RECLAMATION

Managing Water in the West

U.S. Bureau of Reclamation
Lahontan Basin Area Office
Carson City, NV

Water Supply Outlook
January 19, 2016

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U.S. Department of the Interior
Bureau of Reclamation

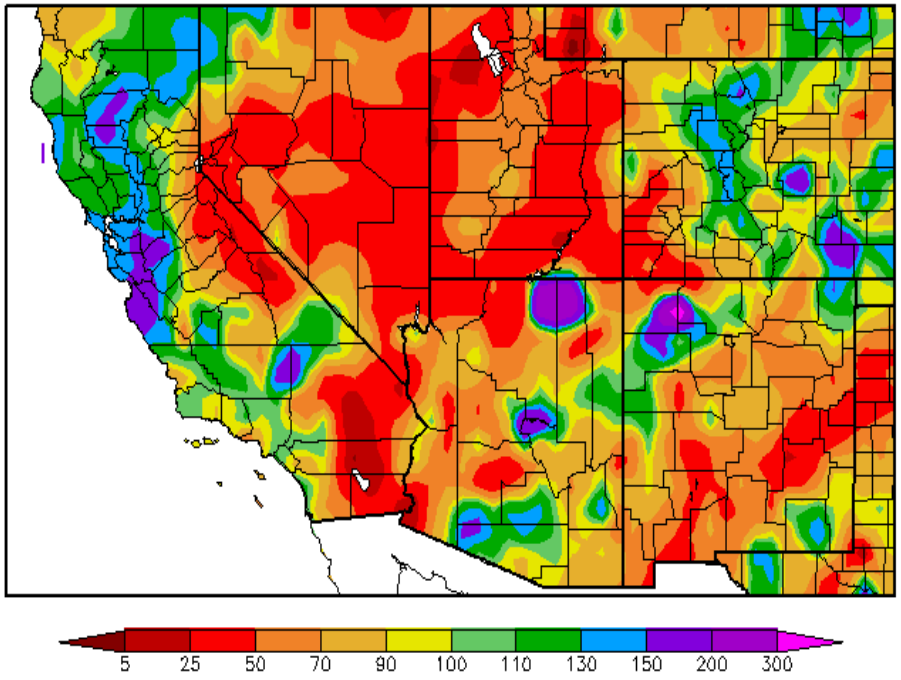
Outline

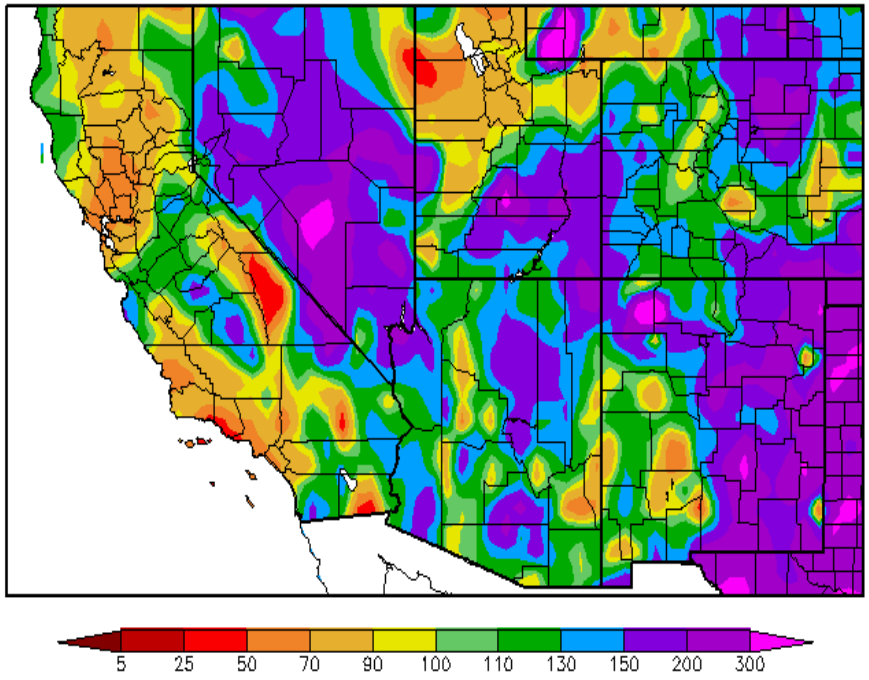
- Current Conditions
- NRCS/RFC Forecasted Data
- Model for Forecasting Basin Outlook
- 2016 Preliminary Outlook


CALIFORNIA
NEVADA
Pyramid Lake
Indian Reservation
WINNEMUCCA
LAKE (dry)
PYRAMID
LAKE
MARBLE BLUFF
Nixon
Derby
Dam
Fernley
TRUCKEE
RIVER
STAMPEDE
INDEPENDENCE
BOCA
PROSSER
DONNER
MARTIS
Reno/Sparks
TRUCKEE
CANAL
Fallon
Stillwater
NWR
Newlands
Project
Fallon Indian
Reservation
LAHONTAN
Carson
City
CARSON
RIVER
CARSON
LAKE
Tahoe City
LAKE TAHOE
Walker River
Indian
Reservation
WALKER
RIVER
Yerington
Schurz
TOPAZ
LAKE
WALKER
LAKE
LOWER HUMBOLDT
REGION
RYE PATCH
RESERVOIR
HUMBOLDT
RIVER
PYRAMID
LAKE
TOULON
LAKE
Humboldt Wildlife
Management Area
HUMBOLDT
LAKE

Water Year 2015 Precipitation % of Normal

10/1/2014 – 3/17/2015





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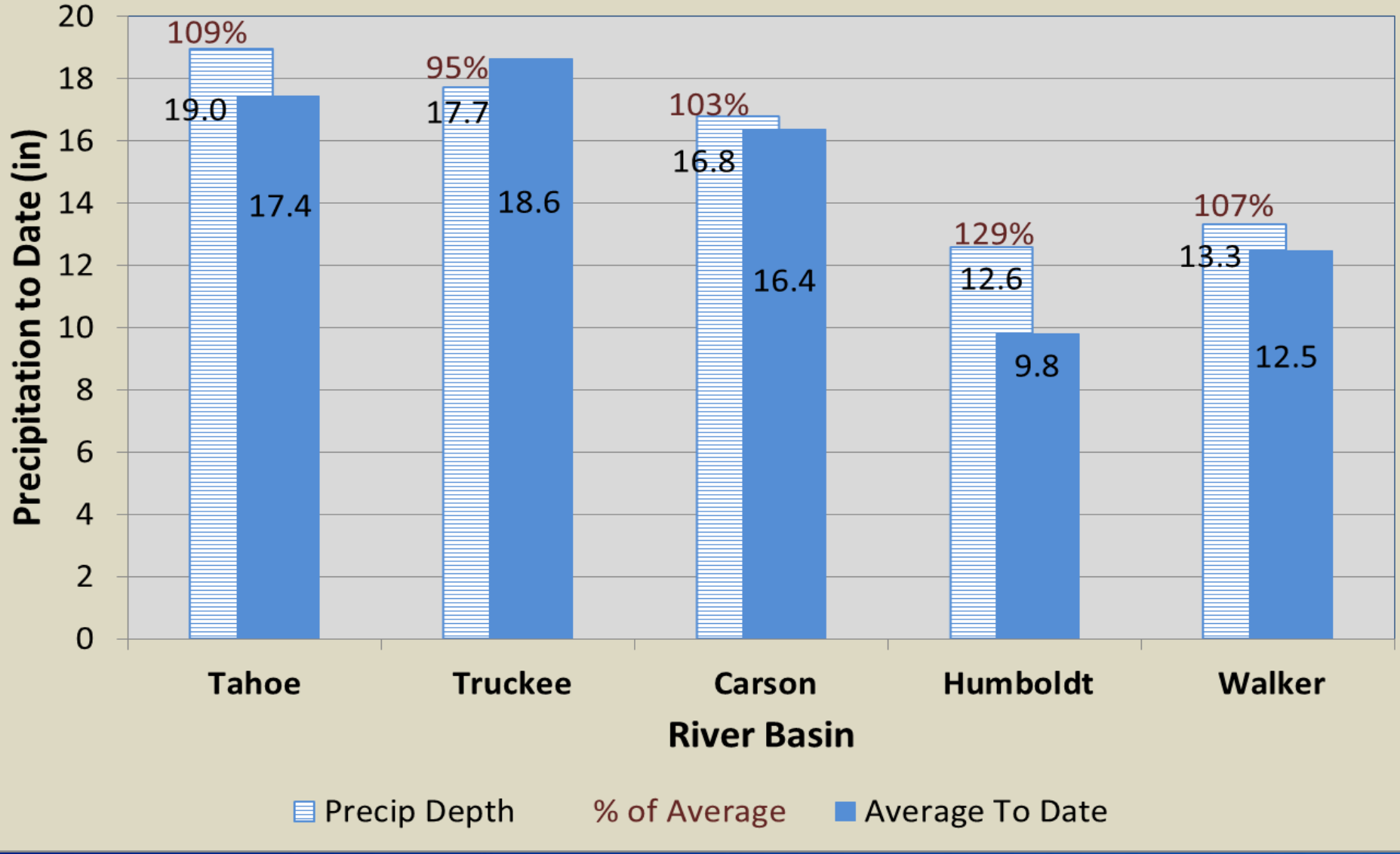
Current WY Precipitation To Date



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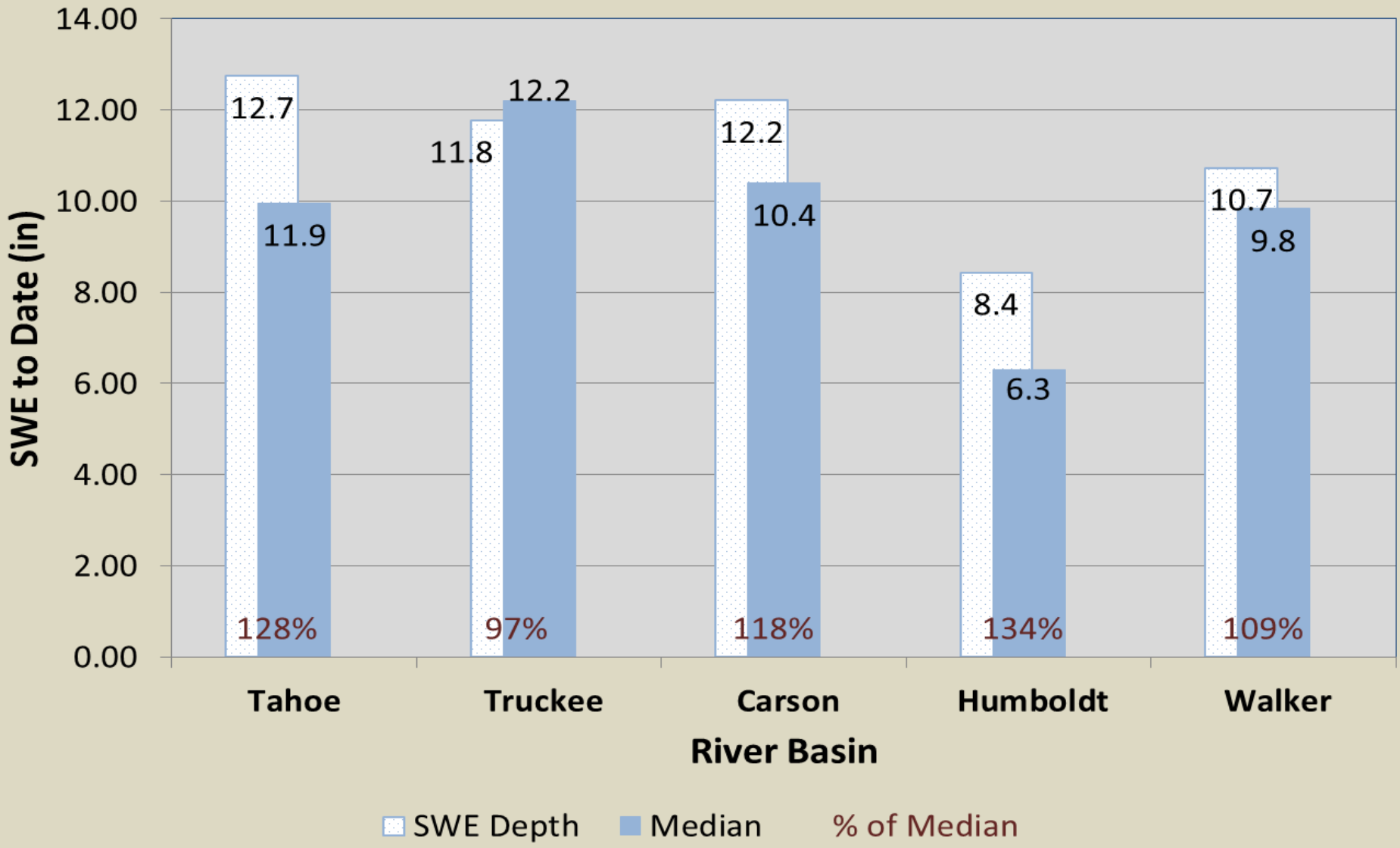
Current Snowpack



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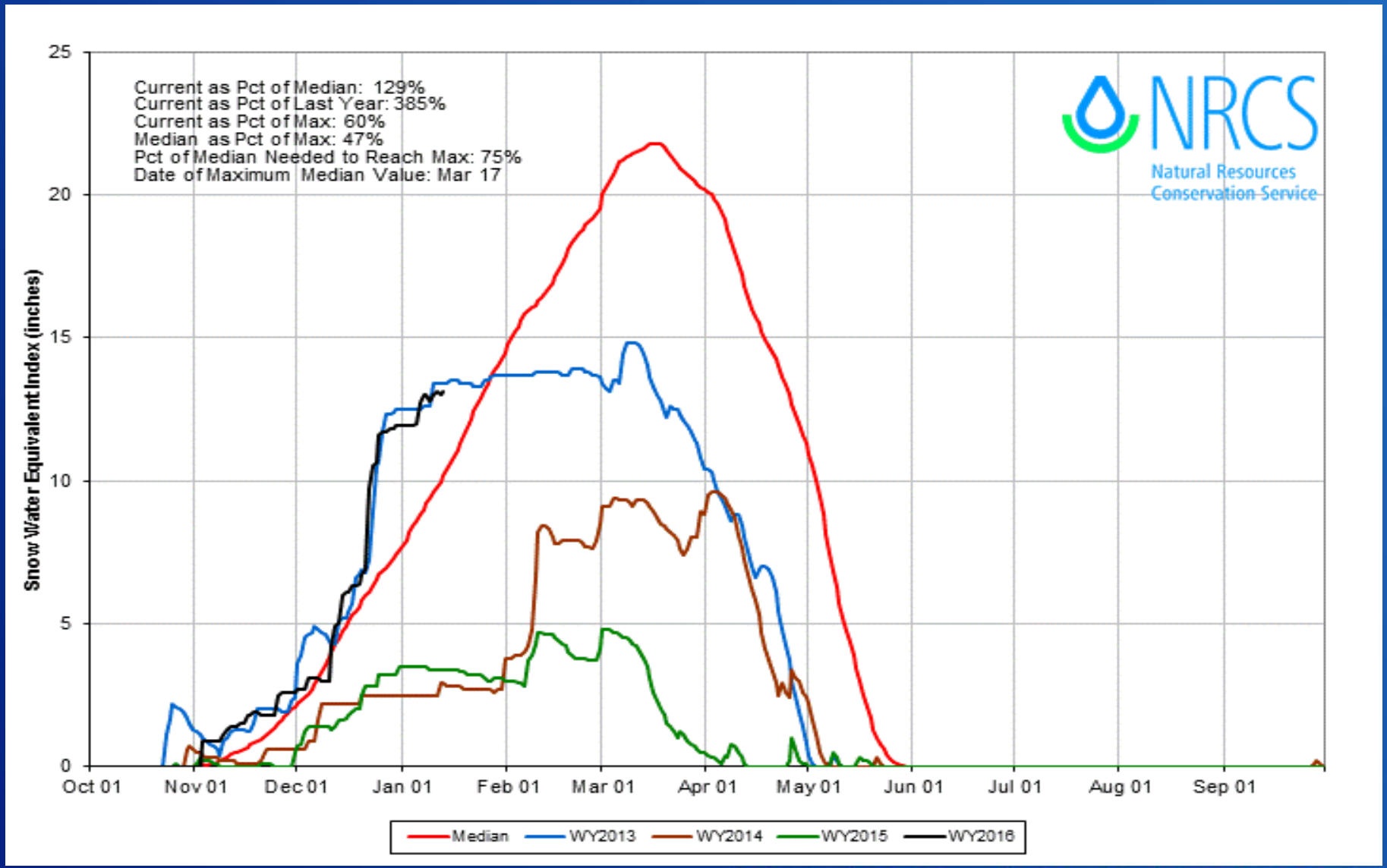
Lake Tahoe Snowpack Per Year



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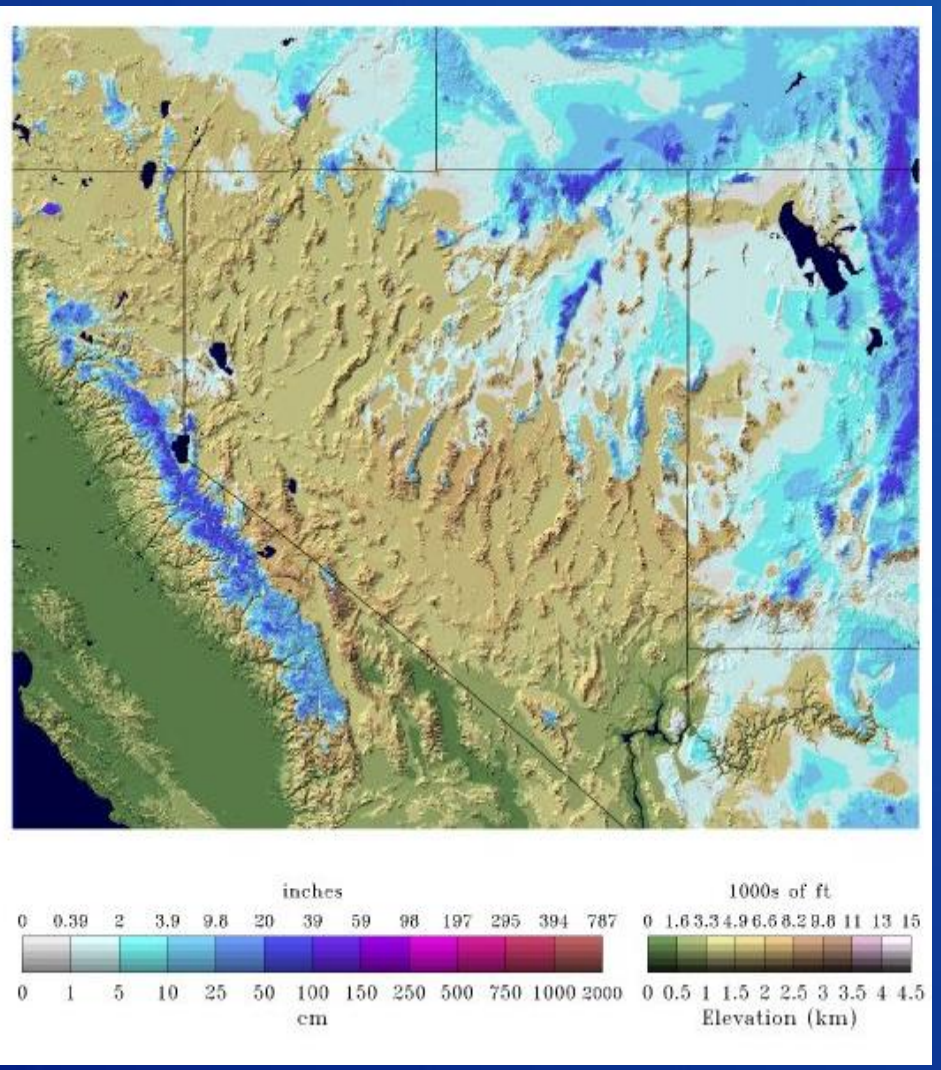
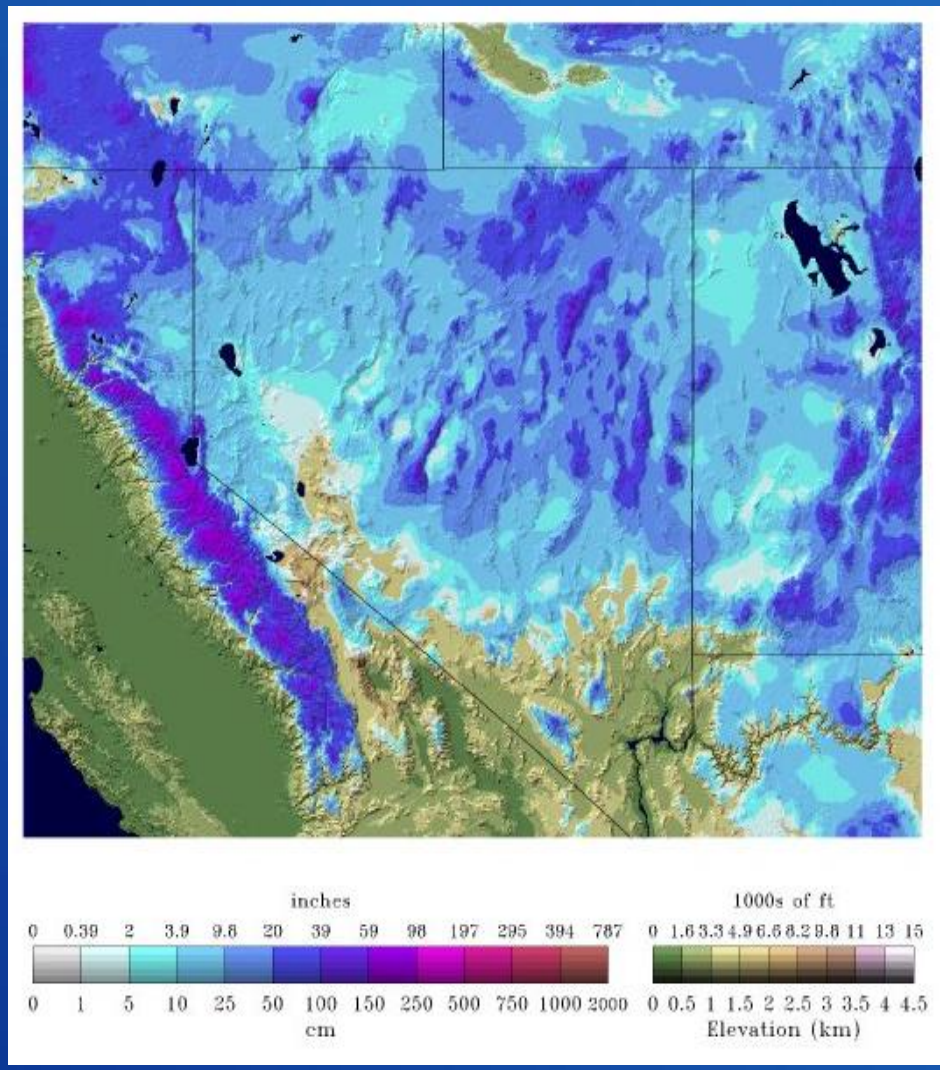
Great Basin Snowpack

January 2015



January 2016



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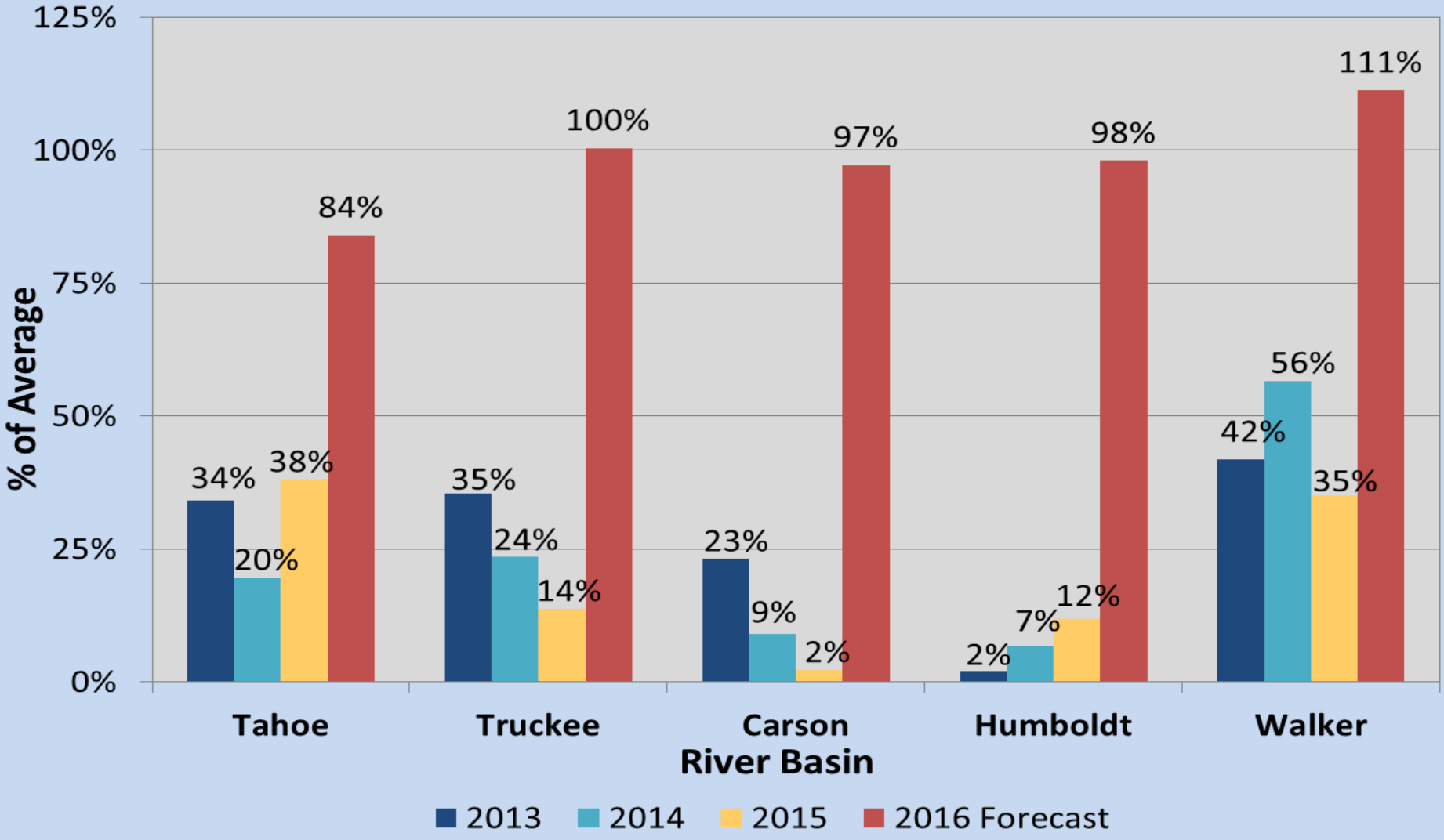
Historical & Forecasted Apr-Jul Runoff by Basin



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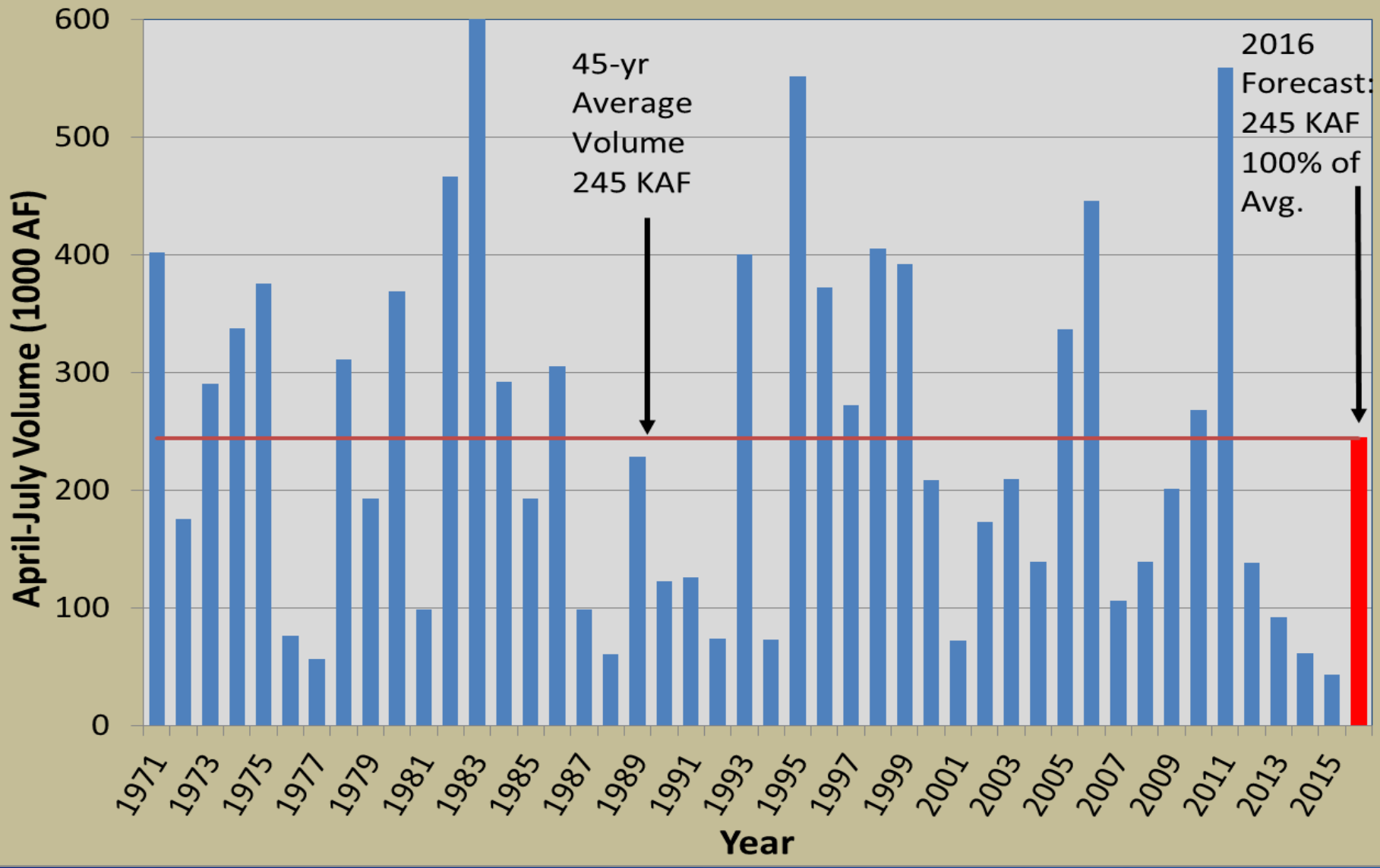
Historical & Forecasted A-J Runoff - Truckee



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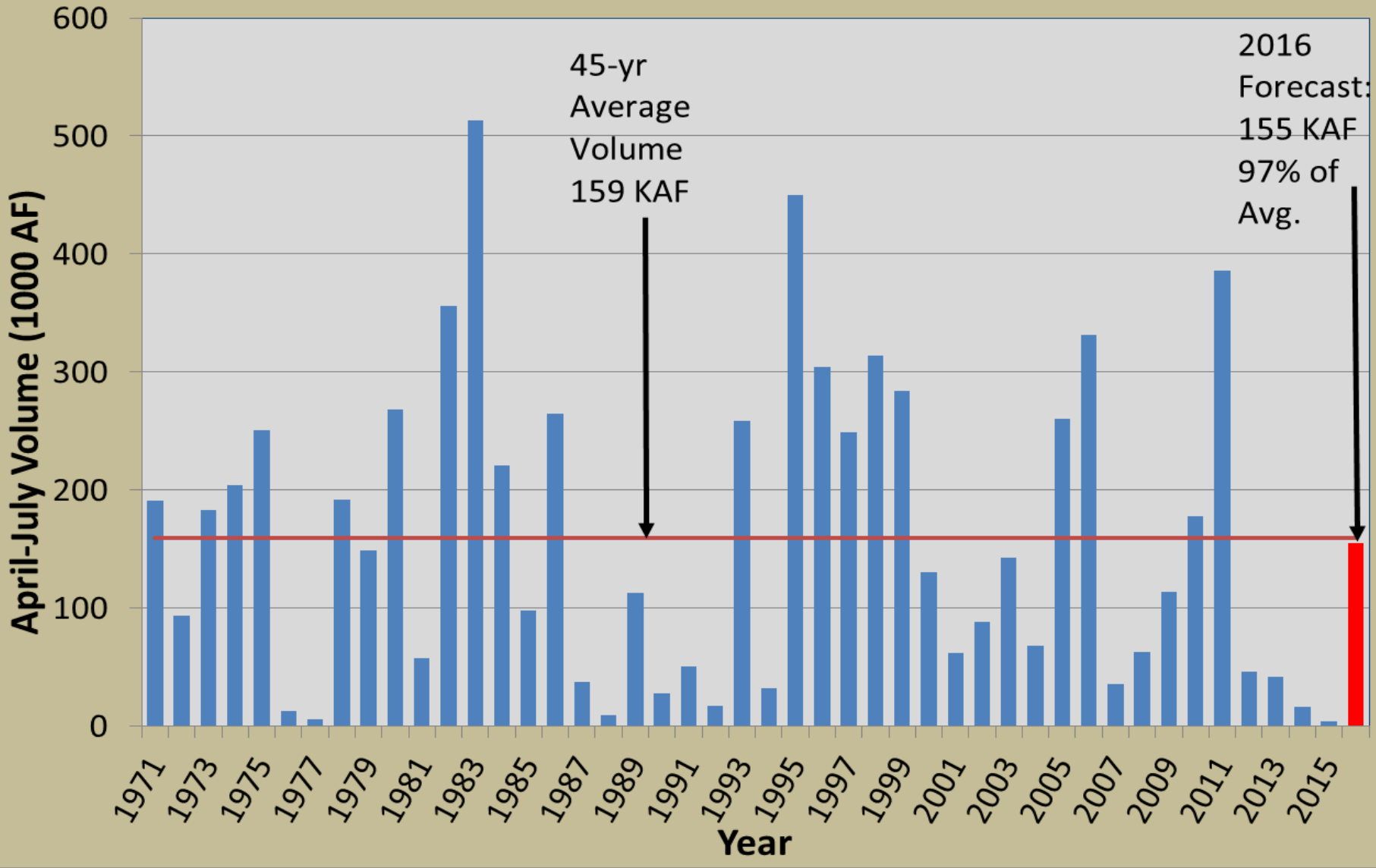
Historical & Forecasted A-J Runoff - Carson



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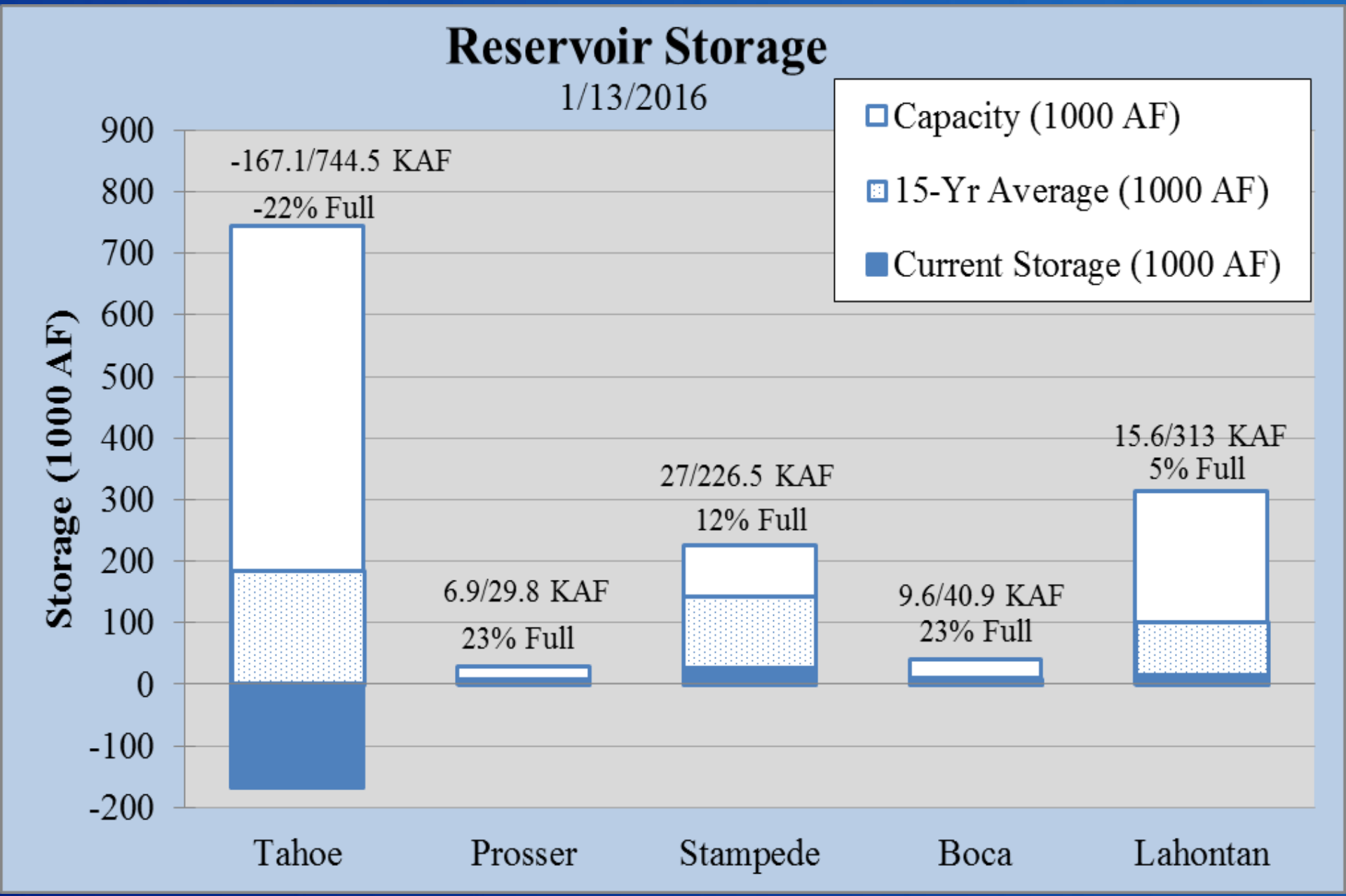

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RiverWare Modeling for Water Management

Truckee Carson River Model Development:

1. Ops Model: Day-to-day Operation
2. Planning Model – Long-term Reliability/Evaluation
   - Joint effort between Reclamation and TROA Implementation Office (Water Master's Office) – for the Operations Model
   - Stakeholders Input

Model Includes:

- Supply (Inflows)
- Demand (water rights, etc.)
- Operating Criteria
  - Pre-TROA: Based on 1935 Truckee River Agreement (TRA)
  - Current: Truckee River Operating Agreement (TROA)

Operation Criteria

- General Electric Decree (1915)
- Truckee River Agreement (1935)
- Orr Ditch Decree (1944)
- Donner Lake Agreement (1943)
- Tahoe-Prosser Exchange (1959)
- Interim Storage Agreement (1994)
- Adjusted OCAP – Operating Criteria and Procedure (1997)

Truckee River Operating Agreement: TROA

- New Operating Policy: TROA
  - Negotiated pursuant to PL 101-618 (1990)
  - Partially implemented on December 1, 2015
  - Full implementation – coming soon
- TROA Builds on current Truckee River Agreement policy
  - Adds operational flexibility
    - Users may hold back their water as “credit water”
    - Allows for system of exchanges between reservoirs

Reservoir Characteristics

Prosser Reservoir

- Storage capacity
- Max Min Pools
- Outlet works
- Spillway capacity
- Storage Priority
- Flood Control Operations
- Evaporation
- Precipitation
- Power

RiverWare Model Development

Pre-TROA	TROA
Operations Model (15 months)	Operations Model (15 months)
Planning Model (100 year)	Planning Model (100 year)

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Ops Model for Water Management

Operation – Day-to-day Operations and Look Ahead

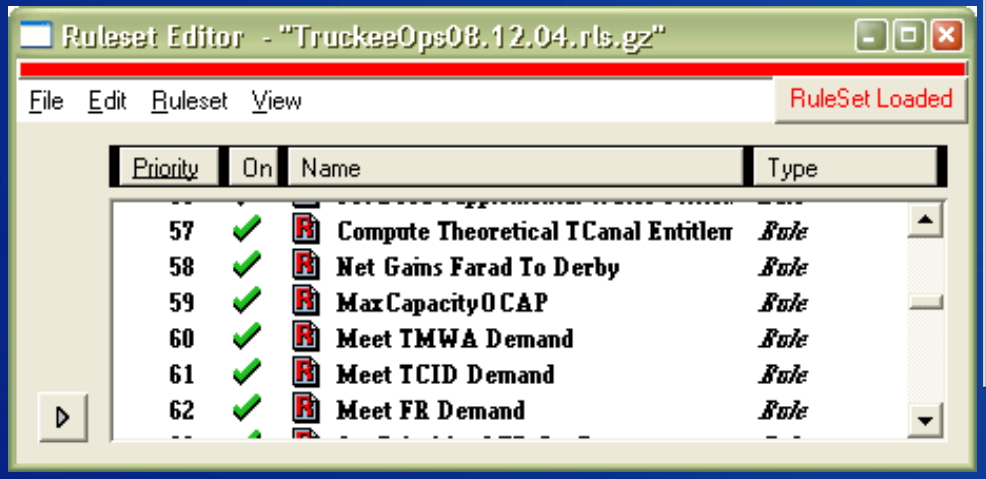
- Short-term Model – 15 months hydrology
- Operational forecasts for stakeholders since 2004
- Inflow – Current Gage and Forecasted

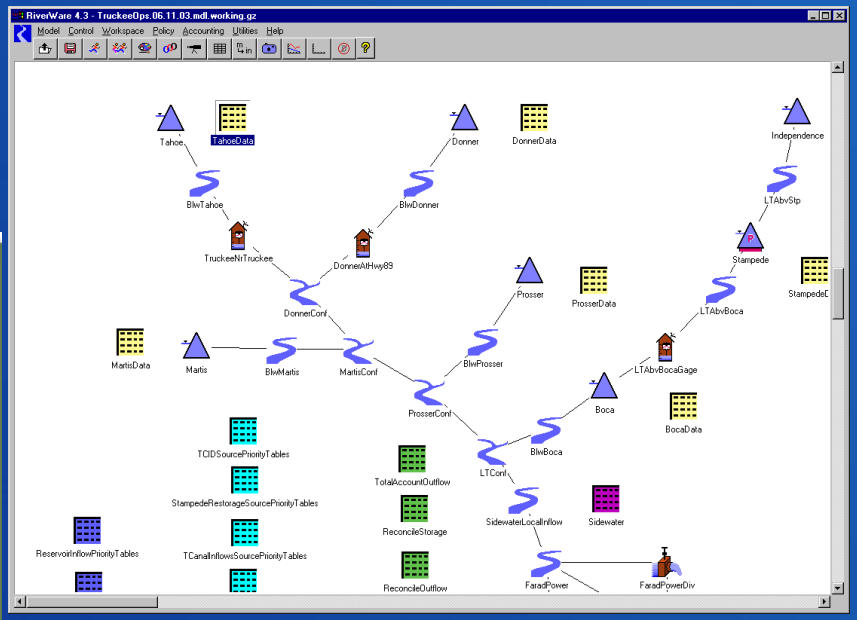
Model Use:

- Water Master – Daily operations and TROA Scheduling Committee
- Reclamation - Truckee Canal Diversion operations & Lahontan Flood operations

RiverWare Framework

- Node-based river system operations model
- Physical characteristics
- Uses rule-based simulation - policy is coded in the rule set





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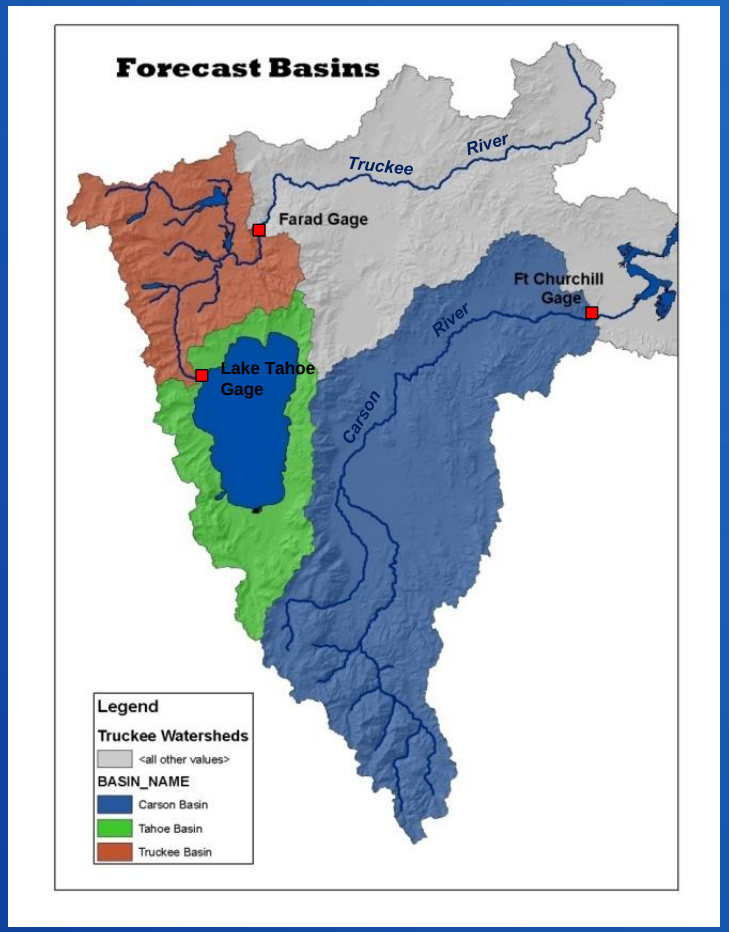
RiverWare Operations Model - Forecasted Inflow Methodology

- NRCS/RFC April-July runoff volume forecasts for 3 basins:
  - Tahoe, Truckee, and Carson.
- Forecasts are given as probability of exceedance:
  - 10%, 30%, 50%, 70%, and 90%
- Obtain inflow hydrograph patterns - volumes are matched to historically similar years
- Disaggregate hydrographs to several basin locations
- Model is run for each exceedance value



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LBAO Forecasting
What forecasts we produce and why

- OCAP Forecasts→
  Truckee Canal Operations
  - Lahontan Monthly Target Storages
    - Ft. Churchill Apr-Jul Volume
    - Carson Division Annual Demand
  - Truckee Canal Monthly Diversions
    - Truckee and Carson Division Monthly Demand
    - Truckee Canal Monthly Losses
    - Lahontan Reservoir Monthly Losses

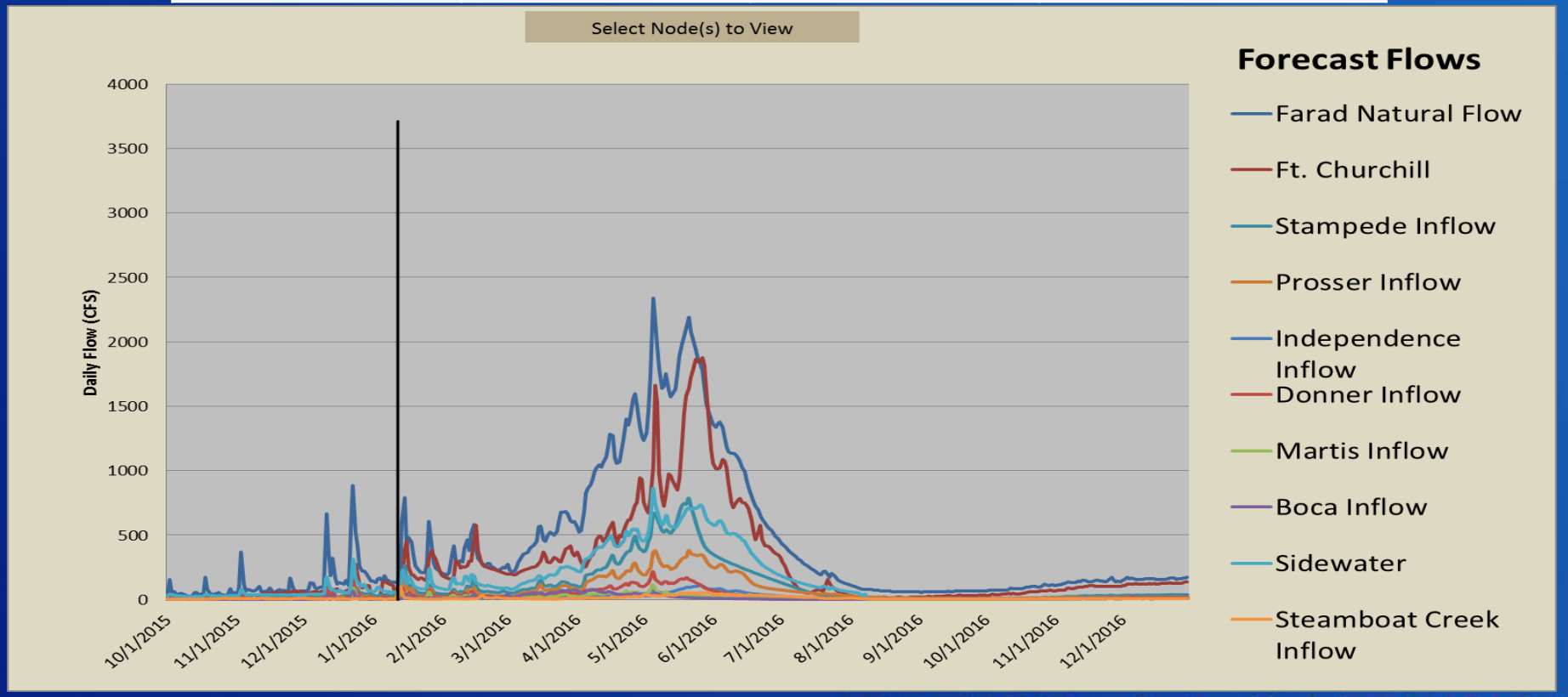
LBAO Forecasting

What forecasts we produce and why

- Forecasts→ Truckee Basin Operations
  - Reservoir Filling/Flood Control Operations
  - Reservoir Operations to meet Floriston Rates
  - Tahoe-Prosser Exchange
  - Truckee Meadows Diversions and Demands
  - Fish and Wildlife Service Fish Releases
  - Truckee Canal Operations
  - Pyramid Lake Elevations
- TROA Operational Forecasting Using RiverWare – TROA Administrator
  - Parties to submit a schedule - coordination process

WY 2016 January 14 Forecast - Hydrograph

	Farad AJ Vol (KAF)	Carson AJ Vol (KAF)	Tahoe Gate Closed Rise (ft)
20% (W)	346	263	2.2
50% (M)	**245**	**175**	1.1
80% (D)	128	94	0.4



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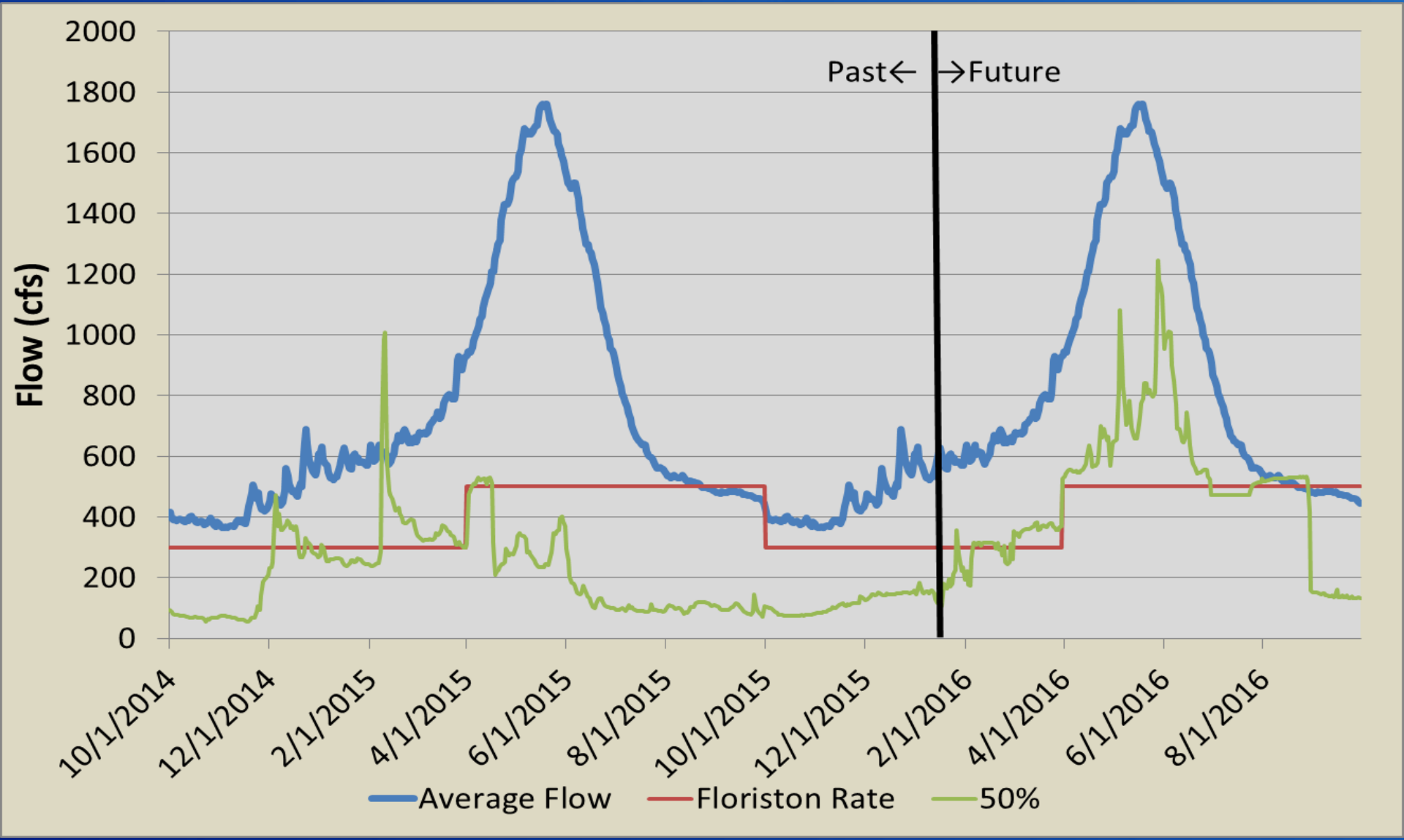
Average & Forecasted Farad Flow



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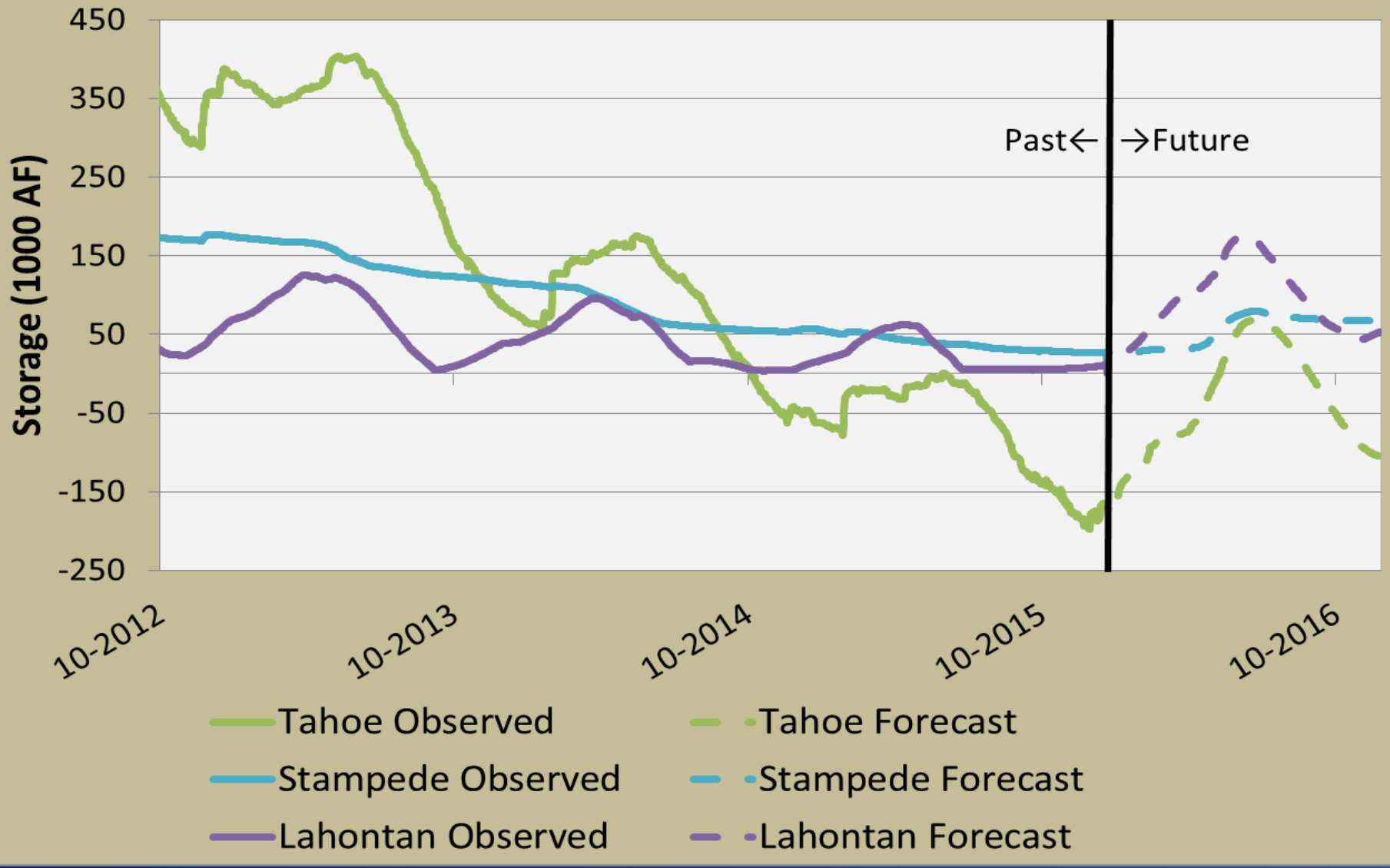
Observed and Forecasted Reservoir Storage



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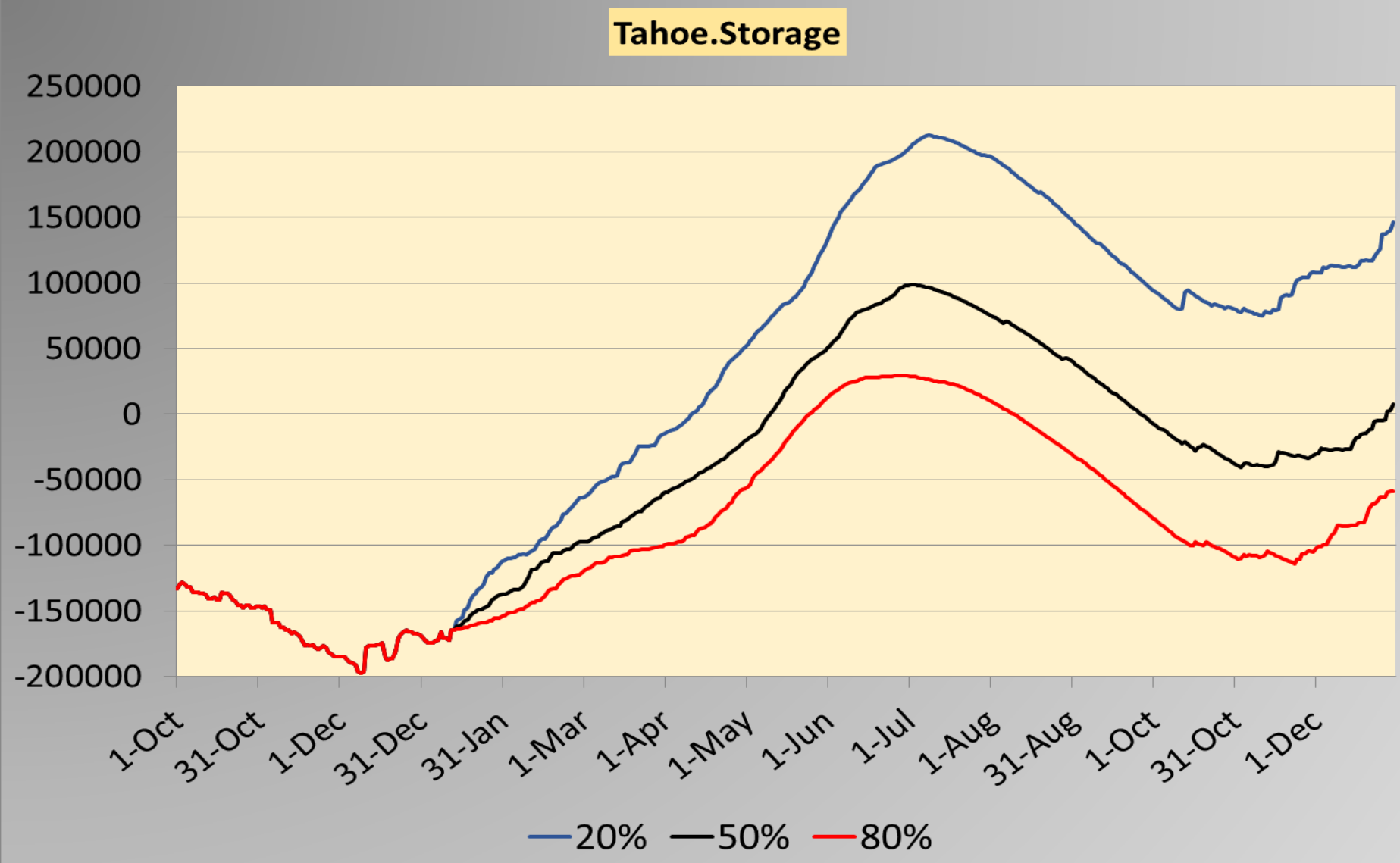
WY 2016 Storage Preliminary Projection -



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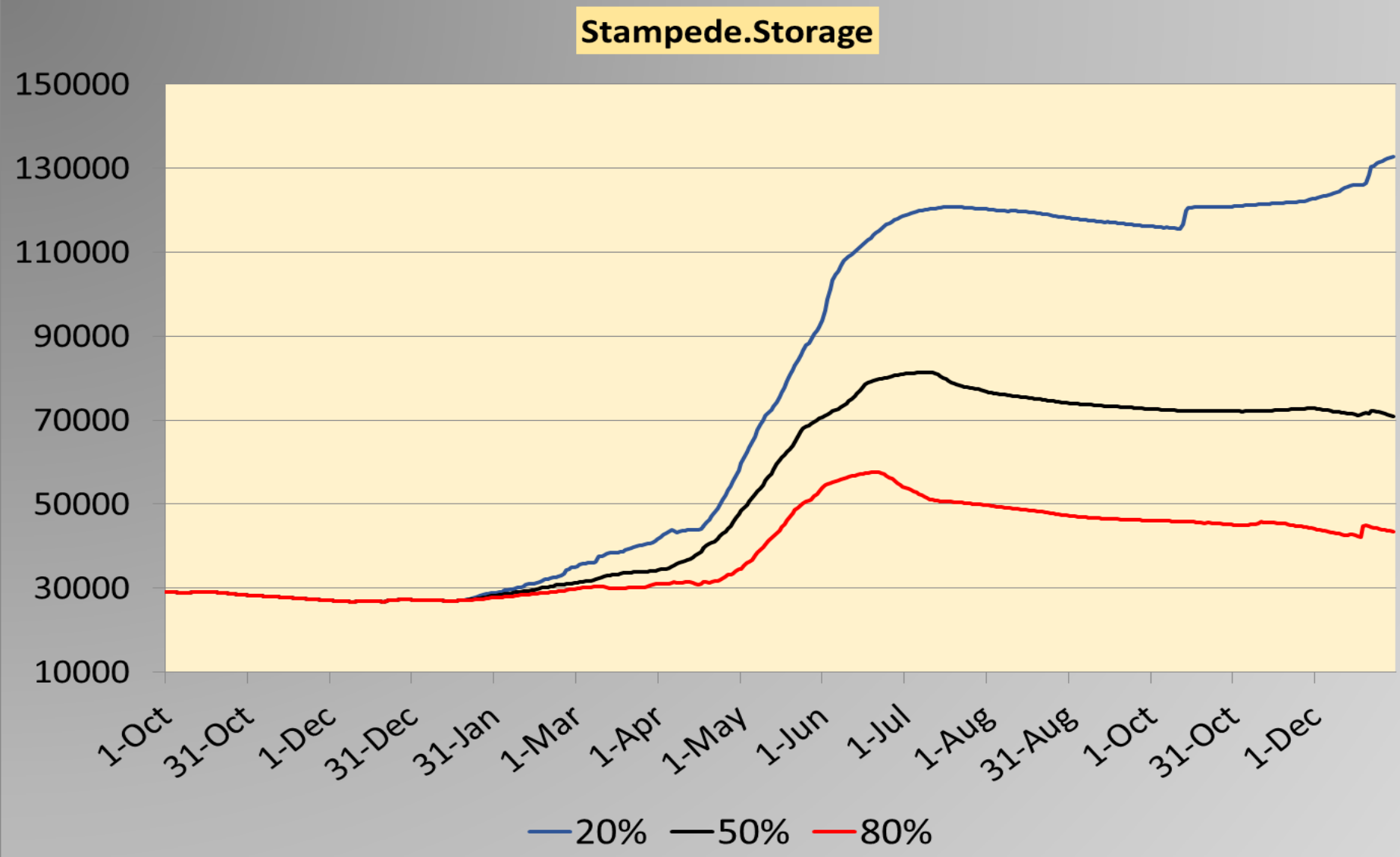

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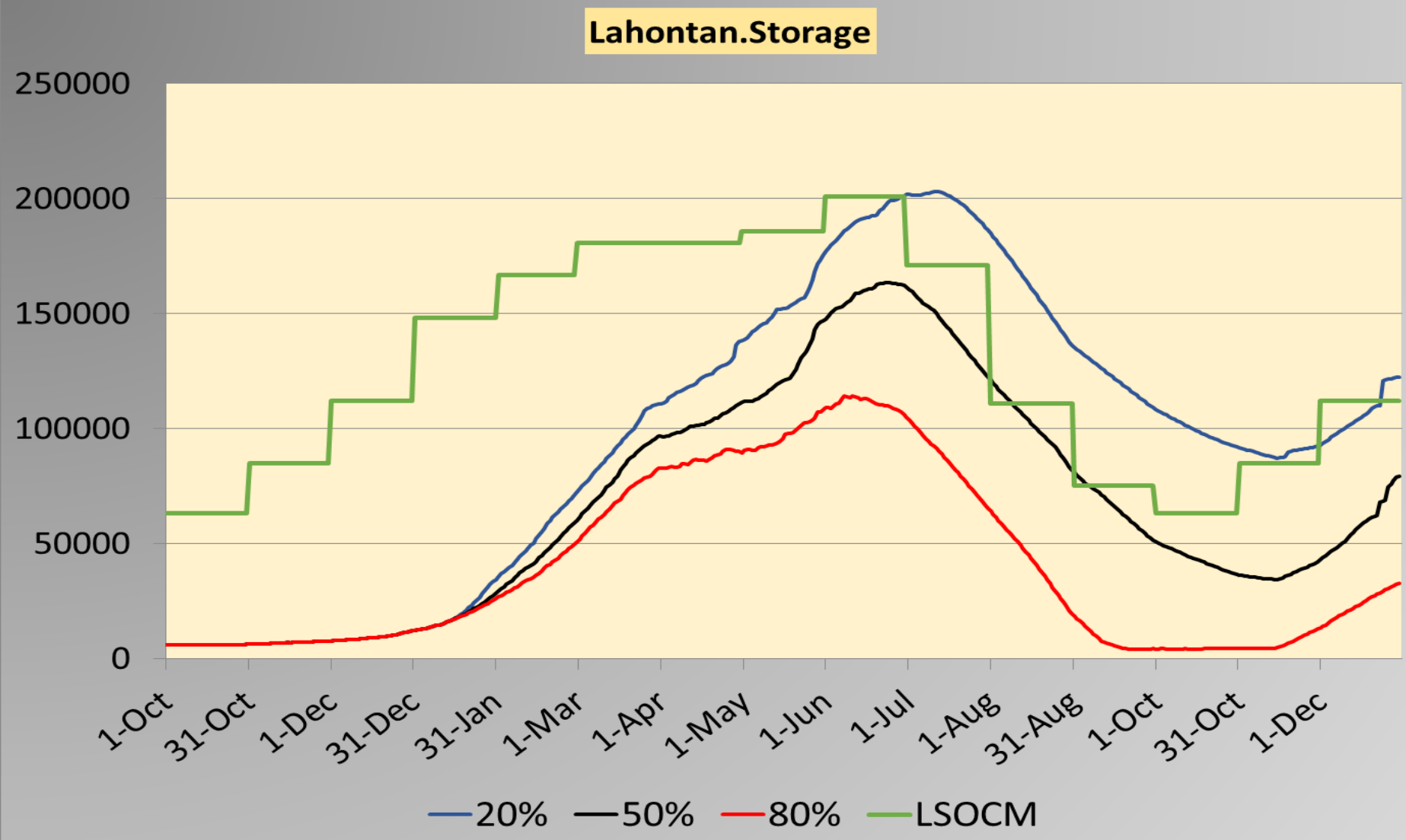

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End!

Comments? Questions?

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Truckee River Agreement-1935

The TRA is the basis for pre-TROA operation of Lake Tahoe, Boca Reservoir, and the Truckee River.

A slightly modified version of the original Floriston Rates Agreement was subsequently incorporated into the Truckee River Agreement. This included Reduced Floriston Rates.

Lake Tahoe Elevations	Oct.	Nov.-Feb.	March	Apr.-Sept.
Less than 6225.25 feet	400	300	300	500
6225.25 to 6226.00 feet	400	350	350	500
Over 6226.00 feet	400	400	500	500

Parties to the TRA include:

TCID, SPPC (TMWA), and WCWCD

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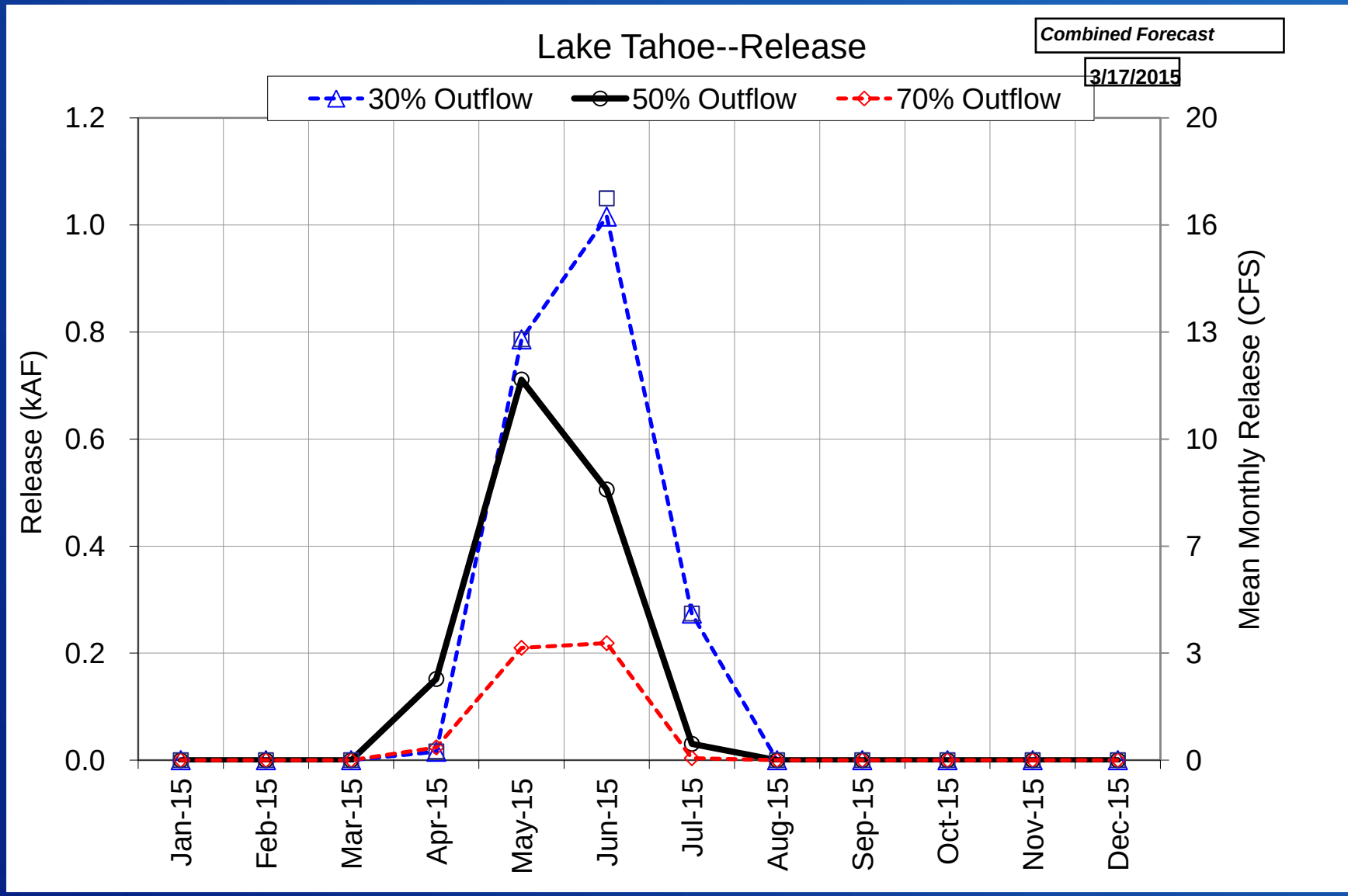
WY 2015 Projection – Lake Tahoe Release



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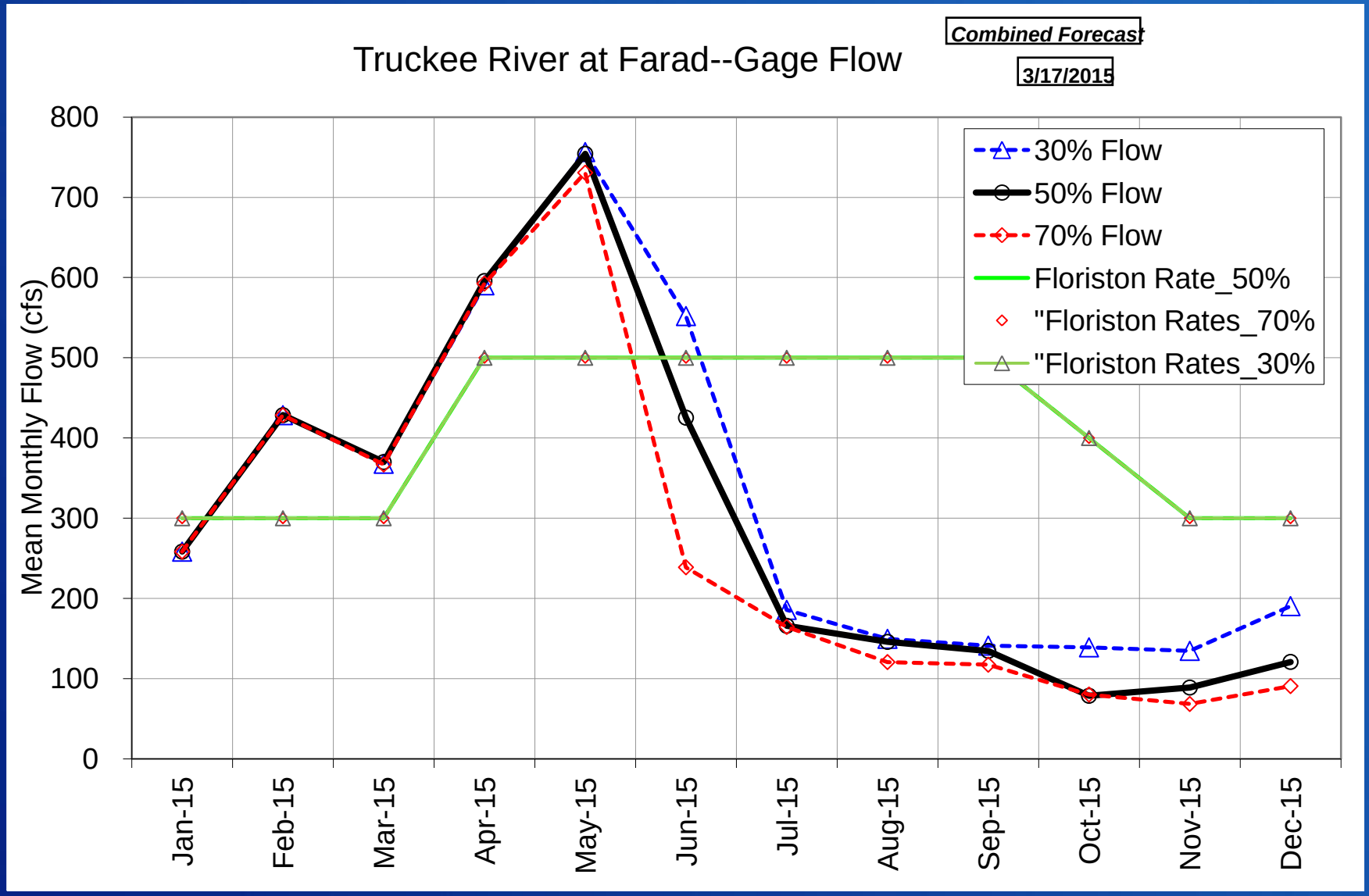
WY 2015 Projection – Farad Gage Flow



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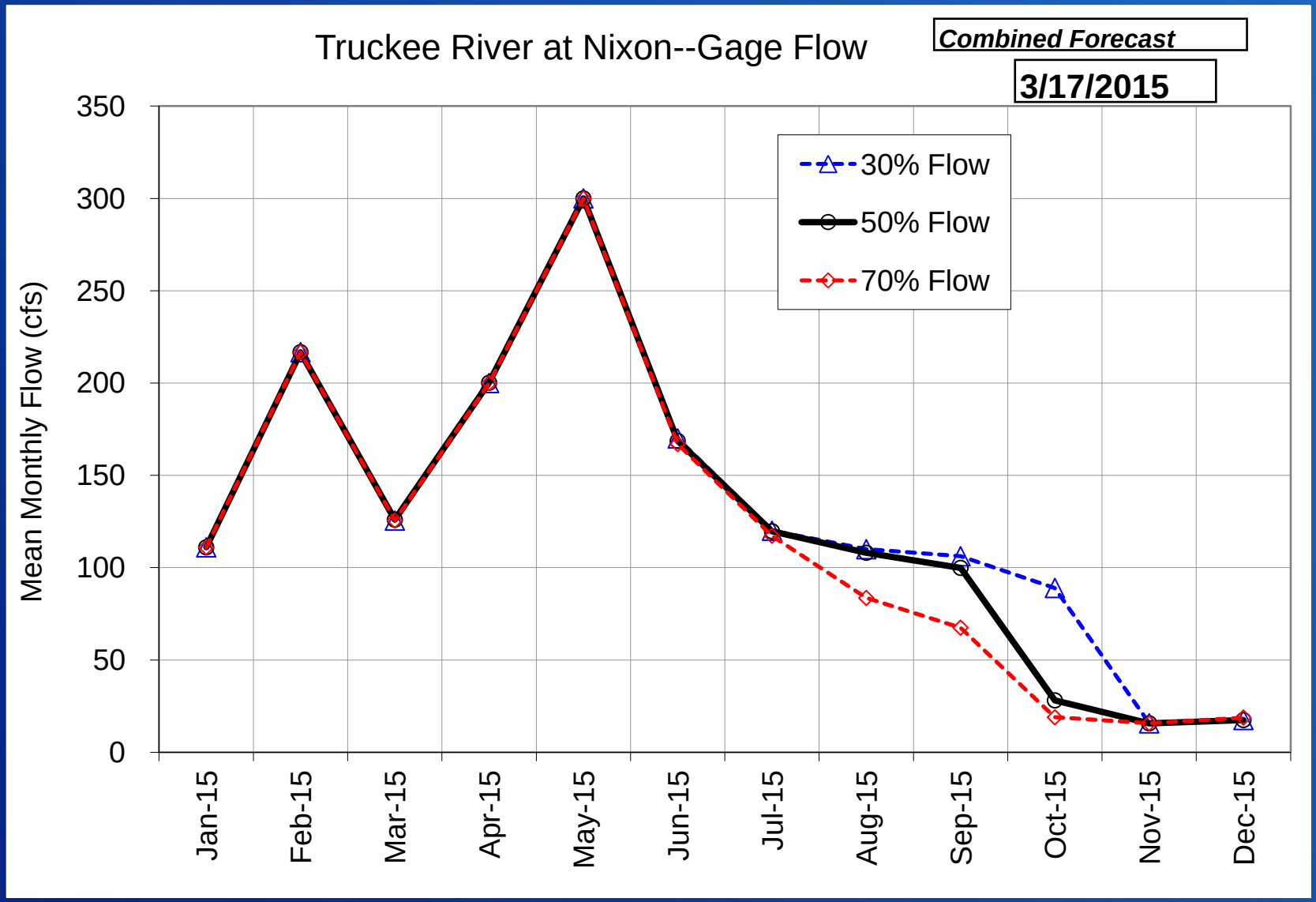
WY 2015 Projection – Nixon Gage Flow



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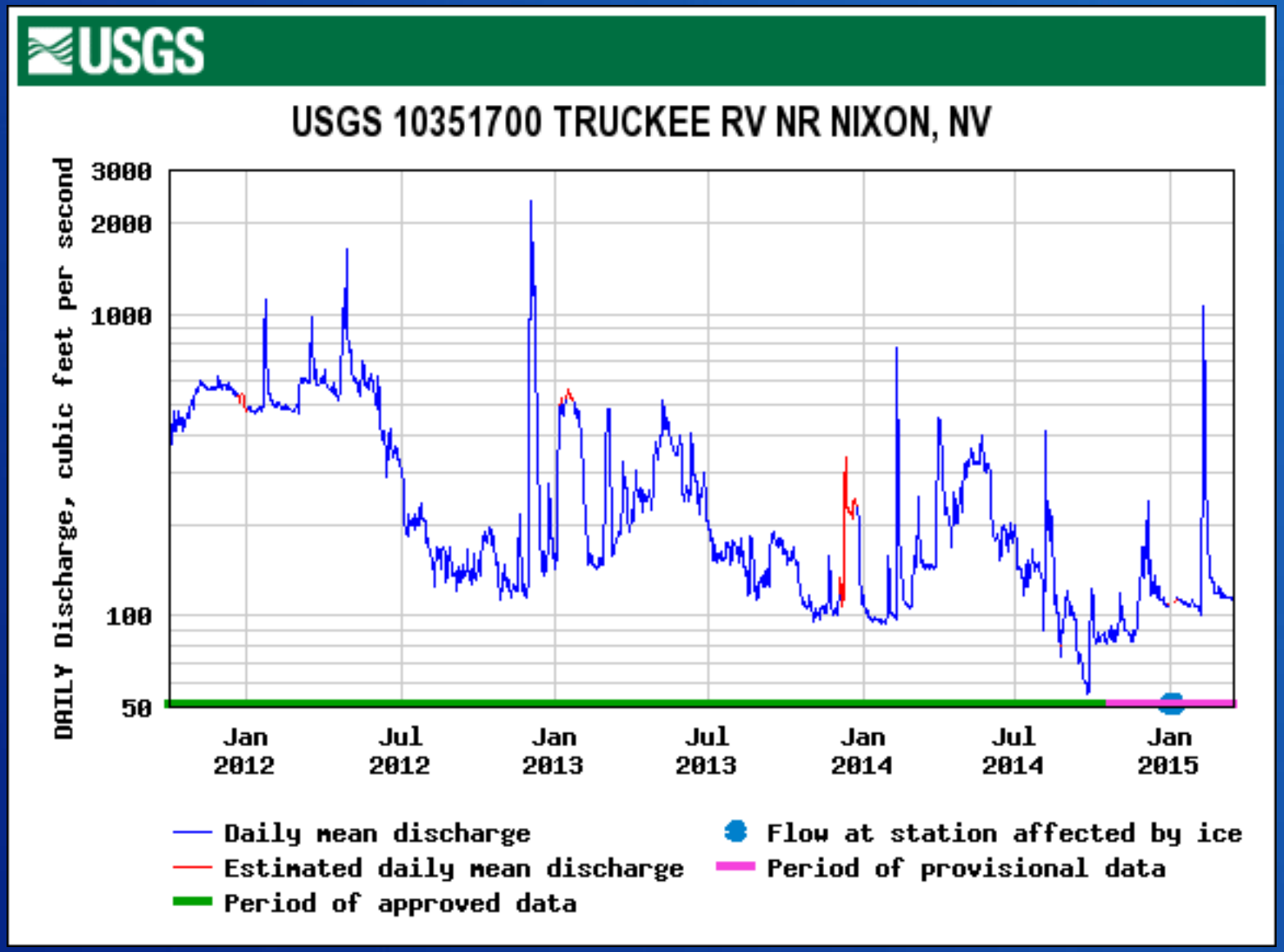
WY 2012-present Nixon Gage Flow



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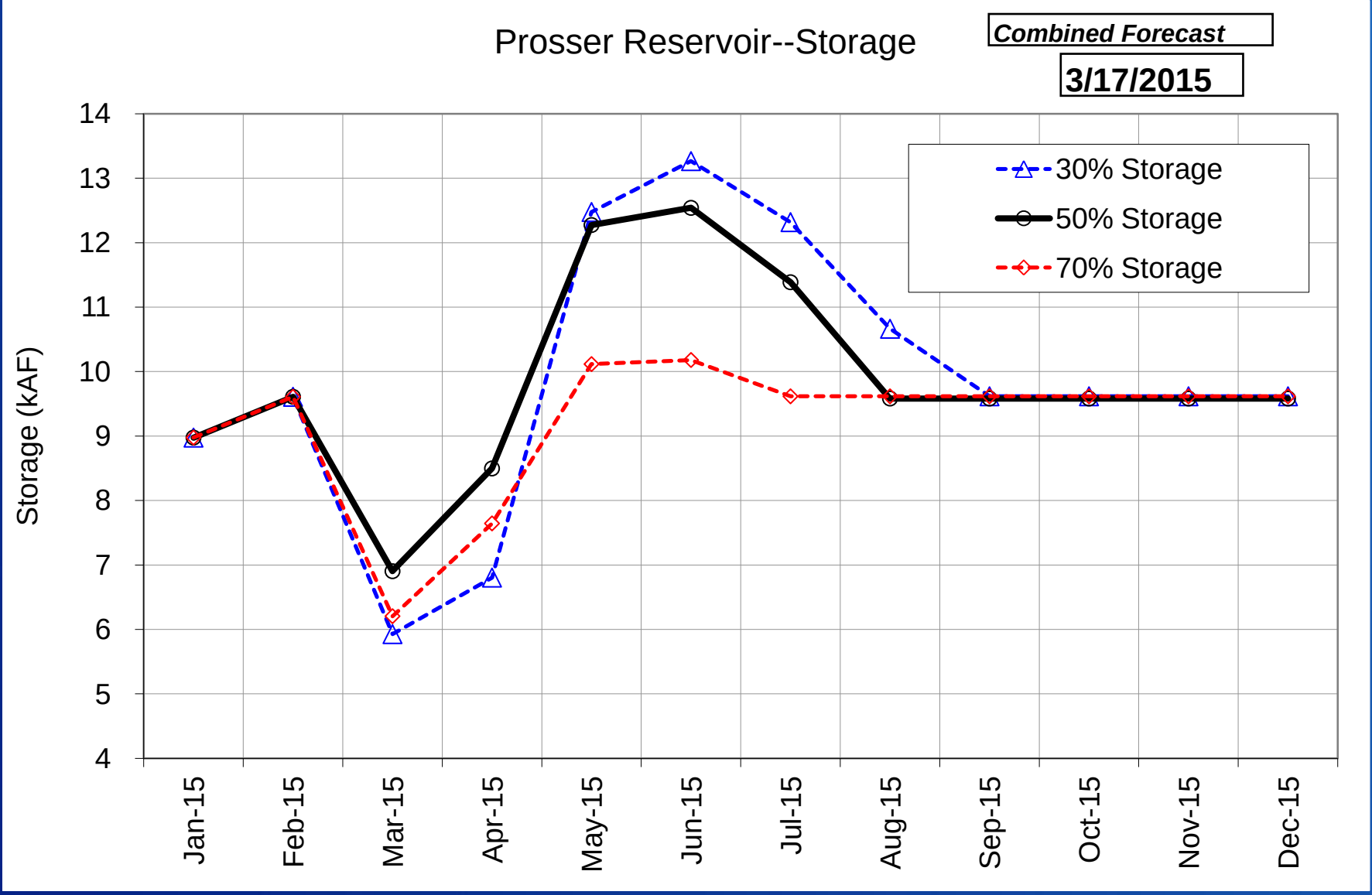
WY 2015 Project – Prosser Storage



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Truckee River Basin Reservoirs

Reservoir	Construction Date	Use	Storage Volume (AF)
Lake Tahoe	1874 / 1913	Floriston Rates	744,600
Independence	Pre 1900 / 1939	POSW	3,000 / 17,500
Donner	1928	POSW	9,500
Boca	1938	Rates / FC / CS	40,870
Prosser	1963	TPX / Fish / FC	29,840
Stampede	1969	Fish / FC / CS	226,500
Martis	1971	Flood Control	20,400

Lake Tahoe Facts

Maximum Elevation: 6229.10 feet

Elevation of Natural Rim: 6223.00 feet

Vertical Storage: 6.10 feet

Storage Capacity: 744,600 acre feet

Total Capacity: 122,160,000 acre feet

Historical Max. Elevation: 6231.26 feet (July 1907)

Historical Min. Elevation: 6220.26 feet (Nov. 1992)

Lake Tahoe Facts

Average Annual Precipitation (Tahoe City): 32.33 inches

Average Annual Evaporation: +/- 3.8 feet (460,000 AF)

"Normal Year" Release: +/- 9.5 inches (95,000 AF)

Tahoe's annual surface evaporation is enough water to meet the Reno-Sparks area surface water demands for over five years!

Surface Area: 85,000 acres in CA + 37,000 acres in NV = **122,000 acres**

RiverWare Development Process

- Began in 2000
  - Joint effort between Reclamation and TROA Implementation Office (Water Master's Office)
- 2009: Shift in Responsibility
  - TROA Implementation Office in lead role for Ops model
  - Reclamation support Ops model; lead planning modeling
- 2010: Planning Model Development, Water Quality Modeling