other words, the target is to get the river "out of bank" once every 3 years.
    - *Medium Flow:* A second middle-range flow criteria are 5,000 cfs for 21 days. The maximum duration of not meeting this flow is 4 years. Frequency is dependent on perturbation storms requiring flushing in about 50% of years and is critical to the maintenance of pike minnow spawning at River Mile (RM) 132 and the moving of cobbles. This flow recommendation was based partially on observed, physical river processes and not just statistics. This particular flow targets the cleaning of fine sediment out of backwaters.
    - *Low Flow:* The low flow criteria are 2,500 cfs for 10 days. The maximum duration of not meeting this flow is 2 years. This level of flow is enough to trigger a pike minnow spawn but it is recognized that higher flows are better. The frequency specified represents a need for frequent spawning conditions.

- *Base Flow:* Base flow criterion is 250 cfs from Navajo Dam to Farmington and 500 cfs from Farmington to Lake Powell. This flow enhances nursery habitat conditions and backwater habitats.

- *San Juan Operating Model Rule Decision Tree*: The San Juan Operating Model Rule Decision Tree provides operating criteria for Navajo Dam operations to meet the flow recommendations and fulfill commitments made as part of the Biological Opinion (BO). Hydrographs were developed for various time frames of 1 to 4 weeks. The hydrograph is overlaid on top of base flow to get to the volume numbers (which range from 114,000 ac-ft to 344,000 ac-ft).
  - *Definitions:*
    - Carryover storage – is water in the reservoir that remains at the end of the year. It is similar to End of Water Year Storage Targets (EOWYST). The water year ends on September 30th.
    - Perturbations – a year in which the nursery habitat has been deteriorated by storm events to a level requiring flushing. In other words, a year in which there have been more than 13 sediment event days between August 1 and December 31. To determine perturbation, if a 6th day is greater than 150 cfs *more* than the previous 5-day running average, this is defined as a perturbation event.

- *Flow Challenges:*
  - Examination of the 10-year running mean-average flow indicates that the system is no longer having high flows. There has not been a "bumper" flow for a long time. In other words, there has been a loss of very wet years in the average. The reality of this is that it is now very challenging to get to the 8,000 cfs and 10,000 cfs flows.
  - 2005 was one of the wettest periods in record and has strongly influenced the statistics.
  - Encroachment of non-native vegetation has resulted in an "armoring" of the channel and banks in many of the reaches. The combination of riparian vegetation changes and loss of high flows has resulted in significant challenges.
  - It has also been determined that, by itself, 5,000 cfs flows do not do what they were supposed to do. It doesn't improve habitat unless the flow reaches 5,000 cfs, but then continues to increase to a larger flow (of 8,000 cfs or greater).
    - Similarly, there is no correlation (or observable changes) between 2,500 cf flow days and cleaning cobbles even in decent runoff years. This doesn't necessarily mean that no areas get cleaned, it is just that forcing a 2,500 cfs release in poor water years is not cleaning the cobbles as anticipated.

- *Conclusion:* The Decision Tree and flow recommendations were developed with the information available at the time. But we now have better information and more data. Some revisions have already been initiated, but there is general acknowledgment that more changes are needed in order to meet the changing system.
  - One suggestion is to consider not attempting to "force" a hydrological peak that nature isn't going to provide or support. An 8,000 cfs or 10,000 cfs river cannot be accomplished without the Animus River contributions and even then there is a timing issue. The concept that Reclamation is proposing [see Section 3.0 of these notes] is correct – to store up water to have the resources available to release higher flows and less "smaller" flows.

2.1 Discussion and Questions

- ***Comment***: The fitted line in the negative habitat response graph is basically meaningless. A linear relationship could have been "drawn."
  - ***Response:*** This is a correct observation. Big flows are needed to do the "big work." Dumping a 5,000 cfs flow for 21 days is not enough to get the work done. This is partially due to the armoring of the banks.
- ***Question***: Where did the hypothesis originate that a flow of 5,000 cfs for 21 days would have a significant physical effect?
  - ***Response:*** The flow recommendation came from years in which similar flows were observed to clean the channels. However, there was an auto-correlation occurring as those flows continued from 5,000 cfs to 8,000 cfs or greater.
  - Even though there is only 5 data points, the data and the observation on the river indicate the same things – the 5,000 cfs flows do not clean out the backwater areas and there is no increased functionality.
- ***Discussion:***
  - The 2005 Revised Flow Recommendations included investigation of the ability to obtain high peak flows (of 8,000 cfs and greater) during runoff periods. The shape of the ascending and descending limbs of the hydrograph was changed. It also resulted in the recommendation to focus on achieving higher flows at the expense of not meeting the 2,500 cfs and 5,000 cfs flow recommendations. This resulted in a simplified Decision Tree.
  - Reclamation's recently recommended changes [see Section 3.0 of these notes] simplify the Decision Tree even further. The underlying question is "why force a release that doesn't do any good?"
  - Similarly, it has been determined that the perturbation releases don't work at all either (don't provide enough water to accomplish any cleaning) so those have been eliminated as well.
- ***Comment:*** It almost appears that the river seems to "bounce along" and then suddenly there are big changes. Even with high flows, the river "meanders along" for a while but then there is a big change year (example: 1995 and 2008).
  - ***Response***: Previous to 1999, the river system was actually very different due to more water (and higher flows). The "reset" in 2008 is harder to explain. Cobbles are a local effect - even at bankfull cobbles won't necessarily be transported. There has to be a break in the resistance before movement can occur. The system is neither aggrading nor degrading; but it is becoming narrower and this changes the total wetted area. The armoring of the channel also impacts how the system functions.

3.0 PRESENTATION: Reclamation's Operational Limitations for Implementing Decision Tree and Hydrology Modeling Analyses of Navajo Reservoir Operations

- Ryan Christianson, with Reclamation, provided background information on the operation of Navajo Dam.
  - Navajo Dam has been operating on the revised recommendations and Decision Tree from 2006. As operators, Reclamation has to meet contractual obligations and all commitments on the project. Over the last several years, the reservoir levels have

become critically low and there are real concerns with shortages in the river basin. These concerns include having enough resources to meet baseflows in drought conditions. Reclamation has developed a concept – an idea to provide some protection in a multi-year drought by "saving" supply toward larger release flows for the species.

- Susan Behery, with Reclamation, then presented on Reclamations Operation Limits for Implementing the Decision Tree and Hydrology Modeling Analyses of Navajo Reservoir Operations.
    - *Concerns and Challenges:* The hydrology reduction (water available) in the San Juan Basin is one of the main concerns. There has been an 18% decrease in the average inflow into Navajo Reservoir over the last 15 year. The dryer conditions are forecasted for the future as well. Stakeholders, including operators, have to plan for this.
    - *The Implementation of the Flow Recommendations and Decision Tree:* Using the Colorado Basin River Forecast Center's (CBRFC) inflow forecast (2x monthly from January to the end of July), the hydrology predictions for spring are calculated. Remember that the forecasts can change until just before a spring release and this can result in a modified decision.
        - There is usually a "spread" in what can happen – between the minimum and maximum of the forecast. But when compared, the system tends to be typically drier than the forecasts. In only 3 years did the actual hydrology turn out to be higher than the predicted hydrology.
        - 2014 has been the only year to date that the Decision Tree wasn't followed. A "one week" release was recommended, but the decision was made to forego that release due to the drought. There is the prospect of getting "stuck" in a small-release "cycle" in the Decision Tree due to below-average water years.
            - The 2,500 cfs flow recommendations have been met due to the Animus River flows having enough to cover the recommendation without a release.
    - *Reclamation's Proposed Changes:*
        - 1. One suggested change is to **operate Navajo Reservoir on an annual basis** – in part because the reservoir hasn't been able to "recover" in subsequent years.
        - 2. Another suggested change is to the **Available Water Calculation – focusing on an End of Water Year Storage Target (EOWYST);** the proposal is to start and end the water year at the same lake elevation every year instead of having a small carryover storage that protects the reservoir for 1 year only.
    - *Modeling:*
        - The differences in spring peak release frequency, size, and timing between the original and proposed methods are being modeled to help determine the change in probability of shortage or spill (see explanation of 'spill' below).
        - Modeling was also used to help determine which EOWYST will provide the most insurance against shortage while minimizing the probability of spill.

- *Recovery Period:* Within the bounds of a single water year, neither method does much better than the other due to the same limiting hydrology. The difference is in the recovery period. The reservoir recovers quicker with the proposed changes.
    - In response to a question regarding the risk of using data from 1970 through 2013 compared to just using the 1990s and on, it was responded that the modeling was completed as 2 separate analyses for just this purpose.
    - In response to a question regarding how the lake elevations are changing the available water, it was shared that if lake elevation is low (ex. 6020) and the following year is very dry, there will be a shortage. But if the lake elevation is between 6050 and 6060 and the same dry year (same hydrology) follows, the reservoir will go down, but is not critically low.
        - If lake elevation is too high, then there is risk of having to "spill" the water. "Spill" water is excess water that has to be released quickly for storage or flood control reasons. Spilt water can almost be considered "wasted" as it is not available for habitat or other environmental uses. Lake elevation above 6064 is too high.
        - If lake elevation is too low, then a single dry year sees very little inflow, but high diversions resulting in shortage situations.
        - If the lake elevation is at a "sweet spot" (~6063), then the reservoir can afford to drop 20-30 ft, still meet demands, and be able to recover more quickly - and thus be in a better starting situation for whatever the following year brings.
- *Changes Under the Proposed Method:*

Original Method	Proposed Method
Less periods of "no releases"	More periods of "no releases"
More 1-week releases	Less periods of 1-week releases
Less periods of higher flow releases	Increased frequency of higher flow releases

    - The water that would have otherwise been "used" or available for the 1-week releases could be "held" toward higher magnitude flows (which are the most beneficial and provide more "bang for the buck.")
    - In other words, there would be more frequent Type 2, Type 3, and Type 4 flows at the expense of reducing the Type 1 flows – using the same decision tree hydrographs and same baseflow volumes that are in the current flow recommendations. And baseflows are the same for each "rank."
        - In response to a question regarding the potential to have to "chase the baseflow," it was responded that it would depend on the year. If more water were available after one of the prescribed hydrographs, then this would probably be true.
- *Flow Statistic Comparison Graph:* Under the proposed method, the lower flow recommendations will be met less often; but the higher flow recommendations are more likely to be met more often.
    - In response to a question regarding how the releases were centered (timing of release), it was responded that this was not done in this model. When trying to "chase the peak" with modeling, it was found to be worse than using the June 4th date. Instead, it is centered and changes with the forecast. The Animus peak forecast was not matched; in reality, we could improve the results if the peak forecast is really good.

- *End Of Water Year Storage Target (EOWYST):* Several model runs of 5-year drought cycles were done to inform the selection of an EOWYST in order to maximize safety while reducing the risk of shortage in the reservoir.
  - Increasing reservoir elevations by as little as 5-feet can result in the ability to meet obligations an extra year.
  - This method allows operators to hold back releases when the water isn't available – instead of forcing small releases even in poor water years that have no real benefit.
  - There is a "basement" reservoir level of 6018.
  - *EOWYST Recommendations*:
    - The minimum elevation to avoid shortage is: 6052
    - The maximum elevation while avoiding spill is: 6063
    - Reclamation's preference is to "aim" for a higher elevation based on the recent changes in hydrology and the resulting higher risk of shortage (there is more demand in dry years, forecasting errors, etc.). To clarify, more has to be released to meet baseflow in dry years but in wet years, users don't divert as much water due to precipitation).
    - In response to a question on the statistics of the diversions (how often/how much), it was responded that those weren't analyzed for this process. This model was "gage to gage" as a statistical model. However, the worst year (2002) was run 5 consecutive times to model a worst case scenario.

- *Comparison of Current and Proposed Methods for Implementation Now:*
  - Hydrology/inflow would be based on the February 3rd CBRFC forecast.
  - The date for the EOWYST is September 30th (end of the water year).
  - Reclamation continues producing twice-monthly calculations.
  - There would be potential spring peak releases:

Original Method	
2015	1-week spring peak release
2016	1-week spring peak release

    - Under the original method, a 1-week spring peak release would be called for in both 2015 and 2016.

  - In the proposed method:

Proposed Method		
EOWYST	Year/Release	Year/Release
6030	2015: 2-wk spring peak release	2016: full hydrology
6040	2015: 86,000 available water	2016: full hydrology
6050	2015: 0 releases	2016: full hydrology
6060	2015: 0 releases	2016: 3-week peak release
6070	2015: 0 releases	2016: 3-week peak release

- The reservoir elevation has to be built up, but once met there will then be opportunity to produce necessary high pulse flows.

3.1 Discussion and Questions

- At the conclusion of the Proposed Methods presentation, attendees asked questions and held a "round robin" table discussion.
- ***Question***: How "good" are the Animus predictions?
  - ***Response***: Animus predictions have only been done for the last 2 years but it is better than just centering over the June 4th date. However, it is not perfect.
  - Looking at release patterns in history, the first peak of the Animus tends not to be the biggest. There is the risk of releasing to match the Animus only to determine it was a "false" peak.
  - The peak is one of the most difficult to forecast and operators have to provide a week's notice in anticipation of a spring peak release. The Animus peaks are driven by temperature.
- ***Comment***: If there is agreement to the EOWYST, a high water year could raise lake elevation beyond the EOWYST which would require a "dumping" of water at the end of the year to maintain the agreed-to elevation.
  - ***Response:*** Correct; the goal would to be start and end every water year around the agreed elevation (ex. 6050 or 6065). There needs to be sufficient space in the reservoir to capture big snow years but covers the dry years as well. The elevation goal is not a "rule" but a target that considers flood control, drought, species needs, etc.
  - If needed/necessary, a large release for flood control purposes would be made. However, in reality and practice, it is better to increase the target baseflow throughout the season(s) instead of waiting until the end of September. Remember, September is in the middle of monsoon season and the reservoir can come up ~10ft.
- ***Question***: In the new approach, elevation target "feeds back" into the management of the reservoir to achieve that goal?
  - ***Response***: Yes; the Available Water Calculation determines what type of spring peak can be made.
  - Reclamation is proposing to operate with a higher EOWYST volume in order to be prepared for multiple drought years.
  - The available water will not necessarily match the releases made. But the intent is to go into the following year with a certain "bank of water." Under the original method, the reservoir can get much lower.
  - Essentially, there is an increase in the carryover storage.
- ***Question:*** How much impact/influence, if any, does the recreational use of Navajo Reservoir have on the management of the water?
  - ***Response***: They have input if there is an excess of water, but they have no real driving input.
- ***Question***: What is the difference between carry over and EOWYST? Carry over looks at how the flow recommendation(s) had been met in the previous year?
  - ***Response:*** Carry over doesn't look back directly, but does consider the previous releases.

        - The proposal is to do an annual "accounting" – so once the targeted elevation has been reached, outflow will basically mimic the Animus in terms of what comes in will be what goes out.
    - ***Question:*** If the proposed changes/methods were run through the model for the last 2 years, would we have been able to have a full release in 2013? Also, the 2015 and 2016 water calculations currently assume an average water year – is this accurate?
        - ***Response***: Realistically, there is a low probability that 2015 and 2016 will be "average" years. But in future years, the proposed methods allow for more flexibility in the releases.
    - ***Comment****:* Concern was raised that the fish would "bear the brunt" of the "shortage" until the reservoir elevations have been met. What do these "interim" years mean in biology terms for the needs of the fish? We know they need the full hydrograph which will be delayed until the lake reaches elevation.
    - ***Question:*** To give us a sense of comparison, if lake elevation were at 6060 in 1999 and given the actual hydrology (actual inflows, 2012 NIPP, etc.) what are the predicted model results? How would the recent years look compared to how they actually turned out?
        - ***Response:*** The models that Reclamation ran used the actual inflow and actual hydrology (gage data) for the period. The releases from Navajo are modeled. Reclamation modeled the predicted releases based on which method was selected.
    - ***Question:*** There is general understanding that the proposed changes will increase reservoir elevation to provide "insurance" toward avoiding shortage situations, but what is it going to take? It can be assumed that there will be little or no releases during that time. And the situation may remain the same in terms of providing base- and other flows. Isn't it likely that once the water user demands have been met the recovery of the reservoir prevents other flows/releases?
        - ***Response***: Operators have been following the decision tree – making small releases that result in low reservoir elevation at the start of every water year. There have been multiple dry and below average water years. Even in a great water year, there would be challenges in meeting flow recommendations because it is a struggle to recover the reservoir. If the starting elevation can be raised, then there will be more opportunity in the future to use good water years for the environmental flows.
        - The idea is to get more of the higher flow years by shifting the operations to target the bigger releases. The bigger flows become the focus by avoiding having to "dump" water in dry years when there is no real benefit to putting that water in the river. If the reservoir can be kept higher, then there is enough to release even in poor years. This is a good interim solution until the flow recommendations can really be revised.
        - Realistically, there won't be any spring peak releases anyway during bad drought years. But under the proposed methods, there would have been some water in 2016 available to make some releases (assuming 2016 is a near normal year).
        - The current path is a "death spiral" unless something changes. The flow recommendations need to be revised, but we have this interim period that has to be addressed.
        - There have been no releases over the last 2 years but that is because there has been no water. Current lake elevation is 6038.

- ***Comment:*** Keller-Bliesner Engineering worked with Reclamation, reviewed the model, and developed a revised decision tree. The major difference is the lack of look-backs. Look-backs are important in considering conditions. The new method doesn't really account for past releases.
    - However, the proposed method accomplishes getting rid of the ineffective, smaller releases (Type 1 – 1-week at 5,000 cfs).
    - The old decision tree forced filling in gaps during a naturally dry hydrograph. The proposed decision tree follows the hydrograph – if wet year, release; if dry, don't release. It tracks the natural hydrograph better by not trying to fill in dry years with "something."
- ***Comment:*** The statistics from the period of record may very well not apply now, but the proposed method makes the best of what is coming in. Another thing to keep in mind is that if the drought conditions stay as is, then this is moot since we can't make the high releases anyway.
    - ***Response:*** The experience we are having now is outside of history.
    - The past can't just be "thrown out" but the future is going to be a lot different.
    - The adaptive management framework can be modified to incorporate the ability to "look back" while making decisions on releases.
    - Decision makers need to stay away from "just the year we are in" but to make determinations based on the "best way to assist" the fish with what is given.
    - The target elevation has to be "set" in order to calculate the Available Water. But storage is not going to happen if there isn't water. Managers will have the opportunity to determine what to release given the constraints.
    - Some attendees see this as a 2-step process: (1) make the collective decision to implement the EOWYST and create additional carry over storage; and (2) available water will be used for a spring peak or other environmental flows or experiments.
- ***Question***: Were any "stress tests" run?
    - ***Response***: Yes; the 5-year drought sequences with 2002 conditions back-to-back. This represents a statistical break out on the 75% exceedance for the experience of record. Running 2002 conditions 5 years in a row was the most severe and is assumed to be "off the charts" and would result in no "rescuing" the reservoir.
- ***Question:*** Regarding the potential modification of the base releases, those still won't go above 1,000 cfs? Just moved up toward that upper limit? The low end (500 cfs) is not optimum for the backwater habitats.
    - ***Response:*** Yes; the baseflow would be increased toward the upper limit of 1,000 cfs.
- ***Comment:*** Keep in mind that these fish evolved many years ago and have experienced horrendous drought in the past. There is a reason the fish live to be 30-40 years. They are resilient to environmental "changes." Adults might only successfully spawn every 10-15 years. Why release small amounts of water with little benefit when "give an all you've got" releases in intervals could have the most impact. Bank as much water as possible to support maximum releases that can create conditions for successful spawning.
- ***Comment:*** It is intriguing to compare both methods – the differences are "not that far off" when graphed. But there is a paradigm shift occurring. In terms of the biology of the fish, they no longer live to be 40 years old. They evolved to handle the good times

for a while as well as the bad times for a while. But they are now dealing with contaminants, non-native fish and vegetation, etc. The biology component needs to be considered. What are the real stressors the fish can stand up to? Avoiding shortage is a good thing – but until the elevation is built up, the fish might be the ones "getting shorted."

- The fish that were resilient to drought lived in certain areas, but this means we need better management of the water we do have.

- ***Comment:*** Currently, low reservoir elevation means that high flows can't be released even in wet years. Once the EOWYST is reached and held, there will eventually be the situation where more frequent high flows are possible.

- ***For Consideration:*** If there is less than 90,800 ac-ft of available water, how should it be used? "Bumping up" base flow or holding the water (for a spike or higher EOWYST)? Thoughts?
  - ***Comments:***
    - The Biology Committee could determine experiments/testing/research opportunities (such as releasing smaller amounts for a set duration). The BC could spend time "fine turning" what is done with the monitoring, looking at specific questions, management tools, non-flow alternatives, etc.
    - Maintaining flows around 1,000 cfs means more consistent habitat. Longer periods between higher flows mean that non-native vegetation is able to encroach and establish on the habitat. That in turn might increase the duration of dry periods and loss of habitat quality.
    - 750 cfs seems to be a critical level. There is the need to increase the baseflow if the hypothesis of losing the secondary channels is true. There is a lot of sand "stuck" in the system. This exasperates the system by not providing flushing flows.
      - ***Response:*** The 5,000 cfs flows are not enough to move the sediment and keep the secondary channels open. It takes the bigger flows to accomplish that work. But the frequency is too infrequent without help. It suggests that some combination of keeping nursery habitat and increasing base flow is the best option.
      - It is hard to target the lower baseflows since there is no control over the Animus.
  - ***Comment:*** One of the strengths of the original flow recommendations is the look-back. The biology of the fish is tied to the flows. A look-back needs to be included in order to monitor the response of the fish.

- ***For Consideration:*** If the baseflow is increased and we target a higher EOWYST, what are the thoughts on how the system is managed?
  - ***Comments:***
    - It the baseflow is set at 750 cfs, then there will be less available water.
    - There is a tradeoff but if available water is <90,000, baseflow can be raised to 1,000 cfs. There would be more wetted area but some of the backwaters would be lost (more flow). However, every one of the River Ecosystem Restoration Initiative (RERI) sites would be flowing at 1,000 cfs (they don't at 750 cfs).

- This is not a long-term setting, but a yearly decision.
- If the group agrees to move forward with these recommendations – even as an experiment - there won't be any releases in 2015.
    - Using the 80% minimum and maximum forecasts, there would be no releases in 2015 and limited water for some adaptive management in 2016.
- There is a wide range of variability in the forecast even in May. While there are outlying years (2005 – wet; and 2002 – dry), the system is usually trending in some "known" direction by May.
- ***Question:*** How did the lake elevation change with not having a spring release in the last 2 years? How long away are we out from getting to a higher (selected) elevation?
    - ***Response:*** The lake elevation was higher than predicted for the end of year. And the response will be tied to the hydrograph.
    - There is a real possibility of having a very dismal base flow in 2015.
    - In response to a question regarding the total volume of diversion every year, it was shared that the total volume of diversions out of the river every year are ~900,000 ac-ft (includes everything). But the total outlet release averages ~300,000 ac-ft not including NIPP – a lot of that is for the base flow.

- ***For Consideration:*** The proposed changes make an effort to minimize the shortage risk but from a biological perspective, do we know how "bad" the delayed releases are for the fish?
    - ***Response***: There has been 0 (zero) flow at Bluff over many of the past years. The fish have survived past droughts but a lot has changed since then (ex. invasive non-natives).
    - Lower flows can be detrimental to non-native fish especially in the summer. However, lower flows mean loss of habitat for the native fish as well. And the native fish don't really have the option of traveling kilometers to find suitable habitat.
    - There needs to be sufficient water (baseflow) to entrain the eggs in the nursery habitat in order to see recruitment to Age 1 (example given of Kevin Best's work in the Green River).
        - It was countered that the Green River is a very different system than the San Juan and it is not known if they are comparable from a larval perspective. But larvae and juveniles can end up "stuck" once flows recede.

- ***Comment:*** It is assumed that increasing baseflow results in increased habitat, but there are needs for low velocity habitat. It is not necessarily "a given" that increasing baseflow is helping fish in low velocity habitat (ex. razorback sucker, mosquito fish, etc.)
    - Distinctions need to be made on the different habitat types: in-river low velocity; off channel; or side channel habitat; etc.
    - The numbers of days with less than 500 cfs have decreased and the non-native fish population crashed. It appears to be detrimental to non-natives but this does not necessarily make it beneficial to the natives.

- ***For Consideration:*** The goal is to come to some agreement on the calculation of available water and EOWYST. Then hold discussions about what the 2015 flows and releases could look like.
  - ***Question:*** What is the volume difference between the lake elevations?
    - ***Response:*** It depends on where the elevation is but loosely: 1 foot = 10,000 ac-ft in the reservoir for lower elevations and 1 foot = 15,000 ac-ft at higher elevations.
    - It was clarified that the lake elevation will never be "taken below the set target" – it will be managed so it will return to that target by the end of the water year (same starting and ending point). An early runoff can be stored causing the reservoir to rise (ex. from starting point of 6050 to 6080). But that water will then be managed – and released as a spring peak. The lake elevation may go below 6050 as a result of the release, but the remainder of the year is managed to bring the elevation back to 6050. The risk occurs when the elevation drops too low.
    - It was also clarified that Reclamation is not proposing storage of any specific flow target (ex. Type 4 flows = 344,000 ac-ft).
    - The EOWYST "fixes" the available water for the next year – the idea is to be able to adaptively manage what is available. Another "version" might provide for upper and lower targets to get the flexibility to move water.
  - ***Question***: If there is little flexibility to store water for environmental releases, won't that force us into "perpetual" small releases?
    - ***Response:*** According to the statistic runs, the proposed method actually has less risk of perpetual small releases than the original method; the tradeoff is that there is higher probability of years without *any* release. This has to do with size of the release and calculations of how much water is available - which is dependent on the hydrology. There could be multiple years of no releases, but a big release could be accomplished in the first "good year." The releases would more closely "track" the Animus.
      - In the proposed method, the time between big events actually decreases. Within the proposed decision framework, the timing between really big events (3 and 4 weeks) decreases from every 5 to 6 years to every 3 years, even during drought.
      - It was pointed out that from a biological standpoint, the reduction in time between the big flow events actually helps to reduce/prevent the cementing of the Russian Olives.
      - The statistics on the 10,000 cfs flows didn't vary significantly between the original method and the proposed method. The real benefit comes at the 5,000 and 8,000 cfs range – there is a higher probability of having 3-week releases more often.
    - Concern was expressed that setting an EOWYST could produce a "use of lose" situation instead of more flexibility with carry over.
  - ***Question***: Is there a difference – in terms of the target elevation – between 6063 and 6050? Does it matter in terms of how often there will be a release?

- ***Response***: No, not for the big releases; there is basically no difference. The difference comes when the original method is compared to the proposed method.

- ***For Consideration:*** To address the biologist's concern about flexibility, it was suggested attendees consider setting a "standard" elevation target of 6063 but if a bigger release is needed in some years, then target elevation could be lowered to 6050.
  - The objective is to consider the cost-benefits between the different target elevations and the amount of shortage "risk insurance." For example, 6045 would still "buy" 2-years of insurance against shortage.

4.0 GROUP DISCUSSION: Develop draft recommended available water calculation/end-of season volume

- After a break, Jim Brooks reconvened the group and highlighted the major discussion topics that were identified during the previous Question/Answer session. Attendees were reminded that the proposals and suggestions are "short-term fixes" until the fish responses to management actions can be analyzed (flow recommendation review). The goal is to develop interim strategies to address 2015 releases. Highlights from the morning discussions include:
  - Flexibility in the system;
  - Ability to alter base flow is important;
  - Decisions regarding the proposed method changes and setting of an EOWYST; combined with adaptive management to determine annual releases;
  - Release decisions need to include monitoring to measure species responses;

- The current proposals for consideration are:
  - (1) setting a "standard target" elevation of 6,063 with a flexibility range to reduce to 6,050 for biological flexibility (ex. extend flow duration from 3 weeks to 5 weeks).
  - (2) set EOWYST at 6,050 for the next 2 to 5 years as an interim level, to have water available for environmental purposes sooner. Increase the elevation to 6,063 after a few years or with the next big water year.
    - Realistically, unless 2015 is a really big water year, a lake elevation of 6,050 won't be achieved this year.

  - ***Comment:*** Unless there are significant changes in the predicted hydrology, baseflow will be the only release for 2015. However, the decisions reached today could inform/guide the potential process for future years. There are concerns that a lack of inflow will limit the testing/monitoring that should occur during this interim process period. How could/should baseflow be altered this year?
    - In both the proposed and original methods, the prediction is the same: no water releases for 2015. More than likely, the EOWYST won't affect operations for 2015. Therefore, a higher EOWYST could be aimed for.
    - The reason this decision is important now (instead of postponing since operations are likely to be unaffected) is that (1) under the original methods, the Decision Tree would call for a 1-week release and (2) there is need to have the agreed-to process in place prior to April 1.
      - In support of the proposed changes, the key is to not just "send water down the river" this year if it is not expected to accomplish anything.
      - It was pointed out that the Program has decided to forego the 1-week release before without setting reservoir elevation targets.

        - In response it was shared that while true, the setting of EOWYST has added benefit in terms of decreasing risk of shortage.
    - ***Question:*** How would a late monsoon affect operations?
        - ***Response:*** A late monsoon could result in a "false peak" release at the end of the water year in order to maintain target elevation. However, with enough advanced notice, the excess would be released incrementally as increased baseflow.

- At this time in the discussion, Jim Brooks facilitated a poll on the agreement to accept the proposed method (decision tree) changes. It is recognized that the current method is no longer functioning as intended. There is the unintended "loop" that occurs with 1-week releases in below-average water years.
    - As a point of clarification, the probability of the high flow releases of 10,000 cfs would not really change under the proposed method but probability for the 5,000 and 8,000 cfs flows increases. Under the proposed method, more full hydrographs will be released compared to the original method.
    - The fish are more likely going to benefit from longer, higher releases at the appropriate times. Going to this new approach creates the likelihood of reaching those longer, higher flows more often given the same hydrology.
    - Given the current lake elevation and most probable forecast, foregoing the 1-week release and basic operations in play (base flows), ~ 8 to 9 ft could be gained in the reservoir this year.
    - Between 2012-2014 when there were no releases, the habitat didn't change significantly. Periods of no release might keep the non-native fish population down. The smaller spring releases are not showing a strong relationship with the native fishes.

- ***Decision Item: Forego 1-week release in 2015***
    - In a call for responses, attendees supported forgoing a 1-week release for 2015, regardless of other decisions. No objections or disagreements were voiced.

- ***Decision Item: Accept Proposed Methods and Revised Decision Tree***
    - With support of the majority of attendees, it was recommended that the Program accept the proposed methods and revised decision tree.

5.0 PRESENTATION: Flaming Gorge Environmental Releases Experiment

- Ms. Beverly Heffernan, with Reclamation, was introduced. She began the Flaming Gorge Environmental Releases Experiment presentation.

- *Description and Background:*
    - Rising 502 feet above bedrock, Flaming Gorge Dam (FGD) impounds waters of the Green River to form the reservoir. The reservoir has a total capacity of ~3.9 million ac-ft. At full elevation of 6,045 feet, it has a surface area of 42,020 acres.
    - There are 3 reaches:
        - Reach 1: Flaming Gorge Dam to the Yampa River confluence;
        - Reach 2: Green River confluence with Duchesne and White Rivers; and
        - Reach 3: Green River confluence with the Colorado River.

        - There is spawning and nursery habitat for both the Pike Minnow (PM) and the Razorback Sucker (RZB) in Reaches 2 and 3.
        - Keep in mind that during spring runoff, the Yampa is responsible for 65% of the volume (on average).
    - In 2005, impact analysis of the Flow and Temperature Recommendations for Endangered Fishes in the Green River Downstream of Flaming Gorge Dam (Flow Recommendations) from 2000 were finalized.

- *Flow Recommendations:*
    - According to the 2000 Flow Recommendations, spring peaks are focused on the importance of 18,600 cfs in Reach 2 in average years;
    - FGD releases should be timed to match peak, or immediate post-peak of the Yampa river; and
    - FGD releases should be timed to coincide with the presence of sucker larvae.

- *2014 Larval Trigger Study Plan (LTSP):*
    - The LTSP was implemented as part of the Upper Colorado River Endangered Fish Recovery Program Spring Flow Request. It was a 6-year study of the larval triggers and timelines.
    - One of the important goals of this program is the entrainment of larval RZB in designated wetlands. However, the flow recommendations put emphasis on the timing of peak flows with the Yampa River rather than on the timing of larval drift. In 2012, most wetlands dried up before juvenile fish could be returned to the river.
    - This lead to the recommendation to pursue flow revisions (shifts) which would better support the species needs.

- *Conclusions:*
    - The Service supports the research – the larval trigger study provided the biological benefit that is equivalent to meeting the peak. While Reclamation is still under the existing Decision Tree and therefore has to meet the first peak, increased flexibility has allowed for more focus on the second peak.

5.1 Discussion and Questions

- There is an acknowledged trade-off between "matching the Yampa's peak" and getting as much water as possible to as much habitat as possible.
- The flow and temperature recommendations are specifically aimed at avoiding thermal shock at the confluence.
    - The original thought was that "matching" the timing with the Yampa peak would be the correct timing for the entrainment of the larvae. That turned out to be incorrect and operations needed to shift the releases from Flaming Gorge to accomplish larval habitat and entrainment.
- The value of the Flaming Gorge example is not the differences between the systems, but the recognition that there are other things that can be used to determine how to manage the use of available water other than just following the path of spring peaks magnitude/frequency/duration. It is an example of thinking "outside the box."
    - As an example, the Flaming Gorge Flow Recommendations were put into effect, but it was subsequently determined that changes were needed. This is conceptually the same process that the SJR RIP is experiencing now.
- The Flaming Gorge example also highlights the need to determine the benefits of base flow versus peak flows.

- In response to a question on the timeline of the FGD Flow Recommendations to the initiation of the larval study, it was responded that the Flow Recommendations were completed in 2000, the EIS in 2001, and the ROD in 2006. Spring 2006 was the first spring of operation and the larval study was completed in 2012. As a 6-year study, it ran in parallel with the recovery program.

6.0 GROUP DISCUSSION: Discuss development of process for determining 2015 Navajo Dam environmental release, including but not limited to identifying information that will be needed (what), the sequence for decision-making (who), and timelines (when)

- In a working session, workshop attendees brainstormed and discussed potential process(es) for 2015 (and potentially future interim years).
- Attendees were reminded that the process for release determinations will need to follow the San Juan procedural process. Once recommendations are developed and passed through the Program office, the preferred actions would be provided to Reclamation and the Service.
- Concerns were raised on whether or not to include the 1999 Flow Recommendations in the Process Flowchart. Some members expressed the opinion that the intent was to move away from the flow recommendations and metrics and therefore they would not be required on the flowchart. However, other attendees expressed the opinion that the 1999 Flow Recommendations are the "foundation" and driving force of the existing process and therefore should remain as a part of the interim process until they have officially been revised.

- Identified "component" parts of the 2015 Process Flowchart included:
    - SJR Technical Working Group (a.k.a. Biology Committee) – will make the 2015 E-Flow recommendation(s) to the CC;
        - The recommendation will be based on:
            - (1) the 1999 flow recommendations;
            - (2) SJR hydrology;
            - (3) Available water calculations; and
            - (4) default recommendations (Reclamation's model).
            - Attendees debated whether or not to keep or remove the 1999 Flow Recommendations from the 2015 Process Flowchart. It was agreed that until the Flow Recommendations are revised, they should remain in the process. It is recognized that the metrics were valid even if not current.
        - An Adaptive Management component will be added in the form of a "feedback" loop that incorporates "new knowledge/new information/planned experiments" into the BC's recommendations.
    - The CC – as the deciding body of the Program will then "bless" the preferred actions and submit them to Reclamation and the Service.
    - Reclamation and the Service as the action and regulatory agencies – to work out the final details toward accomplishing the preferred actions (including ESA compliance).
    - Reclamation as the implementing agency.

- In support of the recommended process for 2015, the Service specified that as long as the "preferred actions" (or recommendations) come from the Program and they are in compliance

with the ROD, then the Service will accept them as the best available science with which to move forward with recovery.

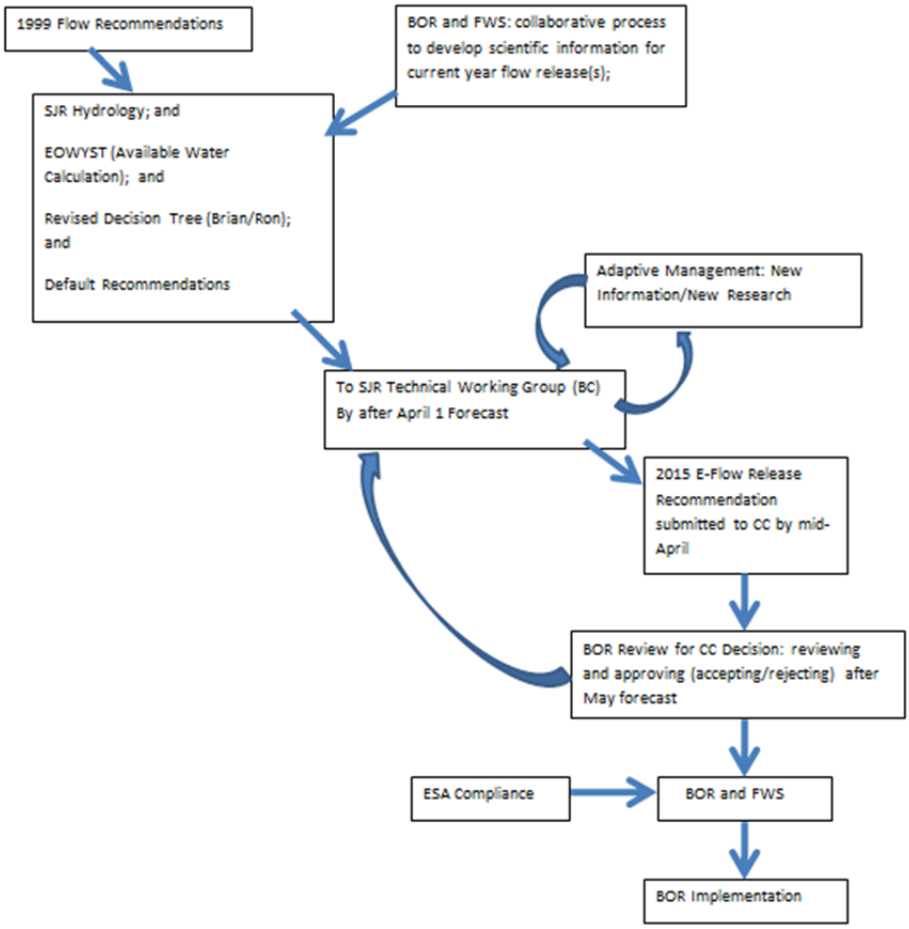

Figure 1. Draft Proposed 2015 Process Flow Chart

- ***Question:*** For a number of projects, consultation compliance depends on meeting specific flow recommendations (Section 7/ESA issues). This is a change from how those projects were analyzed – could it potentially trigger reconsultation with those projects?
    - ***Response:*** Service representatives shared that it is not necessarily a conflict. The preferred actions will be based in part on what water is available to move down system. And no, reconsultation is unlikely.
- ***Question:*** Is there enough scientific information on the benefits of increasing base flow from 500 to 750 or 1,000 cfs? What are the benefits to the fish?
    - ***Response***: Increased base flow opens up the secondary channels. But it would be prudent to treat this as an experiment and actually measure the effects (test the effects at lower flow and higher flows).
        - On-the-ground monitoring of restored sites will occur in 2015.
- ***Question:*** Flaming Gorge set their elevation target in the spring. What is the difference in meeting elevation in the spring or the fall?

- ***Response:*** For Navajo Dam, the water year ends in the fall (September 30th). There needs to be reservoir space for the possibility of monsoons, and early run off.

- ***Comment:*** From a NEPA perspective, the goal is to avoid the necessity of having to redo NEPA analysis on flow recommendations by remaining in compliance with the last environmental statement. This means not violating the 150,000 flow regime.

- *Contracting Considerations*
  - In response to a question regarding the ability to complete experiments and hypothesis testing this year, it was shared that there would be limited ability to use existing contracts to accomplish new work.
  - The BC could discuss what flexibility, if any, is available in relevant/existing scopes of work and contracts.
  - ***Question:*** What latitude, if any, exists under current scopes of work? It may be a moot point for 2015, but should be considered in the process in order to be availed in 2016.
    - There is no flexibility within the Habitat Restoration (HR), stocking, monitoring, or non-native fish removal projects. However, it is not necessarily impossible to find flexibilities within other contracts.
    - Before any modifications are attempted, the BC needs to first identify the pertinent questions that are to be addressed through the change in work.
      - It was suggested the BC develop a list of questions that can be addressed during appropriate years. This would enable crews to have contingencies built-in in order to mobilize in time.
    - With some "cleverness" and relatively "simple tweaks" it could be possible to test certain hypotheses under existing constraints. For example, monitor the changes in wetted habitat when base flow is at 500 and when it is increased.
    - Identified actions, activities, and hypotheses have already been captured in the Long-Term Plan (LTP). However, the BC can develop additional information requests and research needs every fall.

- ***Decision Item: 2015 Process Flow Chart***
  - Attendees agreed to the brainstormed 2015 Process Flow Chart with no objections voiced.

7.0 PRESENTATION: Overview and Update of SJR Hydrology Model Gen2 and Gen3

- Ms. Behery provided an update on the San Juan River Hydrology Models.

- *Background and Evolution:*
  - Gen2 was a monthly timestep model while Gen3 is a multi-modal approach with conversion to a daily timestep for application to the flow recommendations. However, Gen3 is difficult to maintain and impractical to operate. As a result, a simplification process was begun and Gen4 is in progress.
  - Gen 4 uses StateMod natural inflows. The states provide their own evapotranspiration (ET) data and irrigation information (ET-AC).
    - Riverware calculates depletions (implemented upstream of Navajo).
    - Everything above Navajo has been consolidated to the Pin, Piedra, and San Juan.

- The ET-AC method is being implemented downstream of Navajo. Further simplifications for users included:
  - Additional Riverware updates and improvements to simplify the interface for transparency and ease of facility data updates. These changes will not change calculations or results.
  - The documentation process is underway and the model will be calibrated.

- *Next Steps:*
  - The updated natural flow data (StateMod runs and ET-AC data from states) should be available in mid-March.
  - Gages will be calibrated over the incidental losses in spring/summer 2015.
  - Further simplifications to user interface and model transparency are scheduled for summer 2015.
  - Documentation should be completed by summer 2015 with review to occur late summer/fall 2015.
  - Any identified "loose ends" are to be fixed/addressed by the end of FY2015.
  - Gen4 should be ready and available for use as early as this summer.

7.1 Discussion and Questions

- ***Question:*** What is the most current year?
  - ***Response:*** The hope is to have 2014 data included but some states data may only be available through 2013.

8.0 Group Discussion: Finalize Recommended Available Water Calculation (Workshop Outcome #1)

- Returning to the discussion on the calculations for available water, attendees revisited several key points that had been identified earlier.

- The current proposals for consideration are:
  - (1) setting a "standard target" elevation of 6,063 with a flexibility range to reduce to 6,050 for biological flexibility (ex. extend flow duration from 3 weeks to 5 weeks).
  - (2) set EOWYST at 6,050 for the next 2 to 5 years as an interim level, to have water available for environmental purposes sooner. Increase the elevation to 6,063 after a few years or with the next big water year.

- ***Comment:*** If an EOWYST is set for 2015, even at a lower elevation, there will be no water available to do any releases. However, we either have to set the EOWYST or find another way to calculate available water for 2015.
  - ***Response:*** There is a chance for more snow and moisture, even if slim, and there needs to be a plan in place for such a situation.
  - We need to agree on a method for calculating available water but that method can have flexibilities built in.
  - The presented information suggests that the changes have the potential to help fish. Why put off the decision to set an EOWYST? What is there to lose? Even if there is no immediate difference this year, that does not justify "pushing it down the road." The sooner the decision is made, the faster we reach the pattern of higher flow releases.
  - There is no knowing how long the drought will continue. The probability of not moving toward wetter years is one reason why Reclamation has developed this proposed change(s).

- Based on the discussion, it was advocated that the EOWYST be set at 6063 with the caveat to lower that elevation if there were compelling biological needs.

- ***Comment:*** Set the "standard" EOWYST high (6063) but allow the elevation to be decreased at the discretion of the BC. This introduces flexibility to call for a 4-week release versus a 3-week release if there is biological need.
  - ***Response:*** If the EOWYST was set lower (6050) the larger environmental flows could be released sooner. The fish will not be getting the needed large flows while the elevation is built. It has been too long since any big release has occurred and an EOWYST of 6050 increases the likelihood of available water for environmental flows sooner instead of later. This includes increasing base flows sooner.
  - One reason to aim for the higher elevation is the quicker reservoir recovery.
  - ***Recommendation:*** It was suggested that Reclamation provide 2 water calculations: (1) one for EOWYST of 6050 and (2) one for EOWYST of 6063. The BC then determines which has the best species benefit for that year.
  - If the EOWYST is set at 6050 and a great late winter/early spring is realized, then the elevation could potentially exceed the target resulting in "excess" water having to be "dumped."
  - At 6063, there is virtually 0% chance of spill. It is much easier to release water and it is much harder to create water. Shortage is Reclamation's bigger concern.

- ***Decision Item: Setting of the EOWYST***
  - With a majority support, attendees agreed to a "standard target elevation" of 6063 with a flexibility range to reduce to 6050 for biological flexibility (ex. extend flow duration from 3 weeks to 5 weeks).
  - The final decision will be up to the Program Office and the Service, with the consideration of the opinions and recommendations of the workshop.

9.0 NEPA/ESA compliance check:

- Discussion on NEPA and ESA compliance occurred earlier in the meeting, during other discussion. Please refer to Section 6.0, pages 18 and 19 for details pertaining to the compliance discussions.

10.0 Conclusions and Wrap-up:

- Jim Brooks brought the meeting to conclusion with a very brief summary of the agreements reached today:
  - Attendees supported forgoing a 1-week release for 2015, regardless of other decisions;
  - With support of the majority of attendees, it was recommended that the Program accept the proposed methods and revised decision tree;
  - Attendees agreed to the draft 2015 Process Flow Chart developed in working session;
  - With majority support, attendees agreed to a "standard target elevation" of 6063 with a flexibility range to reduce to 6050 for biological flexibility (ex. extend flow duration from 3 weeks to 5 weeks).

- Jim then briefly reviewed the intent for tomorrow's agenda.

- No Action Items had been assigned during the meeting. Several items were recommended for BC considerations/future discussion (in no particular ordering or ranking):

- (1) The Biology Committee (BC) could determine experiments/testing/research opportunities (such as releasing smaller amounts for a set duration). The BC could spend time "fine turning" what is done with the monitoring, looking at specific questions, management tools, non-flow alternatives, etc.
- (2) The BC could discuss what flexibility, if any, is available in relevant/existing scopes of work and contracts.
- (3) It was suggested the BC develop a list of questions that can be addressed during appropriate years. This would enable crews to have contingencies built-in in order to mobilize in time.
- (4) Identified actions, activities, and hypotheses have already been captured in the Long-Term Plan (LTP). The BC can develop additional information requests and research needs every fall.

- The floor was opened, but no public comment was given.

DAY TWO: February 13th, 2015

1.0 Opening and Re-Cap of Day One

- Jim Brooks welcomed everyone back for the second day of the San Juan River Environmental Flows Workshop #1.
- After briefly reviewing the agenda for today's session, Brooks summarized the significant discussion and agreements reached at yesterday's session. He then opened the floor for any outstanding comments, questions, or additional discussion pertaining to yesterday's session.
  - ***Concern:*** A concern was raised that yesterday's decision (to set EOWYST at 6063) basically translates into "giving up" the potential for Type 3 or 4 release this year if one accounts for carry-over storage, current lake elevation, and other accounting.
    - It was clarified that all the diversions and uses have to be accounted for. A 1-week release is the most probable for this year given the Decision Tree and the hydrology. The original calculations would call for a 1-week release – not a Type 3 or 4 release.
    - The shift from one paradigm to a new paradigm could be viewed as temporarily "resulting in the loss of water" but within as little as a year, the situation(s) will be much better for all concerned.
    - The 2,500, 5,000, 8,000 and 10,000 cfs flows have not been met for some time. The fish have been dealing with very little water and very little releases for a while now. Yesterday, we agreed to conserve that water to provide security for users and to have potential in 2016 for some type of beneficial release (possibly a 3-week peak depending on hydrology).
  - ***Concern:*** Concern was expressed that what is modeled doesn't actually translate into "what we see in the actual river." A model doesn't necessarily predict what is on-the-ground, so how can we say the proposed changes are "better?"
    - It was clarified that in Reclamation's work, the actual hydrology was modeled to see how the methods compare. (The same hydrology is used for both; what came into the reservoir was used).

        - The same constants were used for both methods in order to make "apples to apples" comparisons. The result is that the proposed method increases the frequency of the higher flow releases while decreasing the Type 1 flows.
        - Realistically, with the given hydrology (dry) it remains a reality that there won't be the necessary hydrology to achieve big flows under either option.
    - ***Concern:*** Concern was expressed that it will be the fish that has to "absorb the sacrifice" while waiting for the lake to reach higher elevation.
        - As mentioned earlier, regardless of method, it is very unlikely that releases could occur in 2015. Moving to the proposed method actually increases the chances of releases and larger releases in the near future (maybe even 2016). This seems to be the best available information and the best option for this continued severe drought.
        - The changes are not sacrificing anything when compared to the recent years. We haven't been able to achieve beneficial higher flows for several years now.
        - Once the Flow Recommendations are revised, everything will have to be revisited again.
        - The alternative is to continue "business as usual" and have to address the Decision Tree's call for a 1-week release and get to a shortage situation or try the proposed changes and "bank water" to improve the situation as early as next year.
    - ***Clarification:*** The agreement yesterday was to set a "standard" target elevation of 6063 with a flexibility that comes into play once elevations actually reach 6050. This means that once the lake elevation has reached 6050, the BC has the ability to recommend releases. If there are no biological needs for releases at the time, then the water is "banked" toward the next season.

2.0 Group Discussion: Discuss options and objectives for evaluating and modifying the 1999 San Juan River Flow Recommendations during Workshop #2 including but not limited to goals, requirements, outstanding questions, needed analyses/information, stakeholders, and timelines

- In this session of Workshop #1 Day 2, attendees began discussions and planning for Workshop #2.
- It has been suggested that Workshop #2 be focused on the development of new Flow Recommendations. Suggest agenda items included:
    - A) develop proposed updates to the 1999 flow recommendations;
    - B) determine Workshop #2 deliverables;
- In order to accomplish Workshop #2 goals, the following list captures some of the needed information and preparation:
    - a) evaluate the effectiveness of current 1999 Flow Recommendations including:
        - i) understand/characterize/determine fish response(s);
        - ii) understand/characterize/determine habitat response(s);
    - b) understand/characterize fish and habitat response to other factors (e.g. non-native fish, non-native vegetation, fish passage, water quality and temperature, engineering constraints, habitat restoration, etc.);
    - d) process to accomplish A & B for workshop 2

- ***Considerations for Revised Flow Recommendations:***
    - *Review/summarization of the flow ecology relationships (flow with the riparian vegetation)*
        - For example, design flow releases that are not beneficial to non-natives (Russian Olive). Understand the inter-relationships with management.
        - The 2012 Habitat Workshop explores this topic and how it relates to ii) understand/characterize/determine habitat response(s). The Habitat Workshop "sketched out" ways to approach what kind of flows are needed to help restore some of the habitat.
        - The history of the encroachment of vegetation: where the non-natives are located now, how fast they "spread" and encroach, where they are predicted to get worse, what magnitude and frequency of flows are needed to make headway against encroachment, how encroachment has armored the banks and constrained flow and flow effectiveness, etc.
            - It might be useful to divide the river sections into 2 types: (1) areas where Russian Olive is already established and flow isn't expected to accomplish anything there; and (2) RERI sites where there has been mechanical intervention and the relationship with flows and river characteristics that maintain (limit the encroachment of) those sites.
    - *Review Flow Recommendation Assumptions*
        - There are assumptions in the Flow Recommendations that certain flows will accomplish certain things – but recent information indicates they don't.
    - *Review/Discuss the 3 Major Trends (factors) that have emerged in importance since 1999 and assess their relationship with/to flow*
        - 1) proliferation of non-native fish;
        - 2) climate change and climate induced changes in hydrology and the constraints put around the flow releases; and
        - 3) changes in flood plain vegetation dynamics and implications for habitat along the river;
    - *Presentation on the Various Investigations in Data Sets on Fish Response*
        - This should not be a massive effort since this type of work has been on-going for a while. The restored secondary channels could also provide justification for modifying the Flow Recommendations; but the in-river flow regimes for RERI and Phase II sites should be the primary focus.
    - *Review "Outstanding Questions" that need to be addressed and moved forward*
        - The BC could be the venue to identify the specific questions and outstanding data needs.
    - *Suggestion: Focus Workshop #2 on the Review and Summation of Everything We Know*
        - There is so much that we don't collectively know; therefore the focus of the next workshop should be on generating a common understanding of "what we do know." Then the next step would be to connect the water and see what is likely to work.
        - Pull the "pieces" together and then address the conditions to model (integration with the hydrograph).

        - List/identify all the pieces of habitat and fish response that still need hydrology/geomorphology/habitat analysis and leave the water management implications out of the Workshop #2.
        - Investigate the temperature at the confluences for the San Juan.
    - *Contracted Work/Scopes of Work*
        - It is too late to have new contracts move forward this year. Contracts for next fiscal year will need to be completed and in system before December 2015. Examples of potential contracted work could include: exploring temperature/collecting temperature data; reanalyzing any existing data; or run new model(s). Contracted work has to go through the award process: scope of work developed, on the streets for bidding, review bids, negotiate and award.
        - The goal is to develop an adaptive management strategy to manage flows from the available water that we get. The desired conditions need to be defined upfront. Basically, update the original 1999 desired conditions to reflect the changing system.
            - If we can define the desired conditions in a quantitative way, then we can "back track" through performance metrics and conservation actions to arrive at the actions to test.
            - The power of adaptive management is that it addresses some of the uncertainty.
            - Take what we think we know (flow of certain magnitude/duration) and assign performance metrics to arrive at what we think that action will be.
    - *Data Gaps*
        - Identify data gaps, poorly understood relationships, poor correlations between parameters and identify what is responsible.
        - Starting with the 1999 Flow Recommendations and the recommendations report, determine if the we collected the data that was supposed to be collected. If there is an identified data gap, can surrogates be used?
        - This does not need to be completed/identified in a large group but can be assigned to a smaller group to draft and then have the larger group review/input.
        - It was cautioned that the group not get "hung up" on data gaps and lack of data. The flow recommendations have to be adjusted even if there are "holes." But the adaptive management process is about refining things in the future as new information becomes available.
        - A concern was raised that the flow recommendations are being evaluated but in actuality, those flows were not met. This could make it difficult to say whether or not they did as assumed when the river never did see the flows (ex. 5,000 cfs recommended at 21 days but never realized).
    - *Recovery Considerations*
        - One major impediment to recovery is the long-range movement. Individuals travel long distances but can't return. This is related to habitat and not just flow.
            - Remember, however, that the fish population as a whole can exist in a "confined" [or "bracketed"] area. There would be a large portion of the population that remains in a certain area.

        - Concerning larval drift and loss of smaller fish over the waterfall, how can flows be used to move cobble bars to create more upstream usable habitat for the fish?
        - How can flows be used to create more braided channels to warm the water temperature? How can we influence the fish to move upstream?
        - The group should not just consider a set of flow targets but also produce other recommendations that are not strictly flow related (non-native vegetation management, waterfall, etc.).

- ***Suggested Workshop #2 Goal(s) and Objectives:***
    - The goal of the second workshop needs to be clearly defined. One overarching goal is the recovery of the fish. Thus, **the goal of Workshop #2 is to define the flows or range of flows that best support recovery of the 2 endangered fish (evaluate and update the 1999 Flow Recommendations)**. Any agenda item that does not support this workshop goal should not be included on the agenda.
    - The starting points for discussion are the current 1999 Flow Recommendations.
        - What is known about the fish and habitat response to those Flow Recommendations? What information is still unknown? What don't we have data for? Use that knowledge to determine the best options for achieving those conditions in the river.
        - The 1999 Flow Recommendations were based on the assumption that mimicry is the best path forward. But given the system changes (ex. Russian Olives) mimicry may not make the most sense. We need to be open to the possibility that important ideas are not necessarily captured in the existing recommendations.
    - *Objective: review and evaluate the content of the 1999 Flow Recommendations.*
        - Confirm agreement that 1-week releases of 5,000 cfs provide no benefit to the species or system. The needed higher flow of 8,000 and 10,000 cfs cannot be achieved without the Animus.
        - Review the justifications for the 1999 Flow Recommendations.
        - Ask: (1) did the system get the recommended flows and (2) what response was observed to the flows that were realized?; (3) what constraints have changed since 1999 and do these constraints still apply? This gets to the question of how things are different today from when the original conclusions were made.
    - *Objective: what existing (new) flow targets are out there that could be the basis/foundation for new recommendations?*
        - Going back to the biology of the fish, we have subsequently learned that (1) they need high spring flows for spawning, but (2) they can spawn almost anywhere. This means that retention and recruitment might become more important.
    - *Funding Urgency*
        - Congressional funding runs out in 2019. There is a presumed "hard target" of recovering the fish by 2023. There has to be significant progress in down- and delisting by then if funding is to be continued.
        - Some attendees shared the opinion that the Program has actually made huge strides toward recovery.

4.0 Group Discussion: Develop draft conceptual framework/outline (or possibly draft agenda) for Workshop #2

- Attendees determined that it would not be feasible to develop the Workshop #2 agenda during the remaining time today. It was thus recommended that the Program Office take the lead and convene a small workgroup to develop the requested information "packets" and elevate those to the BC:
    - (1) pull together and provide the documents/reports for the full BC;
    - (2) identify the top 10 hypotheses;
    - (3) a list of "known" fish responses:
        - What are the documented fish habitat relationships?;
        - What has been shown as positive responses from native fish and negative responses from non-natives (ex. native fish show a positive response to increased habitat complexity; non-native fish show a negative response to negative flows)?;
        - The effect of Flow X versus Flow Y on native fish/vegetation and non-native fish/vegetation.

- *Workshop Contracting*
    - Contracting for Workshop #2 is partially dependent on the types of analyses and data sets that are desired. Much of the work may already be done but anything new (such as additional temperature data) will have to go through the contracting process or be accomplished "in house." Additional modeling is considered new or additional work.
        - Additional modeling does not necessarily have to be completed this year, but could be acknowledged as a limitation. Additional research and analyses could be identified and initiated in preparation for Workshop #3.
            - It may be an informative exercise to model/analyze the constraints of Navajo Dam releases to see if the high release flows are even able to achieve the intended results (ex. with an armored bank, will a 10,000 cfs flow create/modify the habitat desired?). This might provide a "reality check" about the flows necessary to facilitate habitat changes.
            - Identify any opportunities for hypothesis testing or field investigation for the next year or 2 (ex. increased base flow).
        - Adaptive Management provides the flexibility to adjust as needed and provides opportunity to revise the flow recommendations, implement them, and test upon implementation.

- ***Suggested Objectives:***

    - Attendees continued discussion on the potential objectives for the second workshop:
        - Workshop #2 should not just be about the flow recommendations and their implications. Keep in mind that flow recommendations and data integration have been going on for years but were tabled in 2008 for the 2012 habitat workshop. The most important recommendations may not necessarily center on flow.
        - There are 2 big issues that should potentially be included in Workshop #2:
            - (1) connectivity – huge implication and issue for any aquatic system.
                - Connectivity with Lake Powell is of particular importance and will be very instrumental in successful recovery; utilize the Population Model to provide guidance.

        - (2) Flow considerations are not just magnitude/duration/frequency but also temperature.
    - Research and data and outstanding questions have been identified during other workshops and small groups. Those should be revisited instead of reinventing. Past workshops may provide relevant recommendations and/or data gaps.
    - Fundamentally, the ability to meet flow recommendations depends on how much water is in the basin. The conditions are likely to be different come 2025. There may be enough existing information to make preliminary "stabs" at the future water supply in the San Juan River Basin to say whether we are going to be in real trouble in 20 to 30 years from now and possibly speak to trends in temperature and precipitation. Forward projections might influence the recommendations now.
        - Current understanding of climate change should be considered in the review of flow recommendations. The group can discuss how to incorporate climate change forecasts into the new flow recommendations or adaptive management process.
        - Projected water use by humans and how increases will affect the available water calculations (ex. full depletions) also needs to be considered.

- *Objective 1: Reiterate the Goals of the Program*
- *Objective 2: Review the 1999 Flow Recommendations and the Basis/Justifications for those Recommendations*
- *Objective 3: Hydrologic Conditions to be Modeled*
    - Modeling of the baseline (consulted) depletions and modeling of potential future development depletions can inform operations on how continuing water development in the basin could impact the system.
- *Objective 4: Incorporate Climate Change Projections/Forecasts into the Available Water Calculations and New Flow Recommendations*
    - Does the system need flows greater than 10,000 cfs? We may need to look at other management options for obtaining the needed habitat. How do we accomplish the recovery goals if we don't have the water?
    - We need to have a clear understanding of the "needed flow" even if it will be hard to achieve. The purpose is to determine what is needed and then figure out how to accomplish it.
- *Objective 5: Draft Desired Hydrologic (flow) Conditions*
    - The agreement to implement the EOWYST is a "temporary" solution, but the interim years should be used to develop and test hypotheses about the current range of flows. The results of that testing would then drive/inform the flow recommendation revisions.
        - It was clarified that the hypotheses development and testing would be a task of the BC (or a subgroup). Testing could include how to best use available water (ex. higher base flows).
        - It was pointed out that there is already a lot of data that has been collected that can inform the flow recommendations. However, one of the next steps would be to continue hypotheses testing after the new framework has been applied (within the bounds of the EIS).

- Given the response time for long-lived species to show impacts, it might be worthwhile to (1) synthesize the data we already have to identify/determine the range of flows that are needed/desired; and then (2) go into hypotheses testing. In revising the flow recommendations, the unknowns and the assumptions should be clearly stated. The overall framework of how the system "should look" is then developed and the specifics are tested over the years. But it is not prudent to delay new flow recommendations – they need to be revised on the best available knowledge to date. We move forward with hypotheses testing afterward.
    - In response, a concern was voiced that strict/stringent flow recommendations could result in constraints on the hypotheses that could be tested in the future. There needs to be a range and flexibilities instead of "overly prescribed" flow numbers.
- It is the biological response(s) that need to be tested – it is already known how much habitat is produced with a 1,000 cfs flow. It is the biological "link" that needs to be strengthened.
- Attendees were reminded that any flow released in the next year or two will delay the raising of the lake elevation and therefore the opportunity to pass higher flows. Very little water is expected and the channel is changing. The testing of certain hypotheses will be dependent on the hydrology (ex. a good water year means more can be tested).

- *Objective 6: Characterize Fish and Habitat Response to Observed Flows Regimes*

5.0 Group Discussion: Finalize recommendations for conducting Workshop #2 to evaluate and modify the 1999 San Juan River Flow Recommendations to best meet the Recovery Program goals (Workshop Outcome #3)

- *Workshop #2: Planning and Preparation: Small Group Tasks and Assignments*:
    - Attendees brainstormed the tasks and topics for the small working group to complete no later than mid-April, for review prior to the May meeting.
        - Develop workshop agenda
        - Develop list of data sets (known)
        - Make list of hypotheses of 1999 Flow Recommendations – did they do what they were supposed to? Do we know?
        - Review past workshop products to identify gaps
        - List of known biological responses – negatives and positives
        - Identify/list factors that were not considered in first flow recommendations:
            - Proliferation of non-native fish
            - Encroachment of non-native vegetation
            - Climate change and resulting constraints
            - Floodplain vegetation dynamics
            - Temperature
            - Waterfall (connectivity)
        - Tie flow targets to the life stage(s) of the fish
        - Consider non-flow targets

- *Workshop #2 Suggested/Potential Objectives (in no particular order or ranking):*
    - Reiterate the Goals of the Program
    - Review the 1999 Flow Recommendations and the Basis/Justifications for those
        - What existing (new) flow targets are out there that could be the basis/foundation for new recommendations?
    - Hydrologic Conditions to be Modeled
    - Incorporate Climate Change Projections/Forecasts into the Available Water Calculations and New Flow Recommendations
    - Draft Desired Hydrologic (flow) Conditions
    - Characterize Fish and Habitat Response to Observed Flows Regimes
- *Workshop #2 Deliverable(s)*
    - Draft desired flow conditions
- *Workshop #3: Finalize the Revised Flow Recommendations to Best Meet Recovery Goals*

6.0 Workshop Conclusions and Wrap-Up: assignments; set a date for Workshop #2, if possible; public comment period

- Jim Brooks thanked everyone for their participation and support of this first Environmental Flows workshop. Several tasks were "assigned" to the Program Office and BC for further work and development:
    - The BC could be the venue to identify the specific questions and outstanding data needs in preparation for Workshop #2, including identification of data gaps;
    - Hypotheses development and testing would be a task of the BC (or a subgroup). Testing could include how to best use available water (ex. higher base flows).
- The details of the next workshop will be further developed and refined over the next several months. The intent is to host Workshop #2 within a year – tentatively next winter.
- There was no public comment, but several attendees expressed appreciation for the opportunities, dialog, and accomplishments of this first workshop.

San Juan River Environmental Flows Workshop 1: Attendees

	Name	Affiliation	Date	
			Thurs 2/12	Fri 2/13
1	Bill Miller	Southern Ute Indian Tribe/**B.C. Chair**	✓	✓
2	Jim Brooks	**Facilitator**	✓	✓
3	Martin Schluep	Alliant Environmental, LLC (contractor)	✓	
4	Marta Wood	Alliant Environmental, LLC (contractor/**note taker**)	✓	✓
5	Howard Brandenburg	American Southwest Icthyological Researchers (ASIR)	✓	✓
6	Michael Farrington	American Southwest Icthyological Researchers (ASIR)	✓	
7	Steve Platania	American Southwest Icthyological Researchers (ASIR)	✓	✓
8	Henry Day	Arizona Public Service	✓	✓
9	Rudy Keedah	Bureau of Indian Affairs (BIA) – Gallup	✓	✓
10	Michelle Garrison	Colorado Water Conservation Board	✓	✓
11	Brian Bledsoe	Colorado State University/TNC	✓	✓
12	Harry Crockett	Colorado Parks and Wildlife/State of CO	✓	✓
13	Tom Wesche	Habitech, Inc. (Water Development Interests)	✓	✓
14	Ron Bliesner	Keller-Bliesner Engineering	✓	✓
15	Brian Westfall	Keller-Bliesner Engineering for BIA	✓	✓
16	Bill Miller	Miller Ecological Consultants	✓	✓
17	Jacob Mazzone	Jicarilla Apache Nation	✓	✓
18	Vincent Lamarra	Navajo Nation (Ecosystem Research Institute)	✓	✓
19	Stanley Pollack	Navajo Nation	✓	
20	Chris Cheek	Navajo Nation Department of Fish and Wildlife (NNDFW)	✓	✓
21	Eliza Gilbert	New Mexico Department of Game and Fish (NMDGF)	✓	✓
22	Mike Ruhl	New Mexico Department of Game and Fish (NMDGF)	✓	✓
23	Mel Warren	Peer Reviewer/ U.S. Forest Service	✓	✓
24	Steve Ross	Peer Reviewer	✓	✓
25	Mike Green	Public Service Co. of NM (PNM)		✓
26	Catherine Condon	Southern Ute Indian Tribe	✓	✓
27	Steve Harris	Southwestern Water Conservation Board	✓	✓
28	Carrie Lile	Southwestern Water Conservation Board	✓	✓
29	Dave Gori	The Nature Conservancy (TNC)	✓	✓
30	Patrick McCarthy	The Nature Conservancy (TNC)	✓	✓
31	Dale Lyons	The Nature Conservancy(TNC)	✓	✓
32	John Pitlick	University of Colorado (Peer Reviewer)	✓	✓
33	Nathan Franssen	University of New Mexico (UNM)	✓	✓
34	Brent Uilenberg	U.S. Bureau of Reclamation (BOR)	✓	✓
35	Susan Behery	U.S. Bureau of Reclamation (BOR)	✓	✓
36	Beverly Heffernan	U.S. Bureau of Reclamation (BOR)	✓	✓
37	Ryan Christianson	U.S. Bureau of Reclamation (BOR)	✓	✓

38	Ed Warner	U.S. Bureau of Reclamation (BOR)	✓	✓
39	Mark McKinstry	U.S. Bureau of Reclamation (BOR)	✓	✓
40	Todd Vandergrift	U.S. Bureau of Reclamation (BOR)	✓	✓
41	David Campbell	U.S. Fish and Wildlife Service, Region 2 (FWS)	✓	✓
42	Jason Davis	U.S. Fish and Wildlife Service, Region 2 (FWS)	✓	✓
43	Scott Durst	U.S. Fish and Wildlife Service, Region 2 (FWS)	✓	✓
44	Dale Ryden	U.S. Fish and Wildlife Service (FWS)	✓	✓
45	Benjamin Schleicher	U.S. Fish and Wildlife Service, Region 6 (FWS)	✓	✓
46	Tom Sinclair	U.S. Fish and Wildlife Service (FWS)	✓	✓
47	Sharon Whitmore	U.S. Fish and Wildlife Service (FWS)	✓	✓
48	Leland Begay	Ute Mountain Ute		✓