

RECLAMATION

Managing Water in the West

Bighorn Basin Operations and Water Supply Meeting

April 9, 2015



U.S. Department of the Interior
Bureau of Reclamation

BIGHORN BASIN WATER SUPPLY & RESERVOIR OPERATIONS MEETING

**Billings, Montana
April 9, 2015**

Introduction and Purpose of Meeting

Steve Davies, Manager, Facility Operations and Maintenance
Division, Montana Area Office

Water Supply Outlook & Reservoir Operations

WYAO - Boysen & Buffalo Bill Operations
MTAO - Yellowtail Operations

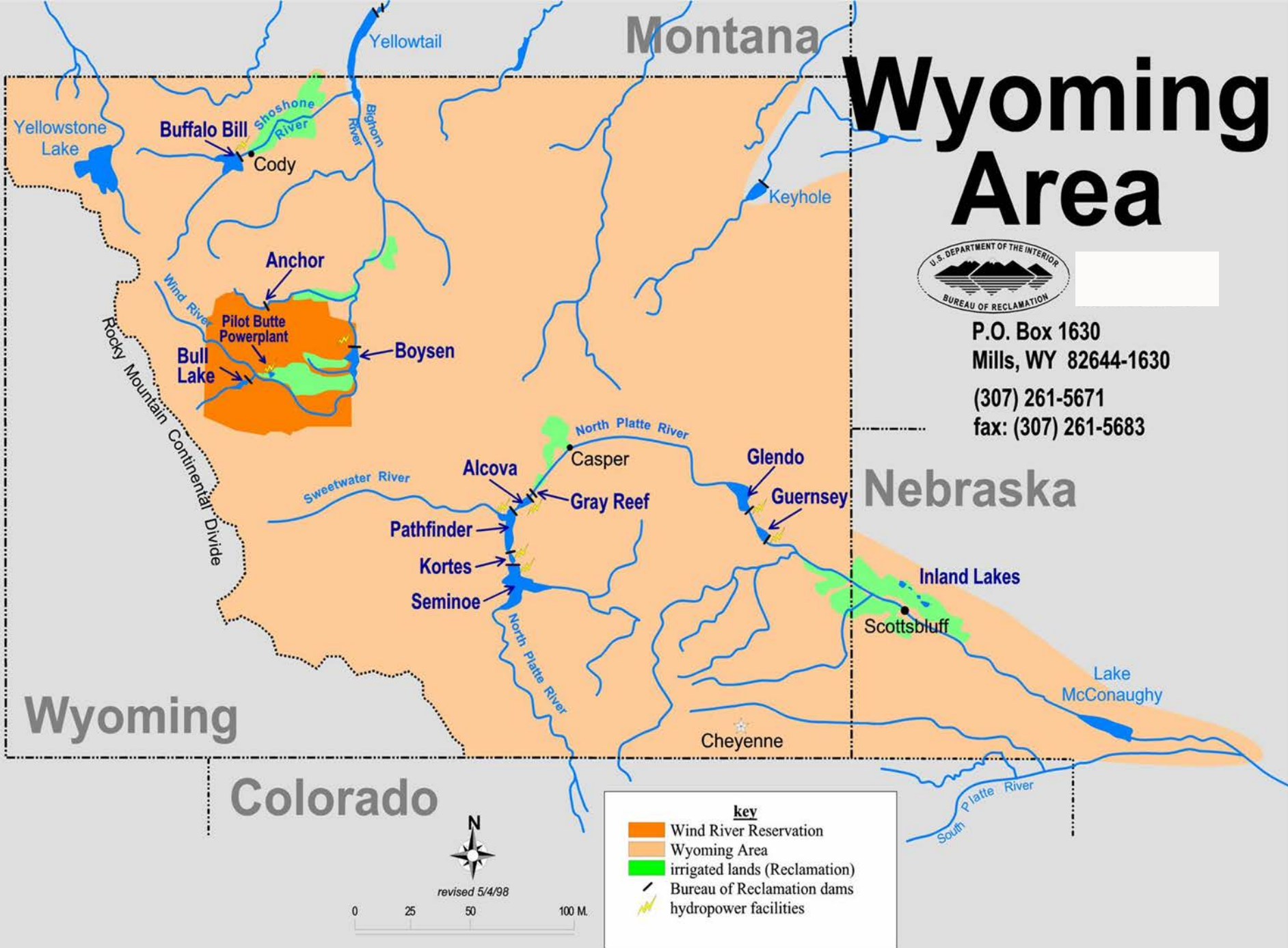
Next Bighorn River System Issues Group Meeting

Public Comments on Operating Criteria

Wyoming Area



P.O. Box 1630
Mills, WY 82644-1630
(307) 261-5671
fax: (307) 261-5683



Wyoming

Colorado

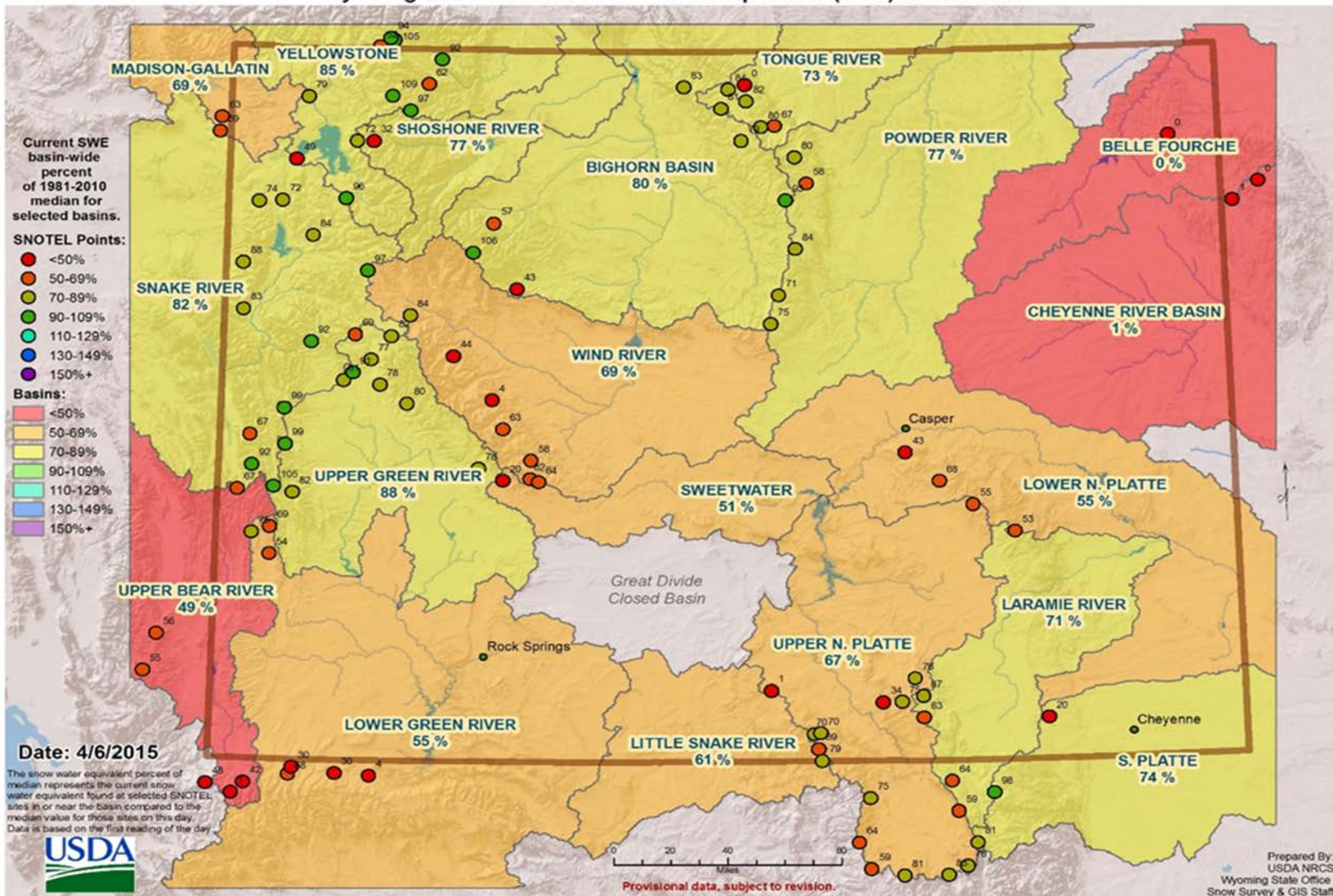
key

- Wind River Reservation
- Wyoming Area
- irrigated lands (Reclamation)
- Bureau of Reclamation dams
- hydropower facilities

Nebraska

revised 5/4/98

Wyoming SNOTEL Current Snow Water Equivalent (SWE) % of Median



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Big Horn Basin Water Supply Forecast

April 1 Forecast of April – July Snowmelt Runoff

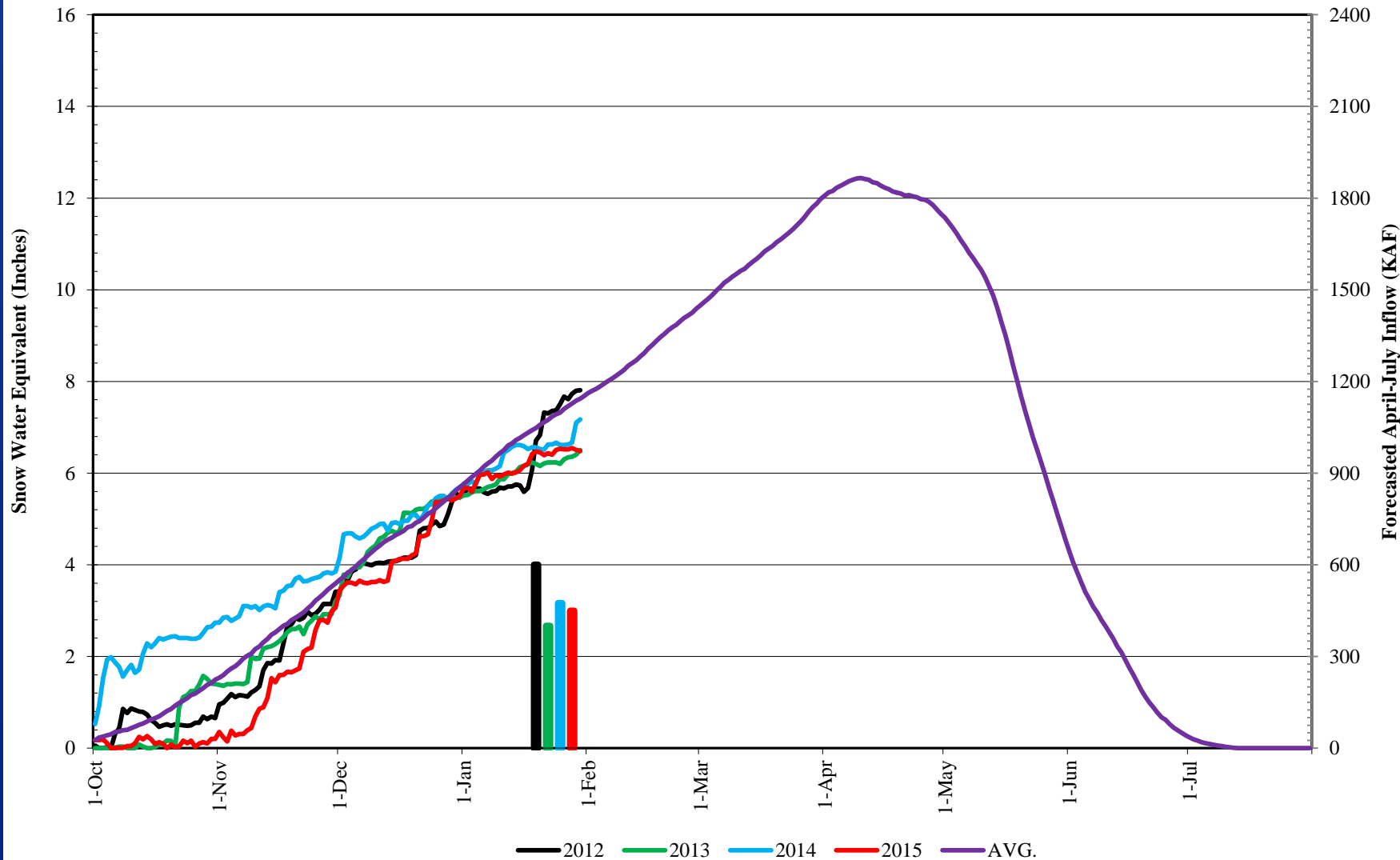
(1000 acre-feet)

Forecast Points	April 1, 2015 Forecast of April-July Runoff			30 Yr. April-July Runoff Avg. ²	Expected % of Avg.	Comparative Actual April - July Runoff			
	Reasonable Minimum ¹	Expected	Reasonable Maximum ¹			W. Yr. 2014	W. Yr. 2013	W. Yr. 2012	W. Yr. 2011
	Bull Lake Reservoir	90	110			130	137.3	80	148
Wind River above Bull Lake Creek	200	300	400	402.0	75	580	283	314	691
Boysen Reservoir	200	300	500	533.8	56	695	216	219	995
Buffalo Bill Reservoir	400	550	700	677.8	81	1062	577	592	1230

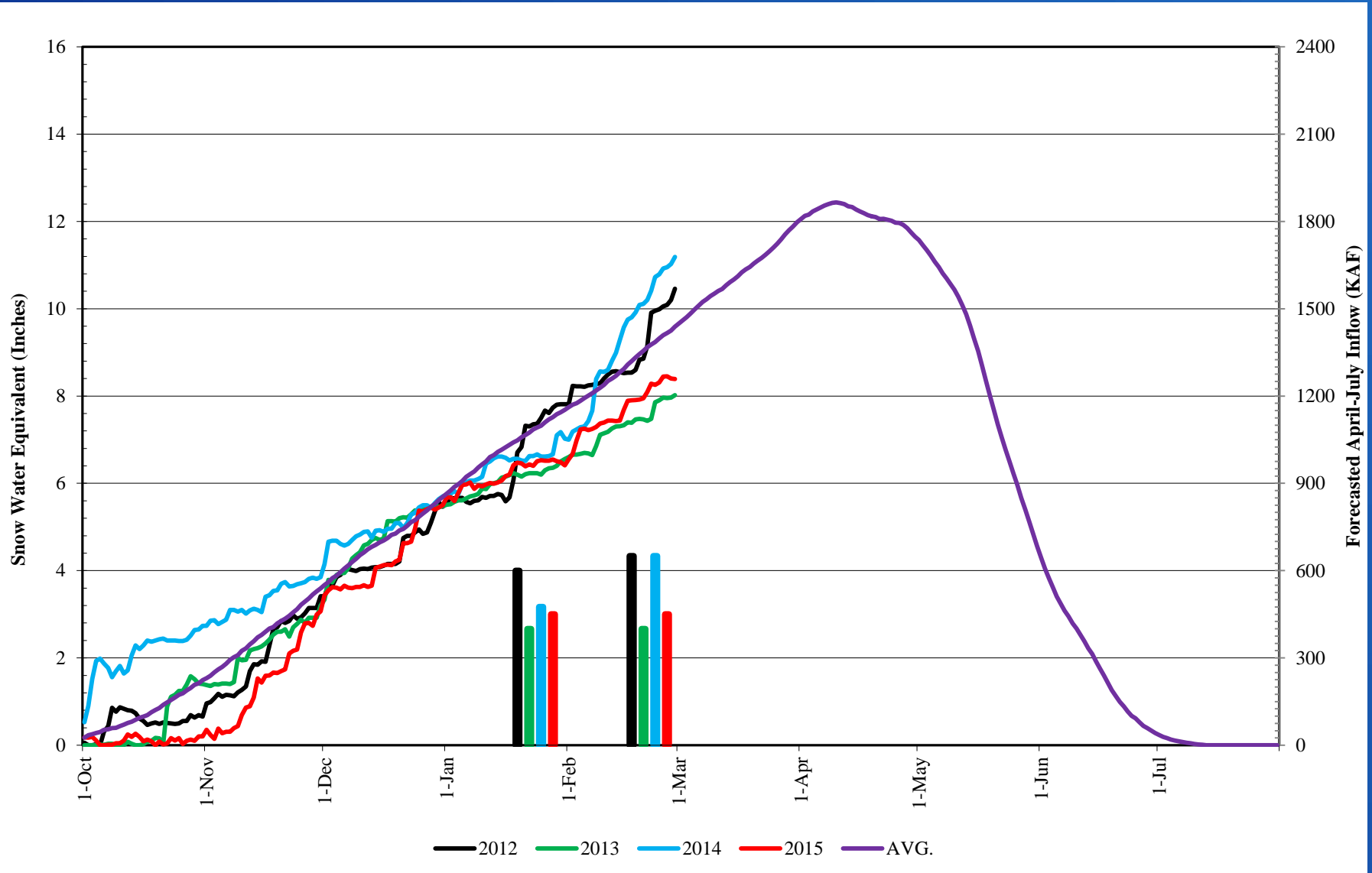
¹ The probability is estimated to be 9 chances in 10 that the actual volume will fall between the reasonable minimum and reasonable maximum.

² Average is based on the 1985-2014 period.

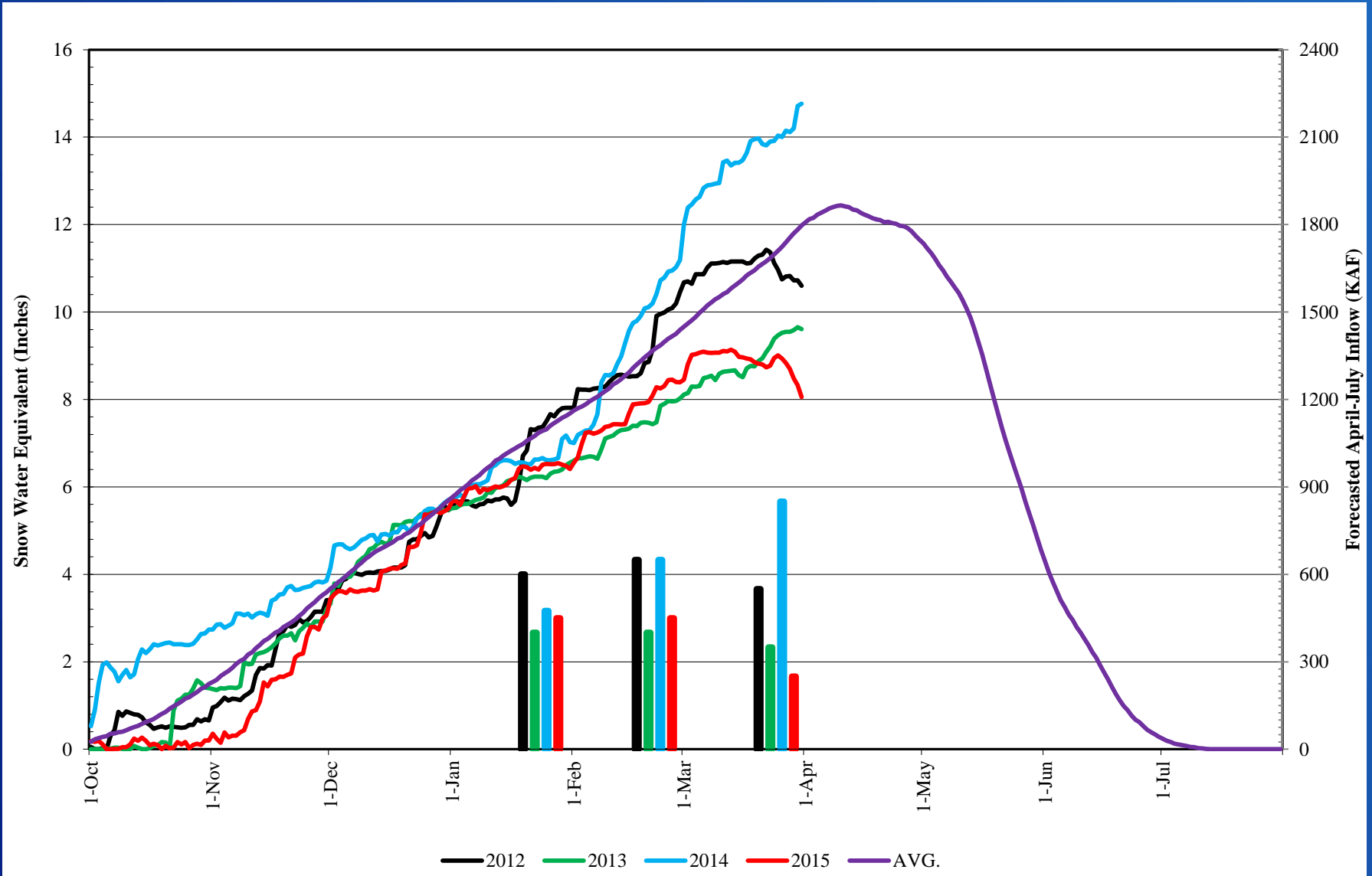
Boysen Forecast - February



Boysen Forecast - March

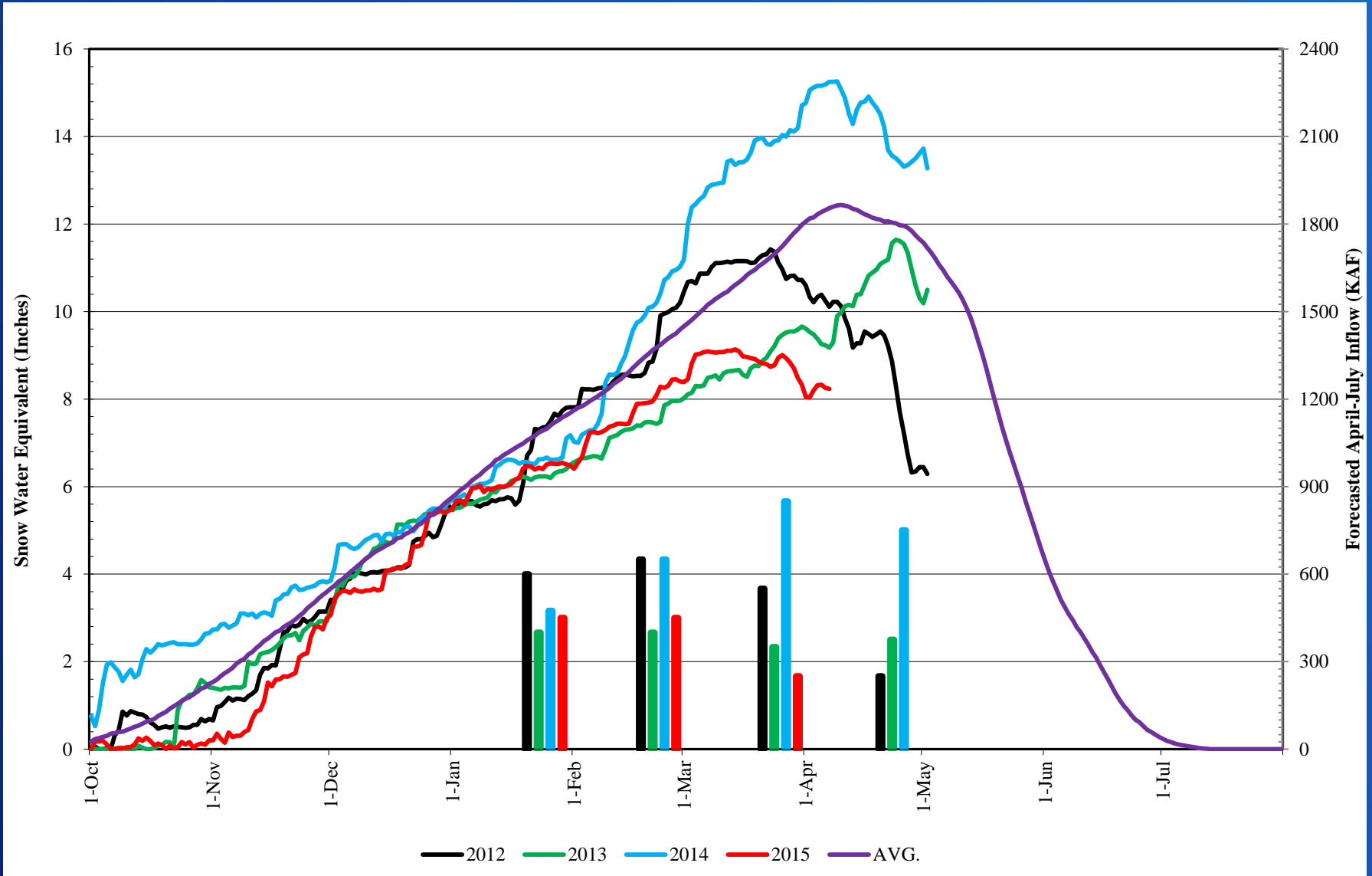


Boysen Forecast - April

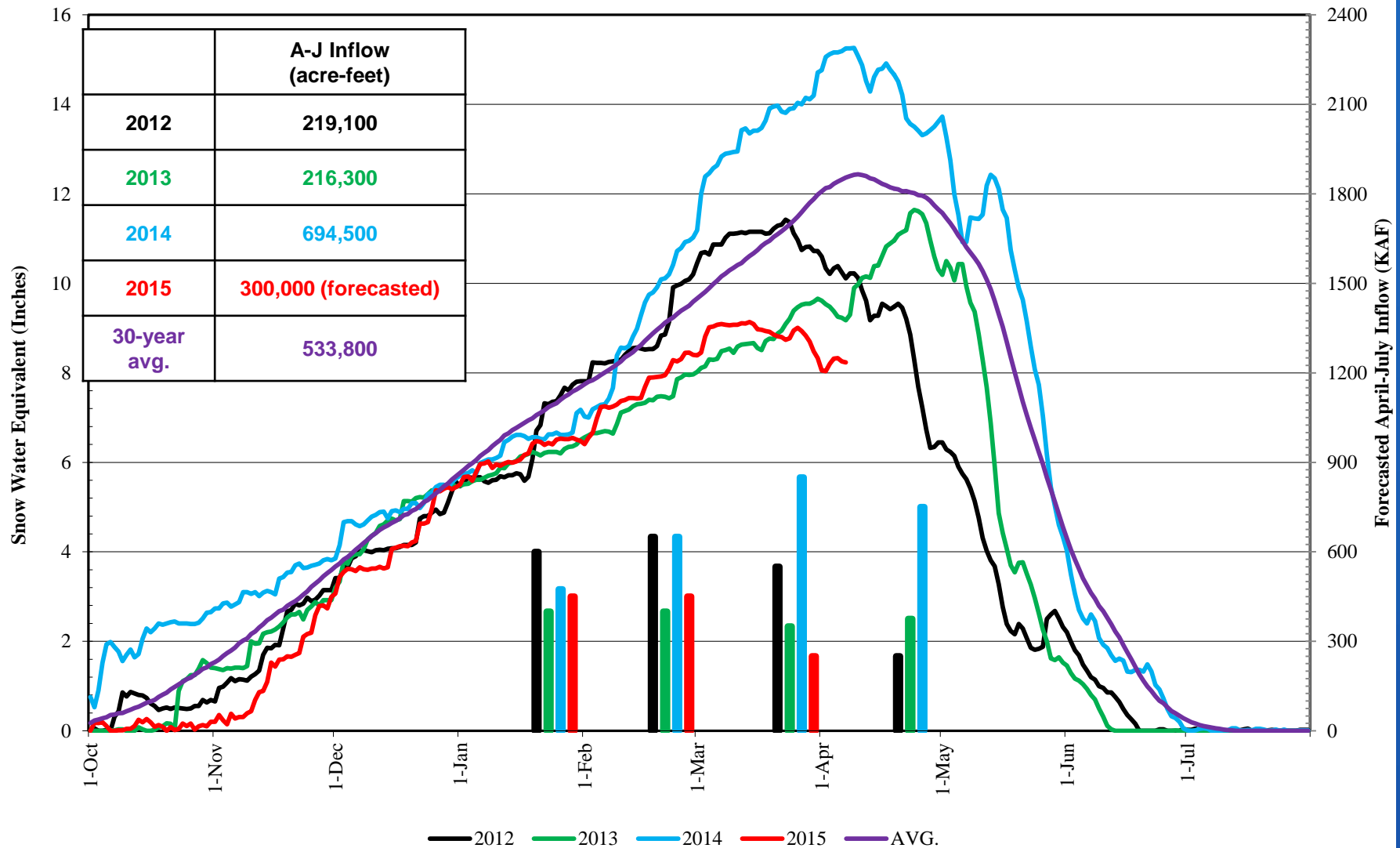


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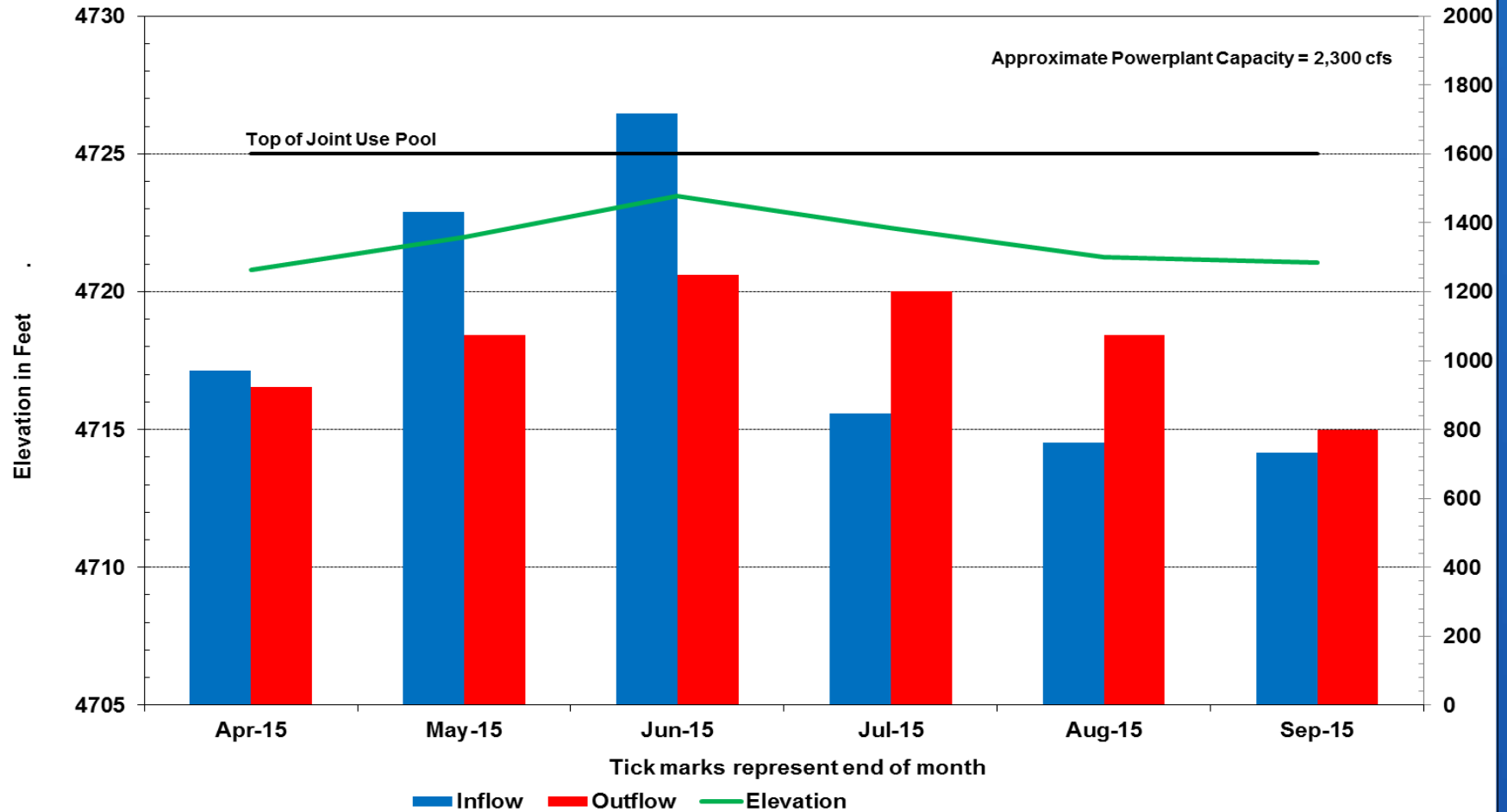
Boysen Forecast - May



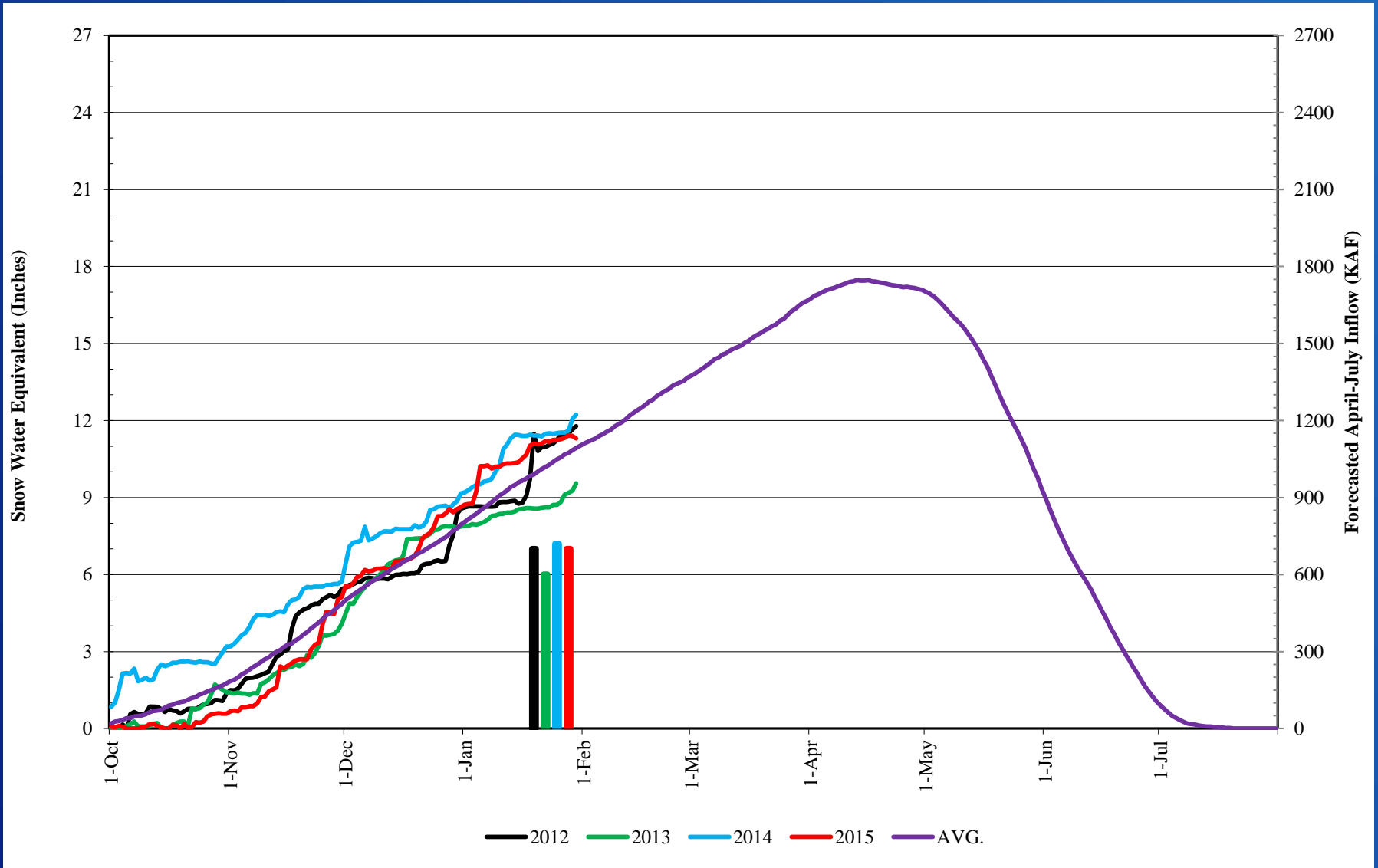
Boysen Forecast - Full Year



Boysen Reservoir Operations

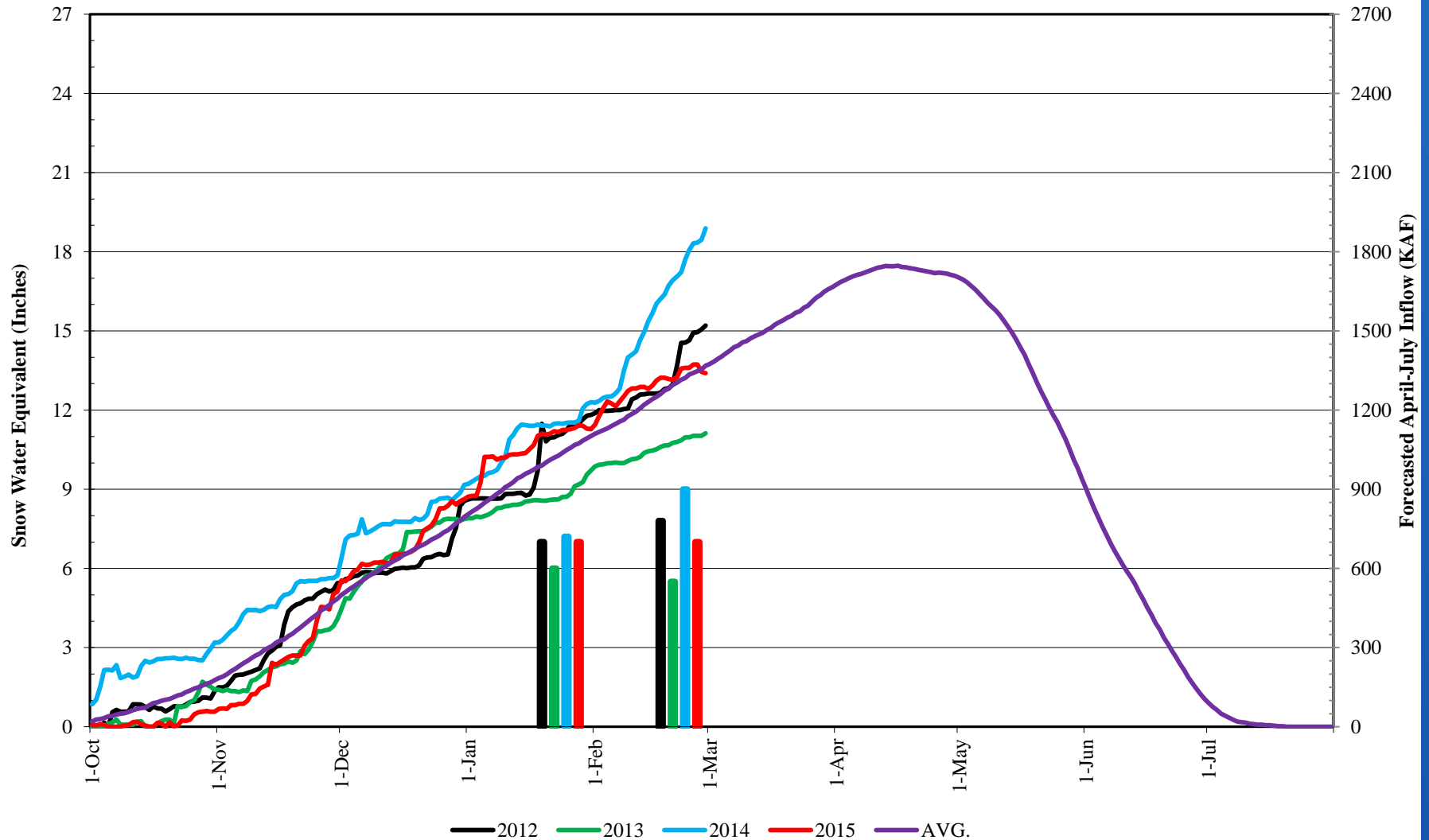


Buffalo Bill Forecast - February

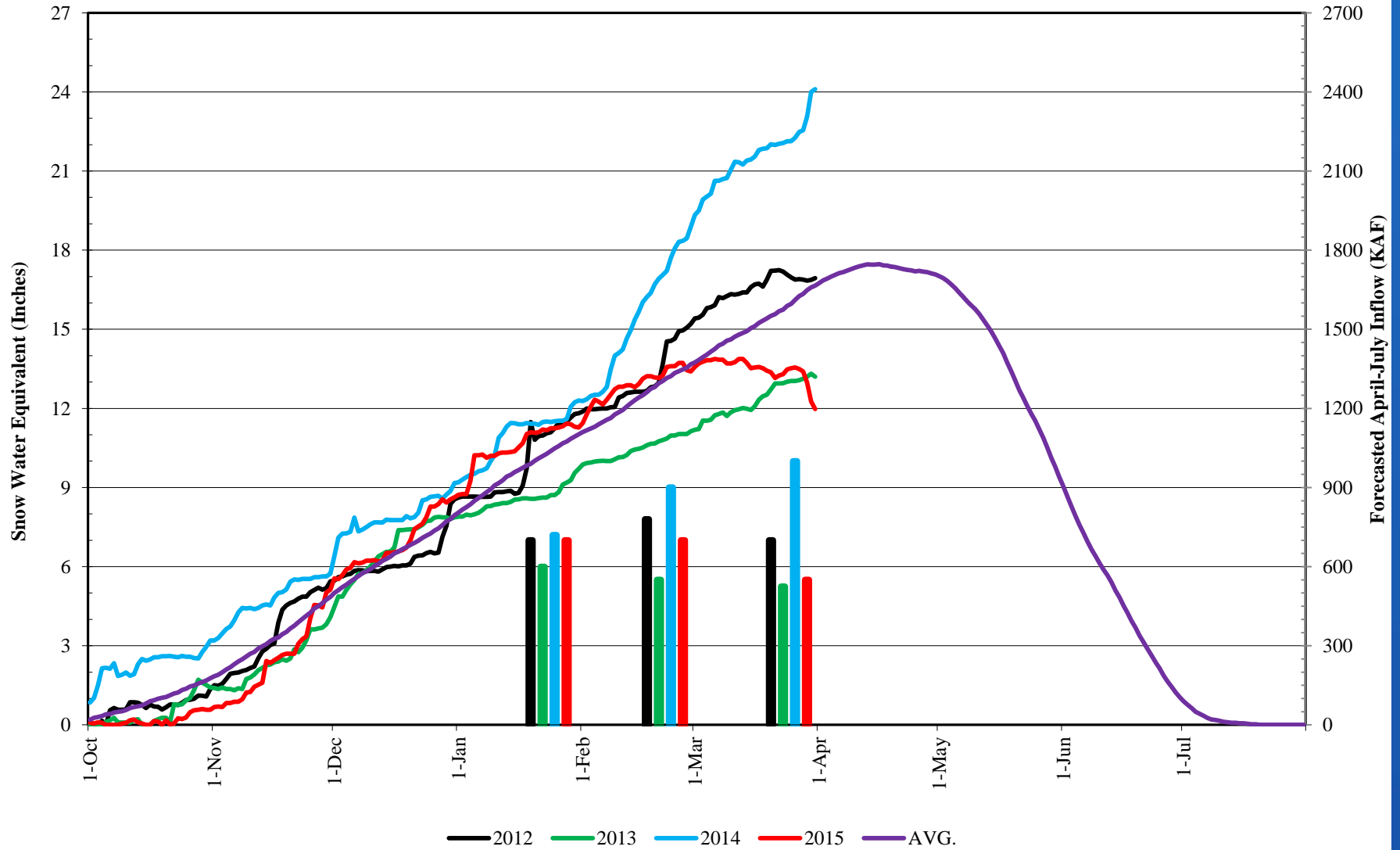


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Buffalo Bill Forecast - March

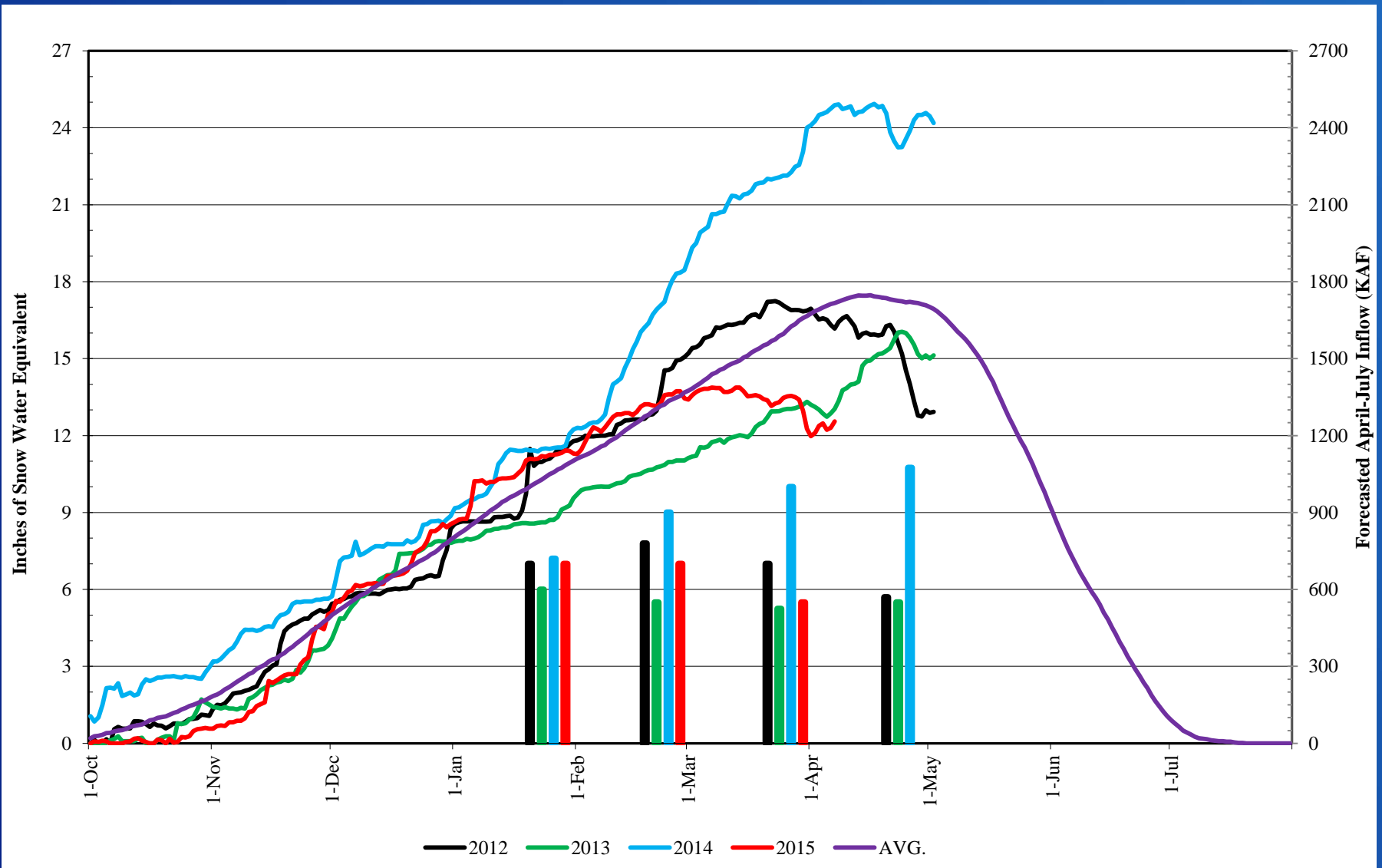


Buffalo Bill Forecast - April



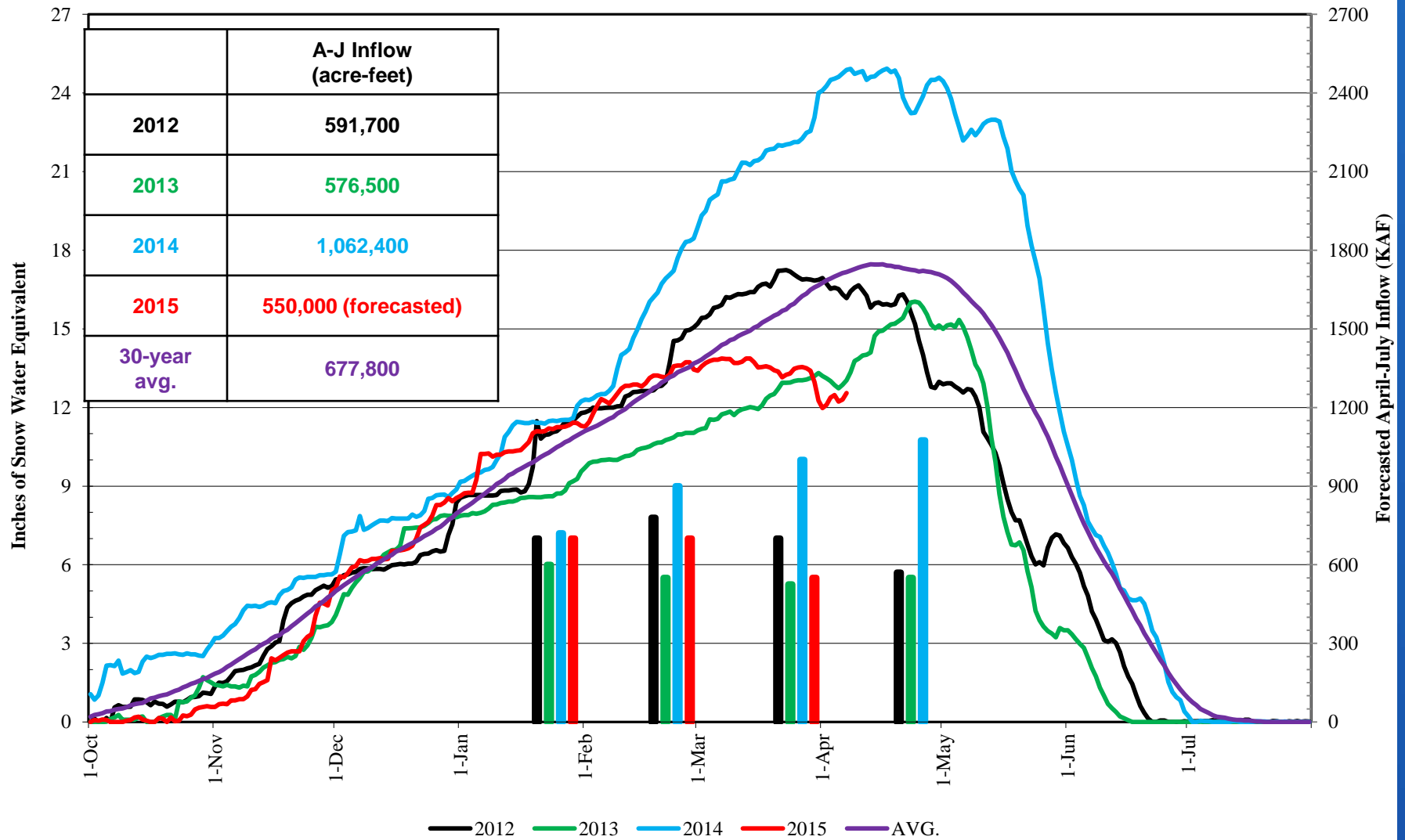
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Buffalo Bill Forecast - May

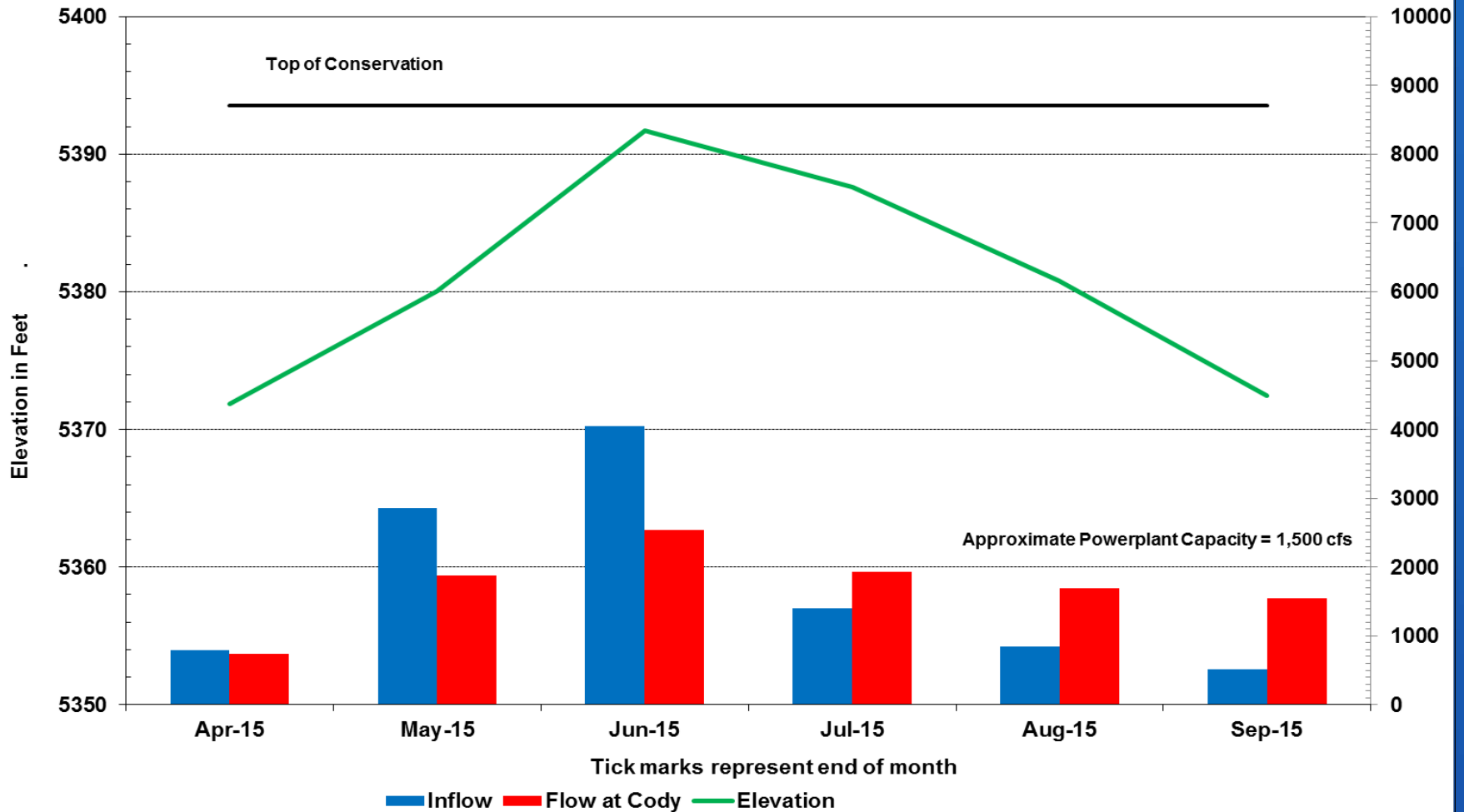


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Buffalo Bill Forecast - Full Year



Buffalo Bill Reservoir Operations



Yellowtail Dam and Bighorn Lake Operations Review

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Recap of Fall and Winter 2014/2015

NOVEMBER - MARCH Bighorn Lake River Release Rate

A	B	C	D	E	F	G	H	I	Month	Gain
ENTER Bighorn Lake Apr-Oct Gain in Acre-feet	CALCULATED Nov-Mar Forecasted Gain Acre-feet	ENTER Bighorn Lake Oct. 31 Storage AF	ENTER Buffalo Bill Nov-Mar Release CFS	ENTER Boysen Res Nov-Mar Release CFS	End of March Bighorn Lake Stor. Target acre-feet (2007 AC Table)	CALCULATED Release to Afterbay CFS	CALCULATED River Release From Afterbay CFS	31-Mar-10 Reservoir Level Target	April	93.6
320,800	268,918	989,700	365	940	821,949	2763	2833	3619.0	May	130.5
Min Probable	228,918								June	146.4
Max Probable	308,918								July	-111.9
									August	-6.7
									September	27
									October	41.9
									Total	320.8

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.

$B = .145 * A + 222402$ $R^2 = .6756$ 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

Forecasted Gain Adjustments

	Elevation	Sotrage
1500-2000 cfs	3615	794,613
2000-2500 cfs	3617	807,921
> 2500 cfs	3619	821,949

Intermediate Calculations for River Release			
J	K	L	M
CALCULATED Step One Release CFS >2500	CALCULATED Step Two Release CFS 2000-2500	CALCULATED Step Three Release CFS 1500-2000	Check Results & Adjust Release CFS
2833	2880	2924	2833
2833	2500	2000	2833
	2000	1500	2833
		1500	2833

If J > 2500 than set to J
If K < 2500 than set to K
If L < 2000 Then set to L
If L < 1500 then set to 1500

K	L
End of March Reservoir Elev. Target	End of March Reservoir Storage Target
3619.0	821,949
3619.0	821,949
3619.0	821,949
3619.0	821,949

Recap of Fall and Winter 2014/2015

Nov-Mar Winter Release Calculation:

Buffalo Bill Average Winter Release: 365 cfs

Boysen Average Winter Release: 940 cfs

Nov-Mar Gain Forecast: 268,900 AF

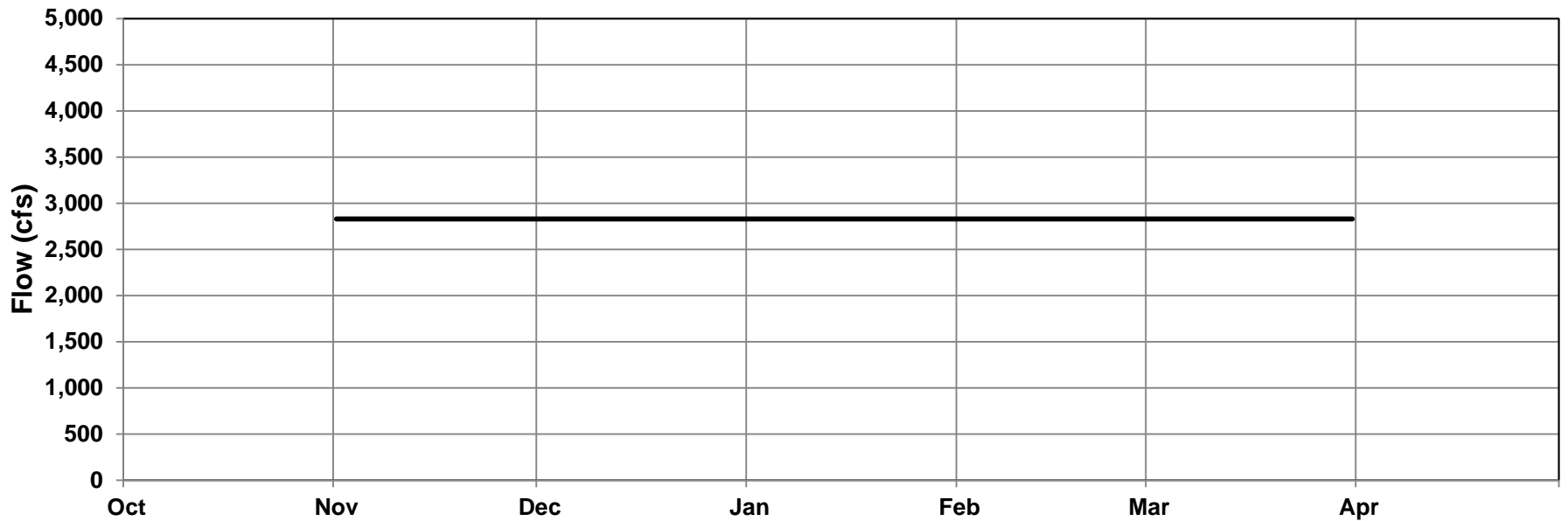
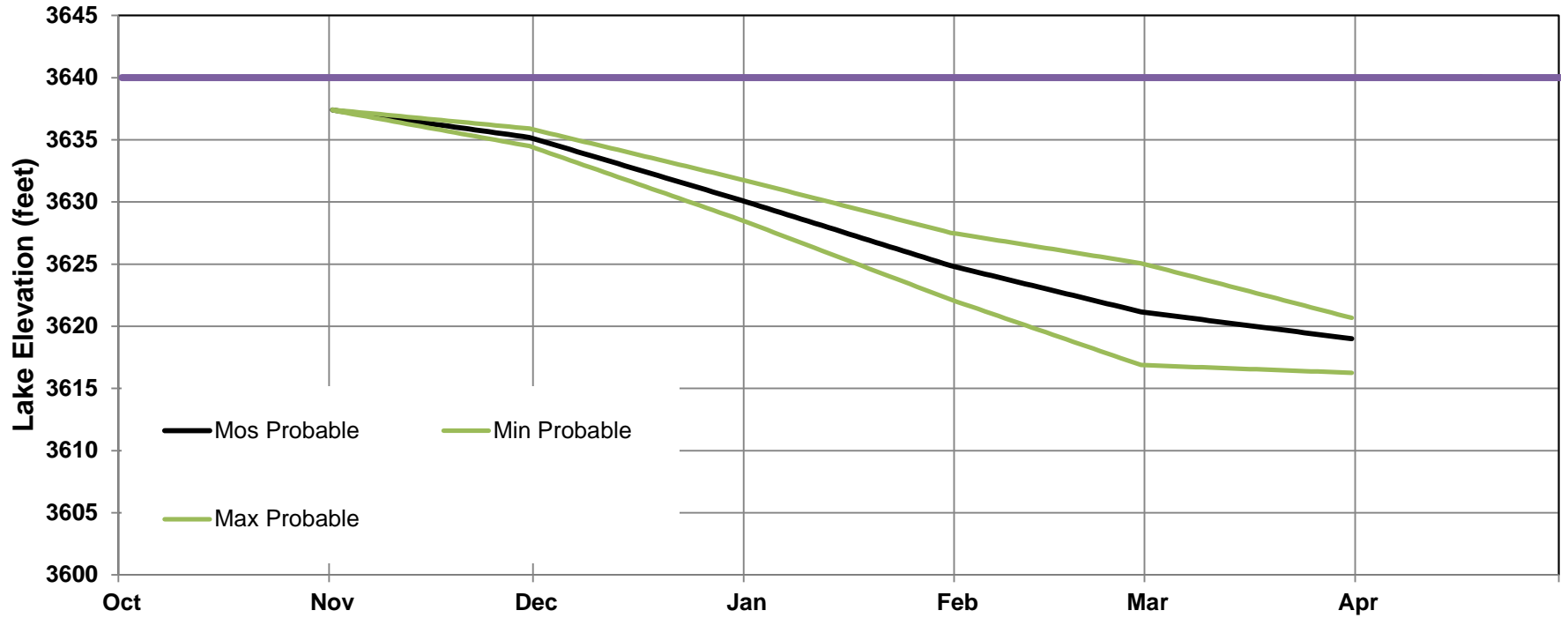
End of October Elevation: 3637.5 feet (989,700 AF)

End of March Target: 3619.0 feet (821,900 AF)

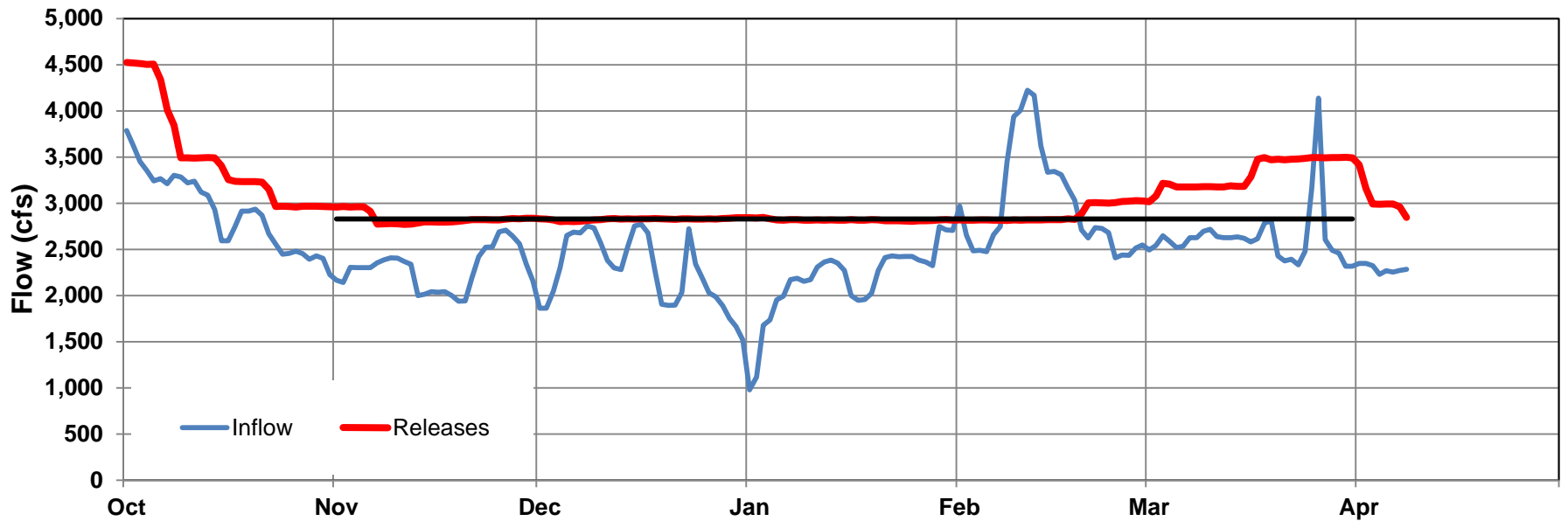
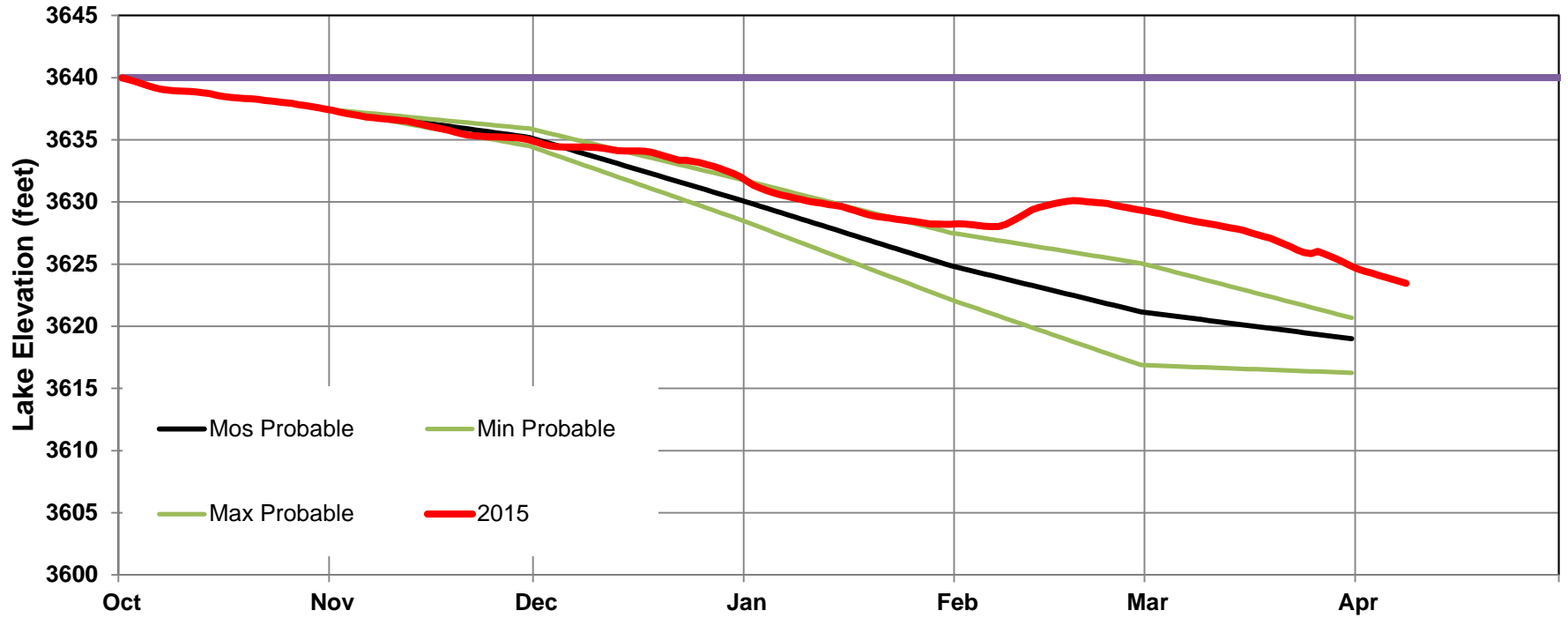
Nov-Mar Bighorn River Release: 2,830 cfs

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Bighorn Lake Operations



Bighorn Lake Operations



Recap of Fall and Winter 2014/2015

Nov-Mar Gains:

Forecast on November 1, 2014: 268.9 kaf (106% of Avg)

Actual November-March Gains: 342.0 kaf (135% of Avg)

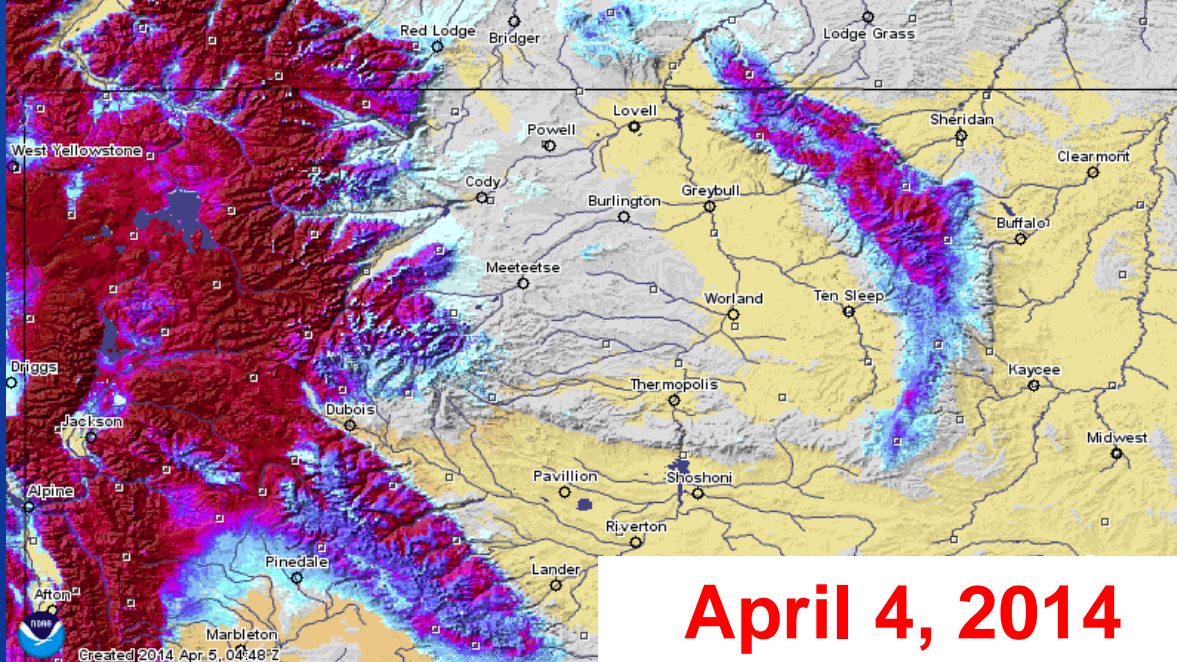
Total Nov-Mar Inflow:

Forecast on November 1, 2014: 659.3 kaf (113% of Avg)

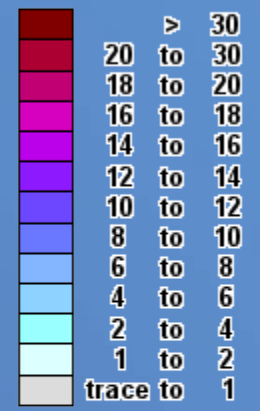
Actual November-March Inflows: 736.4 kaf (127% of Avg)

Snowpack

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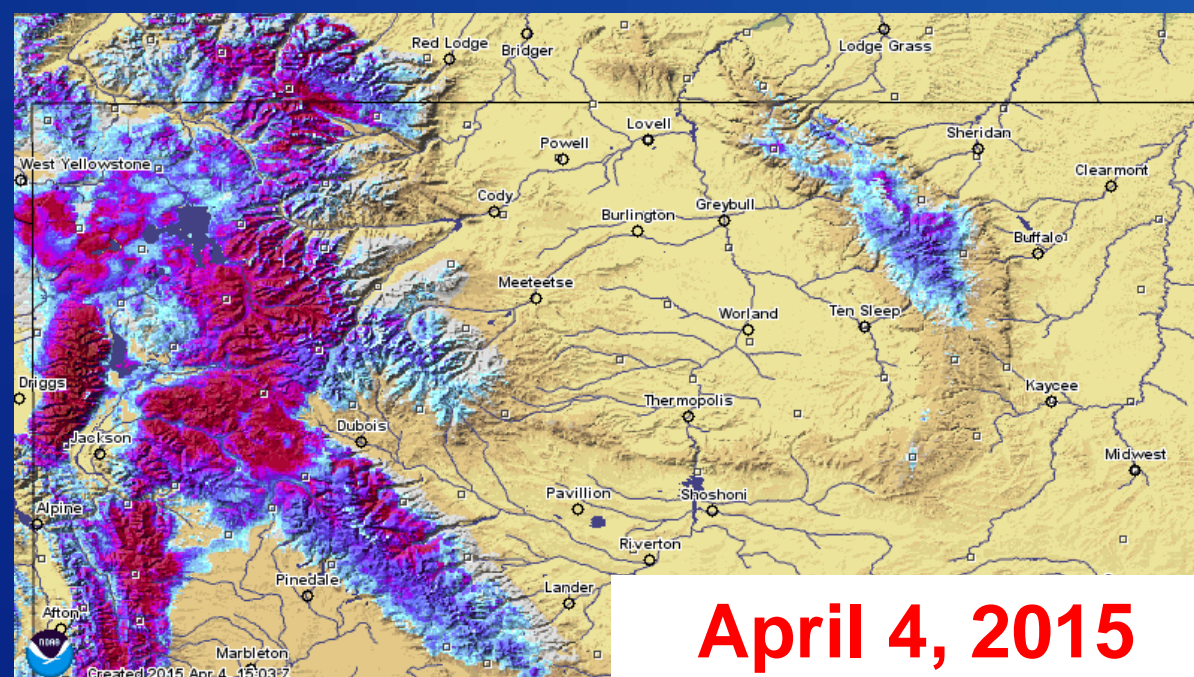


Inches of water equivalent



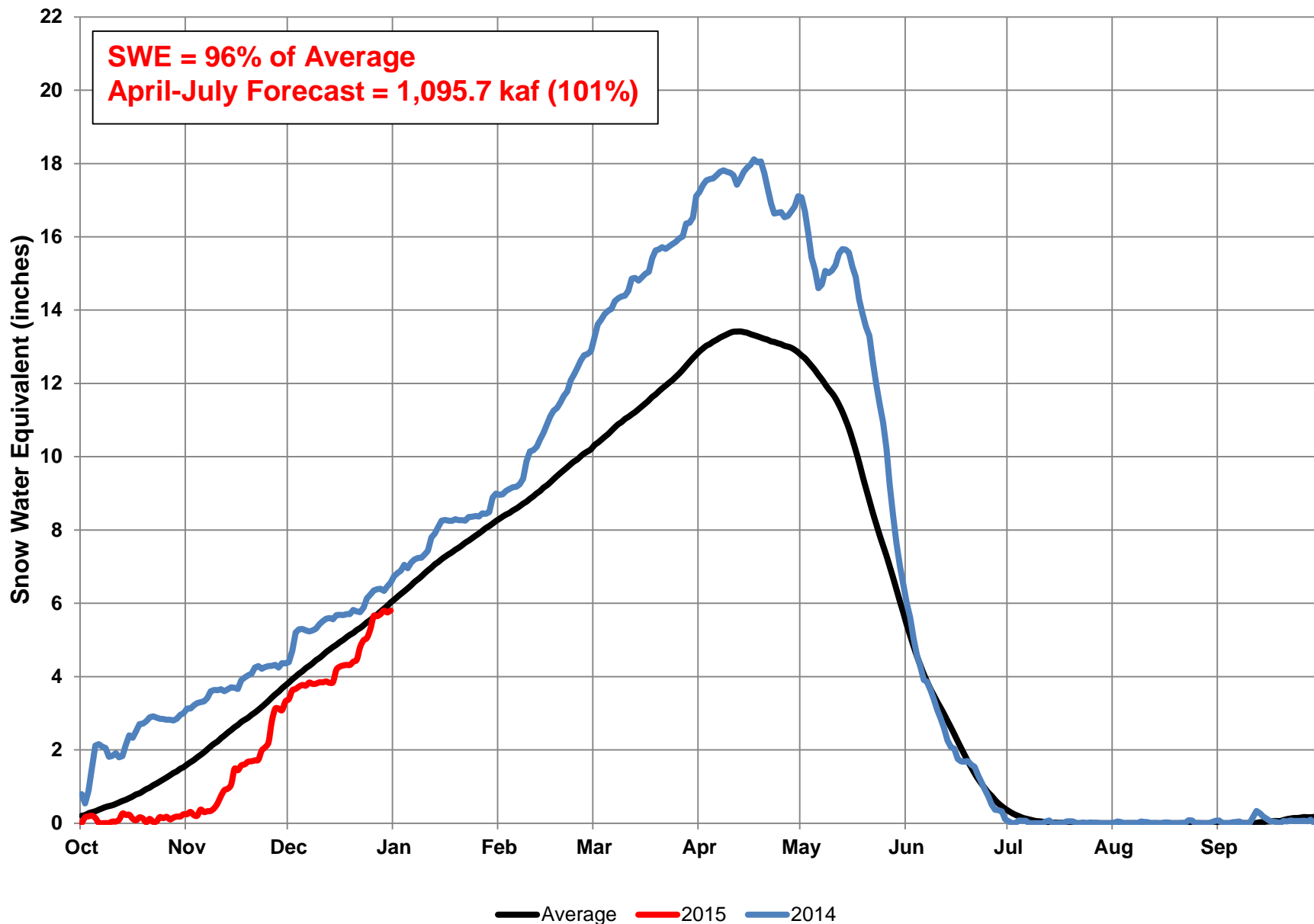
Not Estimated

Elevation in feet

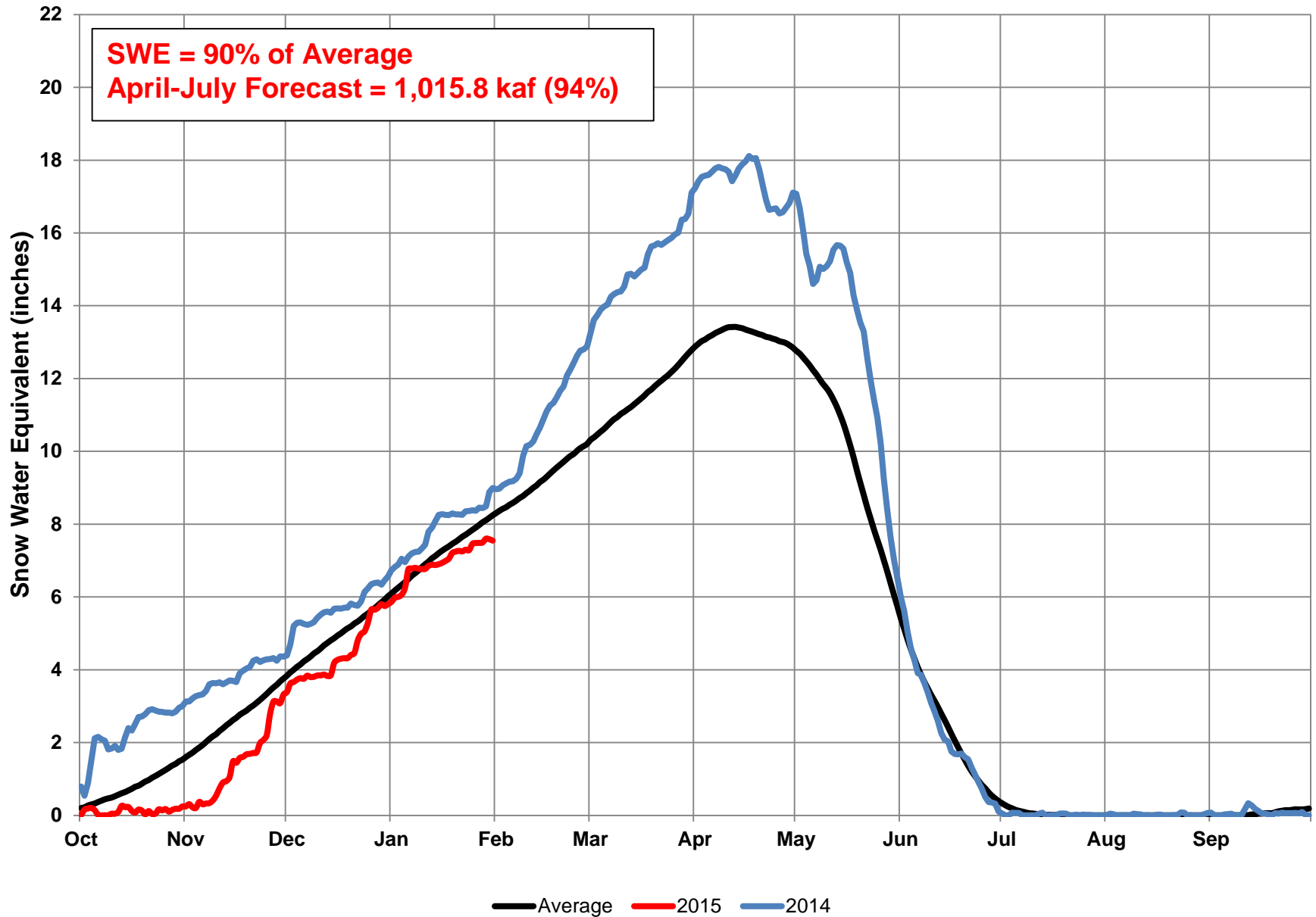


MATION

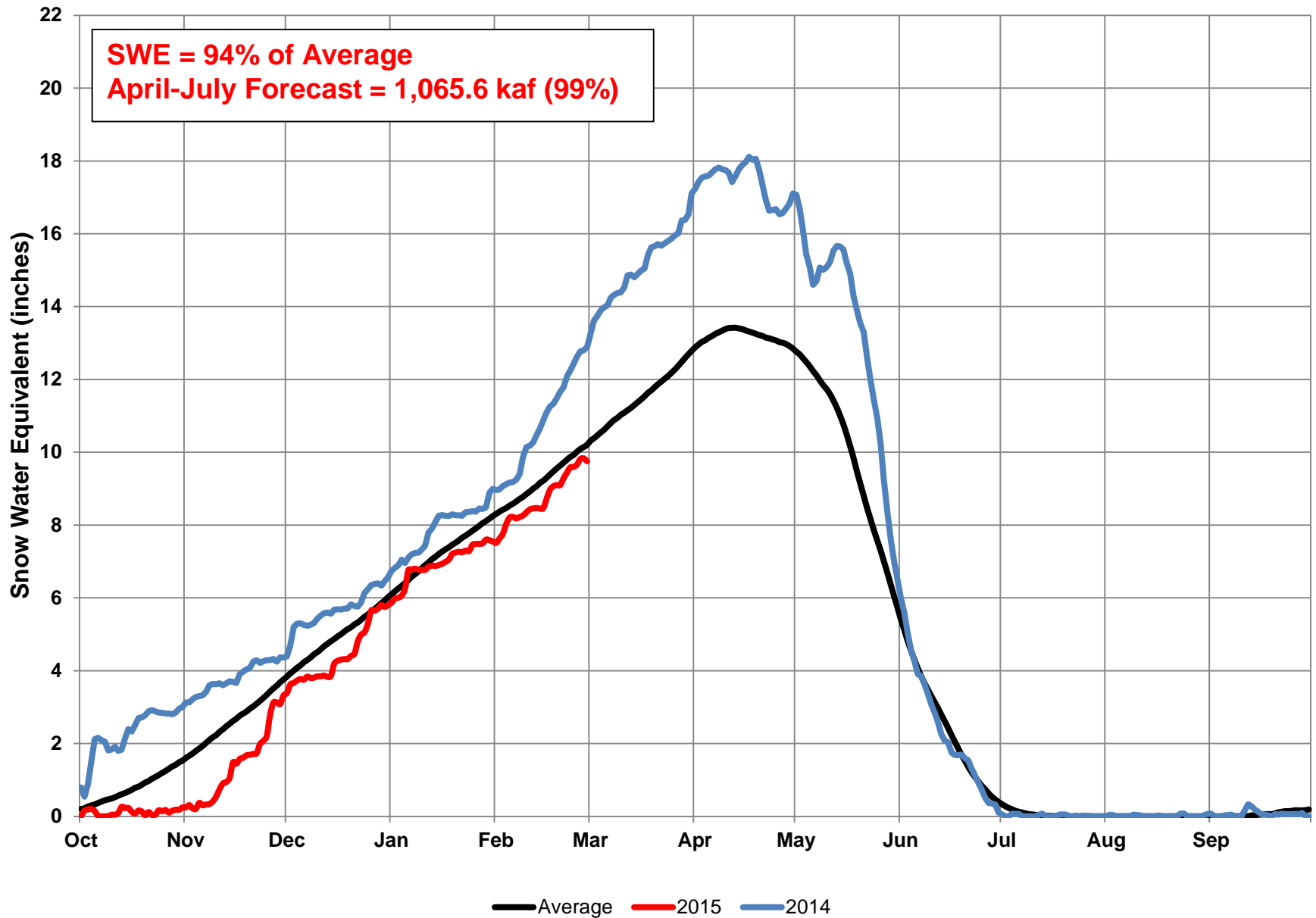
Mountain Snowpack Conditions on January 1



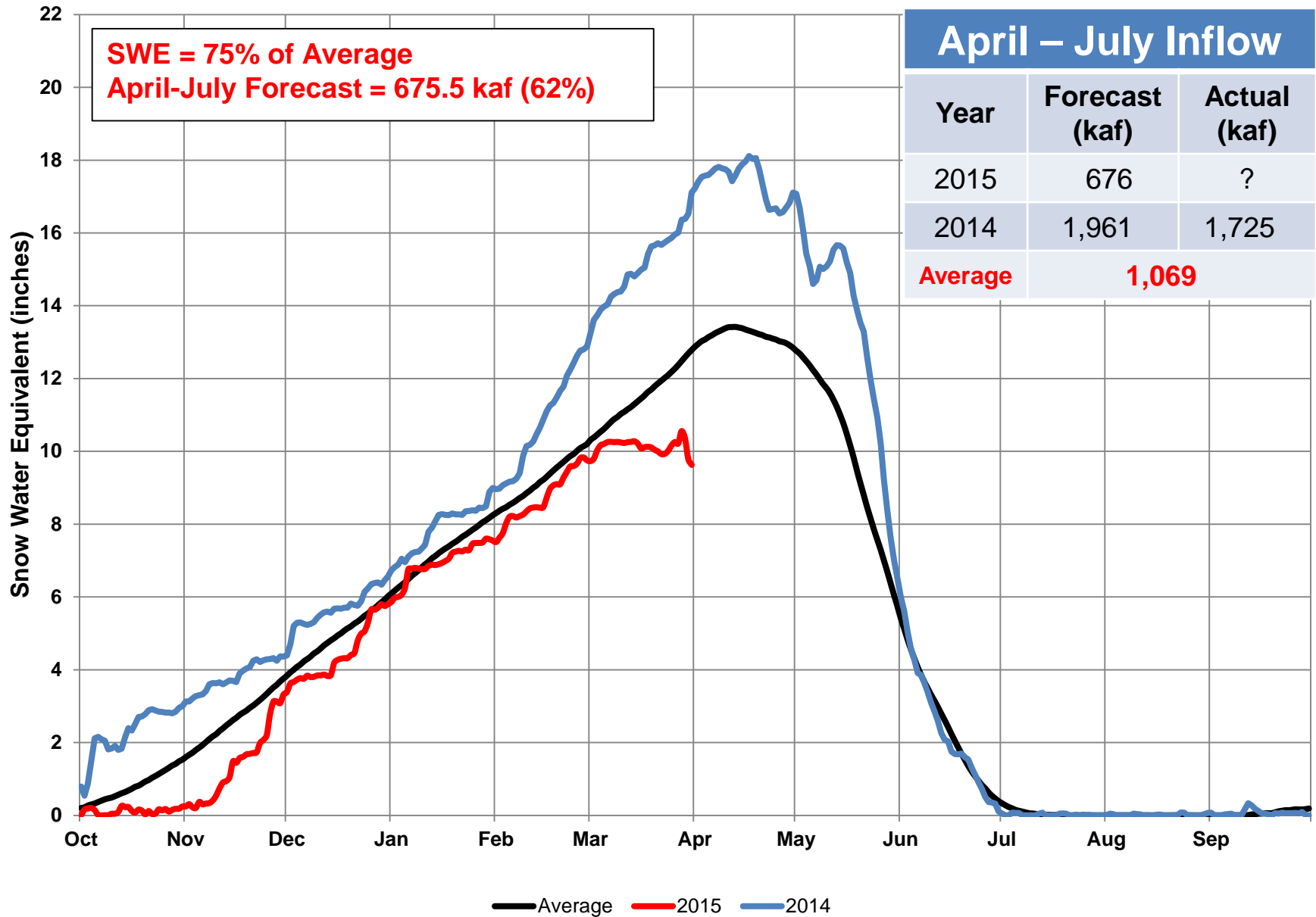
Mountain Snowpack Conditions on February 1



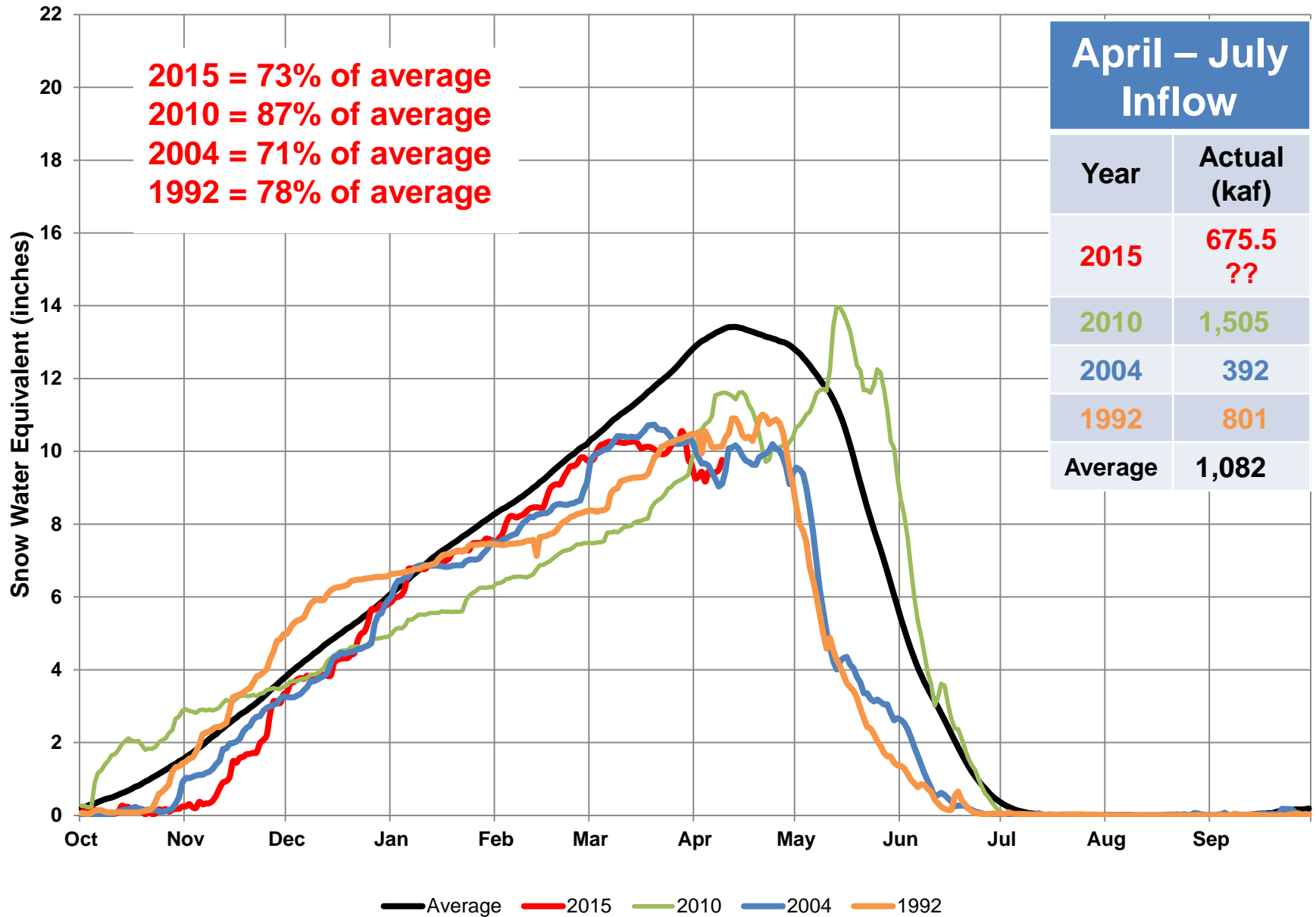
Mountain Snowpack Conditions on March 1



Mountain Snowpack Conditions on April 1



Mountain Snowpack on April 9



2015 Outlook

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Bighorn Lake April – July Forecast

Most Probable Inflow

675,500 af or 62% of average

Minimum Probable Inflow

464,900 af or 43% of average

Maximum Probable Inflow

1,173,900 af or 109% of average

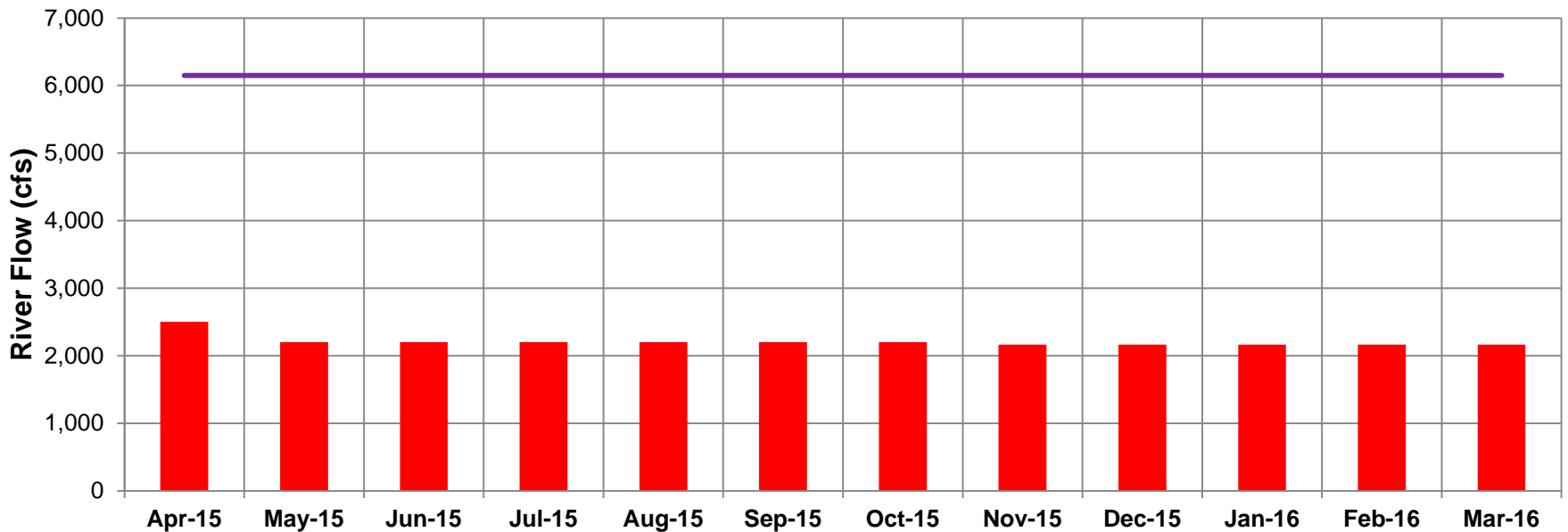
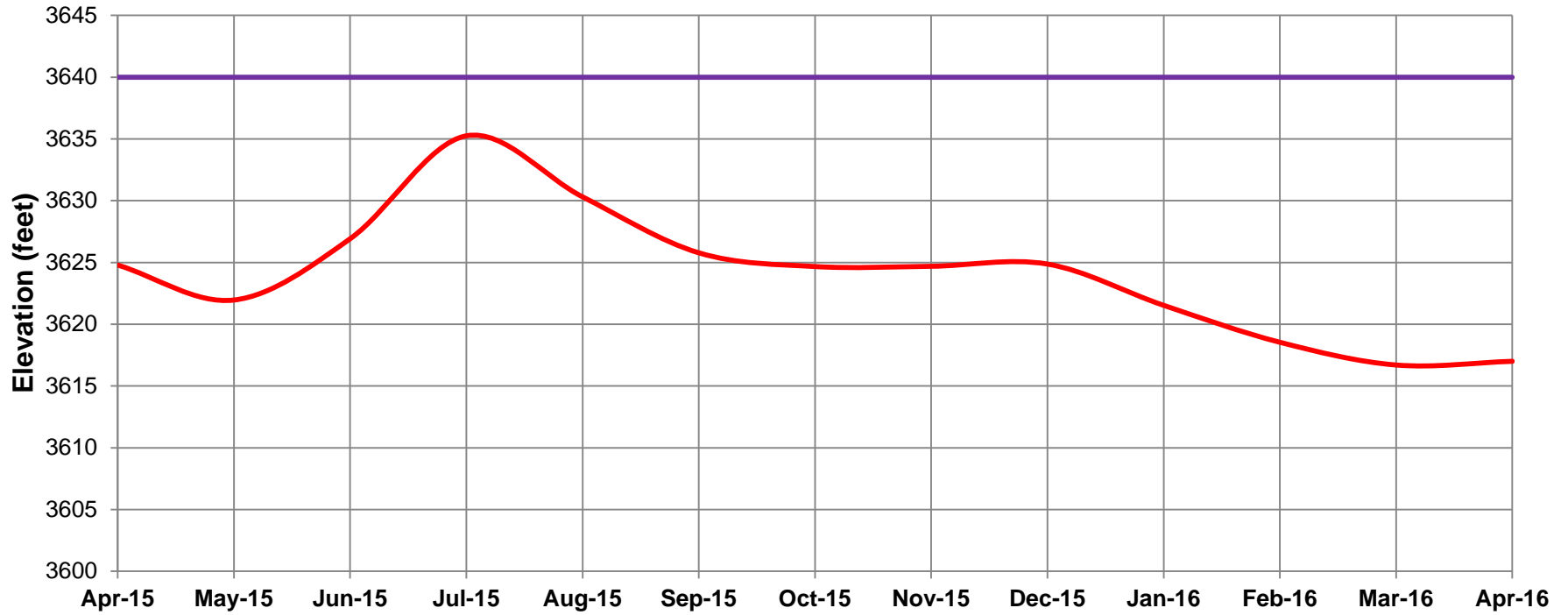
April – July Inflow		
Year	Forecast (kaf)	Actual (kaf)
2015	676	?
2014	1,967	1,725
2013	661	628
2012	1,064	693
2011	1,400	2,572
2010	625	1,504
Average		1,082

Bighorn Lake April – July Forecast

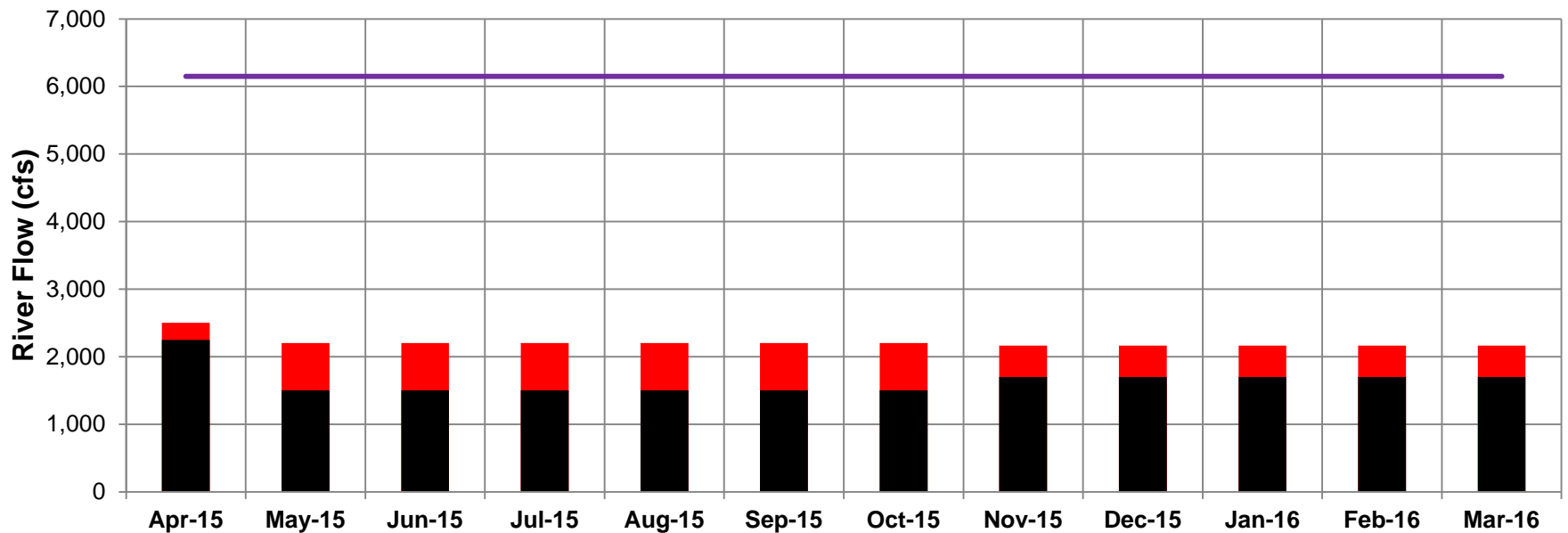
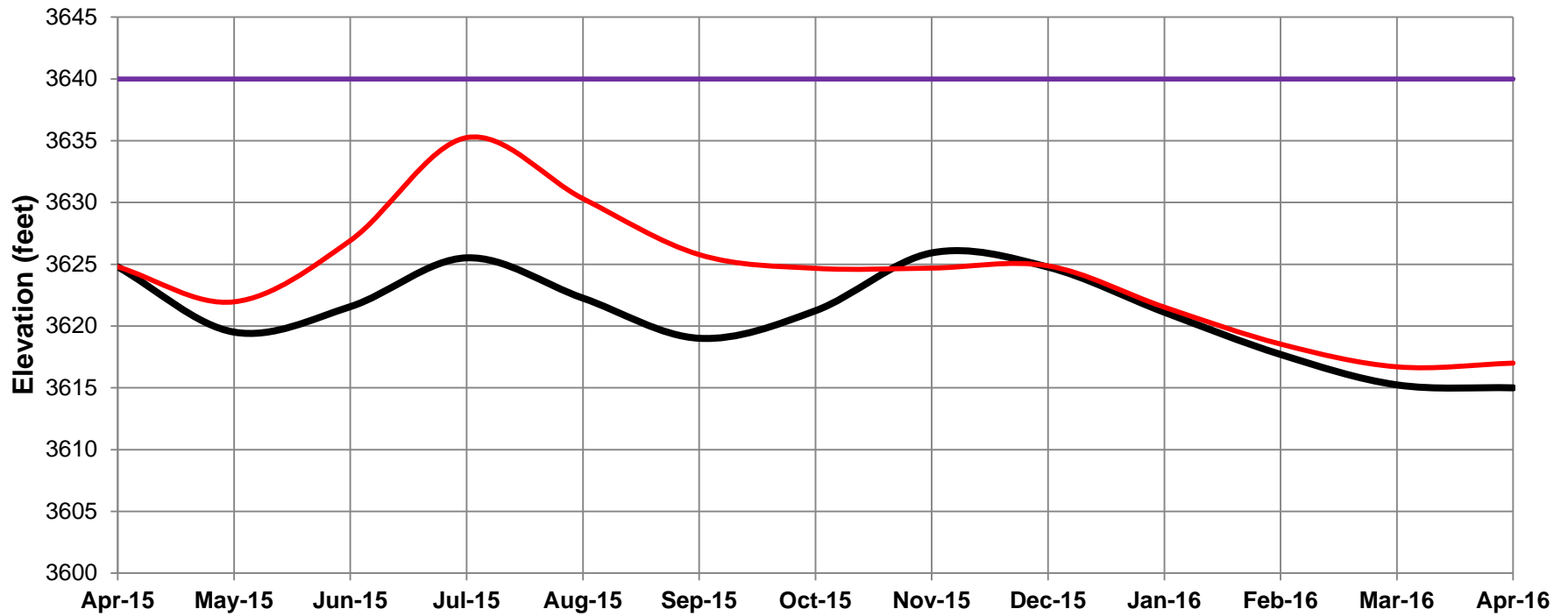
Bighorn Lake Rule Curve

- For forecasted April-July inflow below 727,000 acre-feet, rule curves were not developed
- Balance the lake levels and river release by using an end of March target of 3617 feet

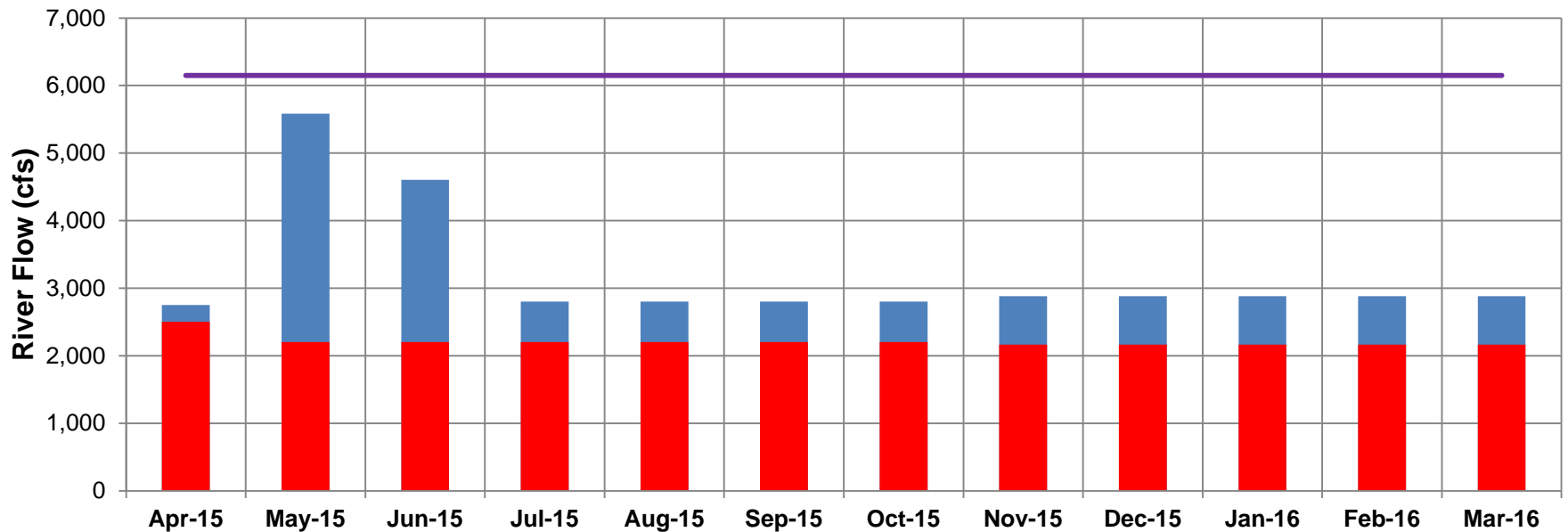
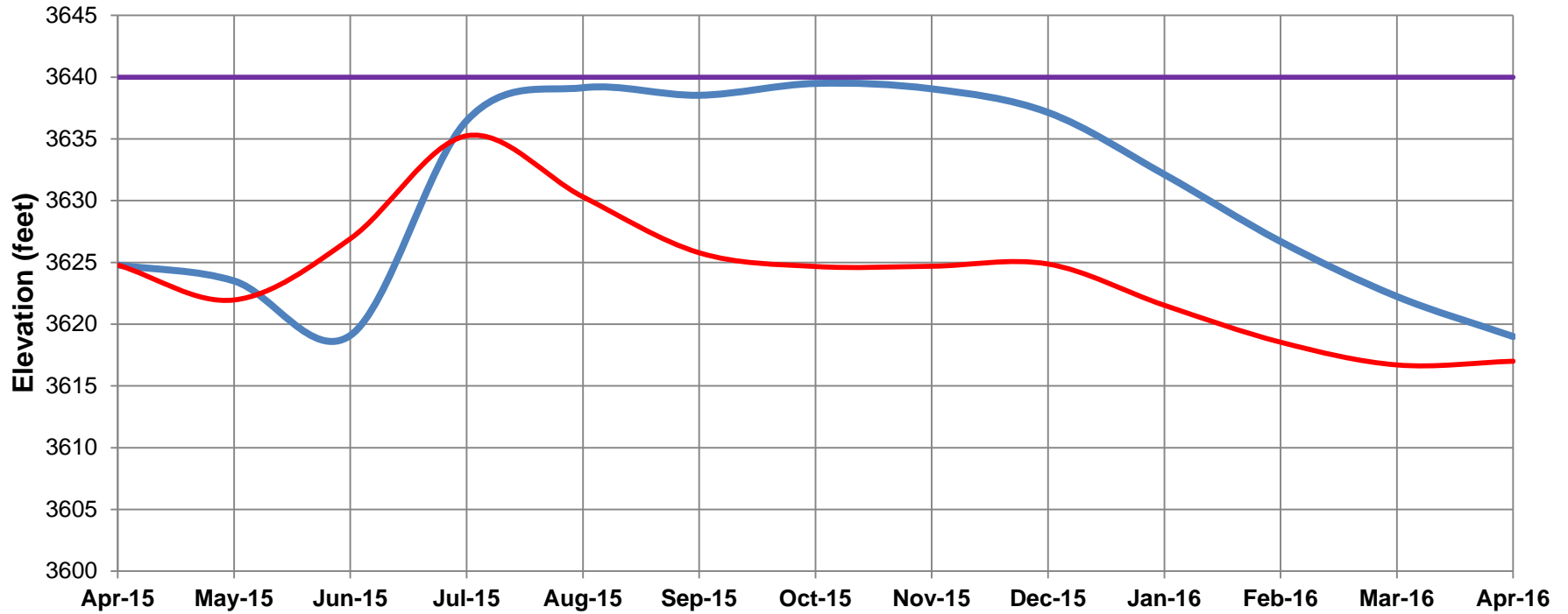
Most Probable Inflow Operations



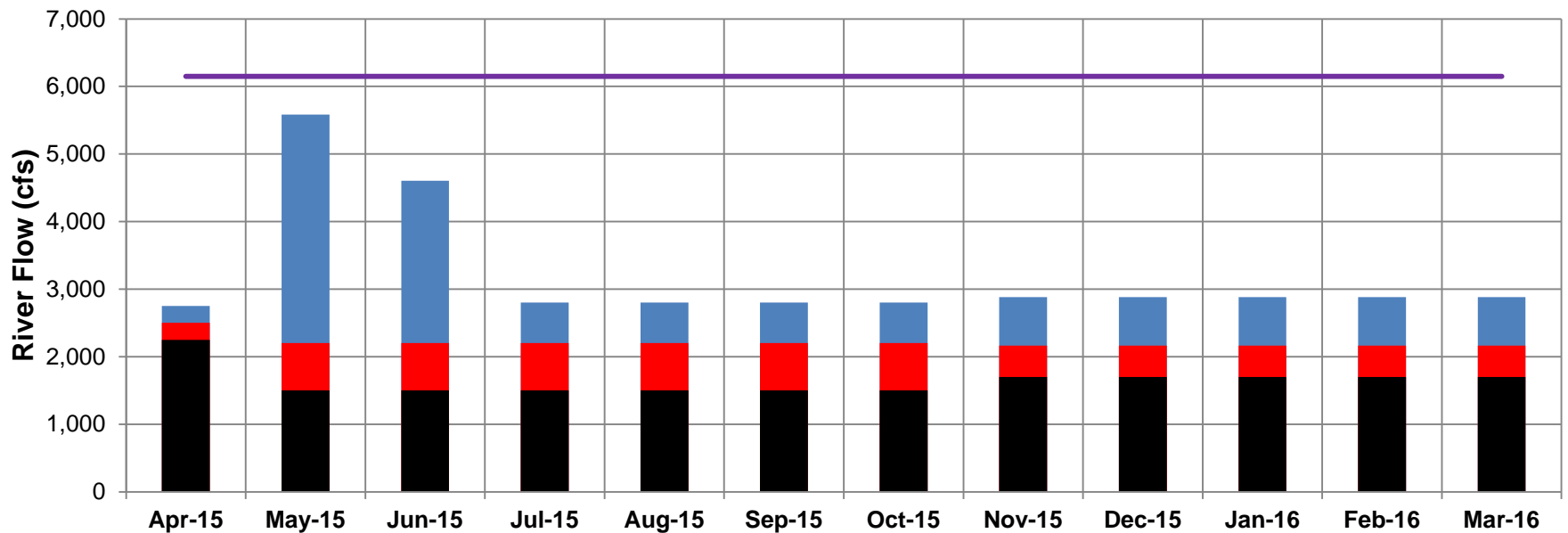
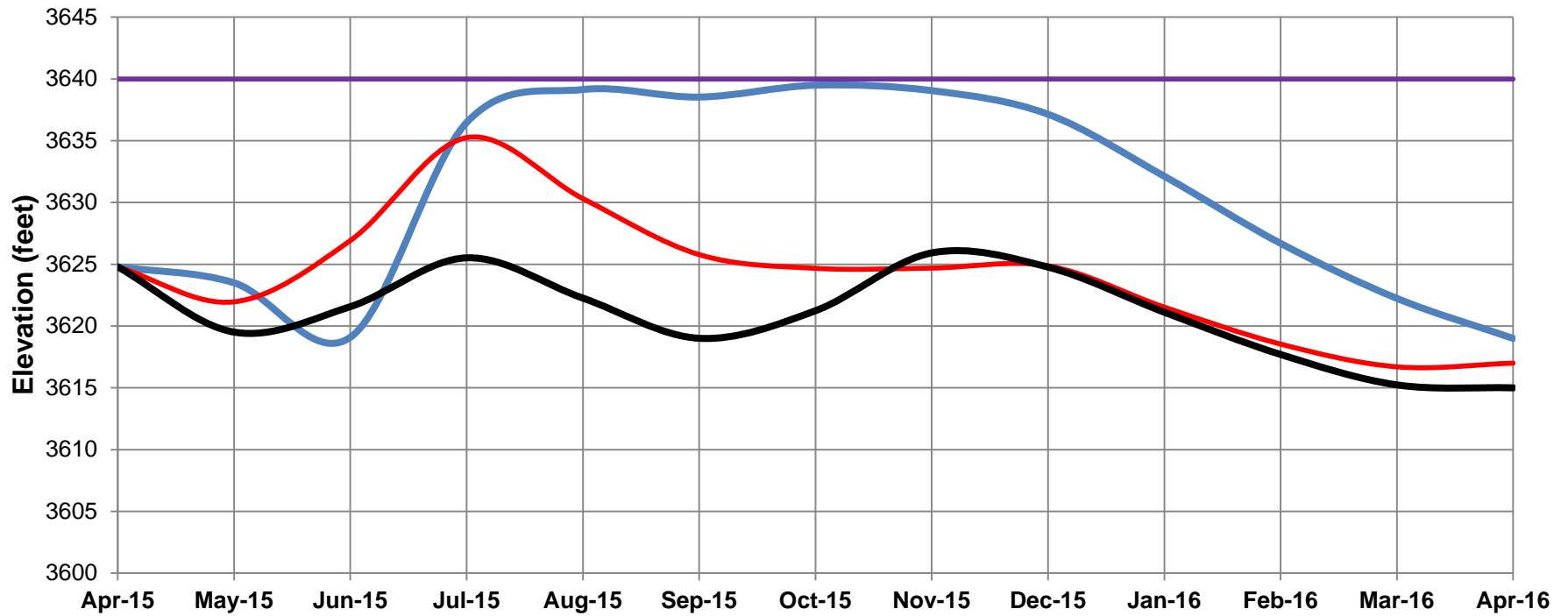
Most and Minimum Probable Inflow Operations



Most and Maximum Probable Inflow Operations



Most, Minimum, and Maximum Probable Inflow Operations



Questions and Feedback

An aerial photograph of a large dam and reservoir. The dam is a long, concrete structure with a spillway on the right side. The reservoir is a large body of water behind the dam. The surrounding landscape is rugged and rocky. A blue semi-transparent box is overlaid on the top part of the image, containing the text "Questions and Feedback".

The information presented at this meeting can be found on the Montana Area Office website at:

www.usbr.gov/gp/mtao/yellowtail/index.html

Bighorn River System Issues Group

- April 23: 10 am to 3 pm
- Lovell Community Center, 1925 Highway 310
- Topics
 - Water Supply Conditions
 - Possible agency activity updates
 - Operating Criteria Comments (46 Comments)
 - Winter Gains Forecast
 - Lake Elevation Targets
 - Manage for River Stage
 - Bighorn Lake Sediment Management
 - http://www.usbr.gov/gp/mtao/yellowtail/bighorn_longterm.html

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