Glen Canyon Dam Adaptive Management Work Group
Agenda Item Information
August 24-25, 2011

Agenda Item

Water Year 2012 Hydrograph

Action Requested

✓ Motion requested. The following motion is recommended by TWG. However, no motion is officially made unless and until an AMWG member makes the motion in accordance with the AMWG Operating Procedures.

AMWG recommends to the Secretary of the Interior his approval the DOI-DOE Proposed Hydrograph for Water Year 2012 as follows:

- Monthly Release Volumes will be adjusted each month based on the most current forecast of the annual release required by the 2007 Interim Guidelines.
- Monthly Release Volumes are anticipated to vary within the targets identified for each month as set forth below. This monthly operational flexibility will be used for existing power production operations under the Modified Low Fluctuating Flow (MLFF) alternative selected by the 1996 ROD and contained in the 1995 FEIS. The targeted operation will also be adjusted as necessary to accommodate a targeted release volume for the month of August 2012 based on the schedule below:
    - January: August 2012 Volume target set to greater of 800 kaf or 10% remaining annual release volume.
    - February: August 2012 Volume target set to greater of 800 kaf or 10% remaining annual release volume.
    - March: August 2012 Volume target set to greater of 800 kaf or 12% remaining annual release volume.
    - April: August 2012 Volume target set to greater of 800 kaf or 15% remaining annual release volume.
    - May: August 2012 Volume target set to greater of 800 kaf or 20% remaining annual release volume.
    - June: August 2012 Volume target set to greater of 800 kaf or 25% remaining annual release volume.
    - July: August 2012 Volume target set to greater of 800 kaf or 40% remaining annual release volume.
    - August: Release volume established as 100% of remaining annual release volume (release could be less than 800 kaf in some cases).
- In some Equalization release scenarios, the release volume required in August could be as high as the full capacity of the powerplant.
- Steady flows will occur in September 2012 (and October 2012) per the 2008 HFE Environmental Assessment (EA).
- Monthly release volumes will be modified each month in consultation with Western Area Power Administration.
- The remaining annual release volume will be computed as the projected WY2012 annual release volume pursuant to the Interim Guidelines less volume already released in WY2012 less the September 2012 projected Steady Flow Experiment release volume.

- Additionally, the Bureau of Reclamation will continue to apply best professional judgment in conducting actual operations and in response to changing conditions throughout the water year. Such efforts will continue to be undertaken in coordination with the DOI/DOE agencies to consider changing conditions and adjust projected operations in a manner consistent with the objectives of these parameters as stated above and pursuant to the Law of the River.

Presenters

Shane Capron, Chair, Technical Work Group (Western Area Power Administration)
Dave Trueman, Division Manager, Upper Colorado Region, Bureau of Reclamation

Previous Action Taken

✓ By TWG: At its June 2011 meeting, the TWG passed the following motion by a vote of 15-1-7. The TWG recommends to AMWG for their approval the DOI-DOE Proposed Hydrograph for Water Year 2012 as described in the Proposed Operating Parameters of the June 6, 2011 document.

Relevant Science

The TWG and AMWG were presented with the sediment/financial results from the DOI-DOE analysis of potential operational scenarios for 2012. These analyses were based upon the USGS sand retention model and Western's GTMax power/financial model.

Background Information

Reclamation Report

The departments of Interior and Energy proposed a WY2012 hydrograph to TWG, which is recommending it to the AMWG. To assist in the deliberations of the Departments, Reclamation analyzed several combinations of hydrologic and operational scenarios with regard to impacts to sand retention and cost. The desired outcome was to minimize costs while maximizing sand retention high in the system for a potential fall HFE.

The presentation at the AMWG meeting will focus on the two operational "finalists," which are compared in the following table.

WY11 Hydrograph Method	Targeted Method (recommended for WY12)
▪ Monthly volume may vary +/-100 kaf from average of remaining balance ▪ 16,000 cfs daily limit up to 11.0 maf annual release ▪ 22,000 cfs daily limit above 11.0 maf annual release ▪ No limits if needed for equalization ▪ ROD limits apply	▪ August releases are limited using the percentage method to conserve sediment inputs ▪ September and October low-steady releases also conserve sediment ▪ No limits on other months ▪ No limits if needed for equalization ▪ ROD limits apply

Both of these operational options was analyzed against three different hydrologic tests, including:

- An "average" release that stayed constant at 9.3 maf throughout the year. This was the most probable release volume at the time of the study.
- Two tests that were designed to stress the operational scenarios with late season changes in both directions: increased volumes of water and decreased volumes.

The results of these analyses will be presented at the AMWG meeting.

The targeted hydrograph was recommended by DOI/DOE because of its performance in both the sand retention and cost categories.

TWG Report

The TWG heard reports on the development of the hydrograph proposal at its March and June 2011 meetings. No significant issues were raised with regard to the targeted proposal. Some concerns were discussed regarding the potential effect of an HFE on the hydrograph and on some of the language in the other parts of the report. Thus, TWG focused on passing the required portion of the report that describes the proposed hydrograph: "Proposed Operating Parameters" of the June 6, 2011 DOI/DOE document. One TWG member could not support the proposed hydrograph but did not propose an alternative at the TWG meeting.

2012 Hydrograph Development

Status

August 2011

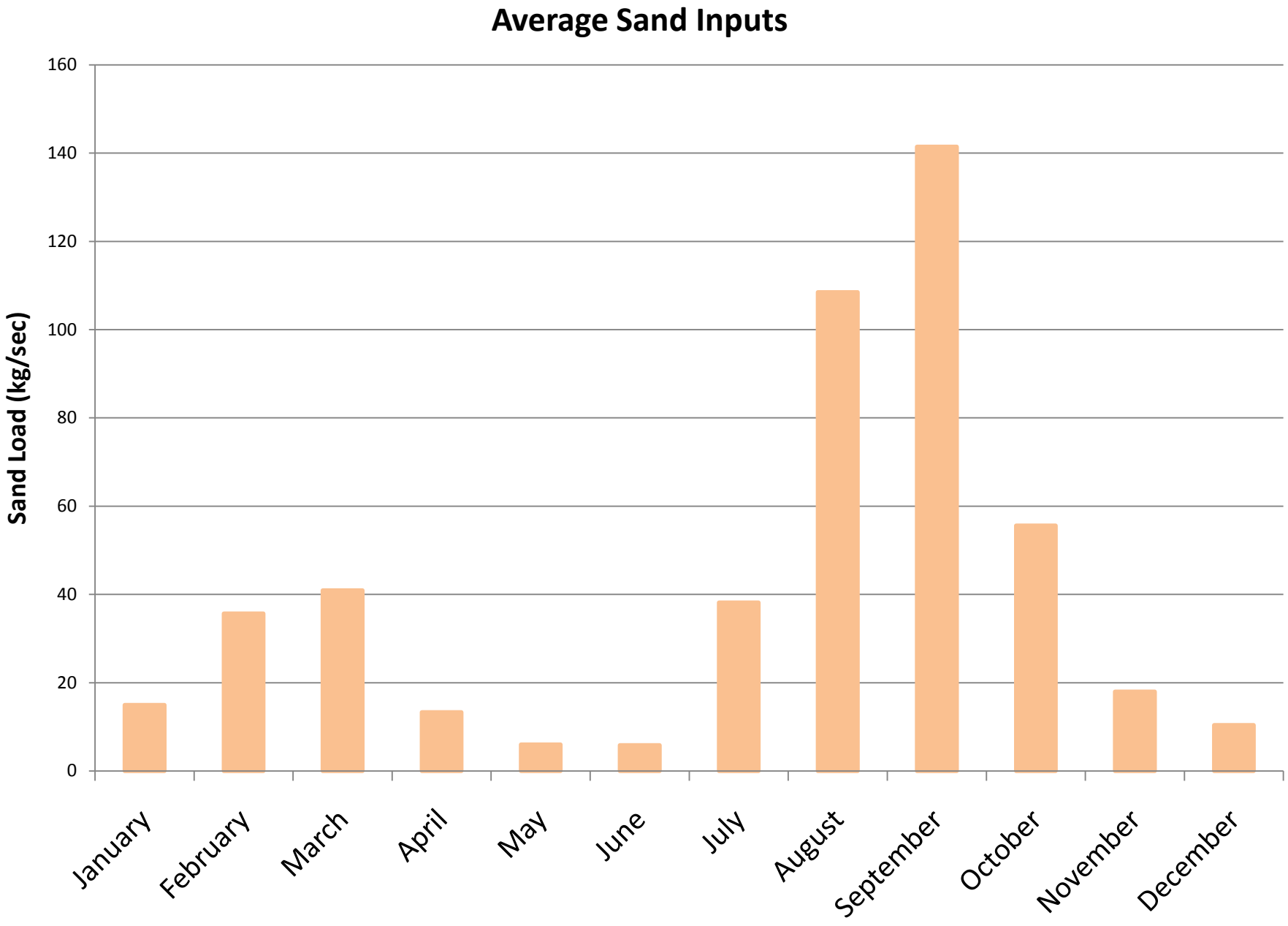
2012 Hydrograph Development

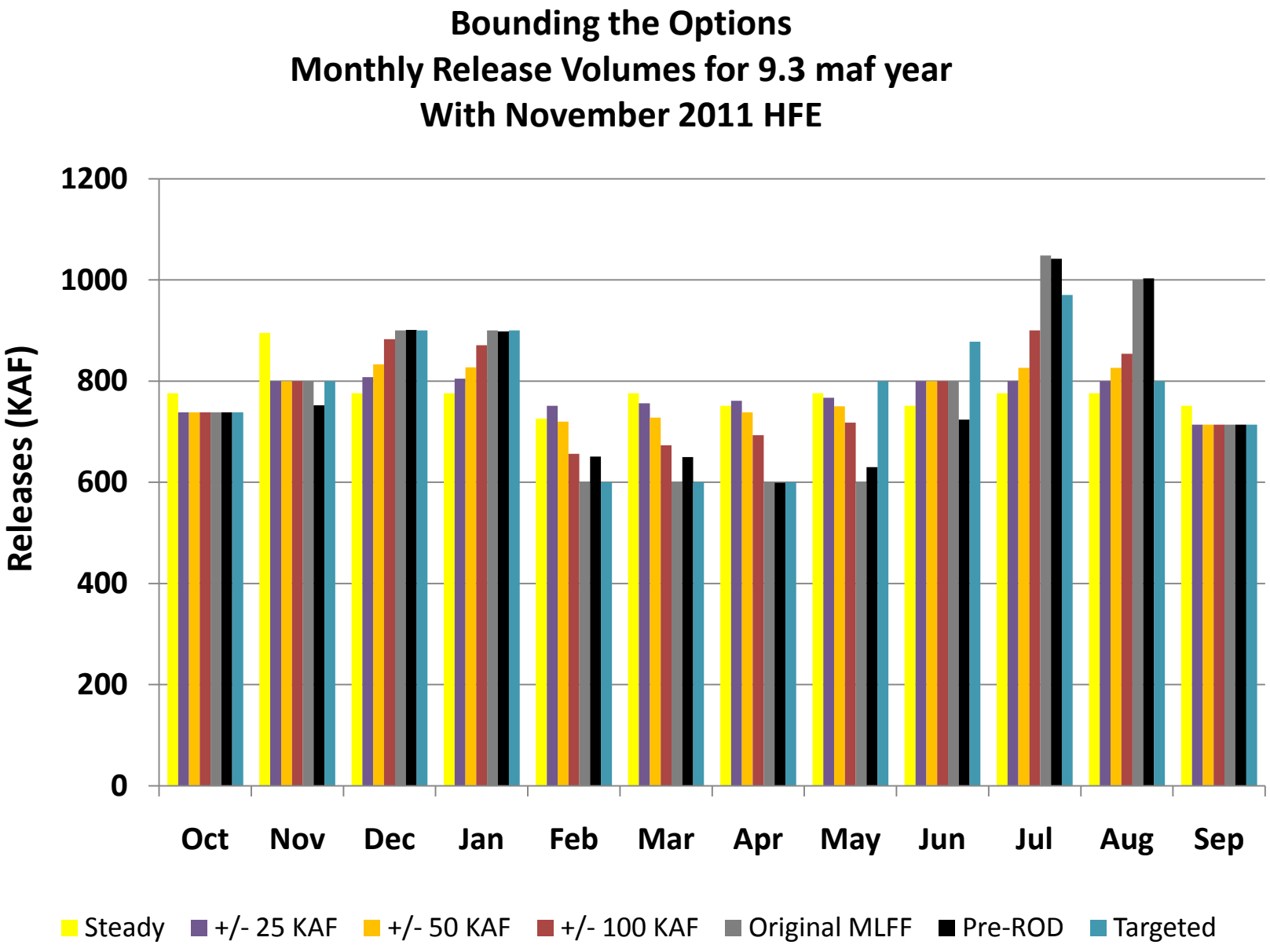
- Start with 2011 Hydrograph

  (+/-100 kaf w/16,000 & 22,000 cfs limits)
- Consider operating experiences from 2011
- Look to improve cost/benefit/flexibility
- Within existing environmental compliance

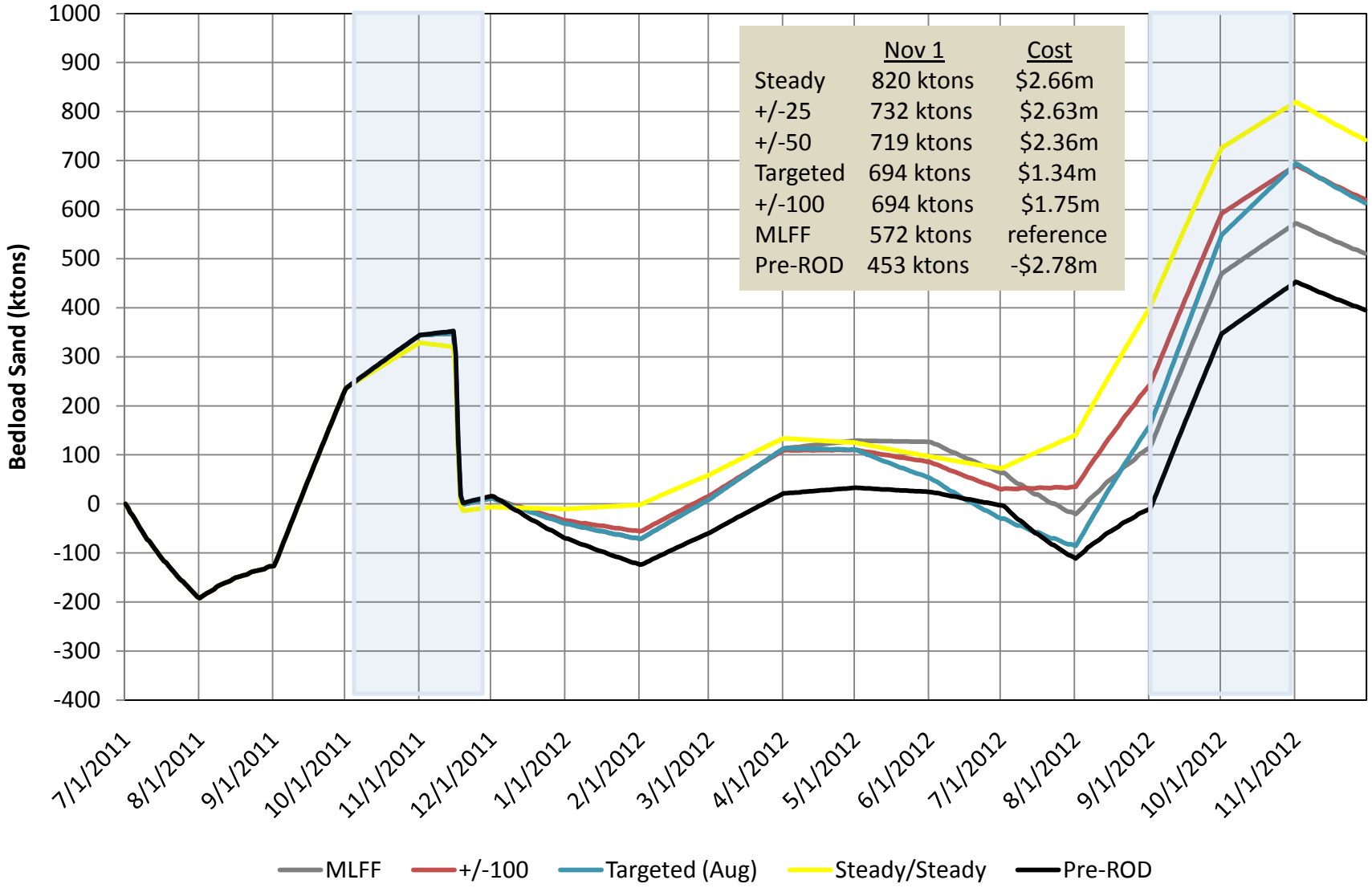
Methods

- USGS Model for sand
- Western's GTMAX hourly model for costs to the Basin Fund
- Compare against original MLFF
- Average sediment inputs
- Objective – Retain sand inputs high in the system in anticipation of a potential HFE


Average Sand Inputs
Sand Load (kg/sec)
160
140
120
100
80
60
40
20
0
January
February
March
April
May
June
July
August
September
October
November
December


Bounding the Options
Monthly Release Volumes for 9.3 maf year
With November 2011 HFE
Releases (KAF)
1200
1000
800
600
400
200
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Steady
+/- 25 KAF
+/- 50 KAF
+/- 100 KAF
Original MLFF
Pre-ROD
Targeted

Bounding the Options
Upper Marble Canyon (RM30)
9.3 maf Release



	Nov 1	Cost
Steady	820 ktons	$2.66m
+/-25	732 ktons	$2.63m
+/-50	719 ktons	$2.36m
Targeted	694 ktons	$1.34m
+/-100	694 ktons	$1.75m
MLFF	572 ktons	reference
Pre-ROD	453 ktons	-$2.78m

Finalists

2011 Hydrograph Method

- Monthly volume may vary +/- 100 kaf from average of remaining balance
- 16,000 cfs limit up to 11.0 maf annual release
- 22,000 cfs limit above 11.0 maf annual release
- No limits if needed for equalization
- ROD limits apply

Targeted Method

- August releases are limited using percentage method to conserve sediment inputs
- Sept/Oct low-steady releases also conserve sediment
- No limits on other months
- No limits if needed for equalization
- ROD limits apply

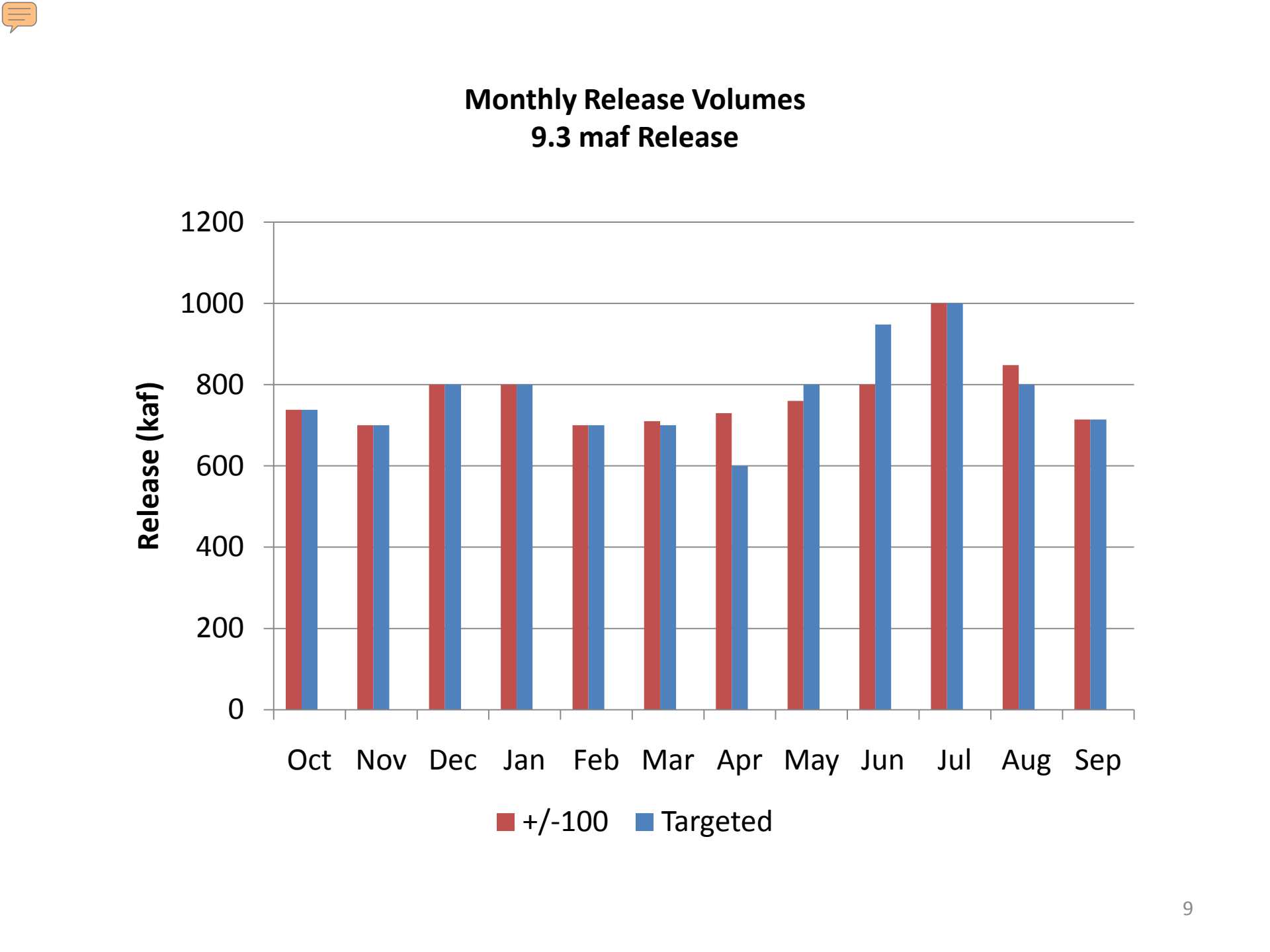
2012 Finalists
9.3 maf Release Example

+/-100 KAF (SCENARIO 18)

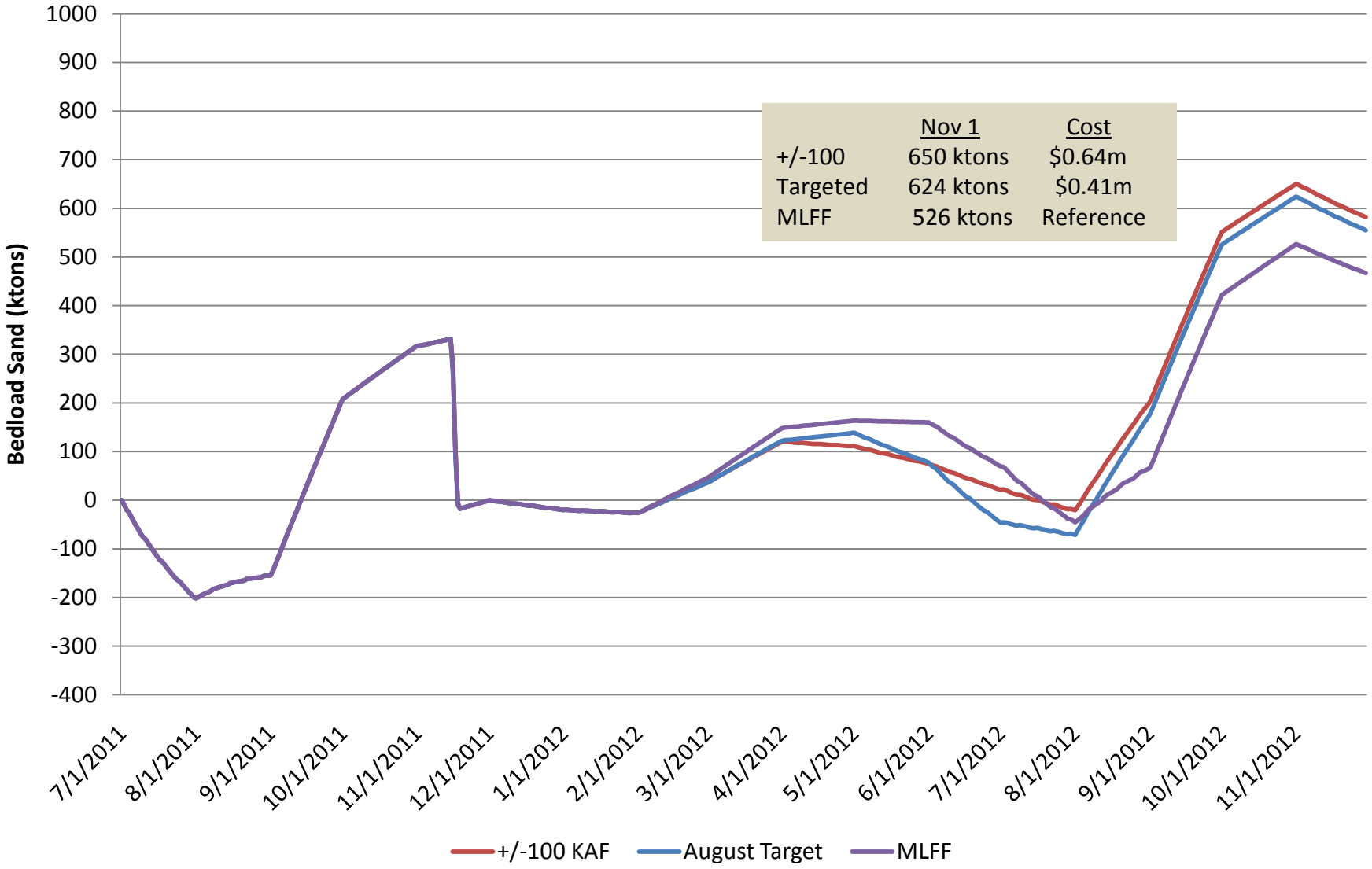
	Release (kaf)	Annual Forecast (maf)	Sept Steady Flow Target (kaf)	Min Monthly Release (Avg - 100 kaf) (kaf)	Max Monthly Release (Avg + 100 kaf) (kaf)
Oct	738	9.30	714	738	738
Nov	700	9.30	714	685	885
Dec	800	9.30	714	694	894
Jan	800	9.30	714	693	893
Feb	700	9.30	714	693	893
Mar	710	9.30	714	708	908
Apr	730	9.30	714	728	928
May	760	9.30	714	752	952
Jun	800	9.30	714	783	983
Jul	1,000	9.30	714	824	1,024
Aug	848	9.30	714	748	948
Sep	714	9.30	714		

Targeted (SCENARIO 19)

	Release (kaf)	Annual Forecast (maf)	Sept Steady Flow Target (kaf)	August Target Percent	August Target Volume (kaf)
Oct	738	9.30	714		800
Nov	700	9.30	714		800
Dec	800	9.30	714		800
Jan	800	9.30	714	10	800
Feb	700	9.30	714	10	800
Mar	700	9.30	714	12	800
Apr	600	9.30	714	15	800
May	800	9.30	714	20	800
Jun	948	9.30	714	25	800
Jul	1,000	9.30	714	40	800
Aug	800	9.30	714	100	800
Sep	714	9.30	714		

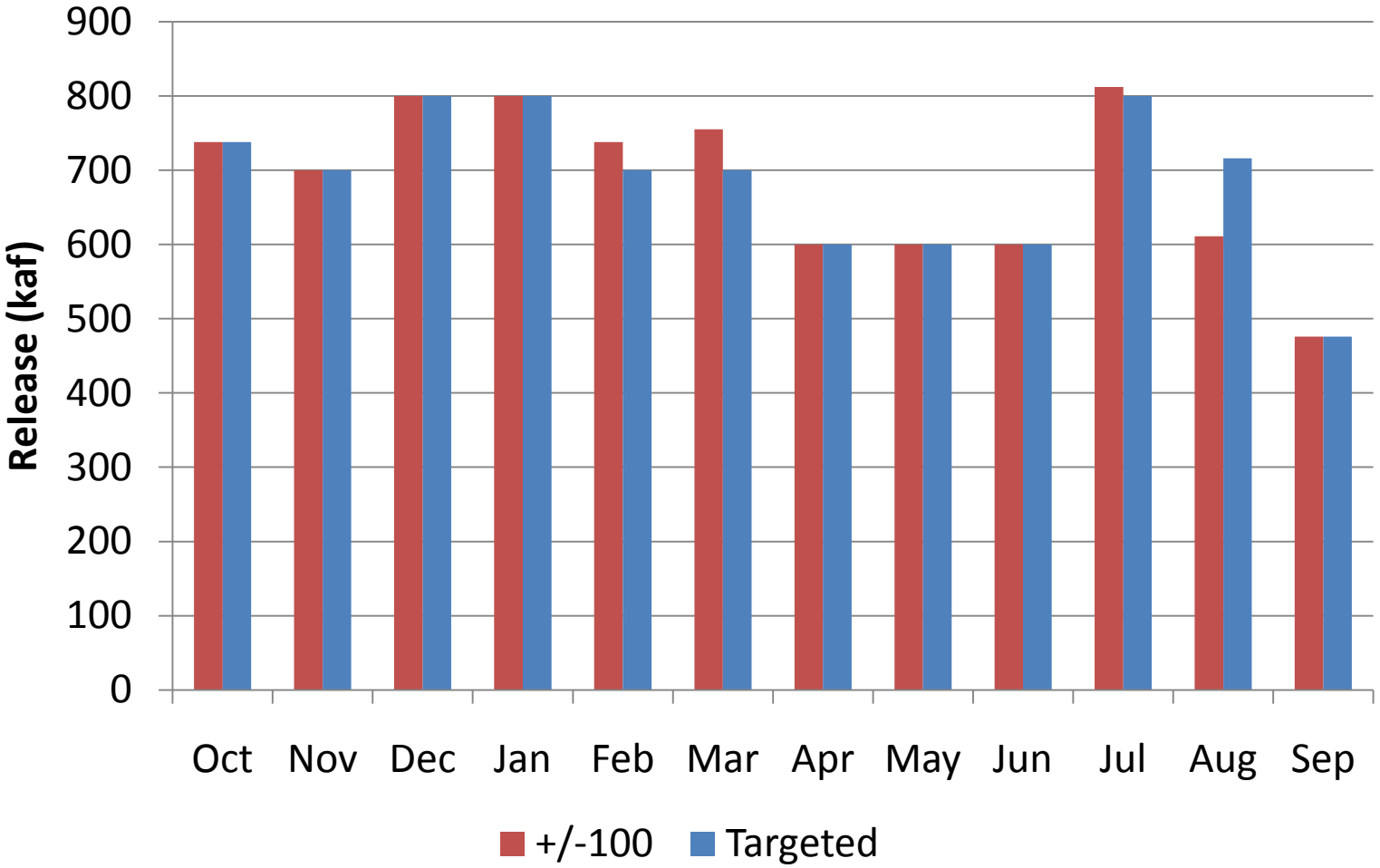

Monthly Release Volumes
9.3 maf Release
Release (kaf)
1200
1000
800
600
400
200
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
+/-100
Targeted

Upper Marble Canyon (RM30)
9.3 maf

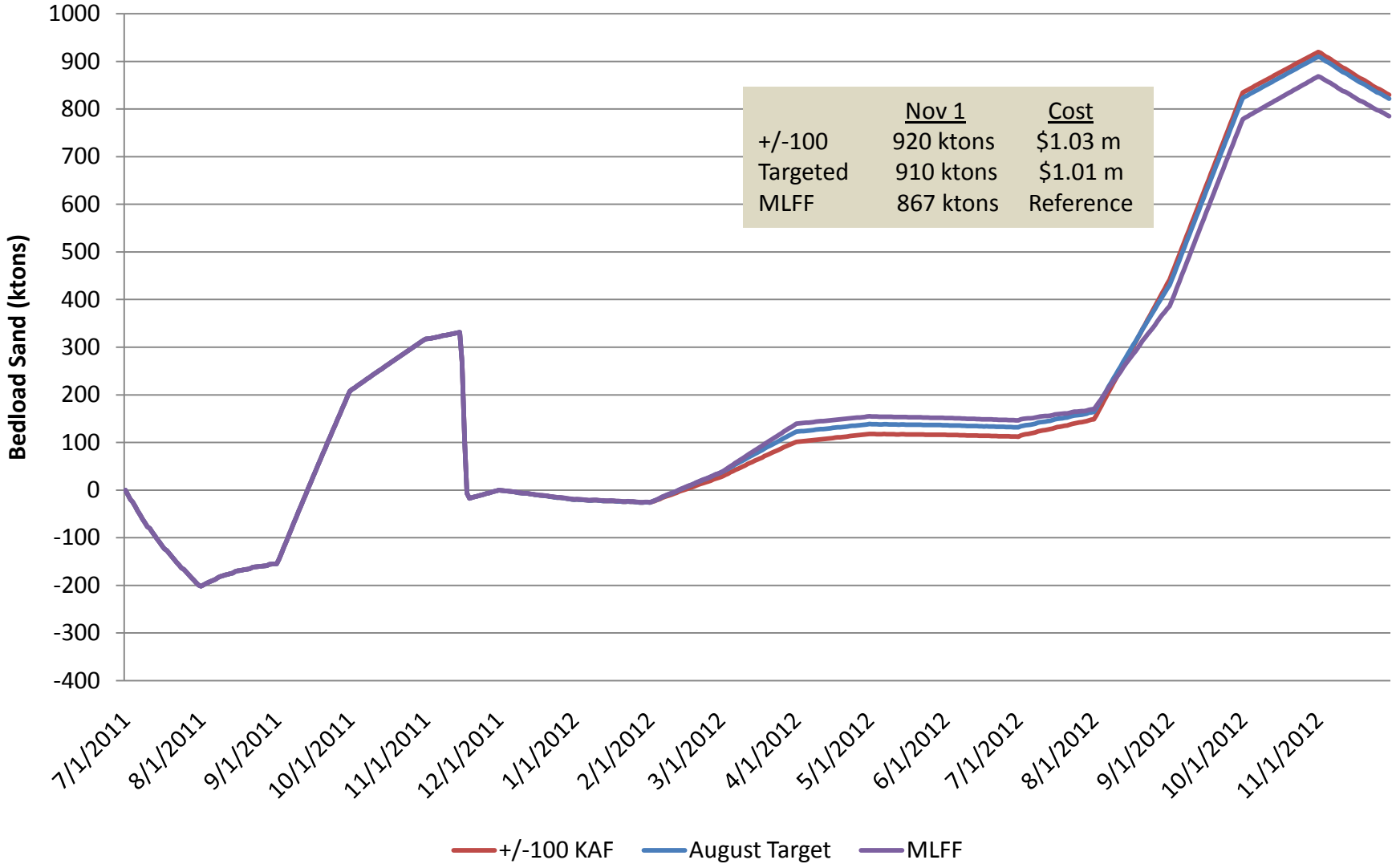


	Nov 1	Cost
+/-100	650 ktons	$0.64m
Targeted	624 ktons	$0.41m
MLFF	526 ktons	Reference

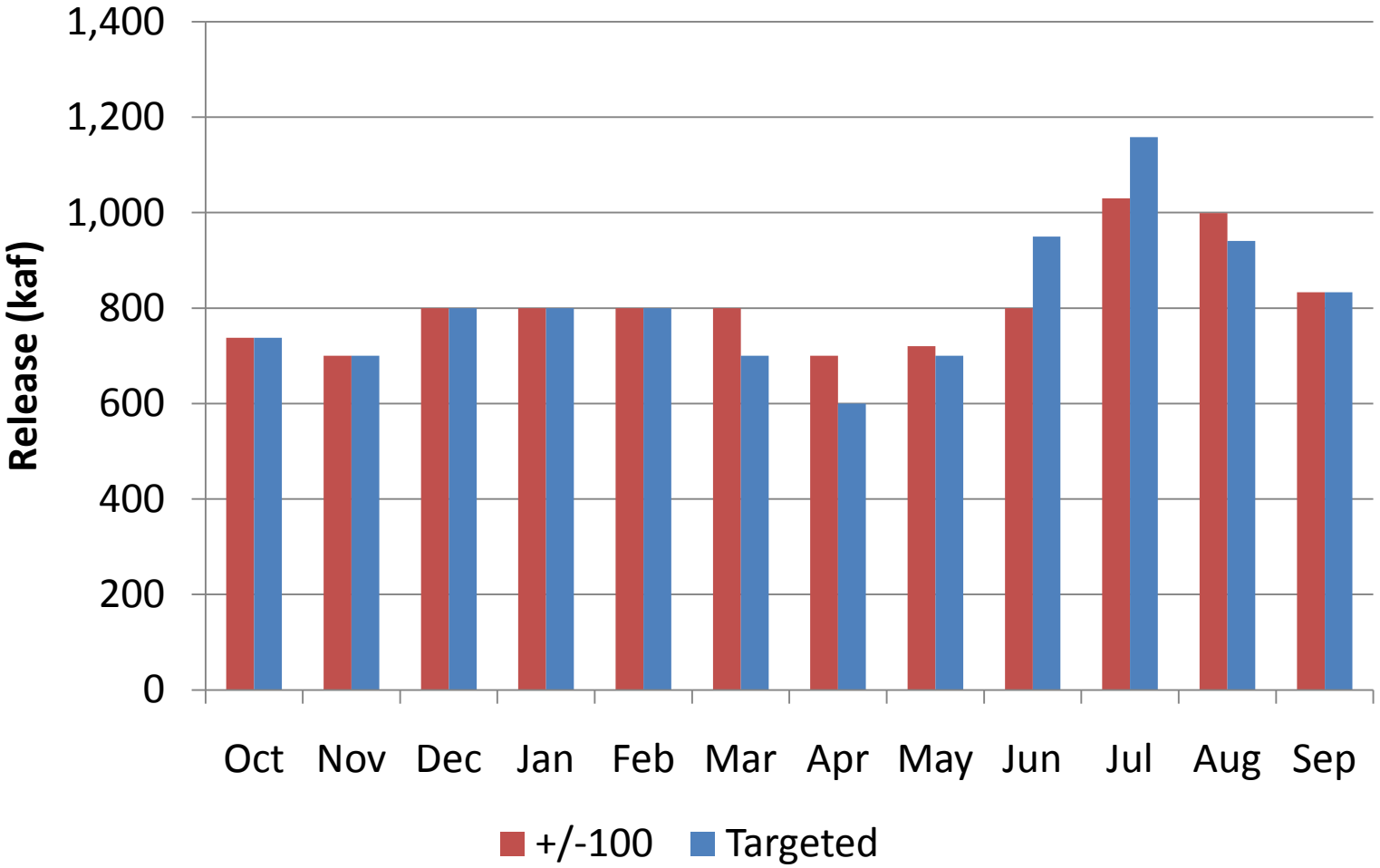
Monthly Release Volumes
9.3 maf > 8.23 maf (2004) Pattern



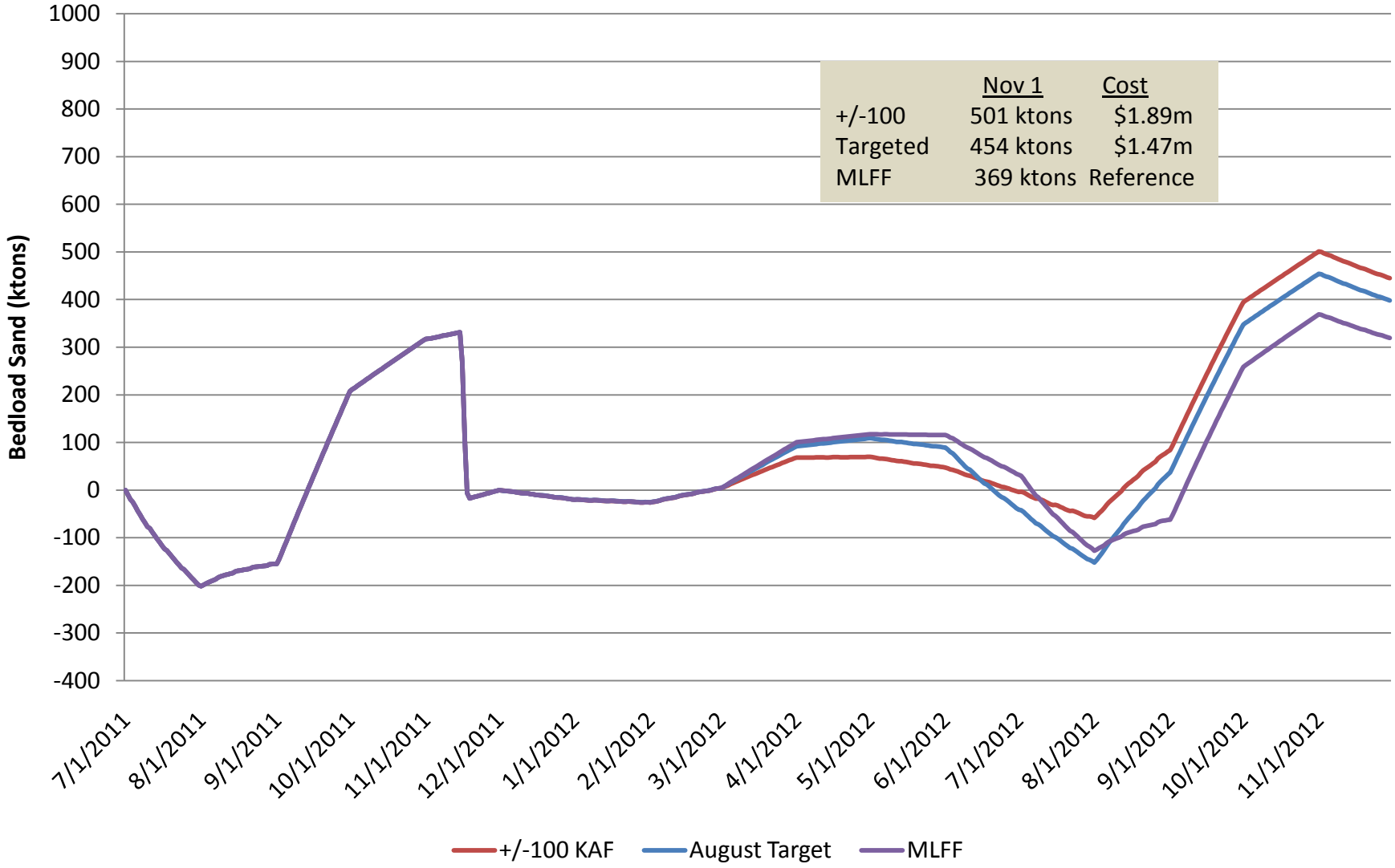
Round 5b
Upper Marble Canyon (RM30)
9.3 maf > 8.23 maf



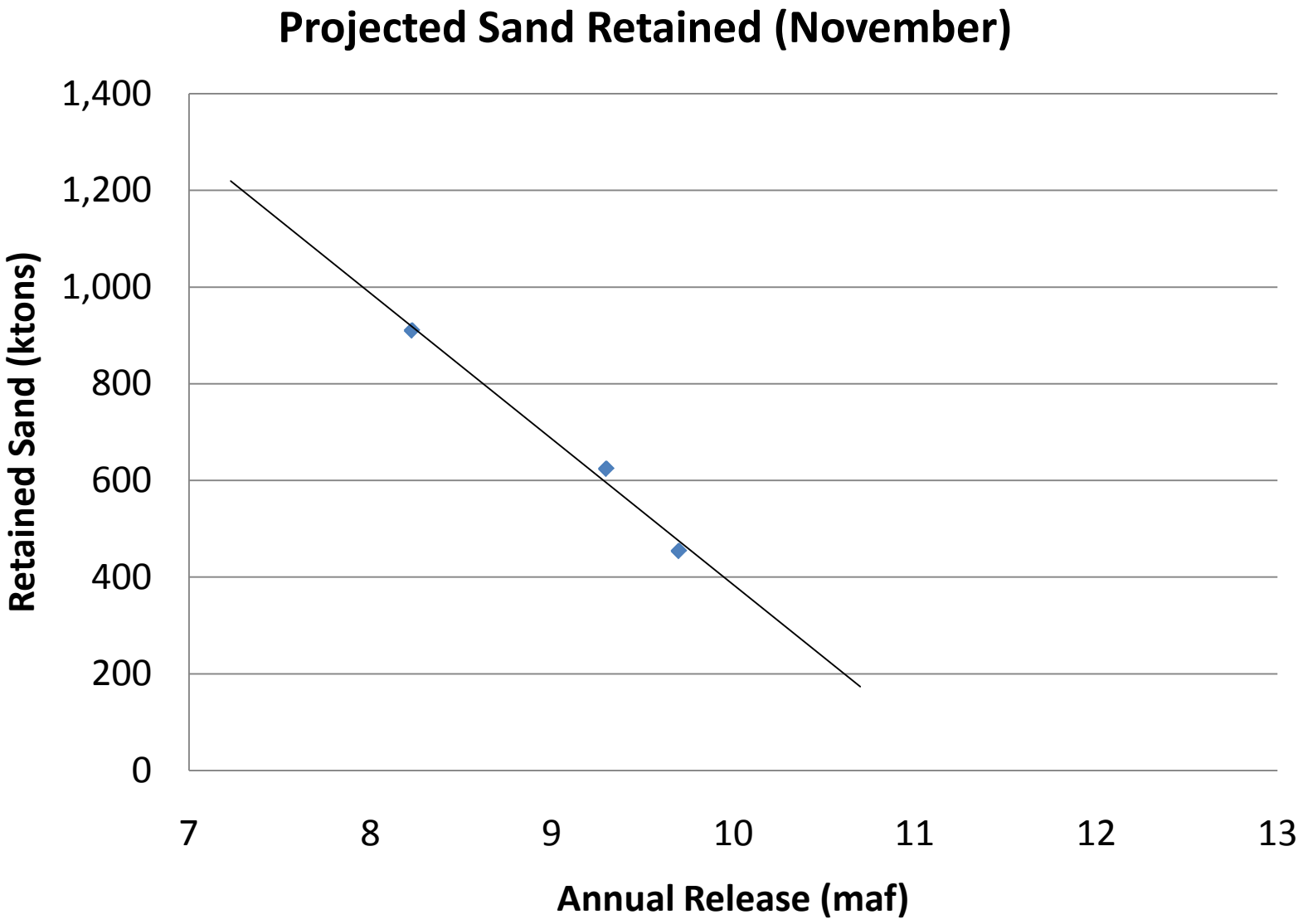
Monthly Release Volumes
9.3 maf > 9.72 maf Release (July 2009)



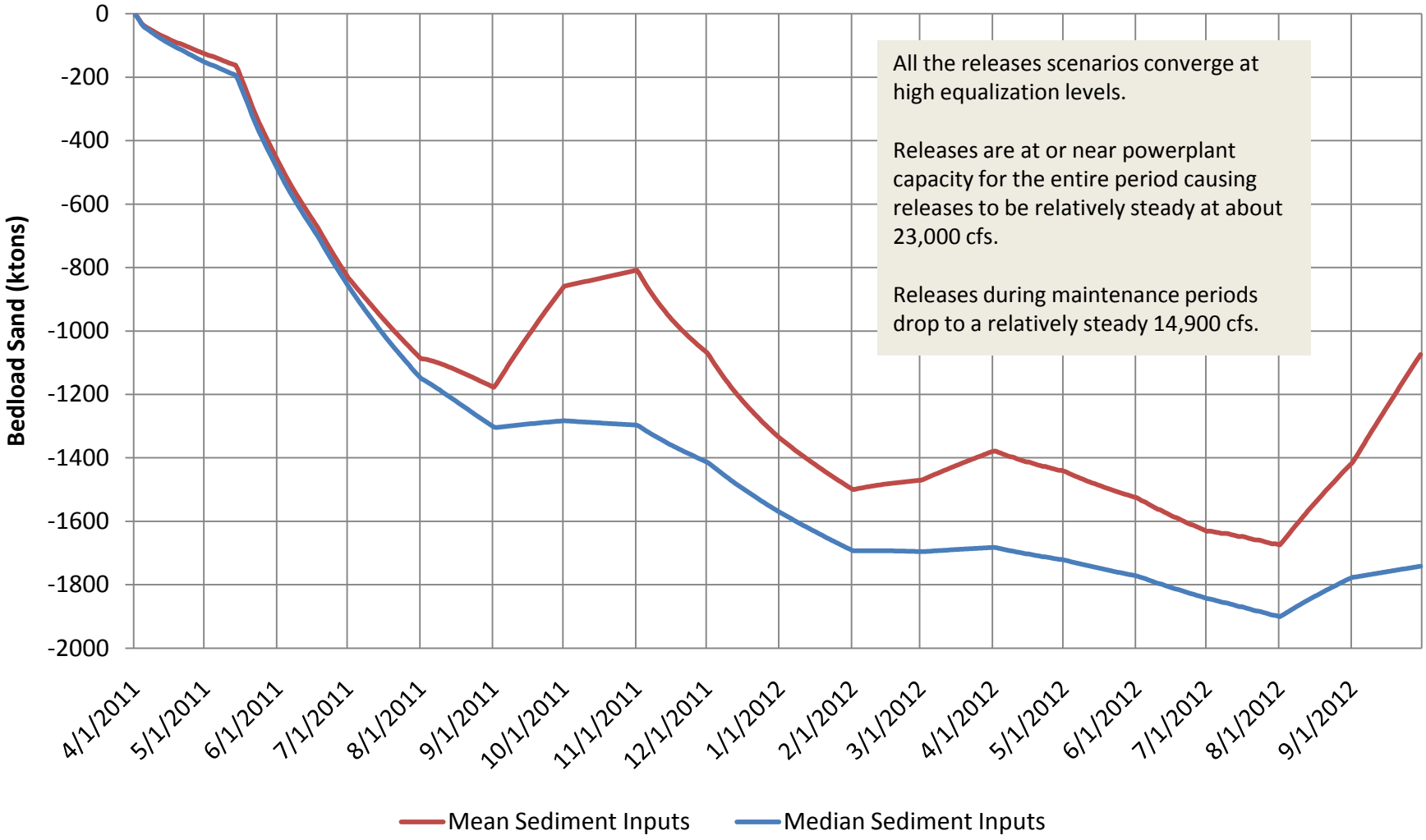
Round 5c
Upper Marble Canyon (RM30)
9.3 maf > 9.7 maf



	Nov 1	Cost
+/-100	501 ktons	$1.89m
Targeted	454 ktons	$1.47m
MLFF	369 ktons	Reference


Projected Sand Retained (November)
Retained Sand (ktons)
1,400
1,200
1,000
800
600
400
200
0
7
8
9
10
11
12
13
Annual Release (maf)

Sand Retention in Upper Marble Canyon
Targeted Approach
June 24 Month Study Releases
(12.4 maf in 2011 and 12.8 in 2012)

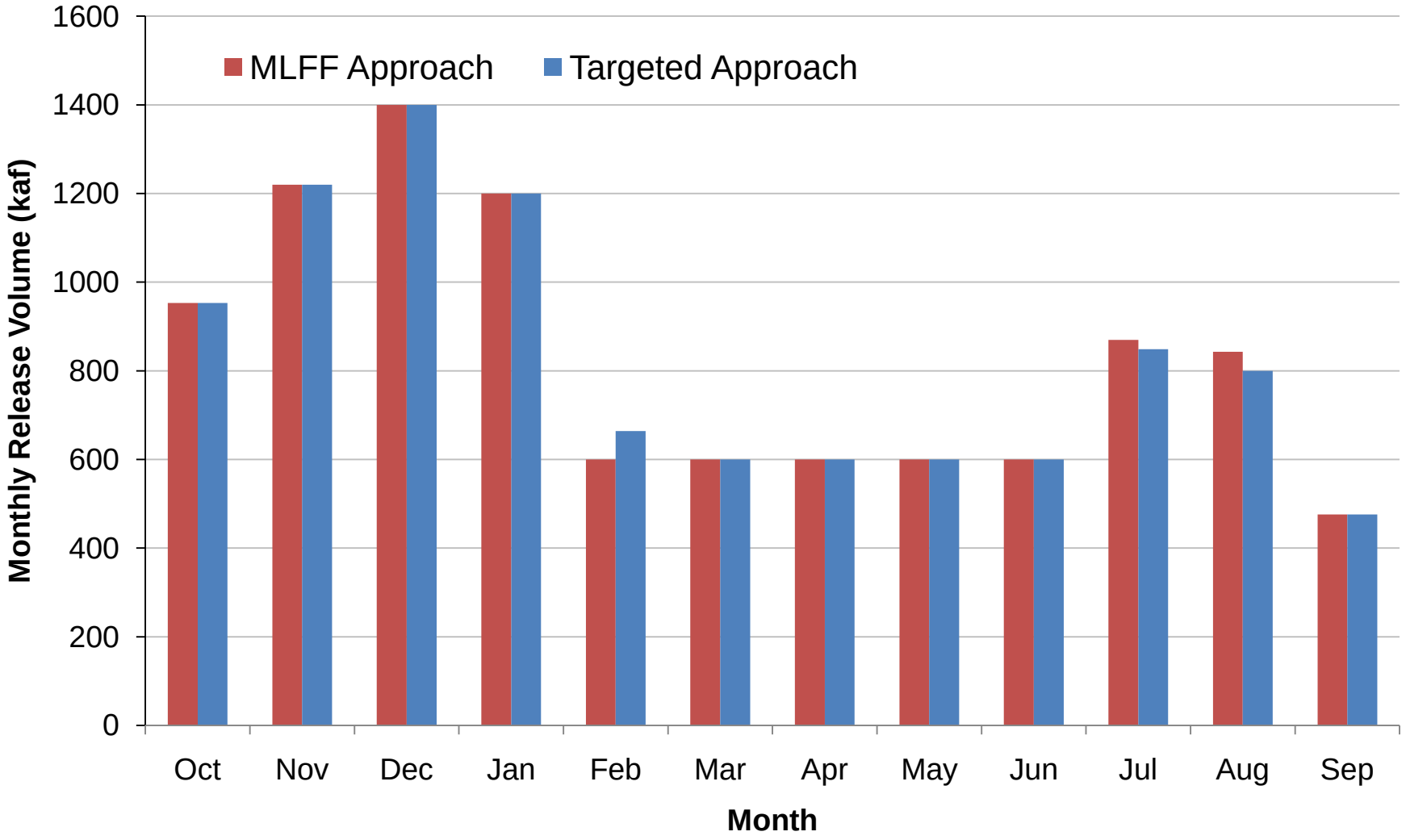


All the releases scenarios converge at high equalization levels.

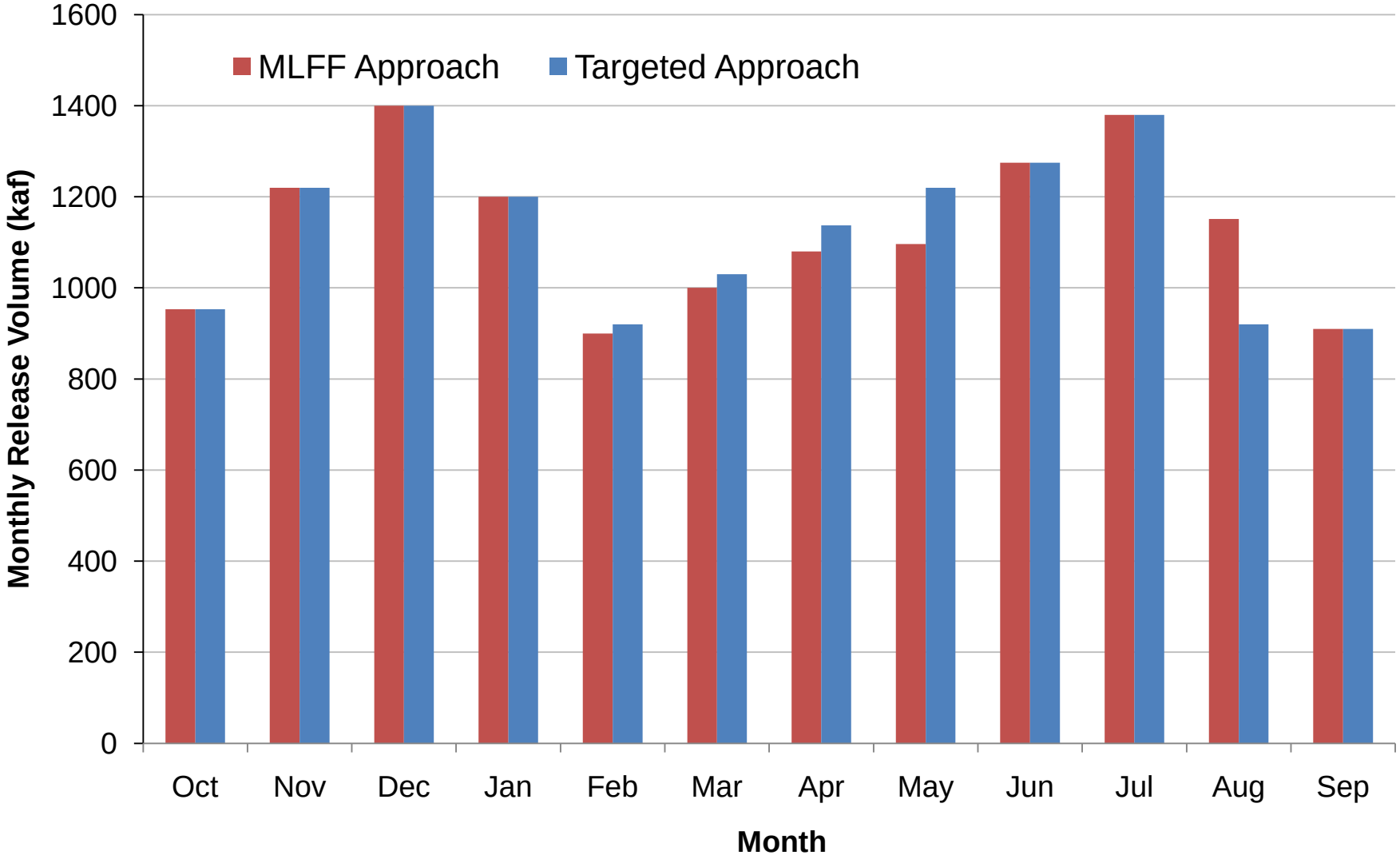
Releases are at or near powerplant capacity for the entire period causing releases to be relatively steady at about 23,000 cfs.

Releases during maintenance periods drop to a relatively steady 14,900 cfs.

Minimum
Probable Inflow Scenario
Water Year 2012



Most Probable Inflow Scenario Water Year 2012



Maximum
Probable Inflow Scenario
Water Year 2012