RECLAMATION

Managing Water in the West

Yellowtail Dam & Bighorn Lake

Potential Revisions to Draft Criteria Based on Comments and Operating Experience

Billings, MT

October 13, 2011

Potential Revisions

- **Some Refinements to Lake Level Targets**
- **Refinement to procedure for forecasting Nov-Mar Gains**
- **Refinement to procedure for setting Nov-Mar Release Rate**
- **Continue review and adjust Rule Curve as needed to improve its effectiveness.**
- **Consideration for providing gradual reduction in release to minimize bank erosion**

REVISED RESERVOIR LEVEL TARGETS

Date	Modified Target Elev.	Draft Criteria Target Elevation
Oct 31	3635-3640	3638-3640
Mar 31	3615-3619	3616.7-3620.6
RC Low Point	3603-3617	3603-3618
July 31	3640	3640

Note: During a prolonged drought minimum level can reach 3570 or lower.

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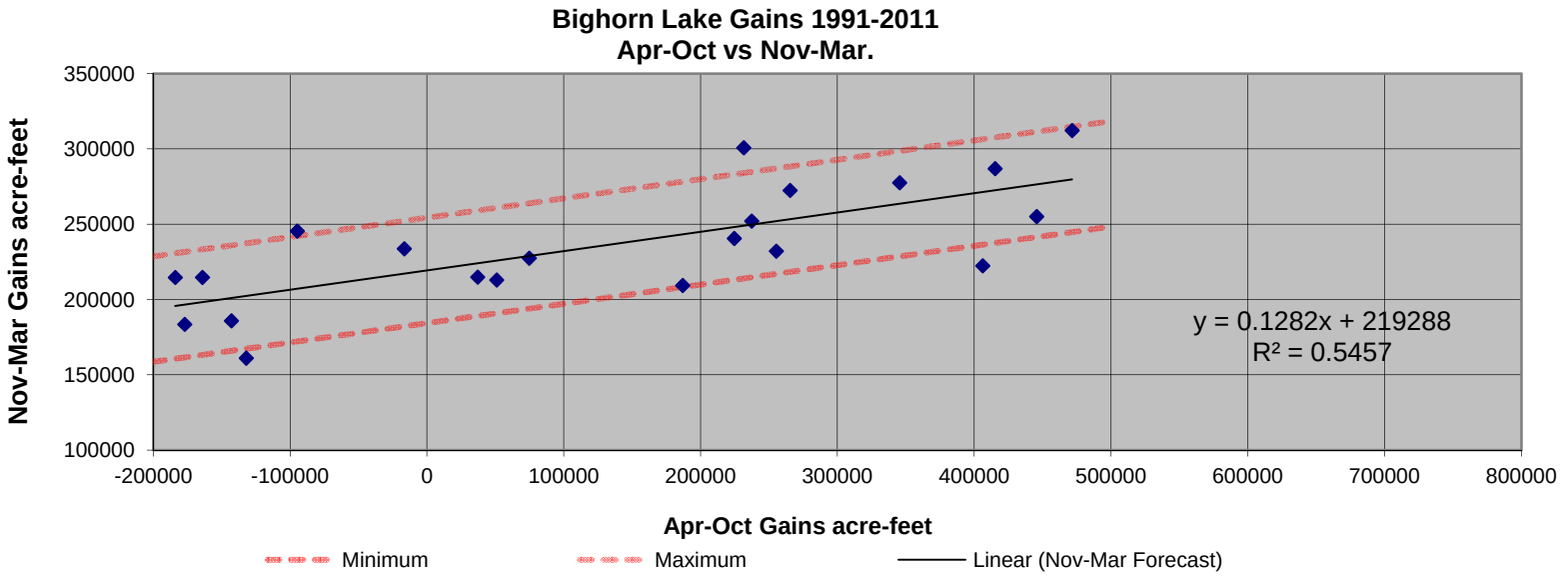
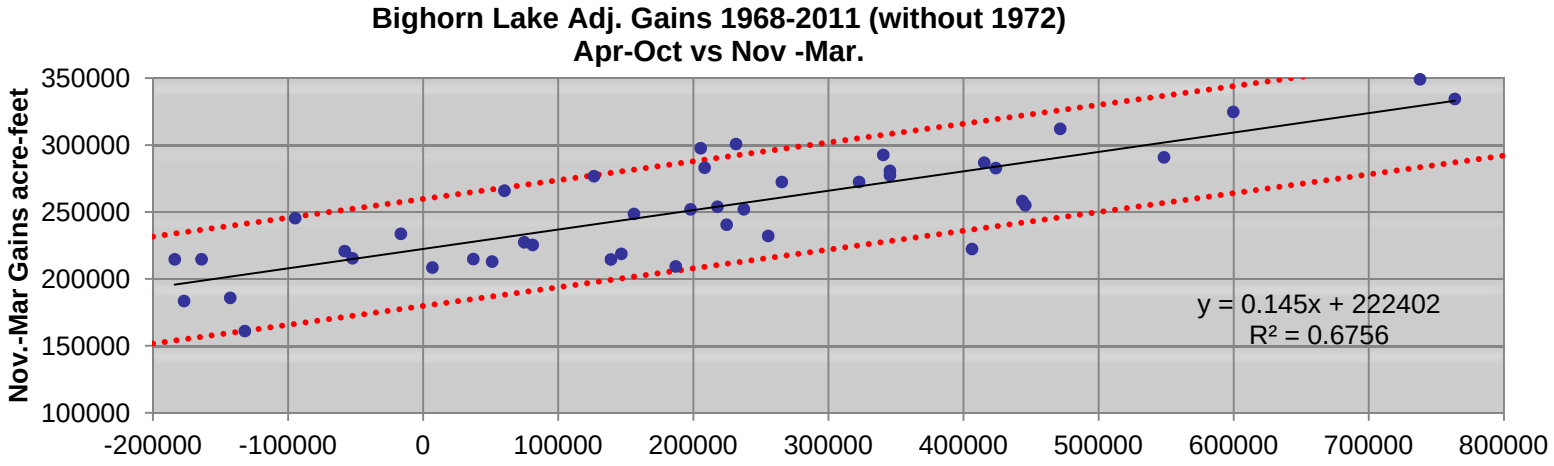
Nov-Mar Release Procedure

- **Revise Equation for Forecasting Gains**
  - **Use Linear Relationship for forecast equation**
  - **Add data through 2011**
  - **Adjust gains for 1967-1990 to allow correlation to be developed for full period of record**
- **Incorporate New End of March Target Elev.**
- **Revised Procedure expected to increase Nov-Mar release by up to 100 cfs as compared to current Procedure.**

Comparison of Gain Correlation





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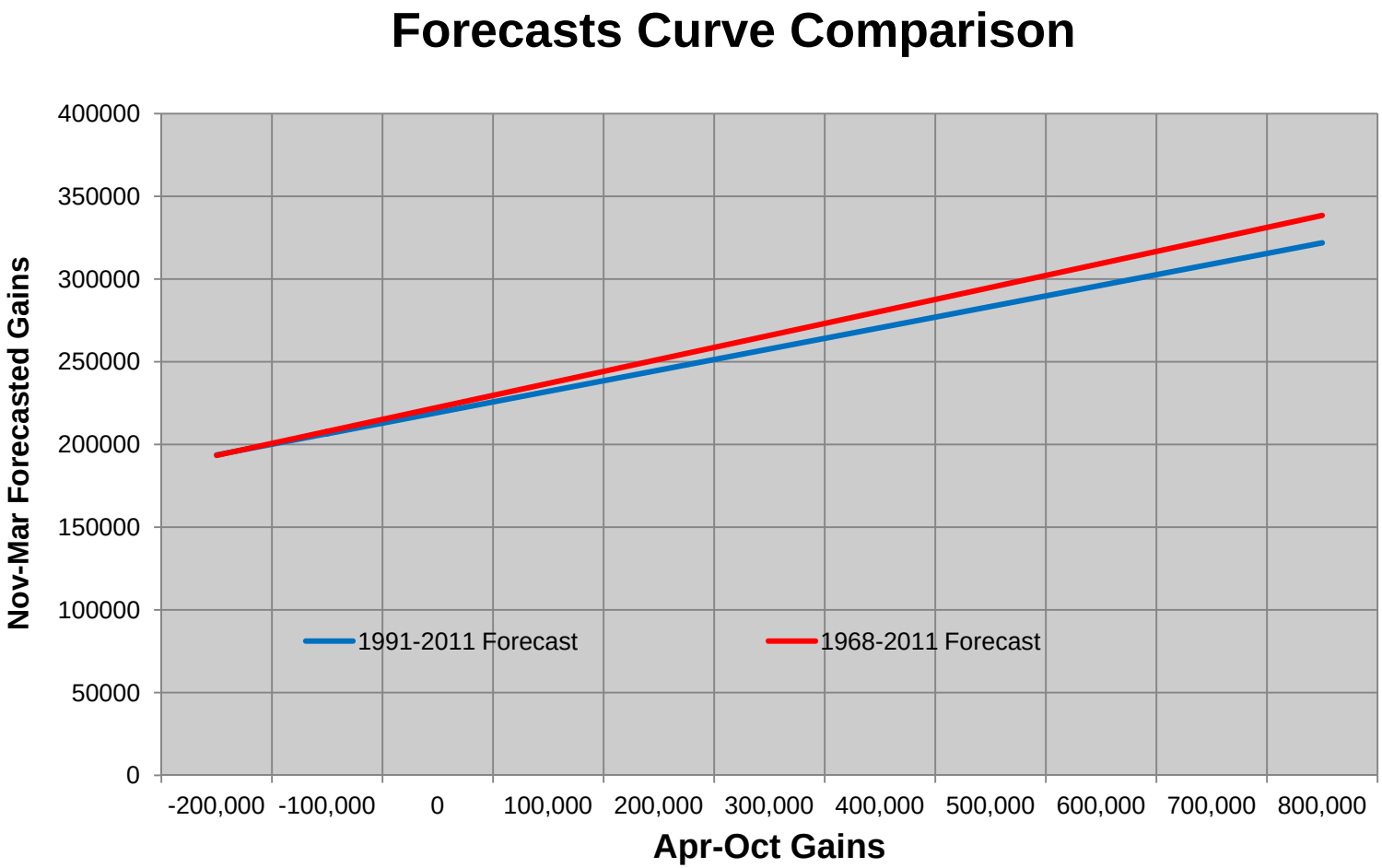
Nov-Mar Gain Forecasts



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Procedure to Setting Nov-Mar Release

End of Mar Target Adjusted based on release range

River Release	March 31 Target
Greater than 2500 cfs	3619
2000-2500 cfs	3617
Less than 2000 cfs	3615

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Effect on 2012 Nov-Mar Release

- **Calculated Nov-Mar River Release Rate**

Proposed Changes	Current Criteria
3170 cfs	3070 cfs
End of March Target elevation	
3619	3620.6

Note: The 100 cfs increase is provided by a 30 cfs increase from lowering the March target by 1.6 feet and a 70 cfs increase due to the revised gain forecasting method.

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Refinements to Rule curve

- Lower starting elev. to 3617. Some minor adjustments where made early in 2011 to the medium to high rule curves to provide a better distribution of water in April and May

- Continuing to review curves to see if they can be improved. 2011 will be added to data base for the curves and refinements will be made accordingly.

- For 2011 the curves worked well in defining the timing for the low point for the lake a day ahead of the rain flood event.

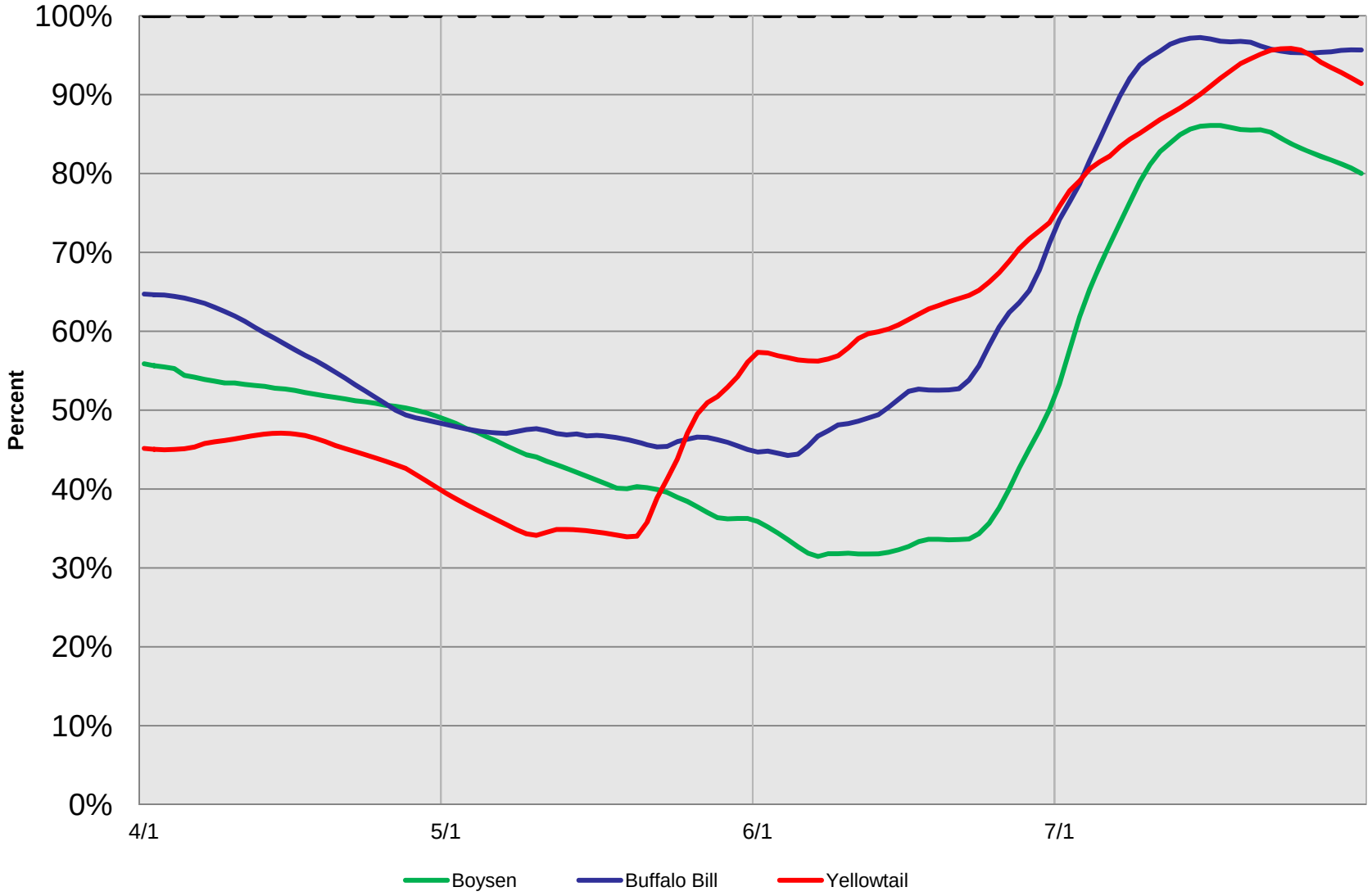
Rule Curve Minimum Target Elevation

A-J Forecast	% of Ave.	Min Elev.	Date
500,000 af	44%	3617.0	4/1
700,000 af	62%	3617.0	4/1
1,000,000 af	88%	3616.1	4/29
1,150,000 af	100%	3614.5	5/5
1,300,000 af	115%	3612.9	5/16
1,500,000 af	132%	3608.9	5/21
1,700,000 af	150%	3606.2	5/22
1,900,000 af	168%	3604.2	5/22
2,000,000 af	176%	3602.7	5/23

Integration of Daily Reservoir Spreadsheets by GPRO

- A new Integrated Spreadsheet was developed to allow better review of the system operations: Buffalo Bill, Boysen and Bighorn Lake
- Travel time between reservoirs carefully tracked by Integrated Spreadsheet
- Additional graphs and tables have been developed to assist with review of system for flood control.

Percent of Total Useable Storage Space Filled
Conservation, Joint Use and Exclusive Flood Pools



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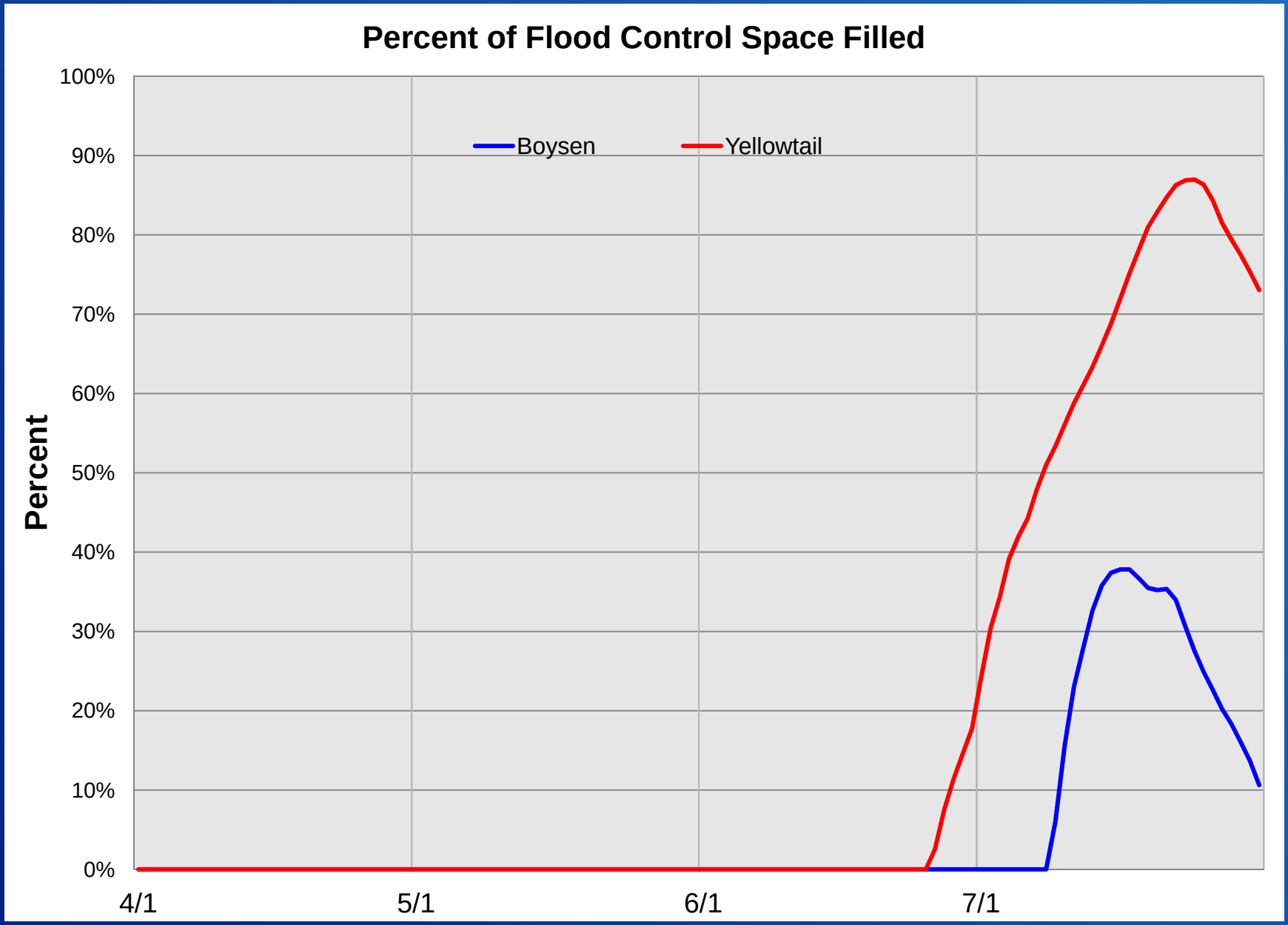

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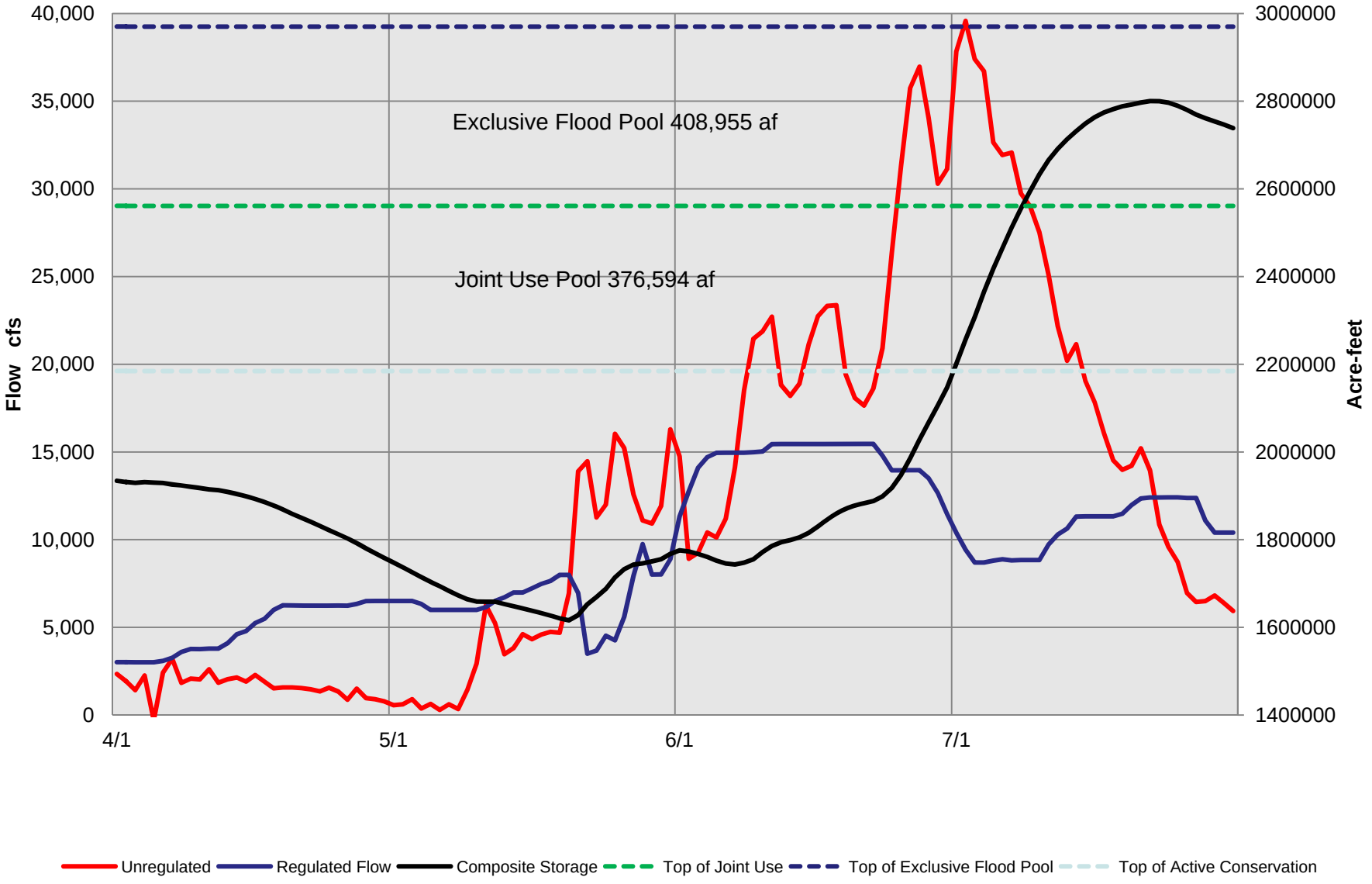
2011 Bighorn River Basin System Operations (Composite Reservoir)



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Draft Criteria Report

- Plan to revise report to provide more clarity
- Additional Table and graphs will be added
- Potential Revisions to Criteria will be discussed.

Questions or Comments

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