

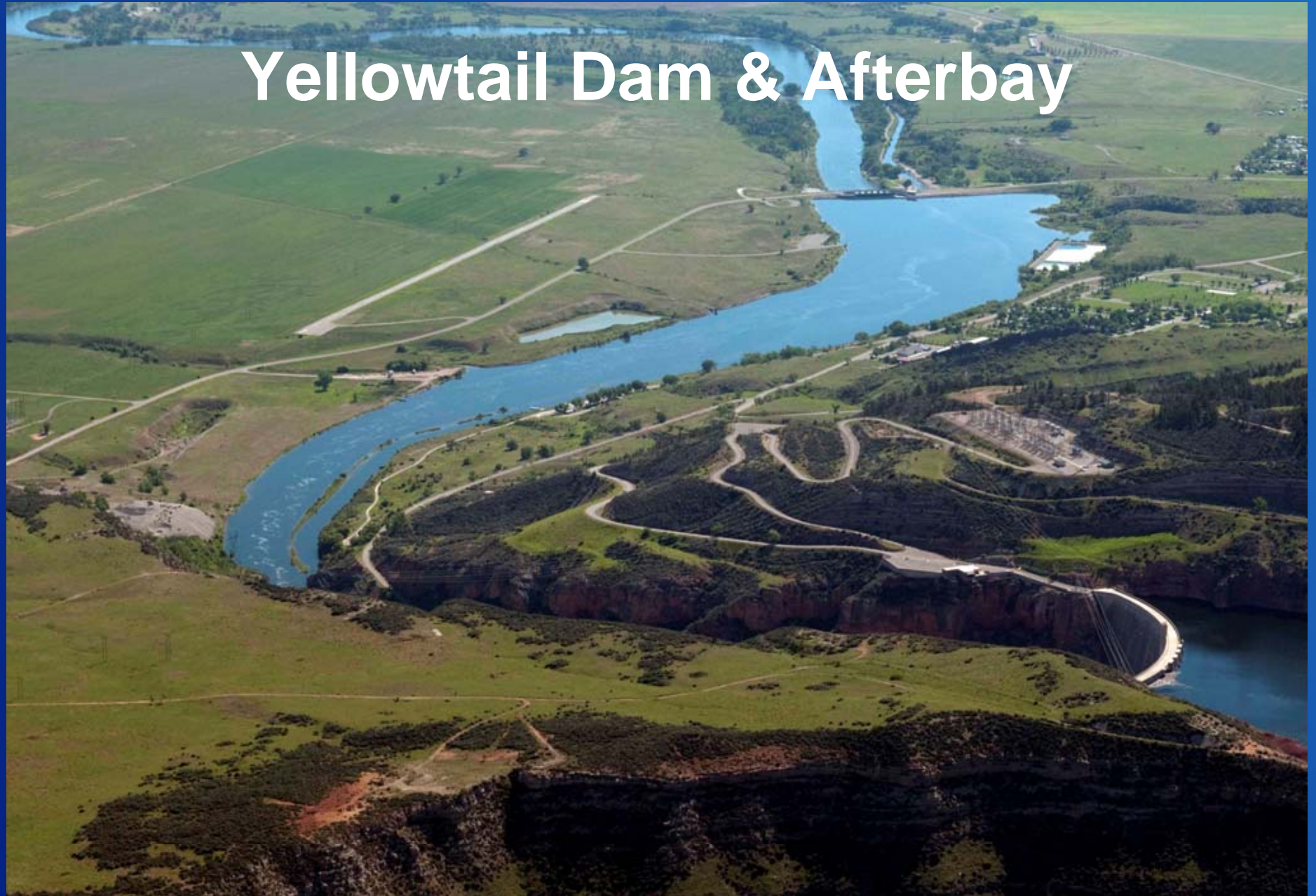
RECLAMATION

Managing Water in the West

Yellowtail Dam & Bighorn Lake Recap of Operations during WY-2012

Billings, Montana
October 3, 2012

Yellowtail Dam & Afterbay



RECLAMATION

BIGHORN LAKE
2012 Operations Review Based on
Operating Criteria

RECLAMATION

BIGHORN LAKE CONDITIONS

November 1, 2011

Elevation

3639.30 ft – 0.7 ft below full pool

Storage

1,011,836 af – 99% full

Inflows = 2,600 cfs

Total Outflow = 3,500 cfs

River = 3,500 cfs

BIA Canal = 0 cfs

RECLAMATION

BIGHORN LAKE FALL OPERATIONS

Operating Criteria Used for 2012 Plans

NOVEMBER - MARCH
Bighorn Lake River Release Rate

11/2/2011 9:18

A	B	C	D	E	F	G	H	I	J	K
ENTER	CALCULATED	ENTER	ENTER	ENTER	End of March	CALCULATED	CALCULATED	31-Mar-10	Month	Gains
Bighorn Lake	Nov-Mar	Bighorn Lake	Buffalo Bill	Boysen Res	Bighorn Lake	Release to	River Release	Reservoir Level	Apr	54.6
Apr-Oct Gain	Forecasted Gain	Oct. 31	Nov-Mar Release	Nov-Mar Release	Stor. Target	Afterbay	From Afterbay	Target	May	184.0
in Acre-feet	Acre-feet	Storage AF	CFS	CFS	acre-feet	CFS	CFS		Jun	390.7
					(2007 AC Table)				Jul	88.4
806,500	339,348	1,011,836	350	950	829,234	3067	3137	3619.0	Aug	-11.6
Min Probable	304,348								Sep	8.7
Max Probable	374,348								Oct	91.7
									Total	806.5
Directions: Enter appropriate values in the Yellow Cells: A10, C10, D10, & E10.										
Bighorn Lake River Release for Nov. - Mar. is calculated in cell H10 and the end of March target elevatio is displayed in I10.										
					Intermediate Calculations for River Release					
					J	K	L	M		K
					CALCULATED	CALCULATED	CALCULATED	Check Results &		End of March
					Step One	Step Two	Step Three	Adjust Release		Reservoir Elev.
					Release CFS	Release CFS	Release CFS	CFS		Target
					>2500	2000-2500	1500-2000			Target
B = .145*A+222402 R ² = .6756	Forecasted Gain									
F = Desired end of March Storage										
G is determined from calculations in J through L with Checks in M										
H = Dam Release (G) + 70 cfs										
					3137	3184	3228	3137	If J > 2500 than set to J	3619.0
					3137	2500	2000	3137	If K < 2500 than set to K	3619.0
Forecasted Gain Adjustments						2000	1500	3137	If L < 2000 Then set to L	3619.0
		Elevation	Storage				1500	3137	If L < 1500 then set to 1500	3619.0
1500-2000 cfs		3615	794,613							829,234
2000-2500 cfs		3617	807,921							829,234
> 2500 cfs		3619	821,949							829,234

RECLAMATION

BIGHORN LAKE FALL OPERATIONS

Operating Criteria Used for 2012 Plans

STEP 1

2011 April-October Gain = 806,500 acre-feet

2011 End-of-October Storage = 1,011,836 acre-feet

Upstream Reservoir Fall & Winter Releases =

Boysen = 950 cfs

Buffalo Bill = 350 cfs

Projected End-of-March Target Elevation = 3617

Calculated November-March Gain = 339,300 acre-feet

Calculated Fall & Winter Release for Yellowtail:

River = 3,175 cfs

RECLAMATION

BIGHORN LAKE FALL CONDITIONS

Operating Criteria Used for 2012 Plans

STEP 2

Since Calculated Fall & Winter Release was $> 2,500$ cfs

Set End-of-March target elevation @ 3619

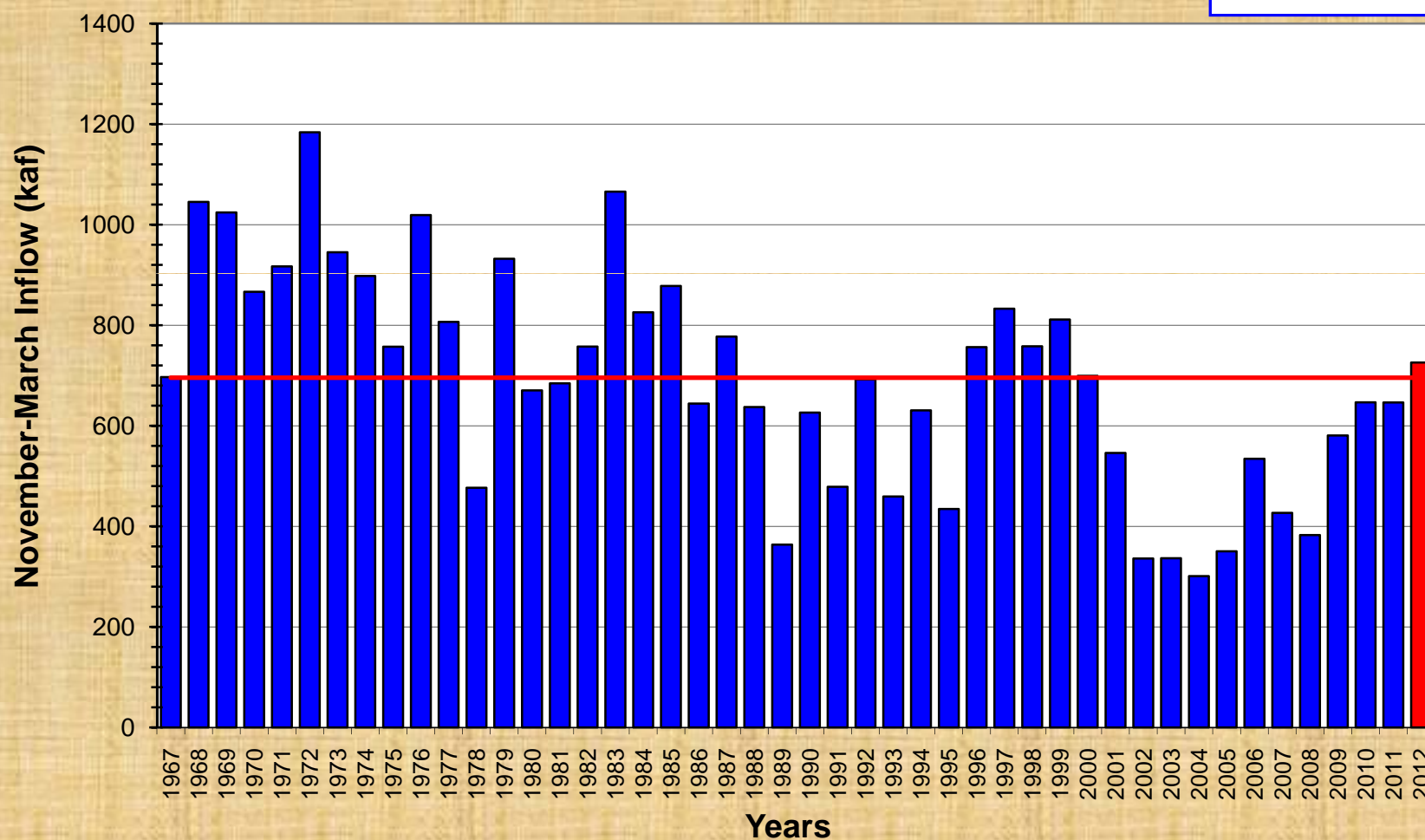
**Calculated New Fall & Winter Release for Yellowtail:
River = 3,130 cfs**

RECLAMATION

Recap of Water Year 2012

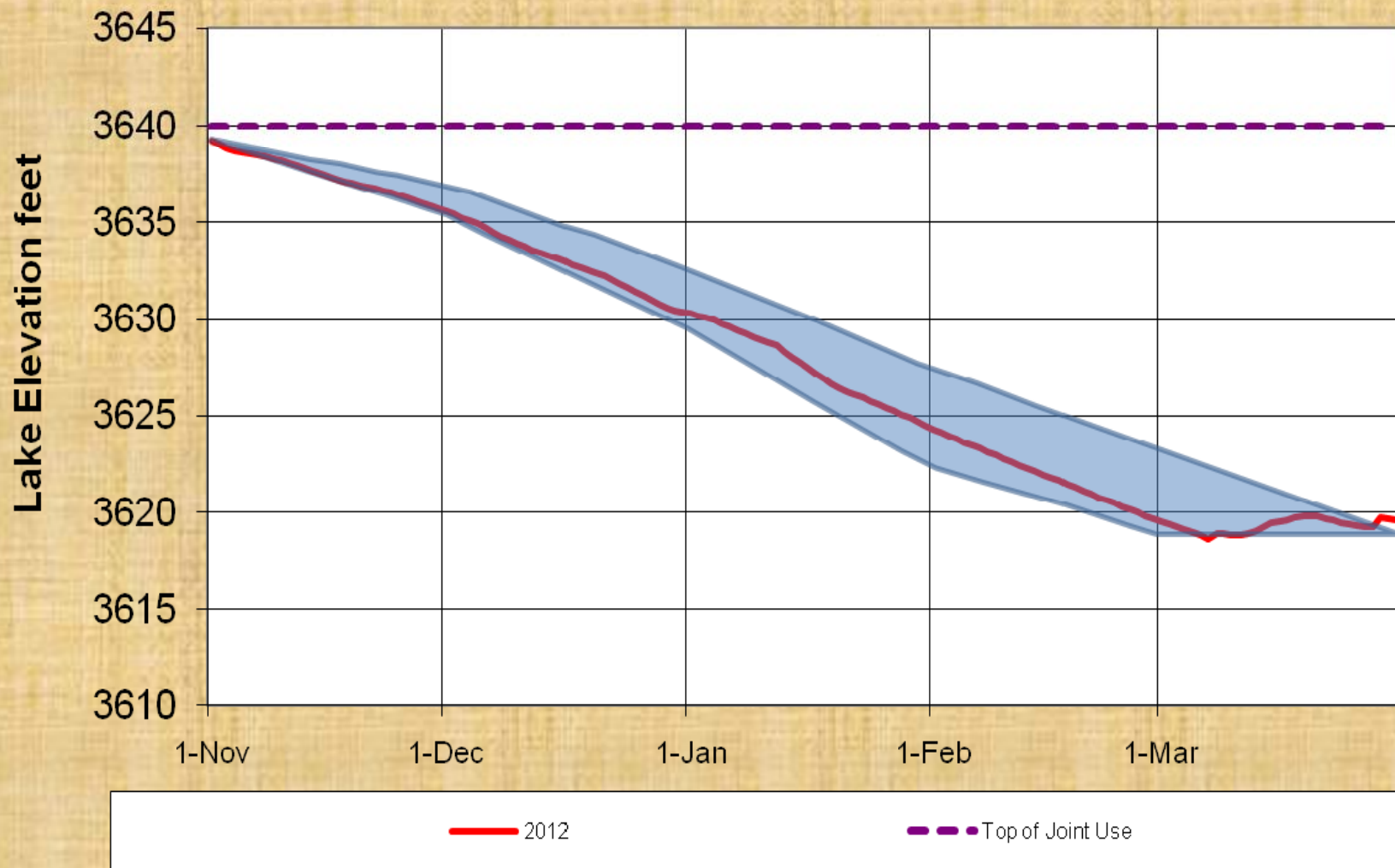
**Bighorn Lake November-March Inflow
1967-2012**

F.C. – 733 kaf
2012 – 726 kaf
Ave. – 696 kaf



RECLAMATION

Bighorn Lake 2012 Nov-Mar Operations



RECLAMATION

November-March River Release

	<u>Target</u>	Actual
Oct 31 Lake Elev.	3635-3640	3639.30
Nov-Mar Release	3,130	3,100 cfs
Mar 31 Lake Elev.	3619	3619.58

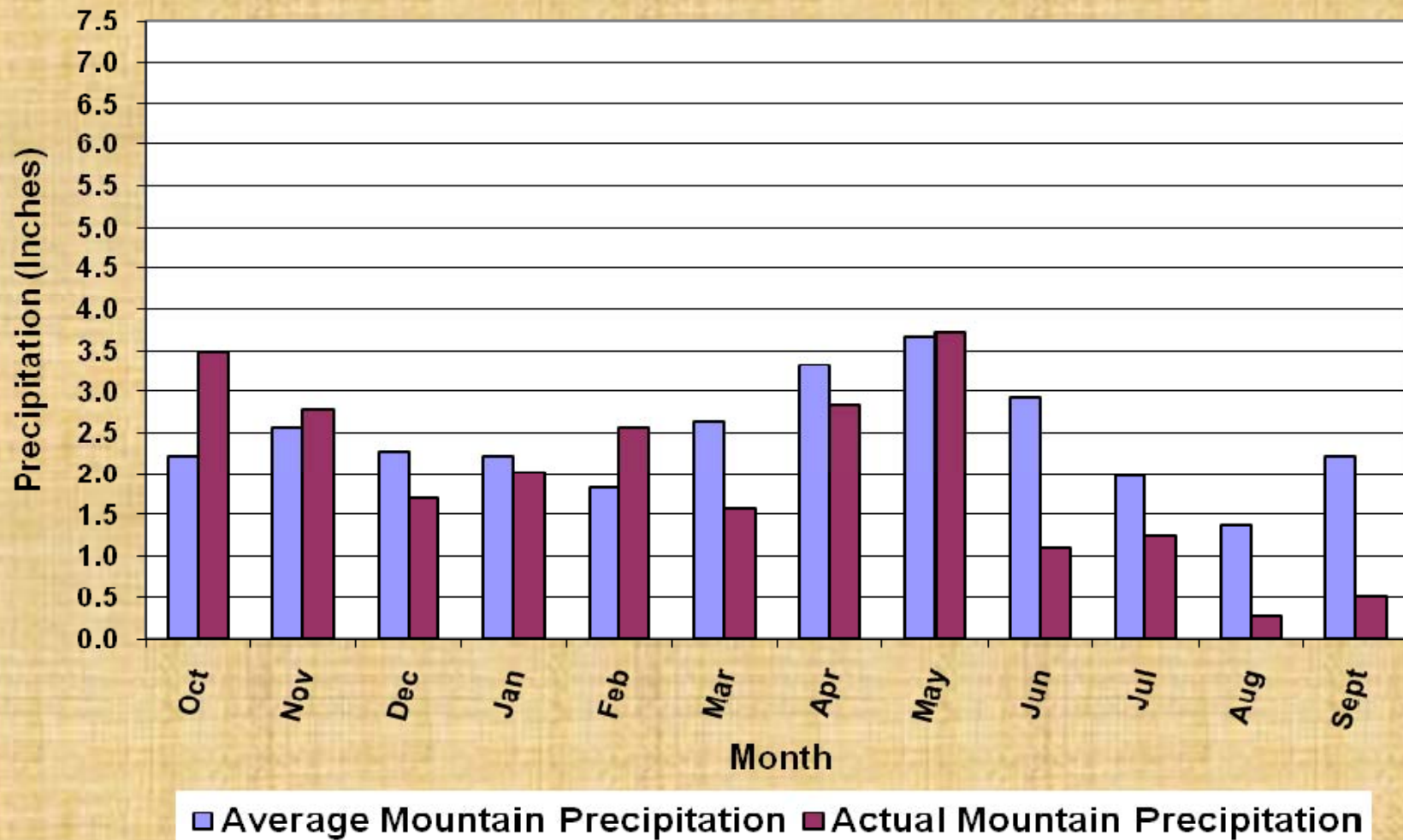
RECLAMATION

Spring Runoff Season

RECLAMATION

Recap of Water Year 2012

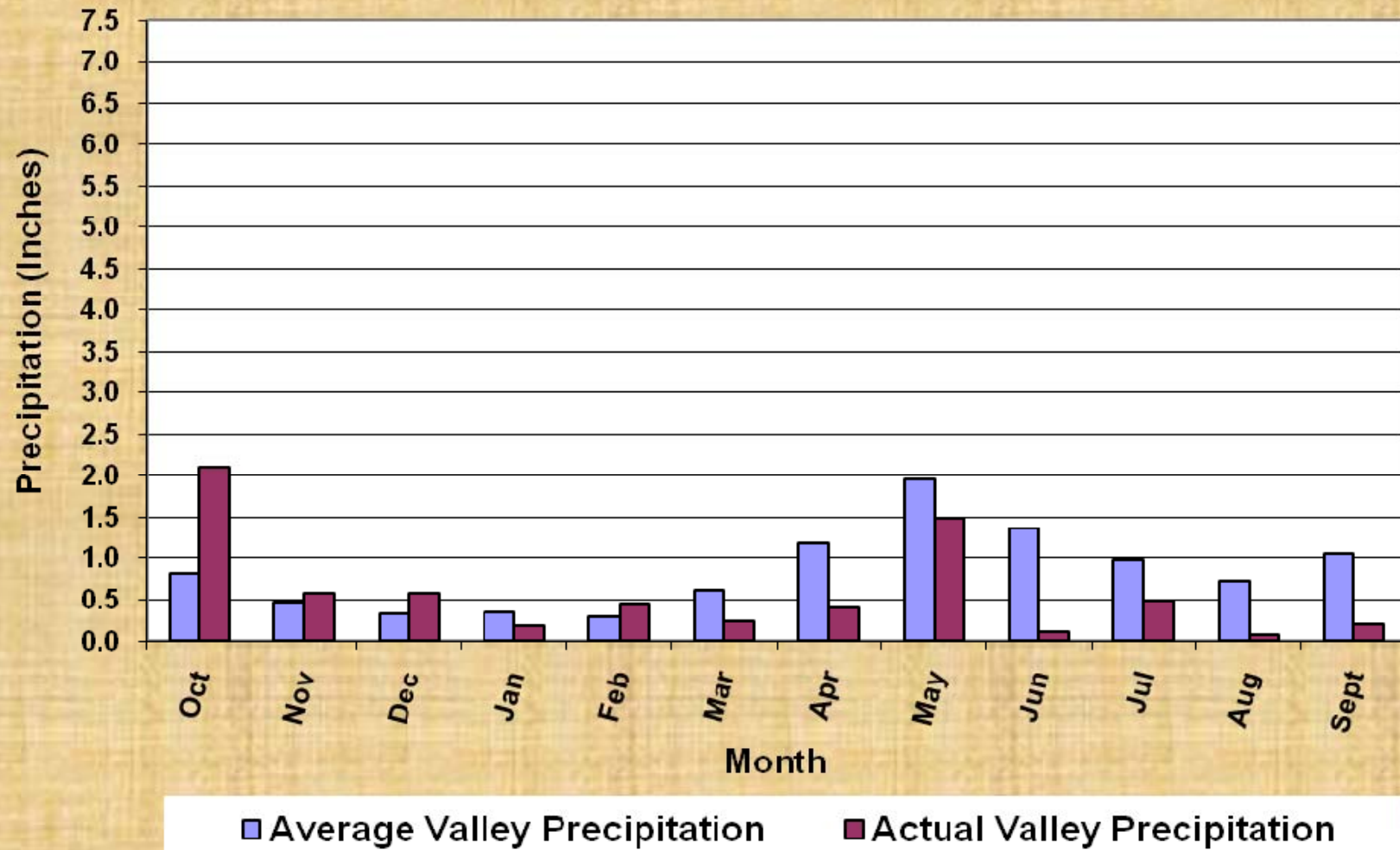
2012 Mountain Precipitation



RECLAMATION

Recap of Water Year 2012

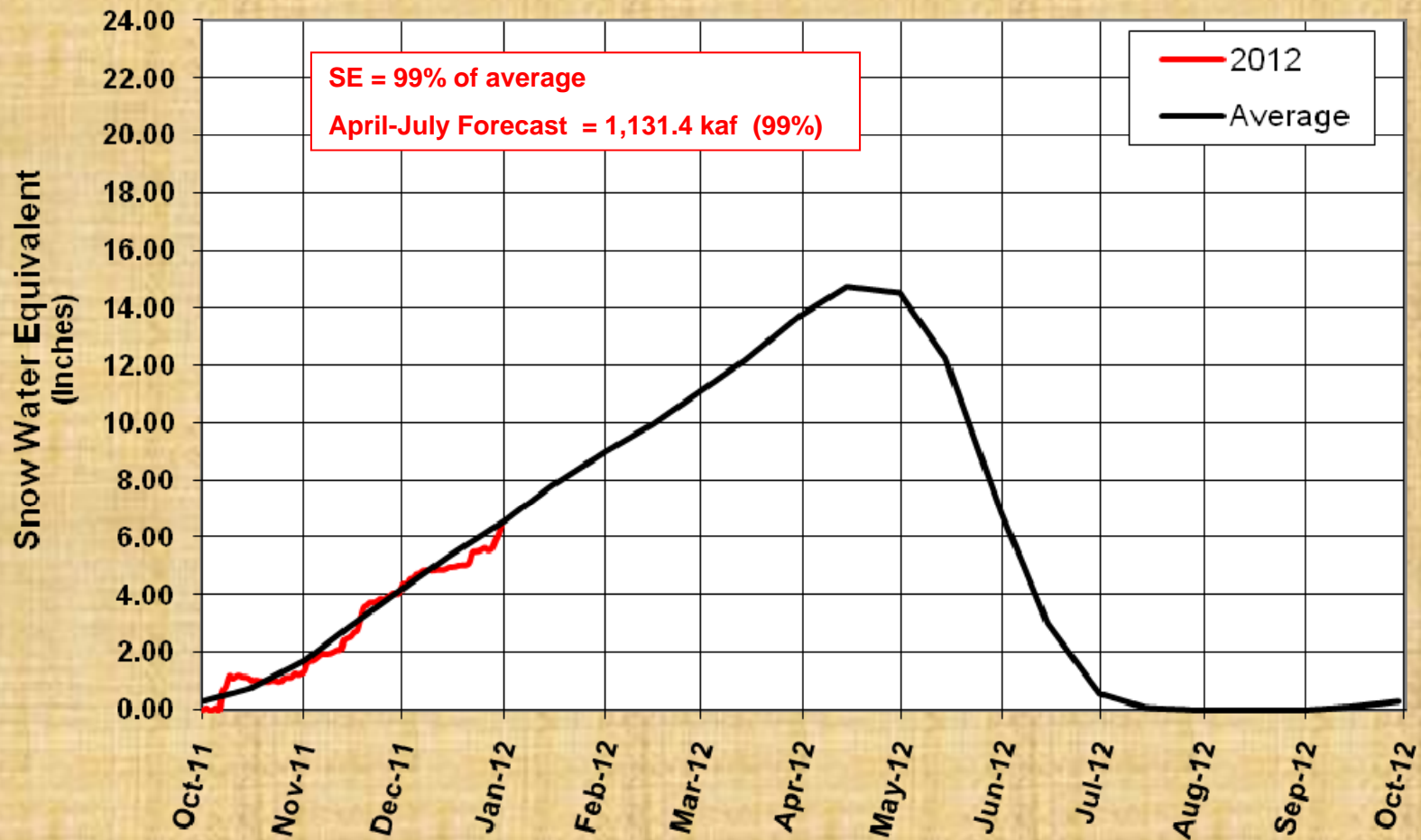
2012 Valley Precipitation



RECLAMATION

Recap of Water Year 2012

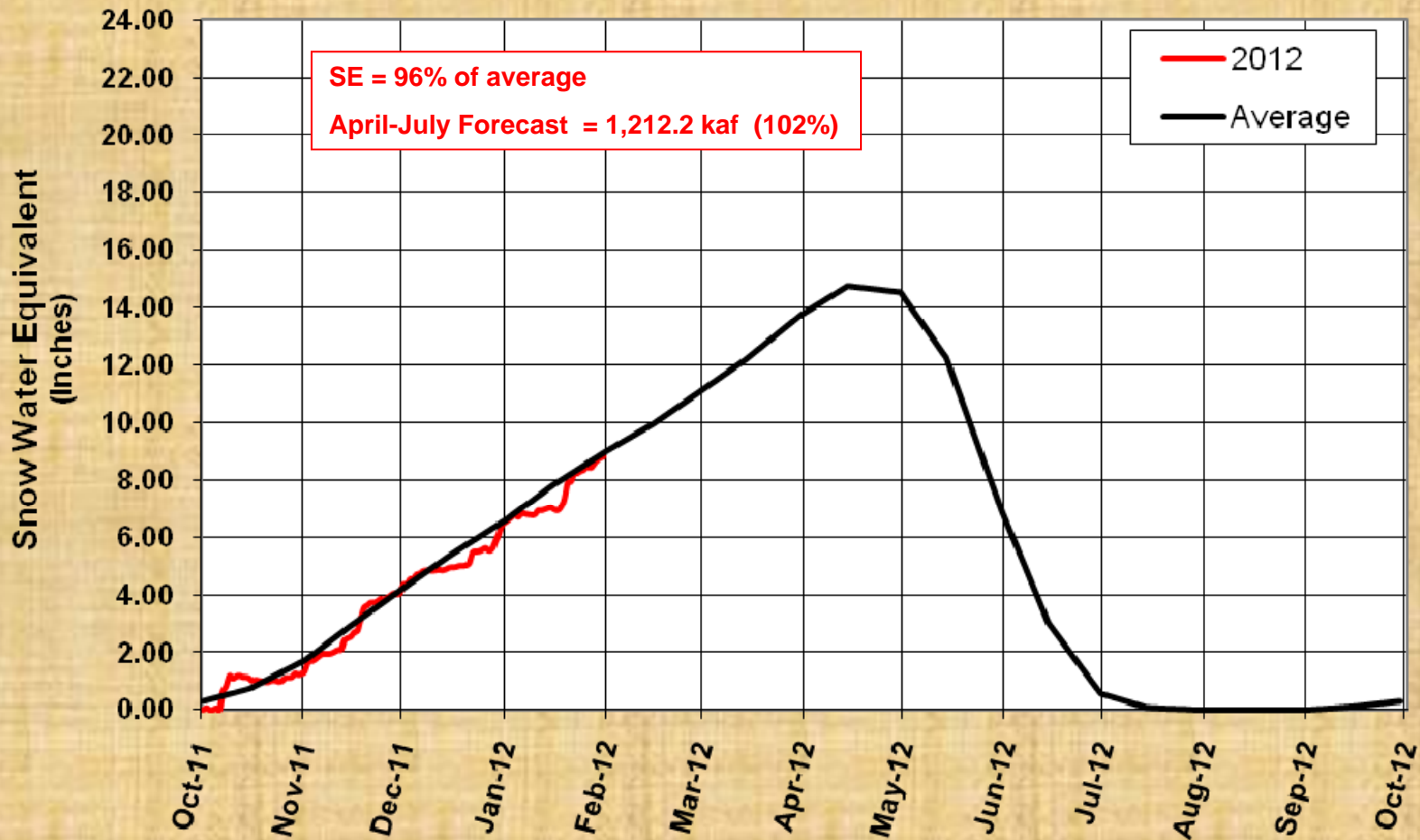
Mountain Snowpack Conditions on January 1



RECLAMATION

Recap of Water Year 2012

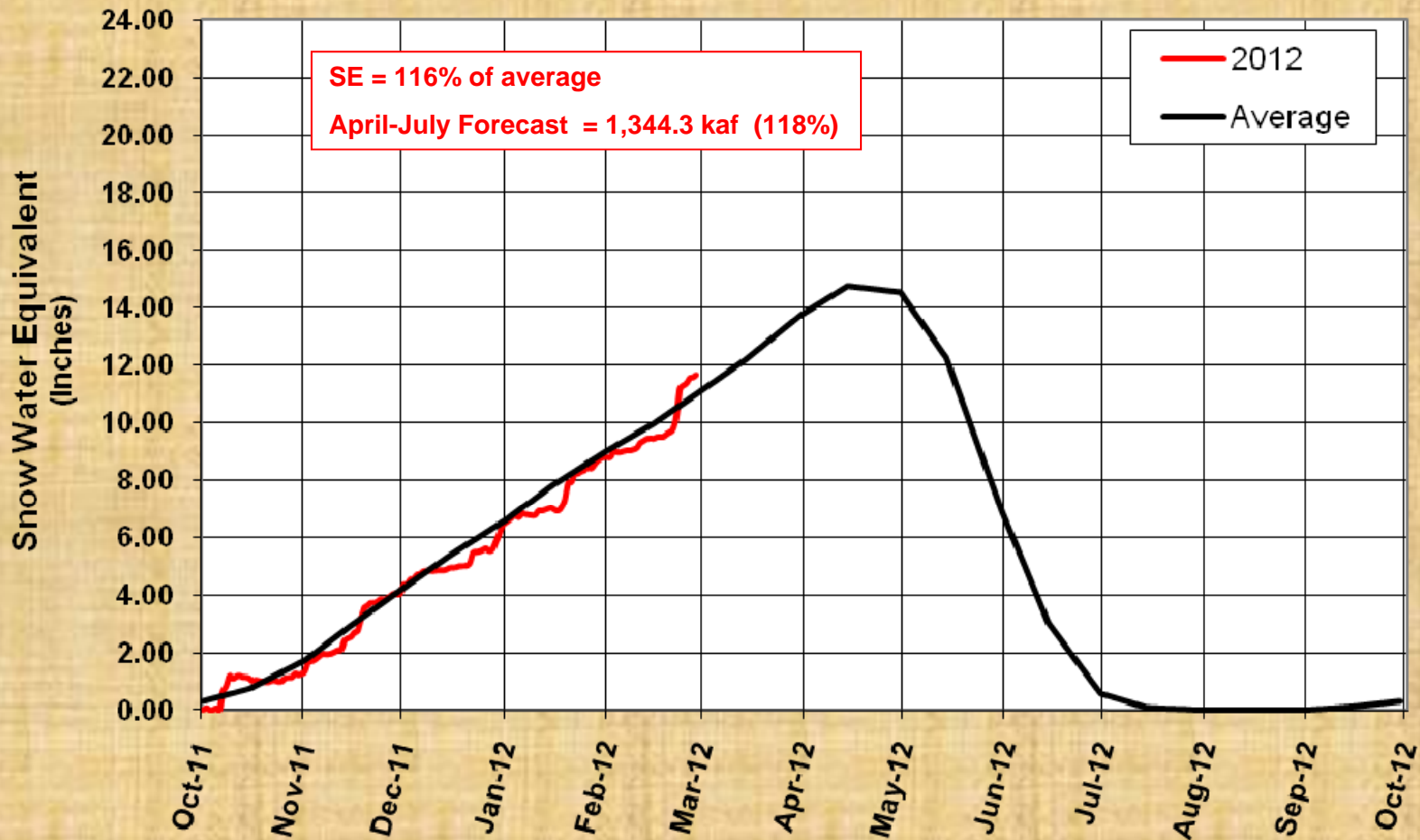
Mountain Snowpack Conditions on February 1



RECLAMATION

Recap of Water Year 2012

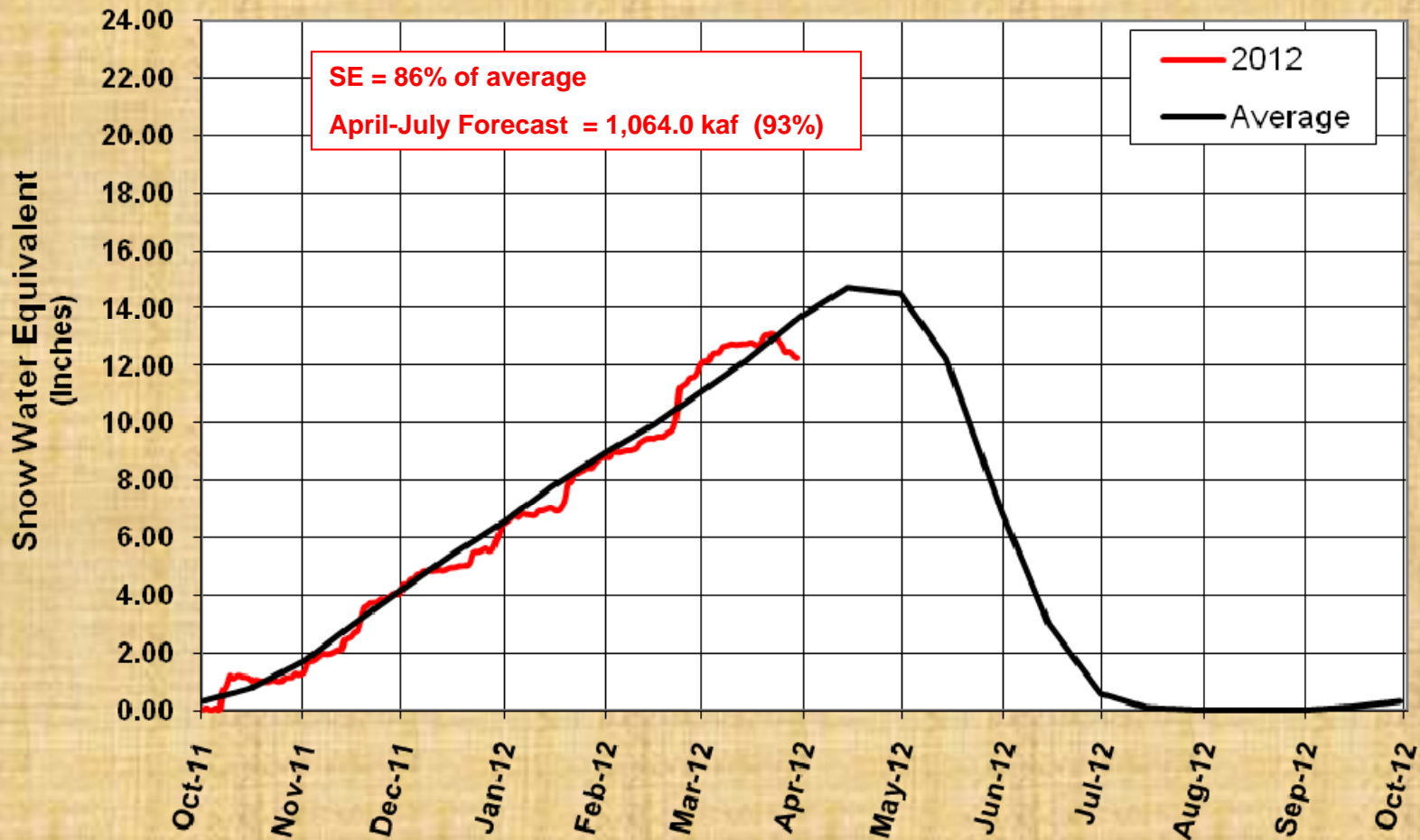
Mountain Snowpack Conditions on March 1



RECLAMATION

Recap of Water Year 2012

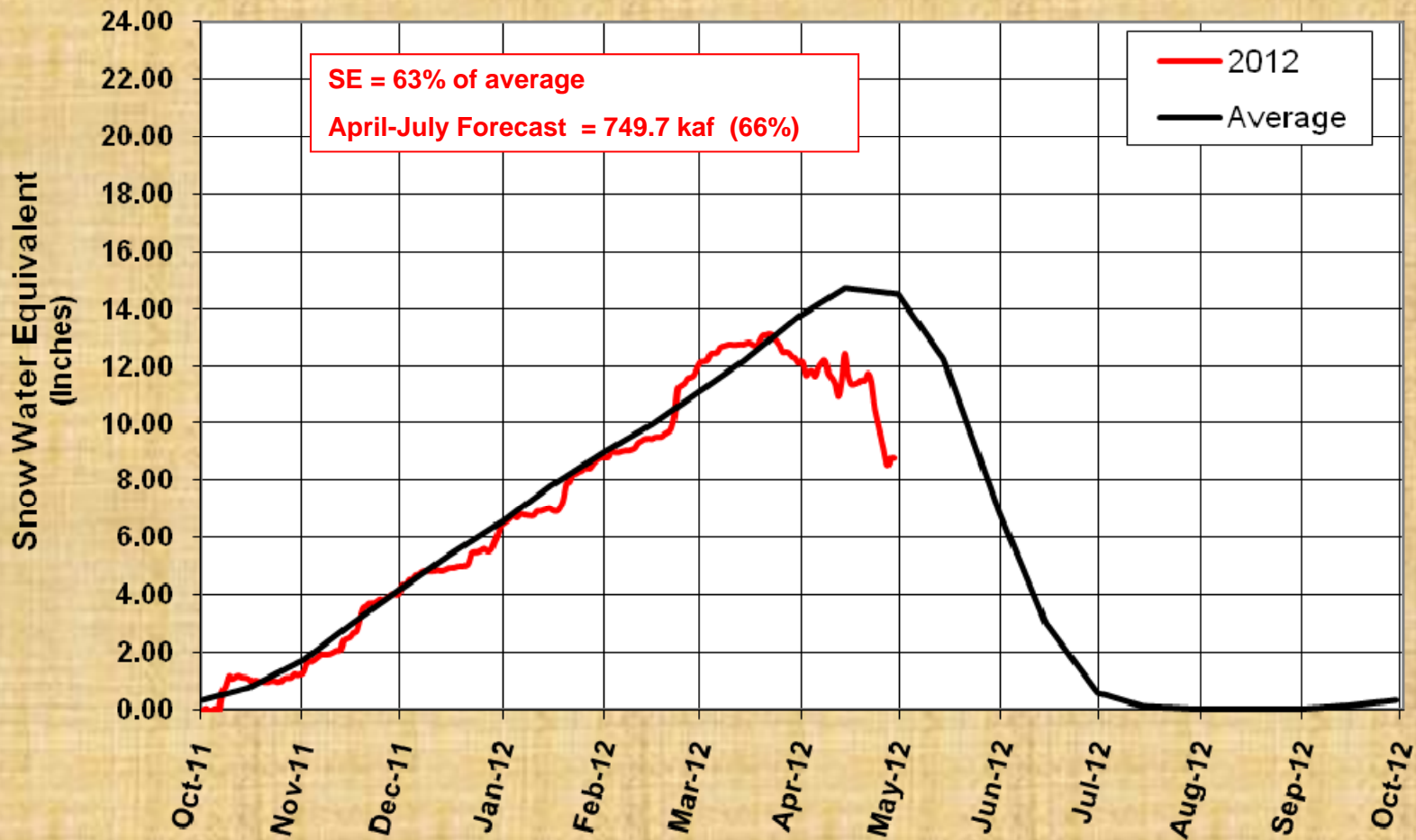
Mountain Snowpack Conditions on April 1



RECLAMATION

Recap of Water Year 2012

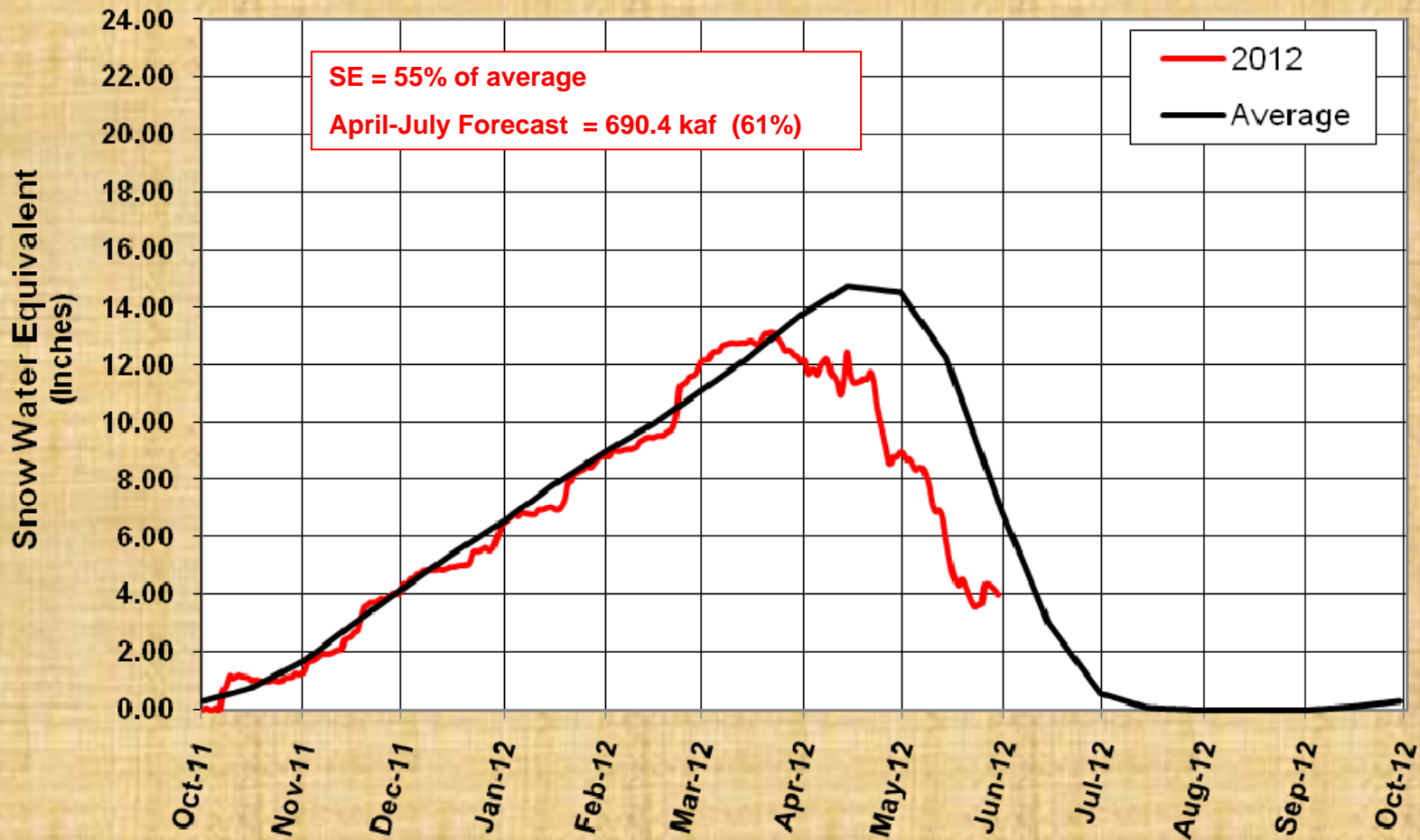
Mountain Snowpack Conditions on May 1



RECLAMATION

Recap of Water Year 2012

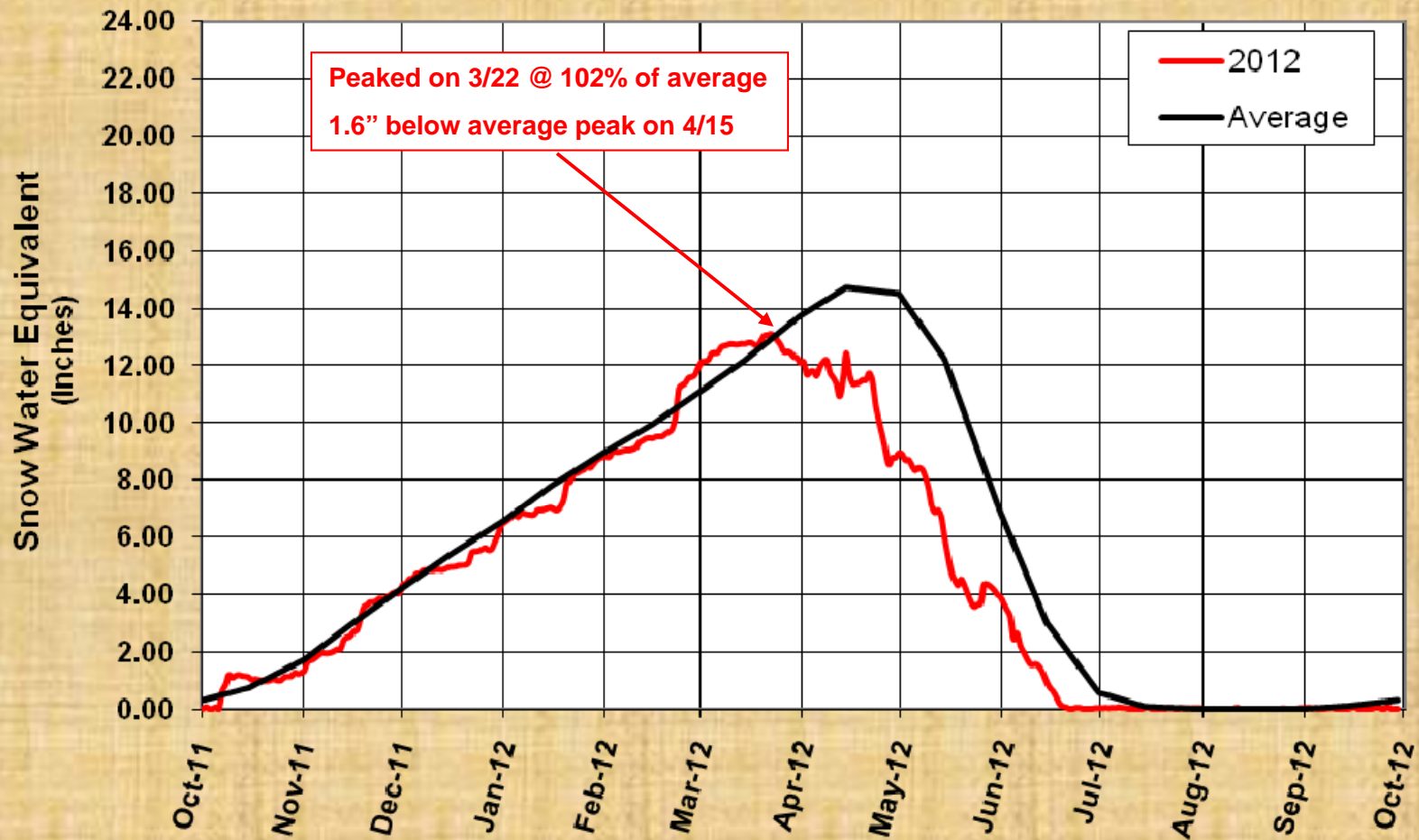
Mountain Snowpack Conditions on June 1



RECLAMATION

Recap of Water Year 2012

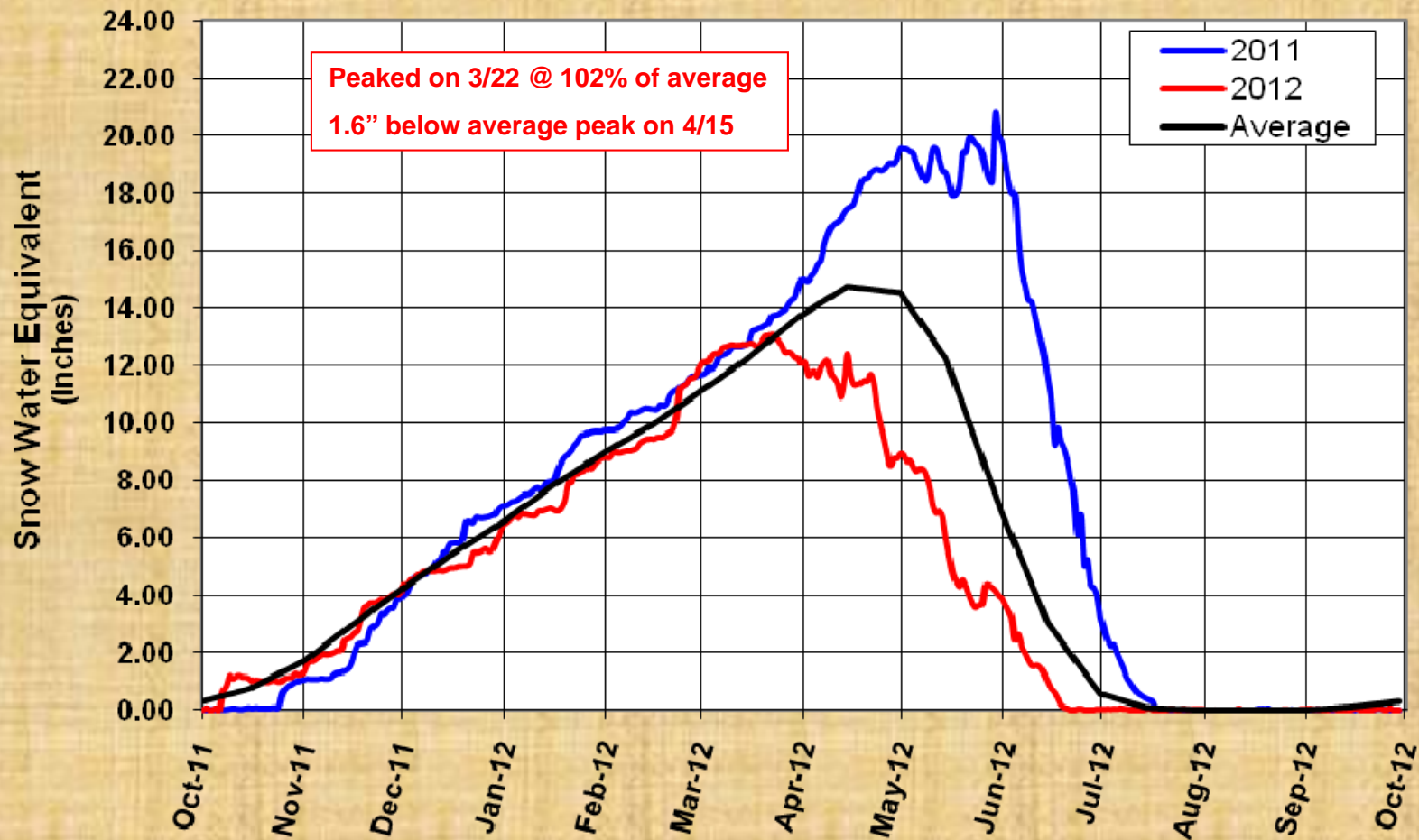
Mountain Snowpack Conditions - 2012



RECLAMATION

Recap of Water Year 2012

Mountain Snowpack Conditions



RECLAMATION

Recap of Water Year 2012

5-17-2012



RECLAMATION

Recap of Water Year 2012

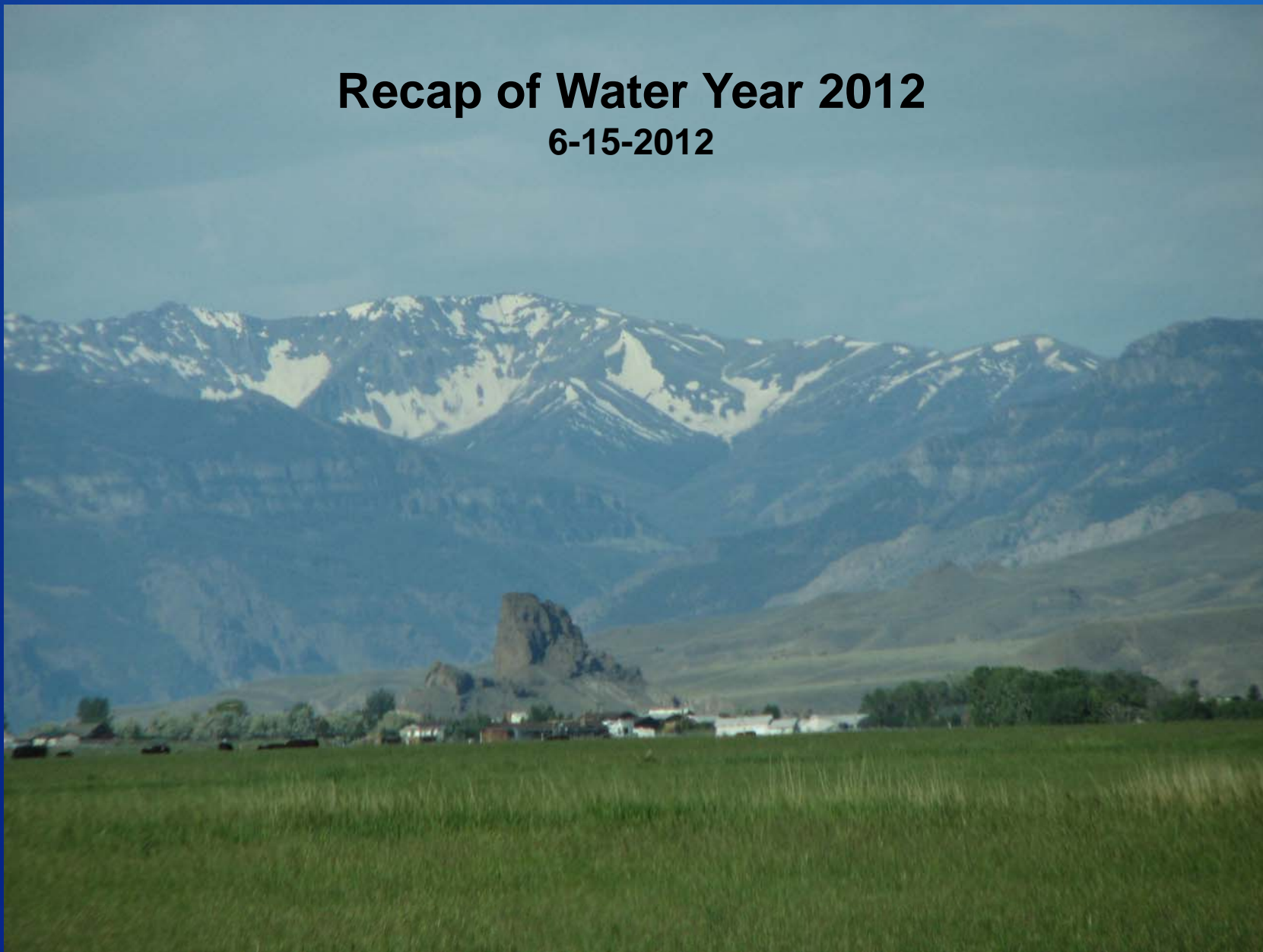
6-8-2012



RECLAMATION

Recap of Water Year 2012

6-15-2012



RECLAMATION

Recap of Water Year 2012

6-20-2012



RECLAMATION

Recap of Water Year 2011

6-30-2011



RECLAMATION

Rule Curve Operations April-July

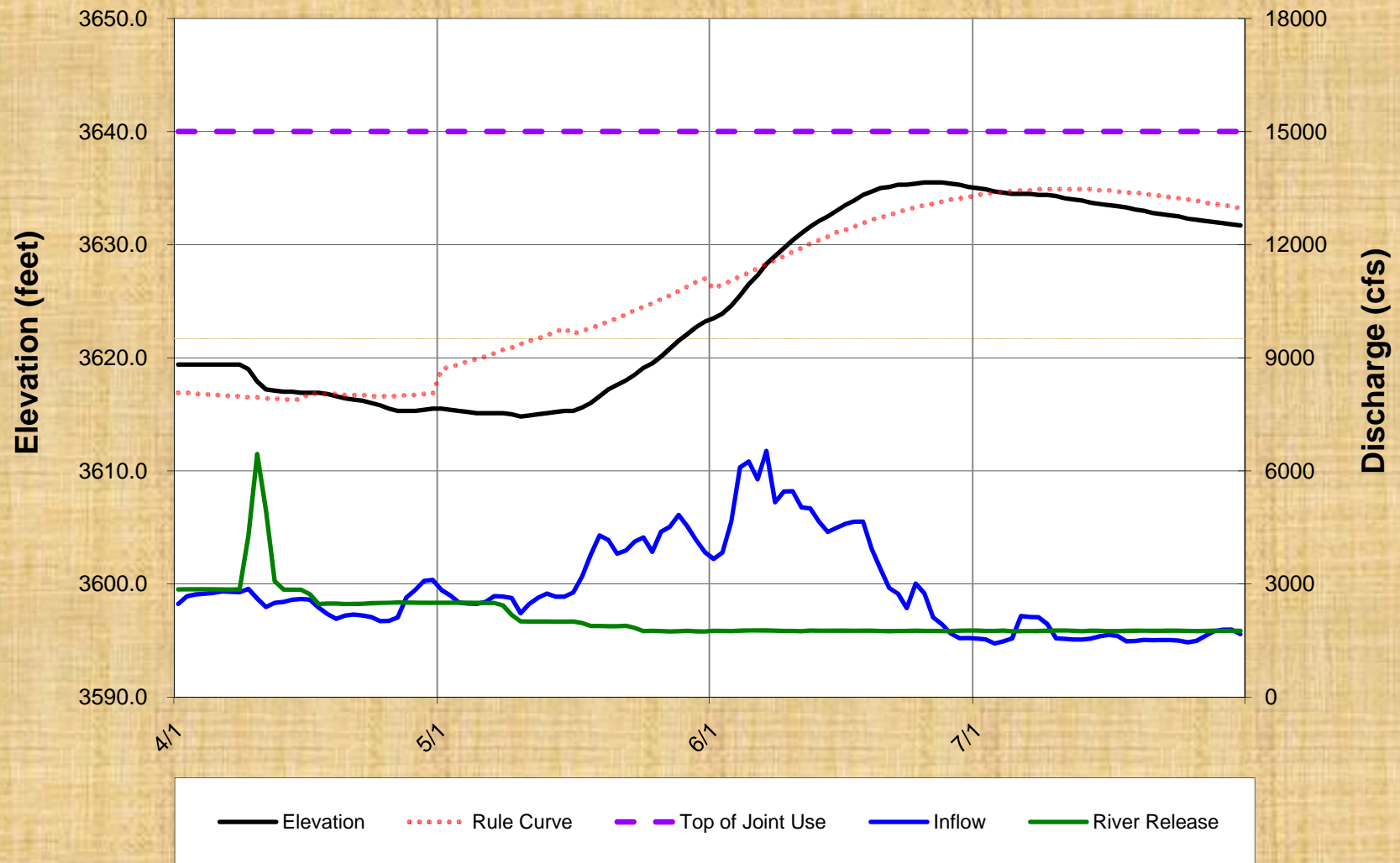
RECLAMATION

2012 April-July Forecasts & Rule Curve Targets

<u>Date</u>	<u>Forecast</u>	<u>% of Avg</u>	Rule Curve <u>Min Elev.</u>	<u>Date</u>
Jan. 1	1,131,400	99%	3613.4	5/03
Feb. 1	1,212,200	102%	3612.6	5/08
Mar. 1	1,344,300	118%	3611.1	5/13
April 1	1,064,000	93%	3614.4	5/02
April 15	903,900	79%	3616.6	4/26
May 1	749,700	77%	3619.0	5/01
May 15	641,800	56%	3622.1	5/16
June 1	690,500	61%	3626.1	6/01
Actual	693,100	61%	3623.6	6/01

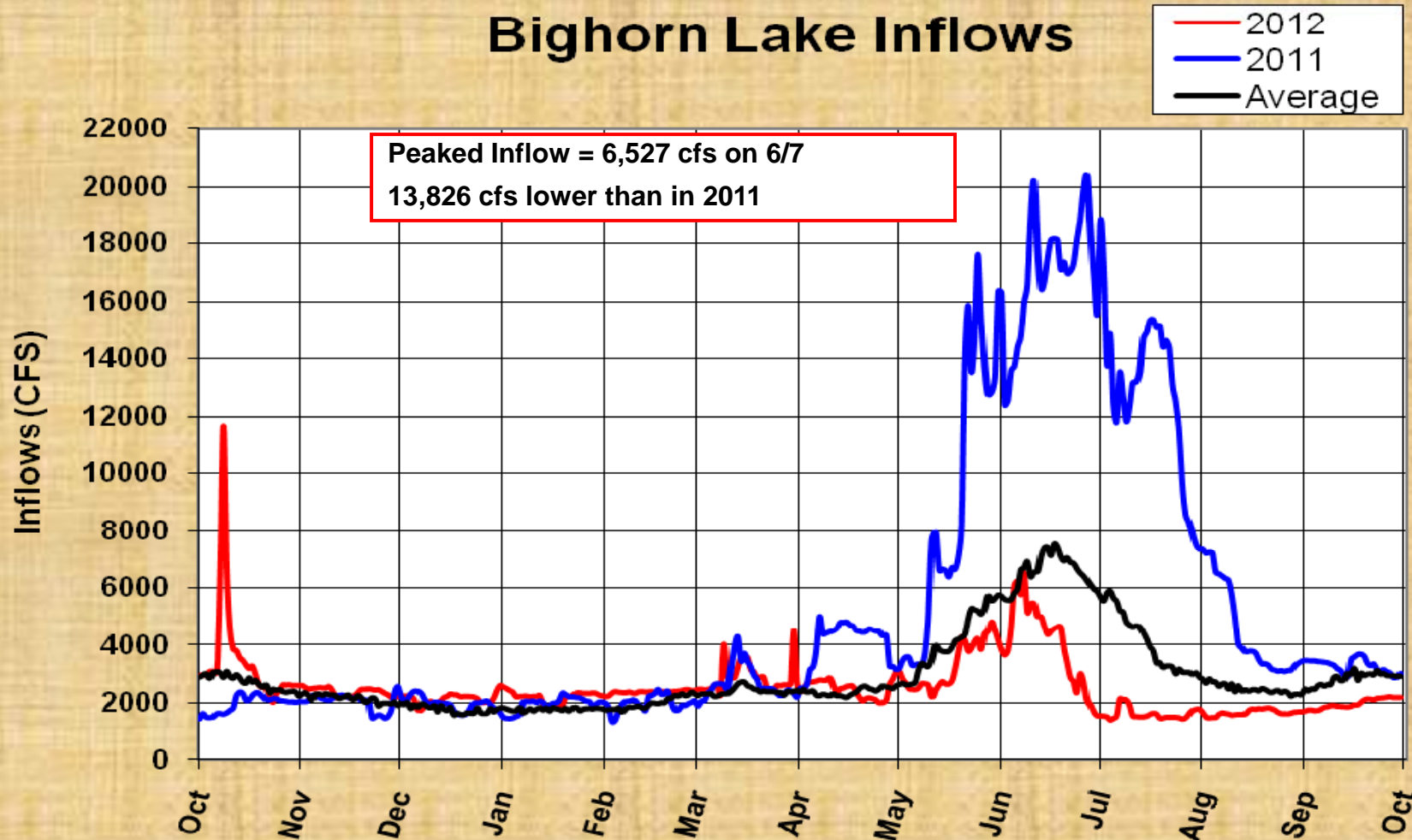
RECLAMATION

Bighorn Lake Rule Curve Operation 2012



RECLAMATION

Recap of Water Year 2012

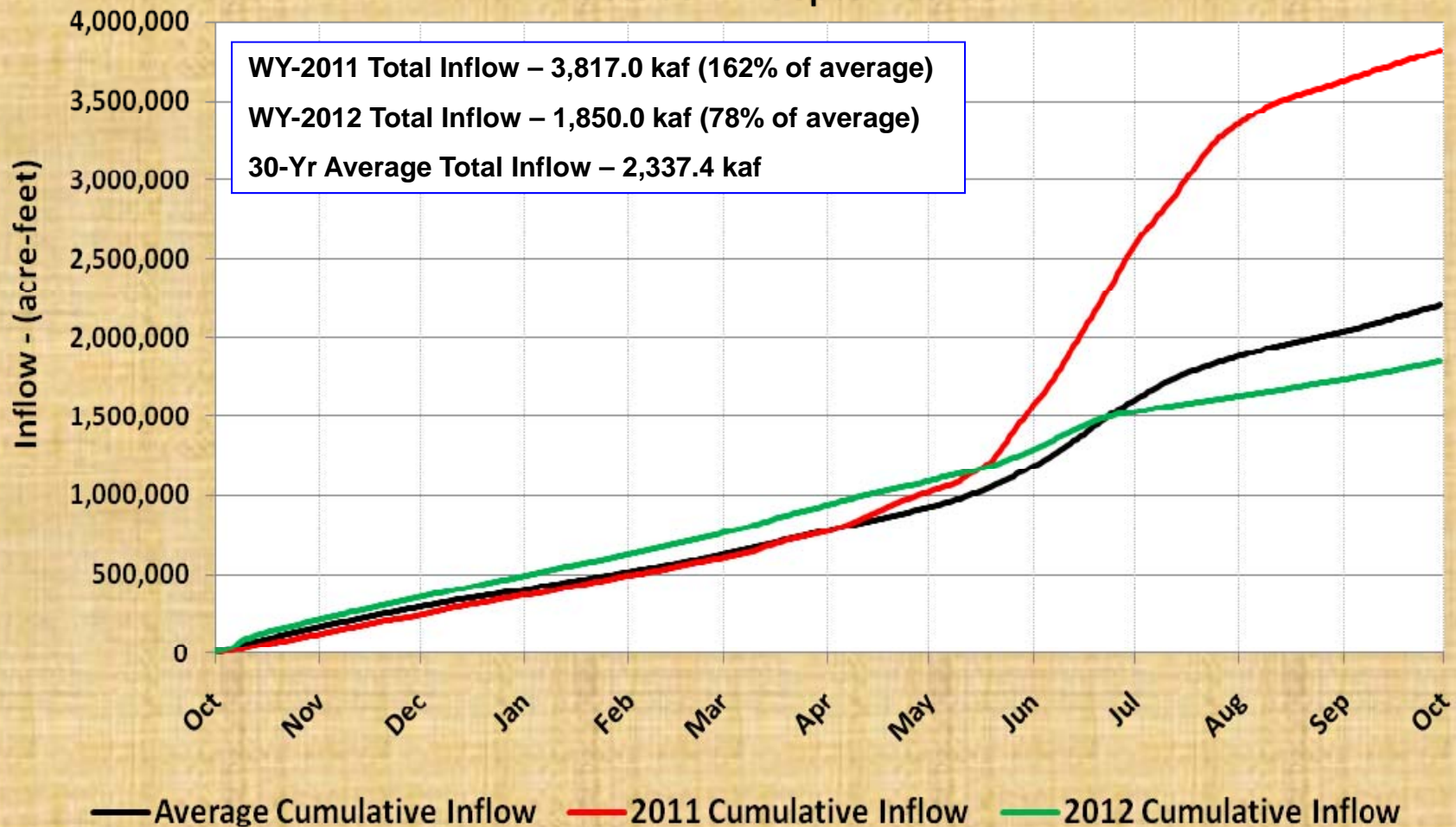


RECLAMATION

Recap of Water Year 2012

Bighorn Lake Cumulative Inflow

October 1 - September 30



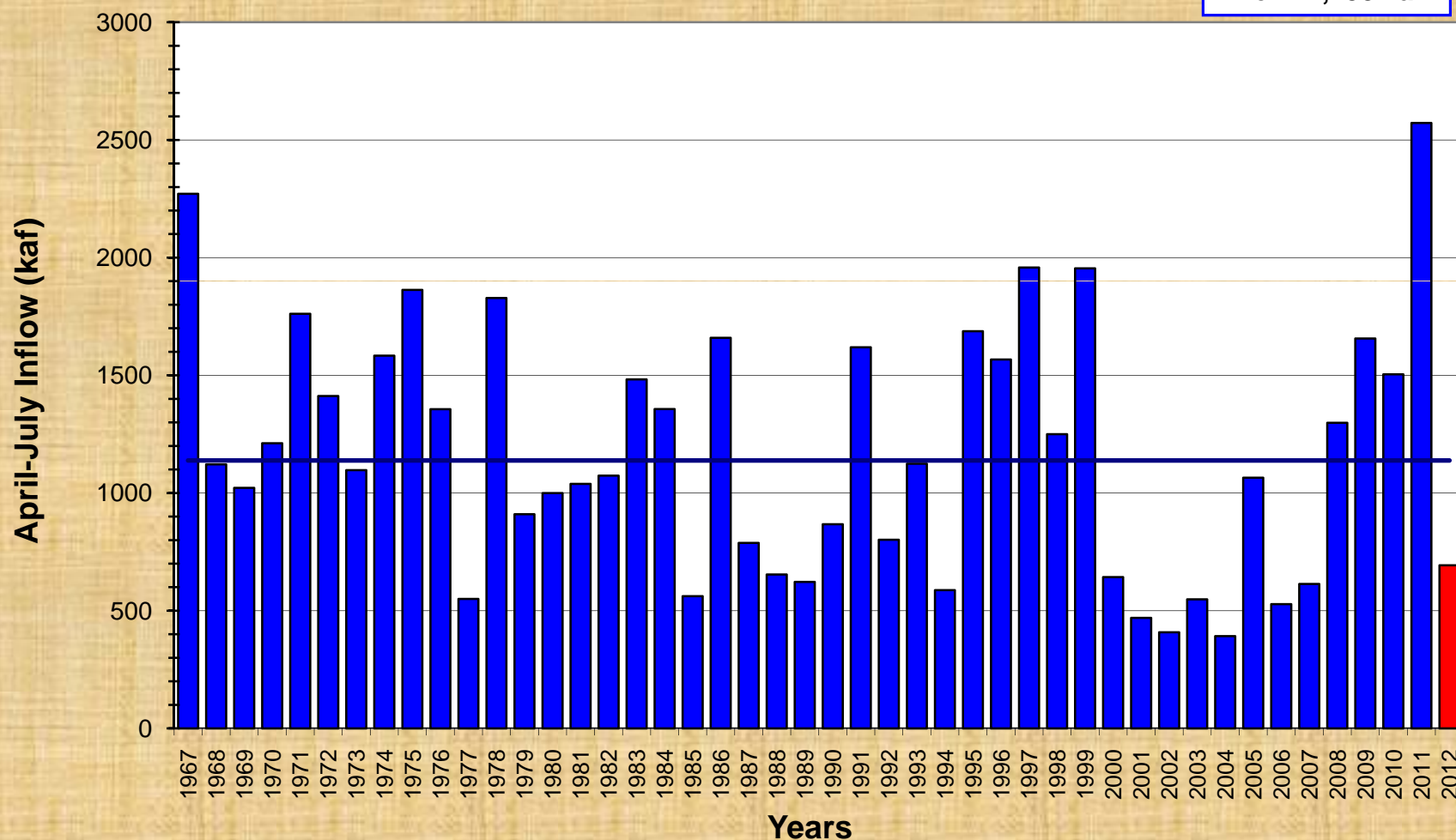
RECLAMATION

Recap of Water Year 2012

Bighorn Lake April-July Inflow
1967-2012

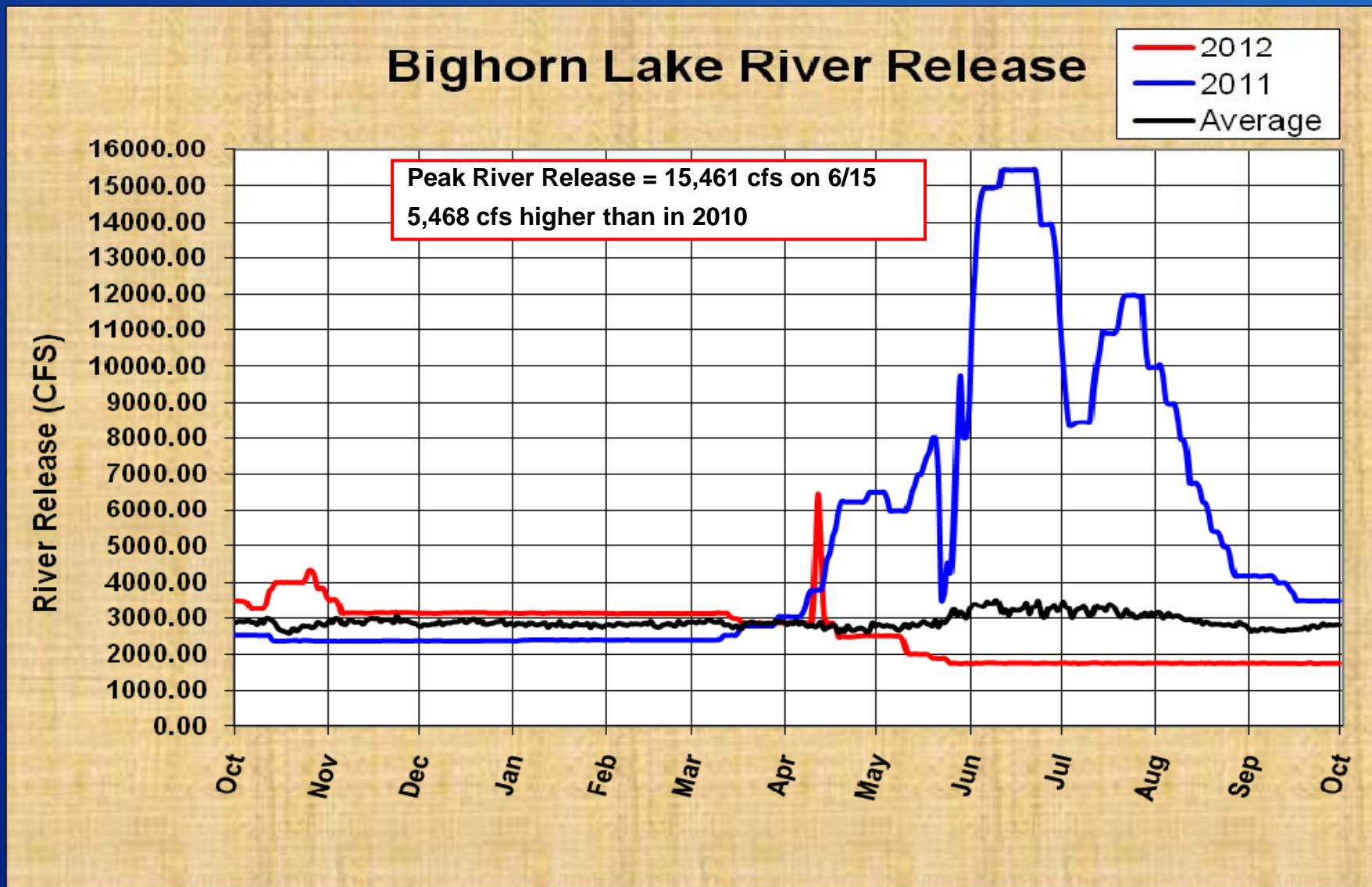
2012 – 693 kaf

Ave. – 1,138 kaf



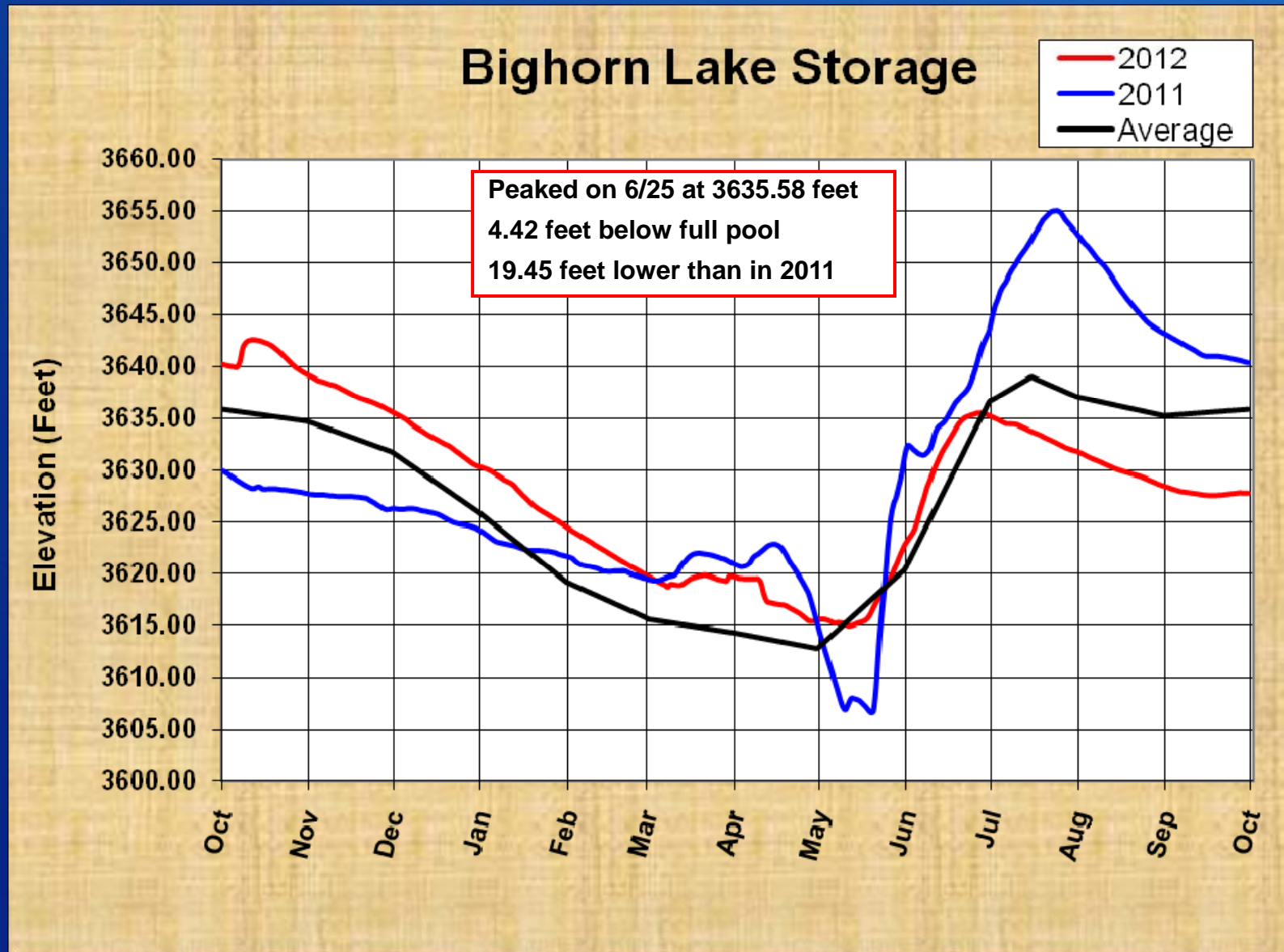
RECLAMATION

Recap of Water Year 2012



RECLAMATION

Recap of Water Year 2012



RECLAMATION

BIGHORN LAKE FALL OPERATIONS

Operating Criteria Used for 2012 Plans

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RECLAMATION

Questions??

Open Discussion

RECLAMATION