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MEMORANDUM

TO: Brian Lipscomb, CBFWA
Tony Nigro, ODFW

Michele DeHart

FROM: Michele DeHart

DATE: October 25, 2005

RE: Libby Operations Review and Preliminary Analysis

In response to your request we have reviewed alternative operations for flow augmentation from Libby Dam. This analysis is preliminary. The proposed alternative presented in this memo does not address all the concerns or desires expressed by either party. Instead, recognition is given to the most important factors identified for both resident and anadromous fish. Efforts were made to remove double peaking flows from Libby Reservoir and preserve productivity in both Libby Reservoir and the Kootenai River, while providing the augmentation volume for anadromous fish when most fish are migrating.

Issue:

The Biological Opinion designates 20-foot withdrawals of water from Libby and Hungry Horse Reservoirs to contribute to meeting Biological Opinion flows for listed juvenile migrants during the summer months. The reservoirs are to be 20 feet from full on August 31 of each year. The objective of the Salmon Managers is to meet salmon flows (200 Kcfs at McNary Dam) as often as possible. The natural flow in the lower Columbia River typically decreases through the summer months. In order to try and maintain August flows as high as possible, the Salmon Managers prefer drafting of the upriver reservoirs during August. This leads to outflow from Libby Dam that is high during the spring for the sturgeon pulse, decreases substantially in July and increases again during August. This operation is referred to as the double peak.

Brian Marotz of Montana Fish Wildlife and Parks gave a presentation to the Technical Management Team in November 2004. Brian analyzed five different flow scenarios and presented model results for primary and secondary productivity in both the reservoir, and downstream of the reservoir in the Kootenai River. Brian's primary concern was that the double

peak operation favored by the Salmon Managers disrupted productivity in the Libby/Kootenai system. The five alternative flow regimes he considered were:

- **Alternative 1.** Flat flows of 12.5 Kcfs till Aug 31, Libby elevation of 2439 feet at the end of August.
- **Alternative 2.** Steady decreasing flow of 16 Kcfs to 6 Kcfs by Aug 31, Libby elevation of 2439 feet at the end of August.
- **Alternative 3.** Steady decreasing flow of 16 Kcfs to 6 Kcfs by Aug 31, Libby elevation of 2439 feet at the end of September.
- **Alternative 4.** Flat flow of 10 Kcfs, Libby elevation of 2439 feet at the end of September.
- **Alternative 5.** Double peak flow, Libby elevation of 2439 feet at the end of August.

The following are some key points of Brian's analysis and are derived from the information presented in Figures 1-4:

1. Under the double peak operation secondary productivity in Libby Reservoir, as well as productivity in the Kootenai River, is considerably less than optimal.
2. Primary productivity in Libby Reservoir is highest under alternatives 4 (flat flow till the end of September) and 5 (double peak), since the reservoir surface area is maintained during July. This same pattern is seen for zooplankton; however, benthic productivity is lower under these scenarios.
3. The productivity in the Kootenai River is highest under a flat flow of 12 Kcfs until the end of August and next highest under a flat flow of 10 kcfs until September 30.

In order to determine an operation of Libby Reservoir that provides benefits to both anadromous and resident fish, we plotted the operation and resulting flows at McNary Dam for both the **Montana Plan** and the **August Flow preference**, together with an alternative called the **Compromise**, for the past eleven years of operation (1995-2005). The model assumed Libby Reservoir was at the actual reservoir level that occurred on July 1 of each of the years (either full or some other elevation depending on inflow). The Montana Plan was modeled as a steady outflow from Libby Reservoir from the starting elevation to 2439 feet by September 30. The August flow preference models the preferred operation for anadromous fish and holds the reservoir full or at the starting elevation for July and drafts to 2439 feet during August. The Compromise operation sets flows flat from July 1 through August 30 and drafts the full 20 feet from Libby by August 31. Unusually high inflows to Libby Dam in September of 2004 made it difficult to accurately compare the Montana Plan to the Compromise Plan. Inflows to Libby averaged 12.6 Kcfs in September of 2004, as compared to 5.2 and 4.3 Kcfs over the same periods in 2002 and 2003. In the Montana Plan scenario, had inflows been relatively normal in September, the draft of Libby over July and August would have been more gradual and the flat flow maintained July through August would have been less than seen in the modeled Montana Plan. In the modeled Compromise Plan the relatively high September inflows resulted in Libby actually refilling approximately seven feet after drafting to 2439 feet by the end of August and dropping Libby outflows to 6 Kcfs in September. Plots showing the differences in 2000 flows at

McNary under each of the model scenarios also need some explanation. The plots show no significant difference between any of the three model scenarios. In actuality, there is little difference between the scenarios. In 2000 under the MT Plan a flat flow of the bull trout minimum 6 Kcfs is maintained from July to September and in the Compromise plan a flat flow of 6.8 Kcfs is maintained July-August (while drafting to 2439 feet by the end of August) then reduced flows to the 6 Kcfs minimum in September.

The Hungry Horse outflows are assumed to have occurred as they did in each of the years. (At this point there is no information to suggest that Hungry Horse Reservoir needs to be operated differently. Should this be the case, additional model runs can be accomplished with different Hungry Horse operations). The resulting McNary Dam flows and Libby operations are shown for each year in the attached figures (Appendices 1 and 2).

In summary, under the proposed compromise operation plan most needs are benefited. Upriver productivity of the lake may not be maximum, but Kootenai River productivity is high. The Salmon Managers maintain flows during July and August that are higher than would occur under the Montana Plan, and would give up the double peaking operation for flat flows, but the water comes out by August 31. There are still two other options that can be considered. First, with the compromise operation the reservoir is drawn down the full 20 feet by August 31. However, in order to transition the flows from the salmon flows to the bull trout flows of 6 Kcfs, a transition period of 3 to 5 days into September might be considered. Second, in years where flows are projected to exceed the 200 Kcfs at McNary throughout the migration period, the consideration may be to alternate between the competing needs. For example, one year when the flows are projected to exceed 200 Kcfs, Libby and Hungry Horse may retain the 20-foot drawdown, and the next year when flows are high the benefit would go to the anadromous stocks and flows would exceed the 200 Kcfs. The next steps may be to conduct additional modeling with Montana Fish, Wildlife and Parks. If possible, the alternatives need to be modeled in the Montana productivity model under the actual conditions that occurred in 1995-2005.

Please do not hesitate to contact us if you have any questions or comments regarding the analysis. We wait to hear from you to advise us as to how you wish to proceed.

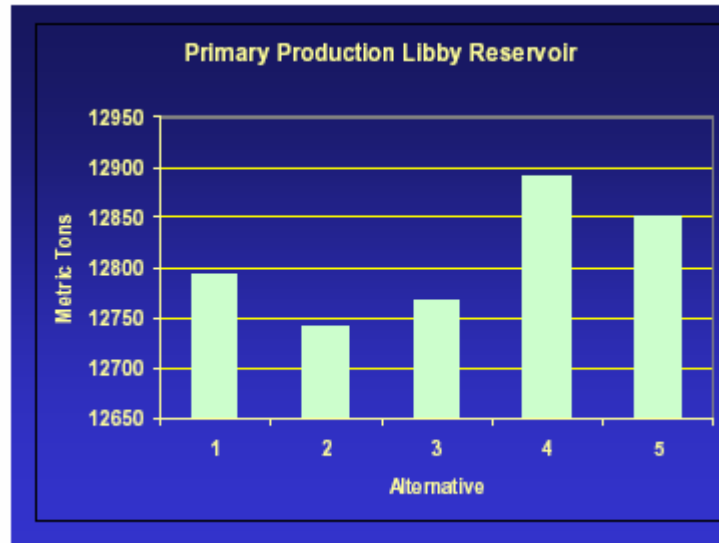


Figure 1. Libby Reservoir primary productivity.

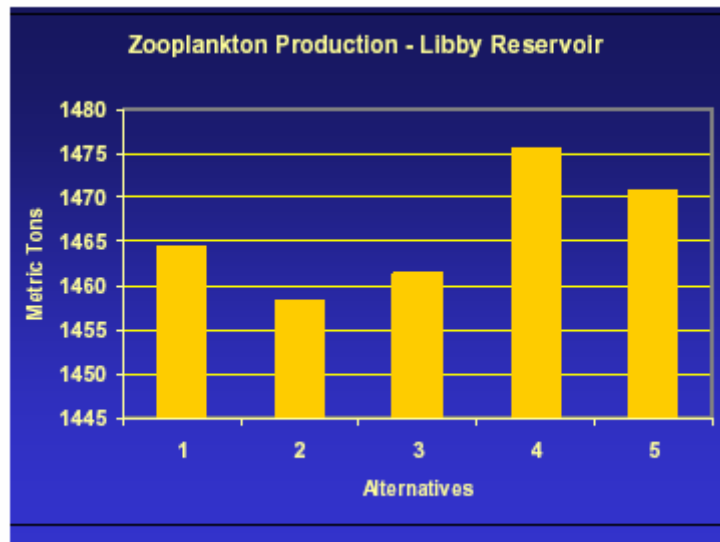


Figure 2. Libby Reservoir Zooplankton productivity.

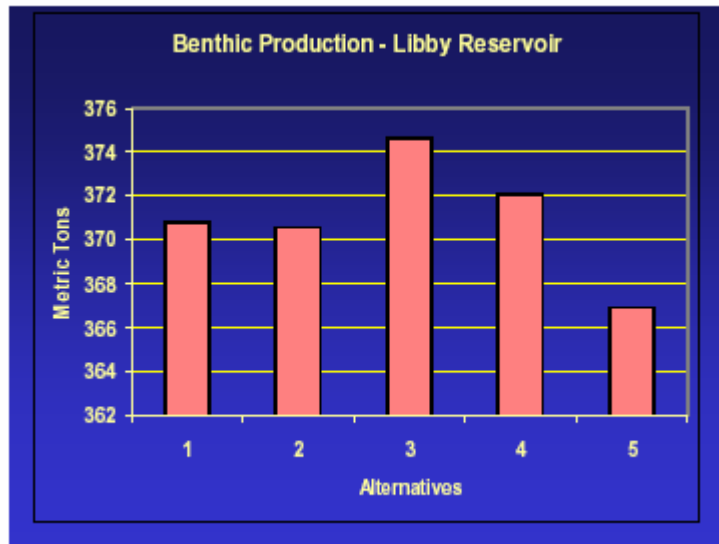


Figure 3. Libby Reservoir benthic productivity.

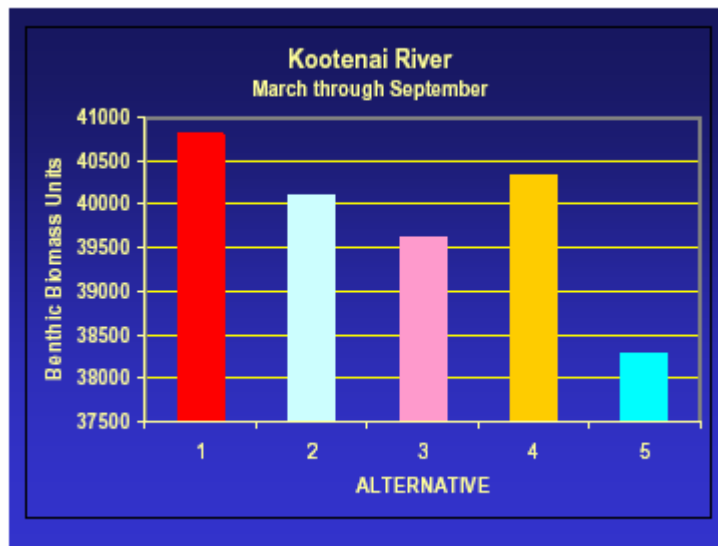
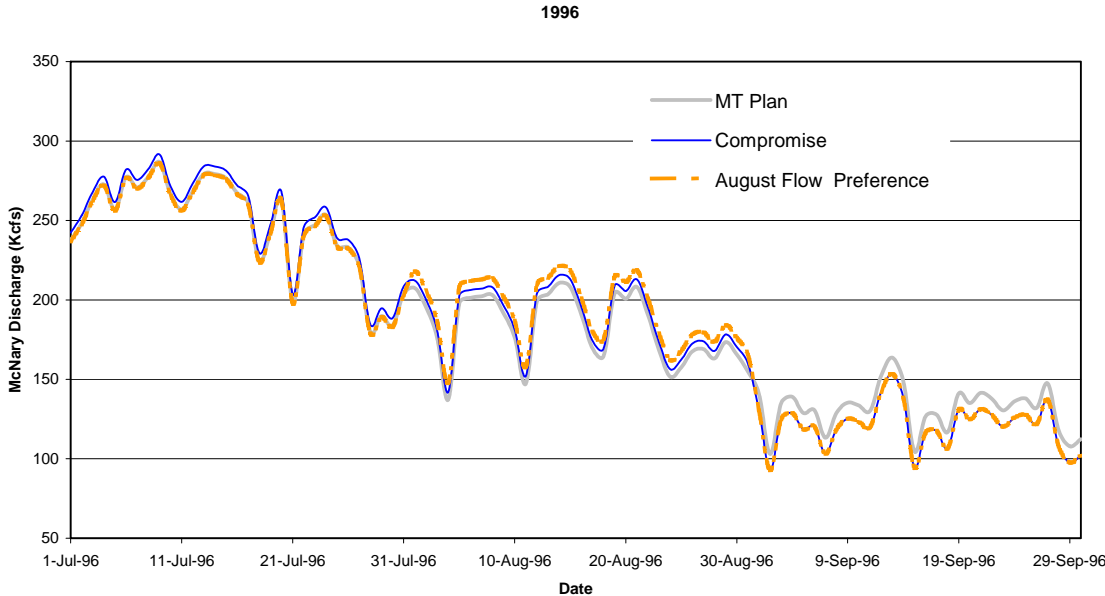
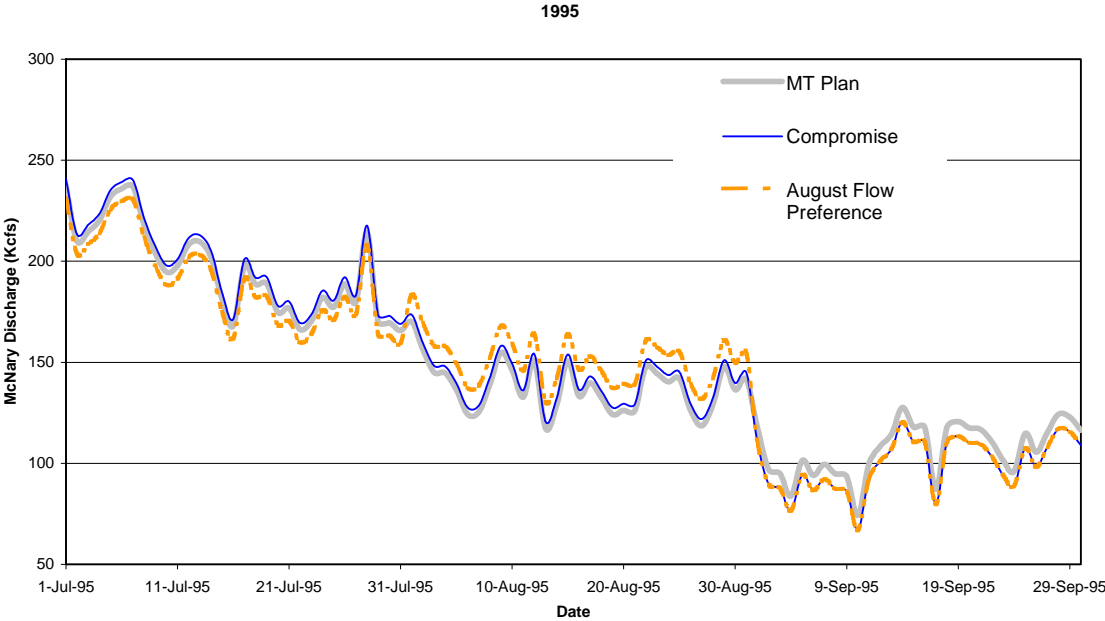
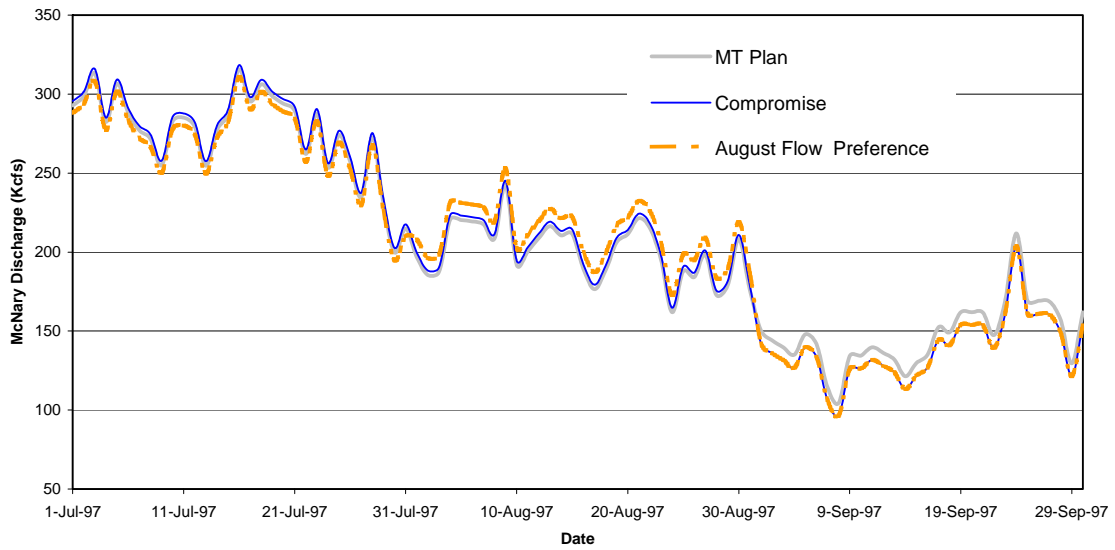


Figure 4. Kootenai River benthic biomass.

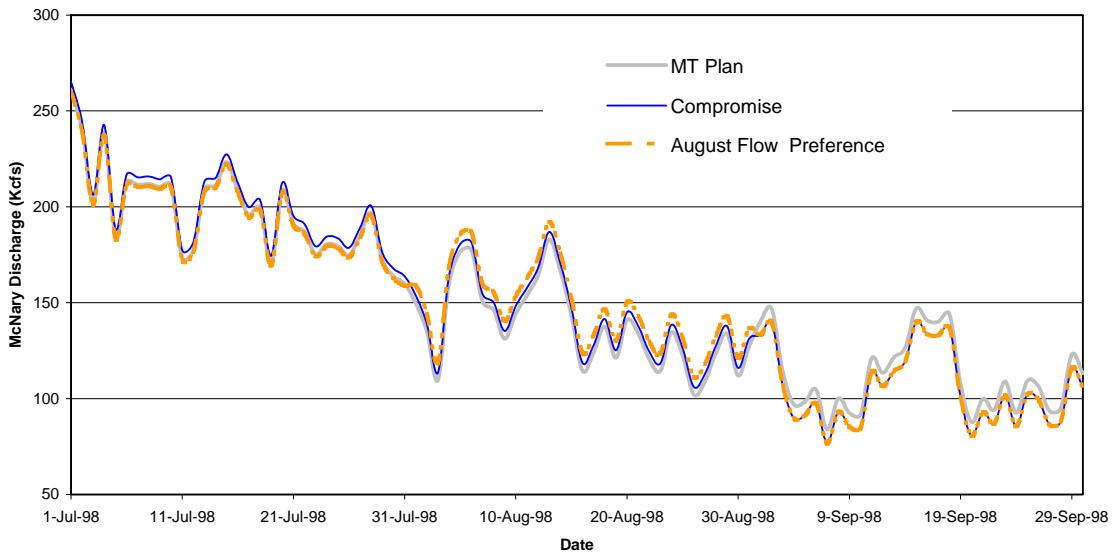
Appendix 1. McNary flows under the different operations scenarios 1995-2005.



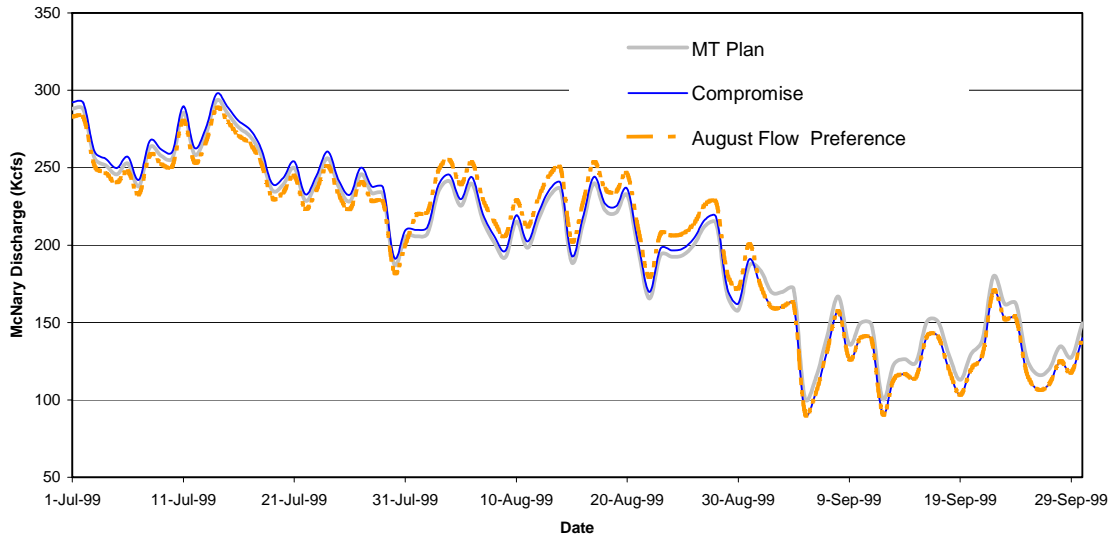
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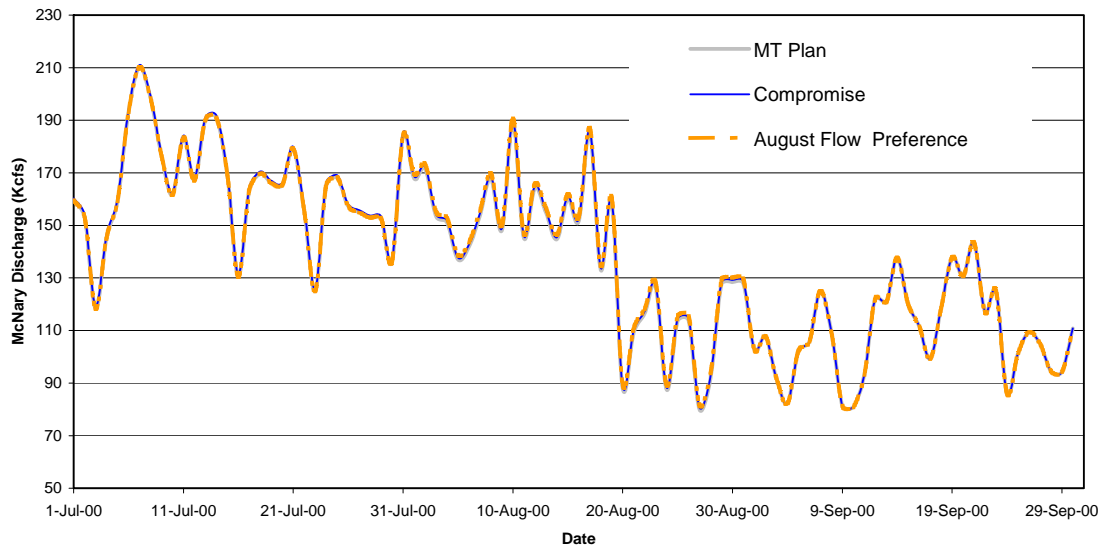
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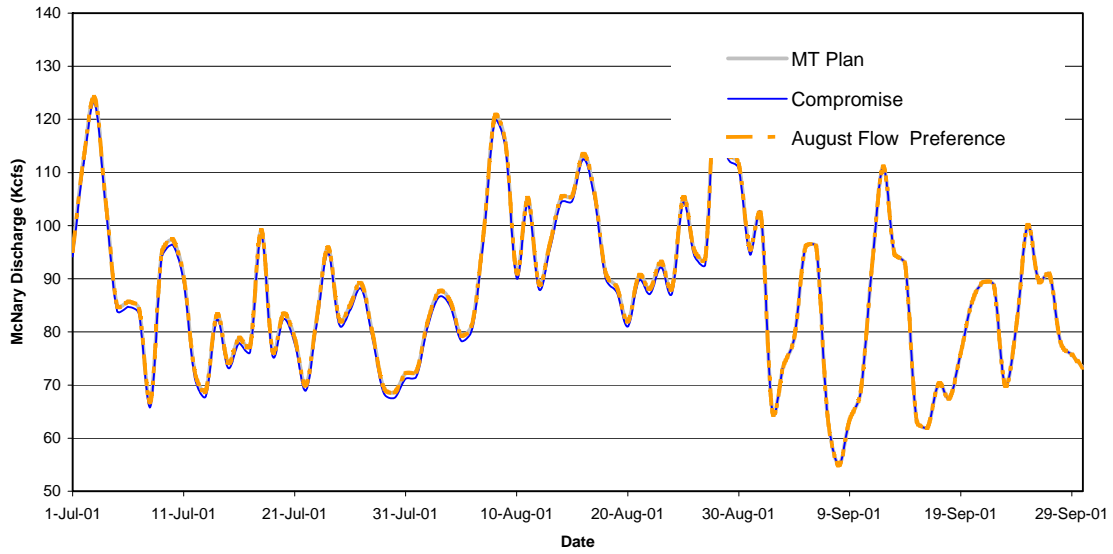
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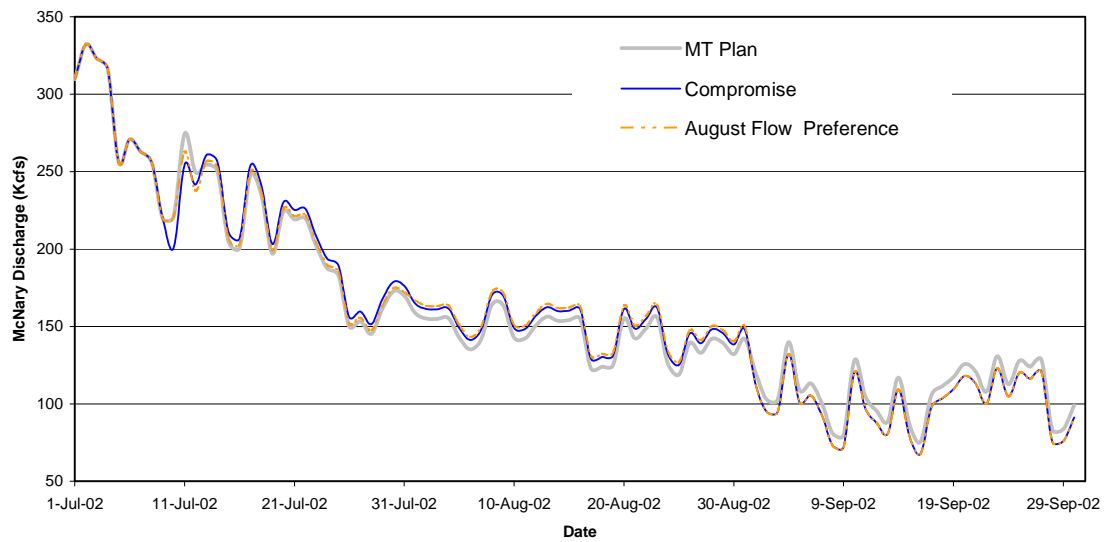
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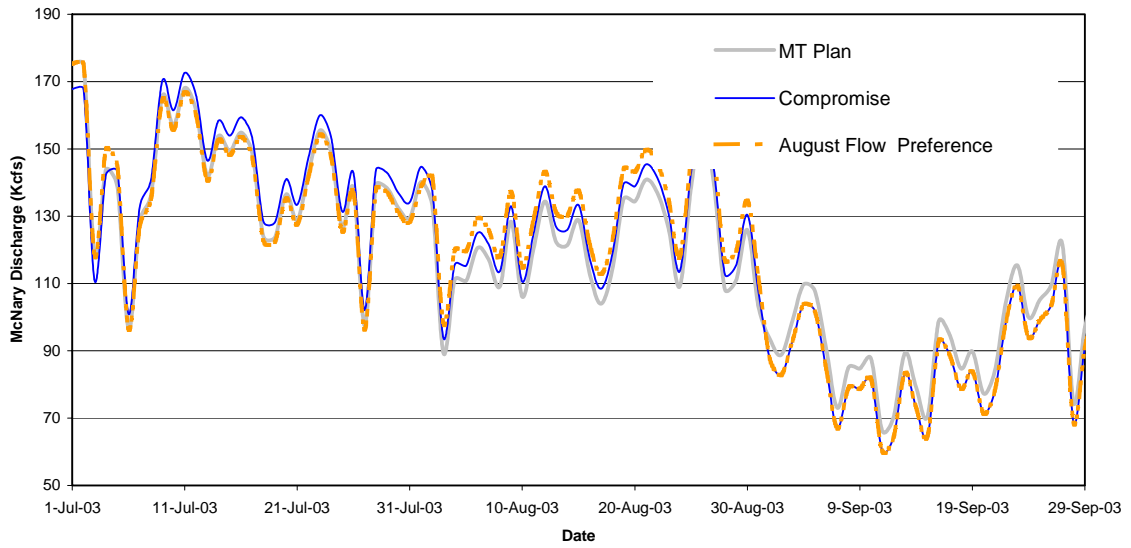
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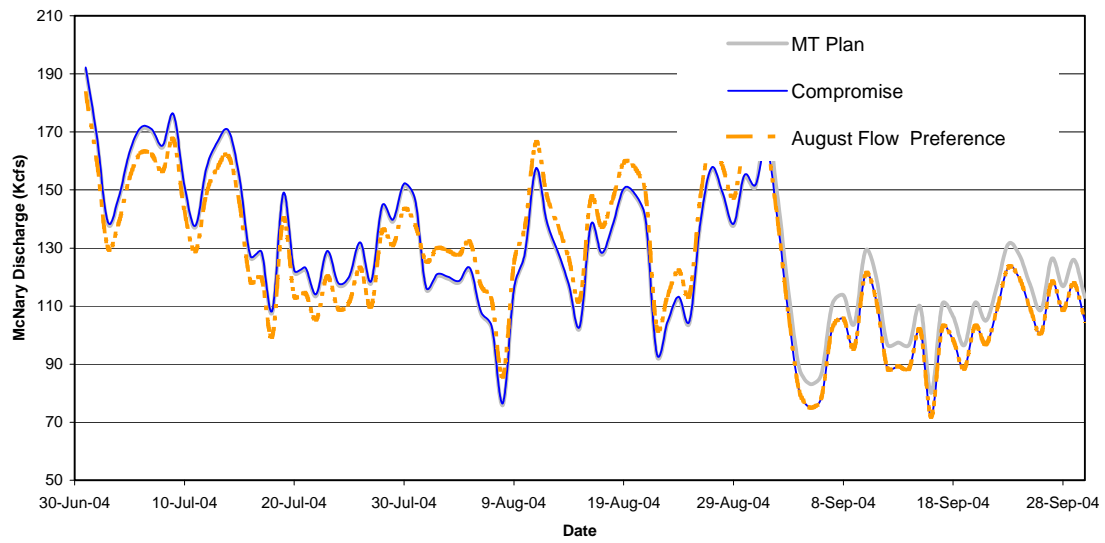
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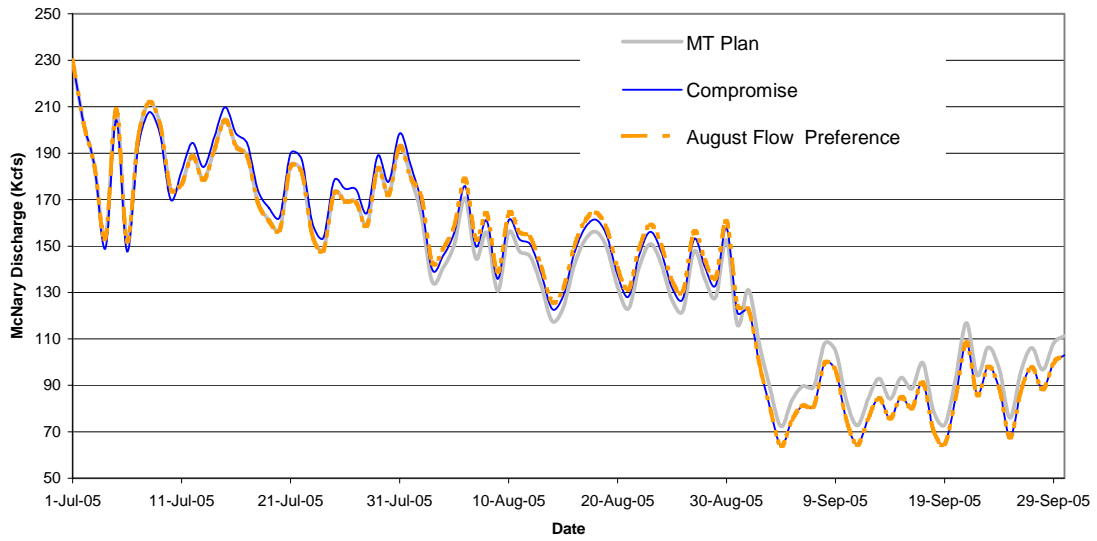
2003



2004



2005



Appendix 2. Libby MT Plan and Compromise Reservoir Elevations and Outflows 1995-2005.

