DRAFT
System Reoperation Study
Forecast-Based Operations Analysis

Technical Report

Prepared for

Department of Water Resources

by

1771 Tribute Road, Suite A
Sacramento, CA 95815
916/456-4400 (phone) • 916/456-0253 (fax)

Contents

List of Tables

List of Figures

Nomenclature

F-BO	forecast-based operation
gross pool	maximum top of conservation space
operation zone	reservoir storage is divided into operation zones, or pools, which are each governed by a specific set of prioritized rules
spill	outflow in excess of the typical operations release
top-con	top of conservation zone in reservoir
USACE	United States Army Corps of Engineers

1 Background

1.1 System Reoperation

The System Reoperation Study ("Reoperation Study") is investigating changes in operations and other strategies that may result in improved system performance in terms of additional water supply, flood hazard reduction, and ecosystem protection and restoration. It is recognized that existing reservoir operations are typically based on meeting all or some of these three objectives. As such, the Reoperation Study focuses on modifications to existing operations and expansion of these benefits. The Reoperation Study team has developed several reoperation components to evaluate at select river/reservoir systems to quantify benefits and improve understanding of the trade-offs involved.

MBK Engineers is providing technical, strategic, and coordination support for the Reoperation Study. An analysis of Forecast-Based Operation (F-BO) is part of that support. The following report summarizes this effort.

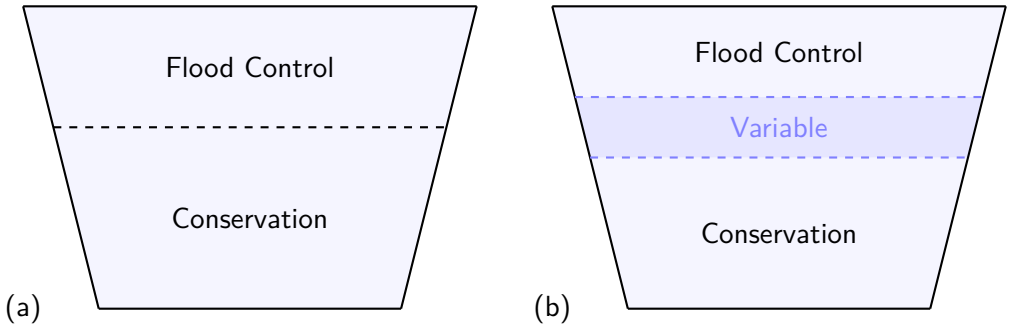
1.2 Forecast-Based Operation

F-BO can be applied to any reservoir with a traditional water supply and flood control space allocation paradigm. The incorporation of weather forecasts allows for greater flexibility in the management of the reservoir's space (flood control versus conservation) and inherently increases the opportunities for gaining additional water supply and flood control benefits through its implementation.

System reoperation is informed by historical flood patterns and utilizes records of inflow, outflow, and storage in the reservoirs to develop modified rules for flood releases. Changes to historical operations of the reservoirs is expected to reveal potential for additional water supply storage. With improvements to many of the reservoir facilities, such as increased release capacity, operations are no longer required to be as conservative as they once were. By reducing outflow and allowing an increase in water storage, significant improvements in water supply can be achieved. However, care must be taken so that sufficient water can still be evacuated in the event of a significant forecasted flood.

Figure 1.1 depicts the typical, rigid flood/conservation space division and flexible division under F-BO.

Figure 1.1. Depiction of reservoir space allocations under (a) typical operating paradigm and (b) forecast-based operation.



2 Purpose

The F-BO portion of the system reoperation study evaluated the potential in reoperating the system reservoirs for two primary purposes:

1. Enhancement of water supply through the relaxation of traditional reservoir flood control rules
2. Enhancement of the flood protection provided by each reservoir.

2.1 Water Supply Enhancement

Reoperation allows additional water to be stored in the reservoir temporarily. Reducing regions of "spill," or times when outflow exceeds the standard operations release, offers a potential for increased storage throughout the year. This may improve water supply after the reservoir fills in the spring. Using spill to define potential times for reoperation resulted in increased storage during periods where a historical spill was deemed unnecessary.

It is proposed that the portion of the analysis aimed to enhance water supply through the implementation of F-BO consist of the following components:

1. Review historical reservoir storage data and flood space requirements to determine when relaxed flood control space requirements could have potentially provided additional water supply during the subsequent season.
2. Develop parameters for F-BO flood space relaxation. Parameters will represent a reasonable level of assumed flood risk (e.g., flood space reduction will be of comparable volume to that which can be evacuated within several days when a significant flood event is forecast and the reserved flood space must increase).
3. Evaluate historical benefits possible with proposed F-BO flood space relaxation approach.
4. Integrate flood space reduction results (end-of-month flood control targets) with system-wide modeling to make use of anticipated water supply gained through F-BO.

2.2 Flood Control Enhancement

The flood management benefits of F-BO vary greatly by river system. The portion of the analysis aimed to enhance flood control through the implementation of F-BO is proposed to consist of the following components:

1. Review and compare historical reservoir storage and river flow data with flood rules and space requirements to determine when additional flood control storage or modification of flood rule parameters would have been beneficial to enhance flood control.
2. Identify factors at each reservoir potentially limiting F-BO effectiveness (e.g., limited outlet capacity or insufficient flood space).

3. Coordinate with National Weather Service/State California-Nevada River Forecast Center to assess level of confidence in using operational weather and reservoir inflow forecasts for decision-making at reservoirs.
4. Develop comparison of each reservoir's potential for use of F-BO to enhance flood control. The comparison will identify the reservoirs' potential in each of several areas (flood space, outlet capacity, channel capacity, etc.).

3 Watershed and Reservoir Characteristics

The following rivers and reservoirs were included in the forecast-based operations analysis performed for the system reoperation study:

- Sacramento River / Shasta Dam
- Feather River / Oroville Dam
- North Yuba River / New Bullards Bar Dam
- American River / Folsom Dam
- Merced River / New Exchequer Dam

Figure 3.1 shows the basin outlines and locations of the reoperation reservoirs within these watersheds. The watersheds experience seasonal flooding primarily influenced by winter rainfall events, with some augmentation due to snowmelt. Rainfall floods in these regions are characterized by smaller volumes but large peaks, while snowmelt-induced floods generally have small peaks spread over much longer durations.

Figure 3.1. Study Region

3.1 Sacramento River Watershed (Shasta Reservoir)

Shasta Dam and Reservoir (Shasta) are located on the Sacramento River below its confluence with the Pit River, about 10 miles north of Redding, CA. The mainstem originates in the Klamath Mountains and flows through Central California. The Sacramento River drains over 27,500 square miles and ends in the Delta. Shasta is a key unit of the Central Valley Project (CVP); irrigation diversions and power generation at Shasta are integrated into the CVP.

Though a number of small privately owned irrigation dams and several private hydroelectric power generation facilities exist on the Pit River and its tributaries, none of these contribute significantly to storage upstream of Shasta Reservoir.

Shasta is owned and operated by the United States Bureau of Reclamation (Reclamation). Flood control operation procedures are coordinated with input from United States Army Corps of Engineers (USACE). The California Department of Water Resources (DWR) coordinates irrigation diversions from Shasta and also provides hydrologic forecasting services. The California Department of Fish and Wildlife (CDFW) coordinates fishery releases with Reclamation. The National Weather Service (NWS) provides hydrologic forecast support.

3.2 Upper Feather River Watershed (Oroville Reservoir)

Oroville Dam and Reservoir (Oroville) were constructed as a unit of the Feather River Project (part of the State Water Project, or SWP) for the purposes of developing water supply, flood control, power generation, recreation and conservation on the Feather River, a tributary of the Sacramento River. The Upper Feather River Watershed drains 3,611 square miles of the eastern side of the Sacramento River Valley and northern end of the Sierra Nevada Range. Flood peaks on streams in the basin above Oroville are often delayed by numerous upstream checkdams, diversions and reservoirs. When high flows in the Feather coincide with large flows in downstream tributaries, channel capacity may be exceeded. Many of the storage reservoirs upstream of Oroville are maintained for power generation facilities managed by PG&E. The combined capacity of all upstream reservoirs is close to 2,000,000 acre-feet. Several of the upstream reservoirs may influence runoff volumes at Oroville during large floods, though most are negligible.

DWR operates Oroville with input from USACE for flood control procedures and CDFW for fishery releases. The operation of Oroville by DWR is closely coordinated with YCWA's operation of New Bullards Bar in order to meet safe objective downstream channel capacities during the flood season.

3.3 Yuba River Watershed (New Bullards Bar Reservoir)

New Bullards Bar Dam and Reservoir (New Bullards Bar) regulate over a third (36%) of the Yuba River Watershed, a drainage area of about 1,350 square miles which lies entirely on the western slope of the Sierra Nevada. There are no reservoirs upstream of New Bullards Bar on the Yuba, but nearly 20 reservoirs with over 1,000 acre-feet of storage exist in the Yuba Watershed. These reservoirs contain no flood control space but may significantly reduce volumes of rainfall runoff to New Bullards Bar early in the season.

The operation of New Bullards Bar by the Yuba County Water Agency (YCWA) is closely coordinated with DWR's operation of Oroville in order to meet safe objective channel capacities downstream of

the two reservoirs during flood season. DWR provides assistance with hydrologic forecasting. Flood control operations are coordinated with USACE, which also provides hydrologic forecasting. Fishery releases are coordinated with CDFW.

3.4 American River Watershed (Folsom Reservoir)

Folsom Dam and Reservoir (Folsom) regulate the majority of the water passing through the American River Watershed. This watershed originates in the Sierra Nevada range and drains toward the delta in California's Central Valley. The Upper American River Watershed houses several reservoirs that were developed primarily for hydropower production but also provide some flood protection and water supply. Hell-Hole, French Meadows, and Union Valley Reservoirs can be used to transfer flood protection credit to Folsom Reservoir, thus reducing Folsom's flood space requirement.

The operation of Folsom is managed by Reclamation, with flood control operations input provided by USACE and the Sacramento Area Flood Control Agency (SAFCA). The United States Fish and Wildlife Service (USFWS) and CDFW coordinate fishery releases for Folsom with Reclamation. Hydrologic forecasting is provided by NWS and DWR, (USACE-SPK, 1987).

3.5 Merced River Watershed (New Exchequer Reservoir)

New Exchequer Dam and its reservoir, Lake McClure, are operated by the Merced Irrigation District (MID). The facilities are located 60 miles upstream of Merced River's confluence with the San Joaquin River and regulate the 1,276-square mile Merced River Watershed on the western slopes of the Sierra Nevada. MBK has prepared a separate report (MBK, 2013) which details forecast-based system reoperation analysis for New Exchequer and its associated facilities.

4 Reservoir Operation Zones

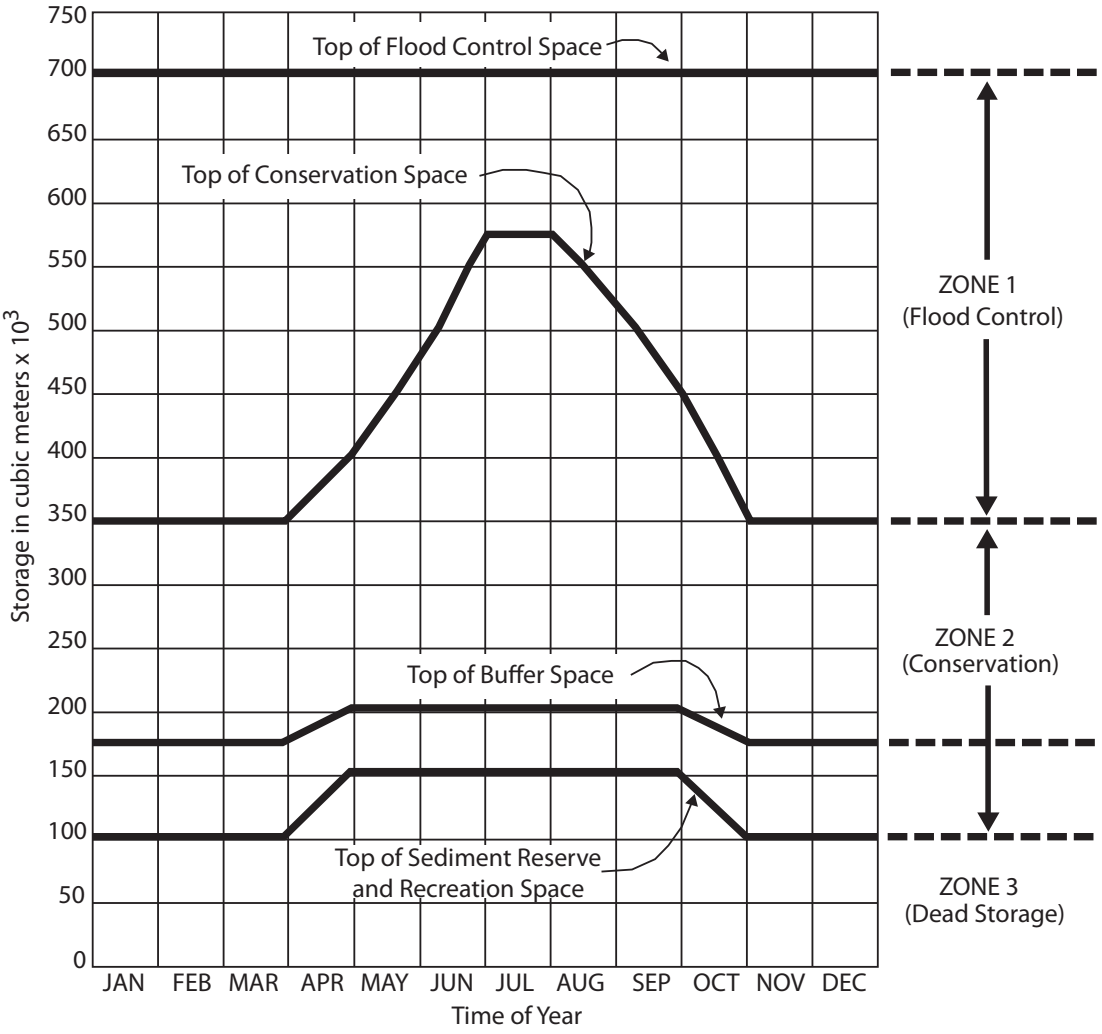
Storage space in each reservoir is divided into specific operation zones, which are defined in the reservoir water control manuals, e.g., USACE-SPK, 1987. The zones are defined by water level in the reservoir. Each zone has a specific set of prioritized rules that govern its storage and operations. For some of the facilities, different government entities are responsible for operation of the dam for different zones. Operation zones are identified and defined in Table 4.1.

Table 4.1. Reservoir Operation Zones

Zone	Description
Inactive "Dead" Zone	The first zone is referred to as the inactive zone, or dead storage. This region lies below the outlet gates, so it is effectively dead water that cannot be released.
Conservation Zone	Above the inactive zone lies the conservation zone, which is important for storing water supply. The top of the conservation zone is called top-con. Maximum top-con,which occurs after the reservoir fills in the spring, is referred to as gross pool.
Flood Control Zone	The flood control zone, which sits above top-con, is the space reserved for accommodating flood waters. Ideally, all flood waters will be stored in this zone during high flood risk seasons. Encroachment of storage into the flood control zone may be used during forecast low flood-risk periods in order to provide additional water supply. The USACE designates operation practices for the flood control zone for the study reservoirs.
Surcharge Zone	The surcharge zone is the region between the top of the flood control zone and the top of dam. Surcharge is the term given to water stored temporarily above the reservoir capacity. Jurisdiction over the surcharge zone is maintained by the primary operating agency for each reservoir. Surcharge is operated with the main priority of maintaining dam safety.

Figure 4.1 provides graphical representation of how operation zones may vary throughout the year. Note that the top of conservation (top-con) reaches a maximum elevation (gross pool) in the drier months of summer, when the least amount of reserved flood space is necessary (lowest threat of flooding).

Figure 4.1. Typical Reservoir Operation Diagram (USACE, 1997)



5 Evaluation of Forecast Reliability

Reservoir operators already use reservoir inflow and downstream flow forecasts to make operational decisions. In order for the use of forecasts to be formalized in reservoir operational rules, such forecasts must be reasonably accurate and reliable. The California-Nevada River Forecast Center (CNRFC) is the agency responsible for producing these forecasts. Forecasts are produced at least once and up to four times daily. Historical forecasts and the corresponding observations from 2005 to the present were made available by the CNRFC for the five reservoirs analyzed in this study.

In Figure 5.1 through Figure 5.4, observed five-day accumulated inflow volumes in thousand acre-feet (TAF) were plotted against the corresponding forecasted volumes. A line with a one-to-one slope was overlaid on each of the plots to indicate where perfect forecasts would plot. The tight clustering of the data points around this ideal trend line indicates that there exists an acceptable level of forecast accuracy for using forecasts to make real-time operational decisions, as long as the forecast-based action only risks a portion of the forecast volume and can be corrected if the forecast trends significantly change.

Figure 5.1. Forecast Accuracy for Folsom (12/02/2005 to 04/01/2013)

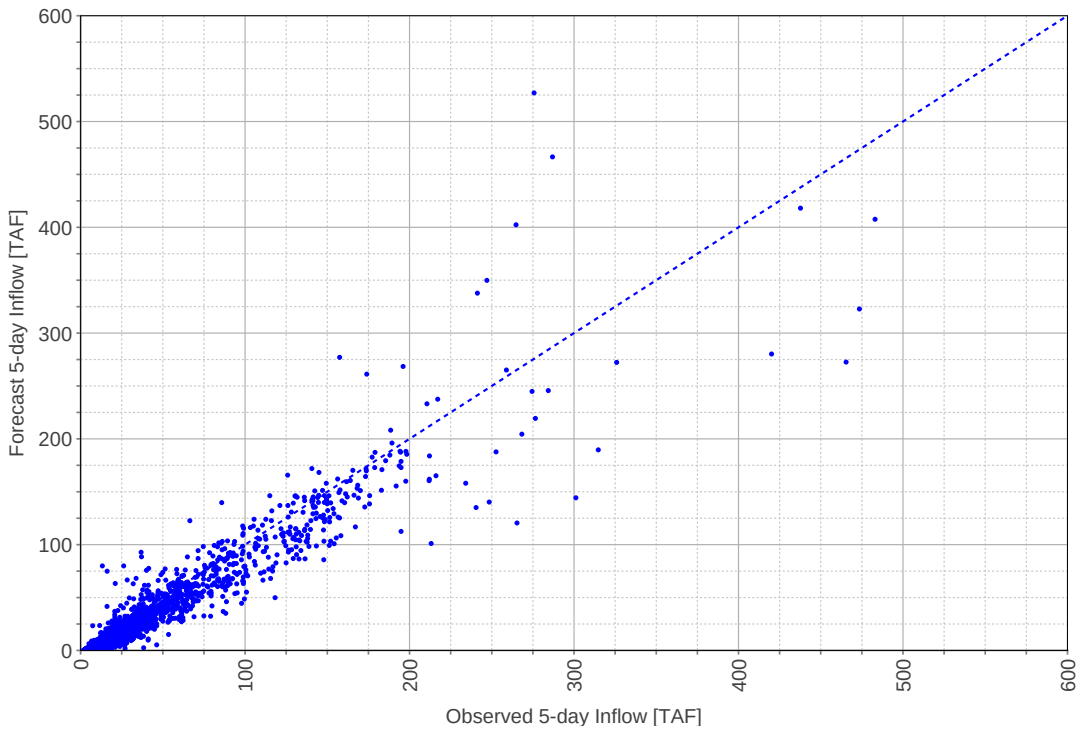


Figure 5.2. Forecast Accuracy for New Bullards Bar (12/02/2005 to 04/01/2013)

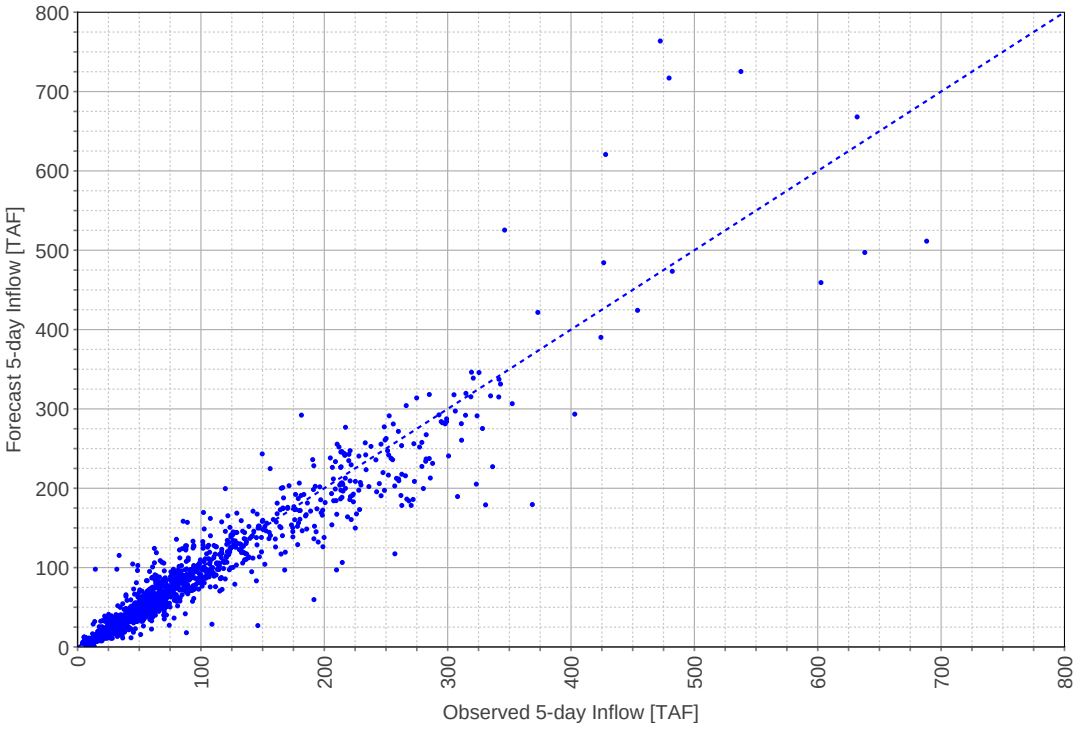


Figure 5.3. Forecast Accuracy for Oroville (12/02/2005 to 04/01/2013)

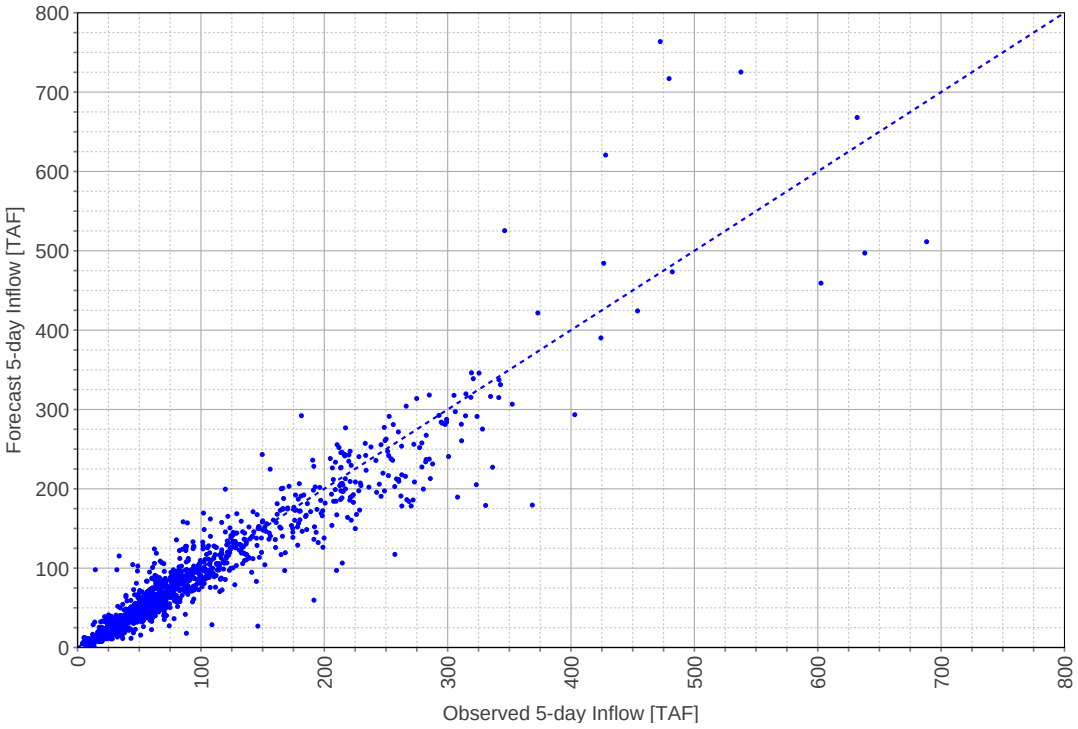
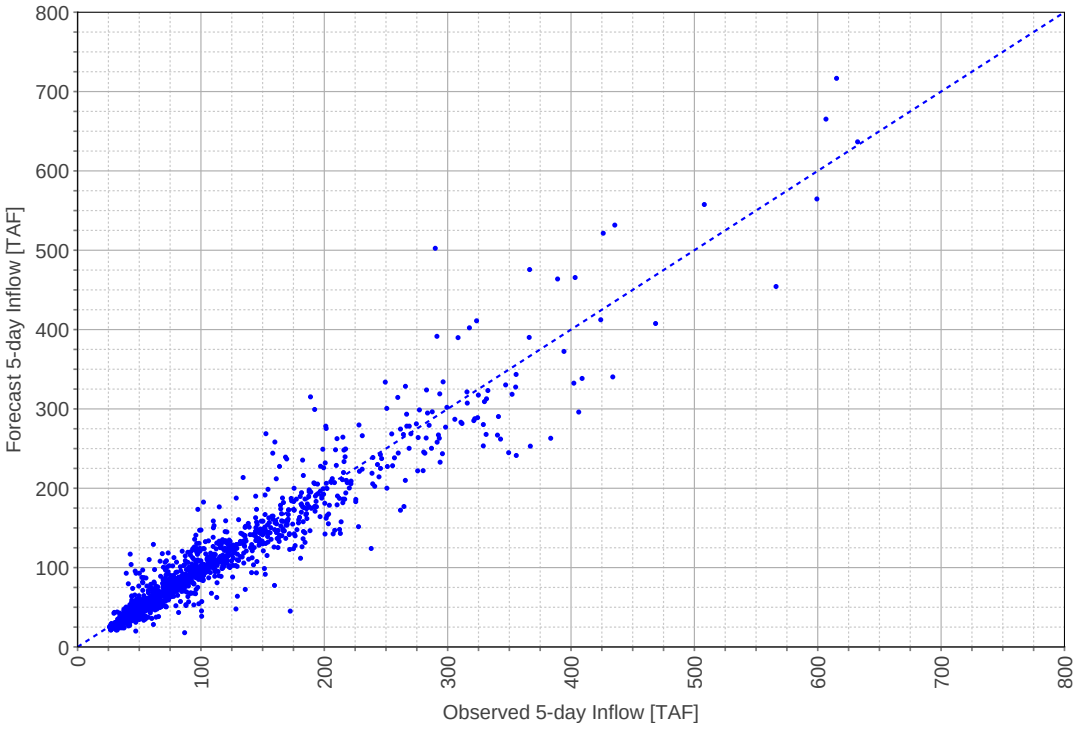


Figure 5.4. Forecast Accuracy for Shasta (12/02/2005 to 04/01/2013)



6 Water Supply Enhancement

F-BO can be used to enhance water supply at each reservoir. This is achieved by storing water above traditional flood control limits during times when significant inflow volume to the reservoir is not predicted. A means to draw the reservoir back down to the traditional flood control limit is provided as part of the reoperation procedure for times when significant inflow volume is forecast.

The following chapter details the reservoir model development and the methods for quantifying increased water supply with F-BO.

6.1 Methodology

The model used for this analysis was developed by MBK Engineers based on historical reservoir inflow and outflow records. The following sections describe the constraints and assumptions used for developing the criteria applied to obtain reoperated reservoir outflow and storage values.

6.2 Analysis Assumptions

This section provides background on some of the key modeling and hydrologic assumptions used for this analysis.

1. **Daily Reoperation**

   Forecast-based system reoperation for the four reservoirs was analyzed in a daily operations model. Operational decisions based on forecast inflow are made on a daily basis, so a daily model is most appropriate for this simulation. This timestep provided a suitable level of detail for the required analysis.

2. **Perfect Forecasting**

   Perfect foresight of historical inflow values was used to perform forecasting for the daily reservoir operation simulations. As discussed in Chapter 5, the strong correlation between observed and forecast data justifies extending the reoperation methodology to real-time operations.

   In a real-time operational environment, operators will not have the luxury of perfect forecasts. The use of perfect forecasts for this analysis only pertains to the drawdown trigger. The fact that the forecasts are perfect is not considered a critical factor in this analysis. That is, the proposed procedure for water supply enhancement should work equally well with uncertain forecasts in the real-time operational environment, provided the trigger levels are adjusted to account for forecast uncertainty.

3. **Reservoir Fill Constraints**

   For the purpose of this study, gross pool storage was used as the maximum reservoir storage constraint. Historically, reservoir refill was occasionally allowed to encroach above the level of

gross pool storage. Outflow was required to exceed the rate necessary to maintain storage below gross pool levels. For several of the reservoirs, the top-con curve has been revised over time. Thus, gross pool was noted each water year to set this constraint.

4. **Spill Threshold Values**

   A typical operation level for each reservoir was selected to provide a baseline outflow value for the reoperation routine. When the flood pool is encroached, typical reservoir operations procedures dictate that outflow should increase so as to draw down storage to the acceptable level (top-con). This may involve increasing release to above typical operation levels, termed "spill" for this study. Reoperation was targeted to times when outflow exceeded the spill threshold value.

5. **Flood Space Evacuation Targets**

   Although the goal of the reoperation was to increase water supply storage in the reservoirs, flood management goals must also be met. As such, a flood space evacuation routine was written into the reoperation so that temporary storage could subsequently be evacuated if a large enough inflow was forecast. This process involved selection of accumulated inflow targets. If forecast inflow over a selected time window exceeded the target for a particular reservoir, the reoperated outflow immediately switched to releasing this accumulated inflow volume divided evenly over the window, which ensured that the storage curve would draw back down to top-con. For this study, the evacuation targets were compared to the five-day accumulated inflow volumes at each timestep.

6. **Flood Pool Encroachment Constraints**

   Historically, many of the reservoirs have been allowed to encroach into the flood pool. There are various reasons for this. In order to be consistent with historical practices, some allowance for this was made in the simulation. Flood pool encroachment was limited to the maximum of either one quarter of the available flood space or the historical storage level. This essentially resulted in a modified top-con curve, which was plotted along with the reoperation results in Appendix A. Outflow was required to exceed the rate necessary to maintain storage levels below the encroachment limit.

7. **Physical Constraints of Reservoir Facilities**

   Physical constraints of the reservoir outlets also constrain the releases. Maximum reservoir outflow capacity and Rate of Increase (ROI) limitations were important for setting maximum limits on outflow, while Rate of Decrease (ROD) set the minimum outflow limit.

Table 6.1 summarizes a number of parameters that were used in the calculation of outflow and storage values for the reoperation procedure.

Table 6.1. Parameters for Reoperation Procedure

	Folsom	New Bullards Bar	Oroville	Shasta
Model Parameter				
Spill Threshold [cfs]	5,000	8,000	10,000	10,000
5-day Inflow Evacuation Trigger [acre-feet]	400,000	280,000	700,000	650,000
Analysis Period	1956-2010	1971-2010	1969-2010	1954-2010
Outflow Constraint				
Reservoir Fill Limit, Gross Pool [AF]	1,010,000 [a] 974,500 [b] 977,000 [c]	966,000	3,538,000	4,493,000 [d] 4,552,100 [e]
Flood Pool Encroachment Limit [%]	25	25	25	25
Rate of Increase Limit [cfs/hr]	7,500	5,000	5,000	7,500
Rate of Decrease Limit [cfs/hr]	5,000	5,000	2,500	2,000
Reservoir Release Capacity [cfs]	115,000	50,000	150,000	79,000

Notes: a.1956-1992; b.1993; c.1994-2010; d.1954-1970; e.1971-2010

Each reservoir storage constraint was converted to a maximum or minimum release value for comparison against a base outflow quantity. The base outflow quantity for the reservoir reoperation model consisted of either the historical release, a typical operation level (threshold release), or an evacuation draw-down release, as described in Section 6.3.3.

6.3 Reservoir Operations Model

This section briefly outlines the reservoir operations model developed for the reservoir reoperation protocols.

6.3.1 Historical Reservoir Data

The inputs for the reoperation routine consisted of DSS records of daily historical inflow, outflow and storage values obtained from USACE. These series were then read into the reoperation routine where potential water supply enhancement and flood space evacuation zones were identified using comparisons of the inflow and outflow data to specific threshold values detailed in Section 6.2. Within the reoperation routine, a number of constraints based on reservoir storage levels and physical release limitations were applied to the base outflow value to obtain a new reoperation outflow value. Reoperated storage levels were then calculated from the historical inflow and storage data and the simulated reoperation outflow.

6.3.2 Water Supply Enhancement Zones

For the purpose of this analysis, outflow releases in excess of the typical threshold operation levels were considered "spill," as described in Section 6.2. This spill was used as a metric to determine

the appropriate times to apply a reoperation procedure in order to enhance water supply in the reservoir. Zones of continuous spill, or water supply enhancement zones, were tabulated in order to define where reoperation would activate. If a timestep fell within a spill zone and did not meet the criteria for flood space evacuation, the reoperation proceeded. Otherwise, the outflow was held to the historical release, with certain constraints applied. In the resulting reoperation plots, the water supply enhancement zones are highlighted in purple (Appendix A).

6.3.3 Flood Space Evacuation Zones

In certain cases, holding reservoir outflow at a constant threshold value caused storage in the reservoir to surpass acceptable limits. As such, a flood space evacuation trigger was included in the procedure in order to prevent excessive encroachment. During the simulation, a forecast window was selected so that current storage levels could be compared with future top-con storage. If the accumulated inflow volume over the duration of the forecast window exceeded the reservoir evacuation target, then the window was added to a flood space evacuation zone. Deactivation of water supply enhancement protocols also occurred when reoperated storage exceeded top-con.

When evacuation was triggered, outflow was shifted to a conversion of the accumulated evacuation volume spread out as a constant release for the duration of the evacuation period. The release volume was calculated as the accumulated inflow over the evacuation zone plus the difference between the reoperated storage value and the level of top-con at the end of the evacuation window. This ensured release of the volume necessary to draw the reoperated storage curve back down to top-con. If reoperation had never previously occurred in the water year, outflow in the evacuation region was held at the historical level, constrained by additional limitations described below. Flood space evacuation zones in the resulting storage and flow plots are highlighted in orange (Appendix A).

6.3.4 Other Simulation Regions

If a particular timestep did not fall into either a water supply enhancement or flood space evacuation region, the flow was held to historical outflow, with the inclusion of the outflow constraints described in Table 6.1.

6.3.5 Reoperated Outflow

Designating the water supply enhancement and flood space evacuation zones allowed the appropriate base outflow value to be selected for each timestep in the model. The following table summarizes the conditions for determining the base outflows.

Table 6.2. Summary of Base Outflow Conditions

Water Supply Enhancement Zone?	Previous "Spill" in Water Year?	Flood Space Evacuation Zone?	Storage Above Top-Con?	Base Outflow
N	N	N	Y/N	max of flood pool encroachment constraint & historical release
Y/N	N	Y	Y/N	max of flood pool encroachment constraint & historical release
N	Y	Y	N	max of flood pool encroachment constraint & historical release
N	Y	N	Y/N	max of flood pool encroachment constraint & historical release
Y	Y/N	N	Y/N	max of flood pool encroachment constraint & threshold release
Y/N	Y	Y	Y	evacuation release

After determination of the base outflow, the constraints detailed in Table 6.1 were applied. The resulting reoperation outflow release value was calculated by the following formula:

$$\begin{aligned} \textit{reoperated outflow} = \textit{max(reservoir fill limit,} \\ \textit{min(ROI, reservoir release capacity,} \\ \textit{max(ROD, base outflow)))} \end{aligned}$$

Reoperated storage was then calculated using the sum of the previous storage value, the historical daily change in storage and the difference in reoperated outflow from historical outflow over one day, converted to acre-feet.

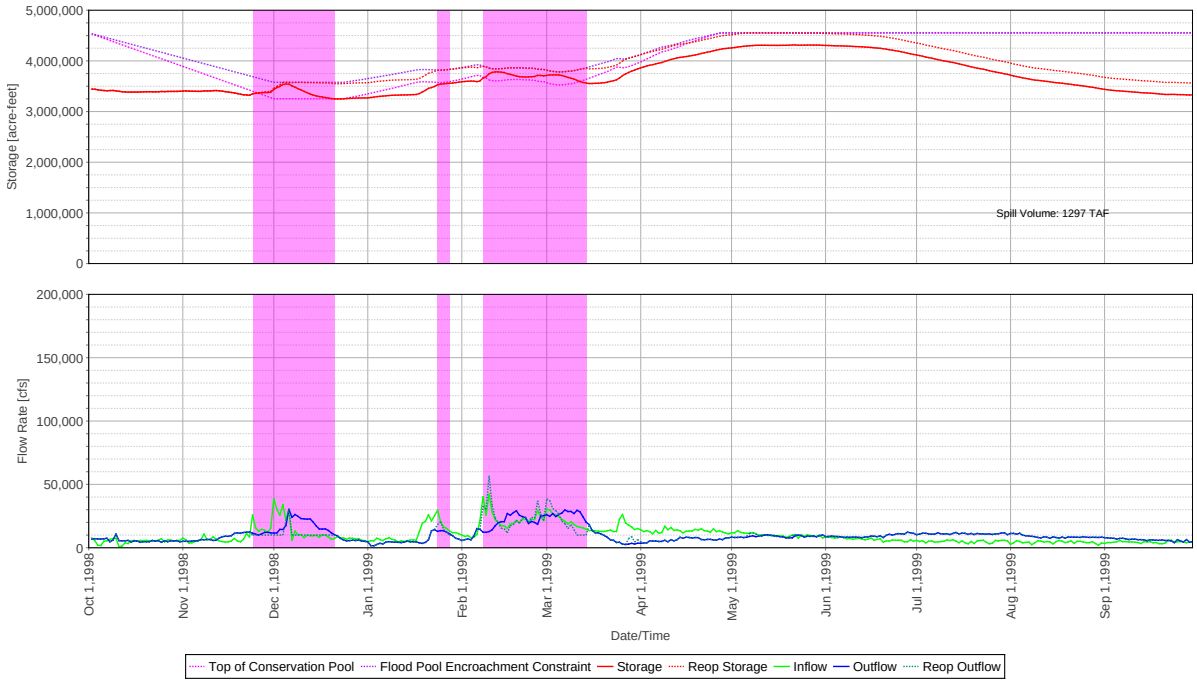
6.4 Results

For each water year, a plot detailing the daily storage and flow values was produced. An example plot for each reservoir is presented in the following section. Plots for the full period of record are included in Appendix A.

6.4.1 Reoperation Outflow and Storage

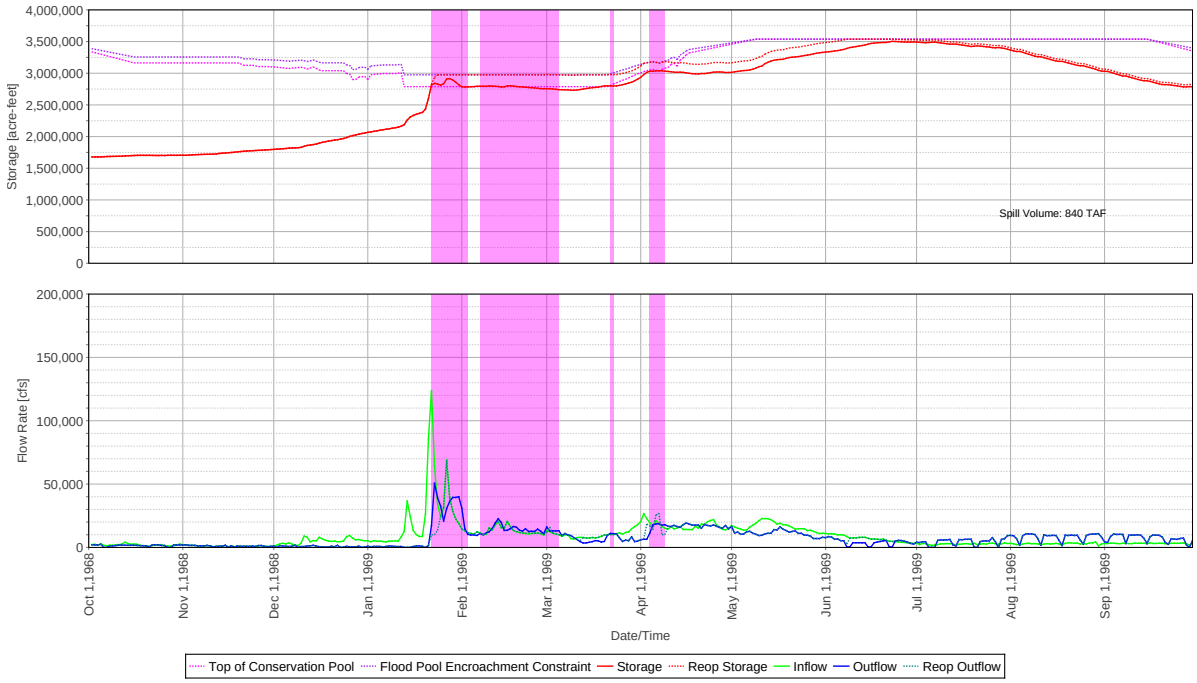
Figure 6.1 demonstrates how reoperation of Shasta Reservoir can enhance the water supply. The highlighted purple regions mark where historical outflow exceeds the threshold spill level. In December, the divergence of the historical and reoperated outflow resulted in a storage difference at Shasta that was maintained throughout the rest of the water year. Cutting the outflow to the threshold value allowed storage to encroach further into the flood control zone, though not higher than one-quarter of the available flood space, as per the constraints detailed in Section 6.2.

Figure 6.1. Example Reservoir Operations Plot for Shasta (1999)



In Figure 6.2, Oroville's reoperated outflow is rarely reduced to the threshold value due to the flood space encroachment constraint which is graphically depicted as the modified top-con curve. As such, once the reoperated storage curve meets the modified top-con, reoperated outflow is held at inflow, so that the storage volume can be maintained.

Figure 6.2. Example Reservoir Operations Plot for Oroville (1969)



Additional storage in New Bullards Bar Reservoir due to reoperation is modest, as seen in Figure 6.3. The reoperation potential is limited, as outflow releases from New Bullards Bar are generally small and do not exceed the selected threshold spill value. By allowing slight encroachment into the flood pool, reoperated storage reaches a higher value than the historical pattern. The highlighted orange zone in this plot designates a potential evacuation zone. However, since reoperation has not occurred prior to this point, outflow is maintained at the historical levels.

Figure 6.3. Example Reservoir Operations Plot for New Bullards Bar (1980)

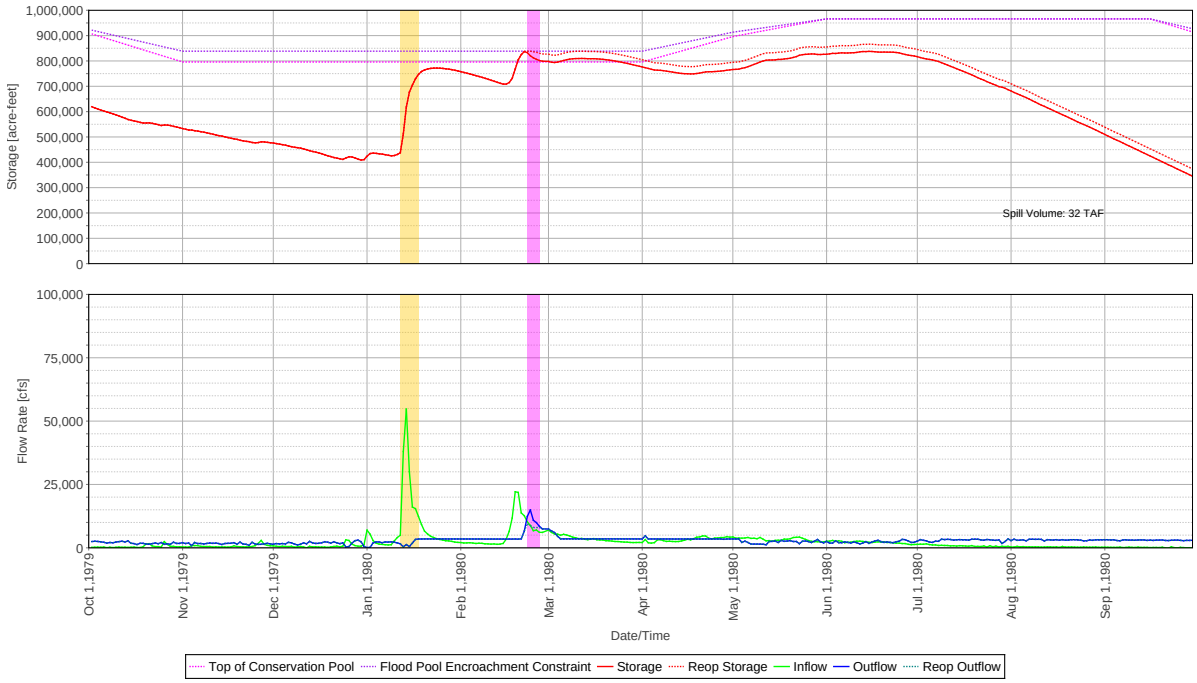
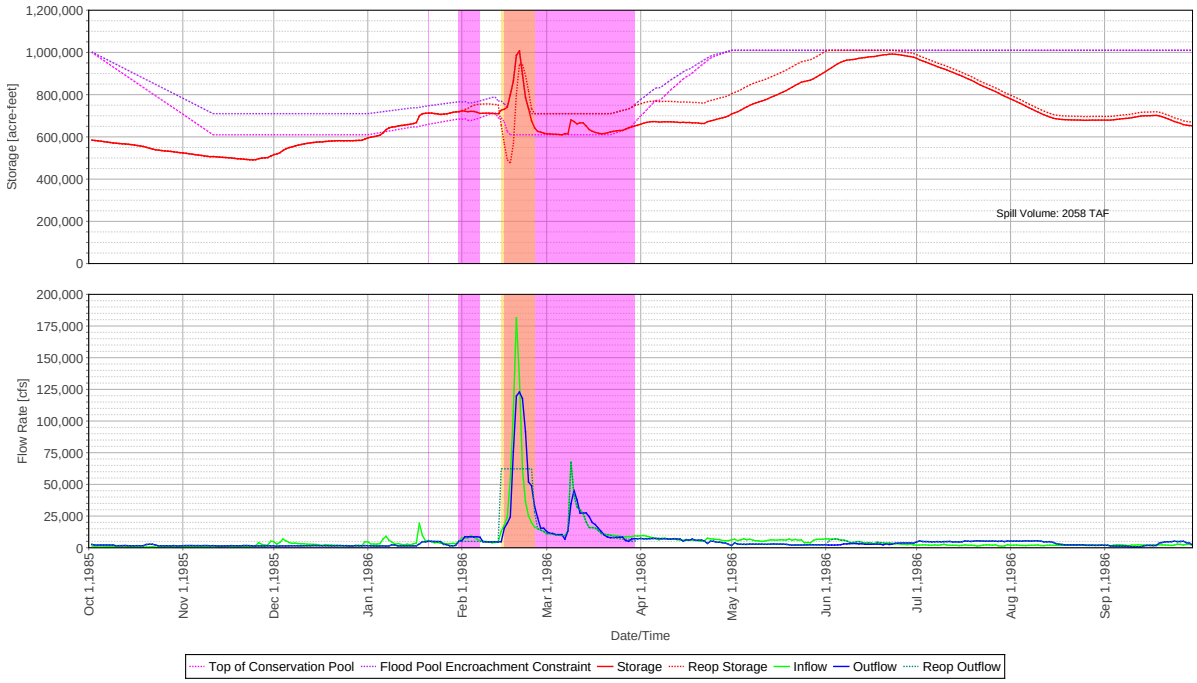


Figure 6.4 demonstrates how reoperation of Folsom Reservoir can result in increased water supply storage. As in the previous plots, the highlighted purple regions mark water supply enhancement zones, while the orange zone indicates evacuation of the flood space has been triggered. Note the flat outflow plateau in the orange zone, which causes storage to draw back down to top-con by the end of the evacuation window. Additionally, the reoperated storage curve reached gross pool nearly a month before the historical pattern. This fulfills the goal of additional water supply storage.

Figure 6.4. Example Reservoir Operations Plot for Folsom (1986)



6.4.2 Refill Potential

Table 6.3 shows the differences between historical and reoperated reservoir fill frequencies. The increased frequency of fill in the reoperation scenarios is a potential measure of their success.

Table 6.3. Summary of Reoperation Results

Water Year	Storage Increased by Reoperation?				Spring Refill?				Sacramento Valley Water Supply	
	SHA	ORO	NBB	FOL	SHA	ORO	NBB	FOL	Index[MAF]	Year-Type
1954					■				8.51	AN
1955									6.14	D
1956					■			■	11.38	W
1957					■			■	7.83	AN
1958					■			■	12.16	W
1959	▲								6.75	BN
1960								■	6.20	D
1961	▲								5.68	D
1962				▲				○	6.65	BN

▲ Maximum reservoir storage increased by reoperation.

○ Spring refill occurs only with reoperation.

■ Spring refill occurs historically.

Shasta(SHA) Oroville(ORO) New Bullards Bar(NBB) Folsom(FOL)

Water Year	Storage Increased by Reoperation?				Spring Refill?				Sacramento Valley Water Supply	
	SHA	ORO	NBB	FOL	SHA	ORO	NBB	FOL	Index[MAF]	Year-Type
1963					■			■	9.63	W
1964	▲							■	6.41	D
1965					■			■	10.15	W
1966					■				7.16	BN
1967					■			■	10.20	W
1968	▲			▲					7.24	BN
1969				▲	■	■		○	11.05	W
1970	▲	▲		▲				○	10.40	W
1971					■	■	■	■	10.37	W
1972	▲							■	7.29	BN
1973	▲				○	■		■	8.58	AN
1974					■	■	■	■	12.99	W
1975				▲	■	■	■	○	9.35	W
1976									5.29	C
1977									3.11	C
1978		▲		▲	■	○		○	8.65	AN
1979						■		■	6.67	BN
1980	▲	▲	▲	▲		○			9.04	AN
1981	▲								6.21	D
1982					■	■	■	■	12.76	W
1983					■	■	■	■	15.29	W
1984	▲	▲				○	■	■	10.00	W
1985	▲			▲					6.47	D
1986		▲					■	■	9.96	W
1987									5.86	D
1988									4.65	C
1989				▲			■		6.13	D
1990									4.81	C
1991									4.21	C
1992									4.06	C
1993					■	■	■	■	8.54	AN
1994									5.02	C
1995	▲					■	■	■	12.89	W
1996					■	■	■	■	10.26	W
1997		▲	▲	▲					10.82	W

▲ Maximum reservoir storage increased by reoperation.

○ Spring refill occurs only with reoperation.

■ Spring refill occurs historically.

Shasta(SHA) Oroville(ORO) New Bullards Bar(NBB) Folsom(FOL)

Water Year	Storage Increased by Reoperation?				Spring Refill?				Sacramento Valley Water Supply	
	SHA	ORO	NBB	FOL	SHA	ORO	NBB	FOL	Index[MAF]	Year-Type
1998					■	■	■	■	13.31	W
1999	▲	▲	▲		○	○		■	9.80	W
2000	▲	▲		▲					8.94	AN
2001									5.76	D
2002									6.35	D
2003					■	■	■	■	8.21	AN
2004	▲	▲		▲					7.51	BN
2005			▲		■	■	○	■	8.49	AN
2006			▲		■	■		■	13.2	W
2007		▲							6.19	D
2008									5.16	C
2009									5.78	D
2010					■		■	■	7.08	BN
Total	15	10	5	12	24[a] 22[b]	19[a] 15[b]	15[a] 14[b]	31[a] 26[b]		

[a] Total years with spring refill under reoperated and historical conditions.

[b] Total years with spring refill under historical conditions.

▲ Maximum reservoir storage increased by reoperation.

○ Spring refill occurs only with reoperation.

■ Spring refill occurs historically.

Shasta (SHA) Oroville (ORO) New Bullards Bar (NBB) Folsom (FOL)

6.4.3 Monthly Storage Effects

In order to track the success of the reoperation routine at water supply enhancement, the probabilities of exceedance for storage at various times during the year were plotted and presented in Figure 6.5 through Figure 6.12. These plots detail the exceedance probabilities for the points of maximum storage in the reservoirs compared to the maximum historical storage. The end-of-month plots draw comparisons for historical and reoperated storage levels at the end of March, April and May of each year in the study.

Figure 6.5. Exceedance Plots for Spring Refill Storage Values at Folsom

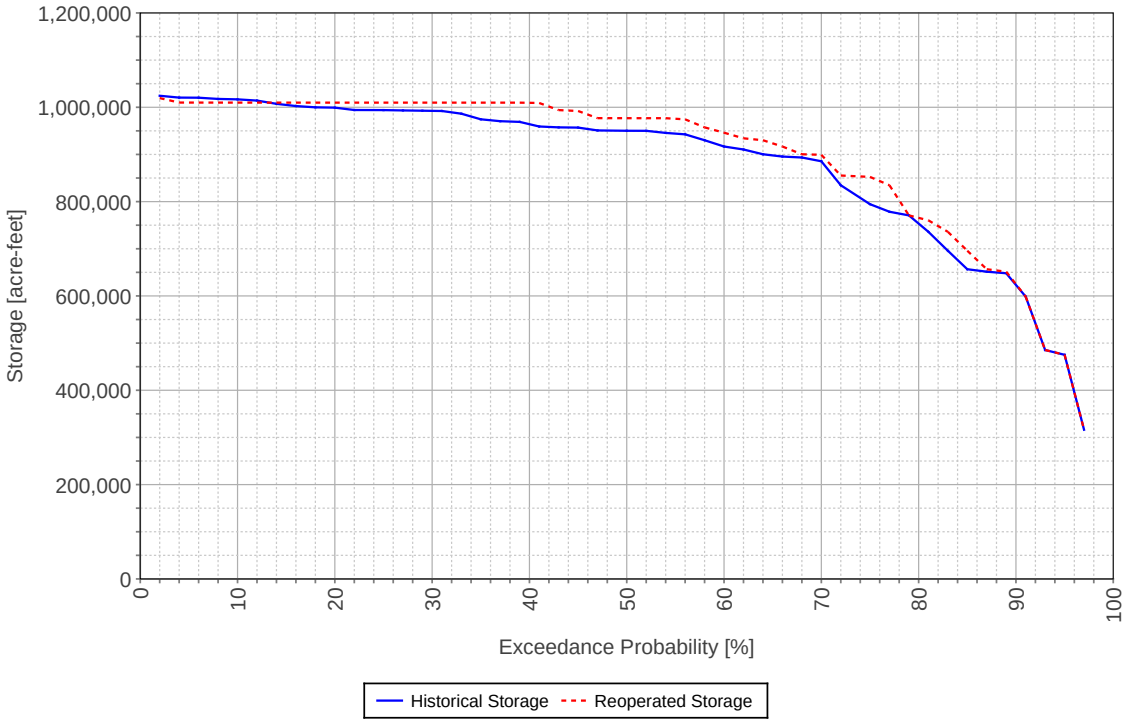


Figure 6.6. Exceedance Plots for Spring Refill Storage Values at New Bullards Bar

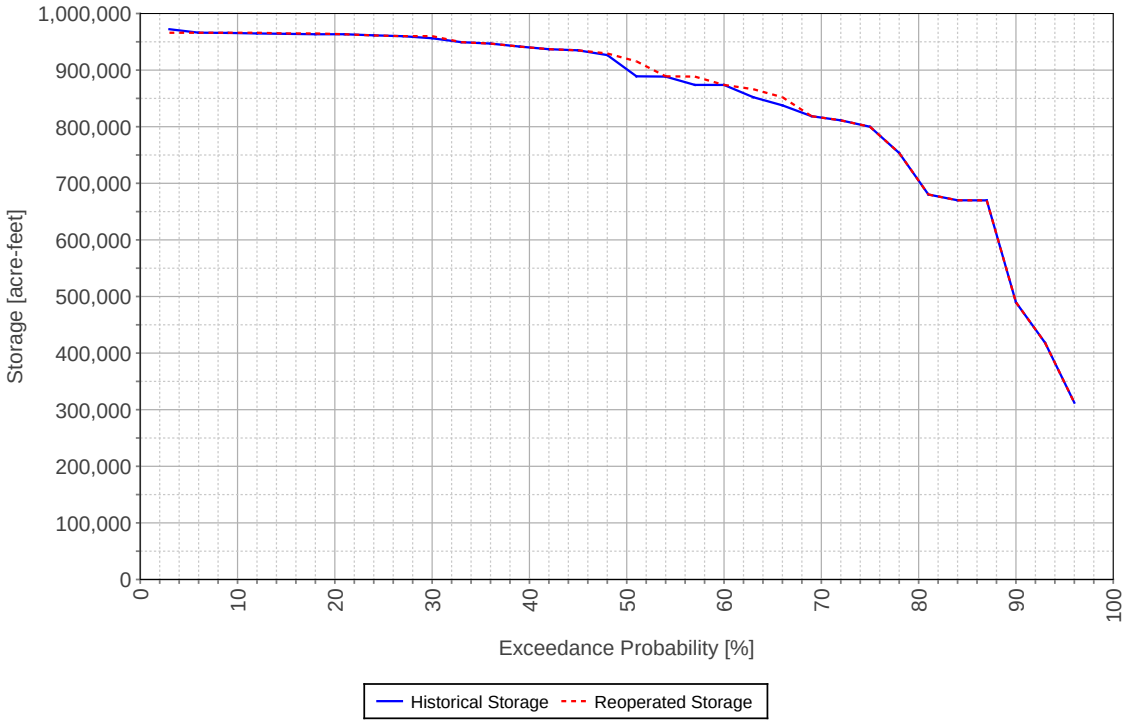


Figure 6.7. Exceedance Plots for Spring Refill Storage Values at Oroville

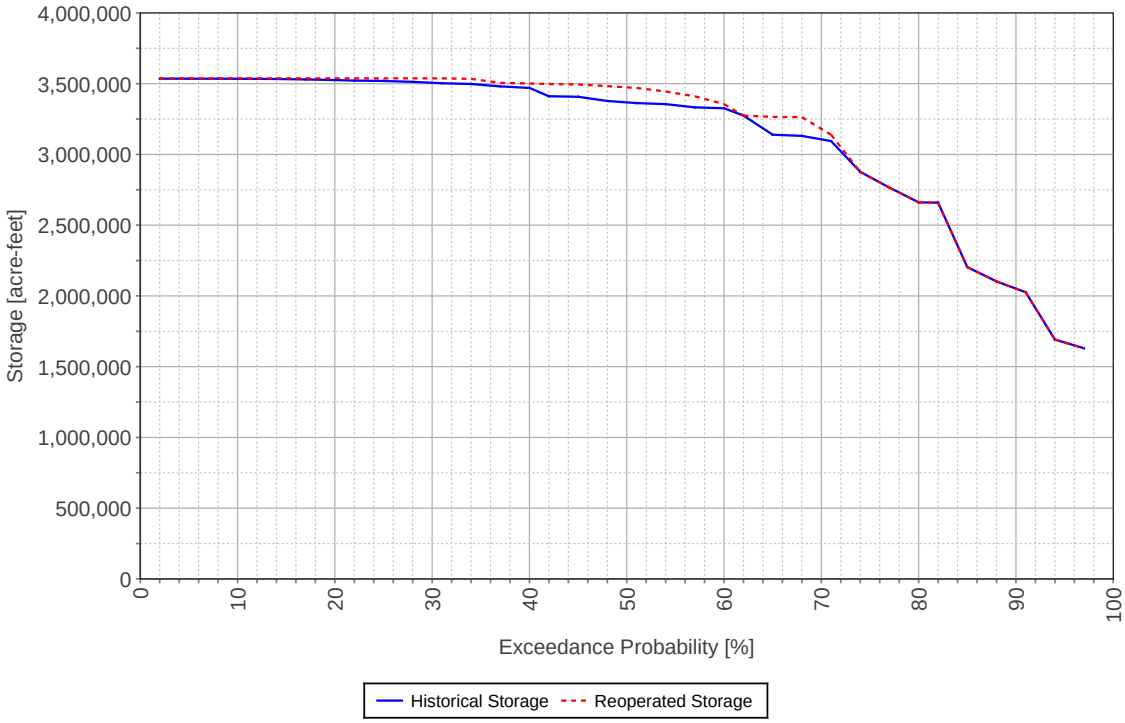


Figure 6.8. Exceedance Plots for Spring Refill Storage Values at Shasta

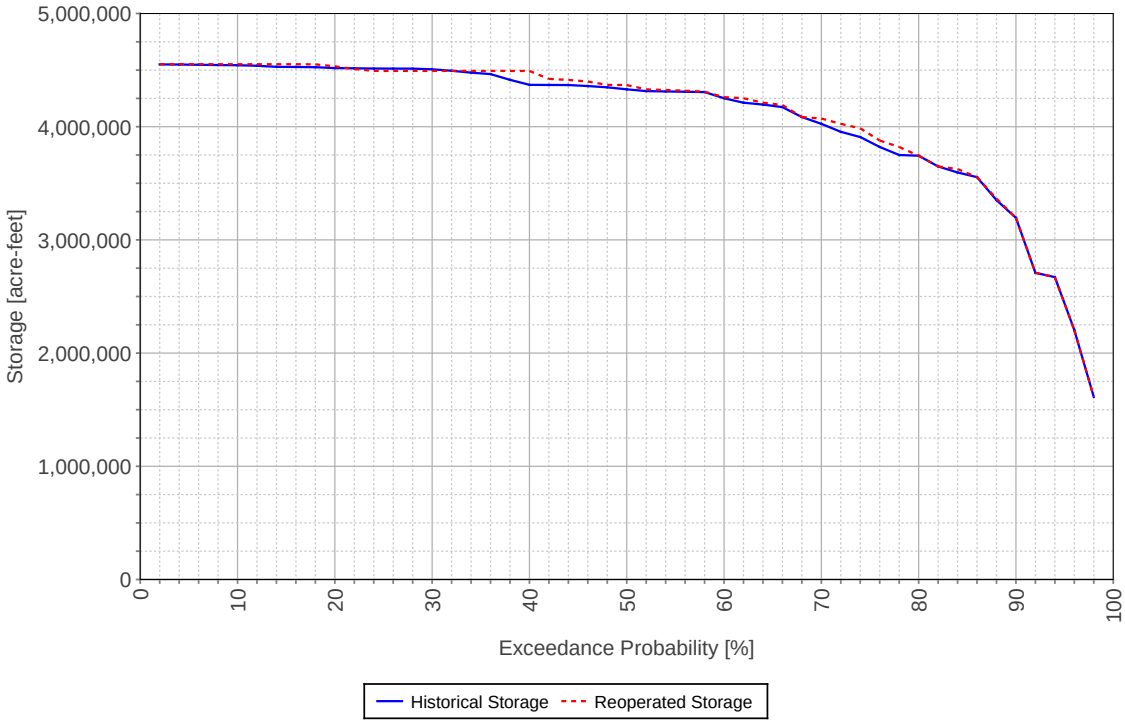


Figure 6.9. Exceedance Plots for End-of-Month Refill Storage Values at Folsom

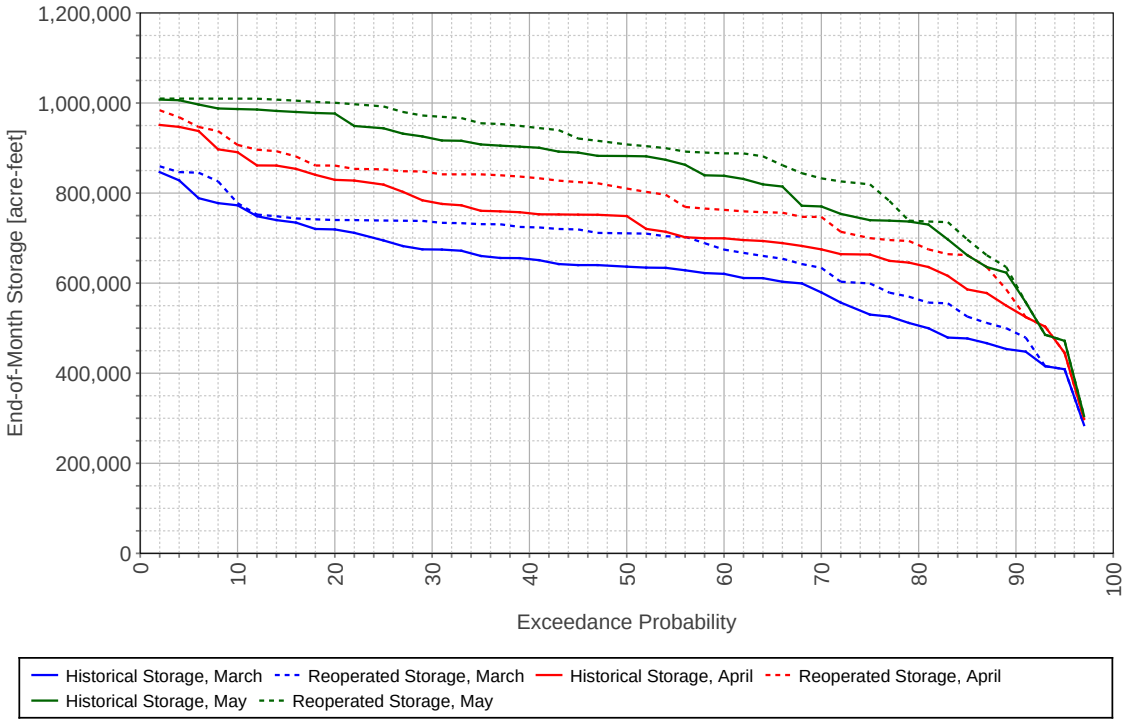


Figure 6.10. Exceedance Plots for End-of-Month Storage Values at New Bullards Bar

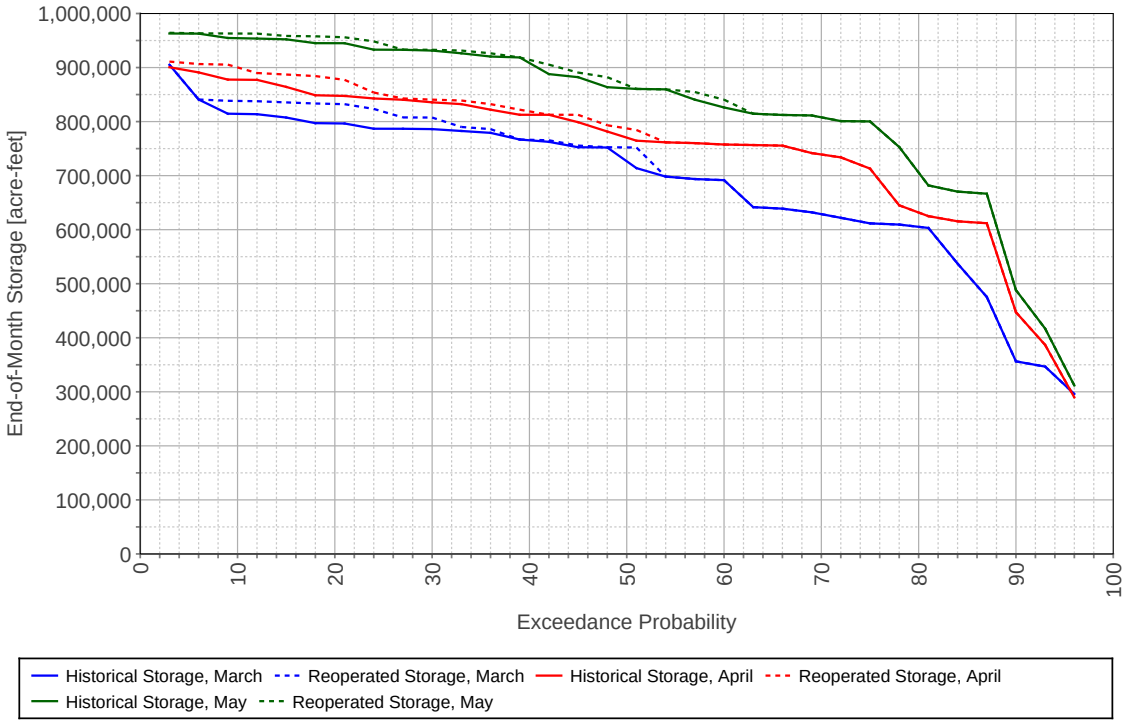


Figure 6.11. Exceedance Plots for End-of-Month Storage Values at Oroville

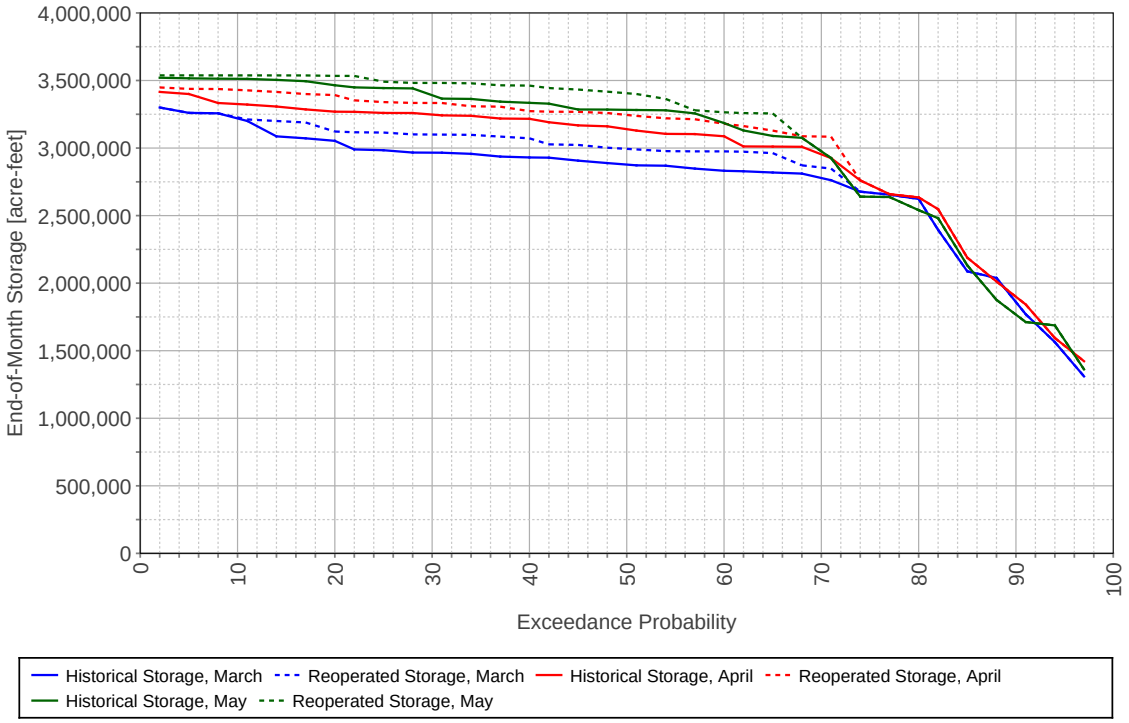
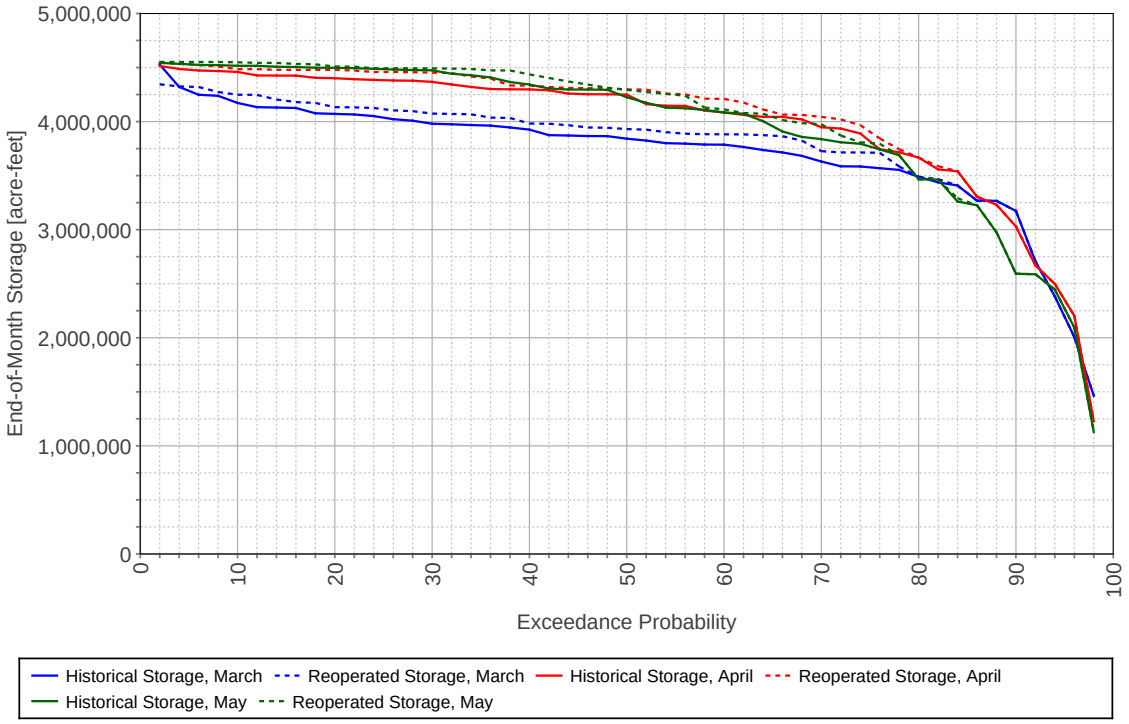


Figure 6.12. Exceedance Plots for End-of-Month Storage Values at Shasta



6.5 Evaluation of Benefits

The previously presented summary of results demonstrated the storage changes made possible by using F-BO for water supply enhancement. In addition, the systemwide benefits of utilizing this enhanced water supply were evaluated using CalLite. Appendix B details how the daily reoperation methodology was approximated in this model and shows the effects of operation with current rules as well as the enhanced water supply made available through reoperation.

6.6 Recommendations for Further Study

The operational modifications suggested in this chapter show there is potential to increase water supply yield through system reoperation. The reoperation parameters selected for this study were developed with careful consideration of the factors that would exist when making such a decision (e.g. impending flood risk). These parameters will require fine-tuning as the procedure to enhance water supply through system reoperation becomes more advanced. Another component of the reoperation that warrants further study is the relationship between the system reservoirs. For the study described herein, all the reservoirs reoperated independently. Pursuing a more comprehensive coordination in reoperation of the reservoirs may yield significant gains. This should be considered in any additional study performed.

7 Flood Control Enhancement

Just as F-BO was utilized to enhance water supply, F-BO can be used in a slightly different framework to enhance flood control objectives at each reservoir. Utilizing available inflow forecasts for releasing water ahead of a main flood wave offers the opportunity to create additional flood space to manage an impending flood.

As part of this assessment, historical reservoir storage and river flow data was reviewed and compared with flood rules and space requirements to determine when additional flood control storage or modification of flood rule parameters would have been beneficial to enhance flood control. Factors potentially limiting F-BO effectiveness were identified at each reservoir (e.g., limited outlet capacity or insufficient flood space). A comparison of each reservoir's potential use of F-BO to enhance flood control was developed. This comparison, shown in Table 7.1, identifies each reservoir's potential in each of several areas (flood space, outlet capacity, and channel capacity).

Table 7.1. Evaluation of Watershed Flood Control System Components with Regard to Ability to Implement F-BO

Reservoir	Flood Space	Outlet Capacity	Channel Capacity
Shasta	Adequate	Adequate	Limited
Oroville	Adequate	Adequate	Adequate
New Bullards Bar	Adequate	Limited	Adequate
Folsom	Adequate	Adequate*	Adequate

* denotes adequate outlet capacity will be available when Folsom Joint-Federal Project is completed in 2017.

7.1 Shasta

Shasta's flood control rules limit reservoir releases such that flows do not exceed 79,000 cfs below Keswick Dam or 100,000 cfs in the Sacramento River at Bend Bridge. It is recommended that the appropriateness of the Sacramento River at Bend Bridge flow target of 100,000 cfs be assessed. The Bend Bridge target significant limits Shasta's ability to release water during a flood event due to the significant tributary inflows to the Sacramento River between Shasta and Bend Bridge. The tributary flows have the potential to approach or reach 100,000 cfs themselves, thus causing Shasta to severely limit releases or stop releasing water altogether.

In comparison to other flow targets on similar systems, the Bend Bridge target seems excessively low. On average, it is exceeded approximately every 5 years. If this flow target were raised, the additional volume of water Shasta could release during a flood event would significantly increase. This would result in extra flood storage capacity during the main flood event which would then likely contribute to a reduction in the peak flood release necessary for these events. It is anticipated that raising the Bend Bridge flow target to 125,000 or 150,000 cfs would significantly affect events in the 1-in-100 to 1-in-200 year frequency range. It is recommended the Bend Bridge flow target be assessed. If

the investigation of this target shows that there is little reason (e.g., damageable property) above 100,000 cfs, it is suggested that a higher flow target be considered.

7.2 Oroville

Oroville Dam coordinates flood release with New Bullards Bar on the North Yuba River. This coordination is mandated in the water control manuals for the two reservoirs. As such, any flood control improvements that can be made to Oroville also have the potential to provide flood control benefits at New Bullards Bar. For example: if Oroville makes a forecast-based release of water in advance of a flood event, additional flood space is provided in Oroville. This otherwise unavailable flood space could be used to do any of the following:

- manage a larger flood than otherwise manageable
- reduced release rates and lower Feather River flows
- reduced release rates and allow New Bullards Bar to perform comparable increase in release rates, thus reducing its flood management burden.

Oroville has adequate flood space, reservoir release capacity, and downstream channel capacity to accommodate F-BO for flood control improvements.

7.3 New Bullards Bar

As mentioned in Section 7.2, New Bullards Bar and Oroville coordinate flood control releases. As such, much of the discussion on the use of F-BO for flood control at Oroville Dam pertains to New Bullards Bar. One constraint for potential application of F-BO at New Bullards Bar is the limited reservoir outlet capacity compared to outlet capacity at Oroville. This limited outlet capacity at New Bullards Bar inhibits the effectiveness of a pre-event flood release, since a significant volume of water is not able to be released within the applicable time window (e.g., 3-5 days ahead of peak). It is thus suggested that improvements to the outlet capacity of New Bullards Bar be considered along with F-BO in the context of improving flood control.

7.4 Folsom

As part of the Joint-Federal Project (JFP), Folsom Dam is required to utilize forecasts in its updated operating rules when the project comes online in 2017. As part of that change, USACE is studying the ways forecasts can be used to enhance flood control.

Once the auxiliary spillway at Folsom is constructed, adequate release capacity will exist to implement F-BO for flood control benefits, e.g., a pre-event release. Folsom has no other operational constraints which significantly reduce the effectiveness of F-BO for use in flood control.

7.5 Recommendations for Further Study

While the flood control modifications suggested are promising for each individual reservoir, in order to warrant additional consideration, the systemwide impacts and benefits of the suggested measures

must be better understood. It is recommended that additional investigation be performed for the elements deemed most promising from this study. A key consideration of the additional study should be how operational changes suggested for individual reservoirs affect flows and stages throughout the flood system.

References

MBK Engineers (2013). *System Reoperation Study: Merced River Analysis Technical Report*.

United States Army Corps of Engineers (1997). *Engineering Manual 1110-2-1420: Hydrologic Engineering Requirements for Reservoirs*.

United States Army Corps of Engineers, Sacramento District (SPK) (1987). *Folsom Dam and Lake, American River, California: Water Control Manual*.

Appendices

A Reoperation Plots

This appendix details the plots that resulted from the daily reoperation routine that was performed in this analysis. Each plot contains the following timeseries:

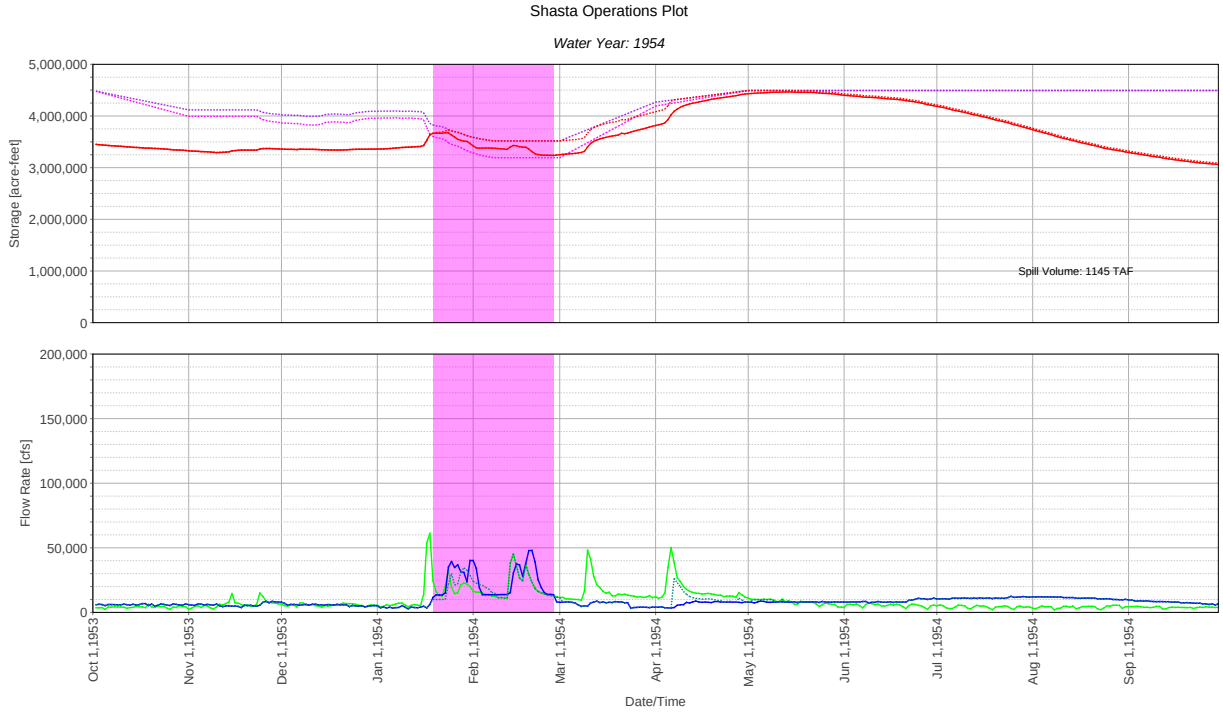
- inflow
- outflow (baseline)
- outflow (reoperated)
- storage (baseline)
- storage (reoperated)

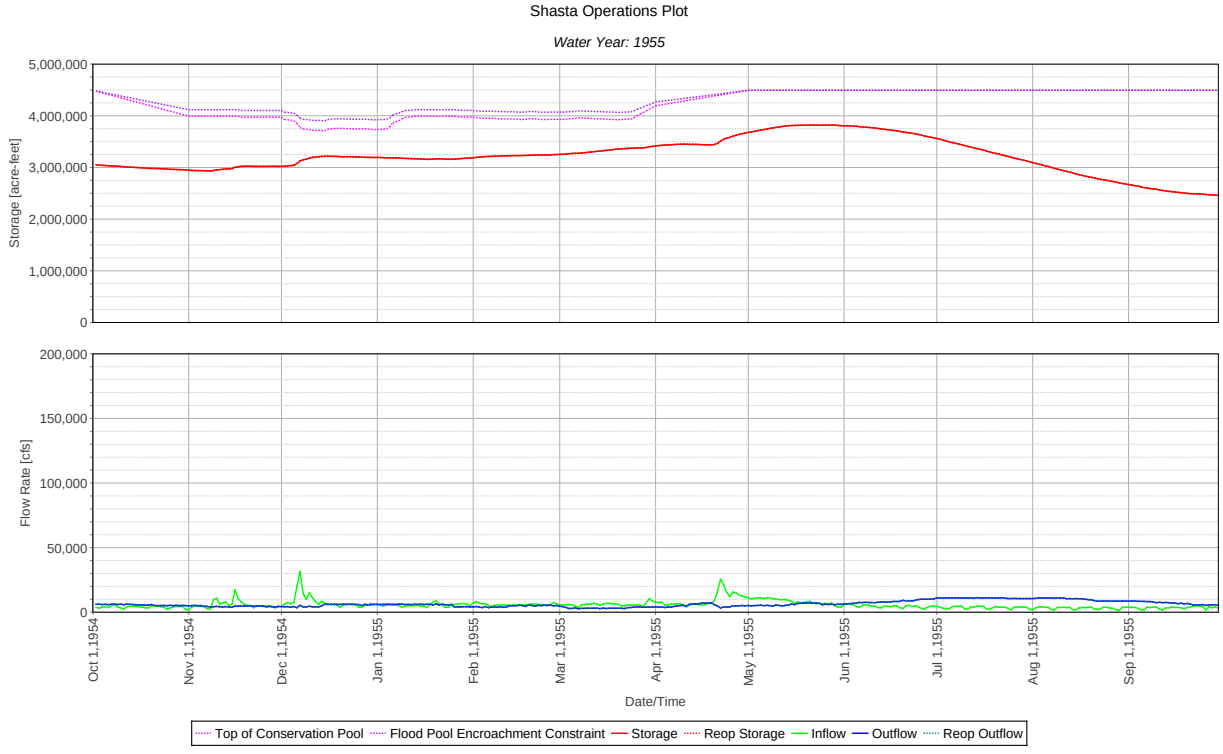
In addition the following regions are color-coded to indicate the different operational regimes:

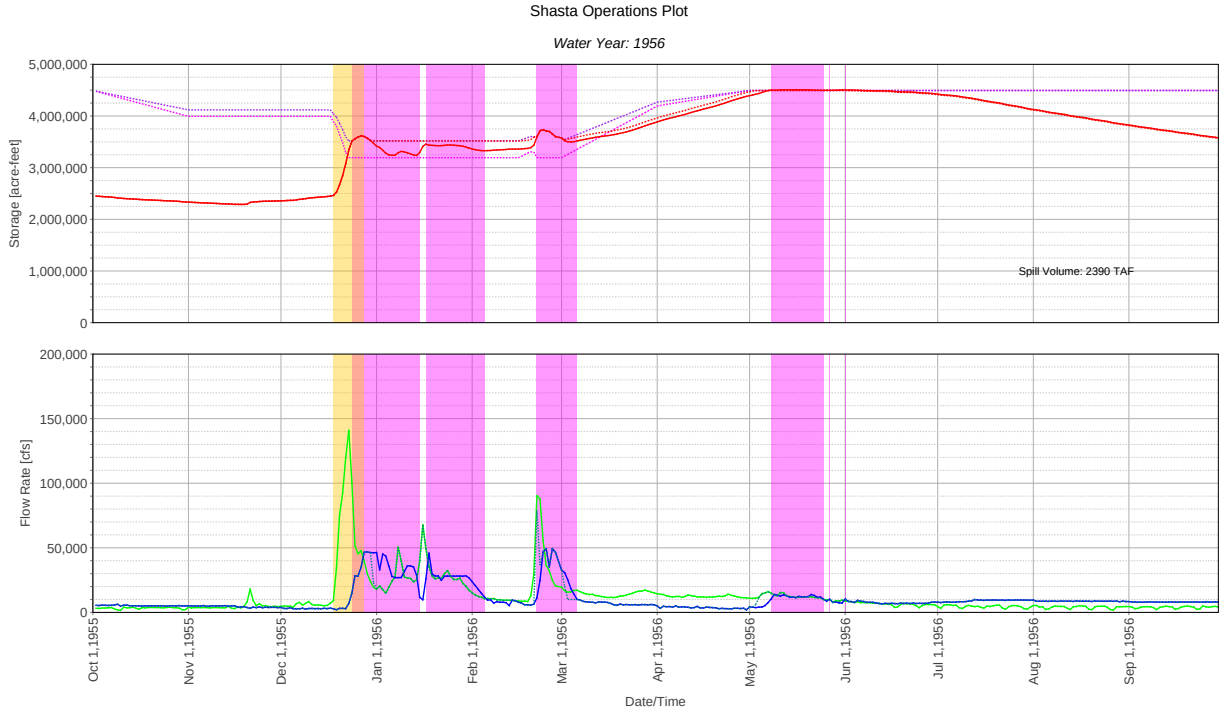
- deactivation (orange)
- reoperation (purple)

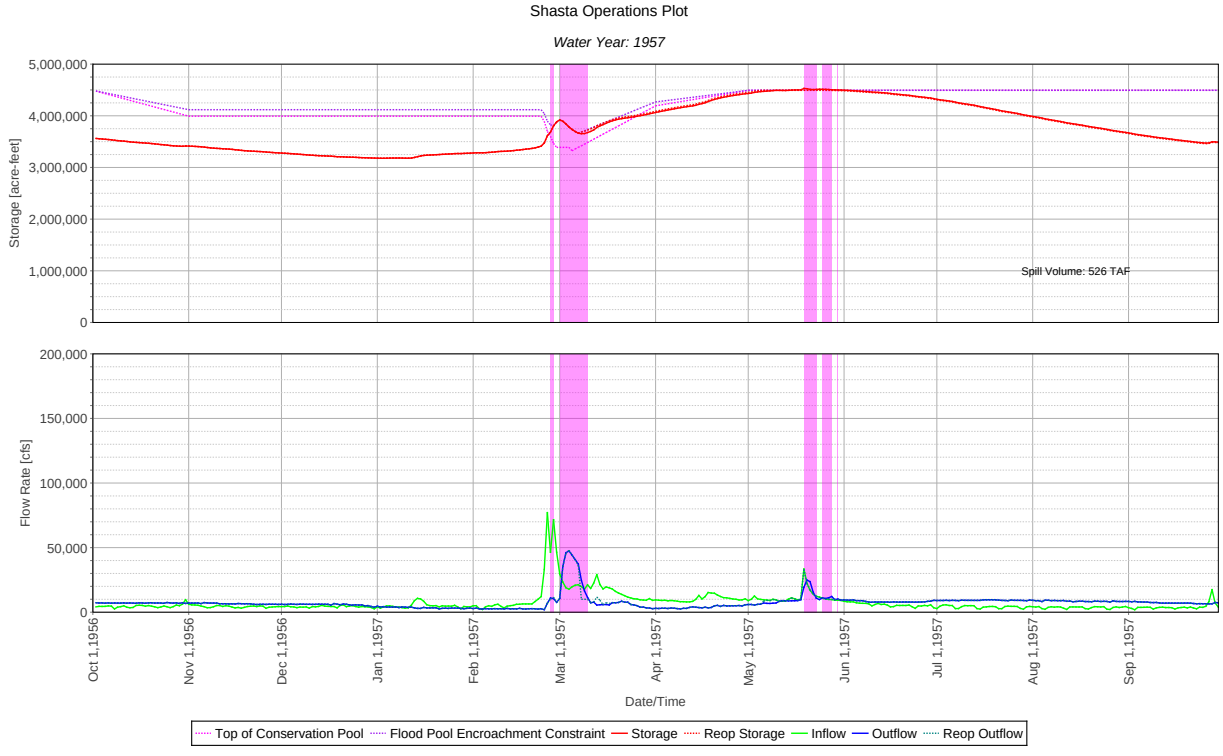
A.1 Shasta

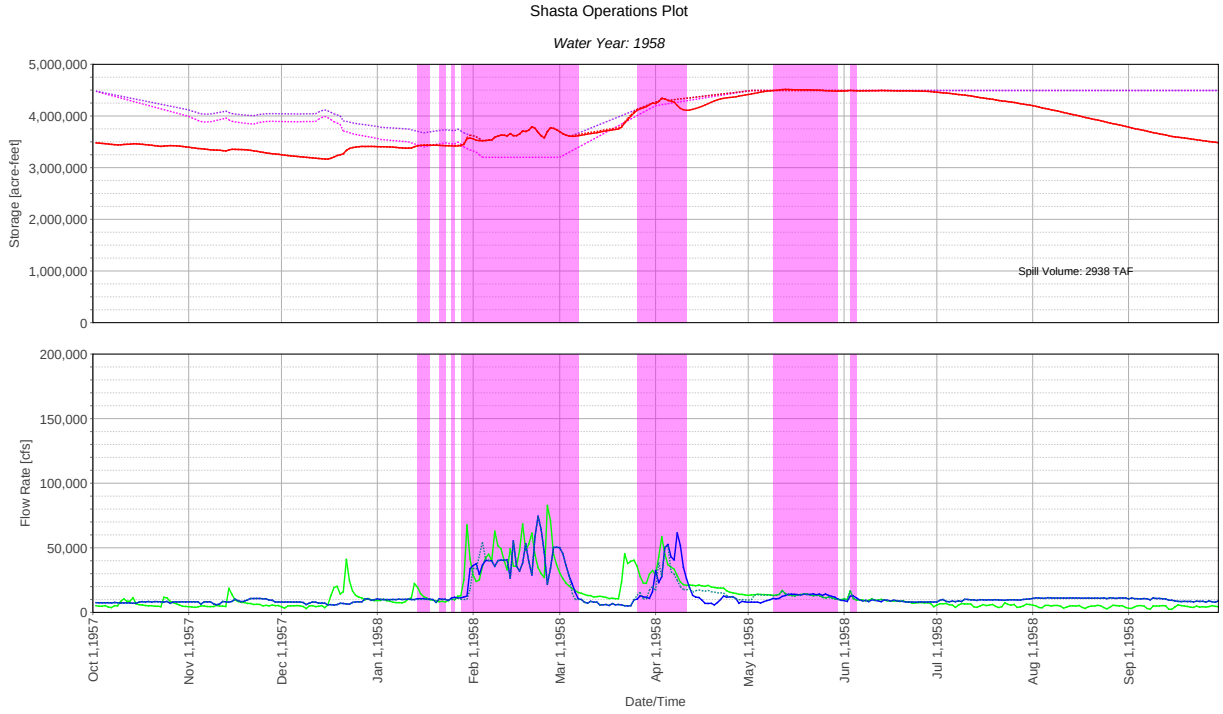
The following section includes the reoperation plots for Shasta Dam.

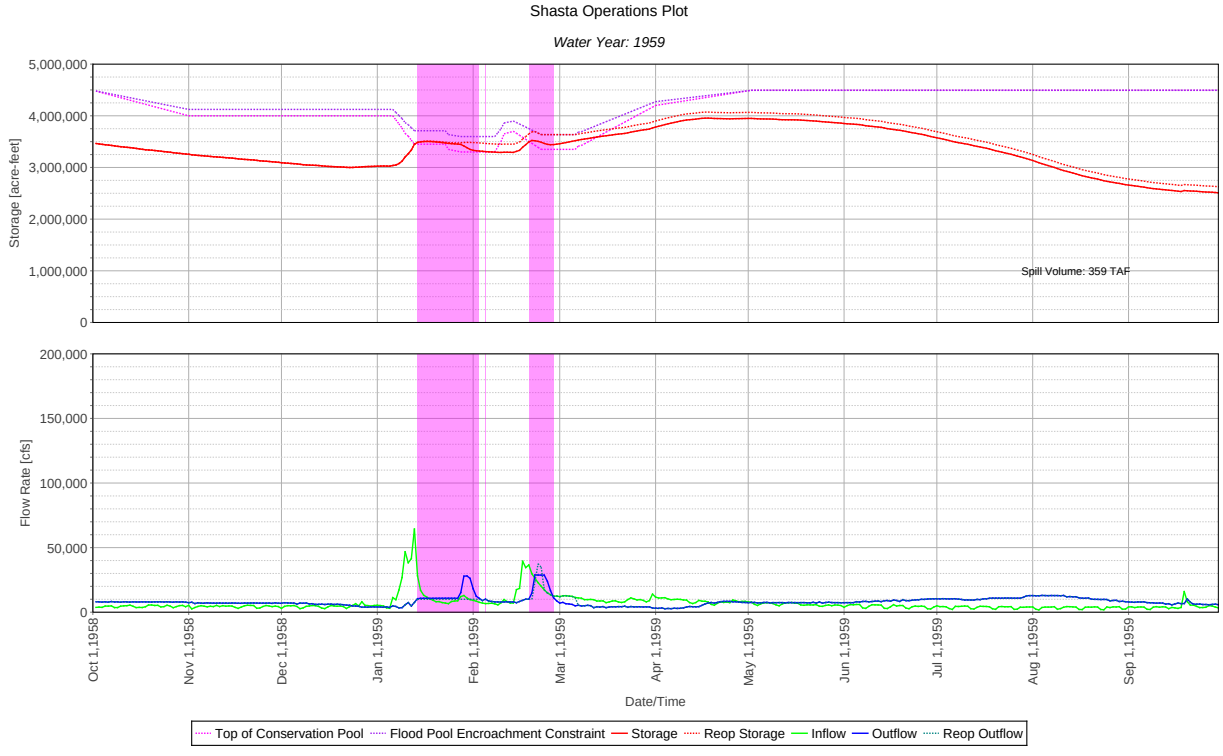

Shasta Operations Plot
Water Year: 1954
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1145 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1953
Nov 1,1953
Dec 1,1953
Jan 1,1954
Feb 1,1954
Mar 1,1954
Apr 1,1954
May 1,1954
Jun 1,1954
Jul 1,1954
Aug 1,1954
Sep 1,1954
Date/Time

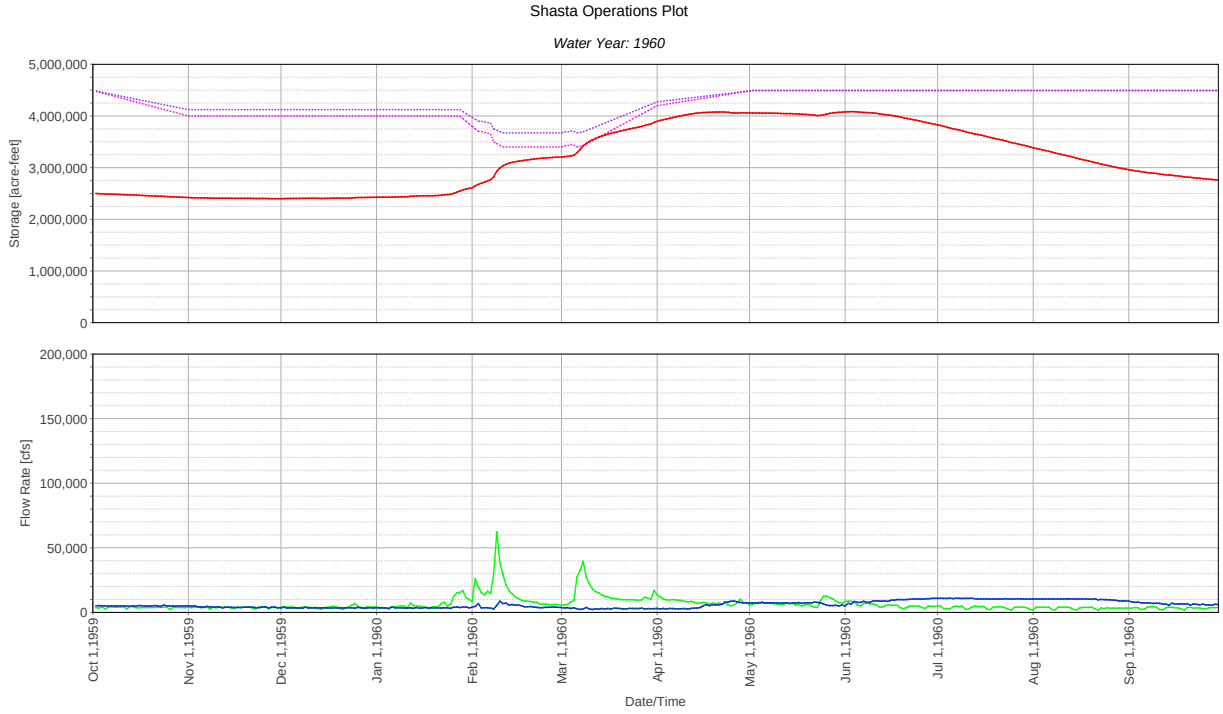

Shasta Operations Plot
Water Year: 1955
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1954
Nov 1,1954
Dec 1,1954
Jan 1,1955
Feb 1,1955
Mar 1,1955
Apr 1,1955
May 1,1955
Jun 1,1955
Jul 1,1955
Aug 1,1955
Sep 1,1955
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

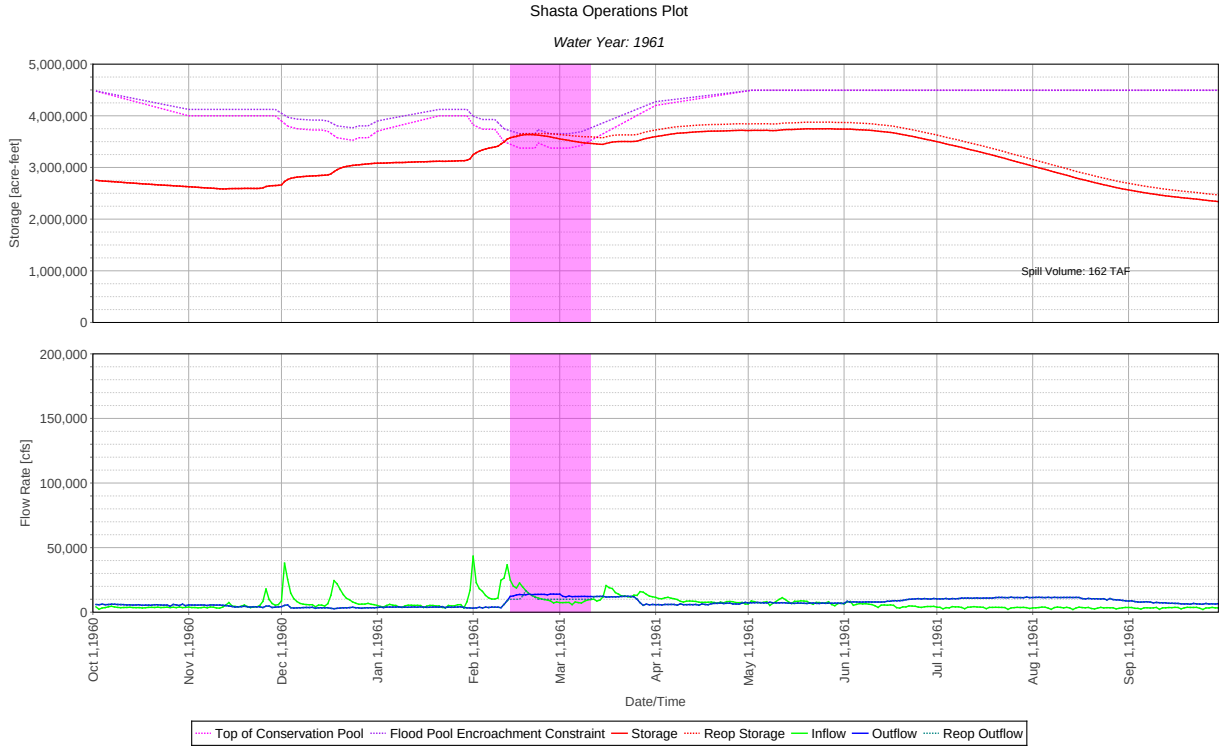

Shasta Operations Plot
Water Year: 1956
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2390 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1955
Nov 1,1955
Dec 1,1955
Jan 1,1956
Feb 1,1956
Mar 1,1956
Apr 1,1956
May 1,1956
Jun 1,1956
Jul 1,1956
Aug 1,1956
Sep 1,1956
Date/Time

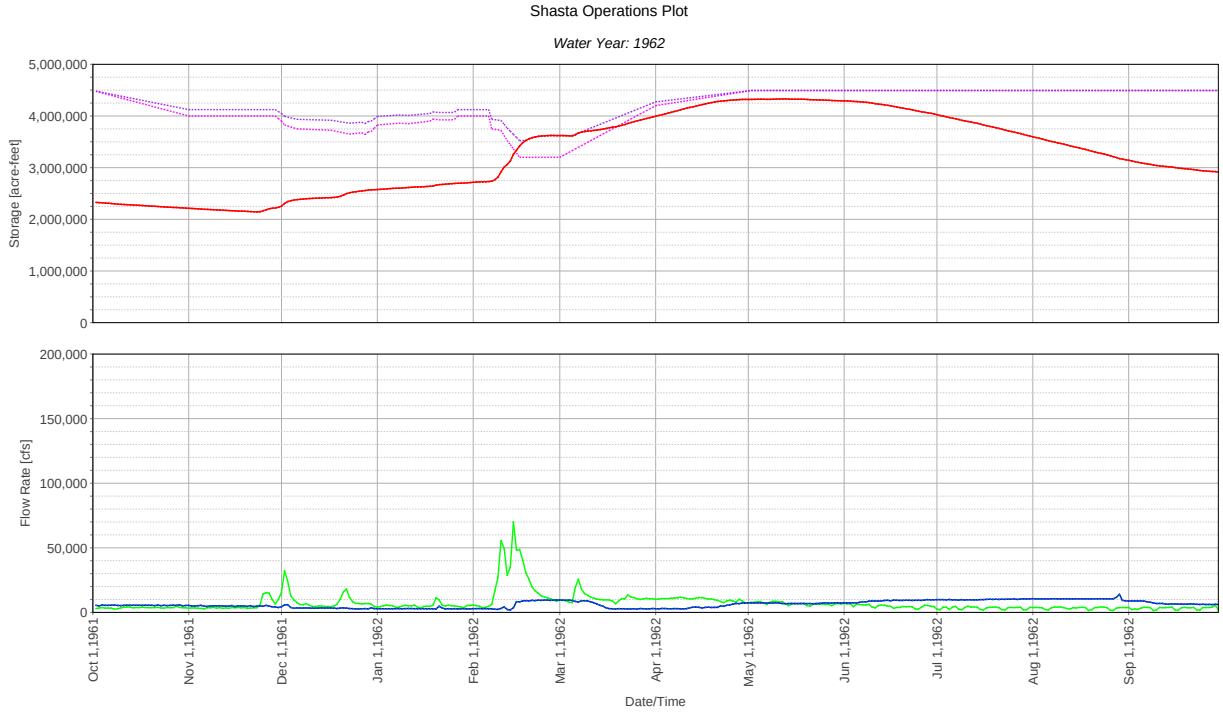

Shasta Operations Plot
Water Year: 1957
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 526 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1956
Nov 1,1956
Dec 1,1956
Jan 1,1957
Feb 1,1957
Mar 1,1957
Apr 1,1957
May 1,1957
Jun 1,1957
Jul 1,1957
Aug 1,1957
Sep 1,1957
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

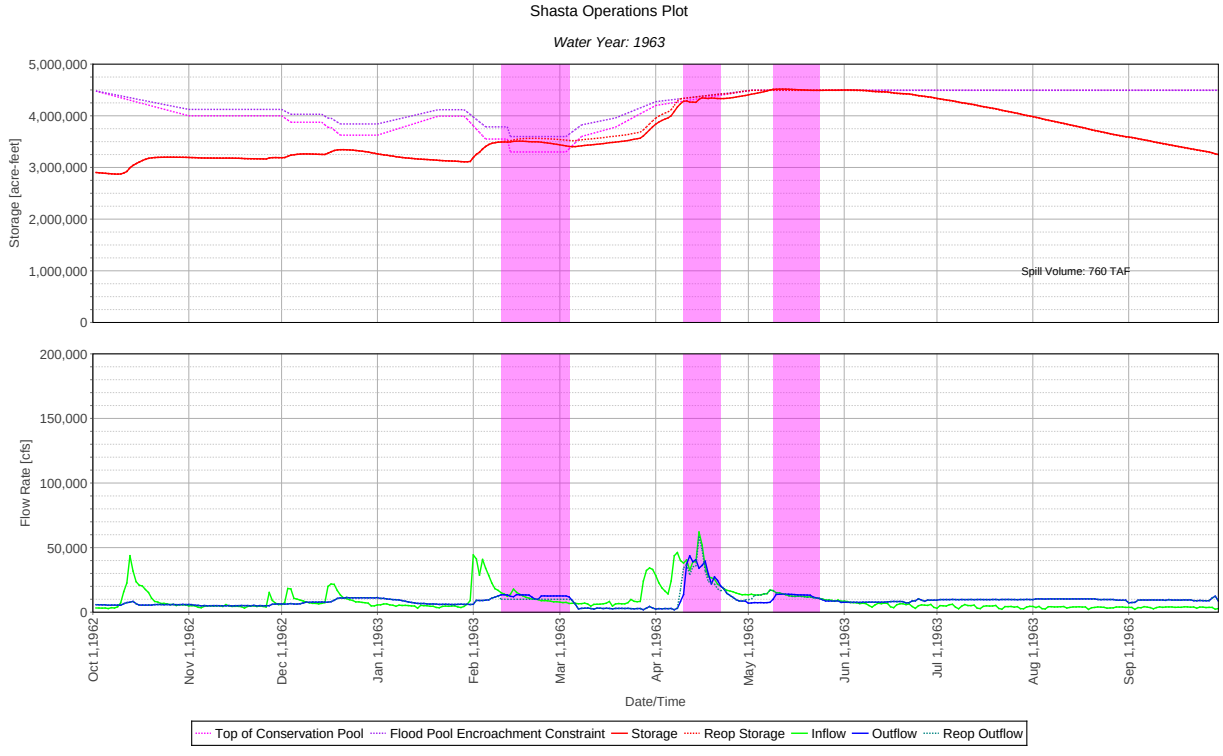

Shasta Operations Plot
Water Year: 1958
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2938 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1957
Nov 1,1957
Dec 1,1957
Jan 1,1958
Feb 1,1958
Mar 1,1958
Apr 1,1958
May 1,1958
Jun 1,1958
Jul 1,1958
Aug 1,1958
Sep 1,1958
Date/Time

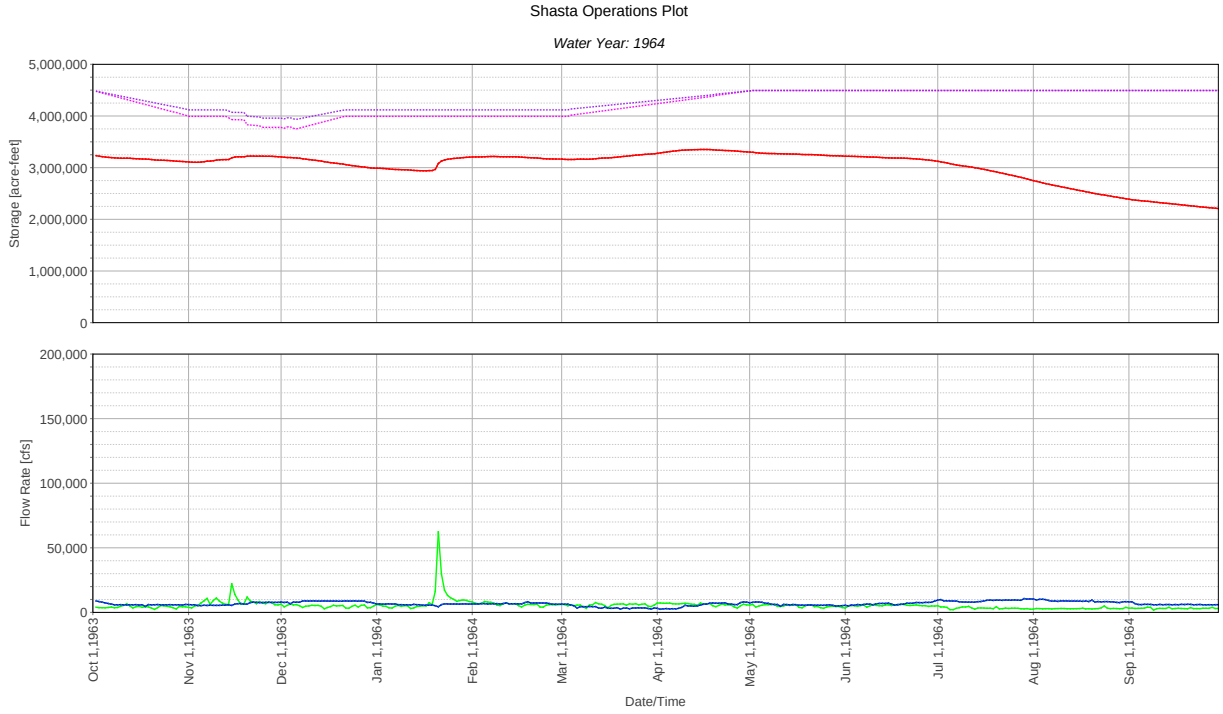

Shasta Operations Plot
Water Year: 1959
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 359 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1958
Nov 1,1958
Dec 1,1958
Jan 1,1959
Feb 1,1959
Mar 1,1959
Apr 1,1959
May 1,1959
Jun 1,1959
Jul 1,1959
Aug 1,1959
Sep 1,1959
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

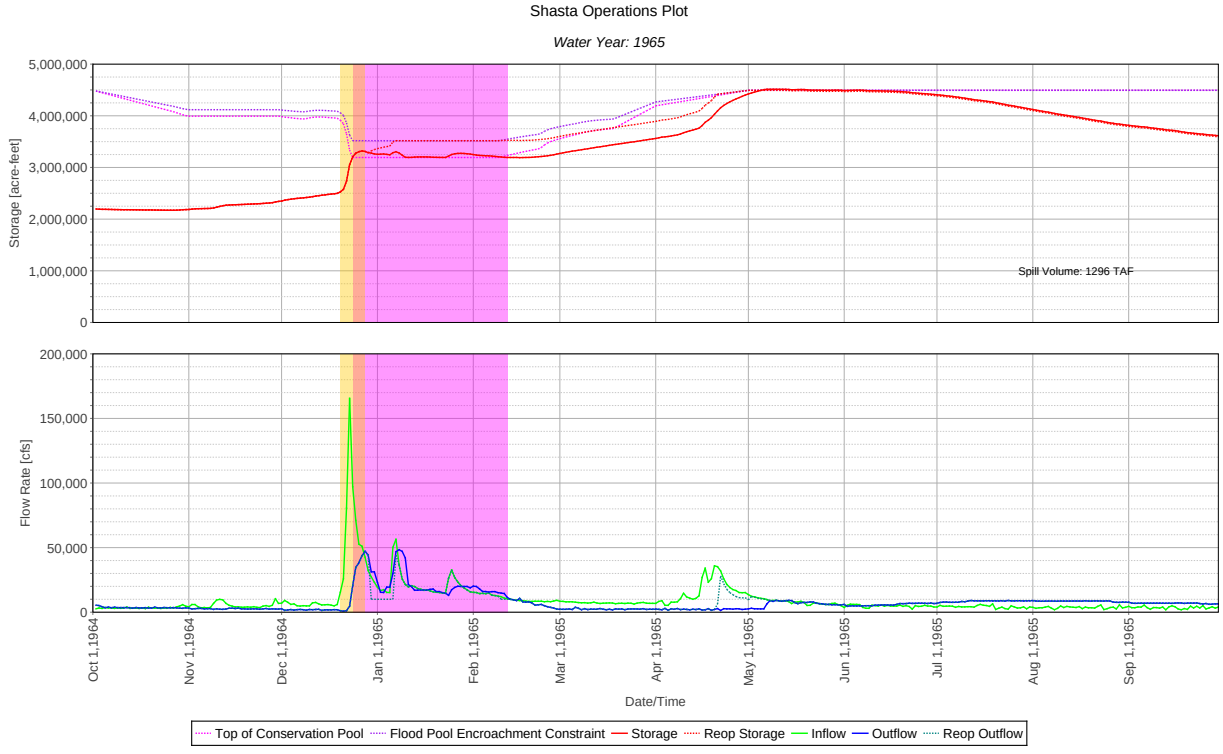

Shasta Operations Plot
Water Year: 1960
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1959
Nov 1,1959
Dec 1,1959
Jan 1,1960
Feb 1,1960
Mar 1,1960
Apr 1,1960
May 1,1960
Jun 1,1960
Jul 1,1960
Aug 1,1960
Sep 1,1960
Date/Time

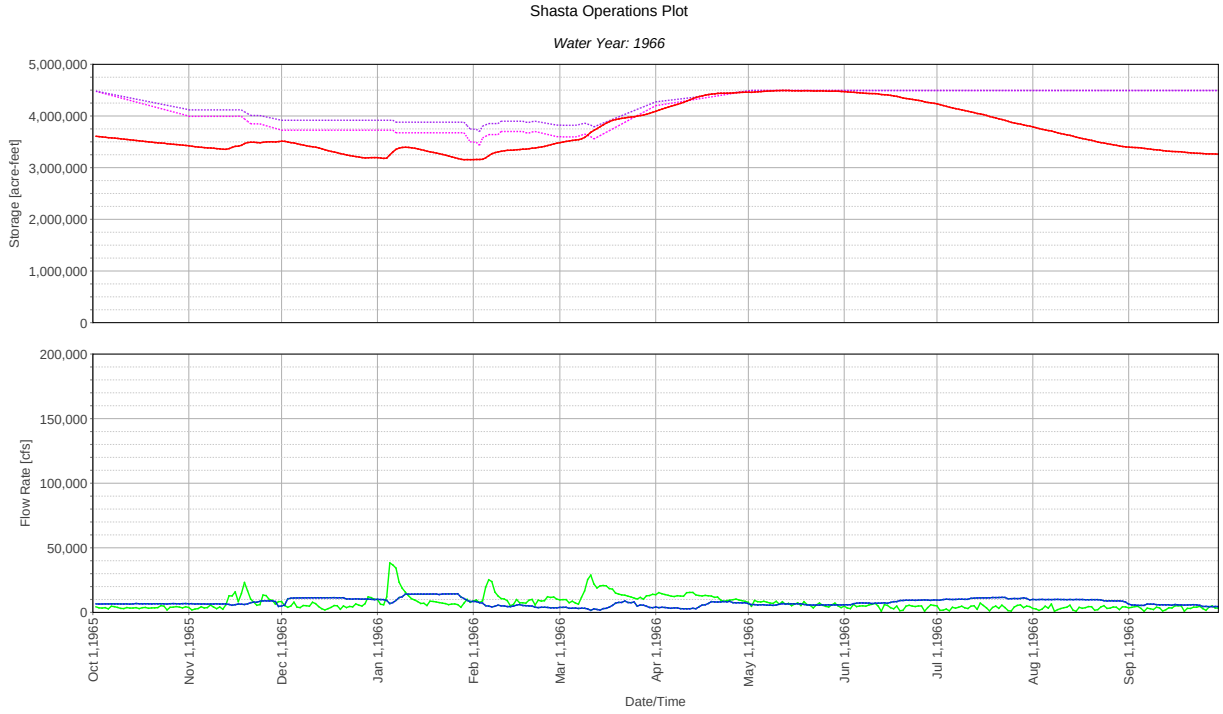

Shasta Operations Plot
Water Year: 1961
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 162 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1960
Nov 1,1960
Dec 1,1960
Jan 1,1961
Feb 1,1961
Mar 1,1961
Apr 1,1961
May 1,1961
Jun 1,1961
Jul 1,1961
Aug 1,1961
Sep 1,1961
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

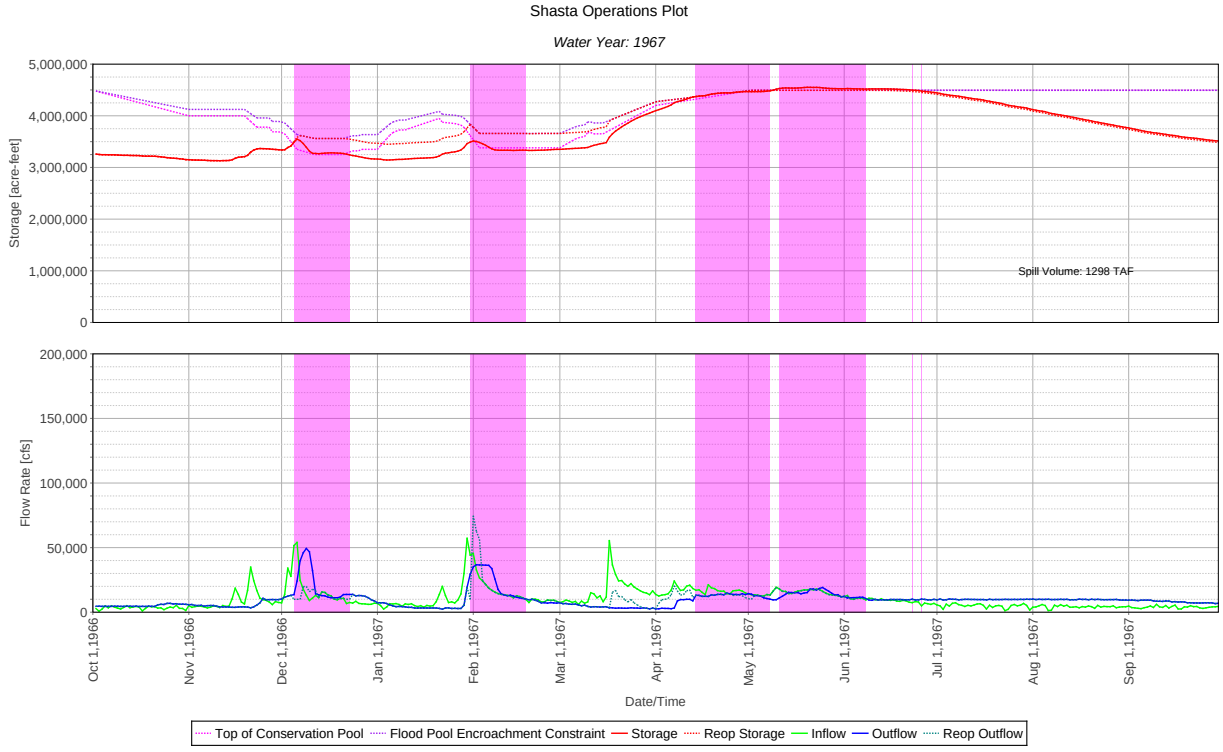

Shasta Operations Plot
Water Year: 1962
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1961
Nov 1,1961
Dec 1,1961
Jan 1,1962
Feb 1,1962
Mar 1,1962
Apr 1,1962
May 1,1962
Jun 1,1962
Jul 1,1962
Aug 1,1962
Sep 1,1962
Date/Time

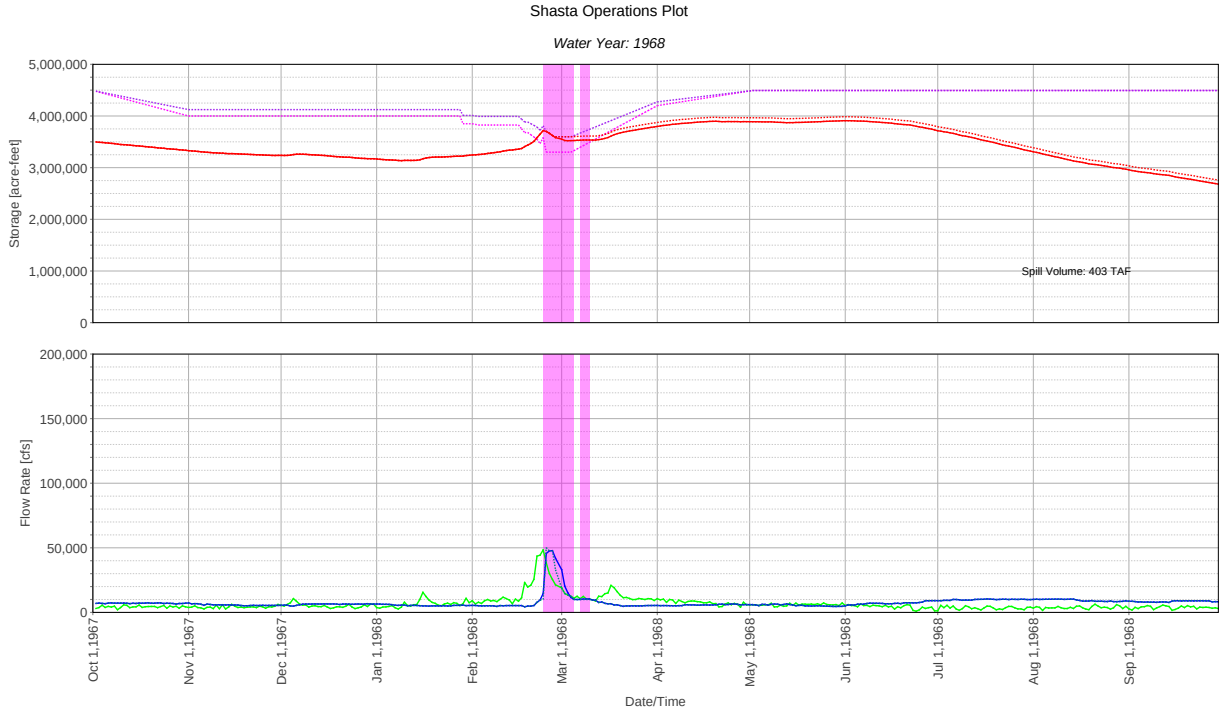

Shasta Operations Plot
Water Year: 1963
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 760 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1962
Nov 1,1962
Dec 1,1962
Jan 1,1963
Feb 1,1963
Mar 1,1963
Apr 1,1963
May 1,1963
Jun 1,1963
Jul 1,1963
Aug 1,1963
Sep 1,1963
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

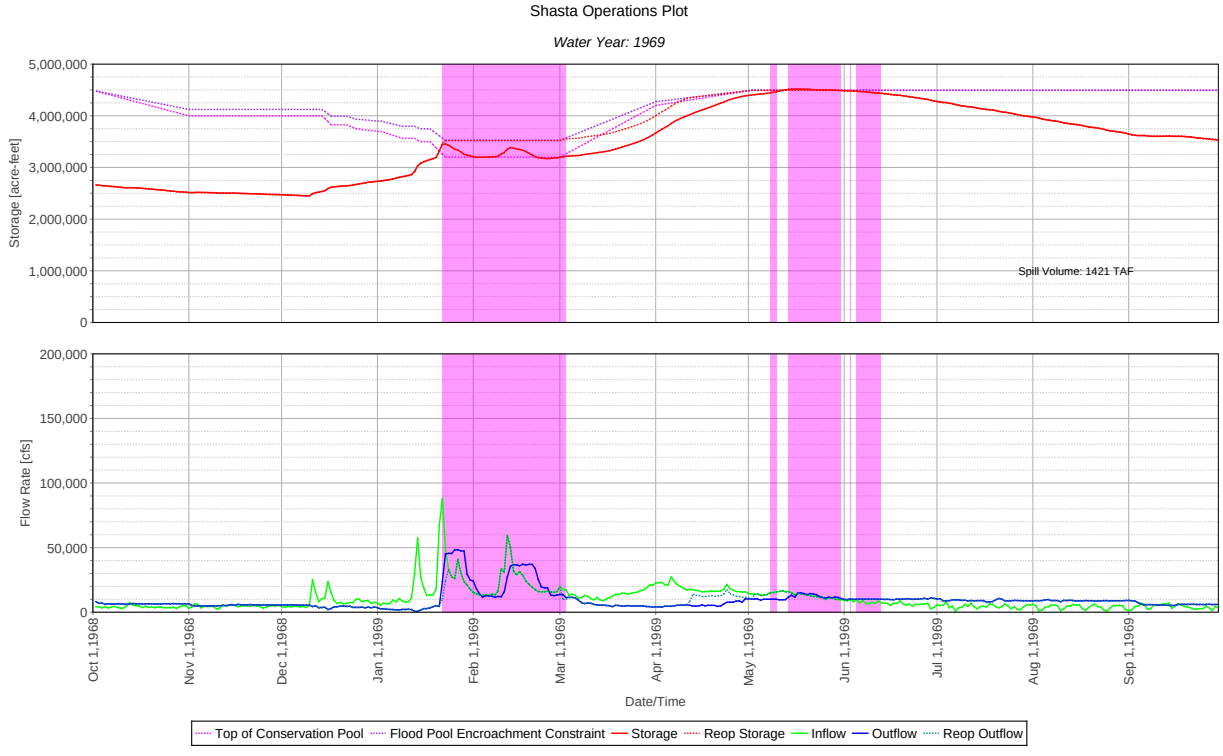

Shasta Operations Plot
Water Year: 1964
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1963
Nov 1,1963
Dec 1,1963
Jan 1,1964
Feb 1,1964
Mar 1,1964
Apr 1,1964
May 1,1964
Jun 1,1964
Jul 1,1964
Aug 1,1964
Sep 1,1964
Date/Time

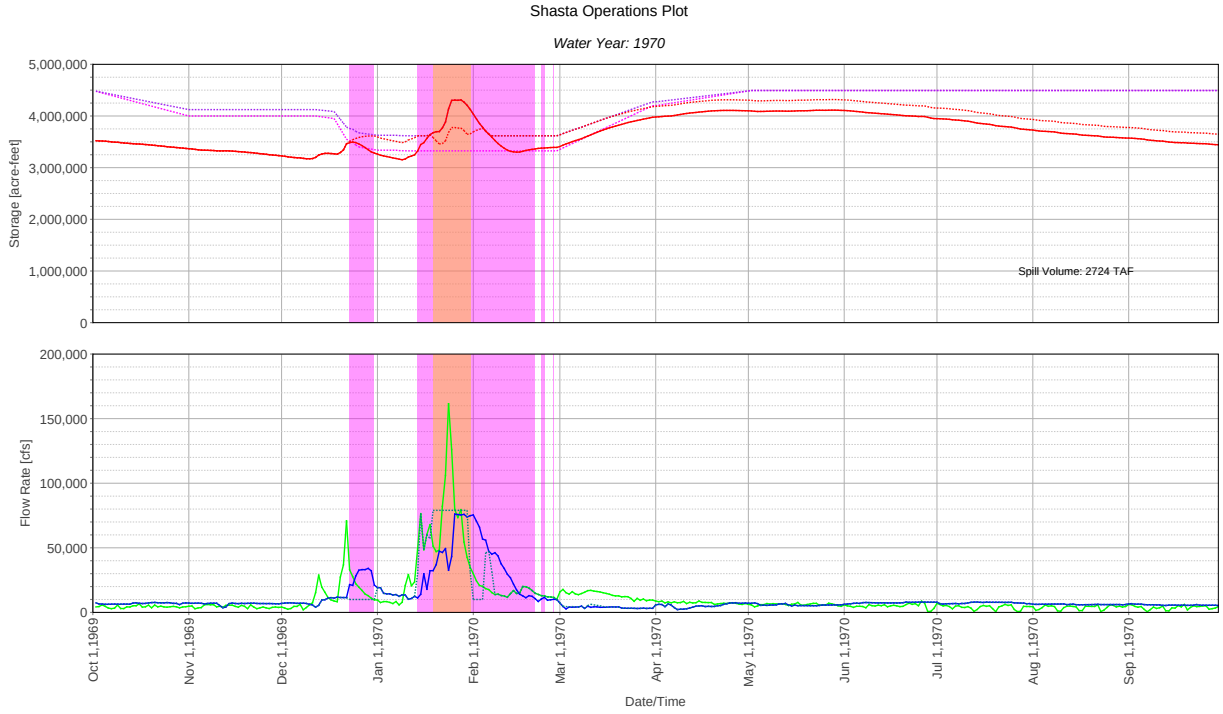

Shasta Operations Plot
Water Year: 1965
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1296 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1964
Nov 1,1964
Dec 1,1964
Jan 1,1965
Feb 1,1965
Mar 1,1965
Apr 1,1965
May 1,1965
Jun 1,1965
Jul 1,1965
Aug 1,1965
Sep 1,1965
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

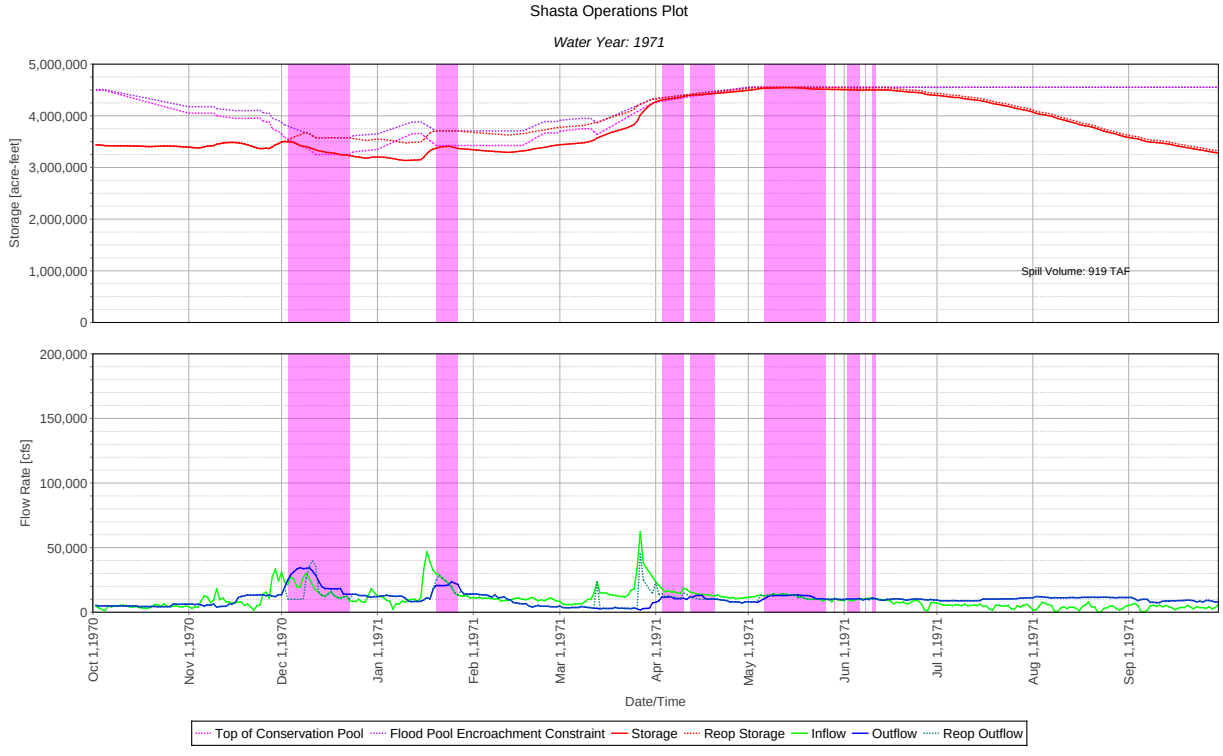

Shasta Operations Plot
Water Year: 1966
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1965
Nov 1,1965
Dec 1,1965
Jan 1,1966
Feb 1,1966
Mar 1,1966
Apr 1,1966
May 1,1966
Jun 1,1966
Jul 1,1966
Aug 1,1966
Sep 1,1966
Date/Time

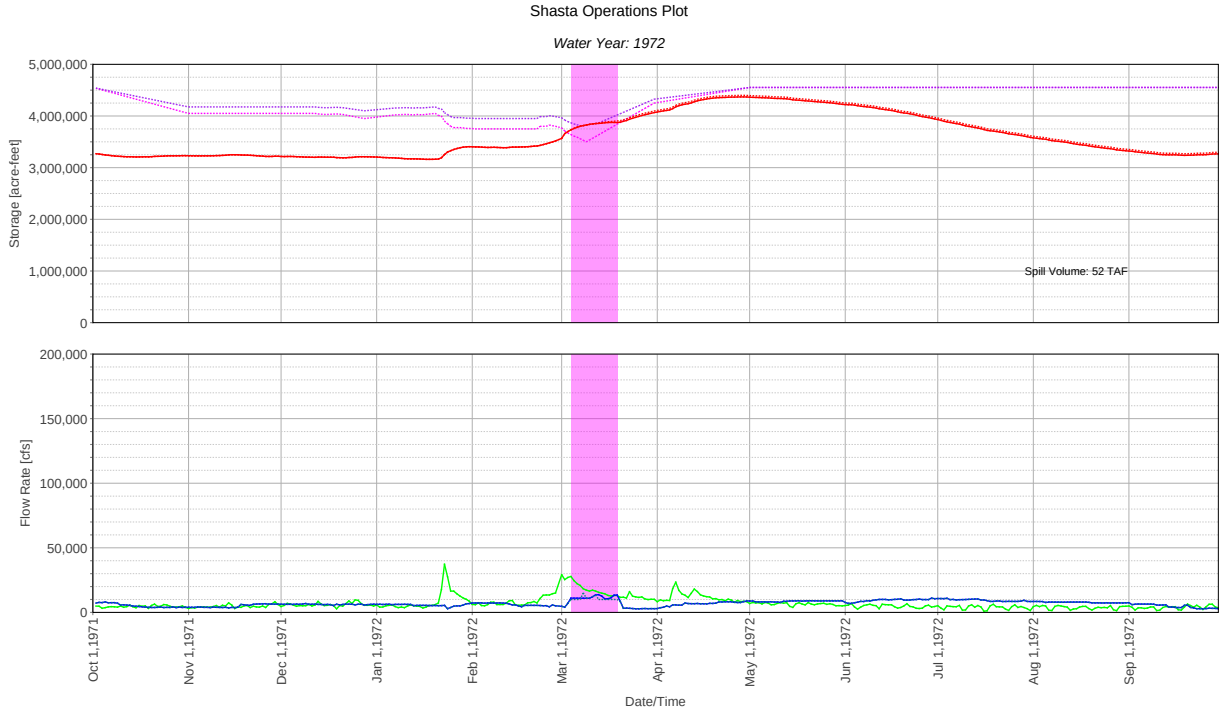

Shasta Operations Plot
Water Year: 1967
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1298 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1966
Nov 1,1966
Dec 1,1966
Jan 1,1967
Feb 1,1967
Mar 1,1967
Apr 1,1967
May 1,1967
Jun 1,1967
Jul 1,1967
Aug 1,1967
Sep 1,1967
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

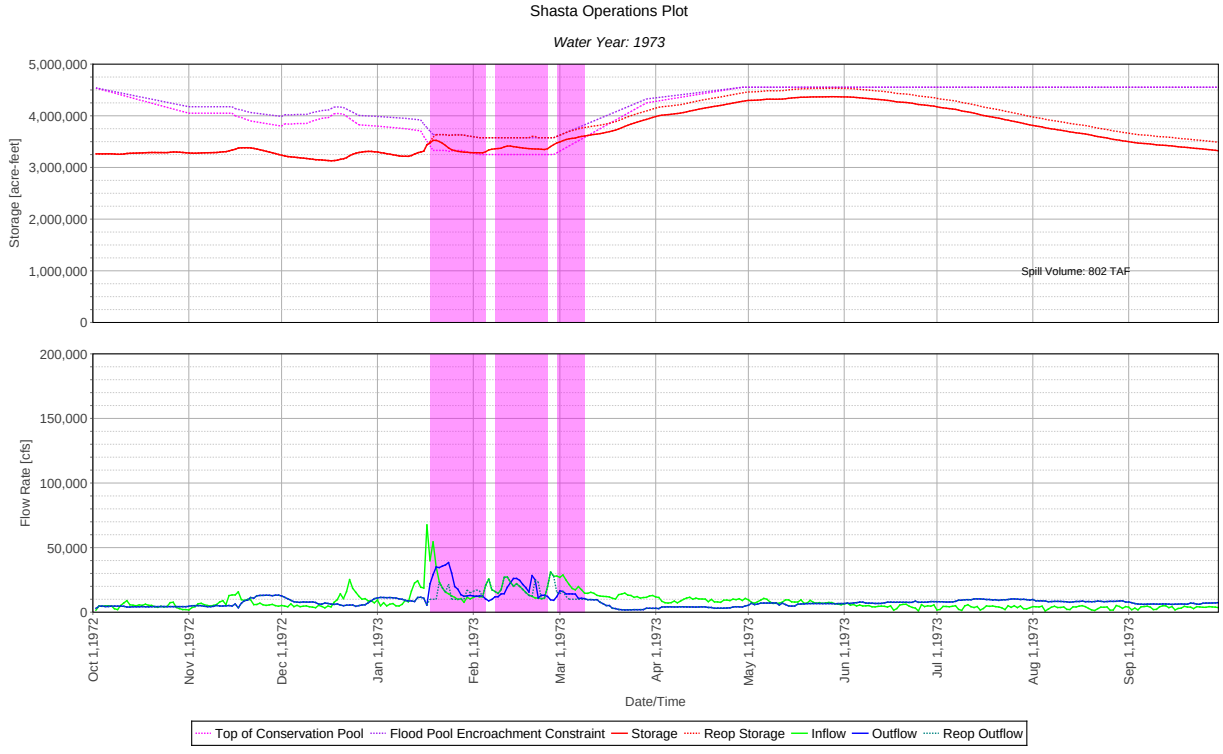

Shasta Operations Plot
Water Year: 1968
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 403 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1967
Nov 1,1967
Dec 1,1967
Jan 1,1968
Feb 1,1968
Mar 1,1968
Apr 1,1968
May 1,1968
Jun 1,1968
Jul 1,1968
Aug 1,1968
Sep 1,1968
Date/Time

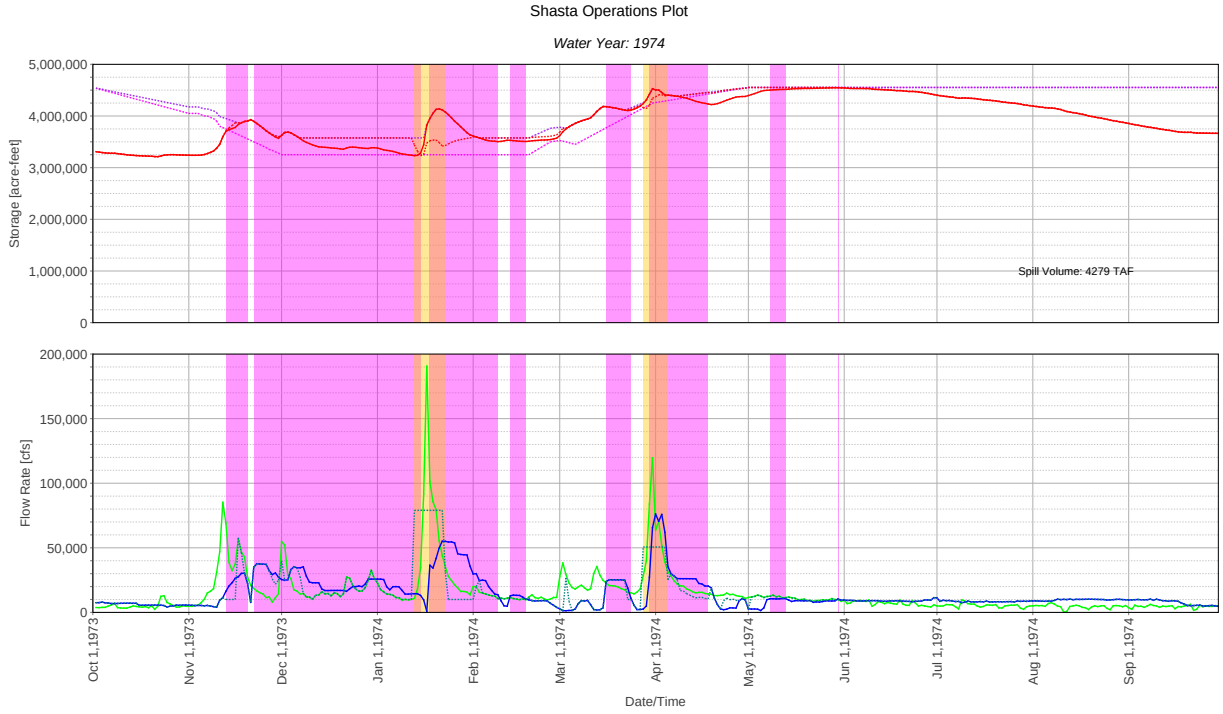

Shasta Operations Plot
Water Year: 1969
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1421 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1968
Nov 1,1968
Dec 1,1968
Jan 1,1969
Feb 1,1969
Mar 1,1969
Apr 1,1969
May 1,1969
Jun 1,1969
Jul 1,1969
Aug 1,1969
Sep 1,1969
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

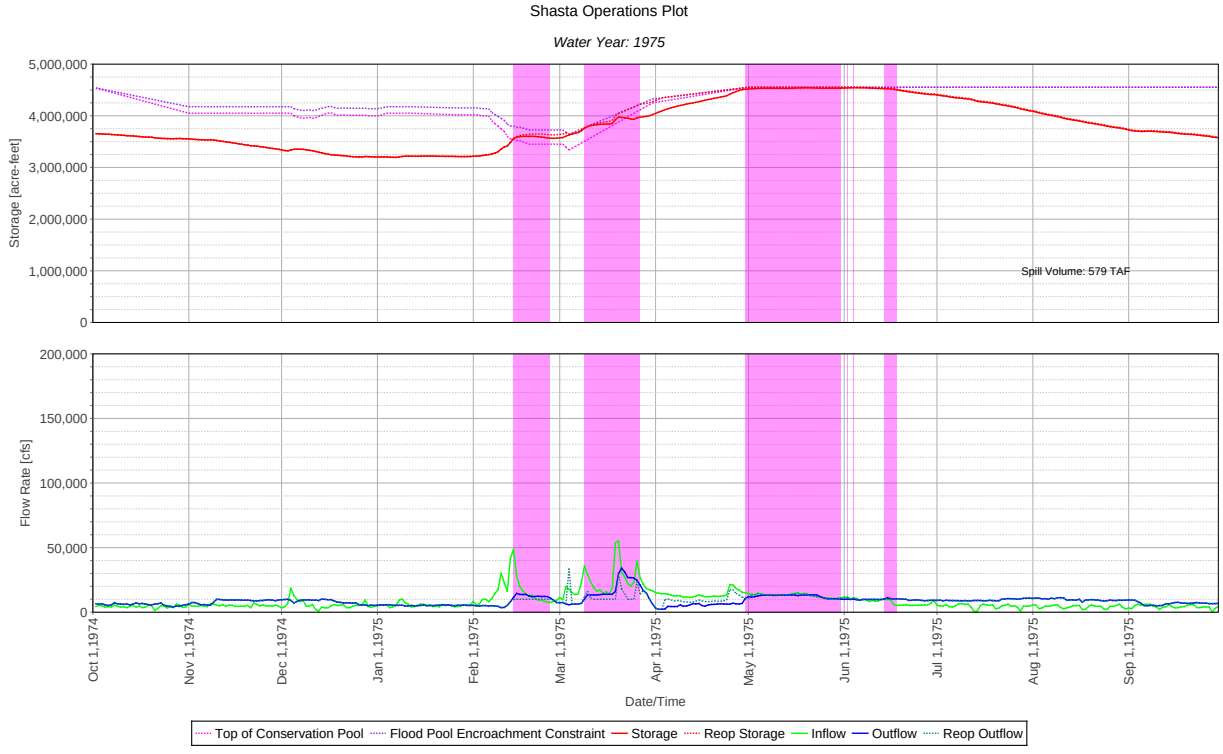

Shasta Operations Plot
Water Year: 1970
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2724 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1969
Nov 1,1969
Dec 1,1969
Jan 1,1970
Feb 1,1970
Mar 1,1970
Apr 1,1970
May 1,1970
Jun 1,1970
Jul 1,1970
Aug 1,1970
Sep 1,1970
Date/Time

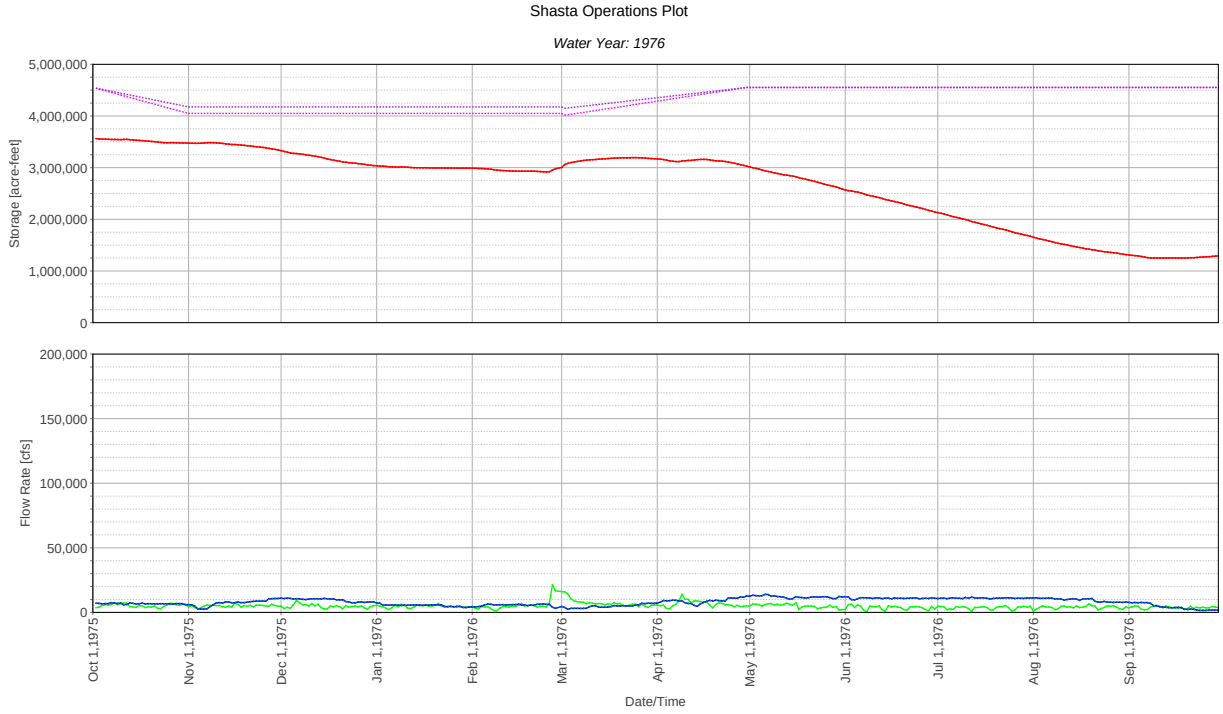

Shasta Operations Plot
Water Year: 1971
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 919 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1970
Nov 1,1970
Dec 1,1970
Jan 1,1971
Feb 1,1971
Mar 1,1971
Apr 1,1971
May 1,1971
Jun 1,1971
Jul 1,1971
Aug 1,1971
Sep 1,1971
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

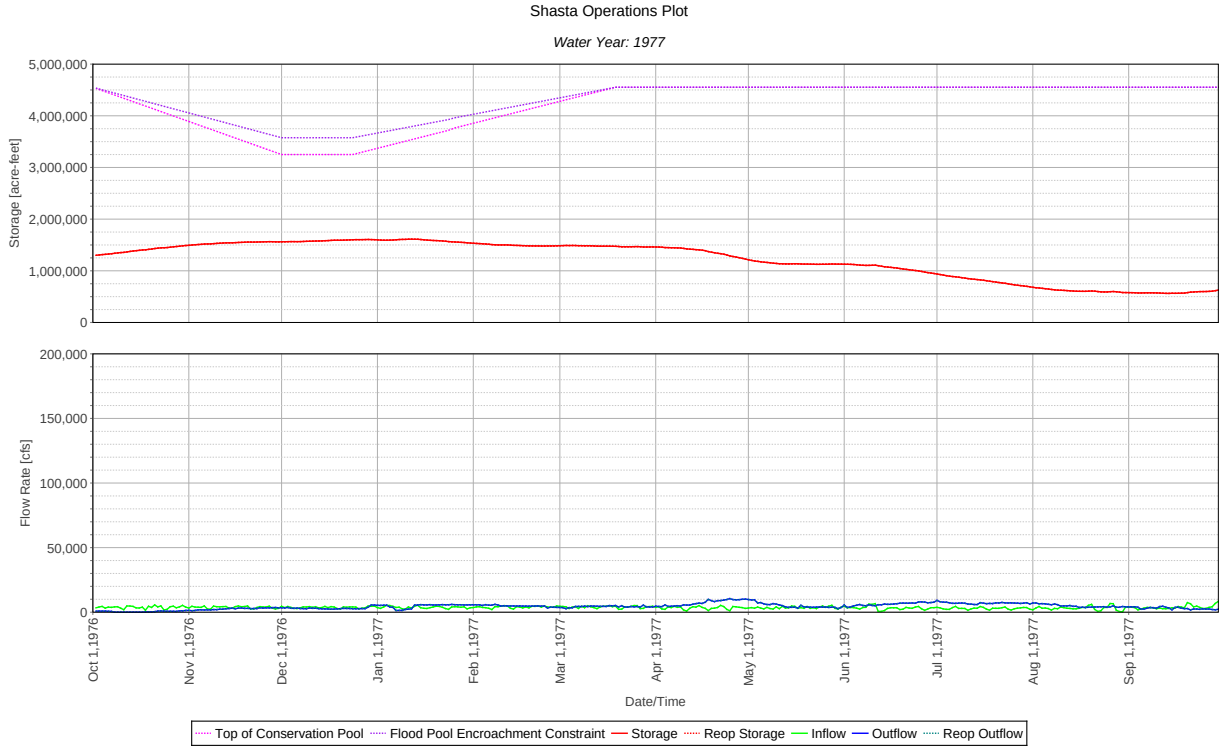

Shasta Operations Plot
Water Year: 1972
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 52 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1971
Nov 1,1971
Dec 1,1971
Jan 1,1972
Feb 1,1972
Mar 1,1972
Apr 1,1972
May 1,1972
Jun 1,1972
Jul 1,1972
Aug 1,1972
Sep 1,1972
Date/Time

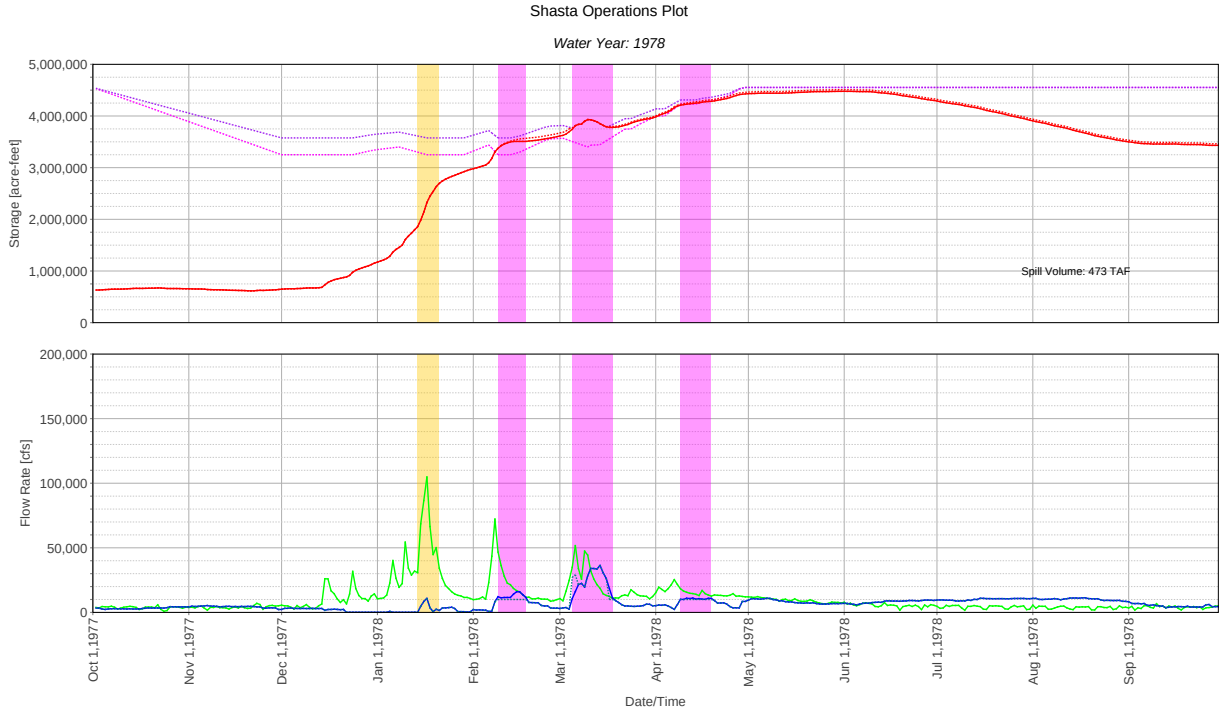

Shasta Operations Plot
Water Year: 1973
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 802 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1972
Nov 1,1972
Dec 1,1972
Jan 1,1973
Feb 1,1973
Mar 1,1973
Apr 1,1973
May 1,1973
Jun 1,1973
Jul 1,1973
Aug 1,1973
Sep 1,1973
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

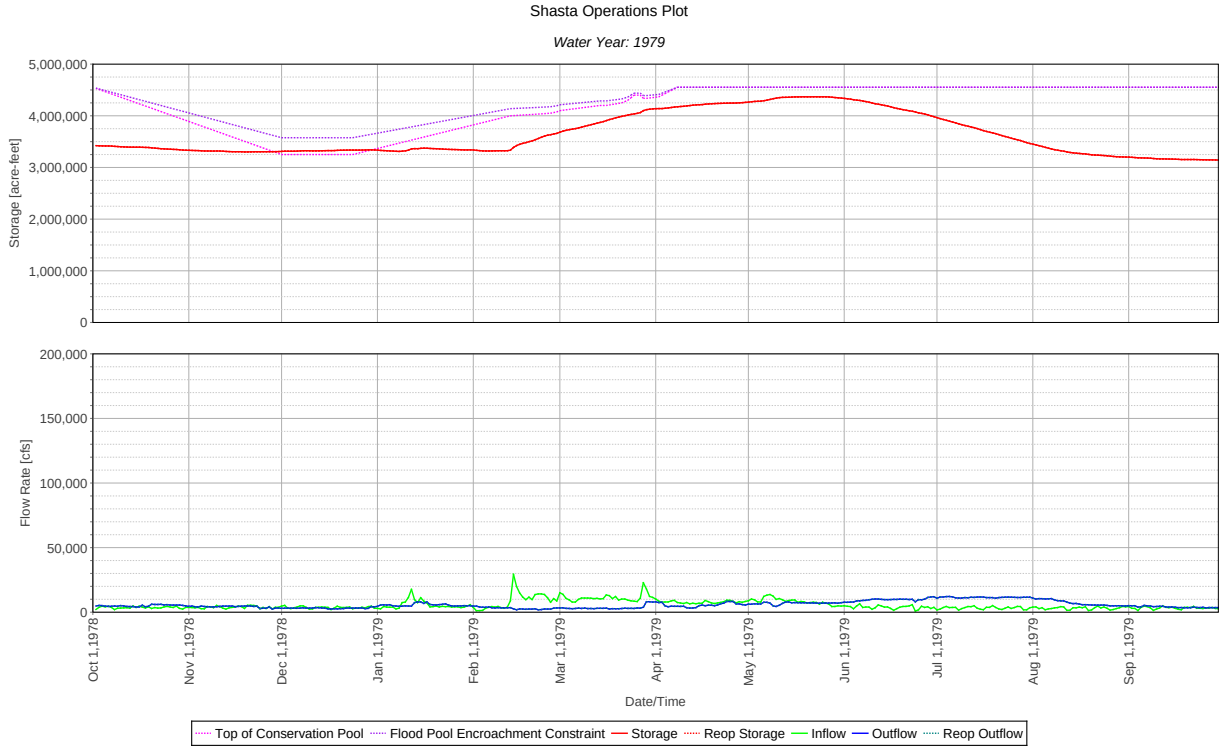

Shasta Operations Plot
Water Year: 1974
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 4279 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1973
Nov 1,1973
Dec 1,1973
Jan 1,1974
Feb 1,1974
Mar 1,1974
Apr 1,1974
May 1,1974
Jun 1,1974
Jul 1,1974
Aug 1,1974
Sep 1,1974
Date/Time

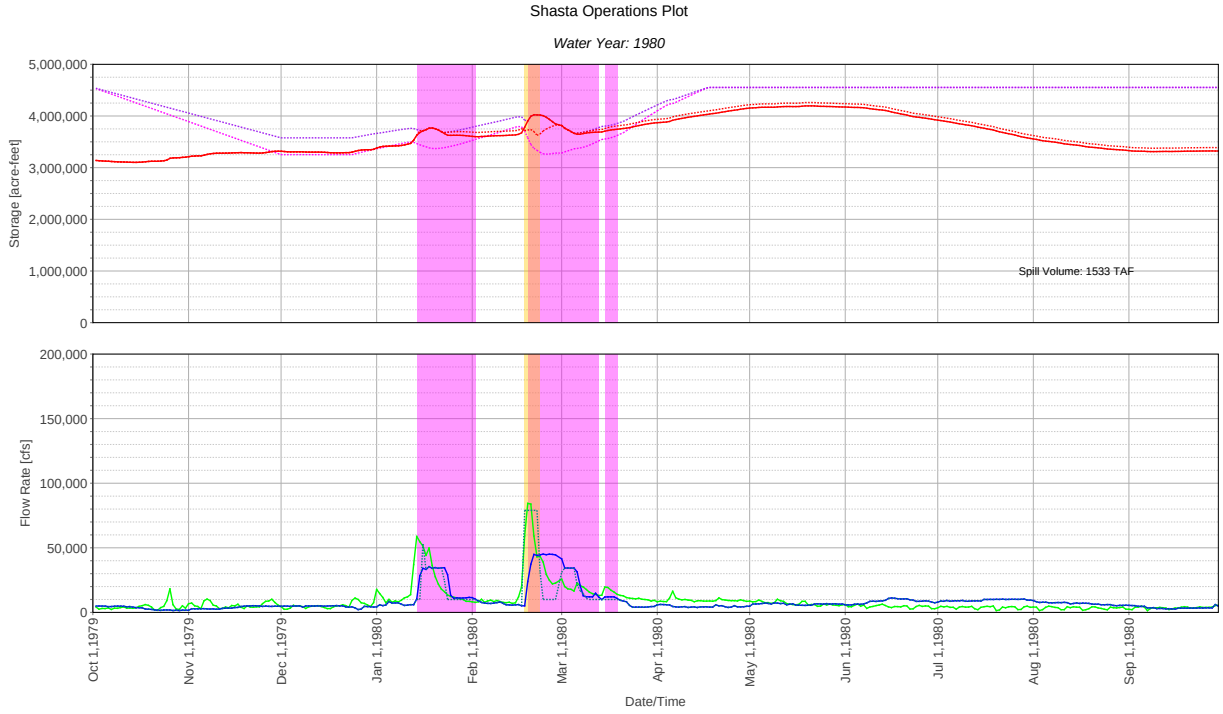

Shasta Operations Plot
Water Year: 1975
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 579 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1974
Nov 1,1974
Dec 1,1974
Jan 1,1975
Feb 1,1975
Mar 1,1975
Apr 1,1975
May 1,1975
Jun 1,1975
Jul 1,1975
Aug 1,1975
Sep 1,1975
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

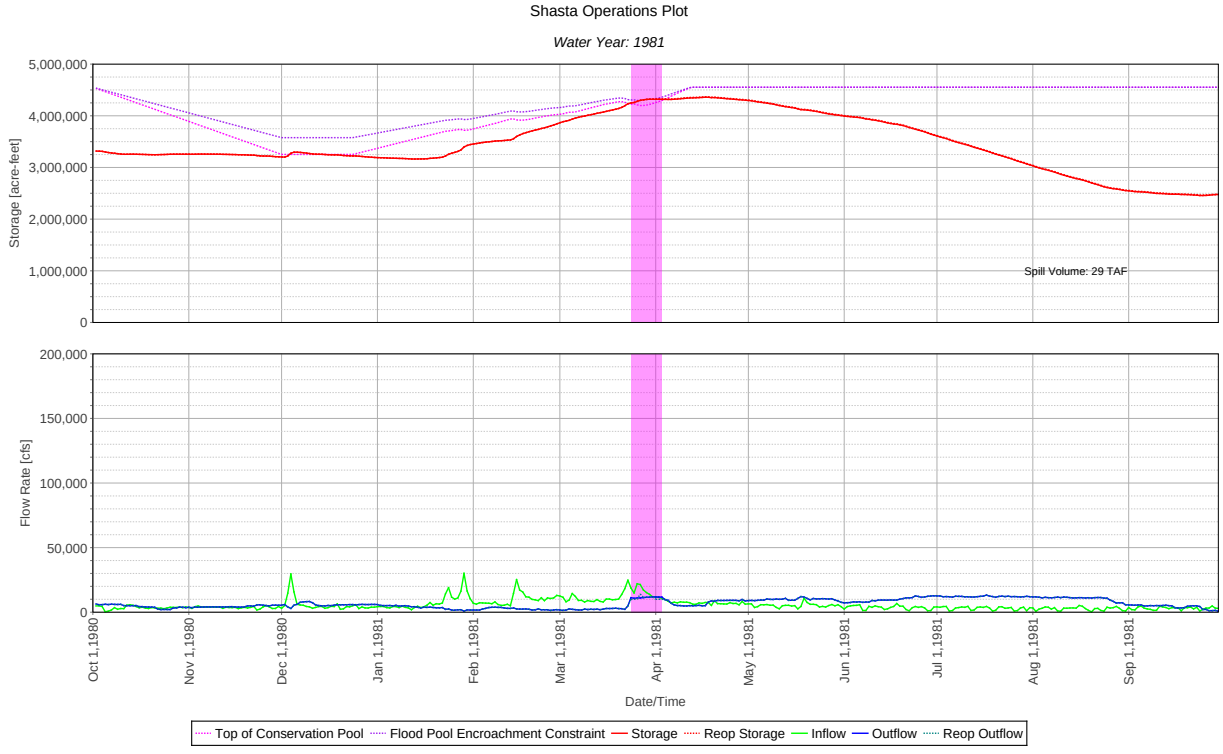

Shasta Operations Plot
Water Year: 1976
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1975
Nov 1,1975
Dec 1,1975
Jan 1,1976
Feb 1,1976
Mar 1,1976
Apr 1,1976
May 1,1976
Jun 1,1976
Jul 1,1976
Aug 1,1976
Sep 1,1976
Date/Time

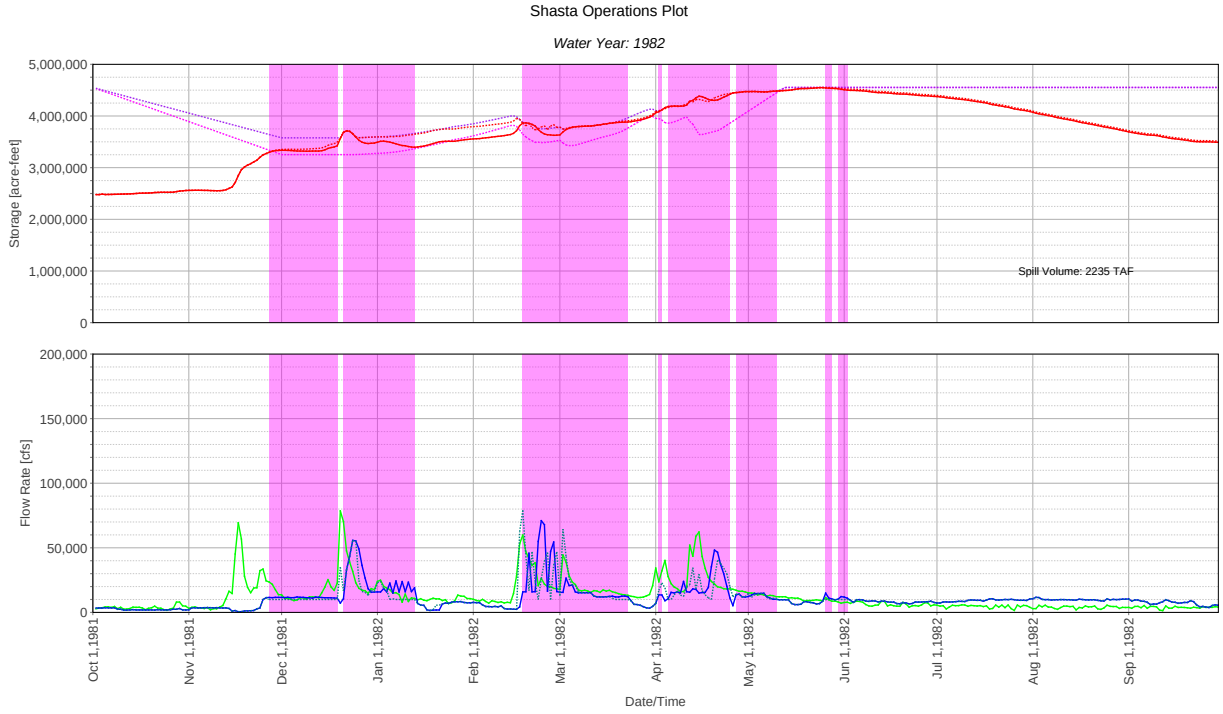

Shasta Operations Plot
Water Year: 1977
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1976
Nov 1,1976
Dec 1,1976
Jan 1,1977
Feb 1,1977
Mar 1,1977
Apr 1,1977
May 1,1977
Jun 1,1977
Jul 1,1977
Aug 1,1977
Sep 1,1977
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

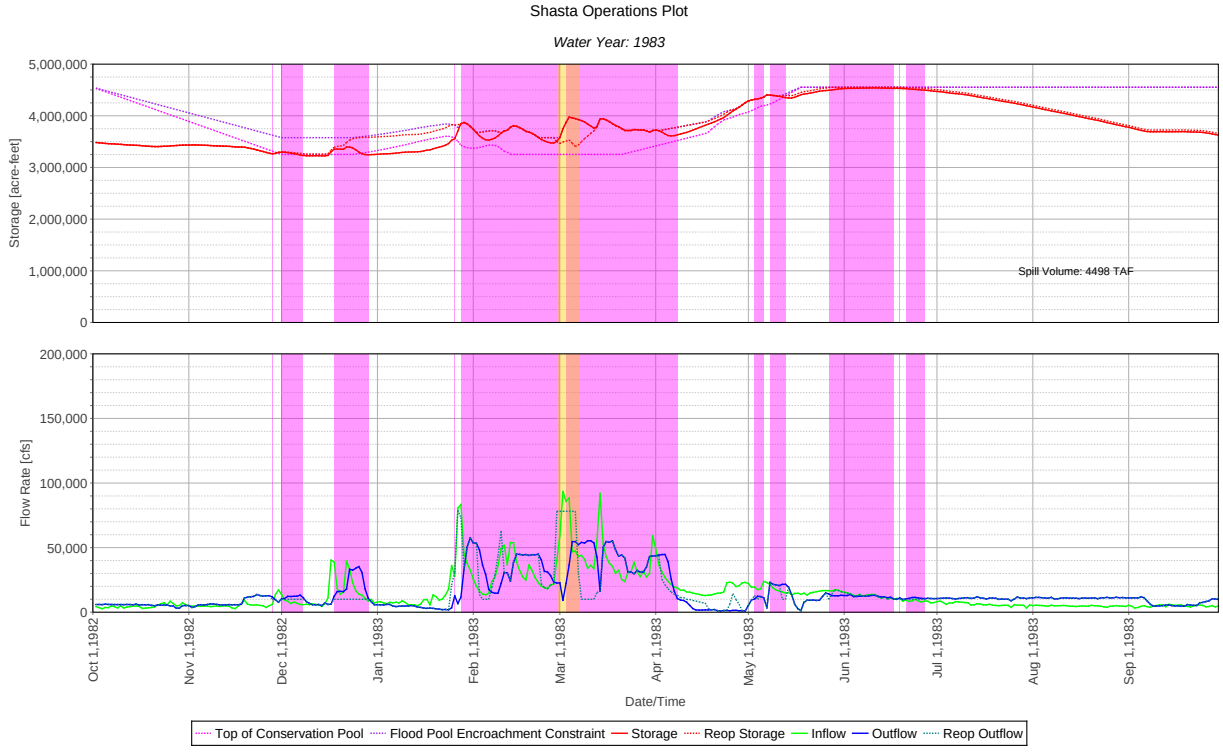

Shasta Operations Plot
Water Year: 1978
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 473 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1977
Nov 1,1977
Dec 1,1977
Jan 1,1978
Feb 1,1978
Mar 1,1978
Apr 1,1978
May 1,1978
Jun 1,1978
Jul 1,1978
Aug 1,1978
Sep 1,1978
Date/Time

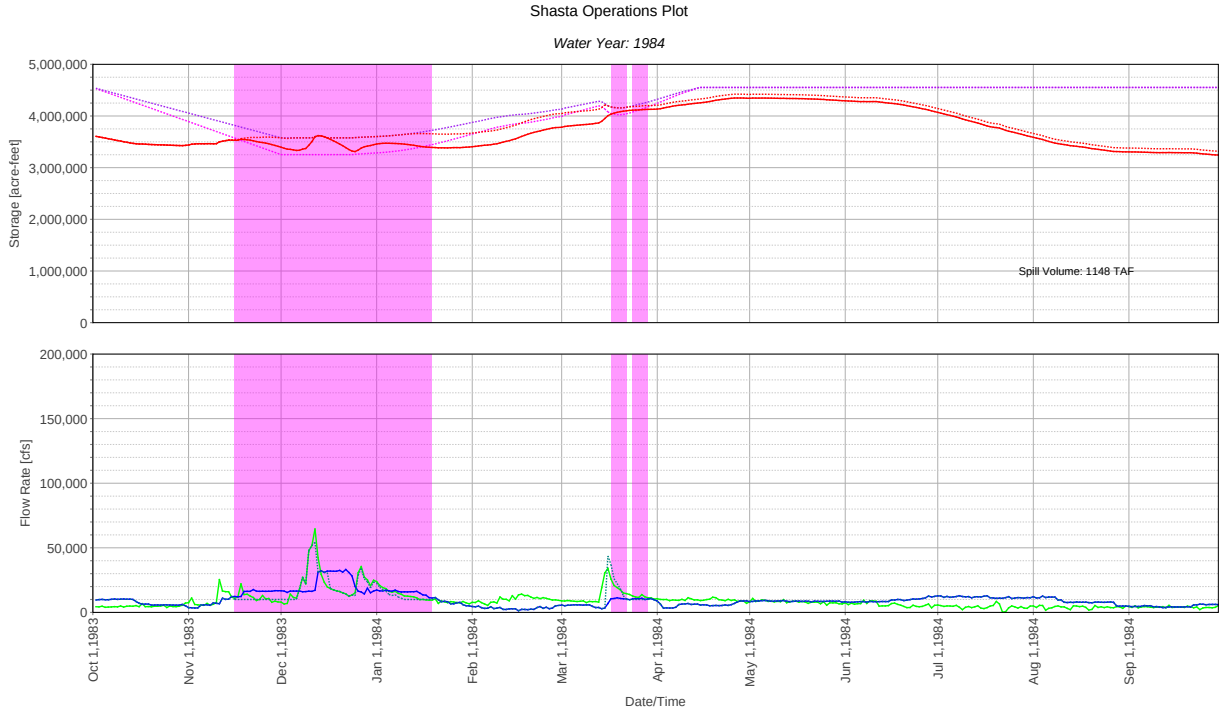

Shasta Operations Plot
Water Year: 1979
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1978
Nov 1,1978
Dec 1,1978
Jan 1,1979
Feb 1,1979
Mar 1,1979
Apr 1,1979
May 1,1979
Jun 1,1979
Jul 1,1979
Aug 1,1979
Sep 1,1979
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

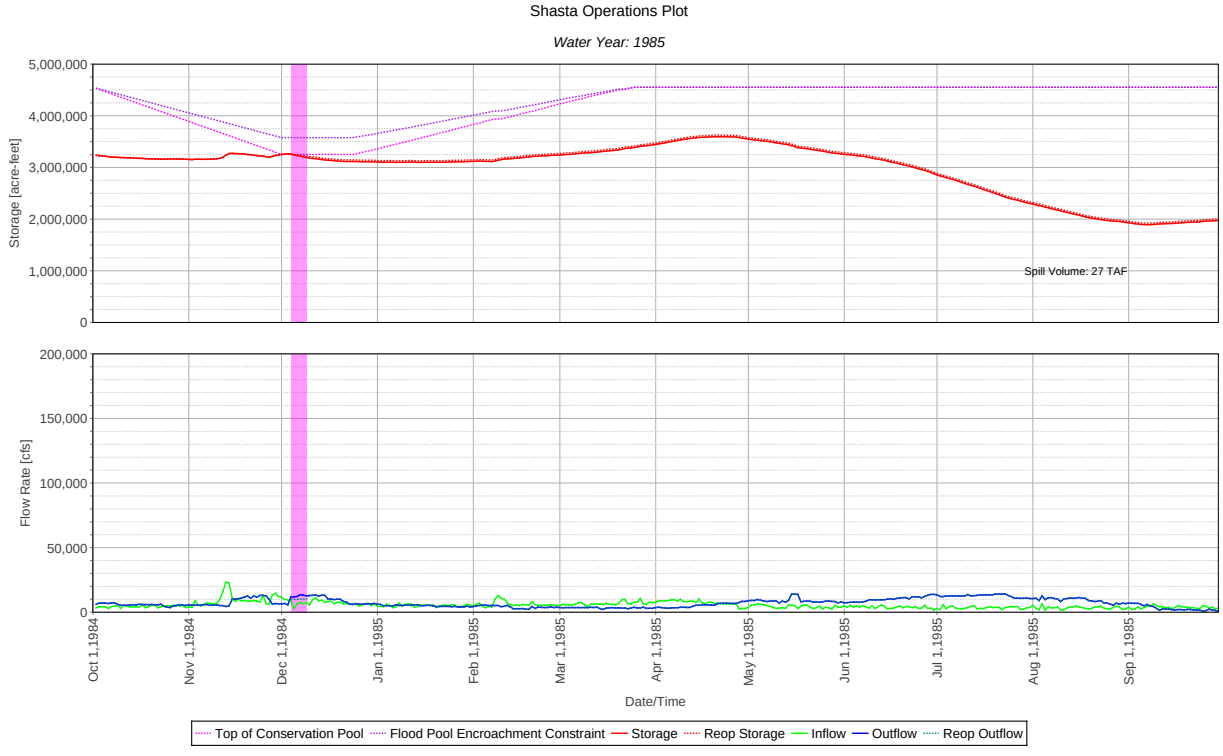

Shasta Operations Plot
Water Year: 1980
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1533 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1979
Nov 1,1979
Dec 1,1979
Jan 1,1980
Feb 1,1980
Mar 1,1980
Apr 1,1980
May 1,1980
Jun 1,1980
Jul 1,1980
Aug 1,1980
Sep 1,1980
Date/Time

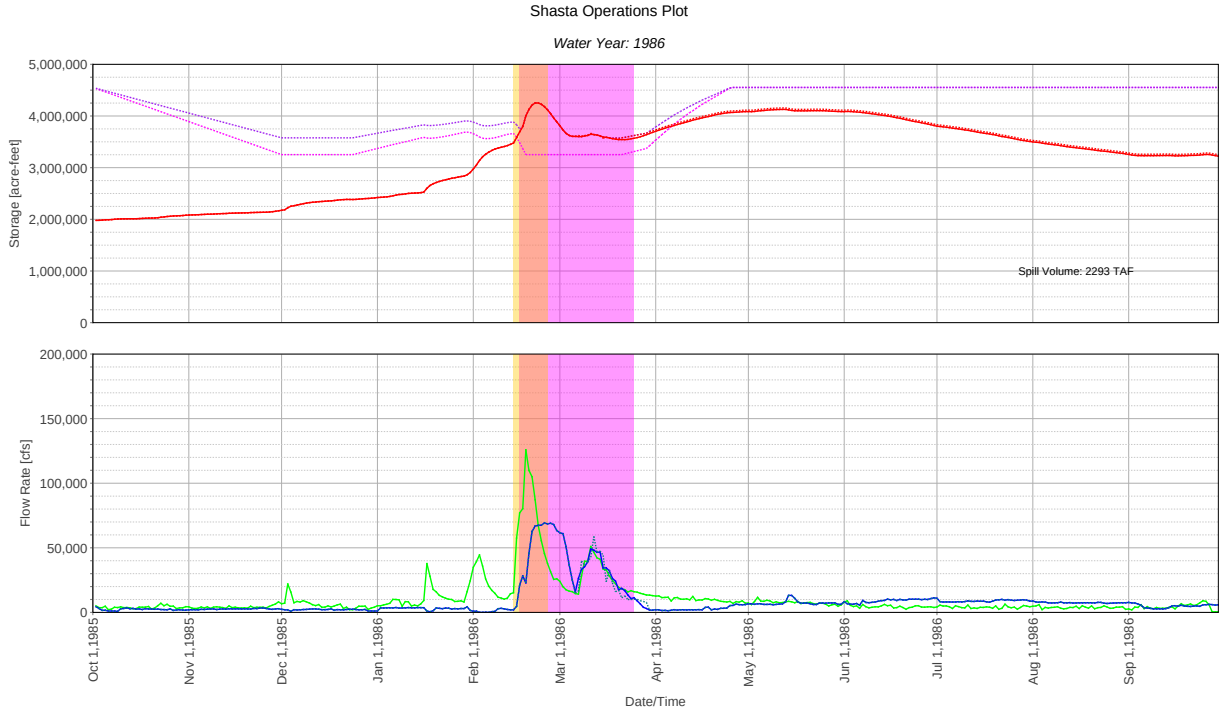

Shasta Operations Plot
Water Year: 1981
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 29 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1980
Nov 1,1980
Dec 1,1980
Jan 1,1981
Feb 1,1981
Mar 1,1981
Apr 1,1981
May 1,1981
Jun 1,1981
Jul 1,1981
Aug 1,1981
Sep 1,1981
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

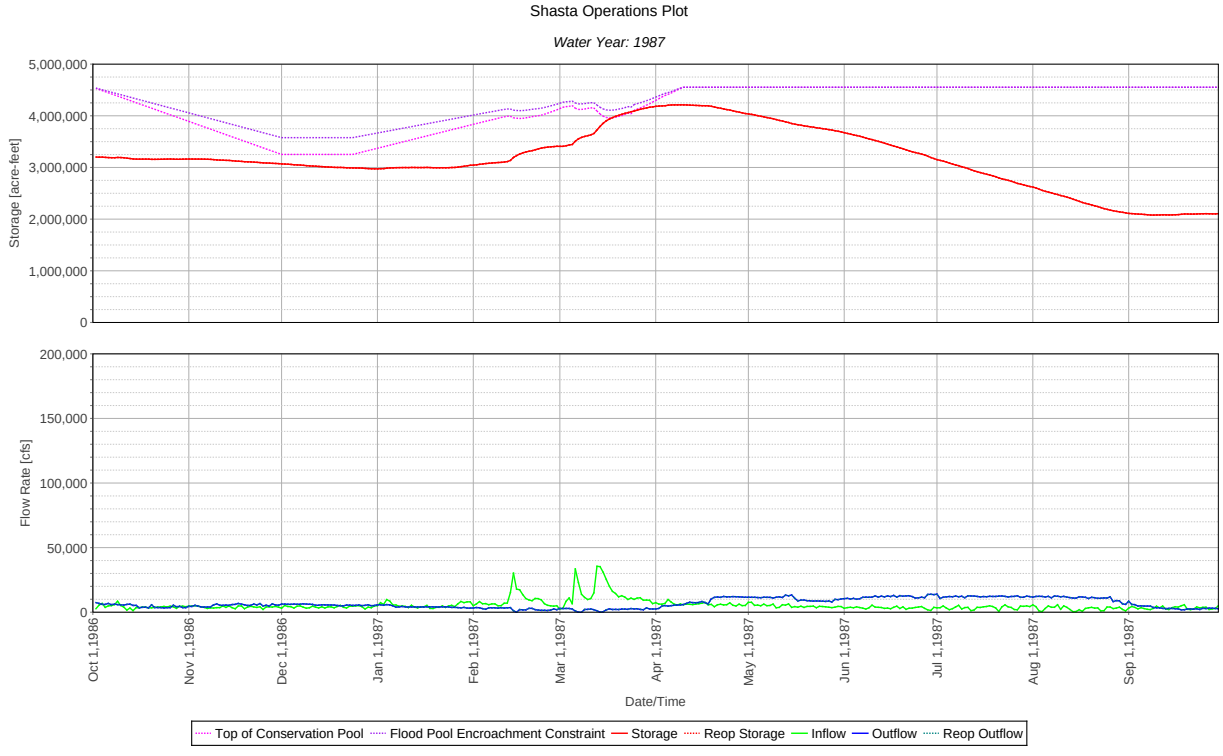

Shasta Operations Plot
Water Year: 1982
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2235 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1981
Nov 1,1981
Dec 1,1981
Jan 1,1982
Feb 1,1982
Mar 1,1982
Apr 1,1982
May 1,1982
Jun 1,1982
Jul 1,1982
Aug 1,1982
Sep 1,1982
Date/Time

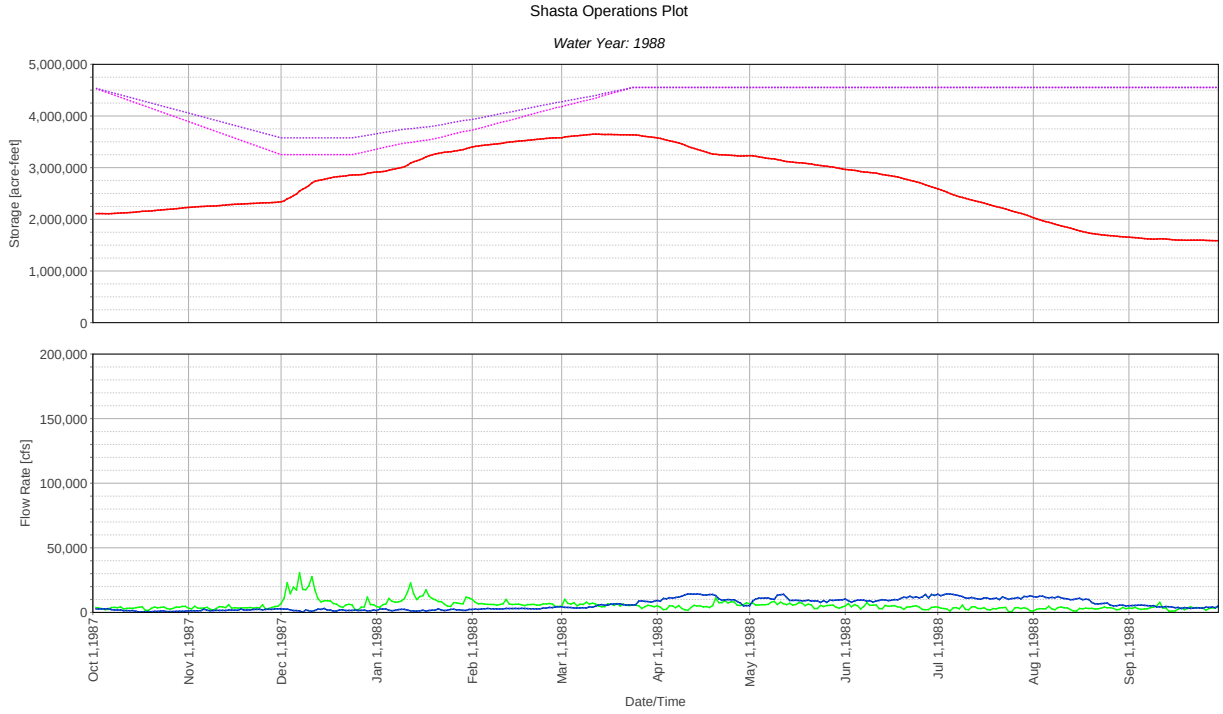

Shasta Operations Plot
Water Year: 1983
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 4498 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1982
Nov 1,1982
Dec 1,1982
Jan 1,1983
Feb 1,1983
Mar 1,1983
Apr 1,1983
May 1,1983
Jun 1,1983
Jul 1,1983
Aug 1,1983
Sep 1,1983
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

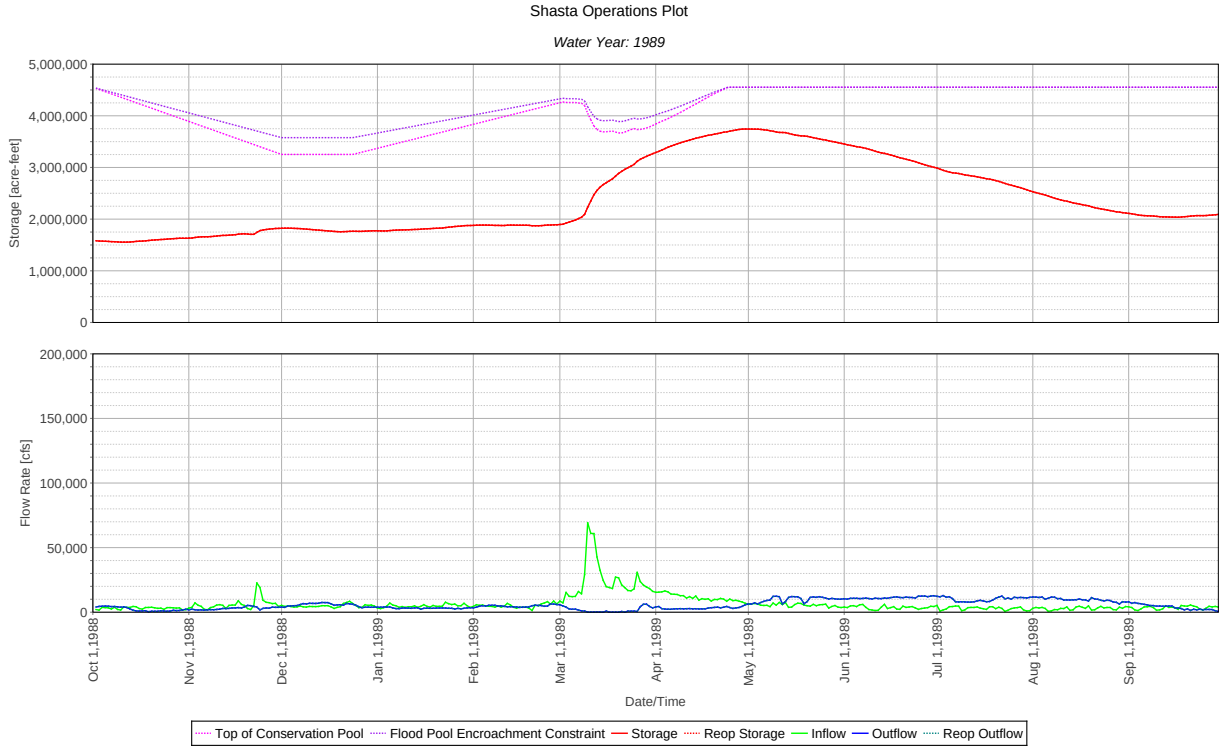

Shasta Operations Plot
Water Year: 1984
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1148 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1983
Nov 1,1983
Dec 1,1983
Jan 1,1984
Feb 1,1984
Mar 1,1984
Apr 1,1984
May 1,1984
Jun 1,1984
Jul 1,1984
Aug 1,1984
Sep 1,1984
Date/Time

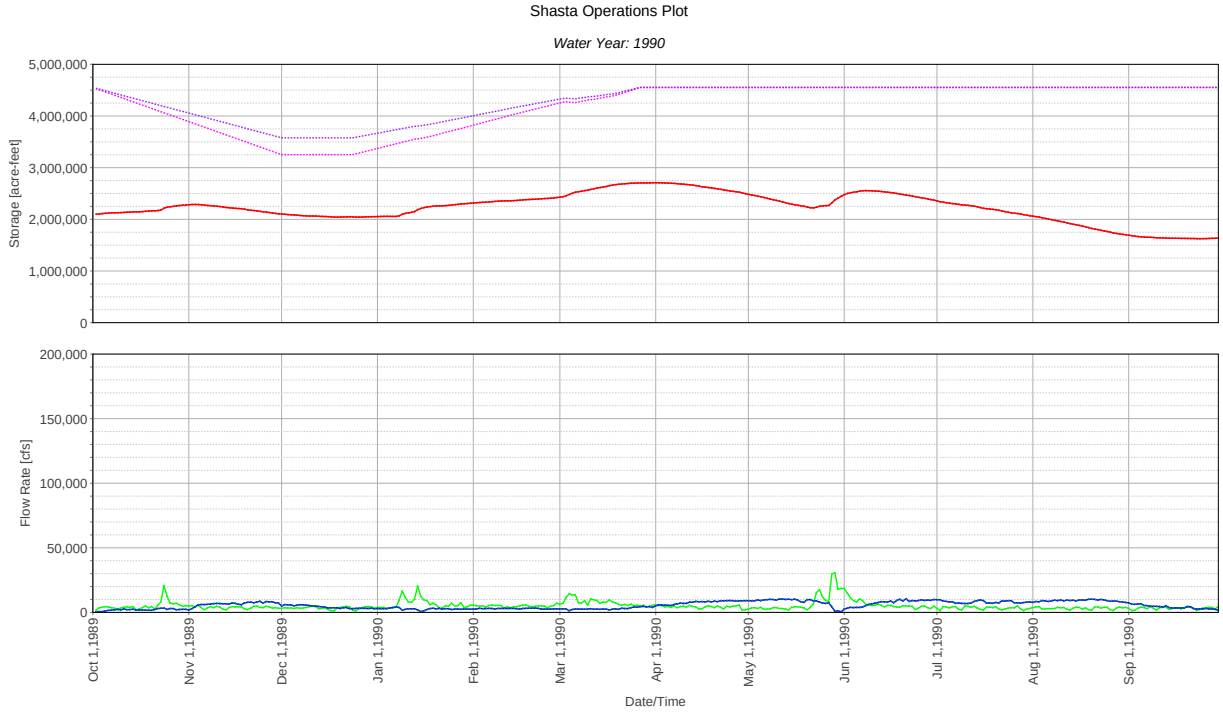

Shasta Operations Plot
Water Year: 1985
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 27 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1984
Nov 1,1984
Dec 1,1984
Jan 1,1985
Feb 1,1985
Mar 1,1985
Apr 1,1985
May 1,1985
Jun 1,1985
Jul 1,1985
Aug 1,1985
Sep 1,1985
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

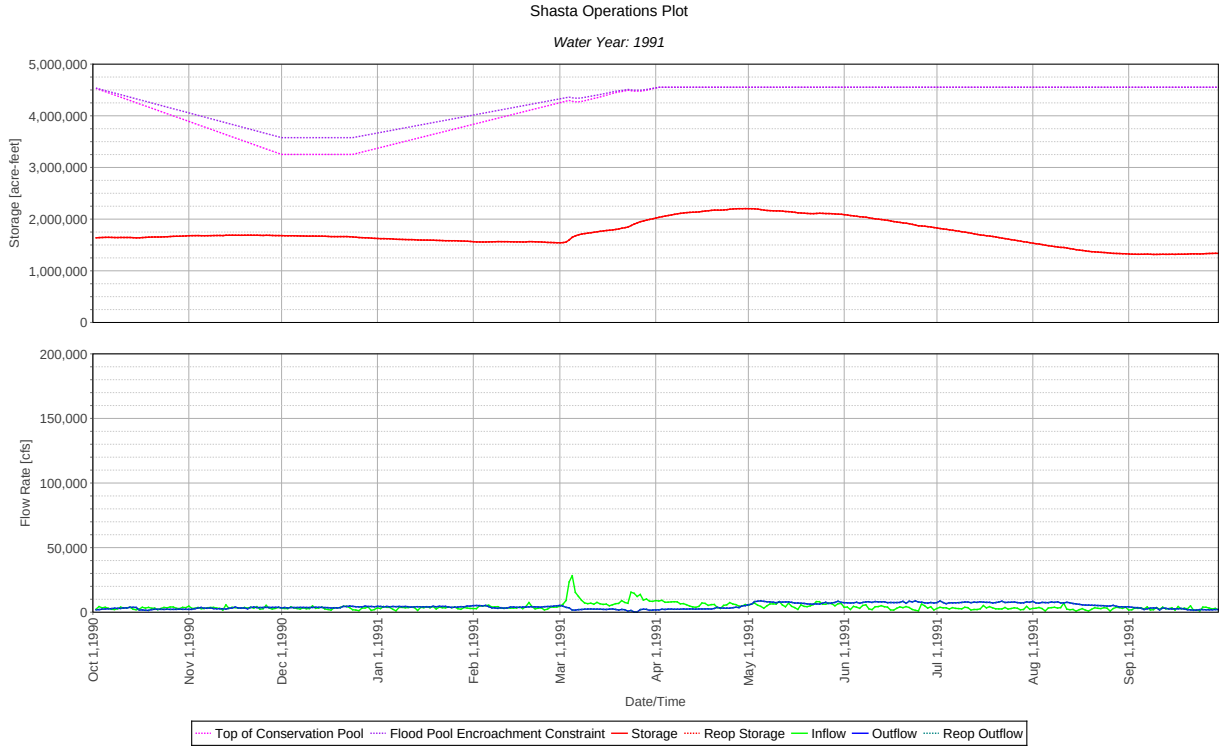

Shasta Operations Plot
Water Year: 1986
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2293 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1985
Nov 1,1985
Dec 1,1985
Jan 1,1986
Feb 1,1986
Mar 1,1986
Apr 1,1986
May 1,1986
Jun 1,1986
Jul 1,1986
Aug 1,1986
Sep 1,1986
Date/Time

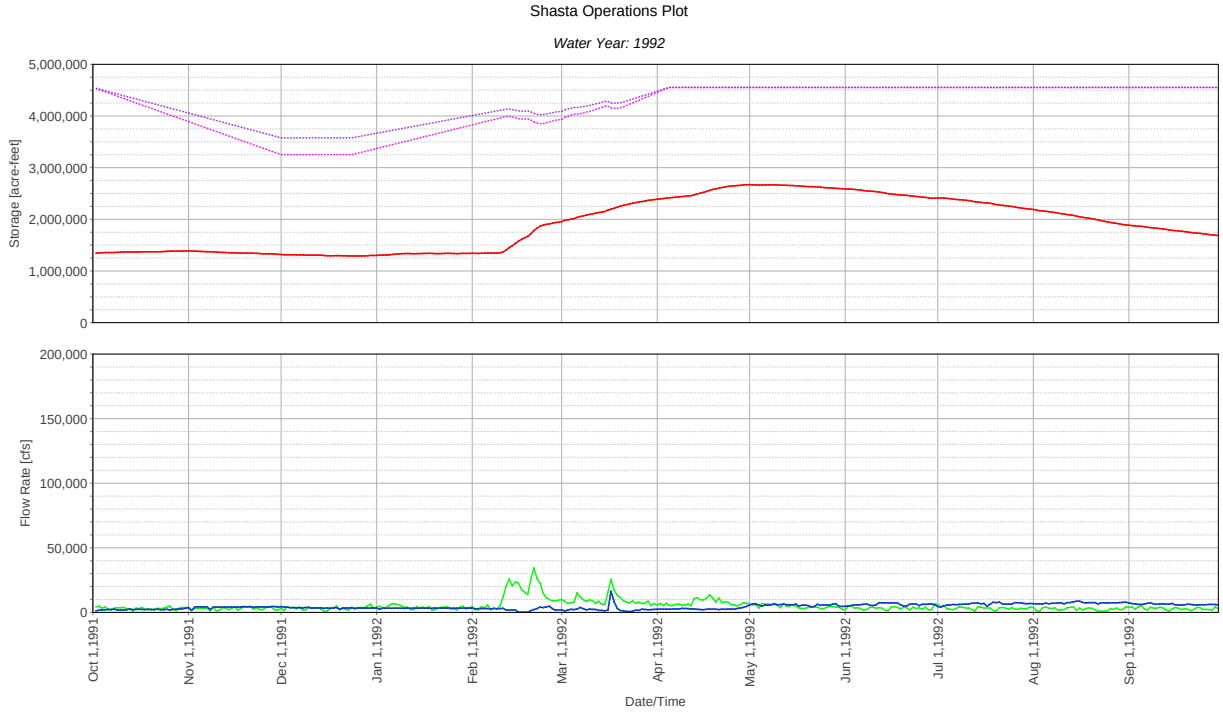

Shasta Operations Plot
Water Year: 1987
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1986
Nov 1,1986
Dec 1,1986
Jan 1,1987
Feb 1,1987
Mar 1,1987
Apr 1,1987
May 1,1987
Jun 1,1987
Jul 1,1987
Aug 1,1987
Sep 1,1987
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

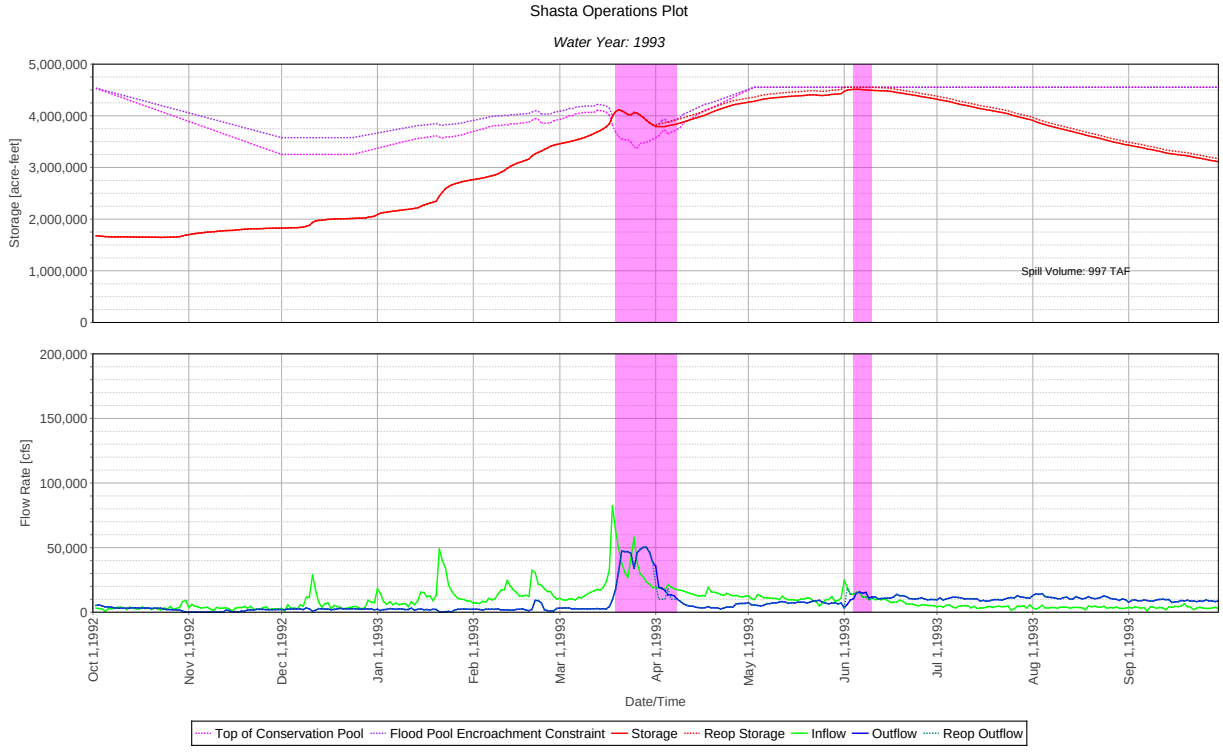

Shasta Operations Plot
Water Year: 1988
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1987
Nov 1,1987
Dec 1,1987
Jan 1,1988
Feb 1,1988
Mar 1,1988
Apr 1,1988
May 1,1988
Jun 1,1988
Jul 1,1988
Aug 1,1988
Sep 1,1988
Date/Time

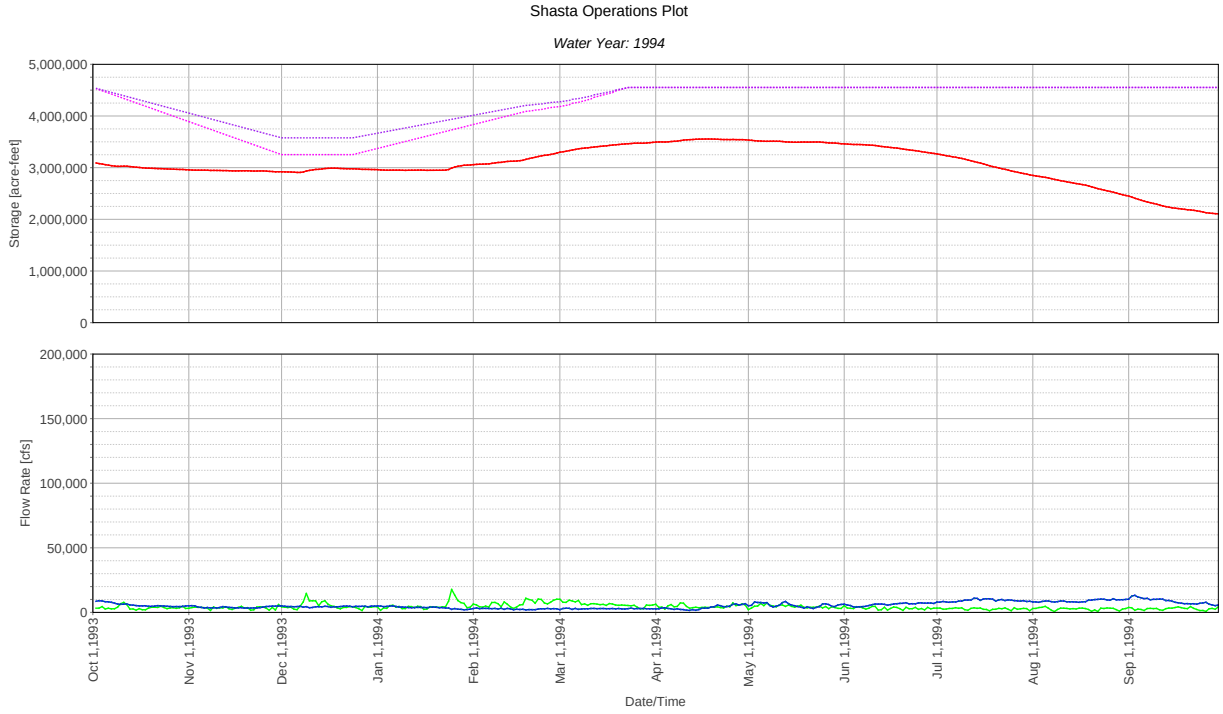

Shasta Operations Plot
Water Year: 1989
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1988
Nov 1,1988
Dec 1,1988
Jan 1,1989
Feb 1,1989
Mar 1,1989
Apr 1,1989
May 1,1989
Jun 1,1989
Jul 1,1989
Aug 1,1989
Sep 1,1989
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

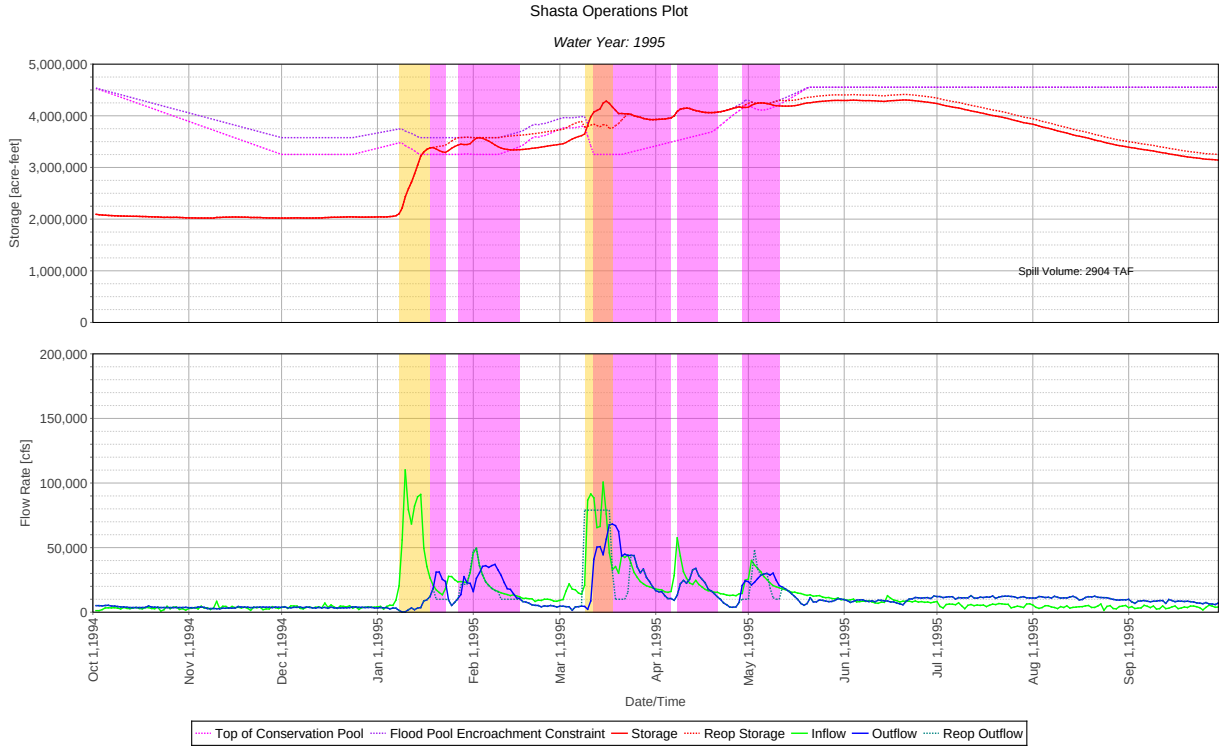

Shasta Operations Plot
Water Year: 1990
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1989
Nov 1,1989
Dec 1,1989
Jan 1,1990
Feb 1,1990
Mar 1,1990
Apr 1,1990
May 1,1990
Jun 1,1990
Jul 1,1990
Aug 1,1990
Sep 1,1990
Date/Time

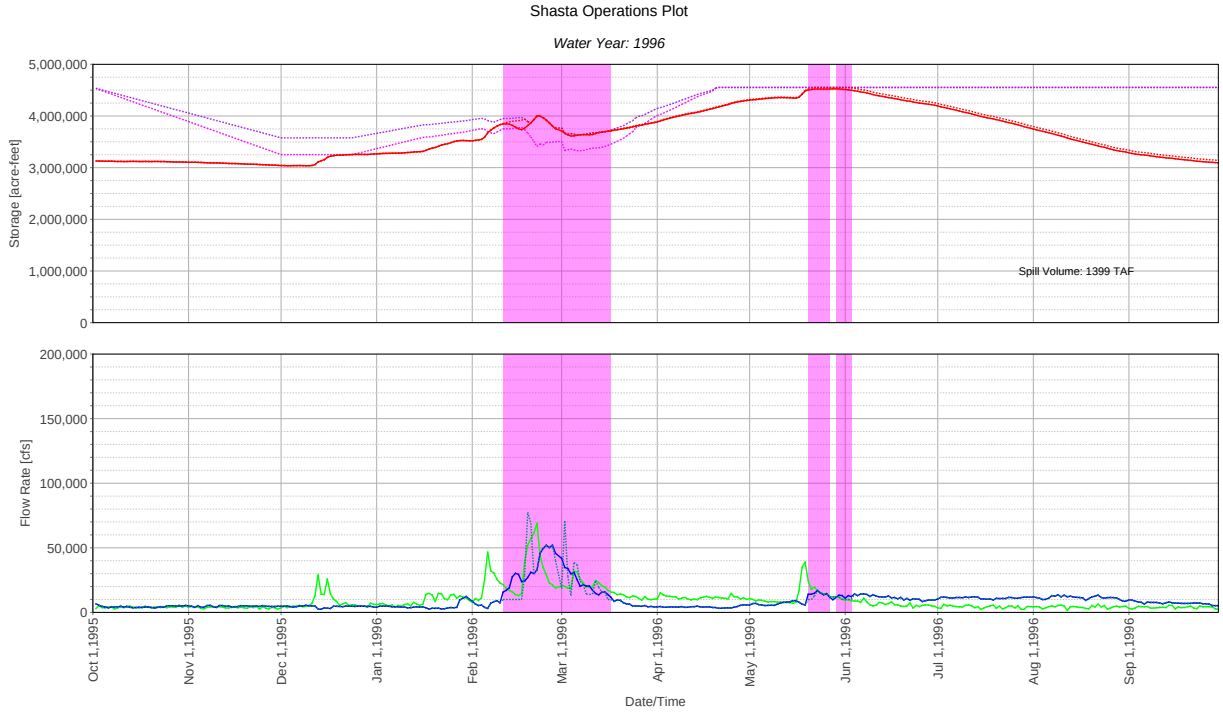

Shasta Operations Plot
Water Year: 1991
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1990
Nov 1,1990
Dec 1,1990
Jan 1,1991
Feb 1,1991
Mar 1,1991
Apr 1,1991
May 1,1991
Jun 1,1991
Jul 1,1991
Aug 1,1991
Sep 1,1991
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

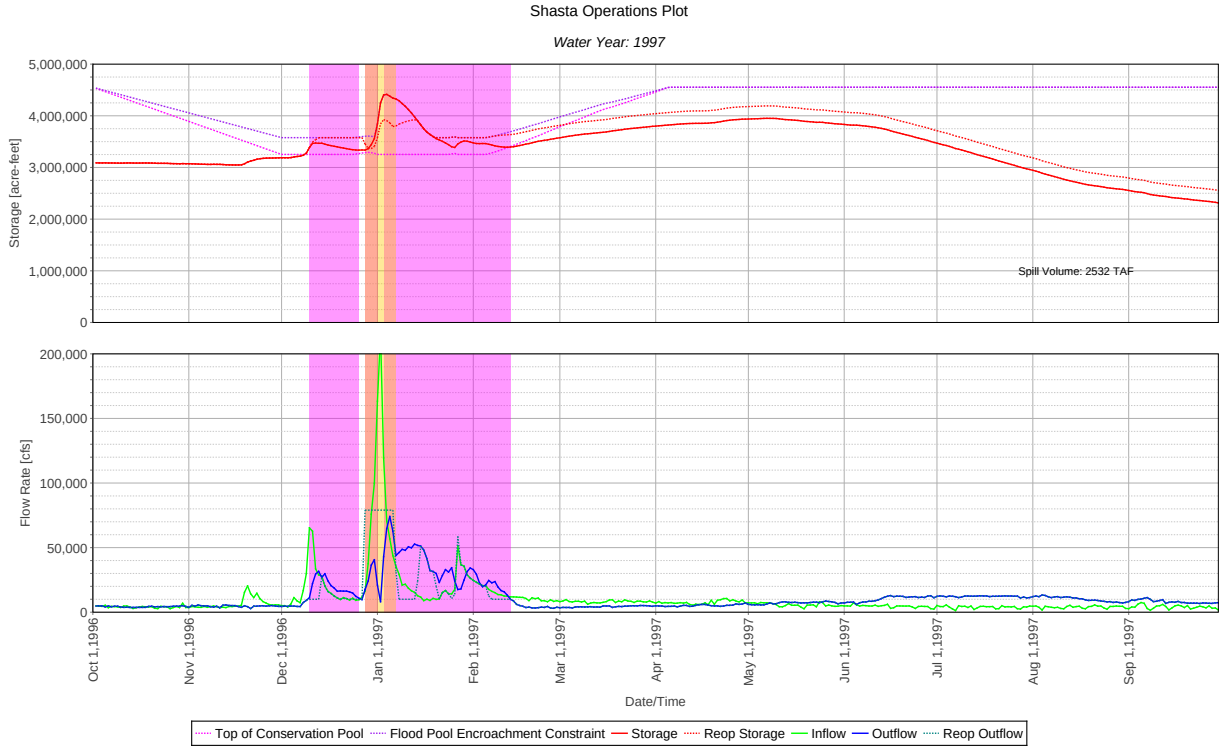

Shasta Operations Plot
Water Year: 1992
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1991
Nov 1,1991
Dec 1,1991
Jan 1,1992
Feb 1,1992
Mar 1,1992
Apr 1,1992
May 1,1992
Jun 1,1992
Jul 1,1992
Aug 1,1992
Sep 1,1992
Date/Time

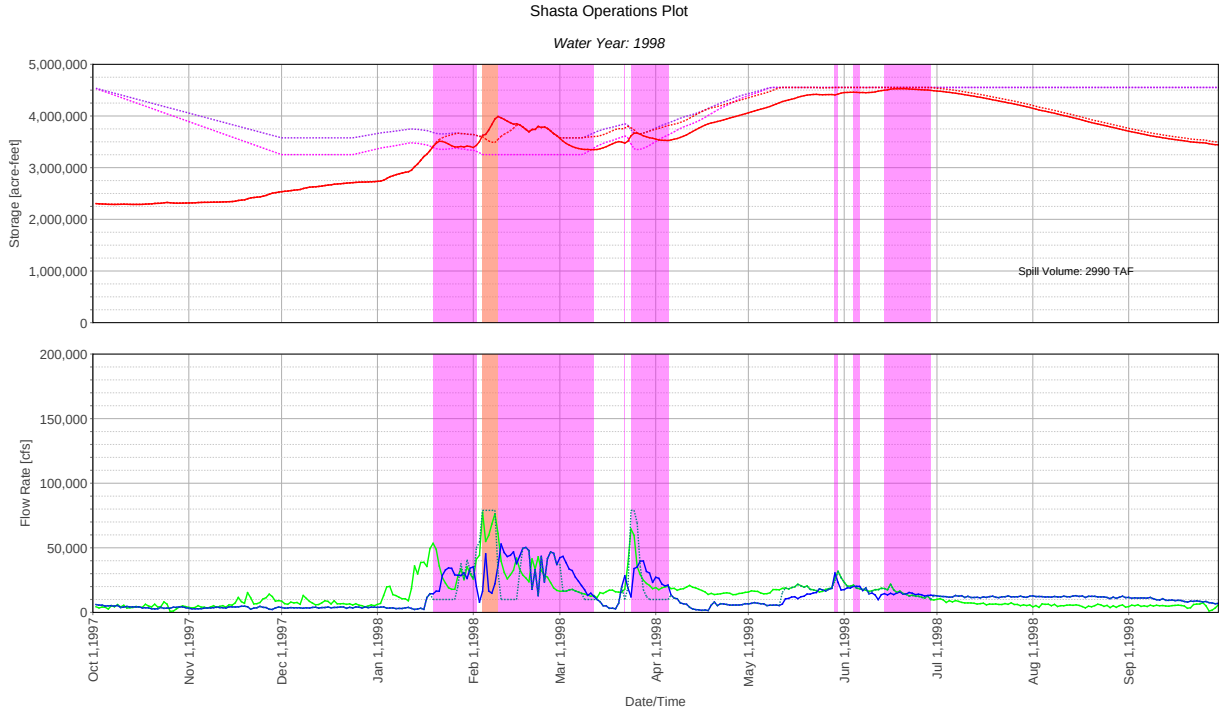

Shasta Operations Plot
Water Year: 1993
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 997 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1992
Nov 1,1992
Dec 1,1992
Jan 1,1993
Feb 1,1993
Mar 1,1993
Apr 1,1993
May 1,1993
Jun 1,1993
Jul 1,1993
Aug 1,1993
Sep 1,1993
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

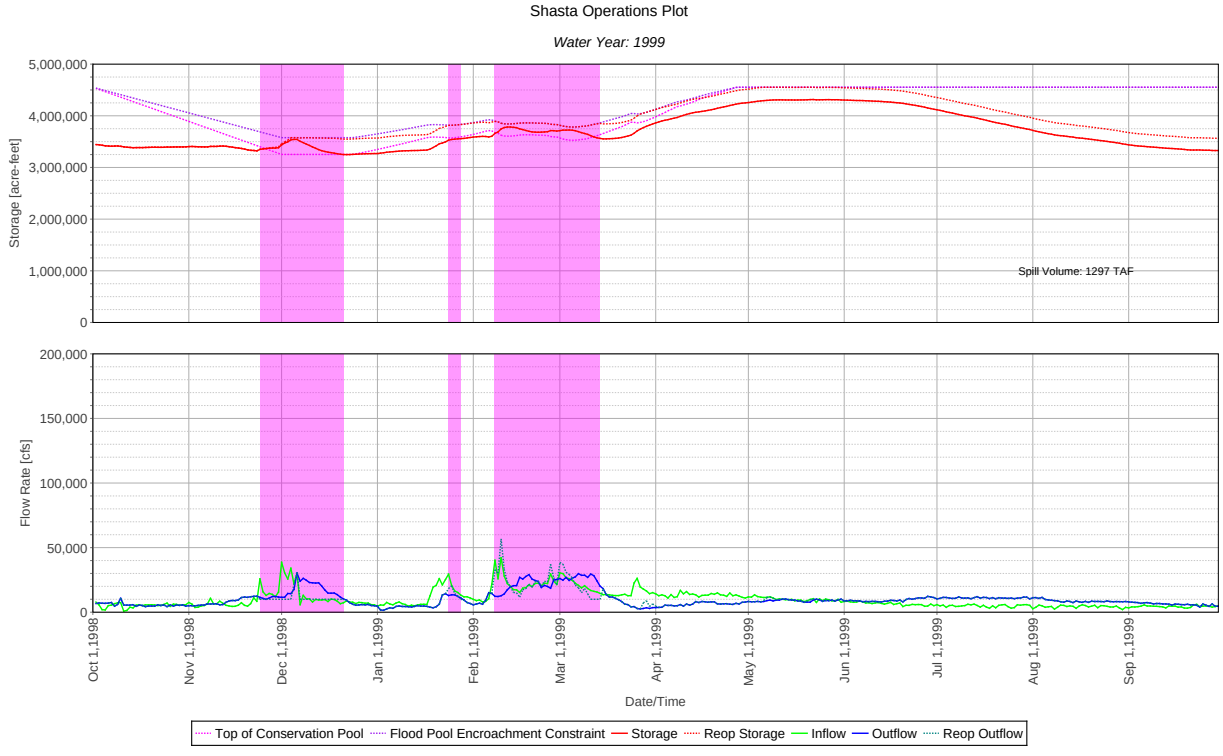

Shasta Operations Plot
Water Year: 1994
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1993
Nov 1,1993
Dec 1,1993
Jan 1,1994
Feb 1,1994
Mar 1,1994
Apr 1,1994
May 1,1994
Jun 1,1994
Jul 1,1994
Aug 1,1994
Sep 1,1994
Date/Time

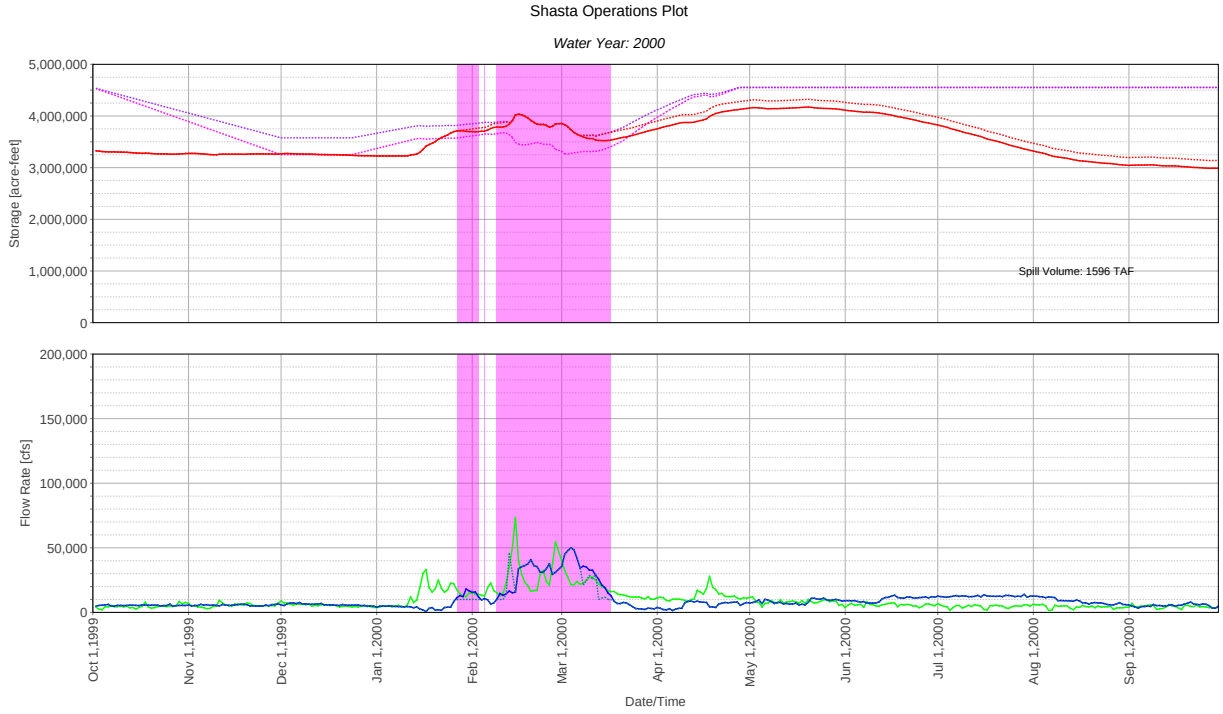

Shasta Operations Plot
Water Year: 1995
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2904 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1994
Nov 1,1994
Dec 1,1994
Jan 1,1995
Feb 1,1995
Mar 1,1995
Apr 1,1995
May 1,1995
Jun 1,1995
Jul 1,1995
Aug 1,1995
Sep 1,1995
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

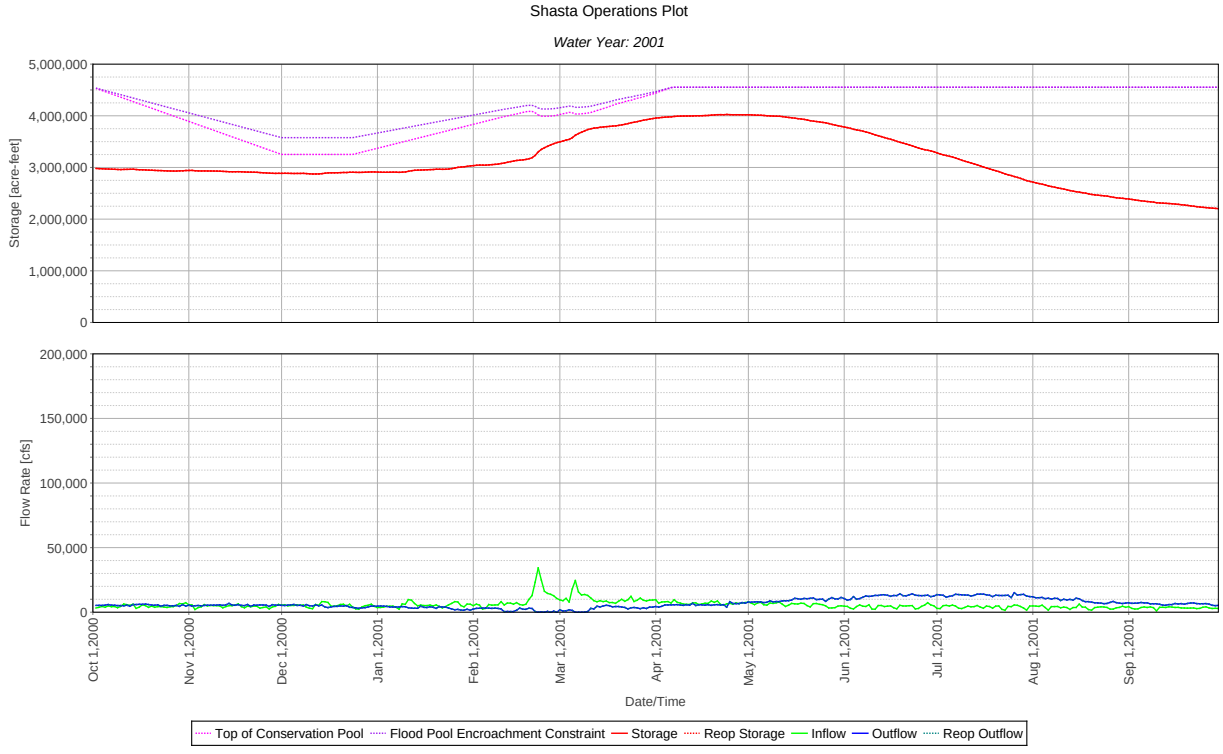

Shasta Operations Plot
Water Year: 1996
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1399 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1995
Nov 1,1995
Dec 1,1995
Jan 1,1996
Feb 1,1996
Mar 1,1996
Apr 1,1996
May 1,1996
Jun 1,1996
Jul 1,1996
Aug 1,1996
Sep 1,1996
Date/Time

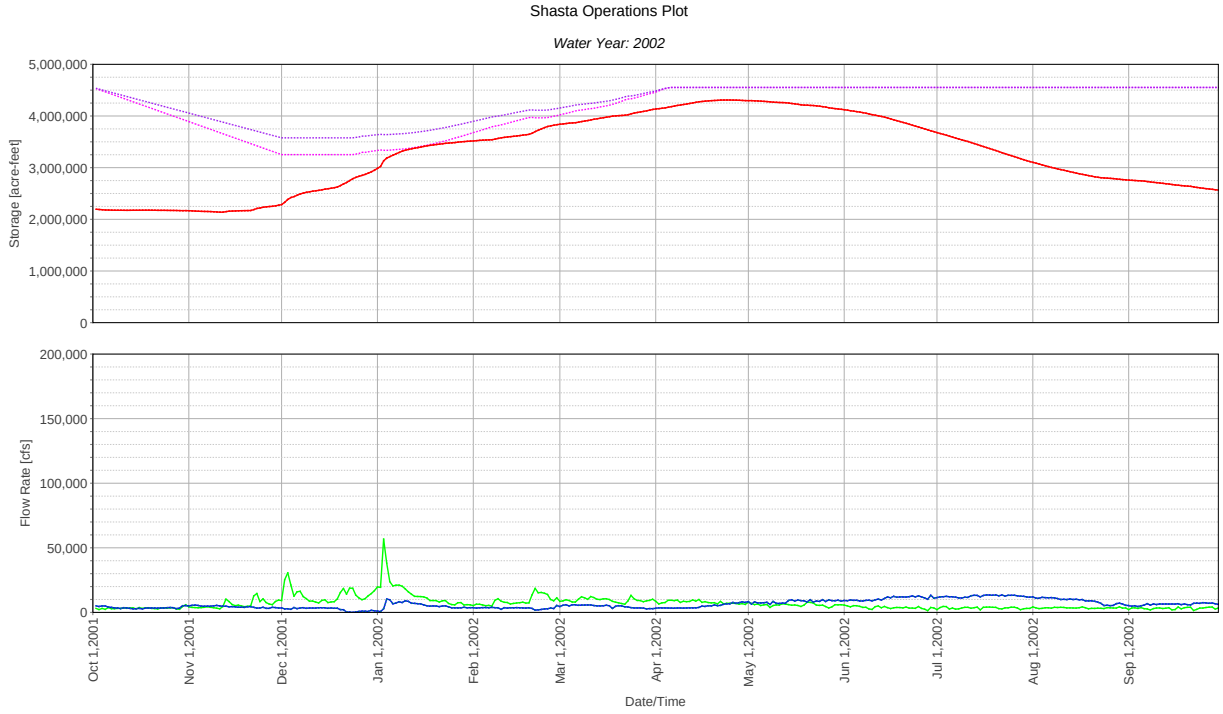

Shasta Operations Plot
Water Year: 1997
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2532 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1996
Nov 1,1996
Dec 1,1996
Jan 1,1997
Feb 1,1997
Mar 1,1997
Apr 1,1997
May 1,1997
Jun 1,1997
Jul 1,1997
Aug 1,1997
Sep 1,1997
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

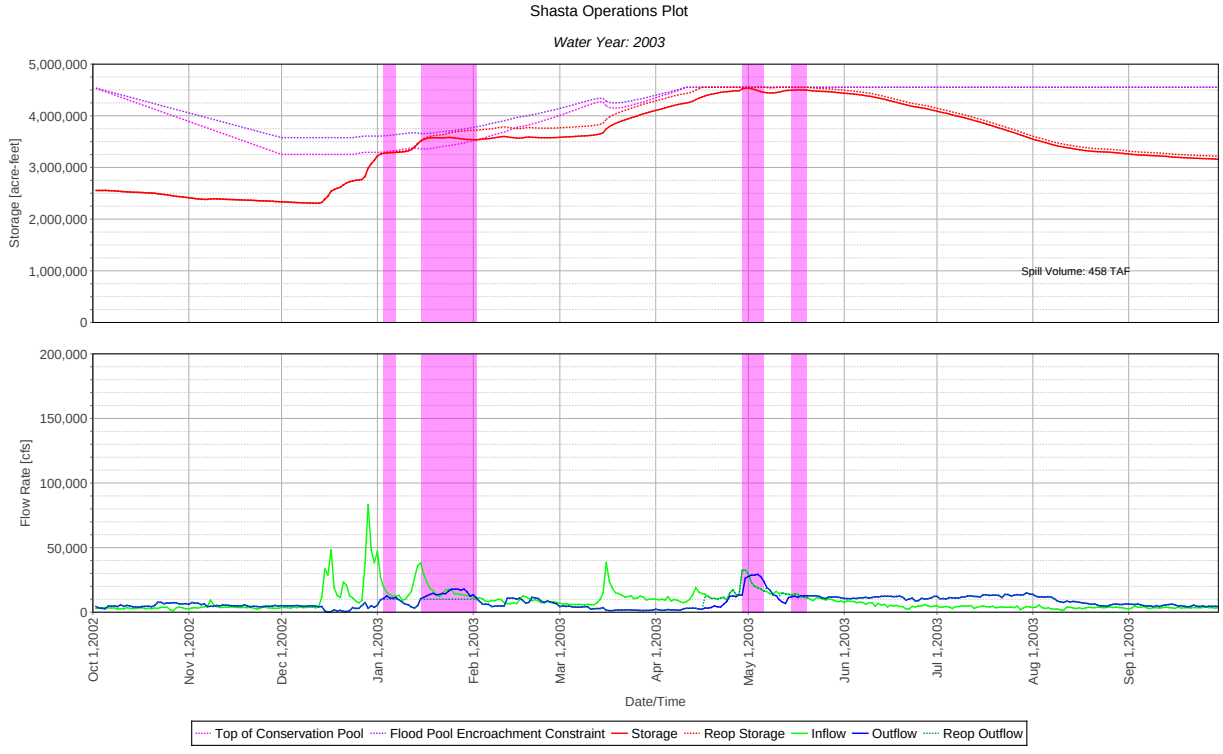

Shasta Operations Plot
Water Year: 1998
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2990 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1997
Nov 1,1997
Dec 1,1997
Jan 1,1998
Feb 1,1998
Mar 1,1998
Apr 1,1998
May 1,1998
Jun 1,1998
Jul 1,1998
Aug 1,1998
Sep 1,1998
Date/Time

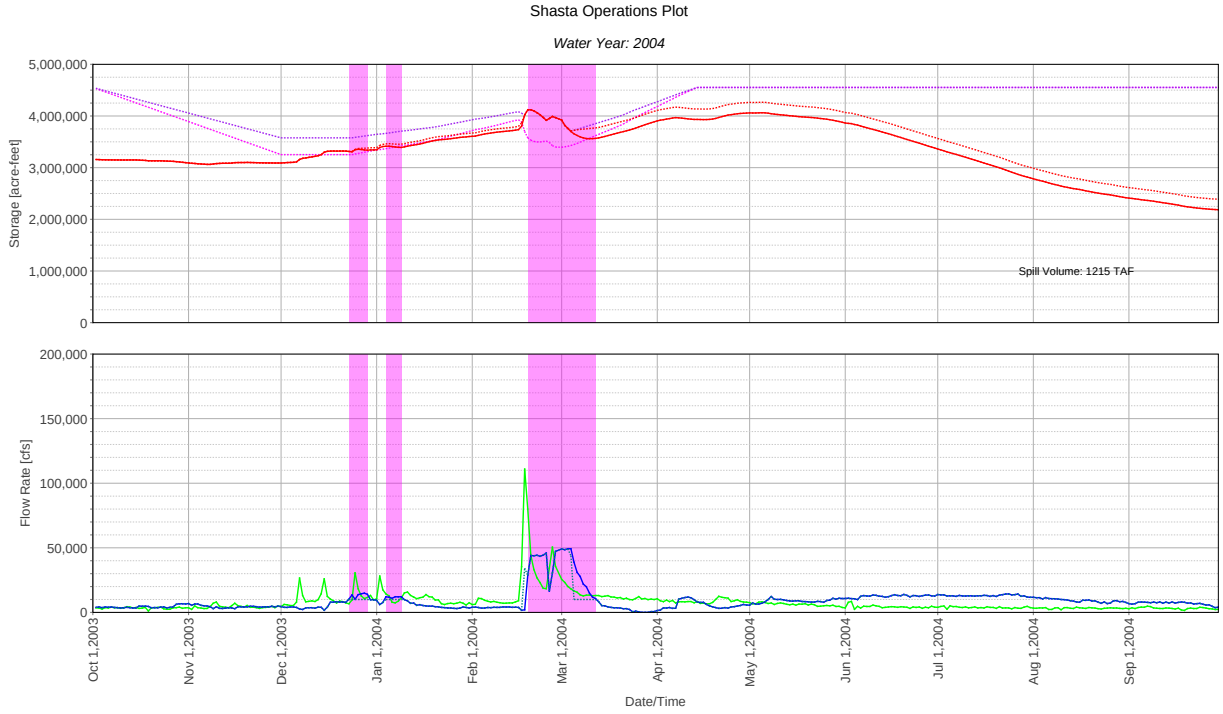

Shasta Operations Plot
Water Year: 1999
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1297 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1998
Nov 1,1998
Dec 1,1998
Jan 1,1999
Feb 1,1999
Mar 1,1999
Apr 1,1999
May 1,1999
Jun 1,1999
Jul 1,1999
Aug 1,1999
Sep 1,1999
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

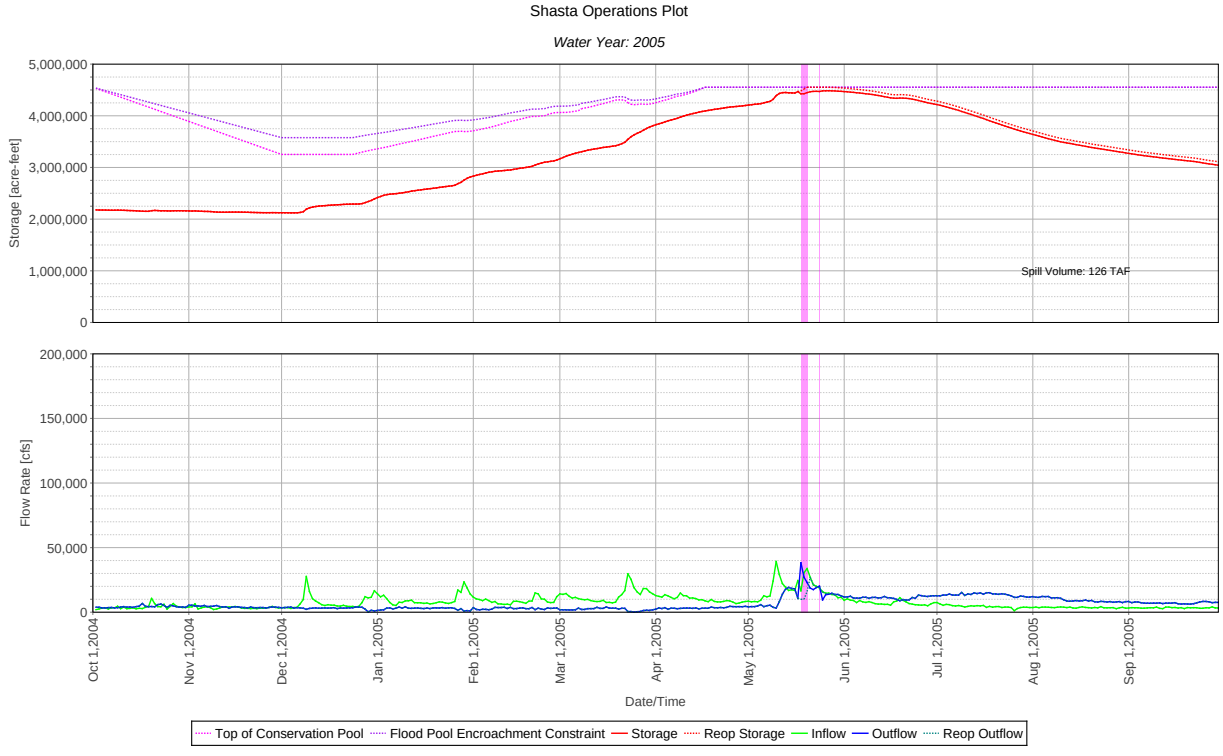

Shasta Operations Plot
Water Year: 2000
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1596 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1999
Nov 1,1999
Dec 1,1999
Jan 1,2000
Feb 1,2000
Mar 1,2000
Apr 1,2000
May 1,2000
Jun 1,2000
Jul 1,2000
Aug 1,2000
Sep 1,2000
Date/Time

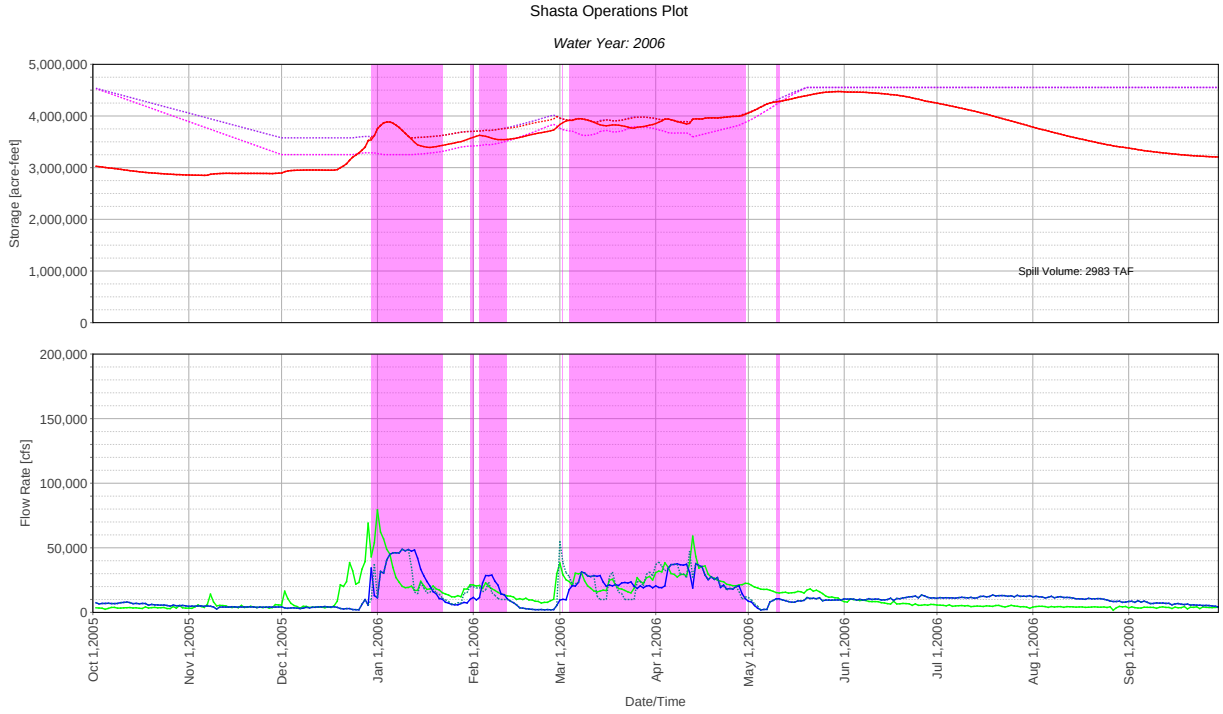

Shasta Operations Plot
Water Year: 2001
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2000
Nov 1,2000
Dec 1,2000
Jan 1,2001
Feb 1,2001
Mar 1,2001
Apr 1,2001
May 1,2001
Jun 1,2001
Jul 1,2001
Aug 1,2001
Sep 1,2001
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

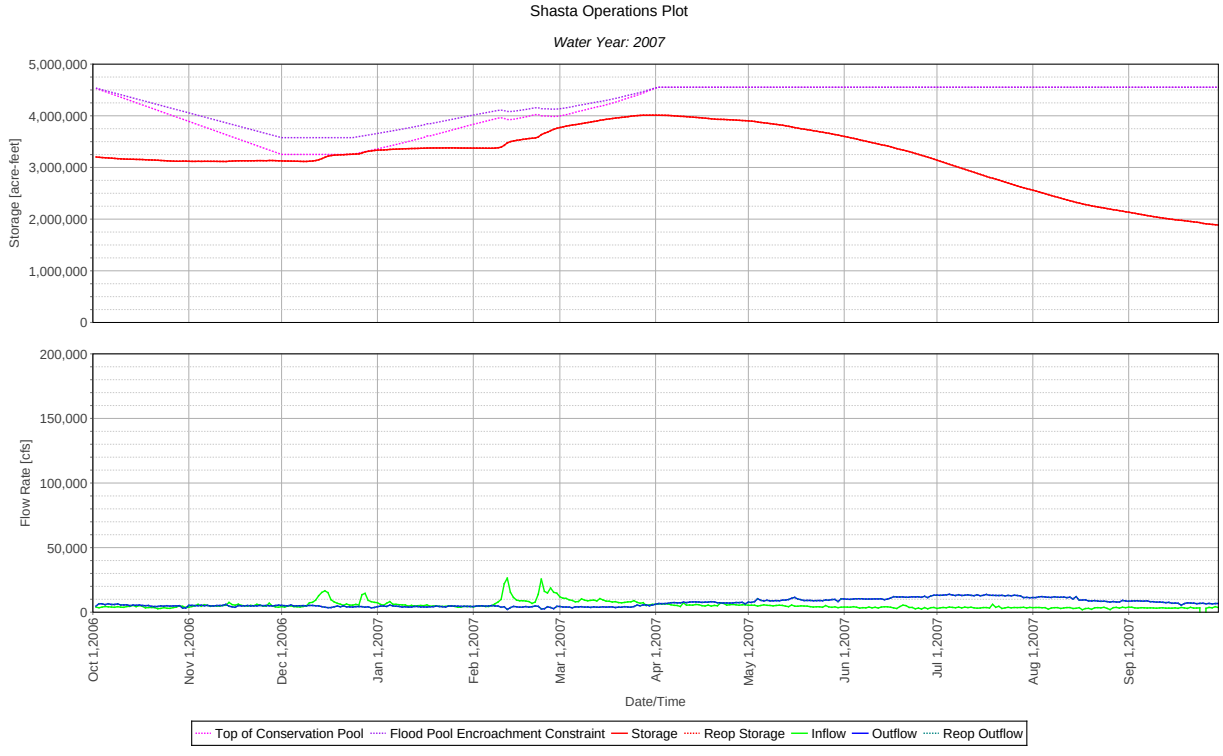

Shasta Operations Plot
Water Year: 2002
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2001
Nov 1,2001
Dec 1,2001
Jan 1,2002
Feb 1,2002
Mar 1,2002
Apr 1,2002
May 1,2002
Jun 1,2002
Jul 1,2002
Aug 1,2002
Sep 1,2002
Date/Time

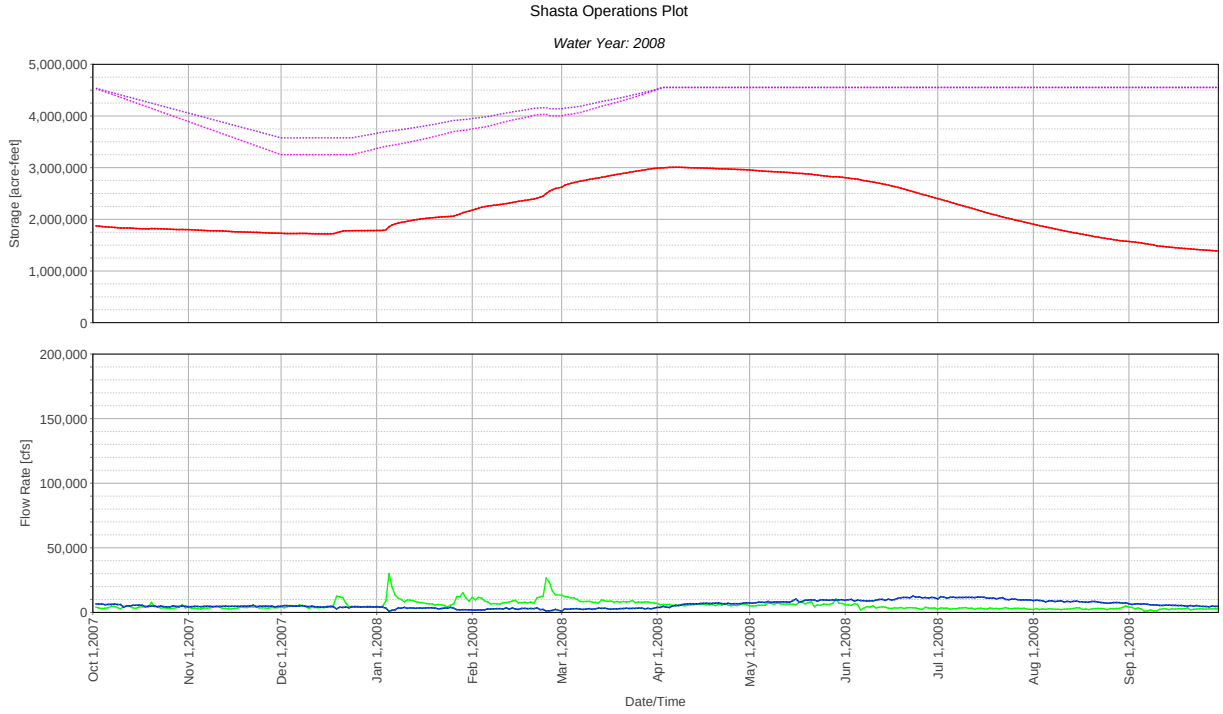

Shasta Operations Plot
Water Year: 2003
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 458 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2002
Nov 1,2002
Dec 1,2002
Jan 1,2003
Feb 1,2003
Mar 1,2003
Apr 1,2003
May 1,2003
Jun 1,2003
Jul 1,2003
Aug 1,2003
Sep 1,2003
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

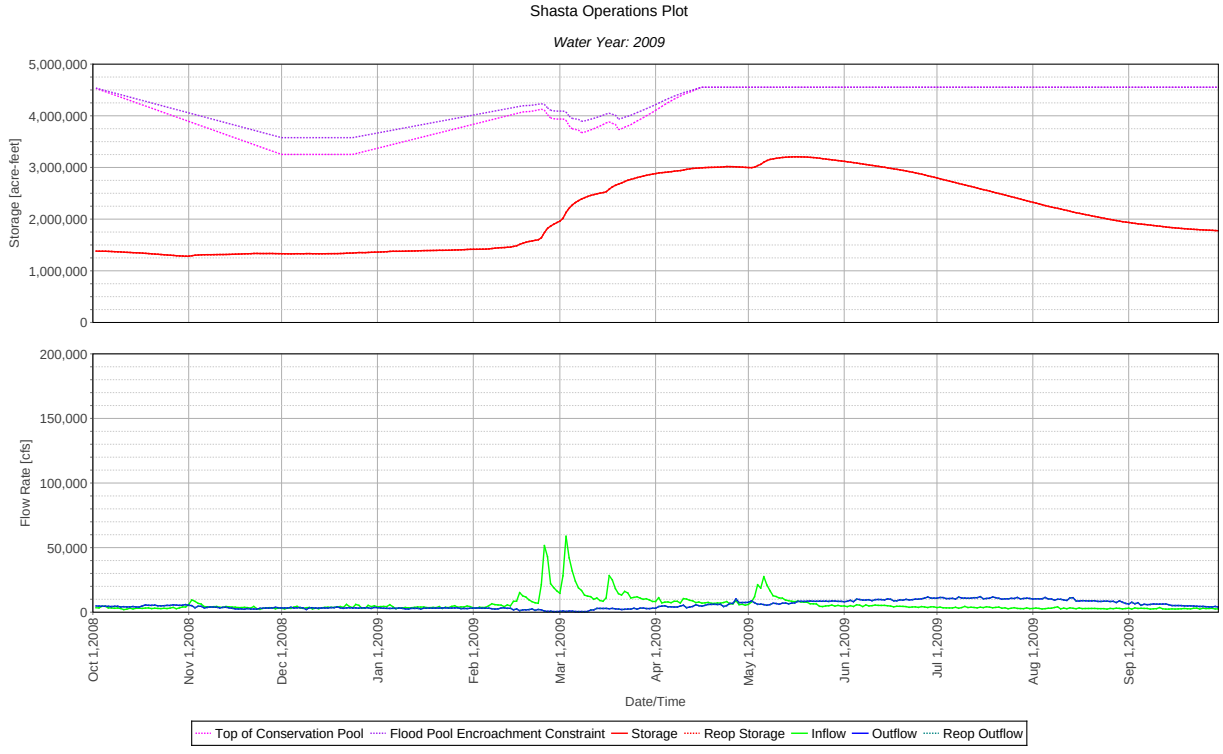

Shasta Operations Plot
Water Year: 2004
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1215 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2003
Nov 1,2003
Dec 1,2003
Jan 1,2004
Feb 1,2004
Mar 1,2004
Apr 1,2004
May 1,2004
Jun 1,2004
Jul 1,2004
Aug 1,2004
Sep 1,2004
Date/Time

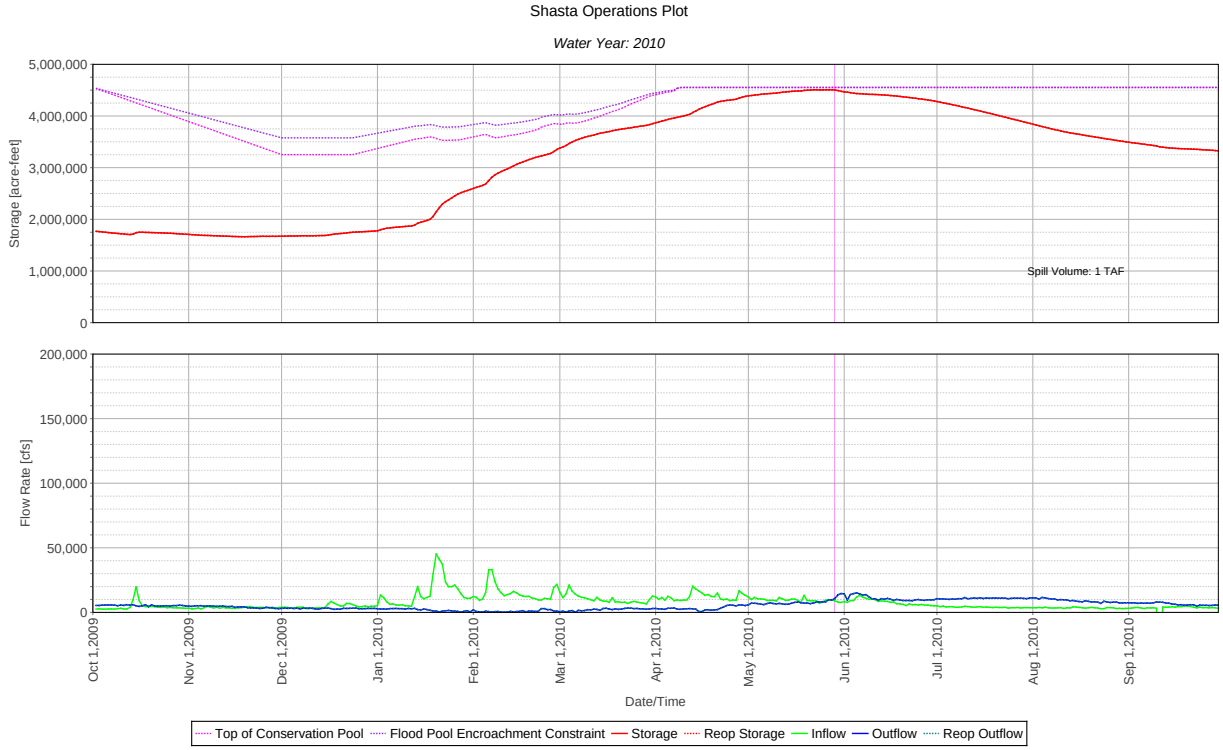

Shasta Operations Plot
Water Year: 2005
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 126 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2004
Nov 1,2004
Dec 1,2004
Jan 1,2005
Feb 1,2005
Mar 1,2005
Apr 1,2005
May 1,2005
Jun 1,2005
Jul 1,2005
Aug 1,2005
Sep 1,2005
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


Shasta Operations Plot
Water Year: 2006
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 2983 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2005
Nov 1,2005
Dec 1,2005
Jan 1,2006
Feb 1,2006
Mar 1,2006
Apr 1,2006
May 1,2006
Jun 1,2006
Jul 1,2006
Aug 1,2006
Sep 1,2006
Date/Time


Shasta Operations Plot
Water Year: 2007
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2006
Nov 1,2006
Dec 1,2006
Jan 1,2007
Feb 1,2007
Mar 1,2007
Apr 1,2007
May 1,2007
Jun 1,2007
Jul 1,2007
Aug 1,2007
Sep 1,2007
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

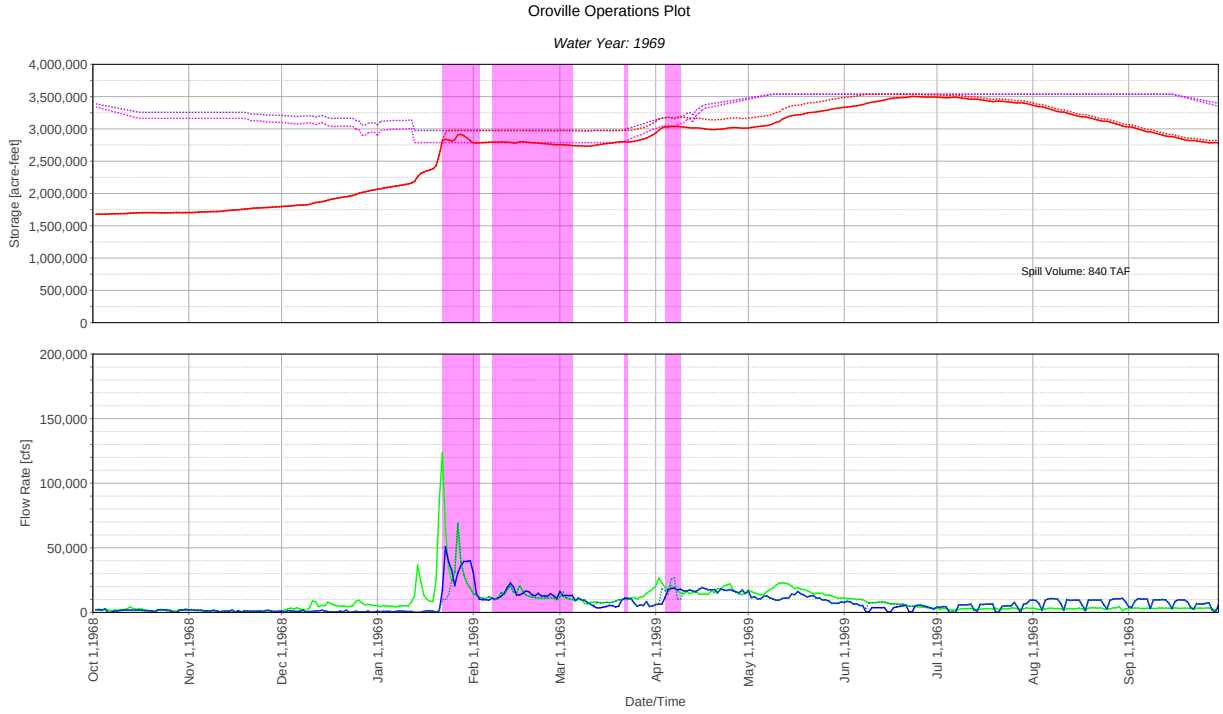

Shasta Operations Plot
Water Year: 2008
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2007
Nov 1,2007
Dec 1,2007
Jan 1,2008
Feb 1,2008
Mar 1,2008
Apr 1,2008
May 1,2008
Jun 1,2008
Jul 1,2008
Aug 1,2008
Sep 1,2008
Date/Time

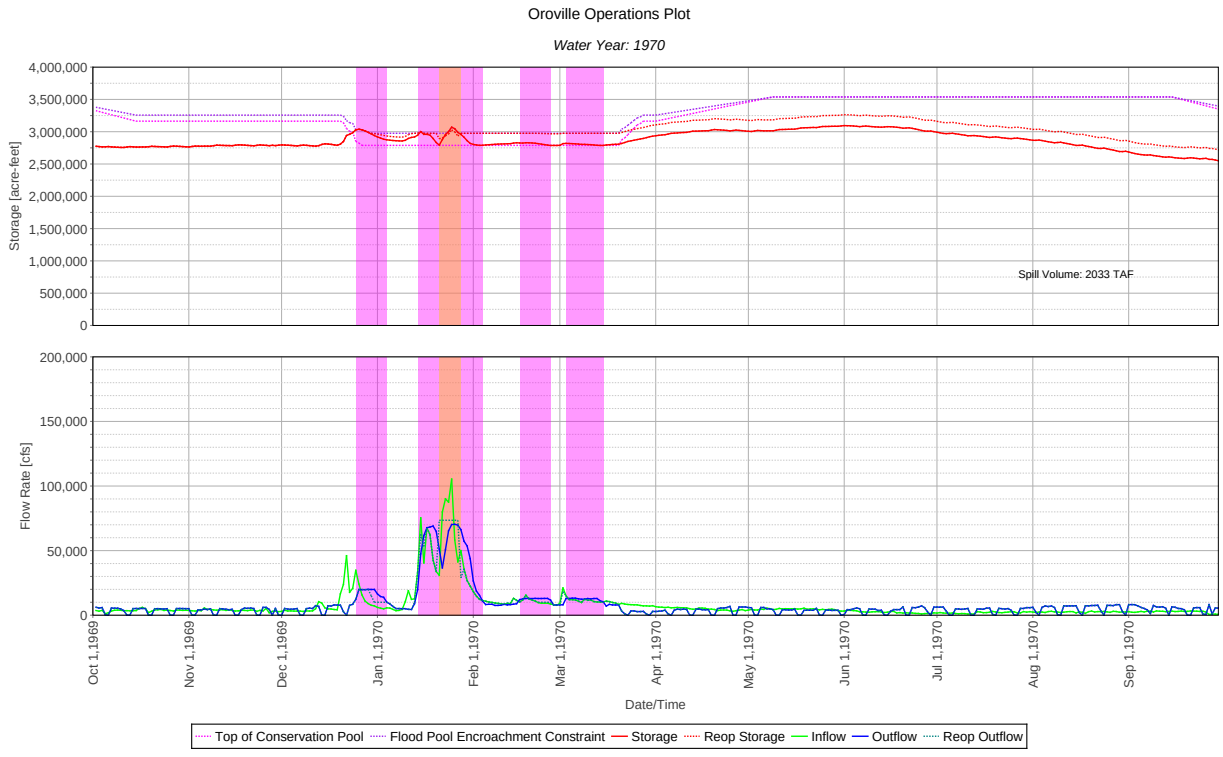

Shasta Operations Plot
Water Year: 2009
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2008
Nov 1,2008
Dec 1,2008
Jan 1,2009
Feb 1,2009
Mar 1,2009
Apr 1,2009
May 1,2009
Jun 1,2009
Jul 1,2009
Aug 1,2009
Sep 1,2009
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

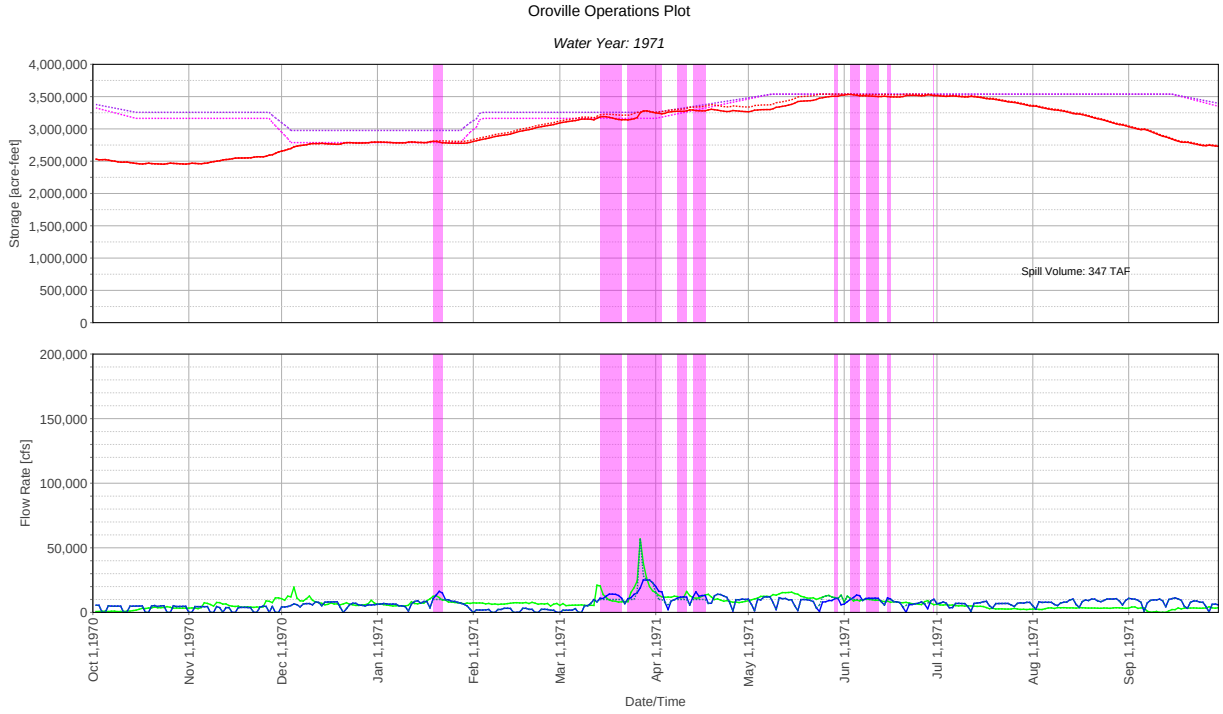

Shasta Operations Plot
Water Year: 2010
Storage [acre-feet]
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Spill Volume: 1 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2009
Nov 1,2009
Dec 1,2009
Jan 1,2010
Feb 1,2010
Mar 1,2010
Apr 1,2010
May 1,2010
Jun 1,2010
Jul 1,2010
Aug 1,2010
Sep 1,2010
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

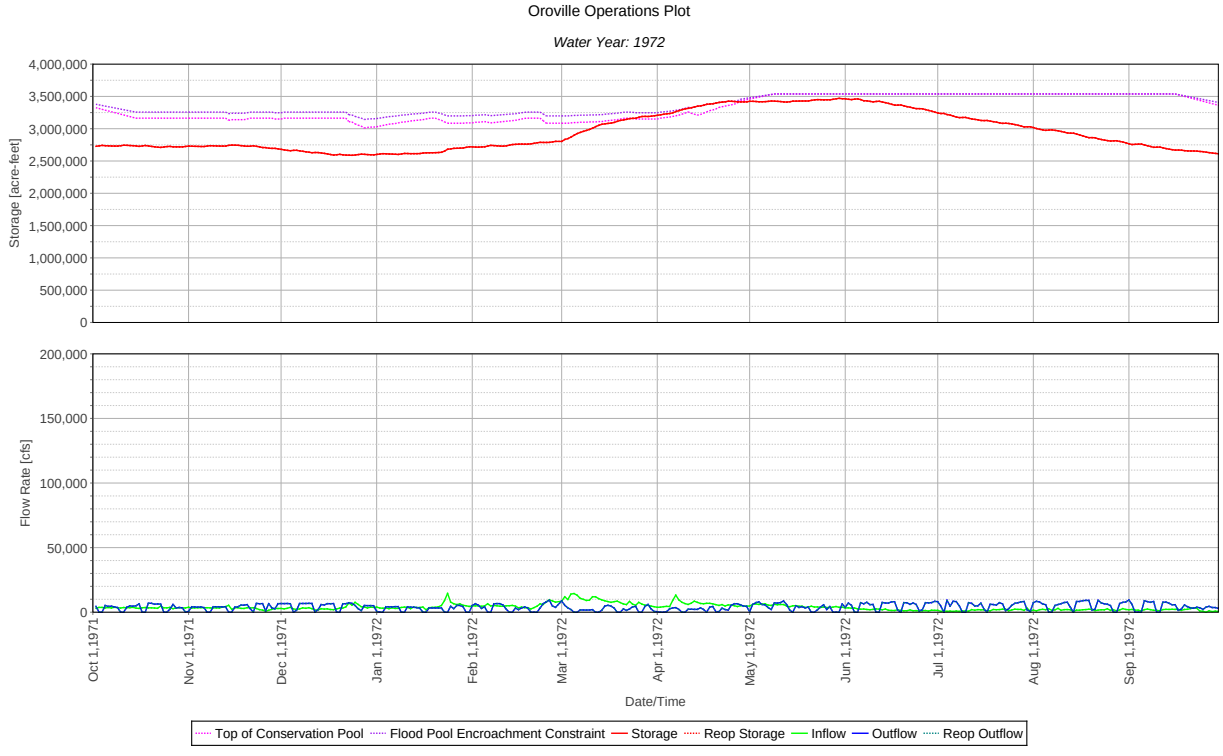
A.2 Oroville

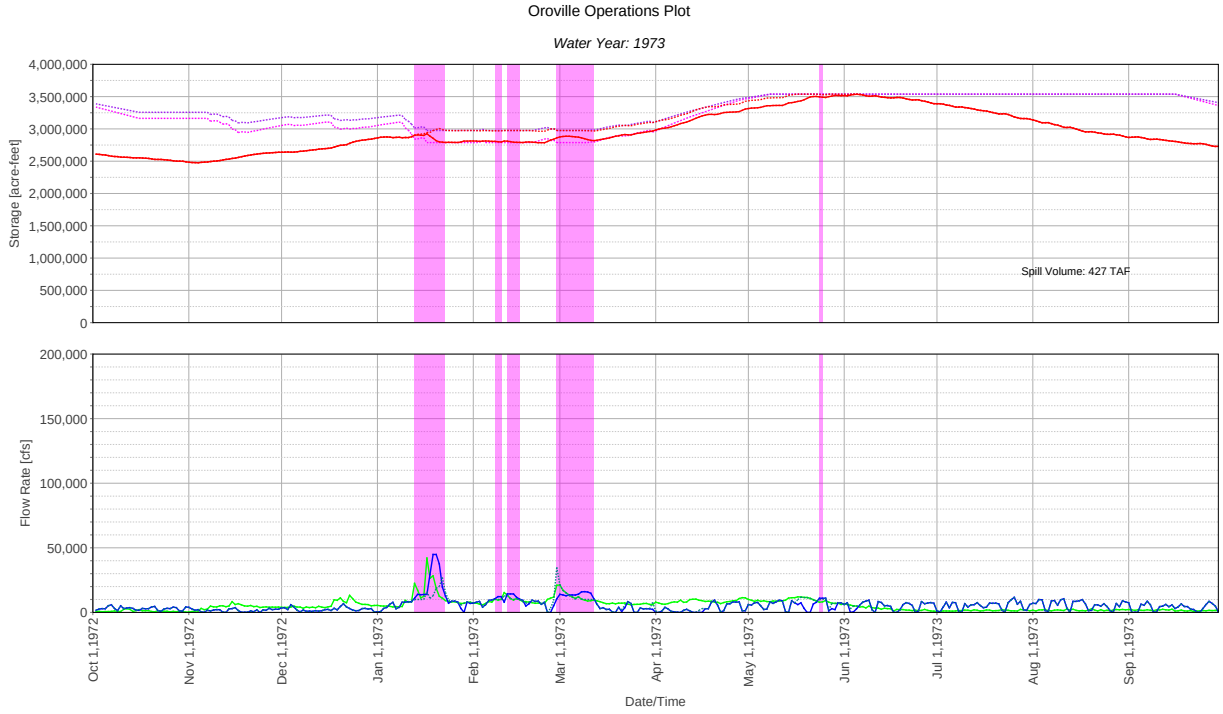
The following section includes the reoperation plots for Oroville Dam.

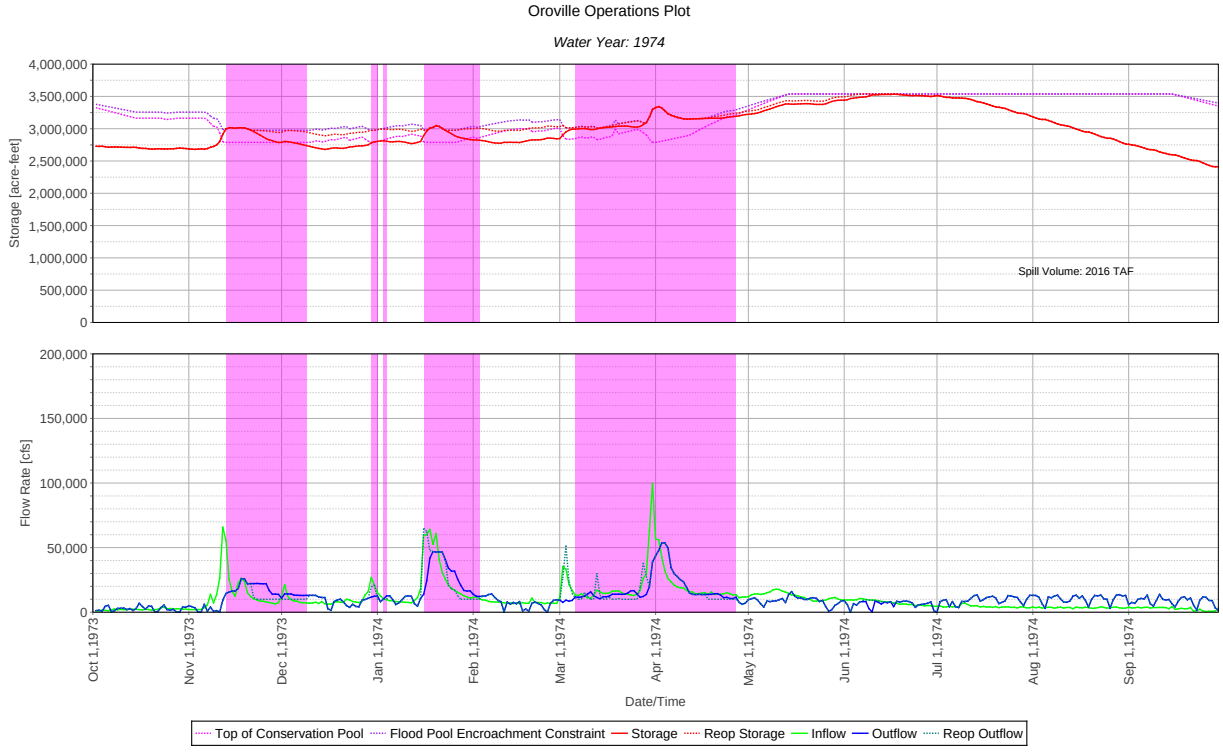

Oroville Operations Plot
Water Year: 1969
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 840 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1968
Nov 1,1968
Dec 1,1968
Jan 1,1969
Feb 1,1969
Mar 1,1969
Apr 1,1969
May 1,1969
Jun 1,1969
Jul 1,1969
Aug 1,1969
Sep 1,1969
Date/Time

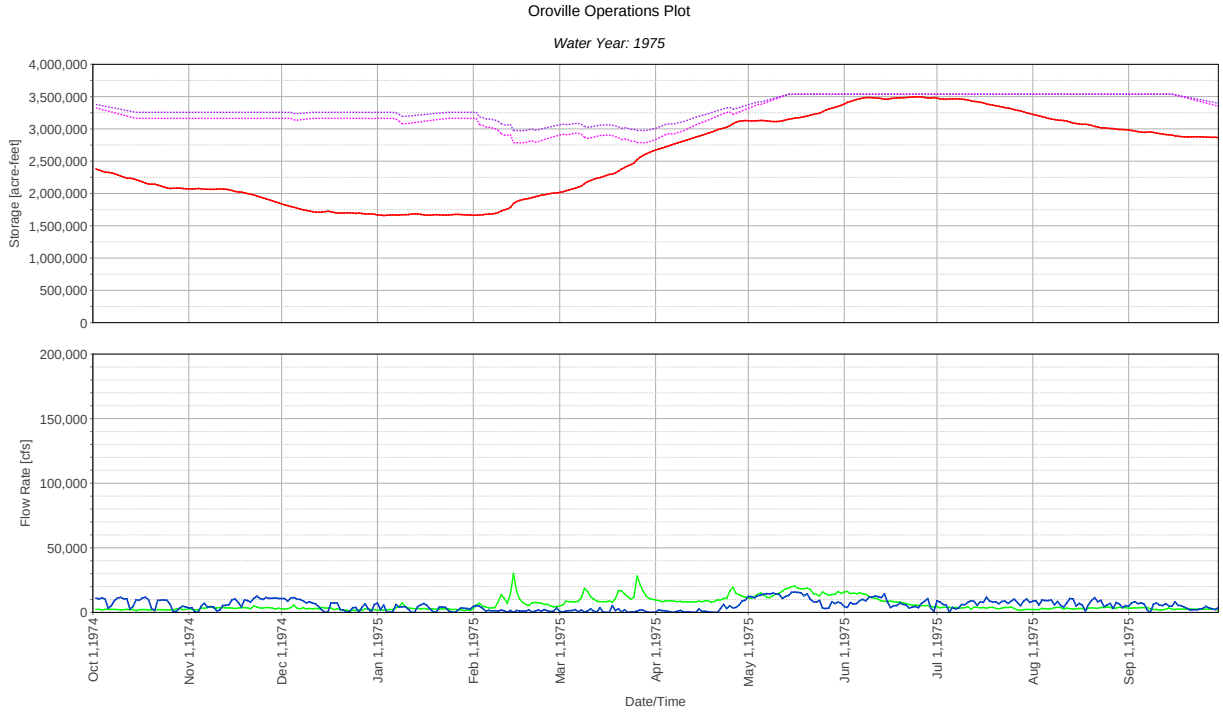

Oroville Operations Plot
Water Year: 1970
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2033 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1969
Nov 1,1969
Dec 1,1969
Jan 1,1970
Feb 1,1970
Mar 1,1970
Apr 1,1970
May 1,1970
Jun 1,1970
Jul 1,1970
Aug 1,1970
Sep 1,1970
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

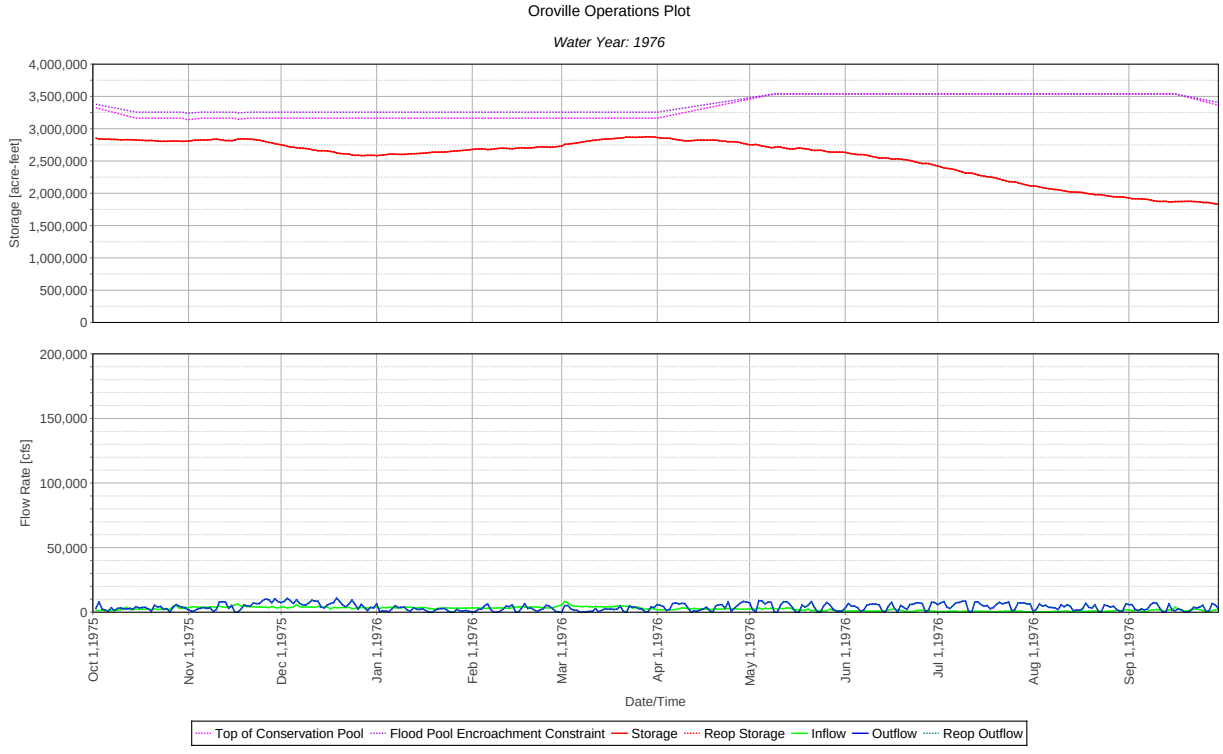

Oroville Operations Plot
Water Year: 1971
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 347 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1970
Nov 1,1970
Dec 1,1970
Jan 1,1971
Feb 1,1971
Mar 1,1971
Apr 1,1971
May 1,1971
Jun 1,1971
Jul 1,1971
Aug 1,1971
Sep 1,1971
Date/Time

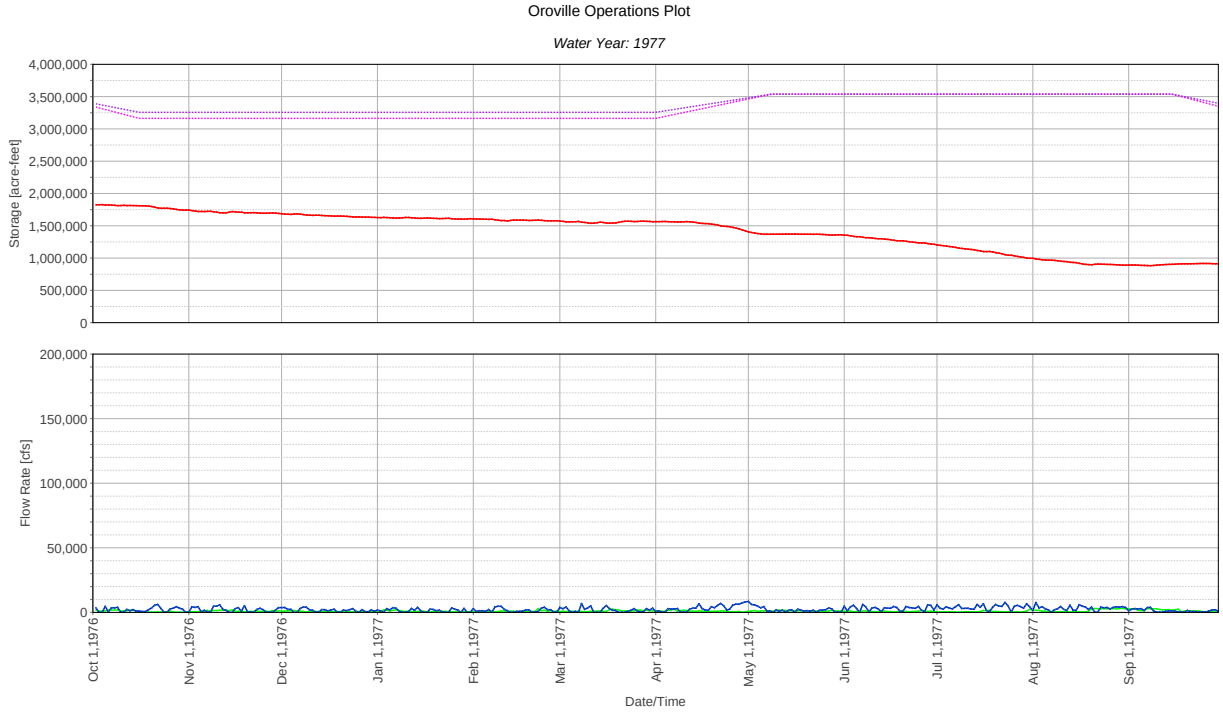

Oroville Operations Plot
Water Year: 1972
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1971
Nov 1,1971
Dec 1,1971
Jan 1,1972
Feb 1,1972
Mar 1,1972
Apr 1,1972
May 1,1972
Jun 1,1972
Jul 1,1972
Aug 1,1972
Sep 1,1972
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

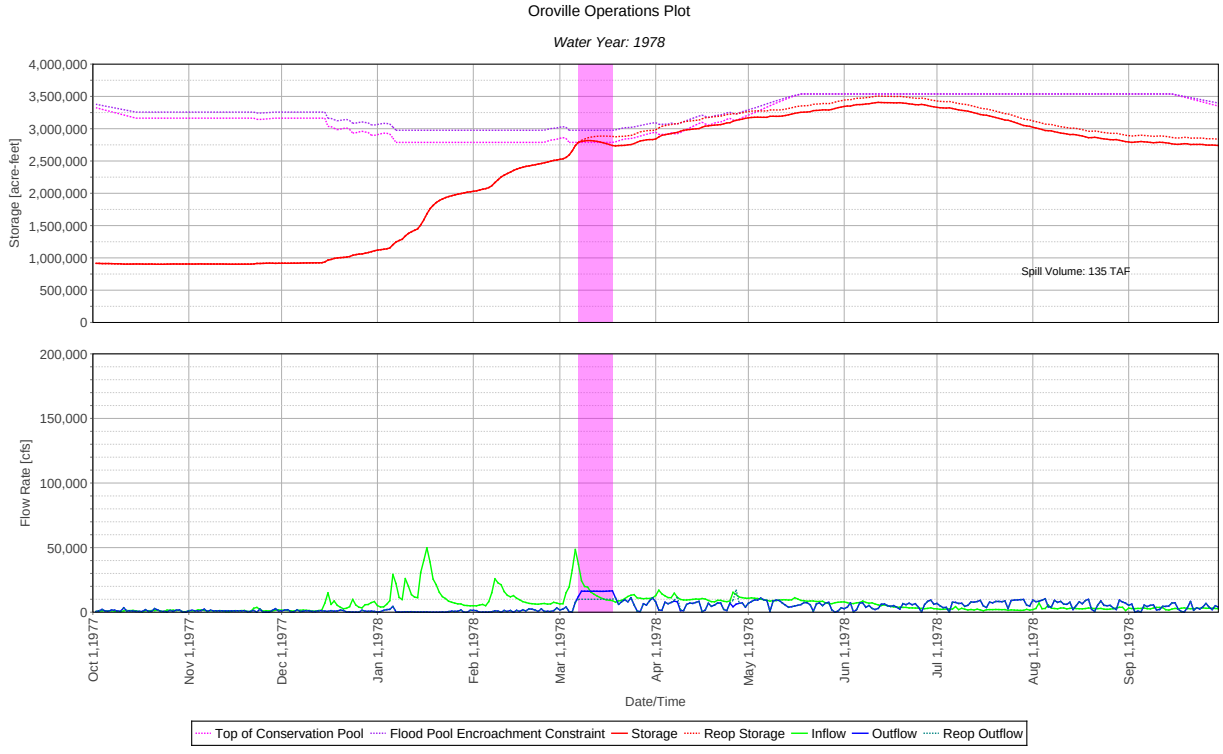

Oroville Operations Plot
Water Year: 1973
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 427 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1972
Nov 1,1972
Dec 1,1972
Jan 1,1973
Feb 1,1973
Mar 1,1973
Apr 1,1973
May 1,1973
Jun 1,1973
Jul 1,1973
Aug 1,1973
Sep 1,1973
Date/Time

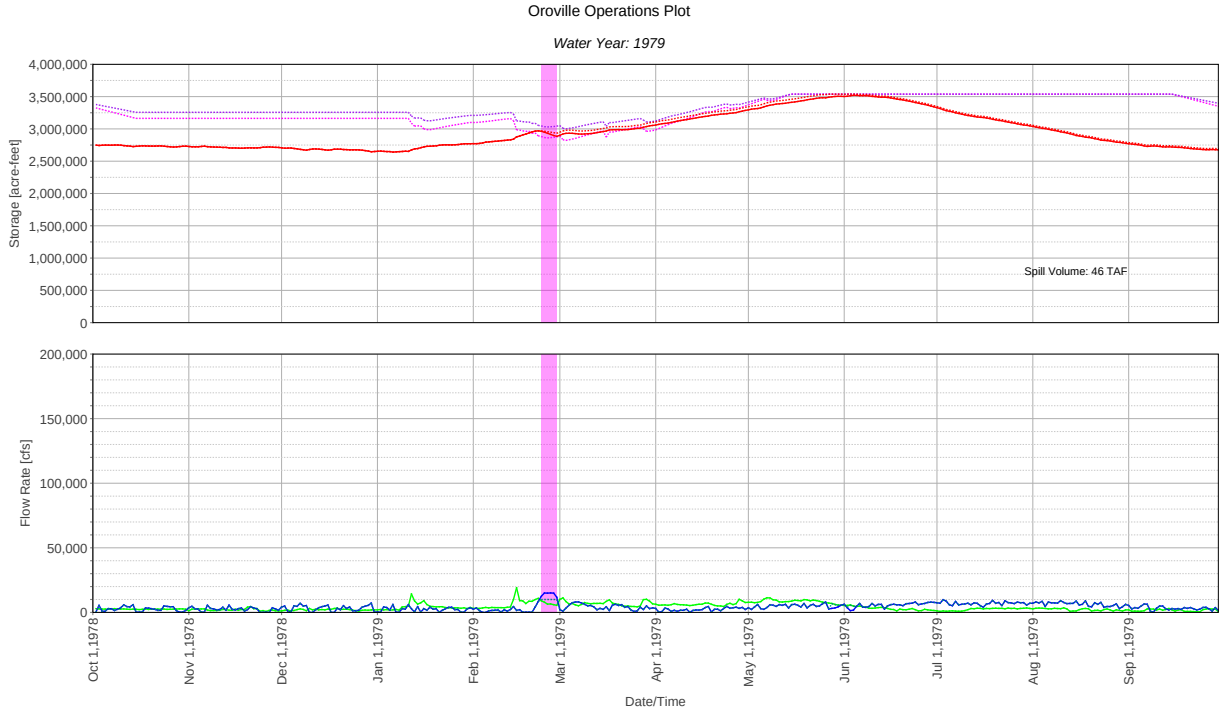

Oroville Operations Plot
Water Year: 1974
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2016 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1973
Nov 1,1973
Dec 1,1973
Jan 1,1974
Feb 1,1974
Mar 1,1974
Apr 1,1974
May 1,1974
Jun 1,1974
Jul 1,1974
Aug 1,1974
Sep 1,1974
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

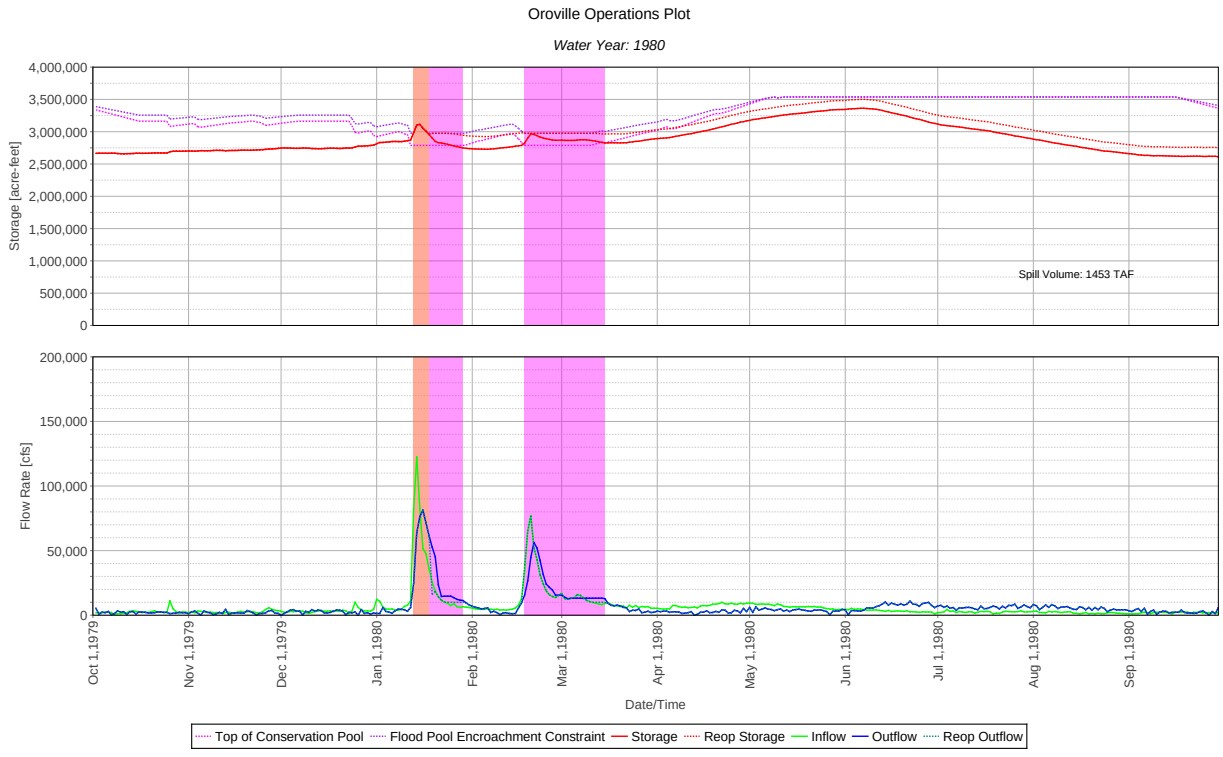

Oroville Operations Plot
Water Year: 1975
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1974
Nov 1,1974
Dec 1,1974
Jan 1,1975
Feb 1,1975
Mar 1,1975
Apr 1,1975
May 1,1975
Jun 1,1975
Jul 1,1975
Aug 1,1975
Sep 1,1975
Date/Time

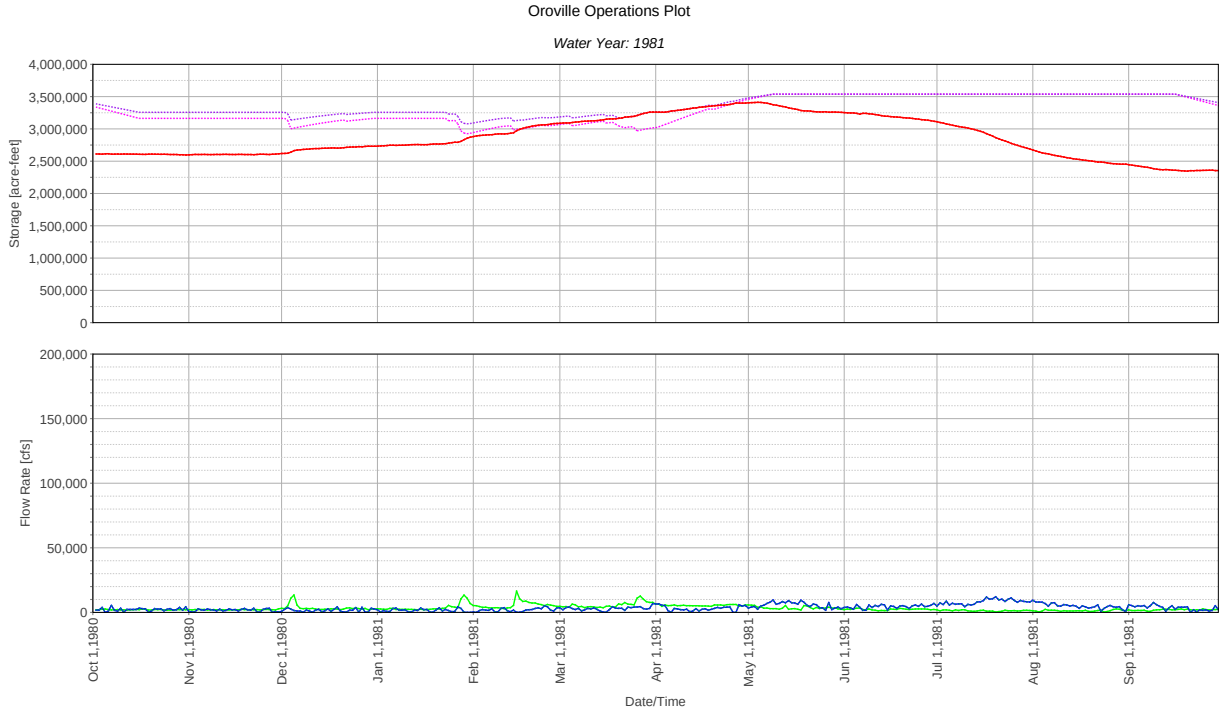

Oroville Operations Plot
Water Year: 1976
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1975
Nov 1,1975
Dec 1,1975
Jan 1,1976
Feb 1,1976
Mar 1,1976
Apr 1,1976
May 1,1976
Jun 1,1976
Jul 1,1976
Aug 1,1976
Sep 1,1976
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

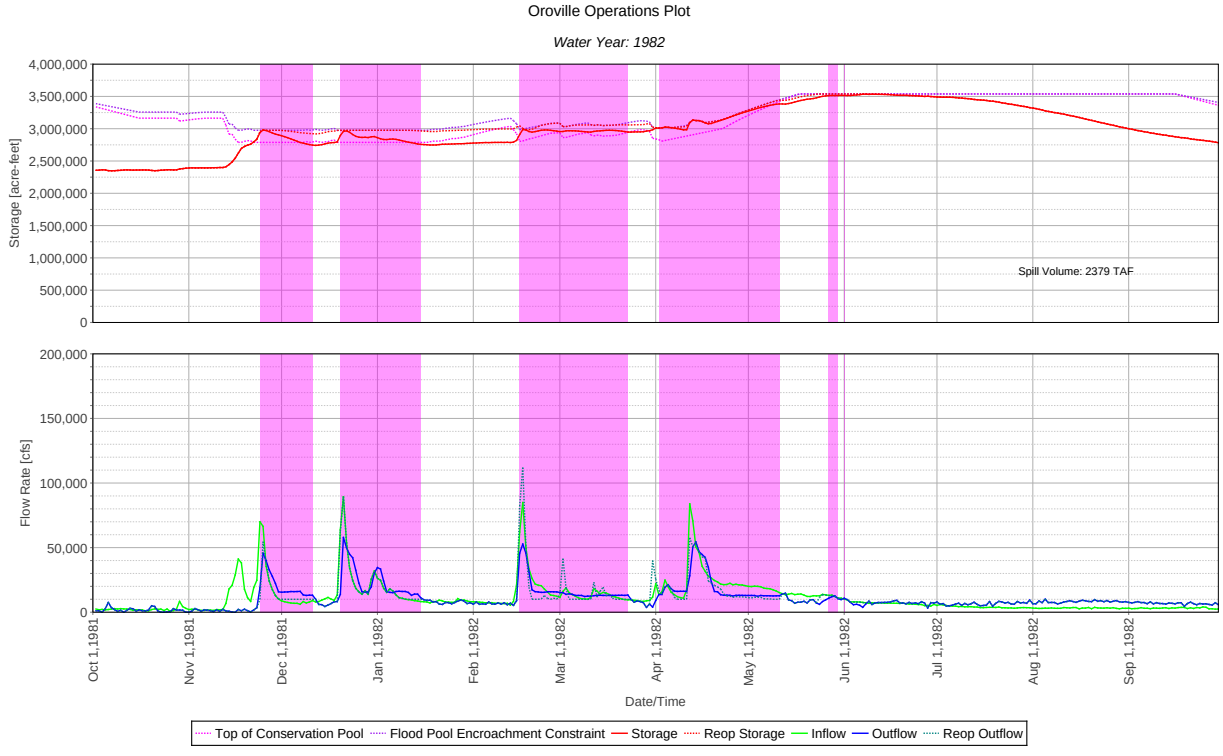

Oroville Operations Plot
Water Year: 1977
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1976
Nov 1,1976
Dec 1,1976
Jan 1,1977
Feb 1,1977
Mar 1,1977
Apr 1,1977
May 1,1977
Jun 1,1977
Jul 1,1977
Aug 1,1977
Sep 1,1977
Date/Time

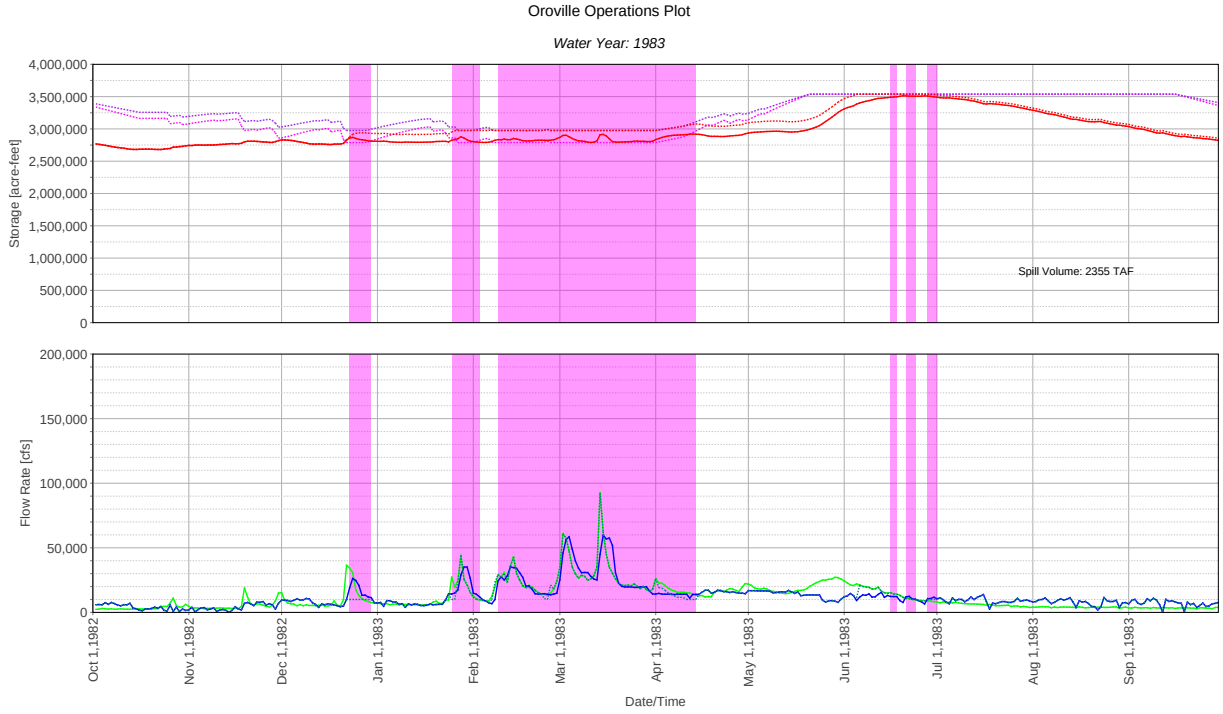

Oroville Operations Plot
Water Year: 1978
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 135 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1977
Nov 1,1977
Dec 1,1977
Jan 1,1978
Feb 1,1978
Mar 1,1978
Apr 1,1978
May 1,1978
Jun 1,1978
Jul 1,1978
Aug 1,1978
Sep 1,1978
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

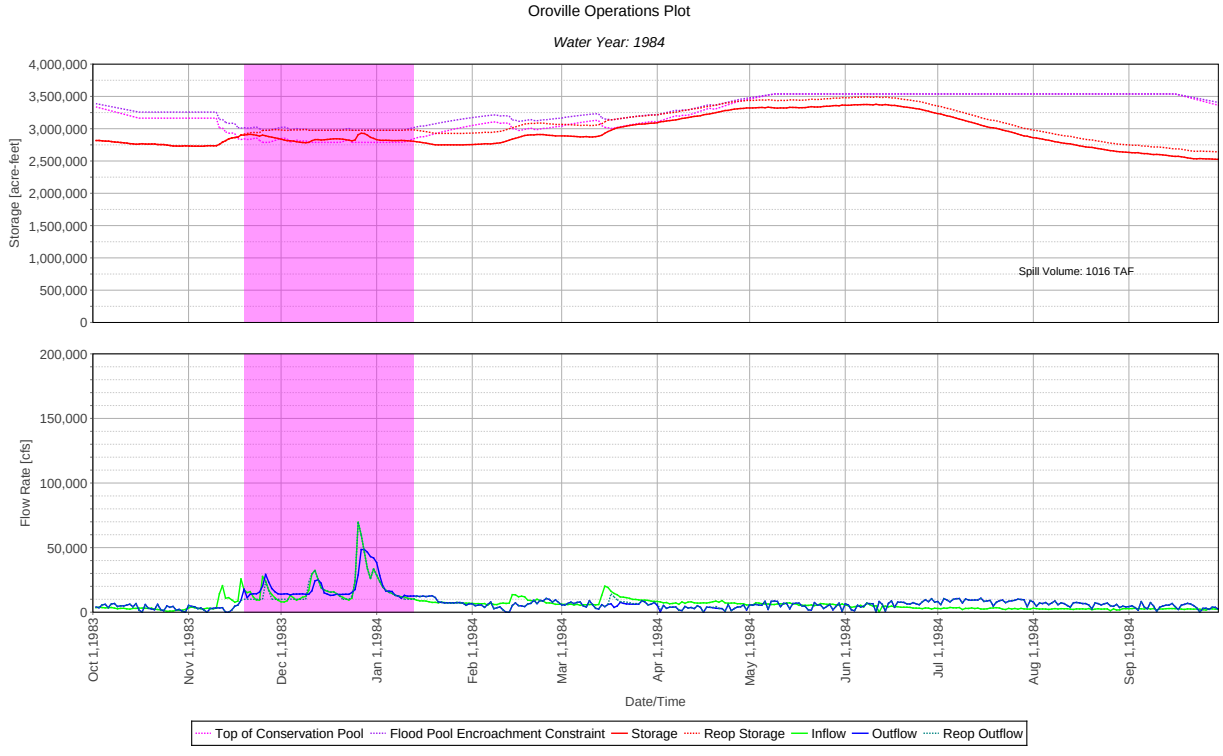

Oroville Operations Plot
Water Year: 1979
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 46 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1978
Nov 1,1978
Dec 1,1978
Jan 1,1979
Feb 1,1979
Mar 1,1979
Apr 1,1979
May 1,1979
Jun 1,1979
Jul 1,1979
Aug 1,1979
Sep 1,1979
Date/Time

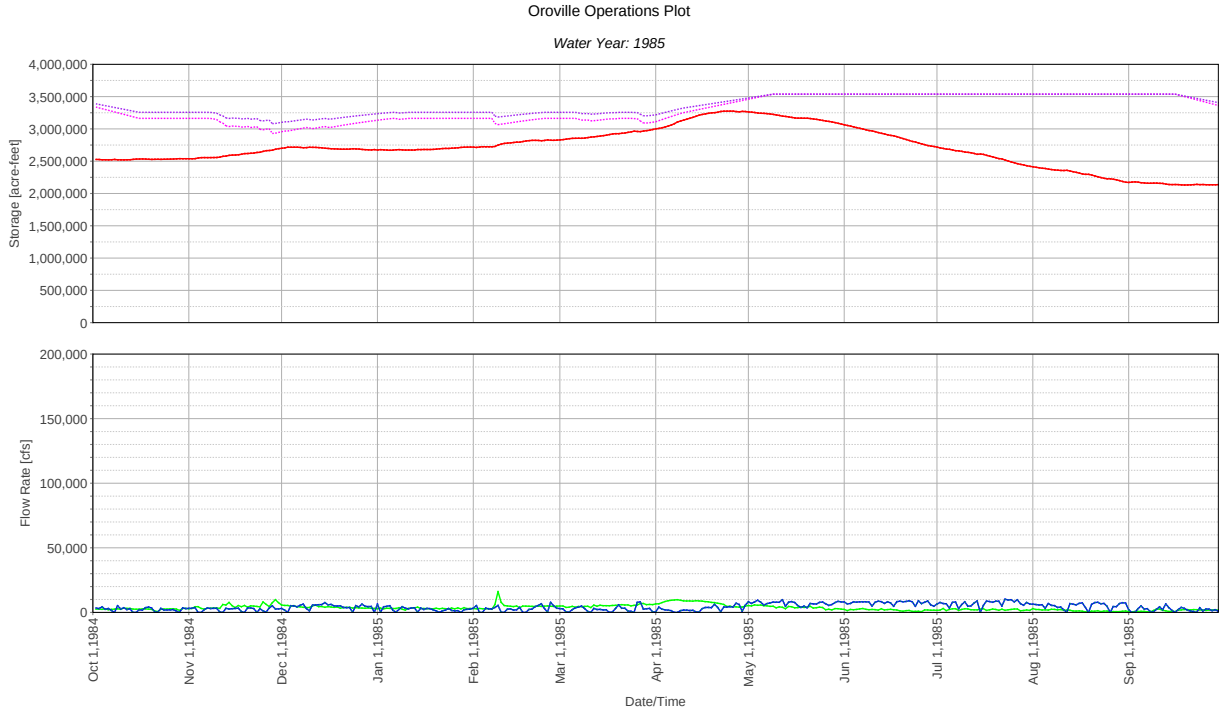

Oroville Operations Plot
Water Year: 1980
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 1453 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1979
Nov 1,1979
Dec 1,1979
Jan 1,1980
Feb 1,1980
Mar 1,1980
Apr 1,1980
May 1,1980
Jun 1,1980
Jul 1,1980
Aug 1,1980
Sep 1,1980
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

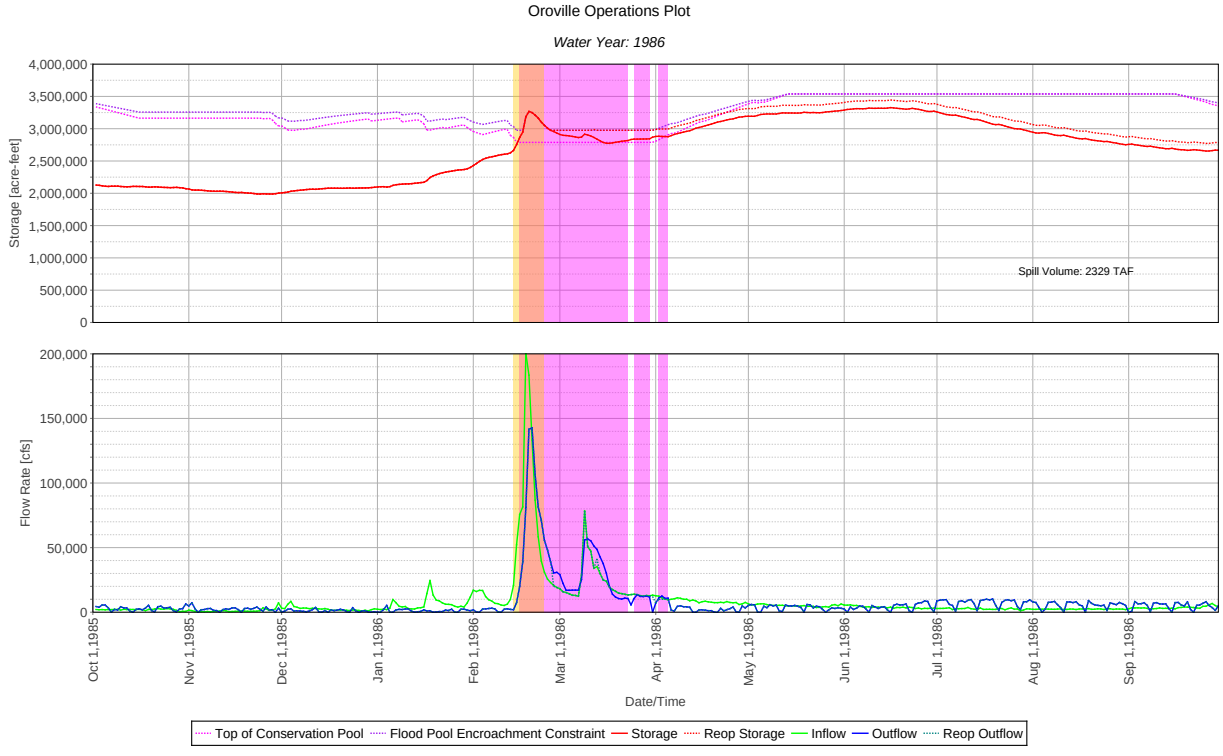

Oroville Operations Plot
Water Year: 1981
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1980
Nov 1,1980
Dec 1,1980
Jan 1,1981
Feb 1,1981
Mar 1,1981
Apr 1,1981
May 1,1981
Jun 1,1981
Jul 1,1981
Aug 1,1981
Sep 1,1981
Date/Time

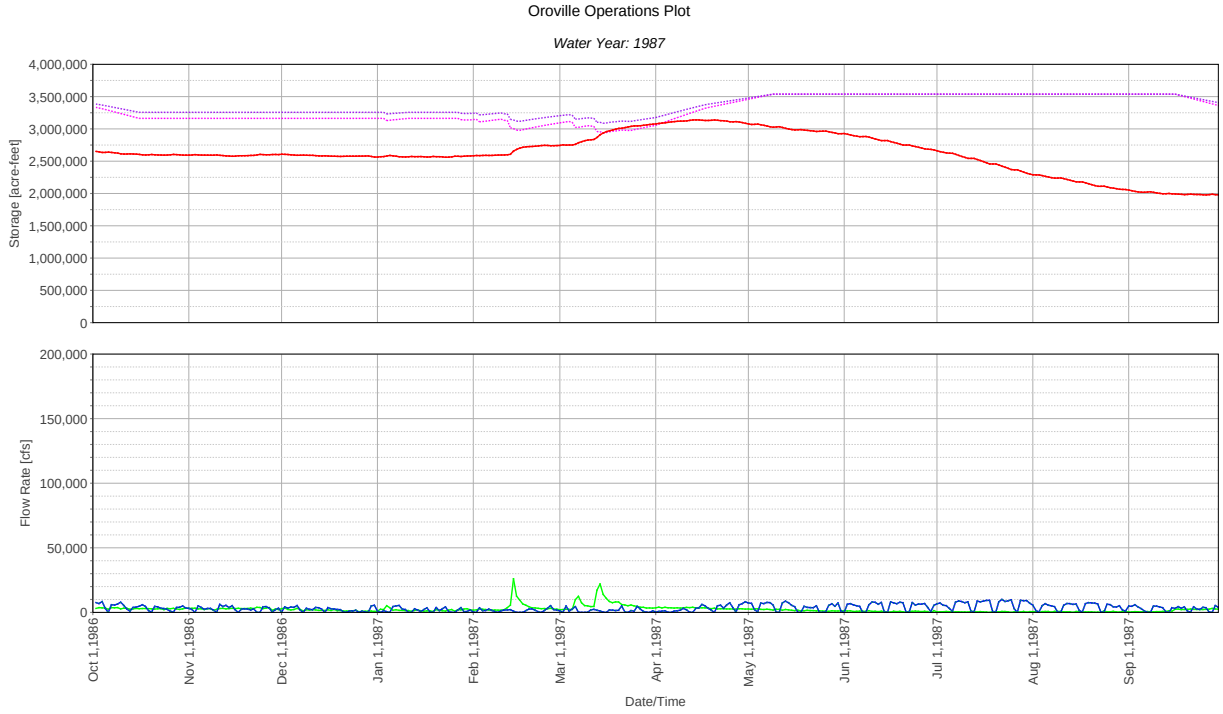

Oroville Operations Plot
Water Year: 1982
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2379 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1981
Nov 1,1981
Dec 1,1981
Jan 1,1982
Feb 1,1982
Mar 1,1982
Apr 1,1982
May 1,1982
Jun 1,1982
Jul 1,1982
Aug 1,1982
Sep 1,1982
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

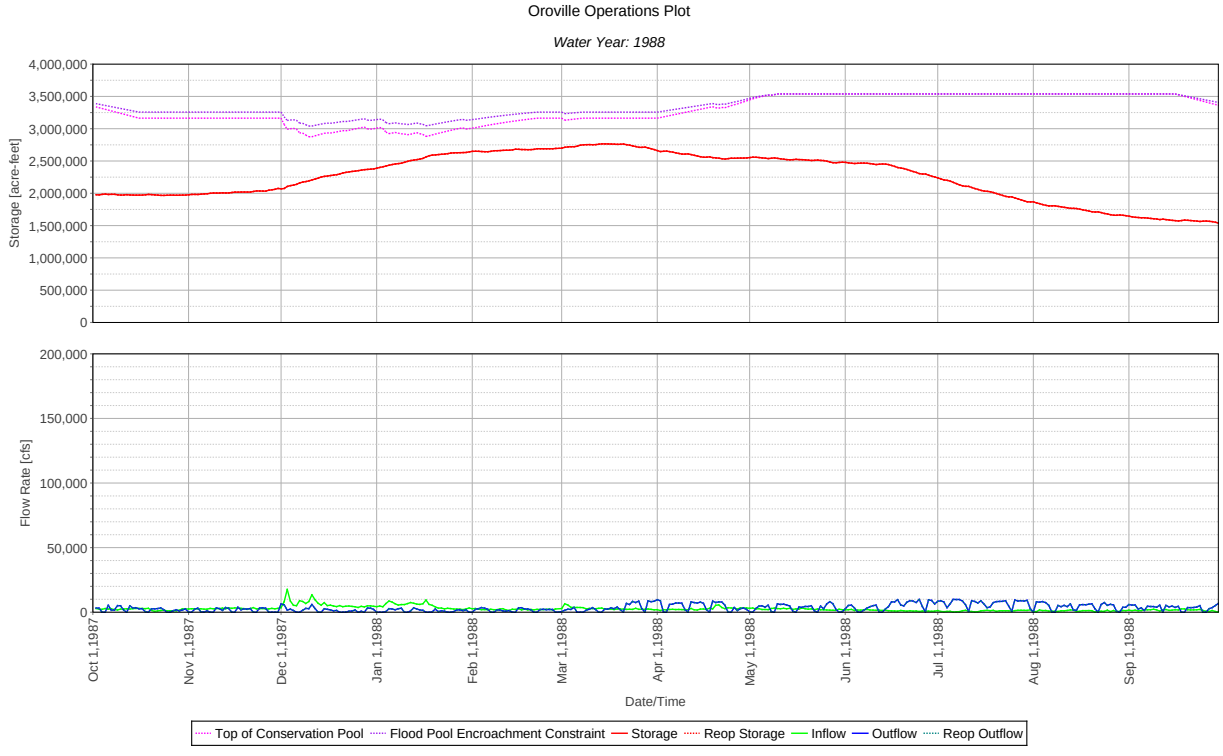

Oroville Operations Plot
Water Year: 1983
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2355 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1982
Nov 1,1982
Dec 1,1982
Jan 1,1983
Feb 1,1983
Mar 1,1983
Apr 1,1983
May 1,1983
Jun 1,1983
Jul 1,1983
Aug 1,1983
Sep 1,1983
Date/Time

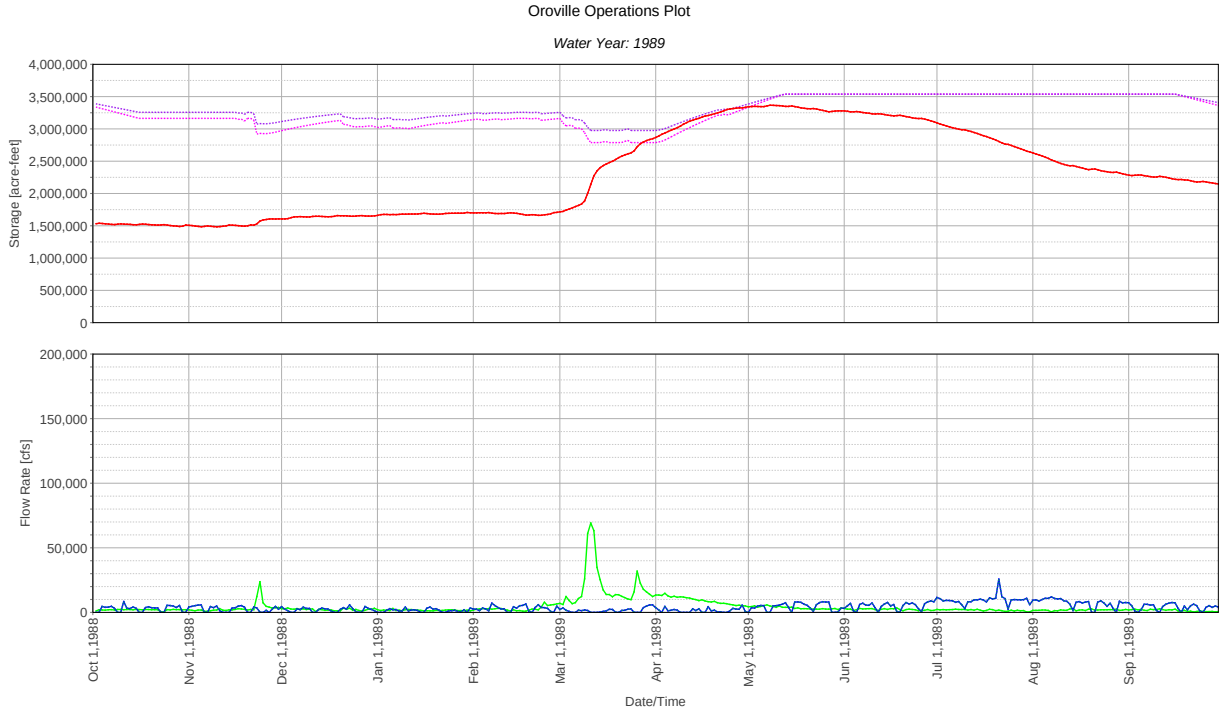

Oroville Operations Plot
Water Year: 1984
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 1016 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1983
Nov 1,1983
Dec 1,1983
Jan 1,1984
Feb 1,1984
Mar 1,1984
Apr 1,1984
May 1,1984
Jun 1,1984
Jul 1,1984
Aug 1,1984
Sep 1,1984
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

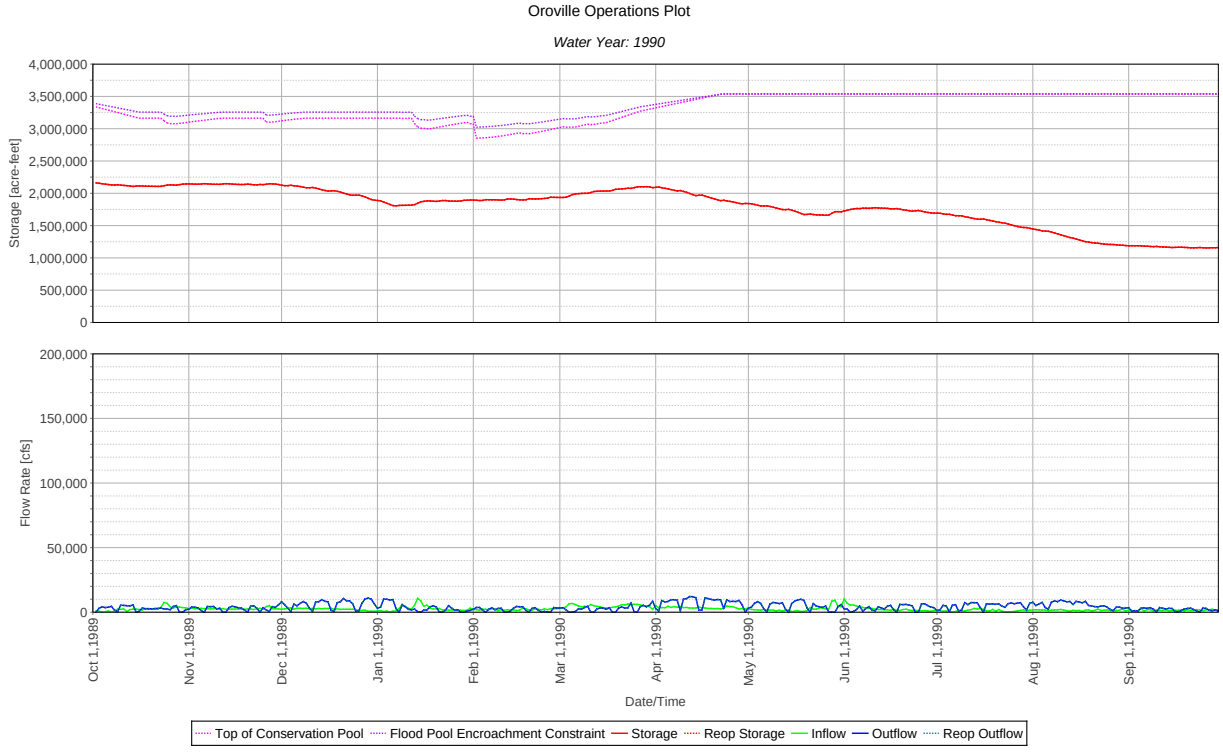

Oroville Operations Plot
Water Year: 1985
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1984
Nov 1,1984
Dec 1,1984
Jan 1,1985
Feb 1,1985
Mar 1,1985
Apr 1,1985
May 1,1985
Jun 1,1985
Jul 1,1985
Aug 1,1985
Sep 1,1985
Date/Time

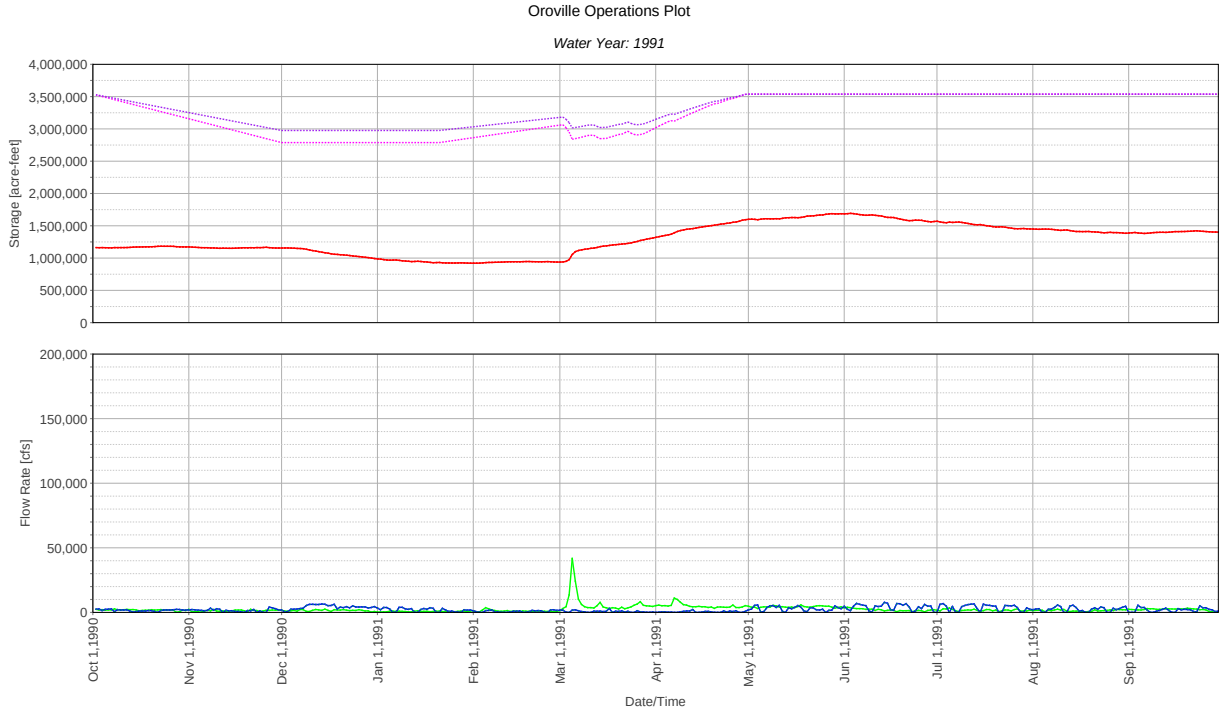

Oroville Operations Plot
Water Year: 1986
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2329 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1985
Nov 1,1985
Dec 1,1985
Jan 1,1986
Feb 1,1986
Mar 1,1986
Apr 1,1986
May 1,1986
Jun 1,1986
Jul 1,1986
Aug 1,1986
Sep 1,1986
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

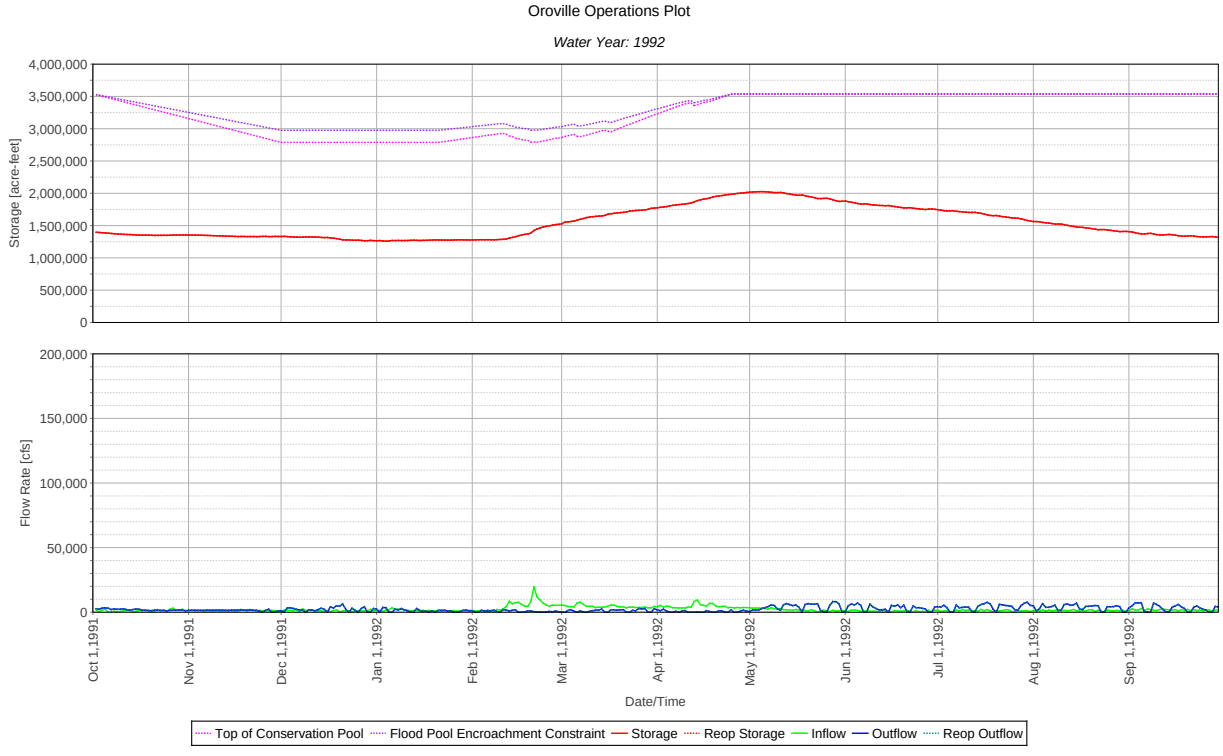

Oroville Operations Plot
Water Year: 1987
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1986
Nov 1,1986
Dec 1,1986
Jan 1,1987
Feb 1,1987
Mar 1,1987
Apr 1,1987
May 1,1987
Jun 1,1987
Jul 1,1987
Aug 1,1987
Sep 1,1987
Date/Time

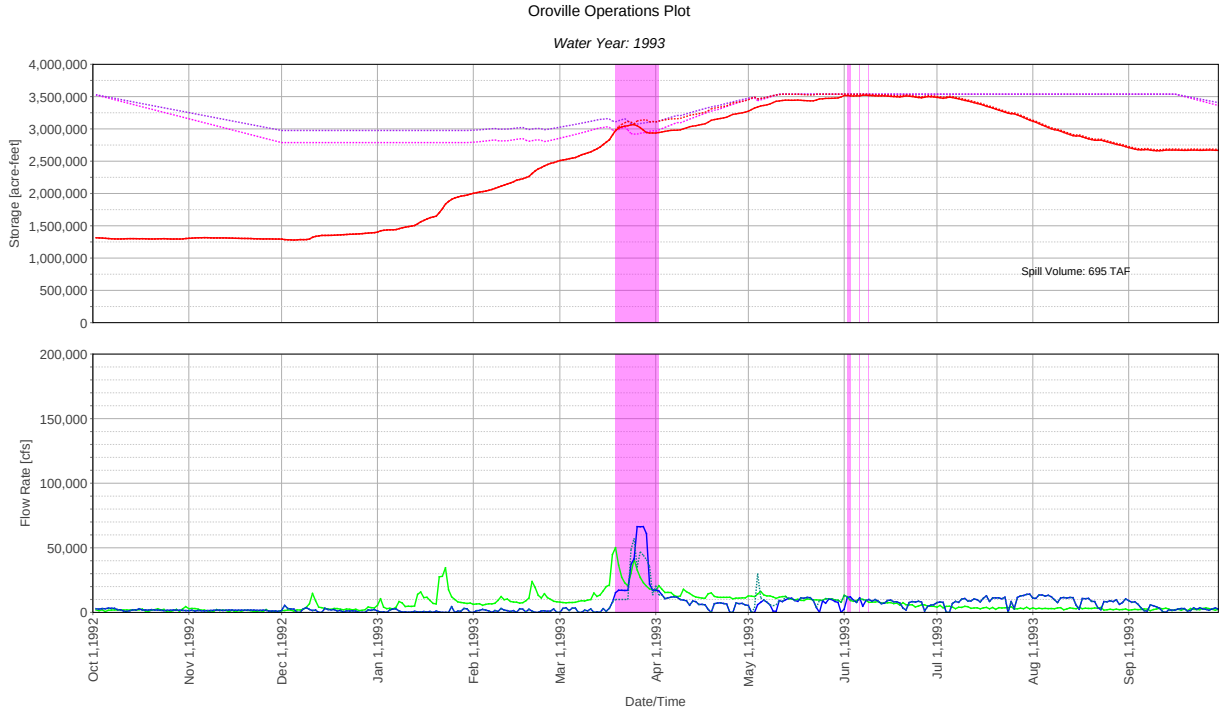

Oroville Operations Plot
Water Year: 1988
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1987
Nov 1,1987
Dec 1,1987
Jan 1,1988
Feb 1,1988
Mar 1,1988
Apr 1,1988
May 1,1988
Jun 1,1988
Jul 1,1988
Aug 1,1988
Sep 1,1988
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

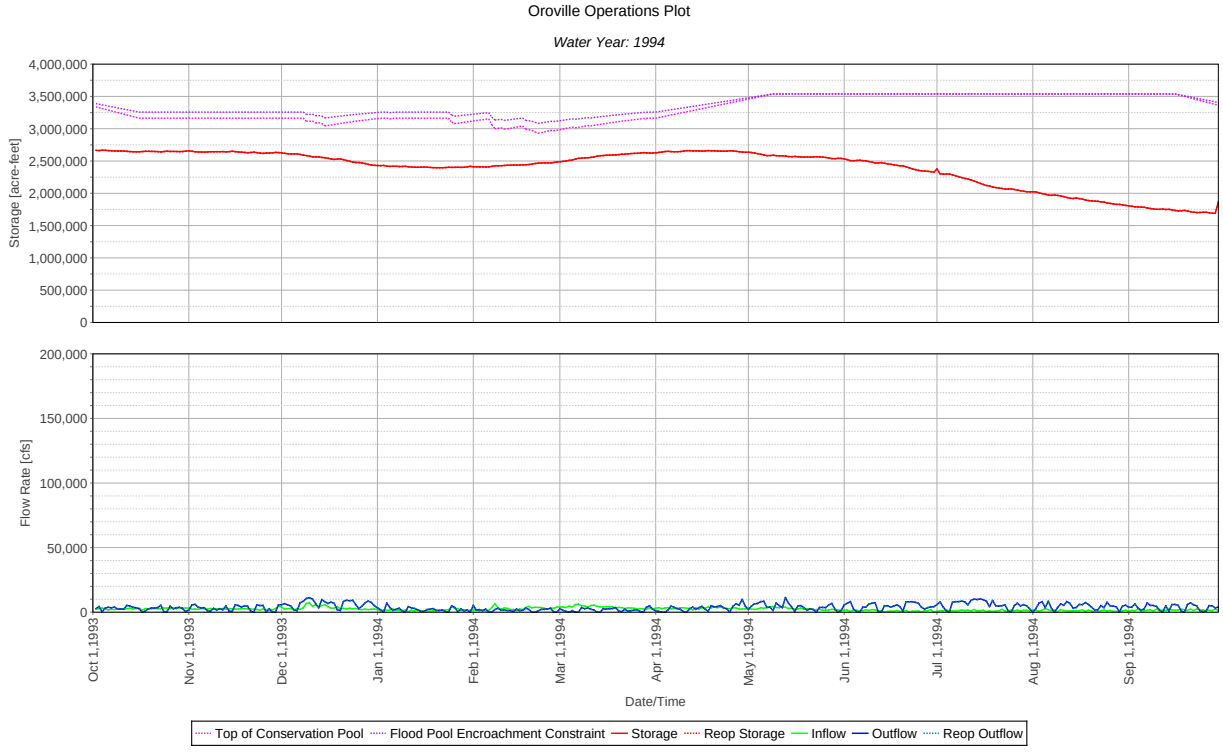

Oroville Operations Plot
Water Year: 1989
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1988
Nov 1,1988
Dec 1,1988
Jan 1,1989
Feb 1,1989
Mar 1,1989
Apr 1,1989
May 1,1989
Jun 1,1989
Jul 1,1989
Aug 1,1989
Sep 1,1989
Date/Time

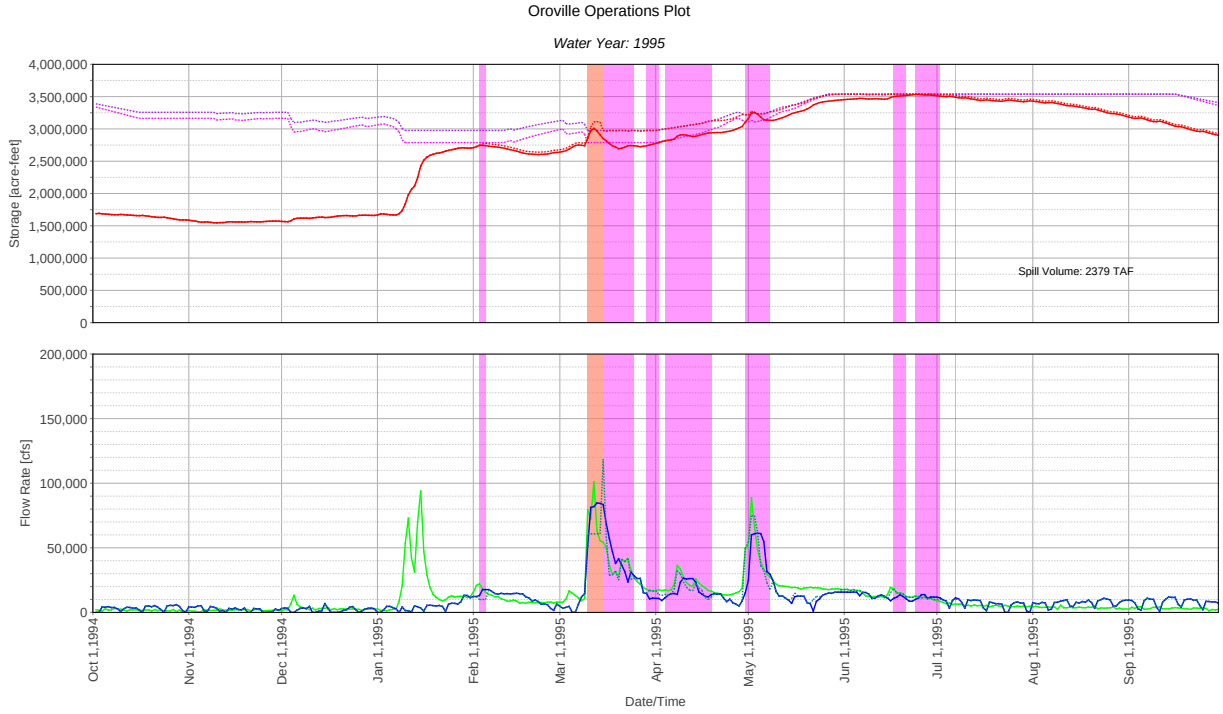

Oroville Operations Plot
Water Year: 1990
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1989
Nov 1,1989
Dec 1,1989
Jan 1,1990
Feb 1,1990
Mar 1,1990
Apr 1,1990
May 1,1990
Jun 1,1990
Jul 1,1990
Aug 1,1990
Sep 1,1990
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

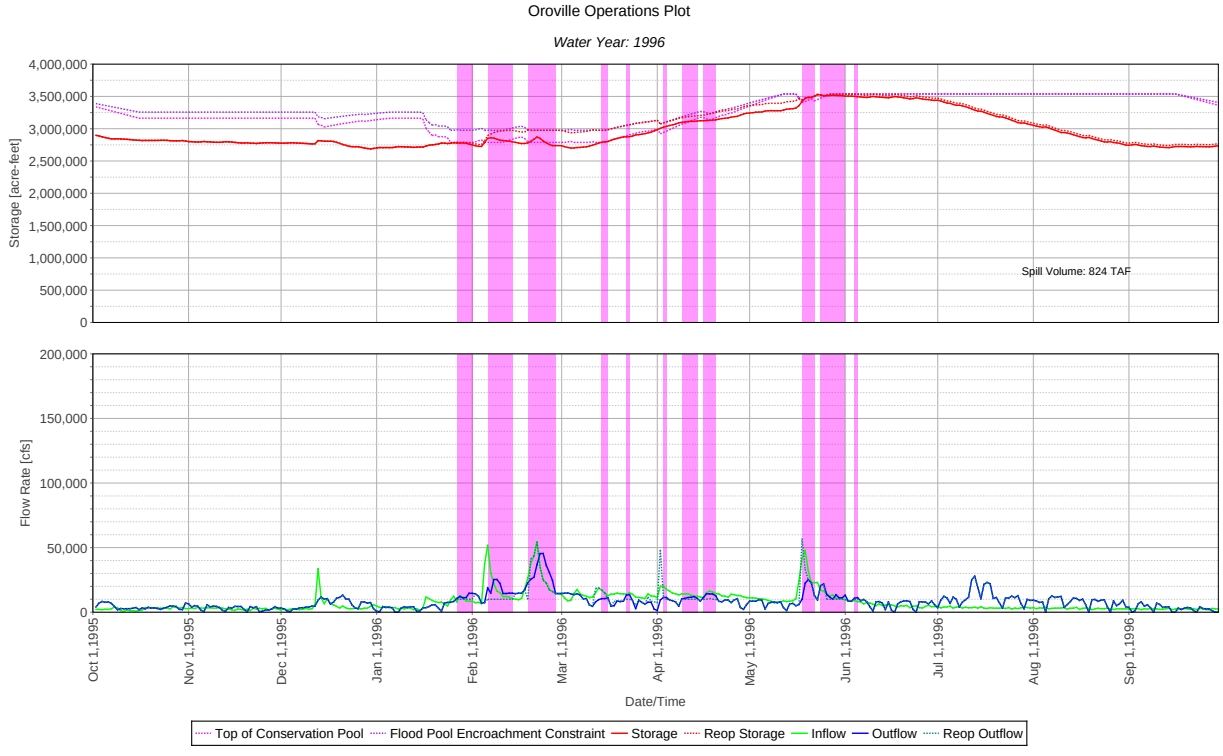

Oroville Operations Plot
Water Year: 1991
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1990
Nov 1,1990
Dec 1,1990
Jan 1,1991
Feb 1,1991
Mar 1,1991
Apr 1,1991
May 1,1991
Jun 1,1991
Jul 1,1991
Aug 1,1991
Sep 1,1991
Date/Time

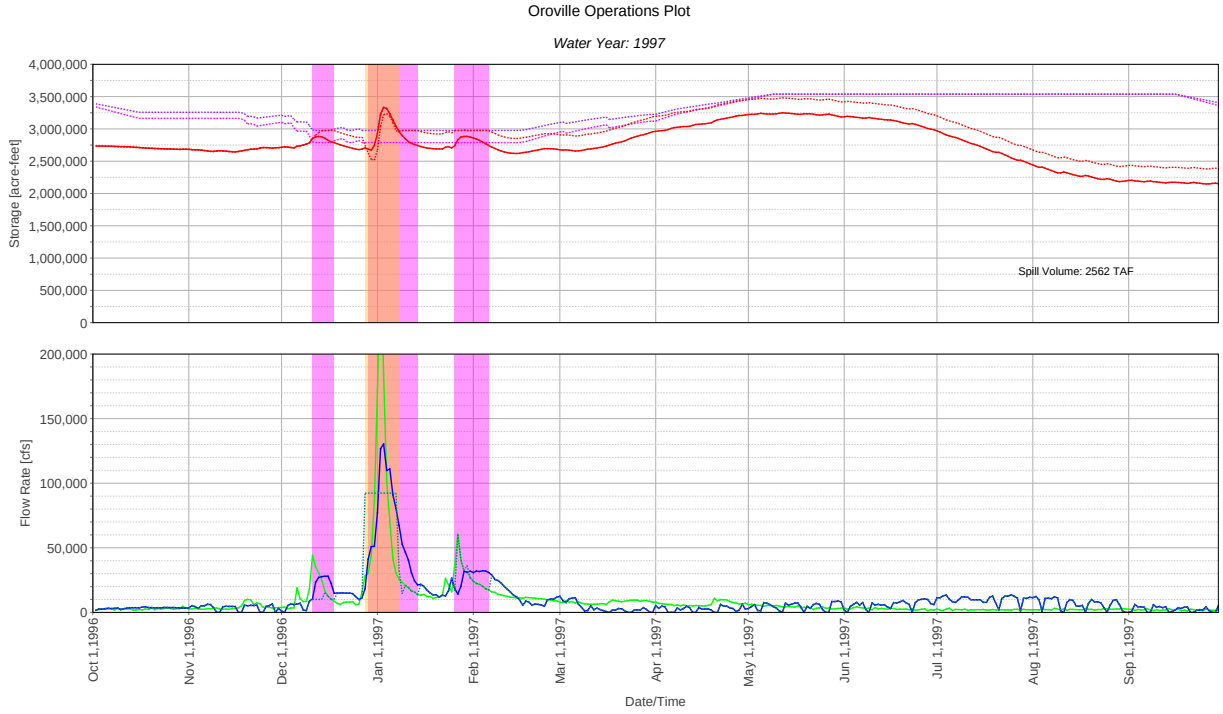

Oroville Operations Plot
Water Year: 1992
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1991
Nov 1,1991
Dec 1,1991
Jan 1,1992
Feb 1,1992
Mar 1,1992
Apr 1,1992
May 1,1992
Jun 1,1992
Jul 1,1992
Aug 1,1992
Sep 1,1992
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

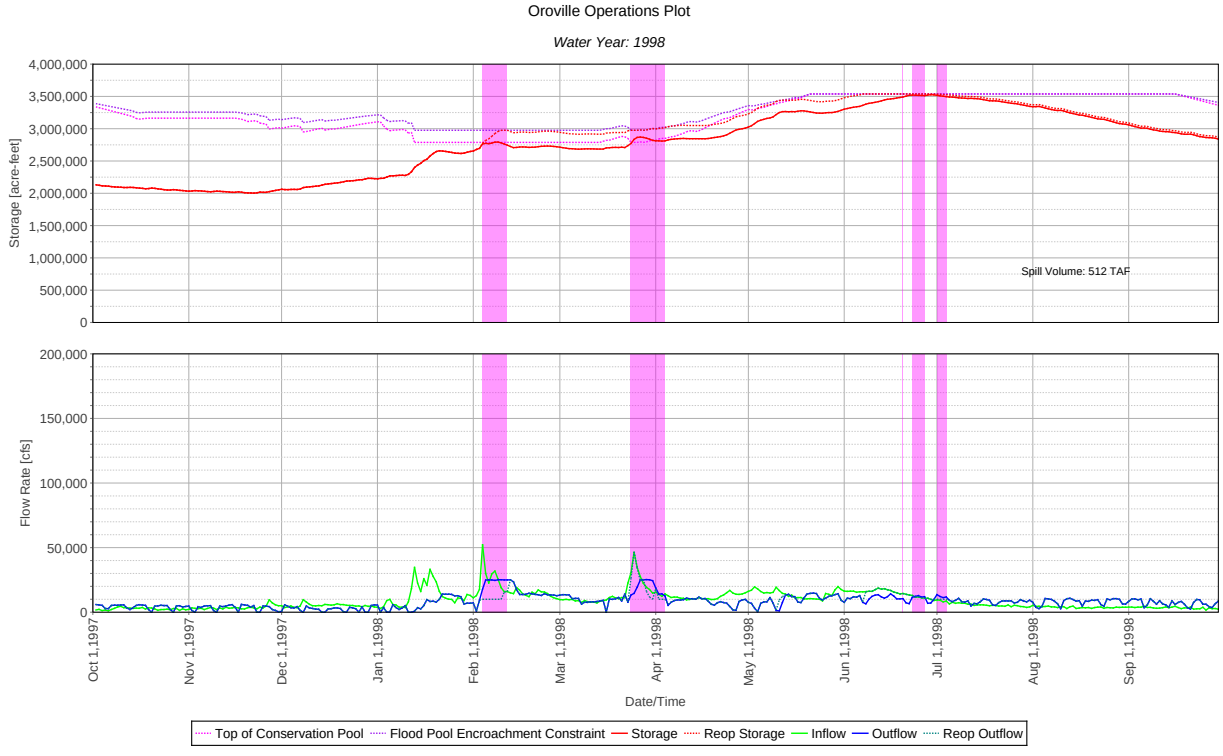

Oroville Operations Plot
Water Year: 1993
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 695 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1992
Nov 1,1992
Dec 1,1992
Jan 1,1993
Feb 1,1993
Mar 1,1993
Apr 1,1993
May 1,1993
Jun 1,1993
Jul 1,1993
Aug 1,1993
Sep 1,1993
Date/Time

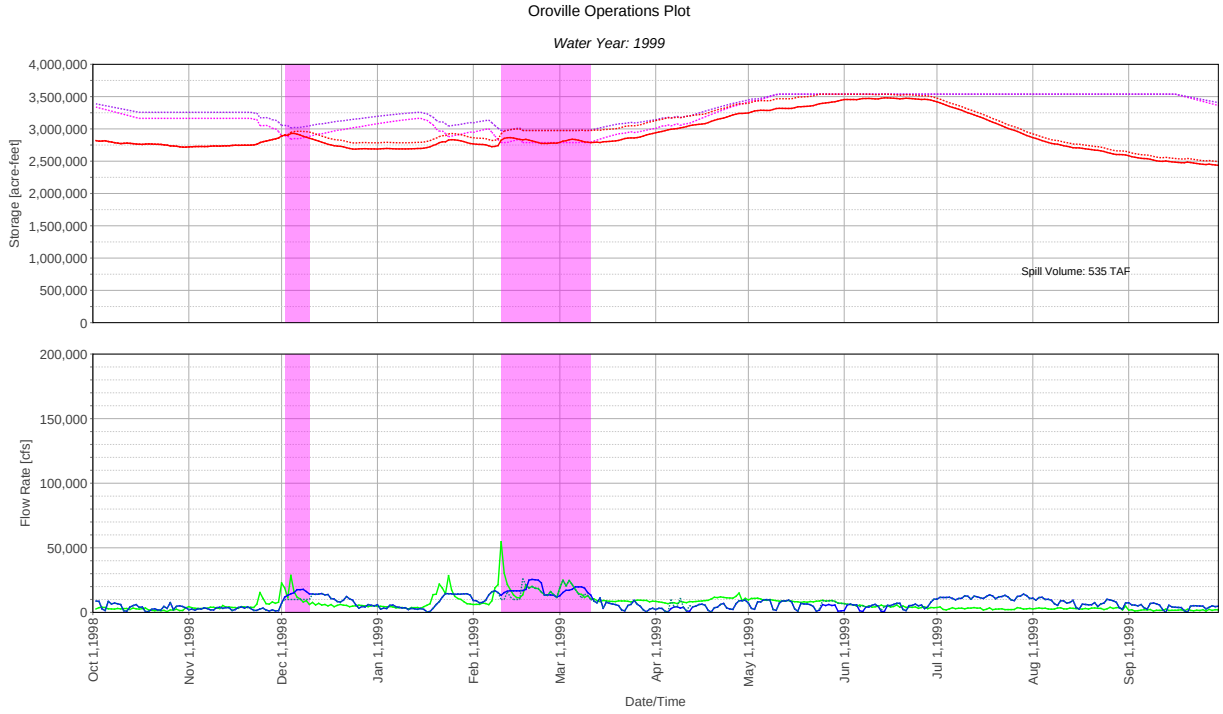

Oroville Operations Plot
Water Year: 1994
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1993
Nov 1,1993
Dec 1,1993
Jan 1,1994
Feb 1,1994
Mar 1,1994
Apr 1,1994
May 1,1994
Jun 1,1994
Jul 1,1994
Aug 1,1994
Sep 1,1994
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

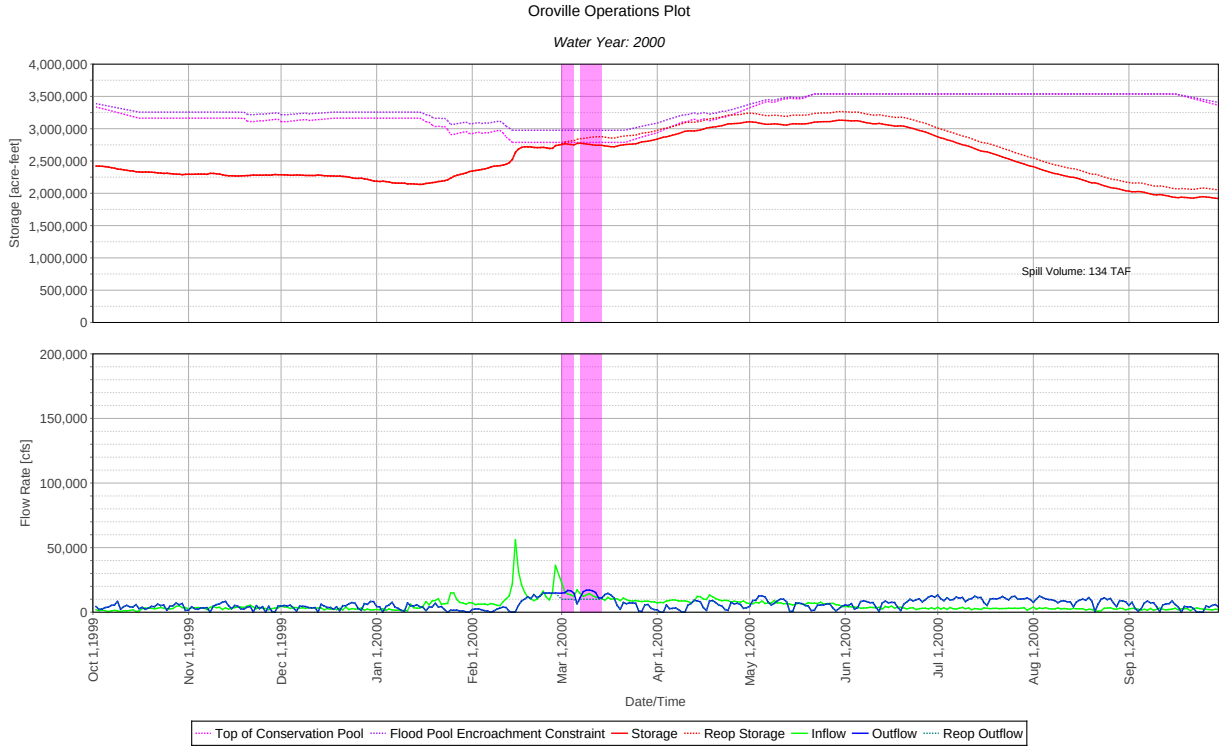

Oroville Operations Plot
Water Year: 1995
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2379 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1994
Nov 1,1994
Dec 1,1994
Jan 1,1995
Feb 1,1995
Mar 1,1995
Apr 1,1995
May 1,1995
Jun 1,1995
Jul 1,1995
Aug 1,1995
Sep 1,1995
Date/Time

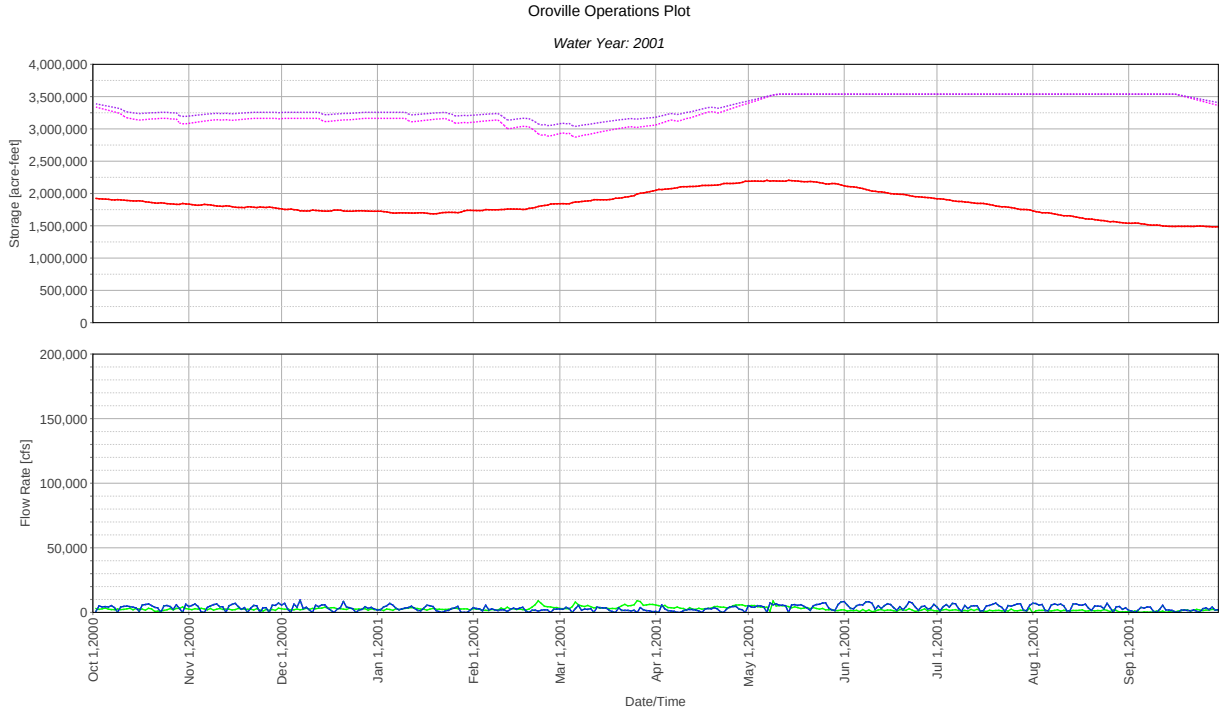

Oroville Operations Plot
Water Year: 1996
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 824 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1995
Nov 1,1995
Dec 1,1995
Jan 1,1996
Feb 1,1996
Mar 1,1996
Apr 1,1996
May 1,1996
Jun 1,1996
Jul 1,1996
Aug 1,1996
Sep 1,1996
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

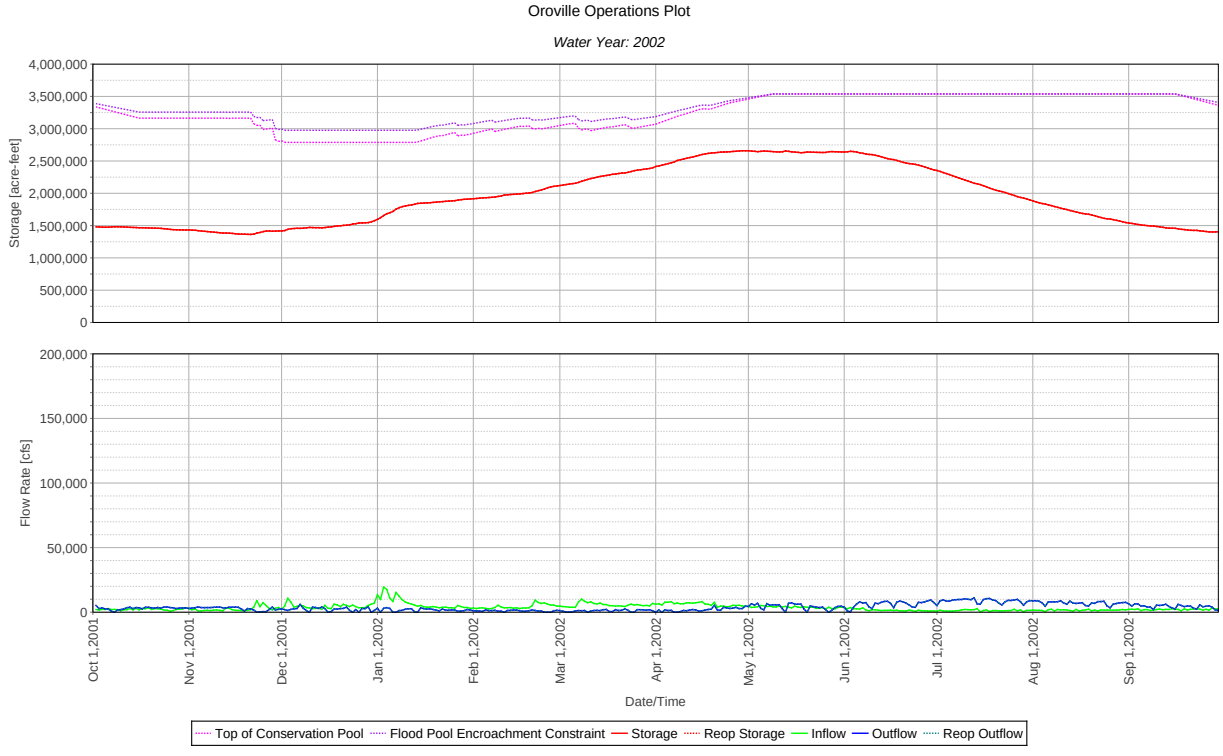

Oroville Operations Plot
Water Year: 1997
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2562 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1996
Nov 1,1996
Dec 1,1996
Jan 1,1997
Feb 1,1997
Mar 1,1997
Apr 1,1997
May 1,1997
Jun 1,1997
Jul 1,1997
Aug 1,1997
Sep 1,1997
Date/Time

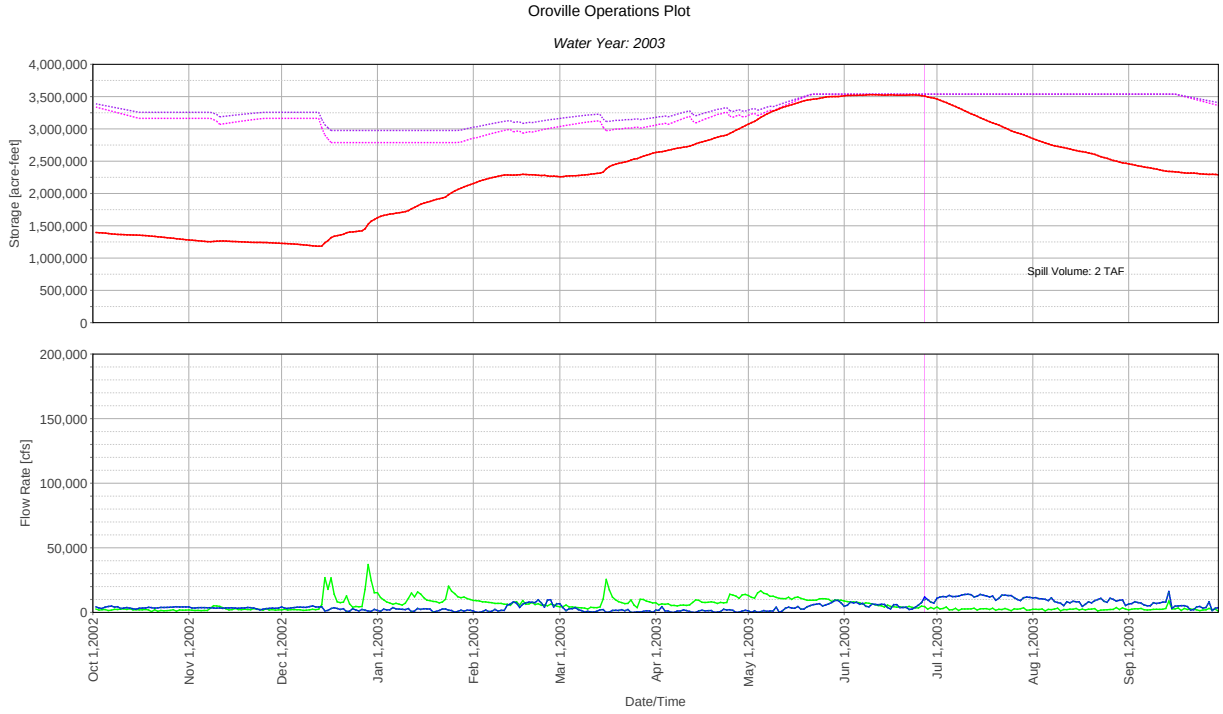

Oroville Operations Plot
Water Year: 1998
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 512 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1997
Nov 1,1997
Dec 1,1997
Jan 1,1998
Feb 1,1998
Mar 1,1998
Apr 1,1998
May 1,1998
Jun 1,1998
Jul 1,1998
Aug 1,1998
Sep 1,1998
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

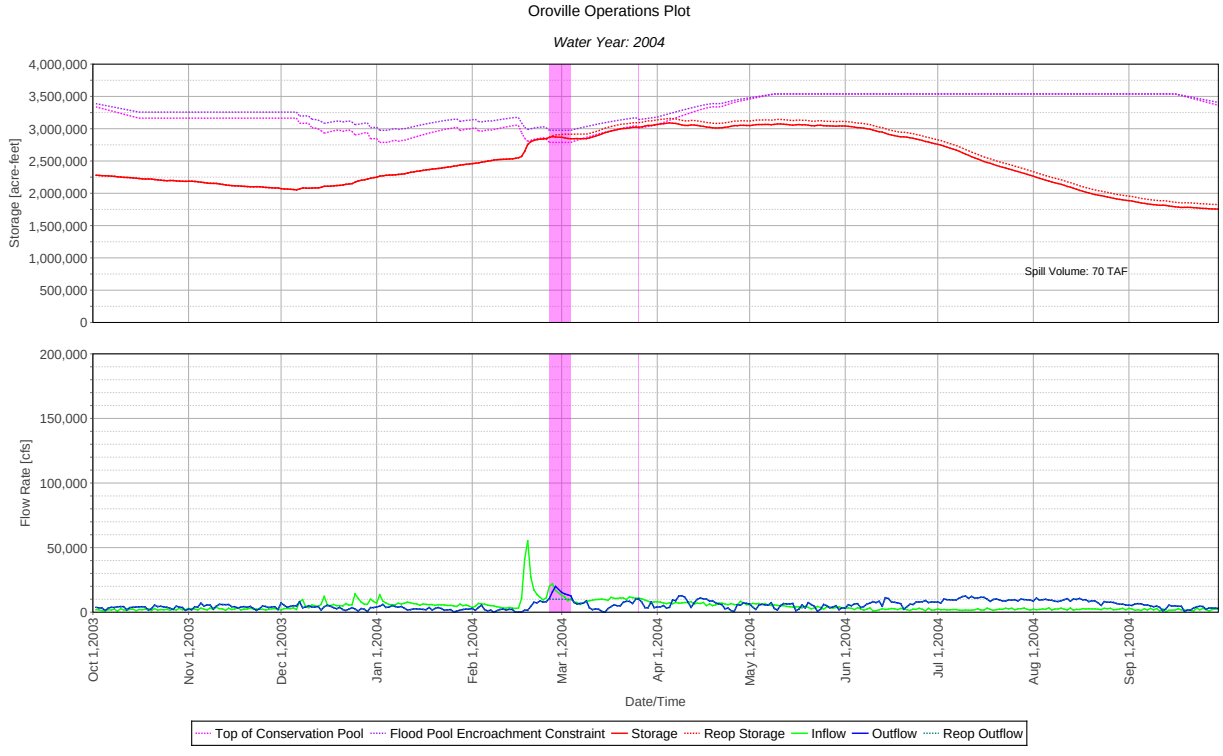

Oroville Operations Plot
Water Year: 1999
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 535 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1998
Nov 1,1998
Dec 1,1998
Jan 1,1999
Feb 1,1999
Mar 1,1999
Apr 1,1999
May 1,1999
Jun 1,1999
Jul 1,1999
Aug 1,1999
Sep 1,1999
Date/Time

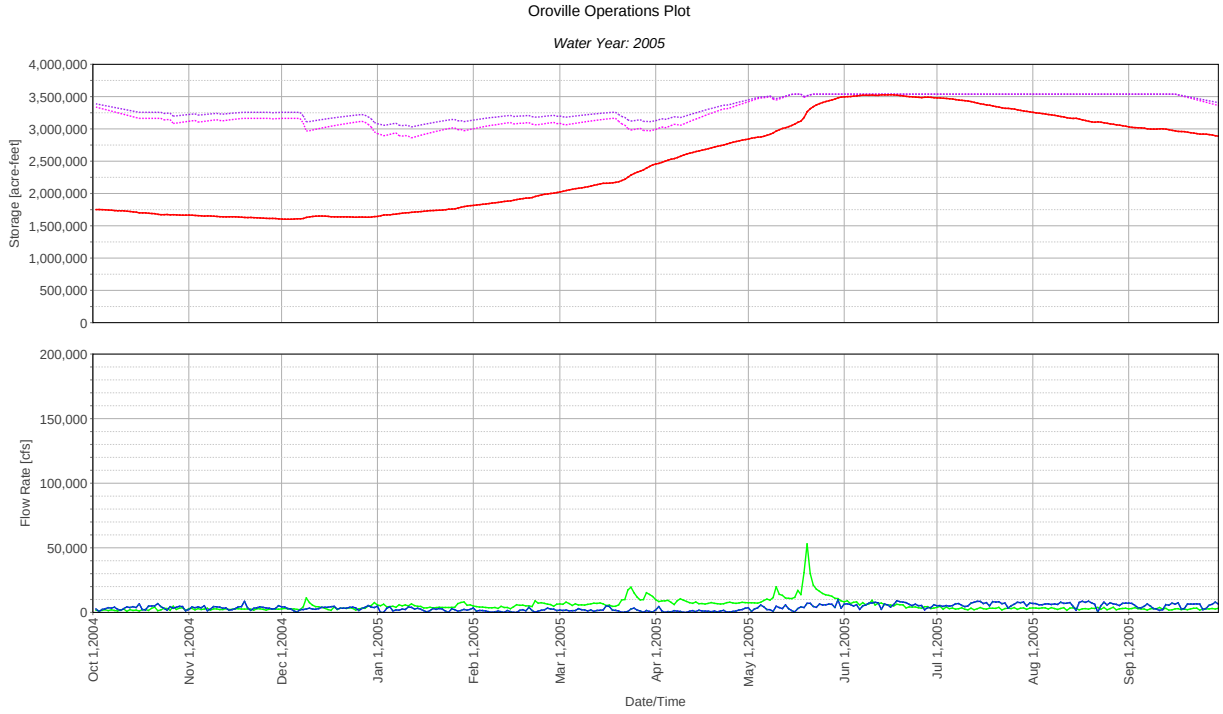

Oroville Operations Plot
Water Year: 2000
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 134 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,1999
Nov 1,1999
Dec 1,1999
Jan 1,2000
Feb 1,2000
Mar 1,2000
Apr 1,2000
May 1,2000
Jun 1,2000
Jul 1,2000
Aug 1,2000
Sep 1,2000
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

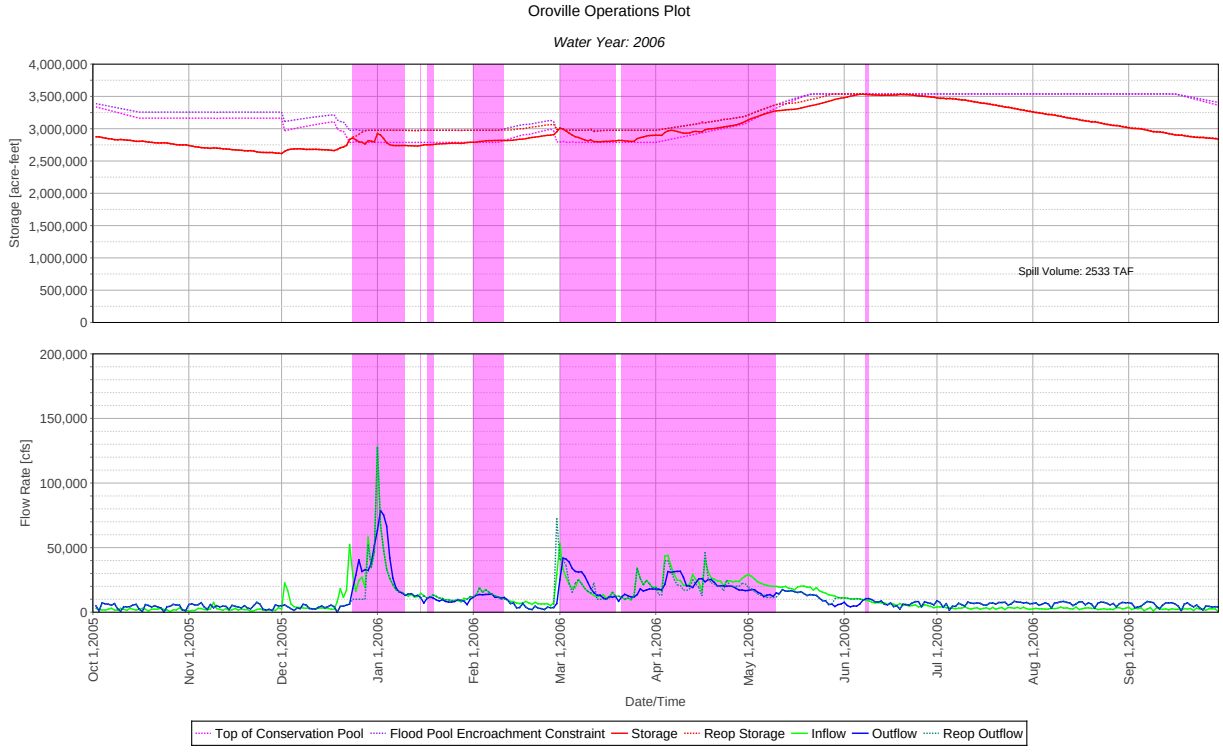

Oroville Operations Plot
Water Year: 2001
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2000
Nov 1,2000
Dec 1,2000
Jan 1,2001
Feb 1,2001
Mar 1,2001
Apr 1,2001
May 1,2001
Jun 1,2001
Jul 1,2001
Aug 1,2001
Sep 1,2001
Date/Time

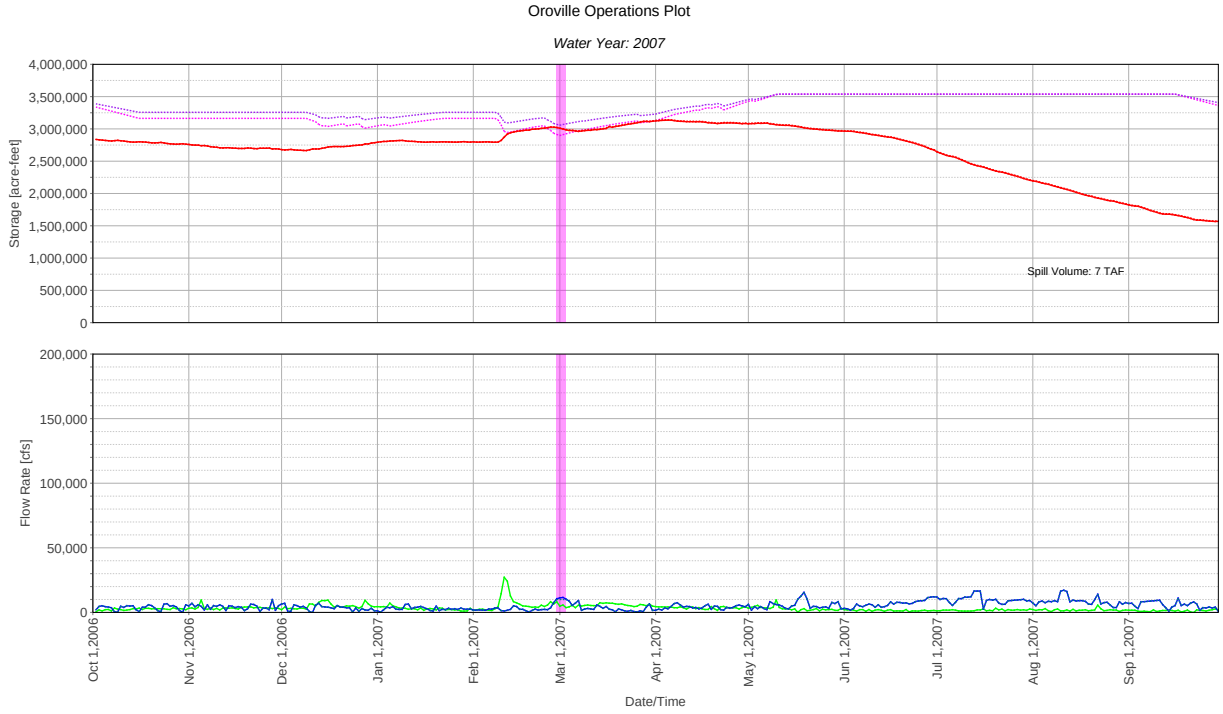

Oroville Operations Plot
Water Year: 2002
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2001
Nov 1,2001
Dec 1,2001
Jan 1,2002
Feb 1,2002
Mar 1,2002
Apr 1,2002
May 1,2002
Jun 1,2002
Jul 1,2002
Aug 1,2002
Sep 1,2002
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

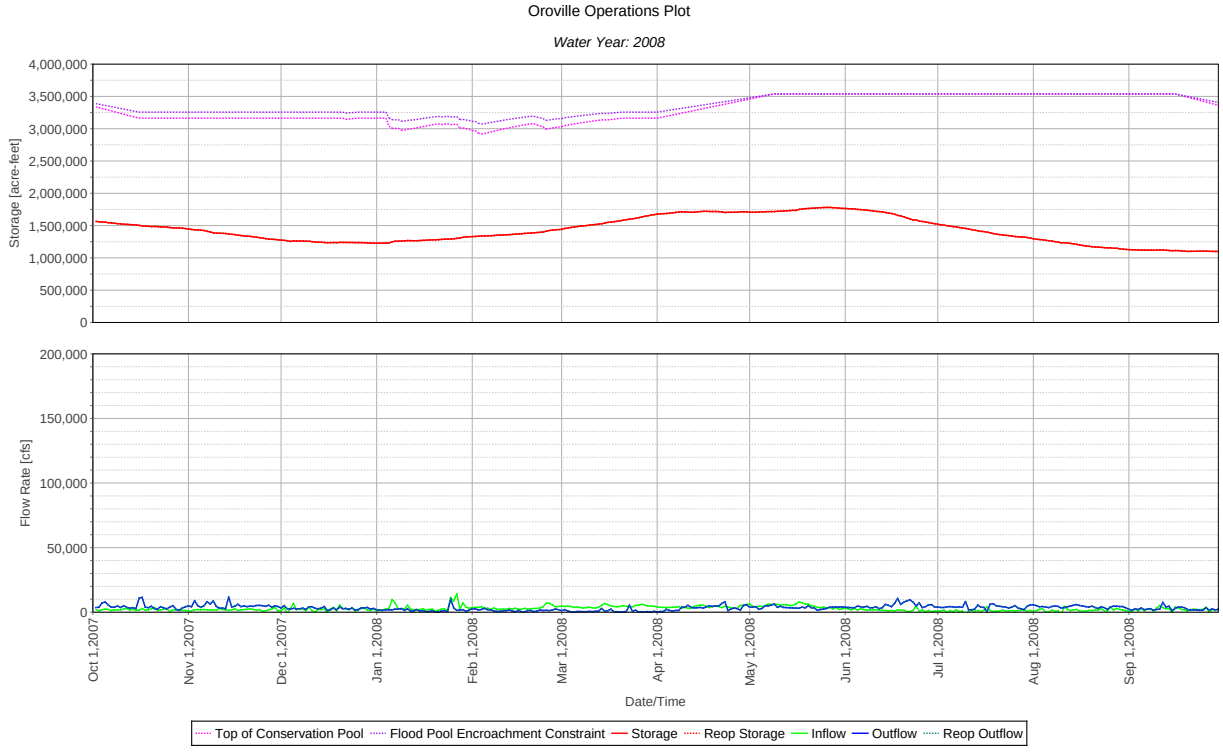

Oroville Operations Plot
Water Year: 2003
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2002
Nov 1,2002
Dec 1,2002
Jan 1,2003
Feb 1,2003
Mar 1,2003
Apr 1,2003
May 1,2003
Jun 1,2003
Jul 1,2003
Aug 1,2003
Sep 1,2003
Date/Time

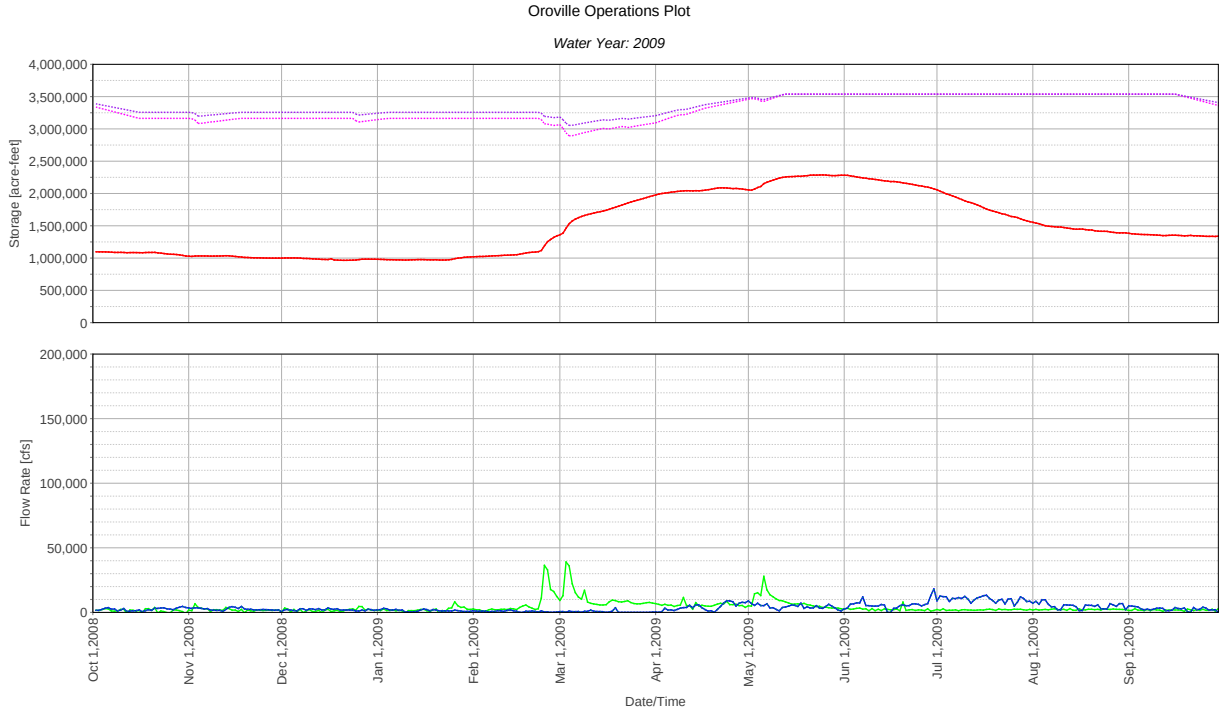

Oroville Operations Plot
Water Year: 2004
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 70 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2003
Nov 1,2003
Dec 1,2003
Jan 1,2004
Feb 1,2004
Mar 1,2004
Apr 1,2004
May 1,2004
Jun 1,2004
Jul 1,2004
Aug 1,2004
Sep 1,2004
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

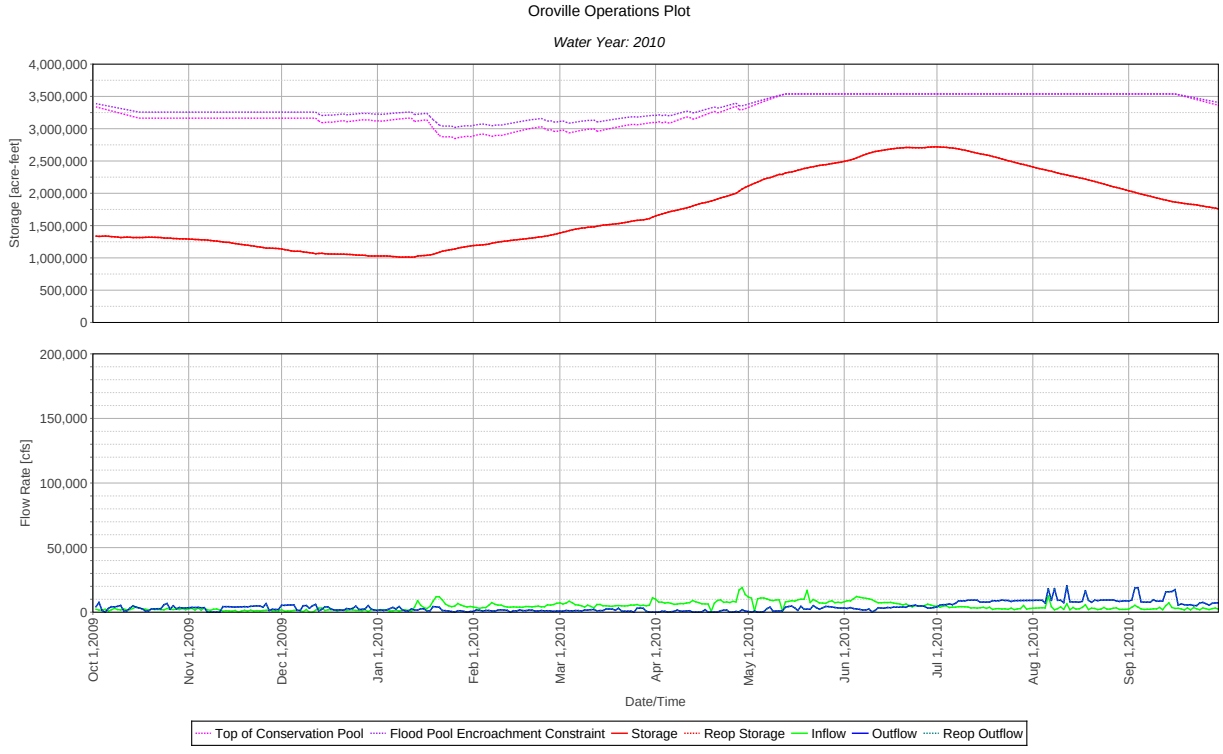

Oroville Operations Plot
Water Year: 2005
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2004
Nov 1,2004
Dec 1,2004
Jan 1,2005
Feb 1,2005
Mar 1,2005
Apr 1,2005
May 1,2005
Jun 1,2005
Jul 1,2005
Aug 1,2005
Sep 1,2005
Date/Time


Oroville Operations Plot
Water Year: 2006
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 2533 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2005
Nov 1,2005
Dec 1,2005
Jan 1,2006
Feb 1,2006
Mar 1,2006
Apr 1,2006
May 1,2006
Jun 1,2006
Jul 1,2006
Aug 1,2006
Sep 1,2006
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


Oroville Operations Plot
Water Year: 2007
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Spill Volume: 7 TAF
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2006
Nov 1,2006
Dec 1,2006
Jan 1,2007
Feb 1,2007
Mar 1,2007
Apr 1,2007
May 1,2007
Jun 1,2007
Jul 1,2007
Aug 1,2007
Sep 1,2007
Date/Time

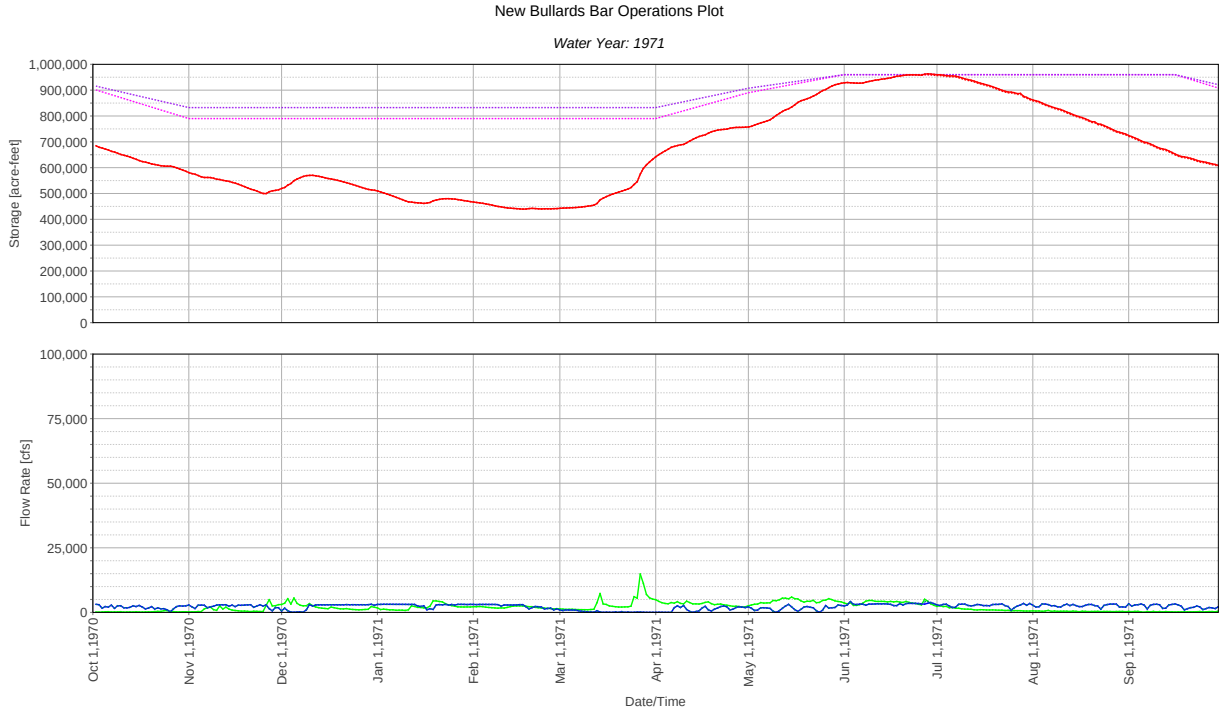

Oroville Operations Plot
Water Year: 2008
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2007
Nov 1,2007
Dec 1,2007
Jan 1,2008
Feb 1,2008
Mar 1,2008
Apr 1,2008
May 1,2008
Jun 1,2008
Jul 1,2008
Aug 1,2008
Sep 1,2008
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

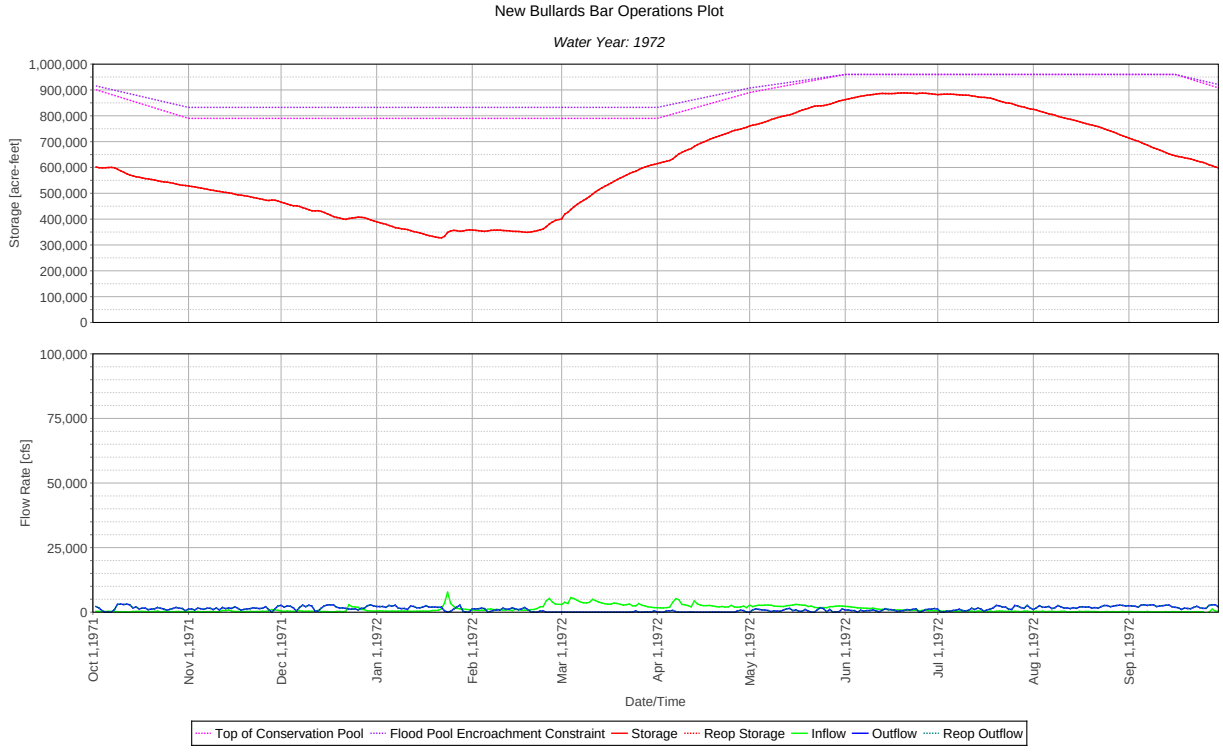

Oroville Operations Plot
Water Year: 2009
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2008
Nov 1,2008
Dec 1,2008
Jan 1,2009
Feb 1,2009
Mar 1,2009
Apr 1,2009
May 1,2009
Jun 1,2009
Jul 1,2009
Aug 1,2009
Sep 1,2009
Date/Time

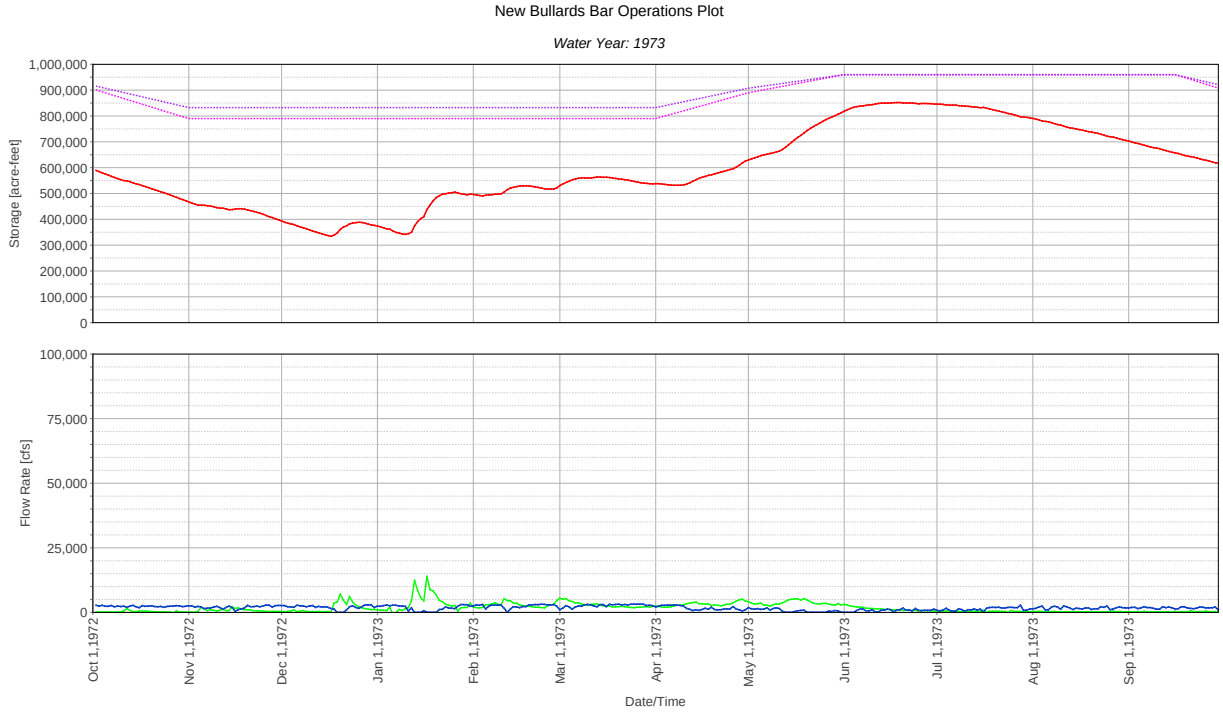

Oroville Operations Plot
Water Year: 2010
Storage [acre-feet]
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Flow Rate [cfs]
200,000
150,000
100,000
50,000
0
Oct 1,2009
Nov 1,2009
Dec 1,2009
Jan 1,2010
Feb 1,2010
Mar 1,2010
Apr 1,2010
May 1,2010
Jun 1,2010
Jul 1,2010
Aug 1,2010
Sep 1,2010
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

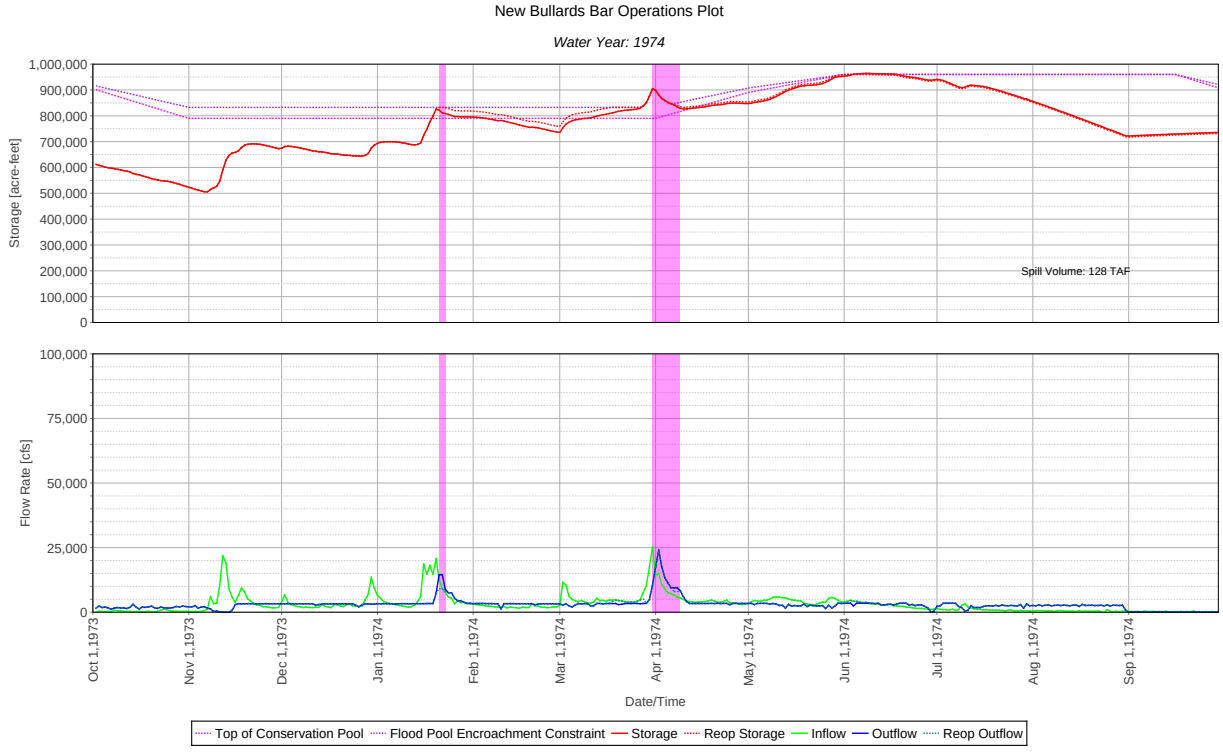
A.3 New Bullards Bar

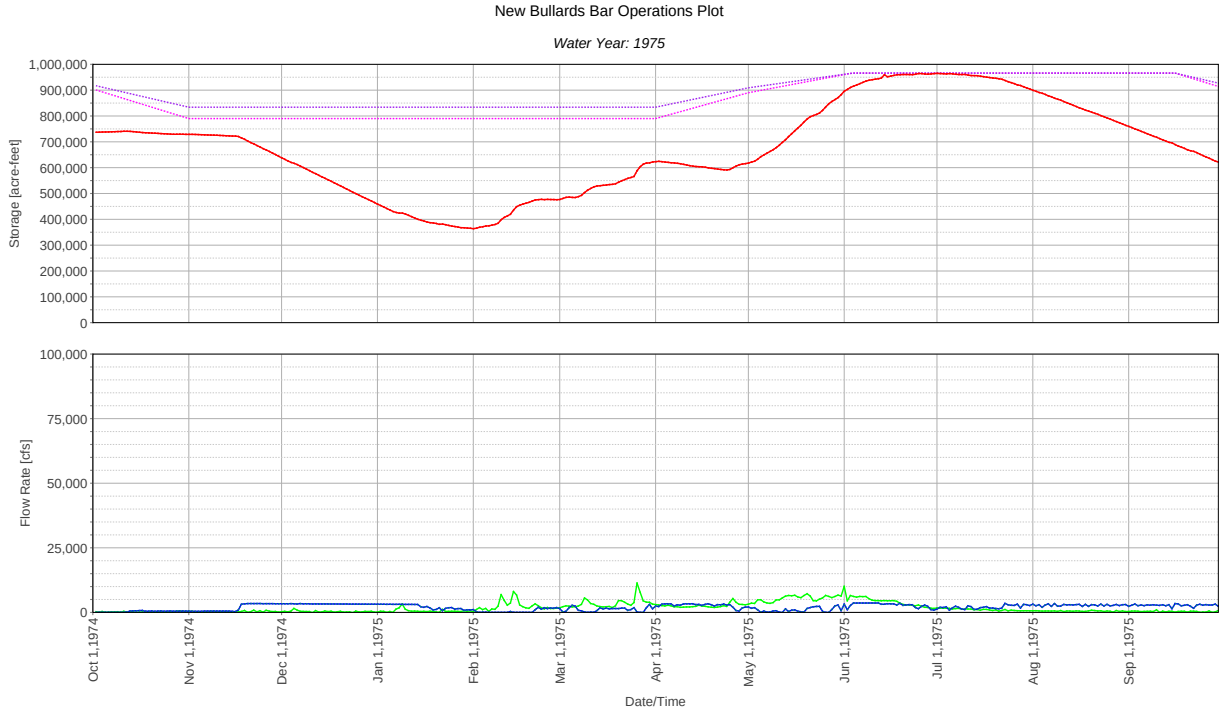
The following section includes the reoperation plots for New Bullards Bar Dam.

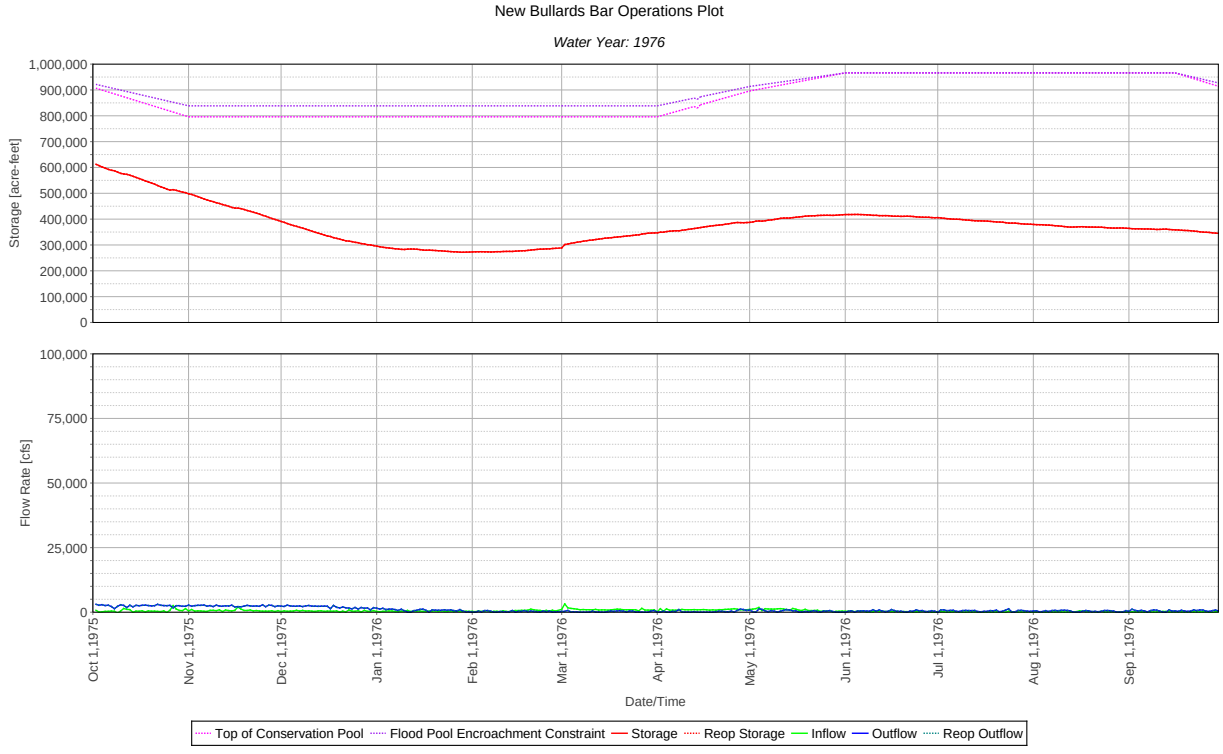

New Bullards Bar Operations Plot
Water Year: 1971
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1970
Nov 1,1970
Dec 1,1970
Jan 1,1971
Feb 1,1971
Mar 1,1971
Apr 1,1971
May 1,1971
Jun 1,1971
Jul 1,1971
Aug 1,1971
Sep 1,1971
Date/Time

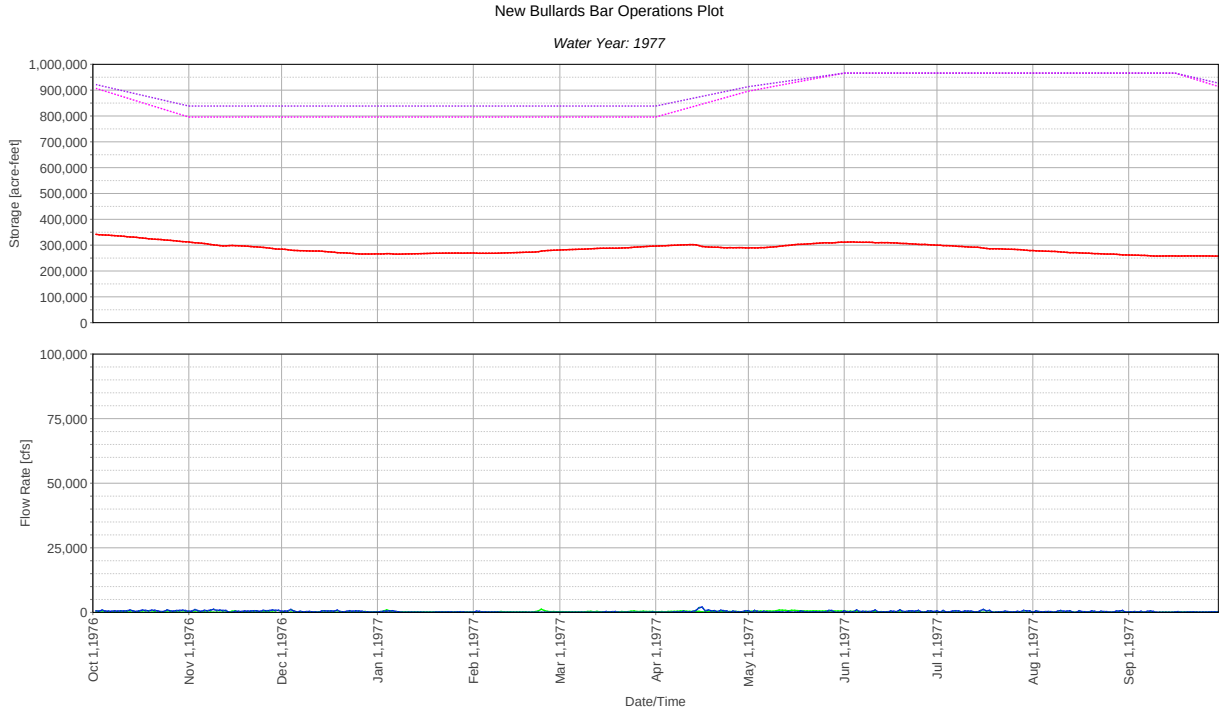

New Bullards Bar Operations Plot
Water Year: 1972
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1971
Nov 1,1971
Dec 1,1971
Jan 1,1972
Feb 1,1972
Mar 1,1972
Apr 1,1972
May 1,1972
Jun 1,1972
Jul 1,1972
Aug 1,1972
Sep 1,1972
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

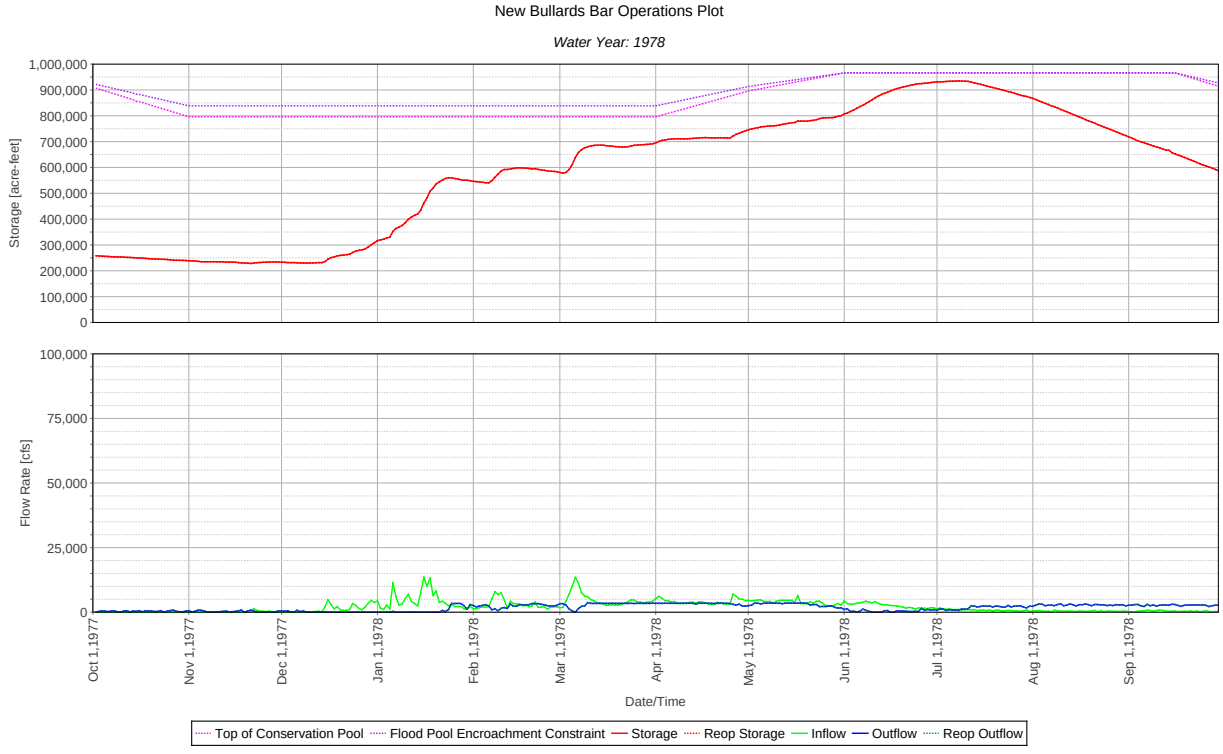

New Bullards Bar Operations Plot
Water Year: 1973
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1972
Nov 1,1972
Dec 1,1972
Jan 1,1973
Feb 1,1973
Mar 1,1973
Apr 1,1973
May 1,1973
Jun 1,1973
Jul 1,1973
Aug 1,1973
Sep 1,1973
Date/Time

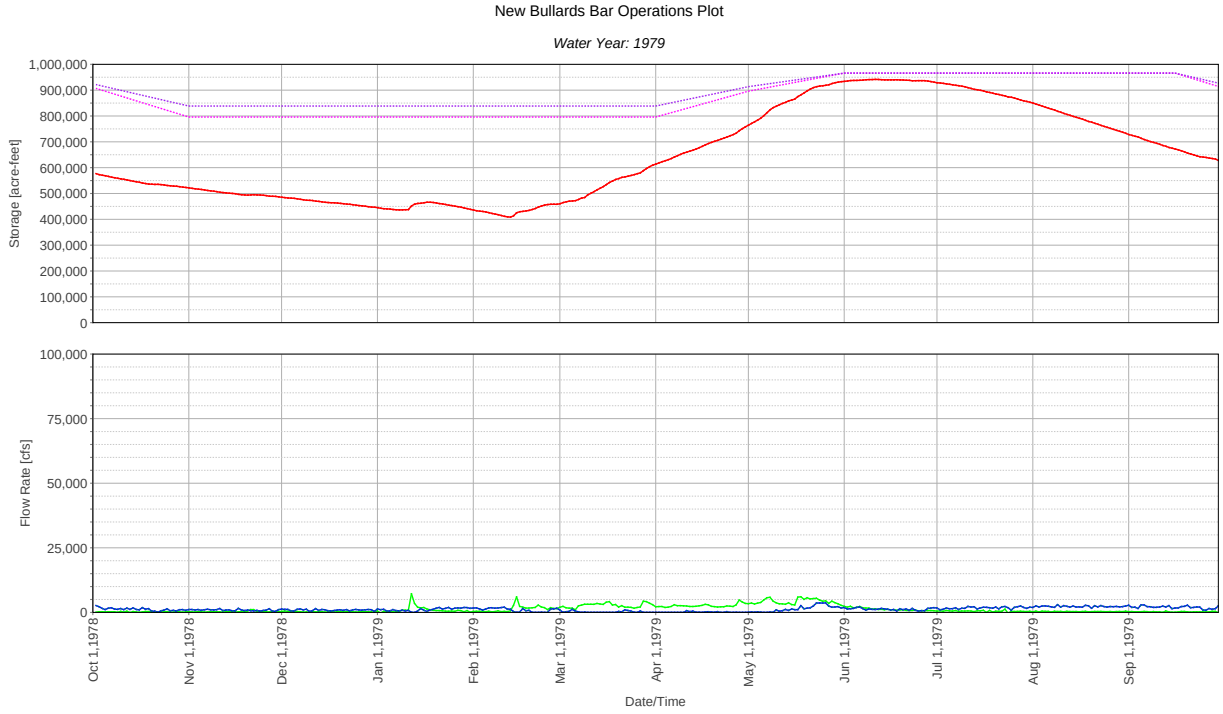

New Bullards Bar Operations Plot
Water Year: 1974
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 128 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1973
Nov 1,1973
Dec 1,1973
Jan 1,1974
Feb 1,1974
Mar 1,1974
Apr 1,1974
May 1,1974
Jun 1,1974
Jul 1,1974
Aug 1,1974
Sep 1,1974
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

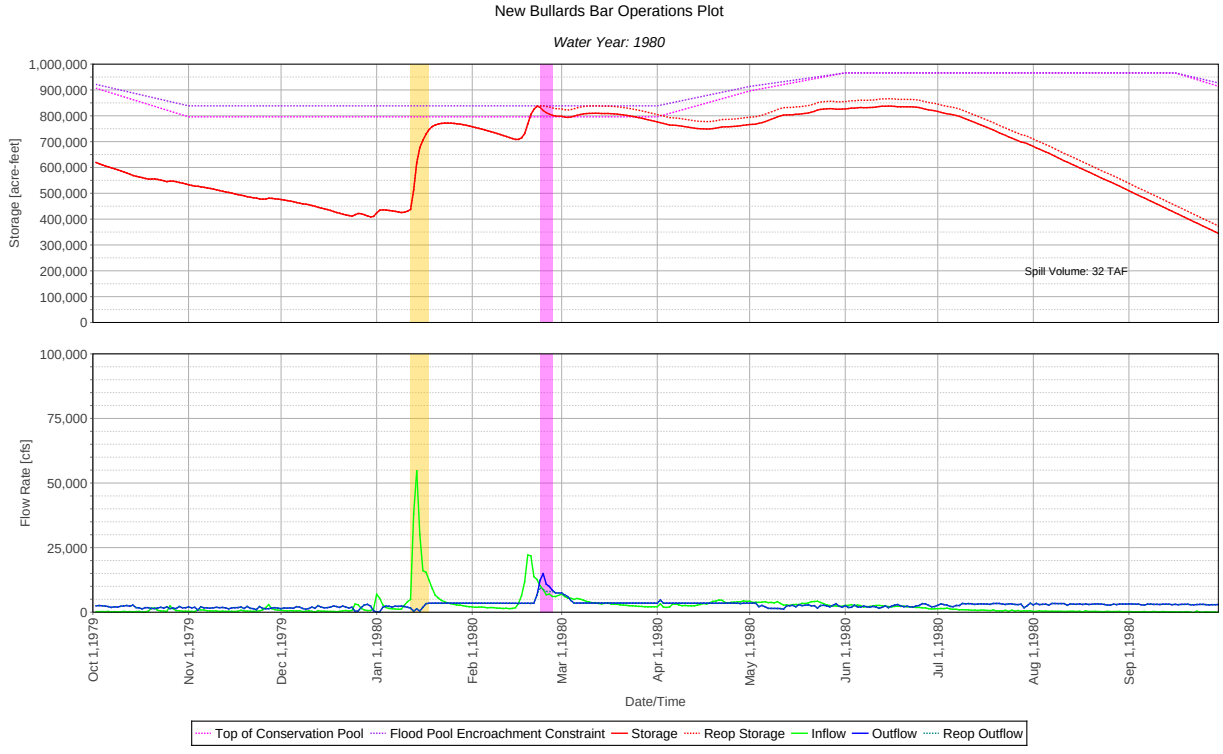

New Bullards Bar Operations Plot
Water Year: 1975
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1974
Nov 1,1974
Dec 1,1974
Jan 1,1975
Feb 1,1975
Mar 1,1975
Apr 1,1975
May 1,1975
Jun 1,1975
Jul 1,1975
Aug 1,1975
Sep 1,1975
Date/Time

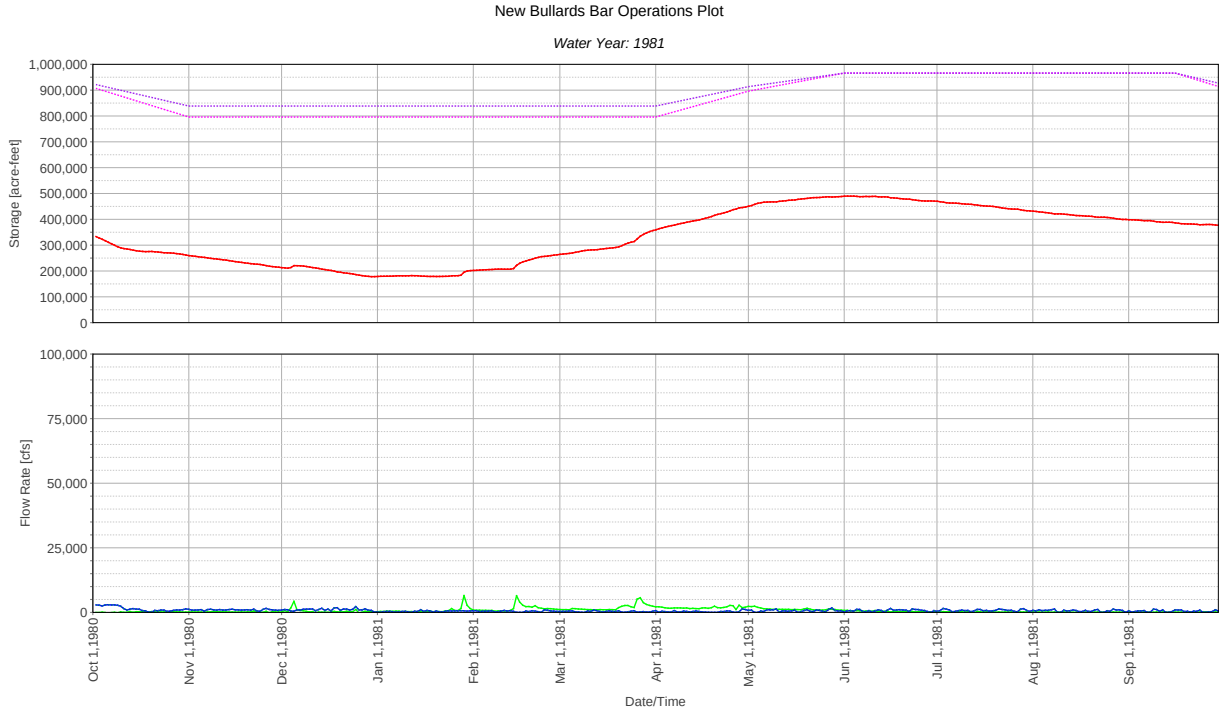

New Bullards Bar Operations Plot
Water Year: 1976
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1975
Nov 1,1975
Dec 1,1975
Jan 1,1976
Feb 1,1976
Mar 1,1976
Apr 1,1976
May 1,1976
Jun 1,1976
Jul 1,1976
Aug 1,1976
Sep 1,1976
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

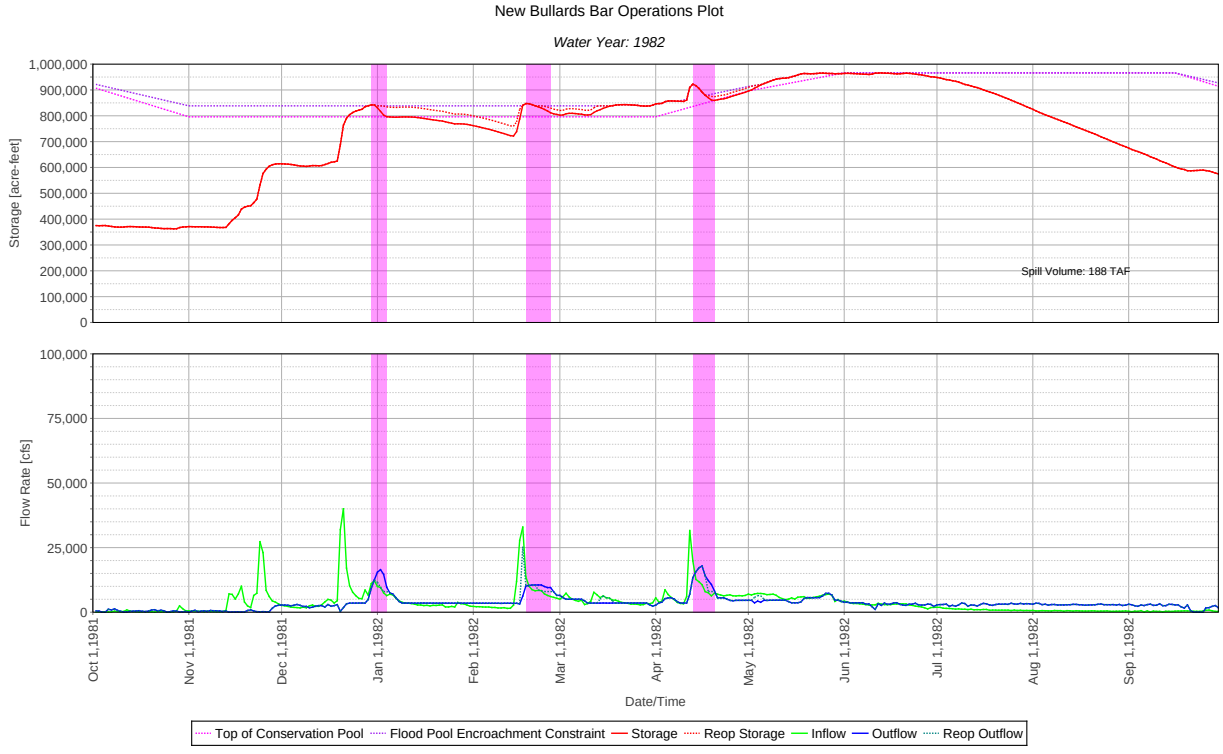

New Bullards Bar Operations Plot
Water Year: 1977
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1976
Nov 1,1976
Dec 1,1976
Jan 1,1977
Feb 1,1977
Mar 1,1977
Apr 1,1977
May 1,1977
Jun 1,1977
Jul 1,1977
Aug 1,1977
Sep 1,1977
Date/Time

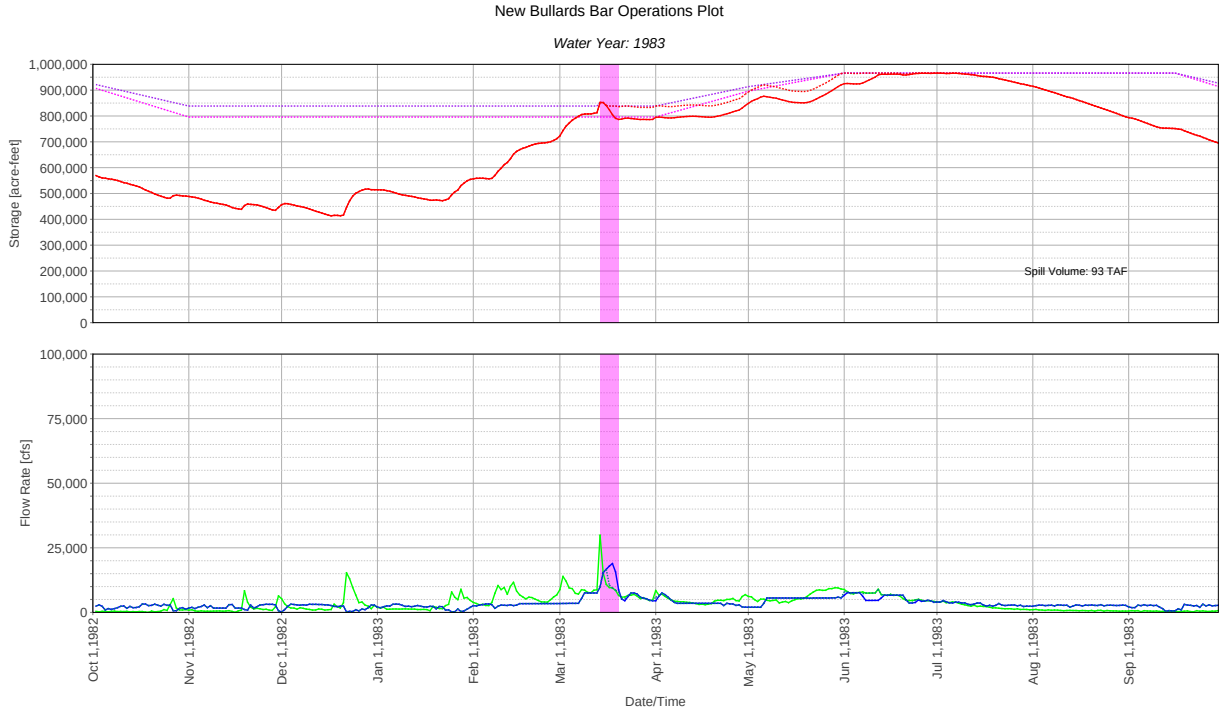

New Bullards Bar Operations Plot
Water Year: 1978
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1977
Nov 1,1977
Dec 1,1977
Jan 1,1978
Feb 1,1978
Mar 1,1978
Apr 1,1978
May 1,1978
Jun 1,1978
Jul 1,1978
Aug 1,1978
Sep 1,1978
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

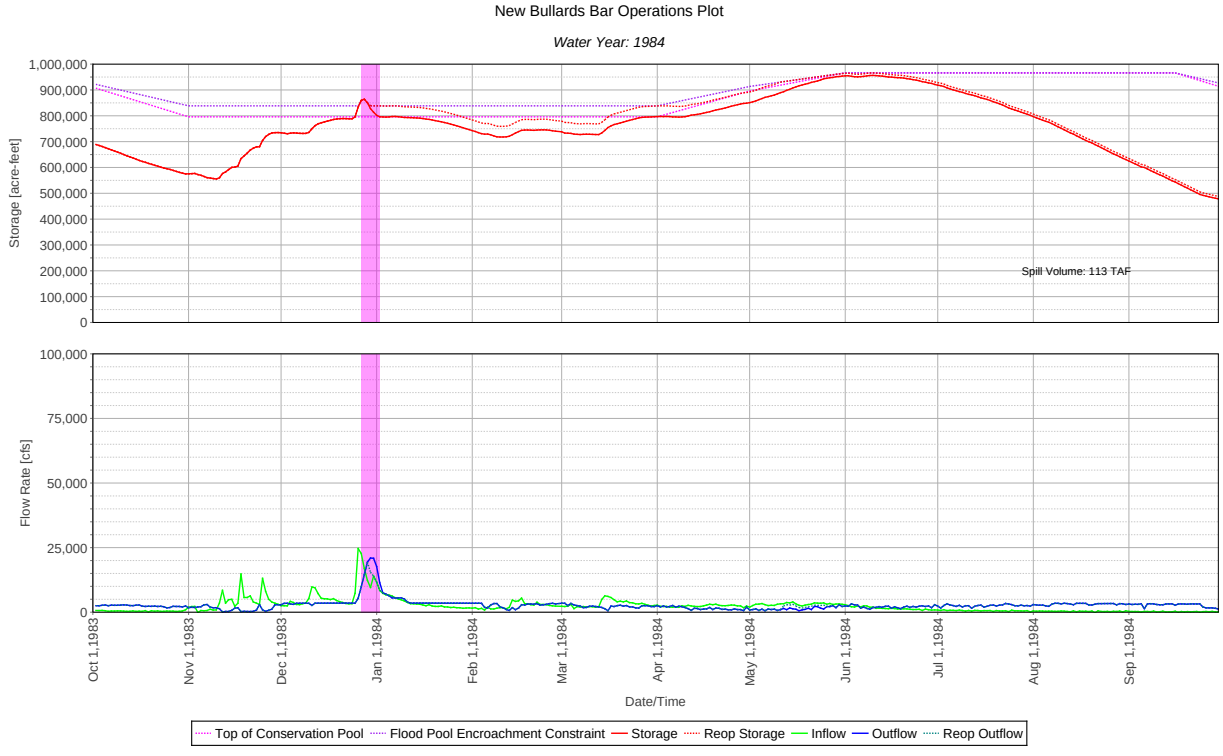

New Bullards Bar Operations Plot
Water Year: 1979
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1978
Nov 1,1978
Dec 1,1978
Jan 1,1979
Feb 1,1979
Mar 1,1979
Apr 1,1979
May 1,1979
Jun 1,1979
Jul 1,1979
Aug 1,1979
Sep 1,1979
Date/Time

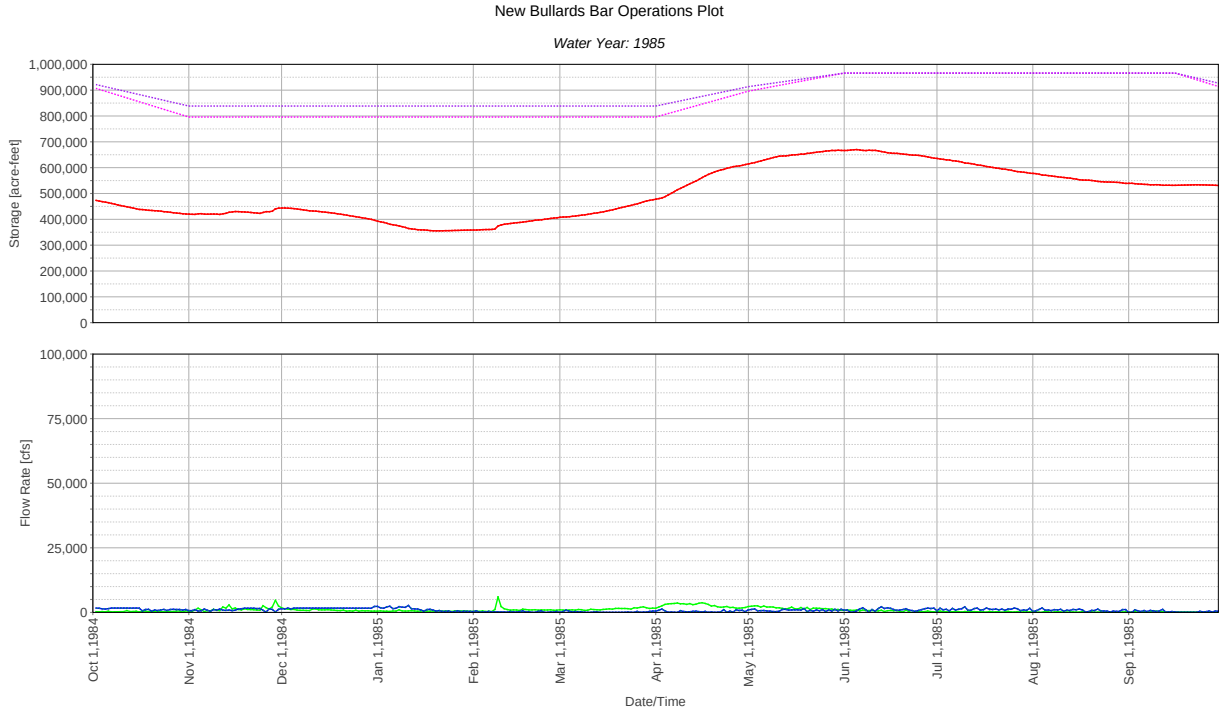

New Bullards Bar Operations Plot
Water Year: 1980
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 32 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1979
Nov 1,1979
Dec 1,1979
Jan 1,1980
Feb 1,1980
Mar 1,1980
Apr 1,1980
May 1,1980
Jun 1,1980
Jul 1,1980
Aug 1,1980
Sep 1,1980
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

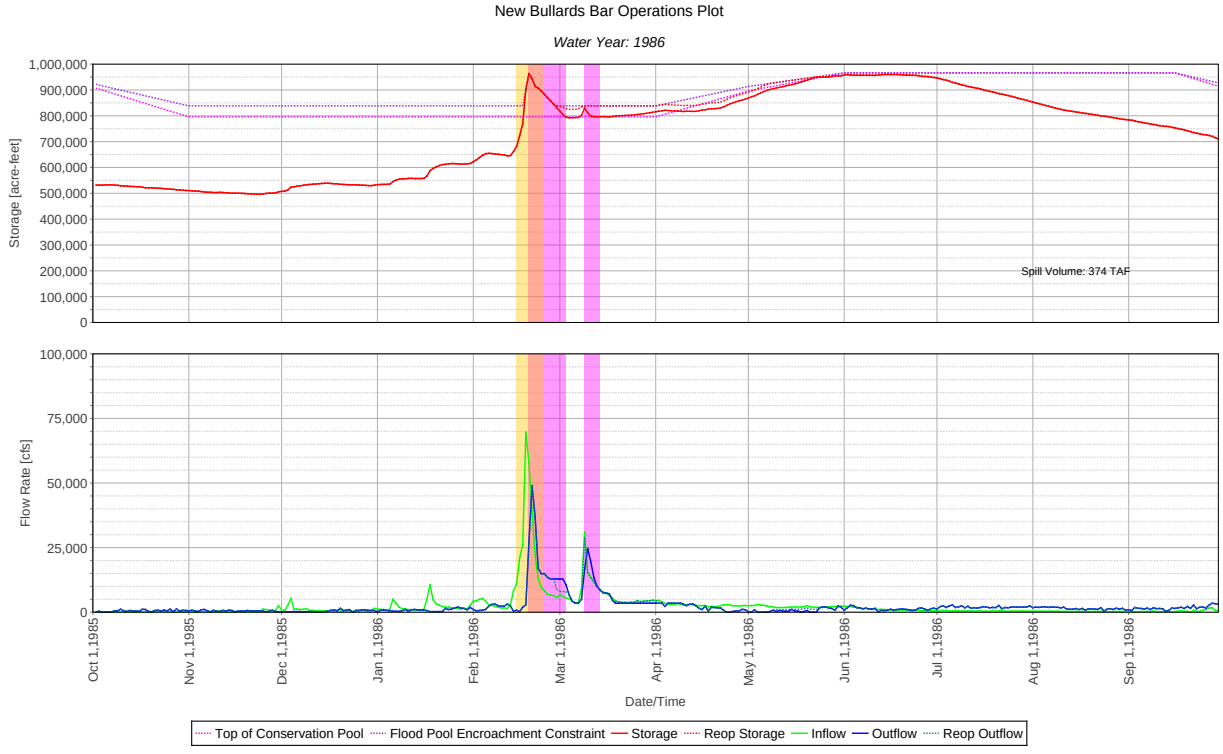

New Bullards Bar Operations Plot
Water Year: 1981
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1980
Nov 1,1980
Dec 1,1980
Jan 1,1981
Feb 1,1981
Mar 1,1981
Apr 1,1981
May 1,1981
Jun 1,1981
Jul 1,1981
Aug 1,1981
Sep 1,1981
Date/Time

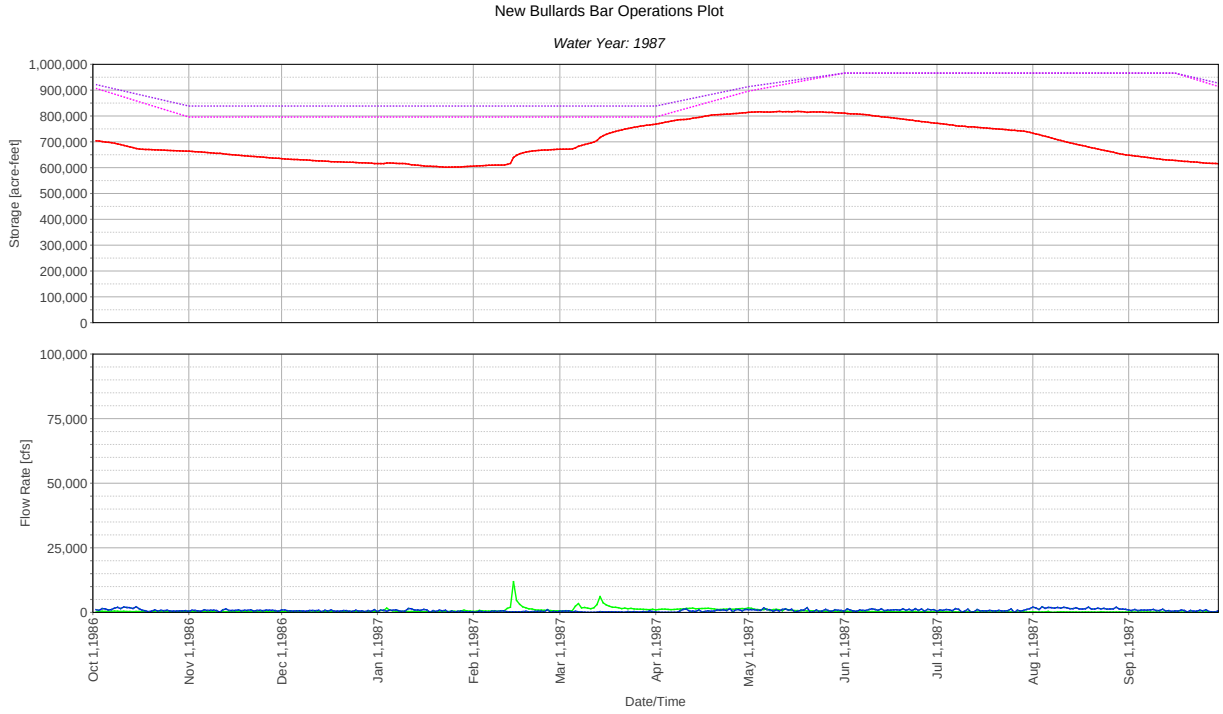

New Bullards Bar Operations Plot
Water Year: 1982
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 188 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1981
Nov 1,1981
Dec 1,1981
Jan 1,1982
Feb 1,1982
Mar 1,1982
Apr 1,1982
May 1,1982
Jun 1,1982
Jul 1,1982
Aug 1,1982
Sep 1,1982
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

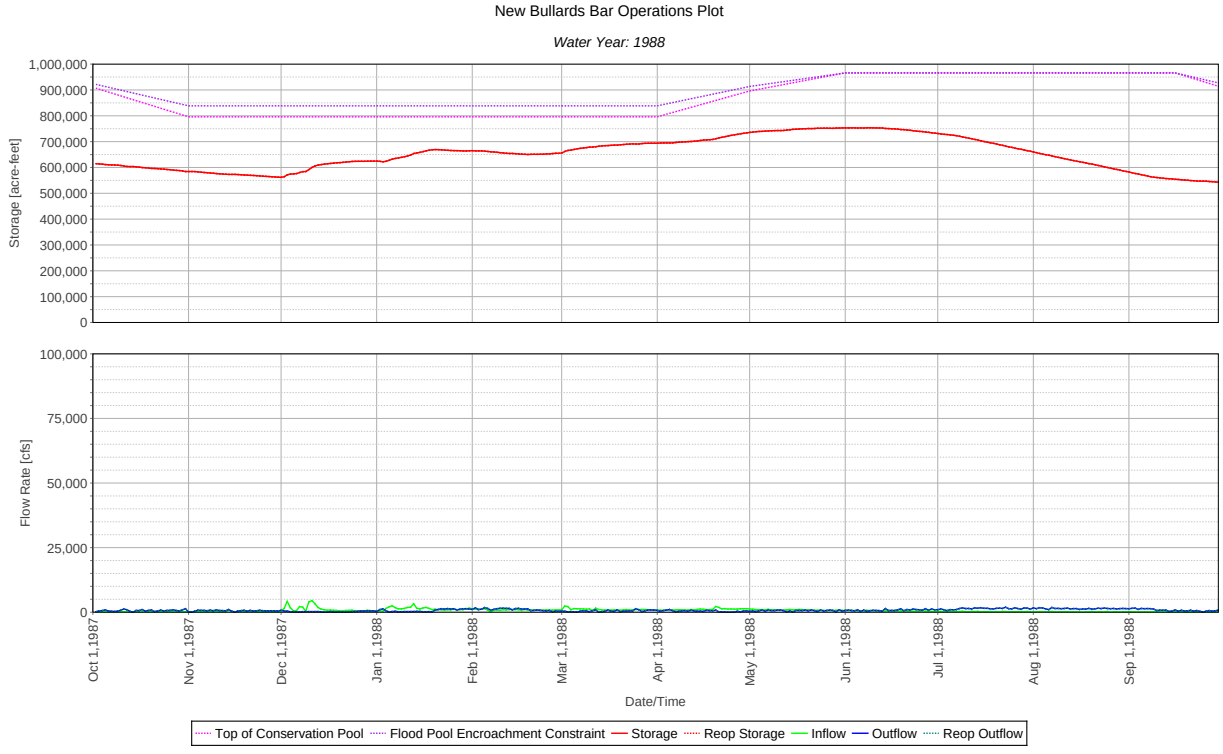

New Bullards Bar Operations Plot
Water Year: 1983
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 93 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1982
Nov 1,1982
Dec 1,1982
Jan 1,1983
Feb 1,1983
Mar 1,1983
Apr 1,1983
May 1,1983
Jun 1,1983
Jul 1,1983
Aug 1,1983
Sep 1,1983
Date/Time

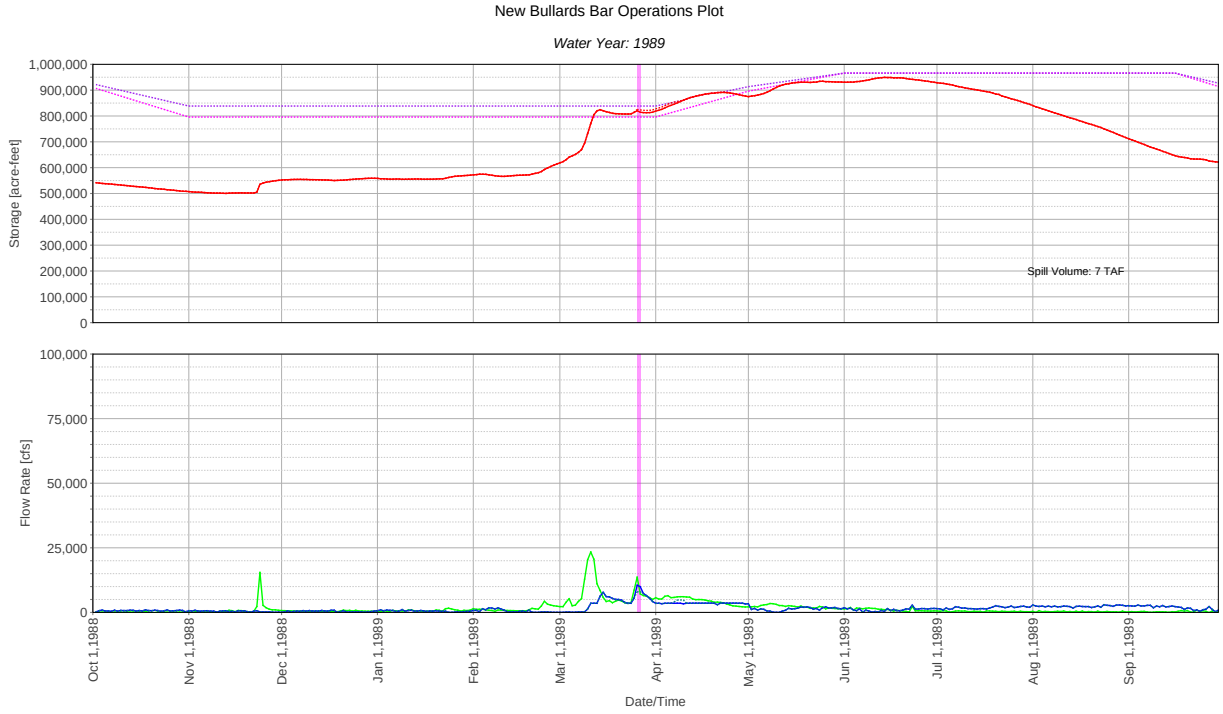

New Bullards Bar Operations Plot
Water Year: 1984
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 113 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1983
Nov 1,1983
Dec 1,1983
Jan 1,1984
Feb 1,1984
Mar 1,1984
Apr 1,1984
May 1,1984
Jun 1,1984
Jul 1,1984
Aug 1,1984
Sep 1,1984
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

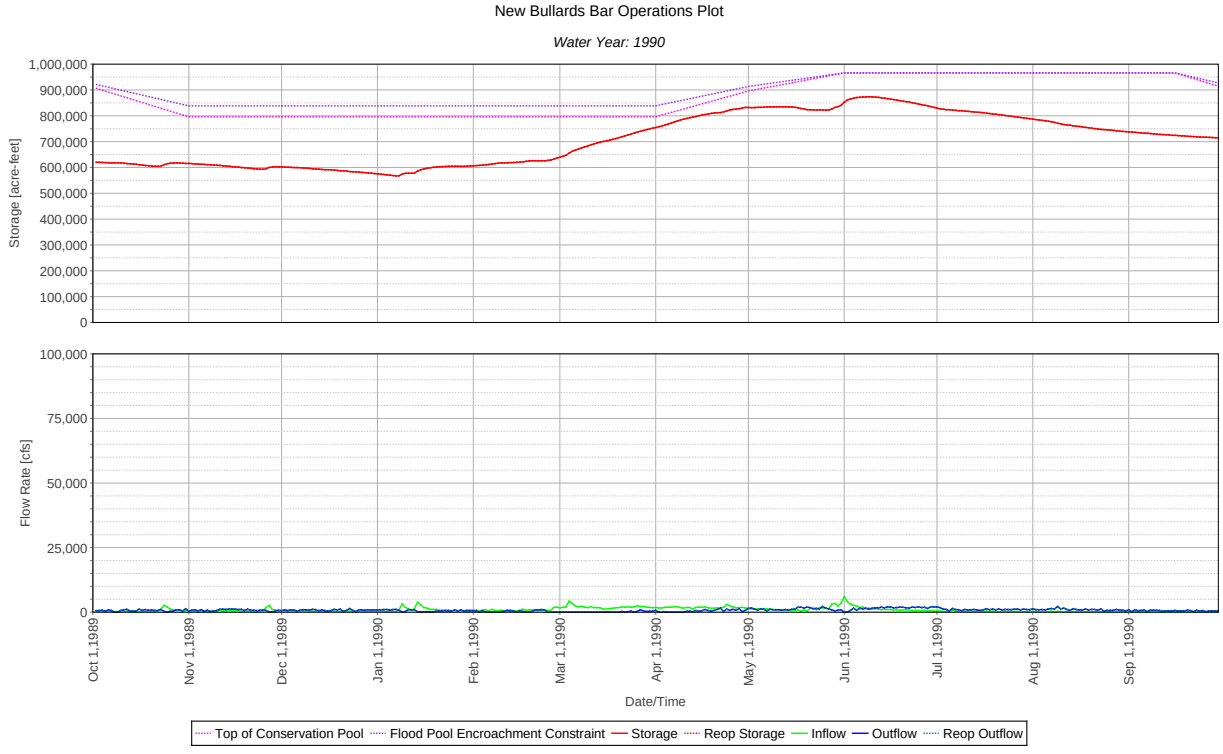

New Bullards Bar Operations Plot
Water Year: 1985
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1984
Nov 1,1984
Dec 1,1984
Jan 1,1985
Feb 1,1985
Mar 1,1985
Apr 1,1985
May 1,1985
Jun 1,1985
Jul 1,1985
Aug 1,1985
Sep 1,1985
Date/Time

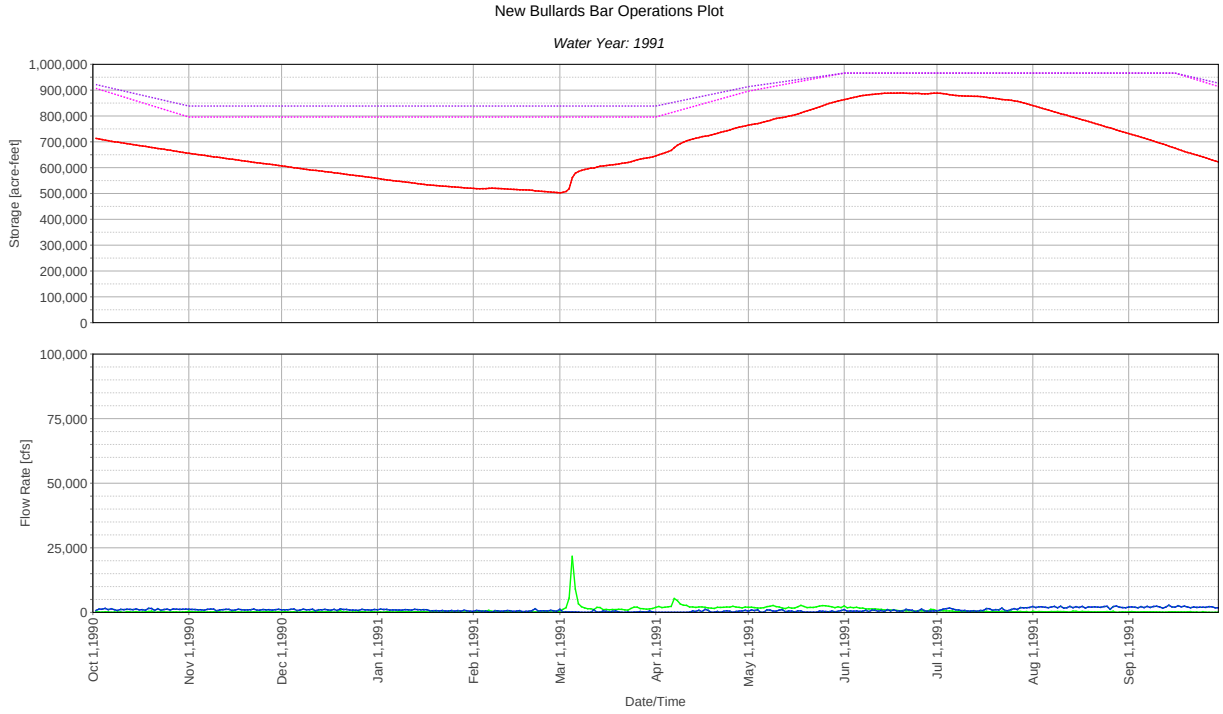

New Bullards Bar Operations Plot
Water Year: 1986
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 374 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1985
Nov 1,1985
Dec 1,1985
Jan 1,1986
Feb 1,1986
Mar 1,1986
Apr 1,1986
May 1,1986
Jun 1,1986
Jul 1,1986
Aug 1,1986
Sep 1,1986
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

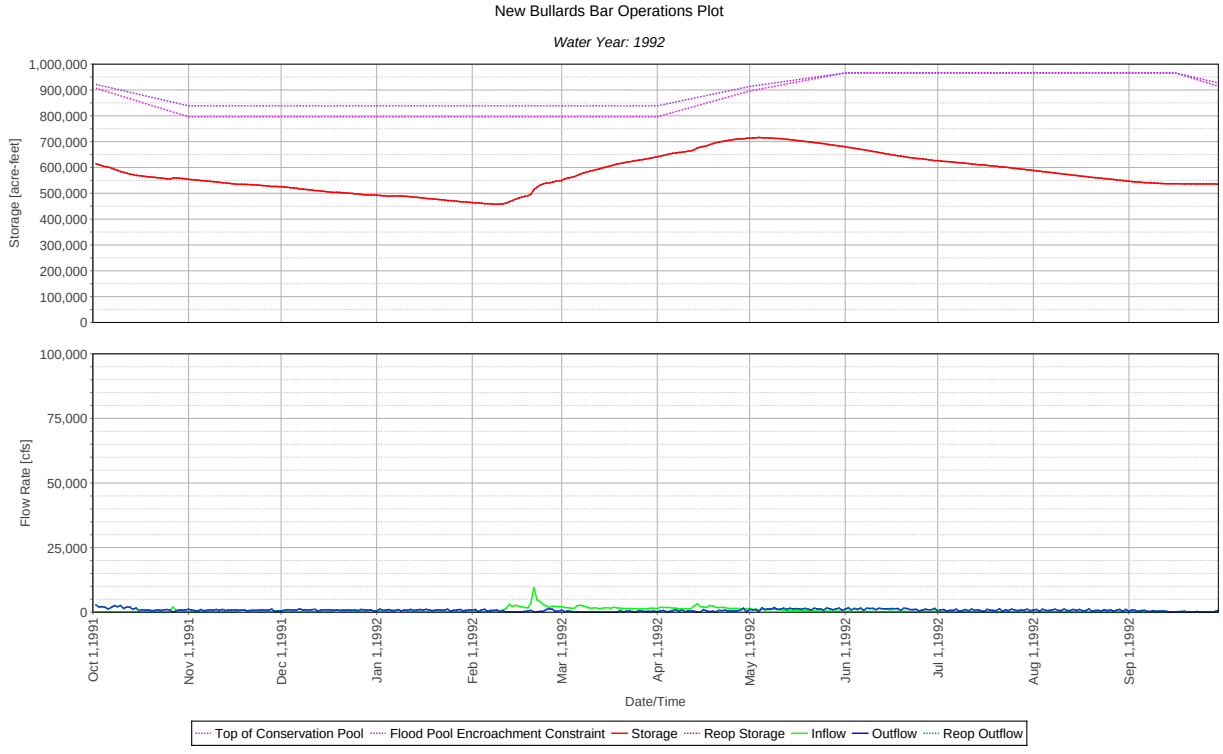

New Bullards Bar Operations Plot
Water Year: 1987
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1986
Nov 1,1986
Dec 1,1986
Jan 1,1987
Feb 1,1987
Mar 1,1987
Apr 1,1987
May 1,1987
Jun 1,1987
Jul 1,1987
Aug 1,1987
Sep 1,1987
Date/Time

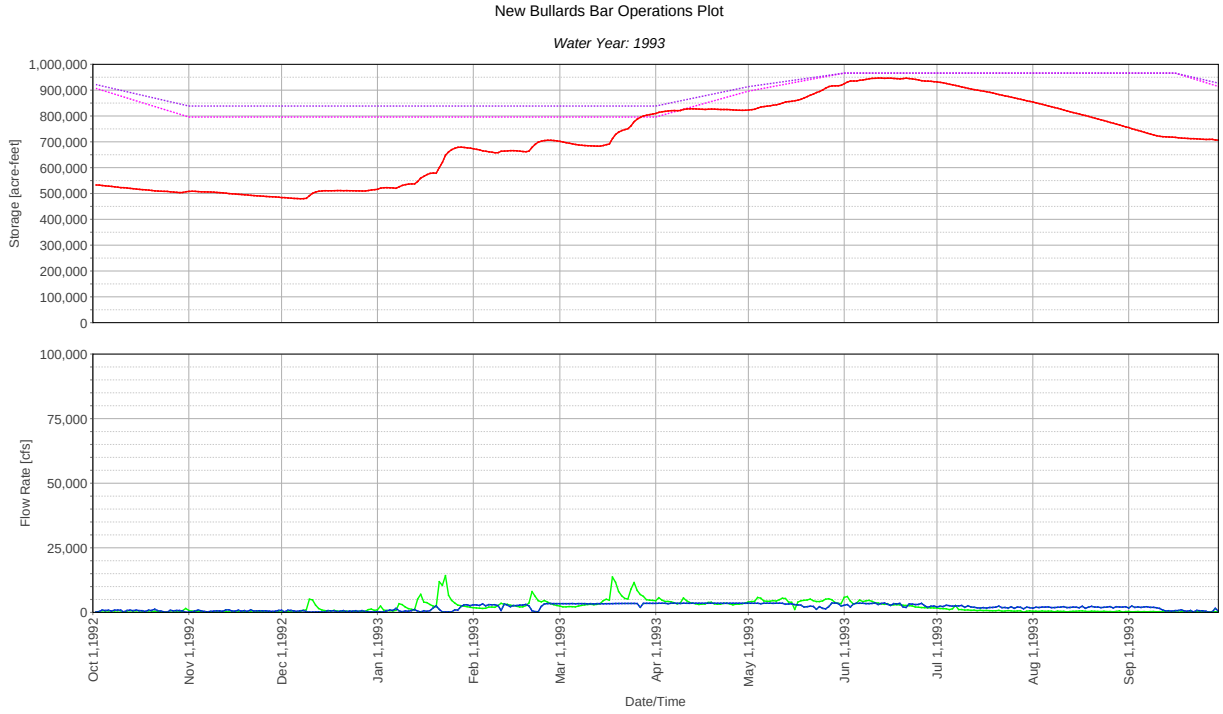

New Bullards Bar Operations Plot
Water Year: 1988
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1987
Nov 1,1987
Dec 1,1987
Jan 1,1988
Feb 1,1988
Mar 1,1988
Apr 1,1988
May 1,1988
Jun 1,1988
Jul 1,1988
Aug 1,1988
Sep 1,1988
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

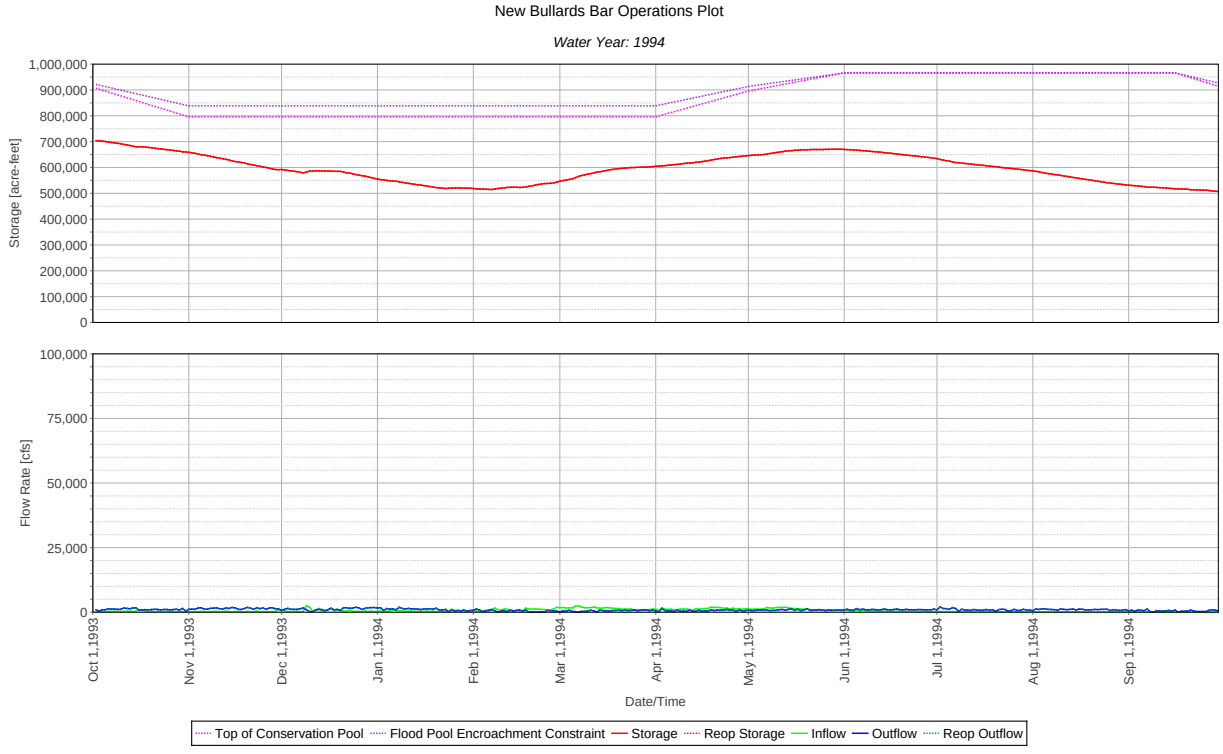

New Bullards Bar Operations Plot
Water Year: 1989
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 7 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1988
Nov 1,1988
Dec 1,1988
Jan 1,1989
Feb 1,1989
Mar 1,1989
Apr 1,1989
May 1,1989
Jun 1,1989
Jul 1,1989
Aug 1,1989
Sep 1,1989
Date/Time

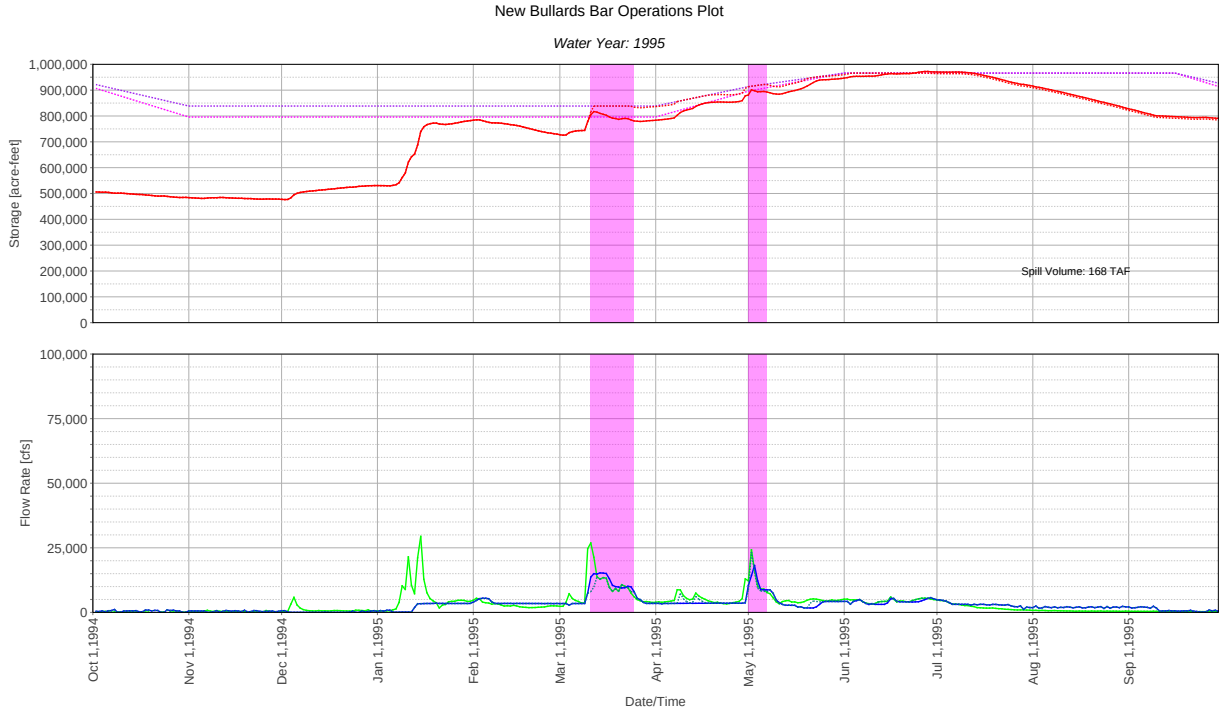

New Bullards Bar Operations Plot
Water Year: 1990
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1989
Nov 1,1989
Dec 1,1989
Jan 1,1990
Feb 1,1990
Mar 1,1990
Apr 1,1990
May 1,1990
Jun 1,1990
Jul 1,1990
Aug 1,1990
Sep 1,1990
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

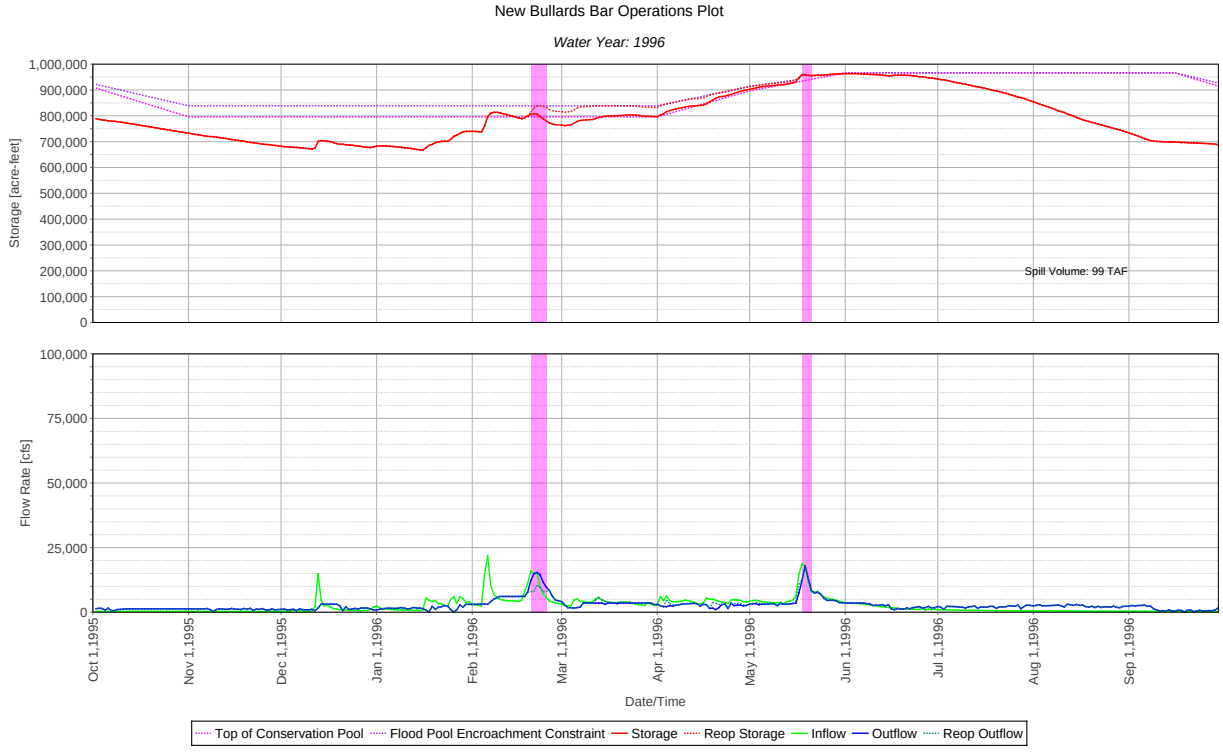

New Bullards Bar Operations Plot
Water Year: 1991
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1990
Nov 1,1990
Dec 1,1990
Jan 1,1991
Feb 1,1991
Mar 1,1991
Apr 1,1991
May 1,1991
Jun 1,1991
Jul 1,1991
Aug 1,1991
Sep 1,1991
Date/Time

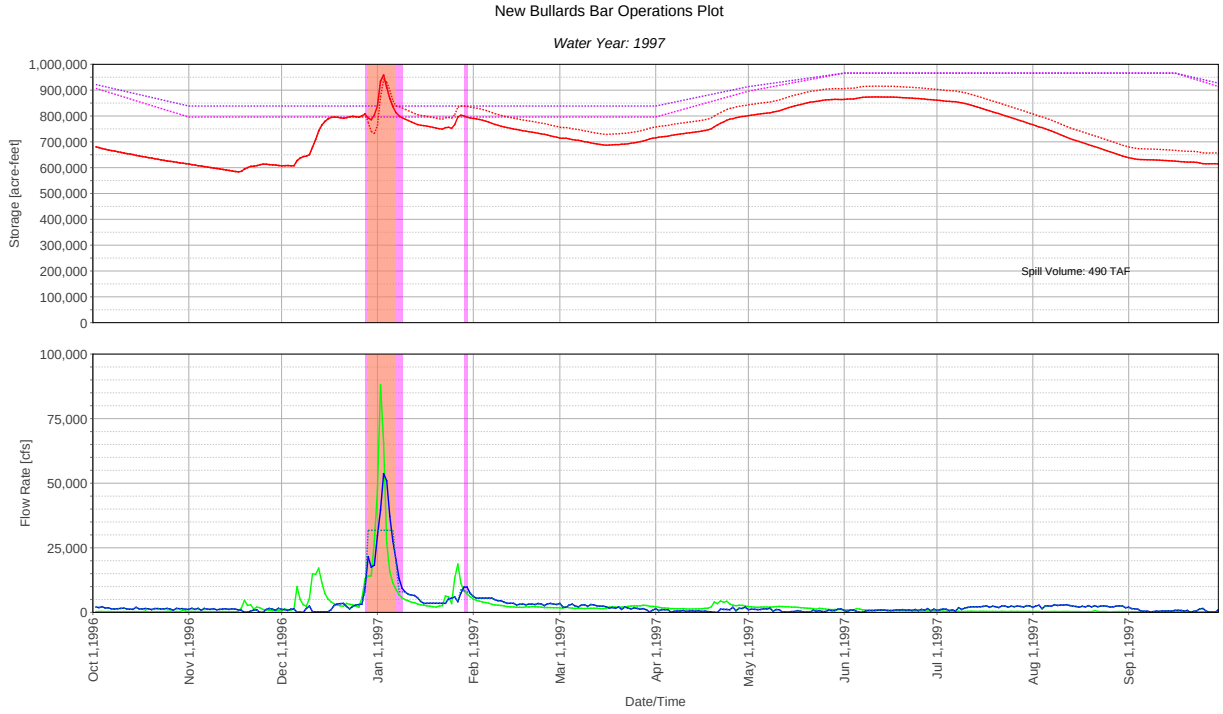

New Bullards Bar Operations Plot
Water Year: 1992
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1991
Nov 1,1991
Dec 1,1991
Jan 1,1992
Feb 1,1992
Mar 1,1992
Apr 1,1992
May 1,1992
Jun 1,1992
Jul 1,1992
Aug 1,1992
Sep 1,1992
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

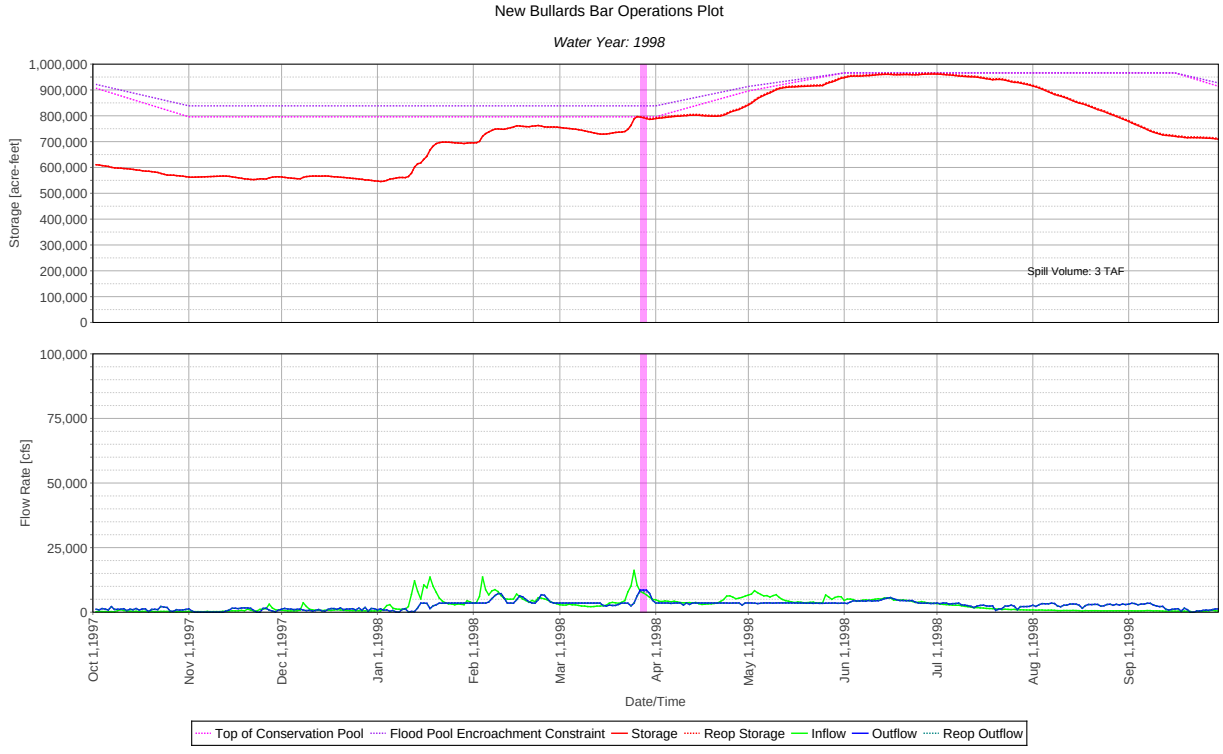

New Bullards Bar Operations Plot
Water Year: 1993
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1992
Nov 1,1992
Dec 1,1992
Jan 1,1993
Feb 1,1993
Mar 1,1993
Apr 1,1993
May 1,1993
Jun 1,1993
Jul 1,1993
Aug 1,1993
Sep 1,1993
Date/Time

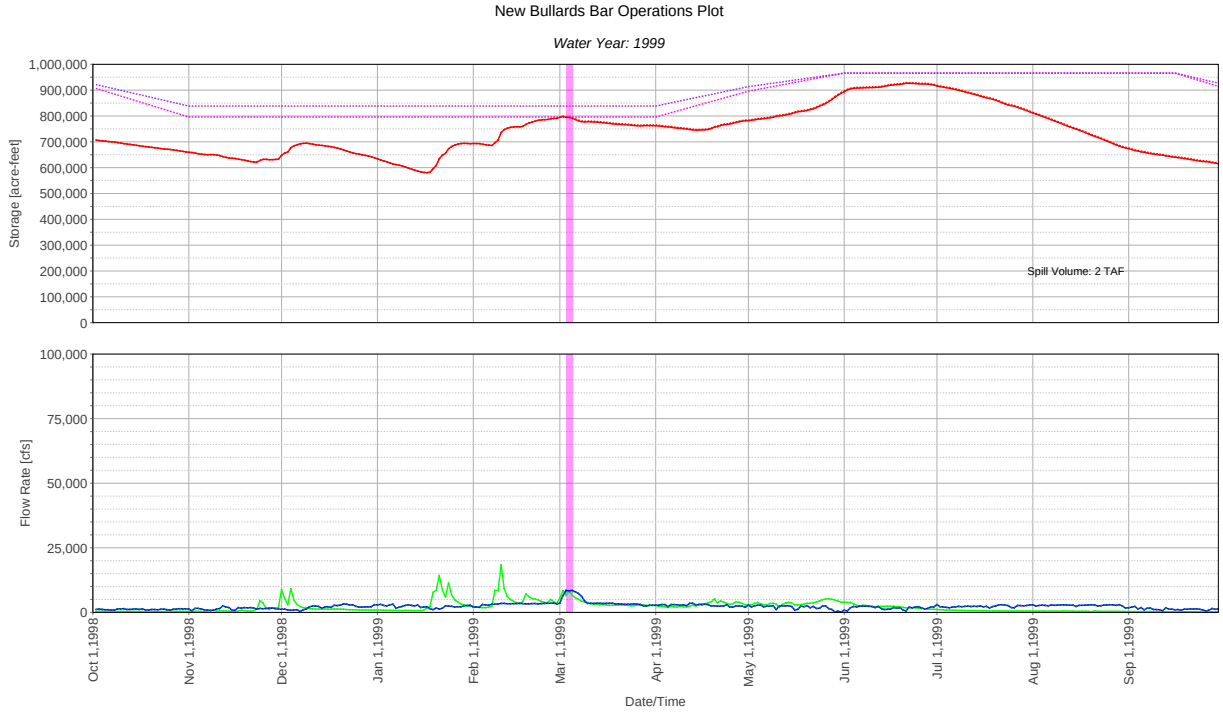

New Bullards Bar Operations Plot
Water Year: 1994
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1993
Nov 1,1993
Dec 1,1993
Jan 1,1994
Feb 1,1994
Mar 1,1994
Apr 1,1994
May 1,1994
Jun 1,1994
Jul 1,1994
Aug 1,1994
Sep 1,1994
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

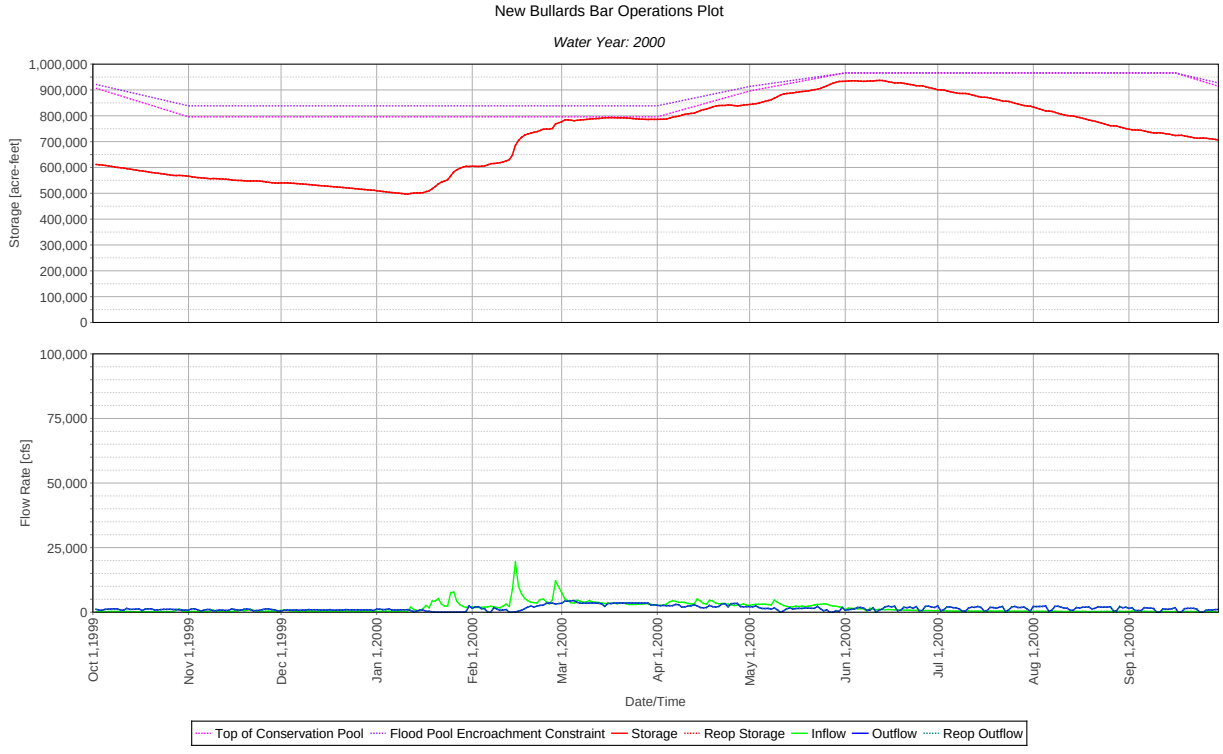

New Bullards Bar Operations Plot
Water Year: 1995
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 168 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1994
Nov 1,1994
Dec 1,1994
Jan 1,1995
Feb 1,1995
Mar 1,1995
Apr 1,1995
May 1,1995
Jun 1,1995
Jul 1,1995
Aug 1,1995
Sep 1,1995
Date/Time

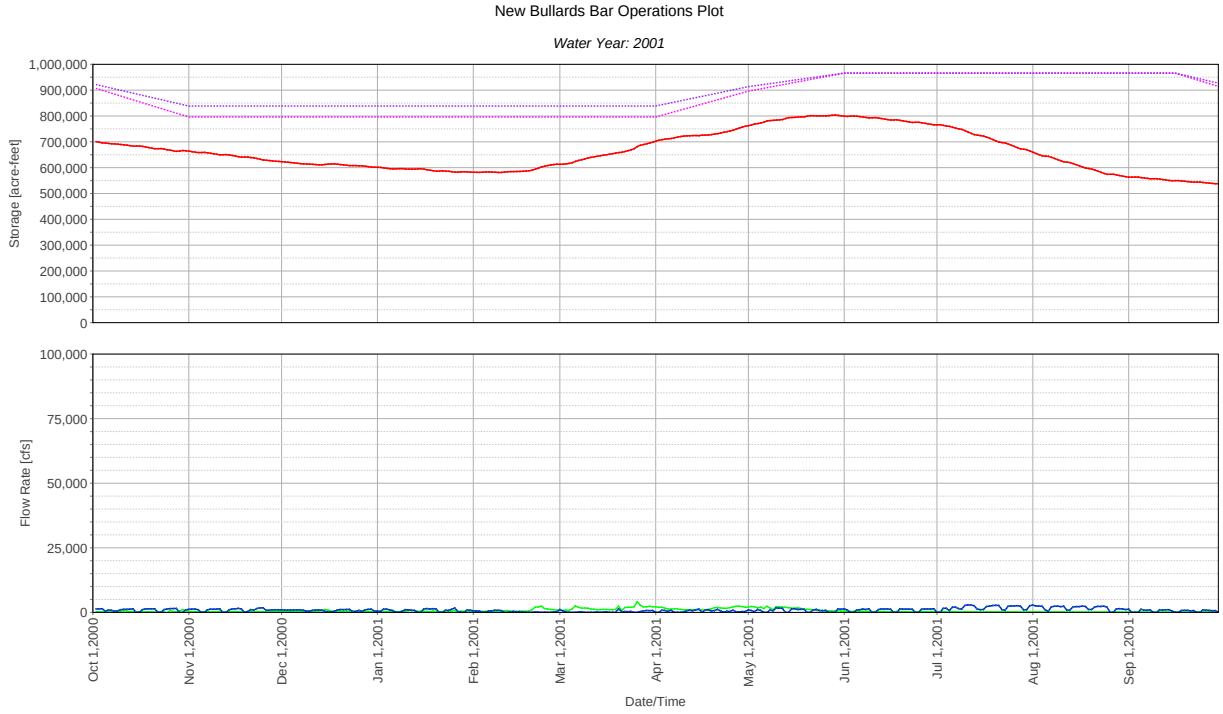

New Bullards Bar Operations Plot
Water Year: 1996
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 99 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1995
Nov 1,1995
Dec 1,1995
Jan 1,1996
Feb 1,1996
Mar 1,1996
Apr 1,1996
May 1,1996
Jun 1,1996
Jul 1,1996
Aug 1,1996
Sep 1,1996
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

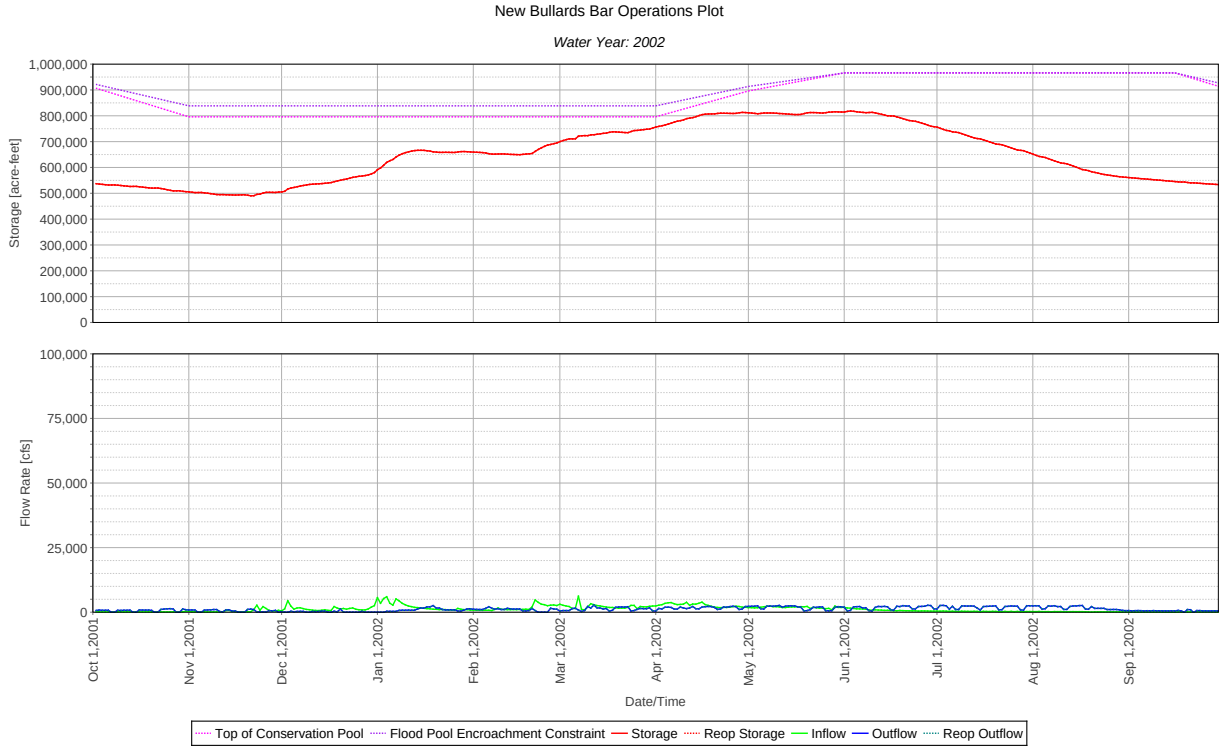

New Bullards Bar Operations Plot
Water Year: 1997
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 490 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1996
Nov 1,1996
Dec 1,1996
Jan 1,1997
Feb 1,1997
Mar 1,1997
Apr 1,1997
May 1,1997
Jun 1,1997
Jul 1,1997
Aug 1,1997
Sep 1,1997
Date/Time

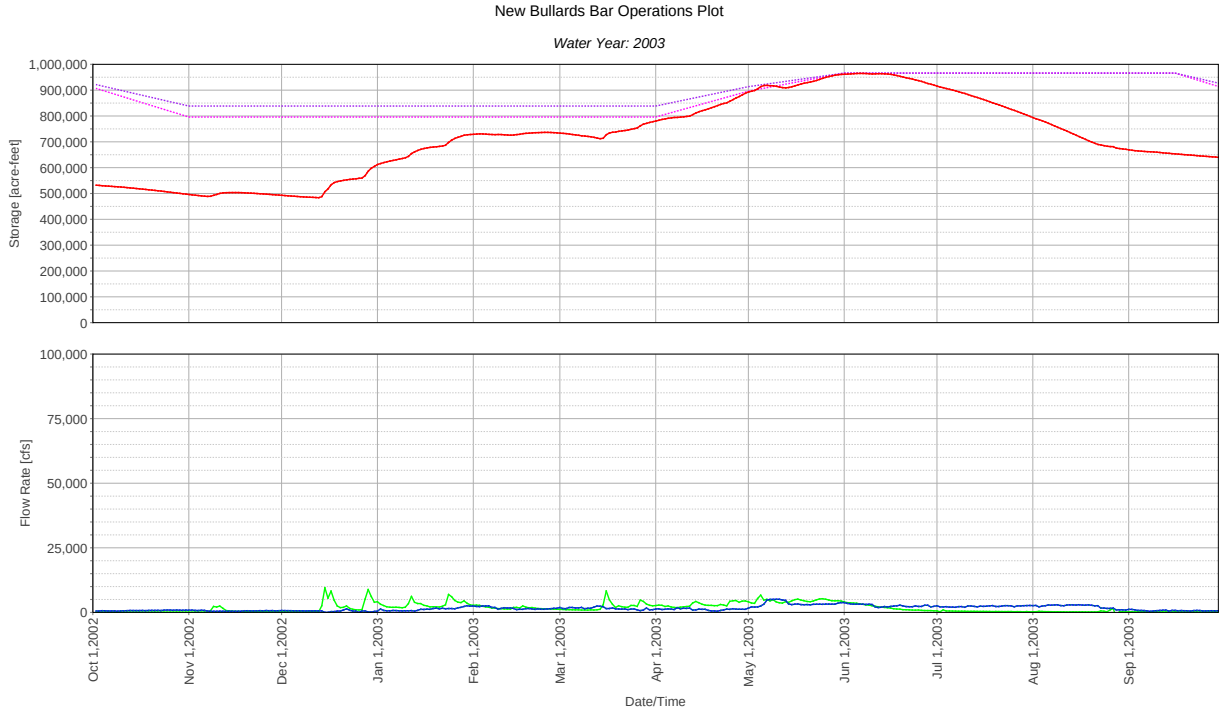

New Bullards Bar Operations Plot
Water Year: 1998
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 3 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1997
Nov 1,1997
Dec 1,1997
Jan 1,1998
Feb 1,1998
Mar 1,1998
Apr 1,1998
May 1,1998
Jun 1,1998
Jul 1,1998
Aug 1,1998
Sep 1,1998
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

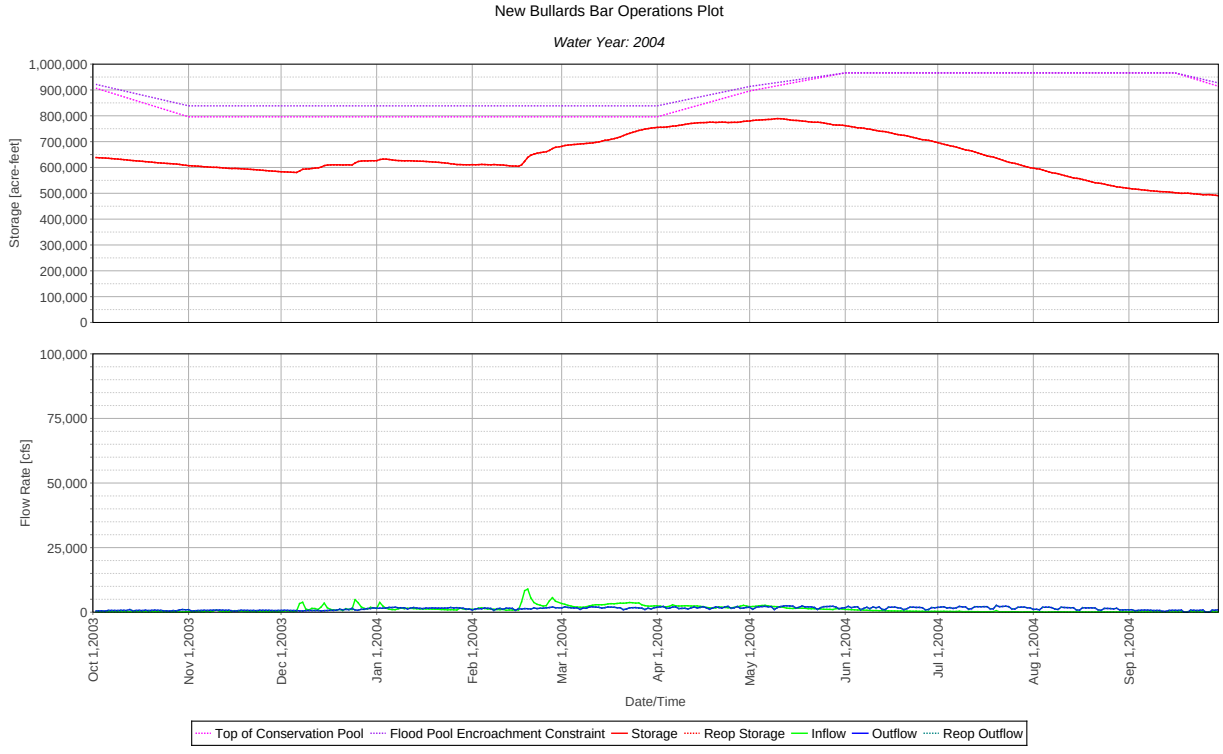

New Bullards Bar Operations Plot
Water Year: 1999
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 2 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1998
Nov 1,1998
Dec 1,1998
Jan 1,1999
Feb 1,1999
Mar 1,1999
Apr 1,1999
May 1,1999
Jun 1,1999
Jul 1,1999
Aug 1,1999
Sep 1,1999
Date/Time

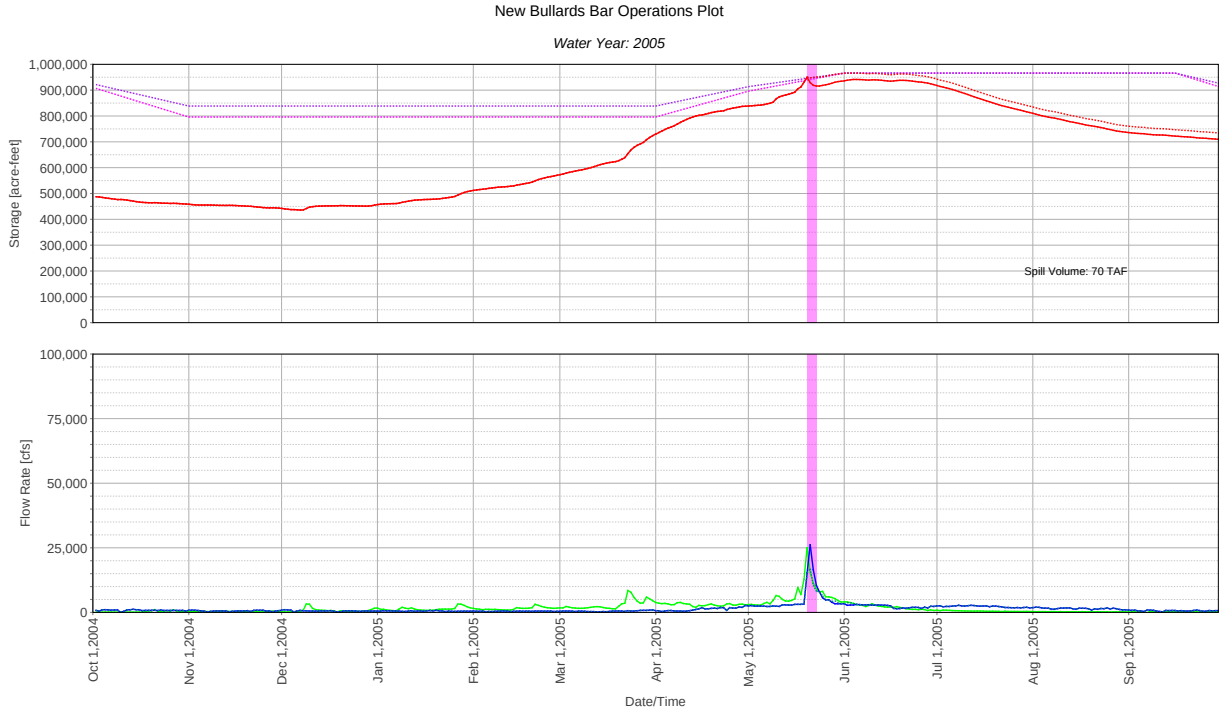

New Bullards Bar Operations Plot
Water Year: 2000
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,1999
Nov 1,1999
Dec 1,1999
Jan 1,2000
Feb 1,2000
Mar 1,2000
Apr 1,2000
May 1,2000
Jun 1,2000
Jul 1,2000
Aug 1,2000
Sep 1,2000
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

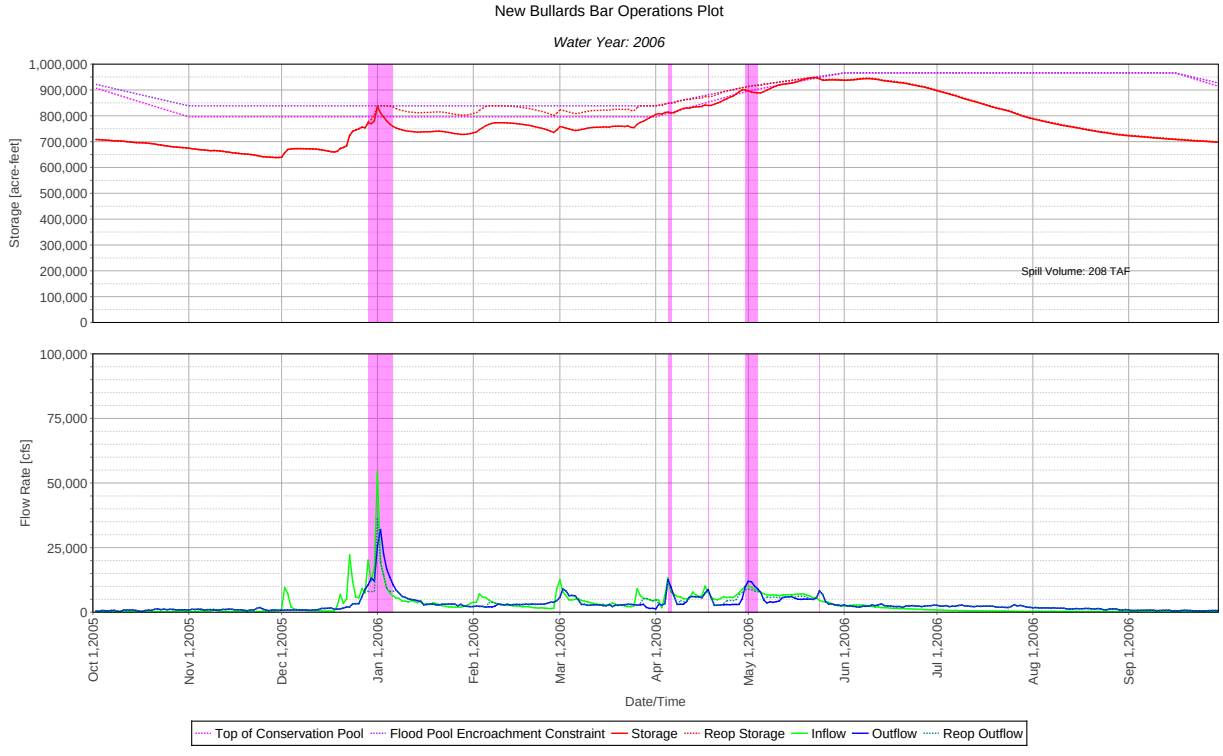

New Bullards Bar Operations Plot
Water Year: 2001
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2000
Nov 1,2000
Dec 1,2000
Jan 1,2001
Feb 1,2001
Mar 1,2001
Apr 1,2001
May 1,2001
Jun 1,2001
Jul 1,2001
Aug 1,2001
Sep 1,2001
Date/Time

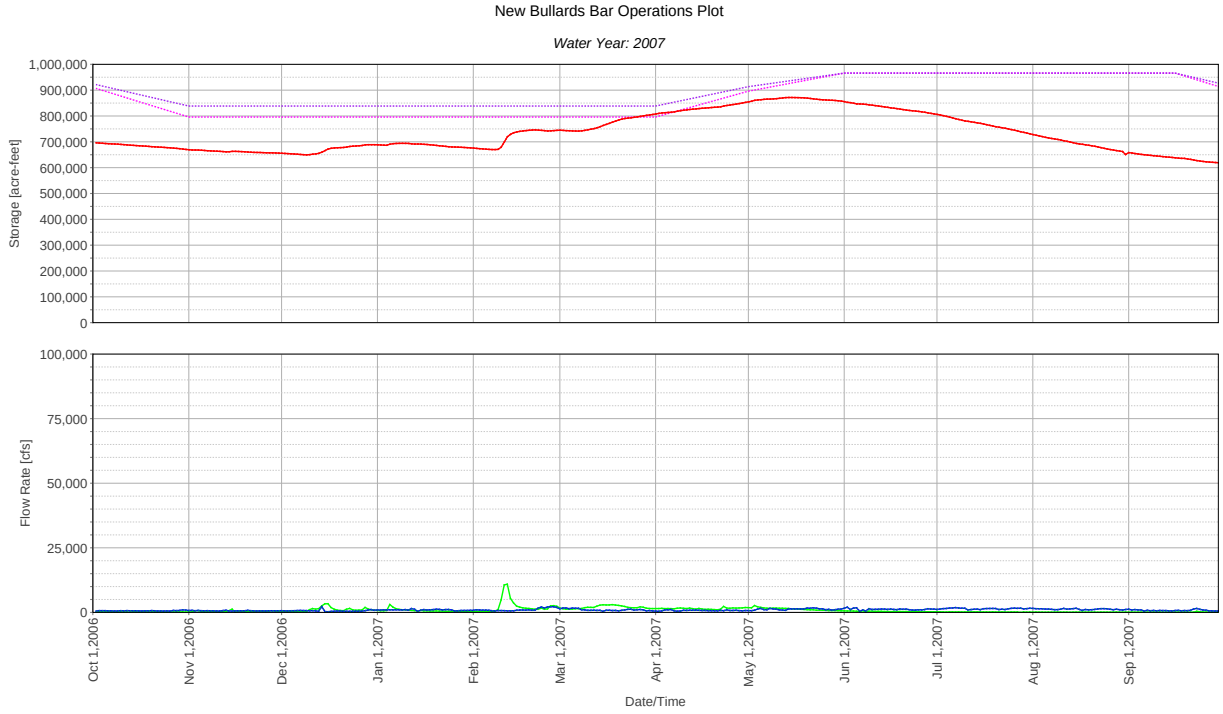

New Bullards Bar Operations Plot
Water Year: 2002
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2001
Nov 1,2001
Dec 1,2001
Jan 1,2002
Feb 1,2002
Mar 1,2002
Apr 1,2002
May 1,2002
Jun 1,2002
Jul 1,2002
Aug 1,2002
Sep 1,2002
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

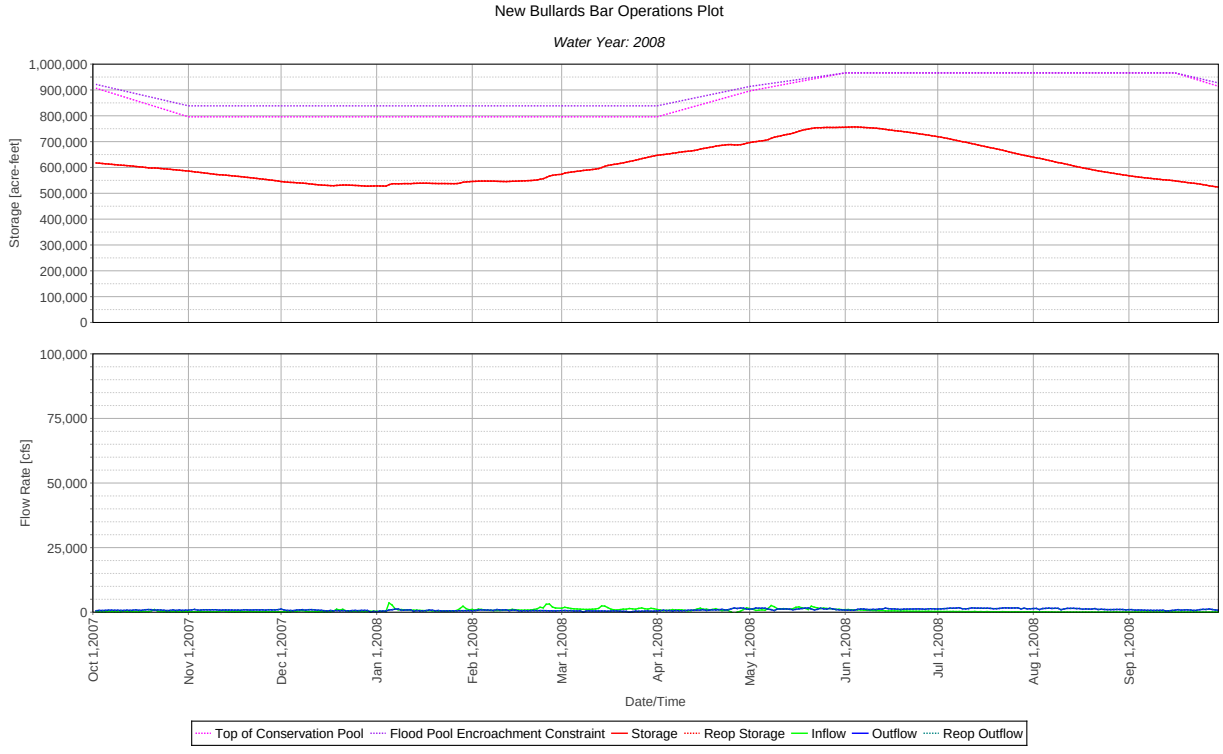

New Bullards Bar Operations Plot
Water Year: 2003
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2002
Nov 1,2002
Dec 1,2002
Jan 1,2003
Feb 1,2003
Mar 1,2003
Apr 1,2003
May 1,2003
Jun 1,2003
Jul 1,2003
Aug 1,2003
Sep 1,2003
Date/Time

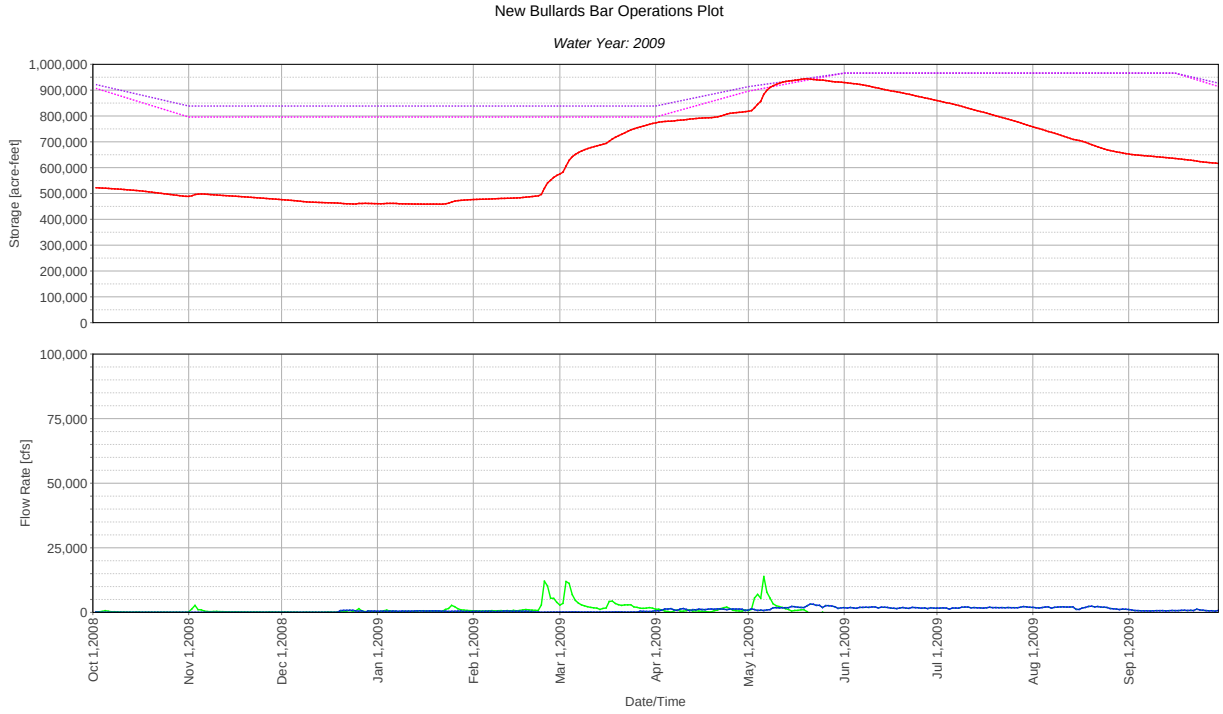

New Bullards Bar Operations Plot
Water Year: 2004
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2003
Nov 1,2003
Dec 1,2003
Jan 1,2004
Feb 1,2004
Mar 1,2004
Apr 1,2004
May 1,2004
Jun 1,2004
Jul 1,2004
Aug 1,2004
Sep 1,2004
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

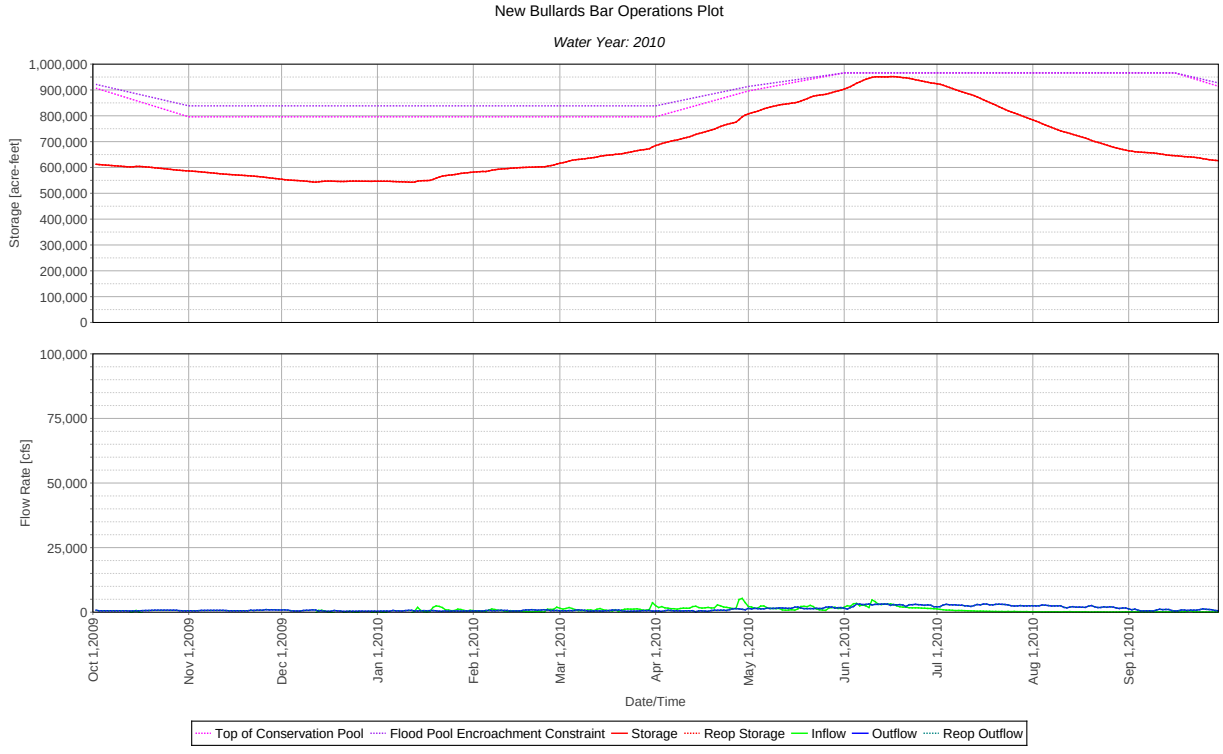

New Bullards Bar Operations Plot
Water Year: 2005
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 70 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2004
Nov 1,2004
Dec 1,2004
Jan 1,2005
Feb 1,2005
Mar 1,2005
Apr 1,2005
May 1,2005
Jun 1,2005
Jul 1,2005
Aug 1,2005
Sep 1,2005
Date/Time

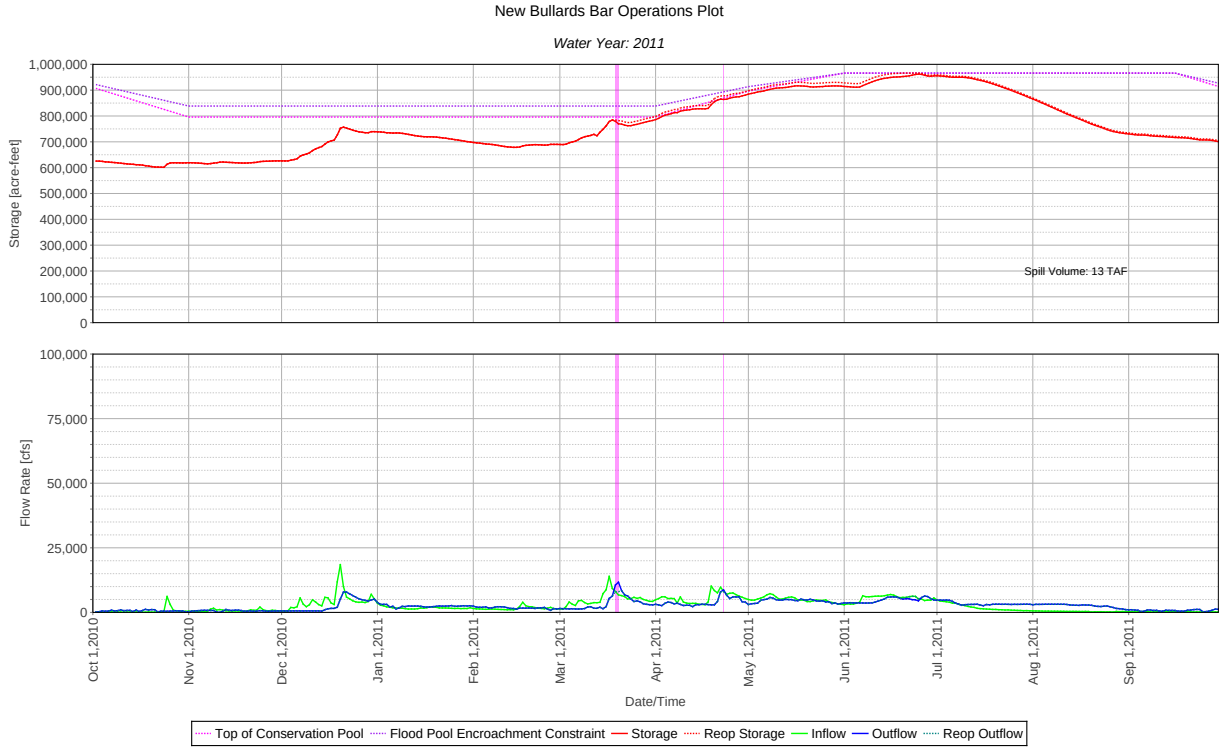

New Bullards Bar Operations Plot
Water Year: 2006
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 208 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2005
Nov 1,2005
Dec 1,2005
Jan 1,2006
Feb 1,2006
Mar 1,2006
Apr 1,2006
May 1,2006
Jun 1,2006
Jul 1,2006
Aug 1,2006
Sep 1,2006
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


New Bullards Bar Operations Plot
Water Year: 2007
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2006
Nov 1,2006
Dec 1,2006
Jan 1,2007
Feb 1,2007
Mar 1,2007
Apr 1,2007
May 1,2007
Jun 1,2007
Jul 1,2007
Aug 1,2007
Sep 1,2007
Date/Time


New Bullards Bar Operations Plot
Water Year: 2008
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2007
Nov 1,2007
Dec 1,2007
Jan 1,2008
Feb 1,2008
Mar 1,2008
Apr 1,2008
May 1,2008
Jun 1,2008
Jul 1,2008
Aug 1,2008
Sep 1,2008
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

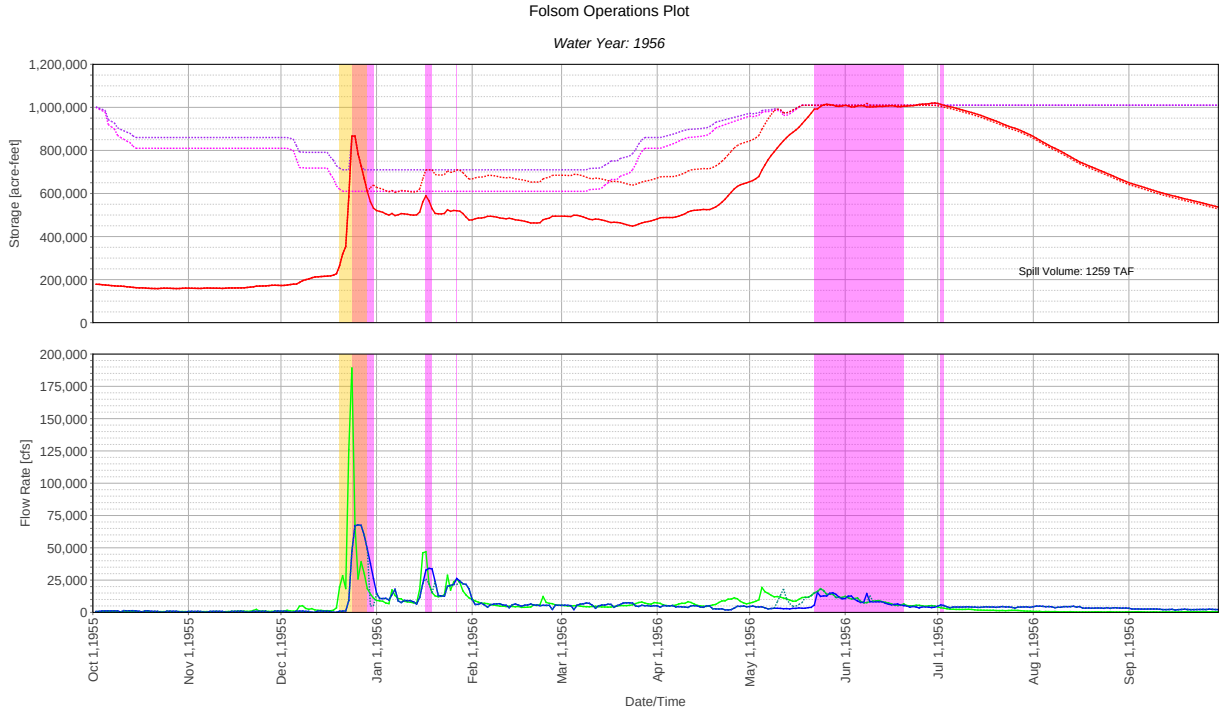

New Bullards Bar Operations Plot
Water Year: 2009
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2008
Nov 1,2008
Dec 1,2008
Jan 1,2009
Feb 1,2009
Mar 1,2009
Apr 1,2009
May 1,2009
Jun 1,2009
Jul 1,2009
Aug 1,2009
Sep 1,2009
Date/Time

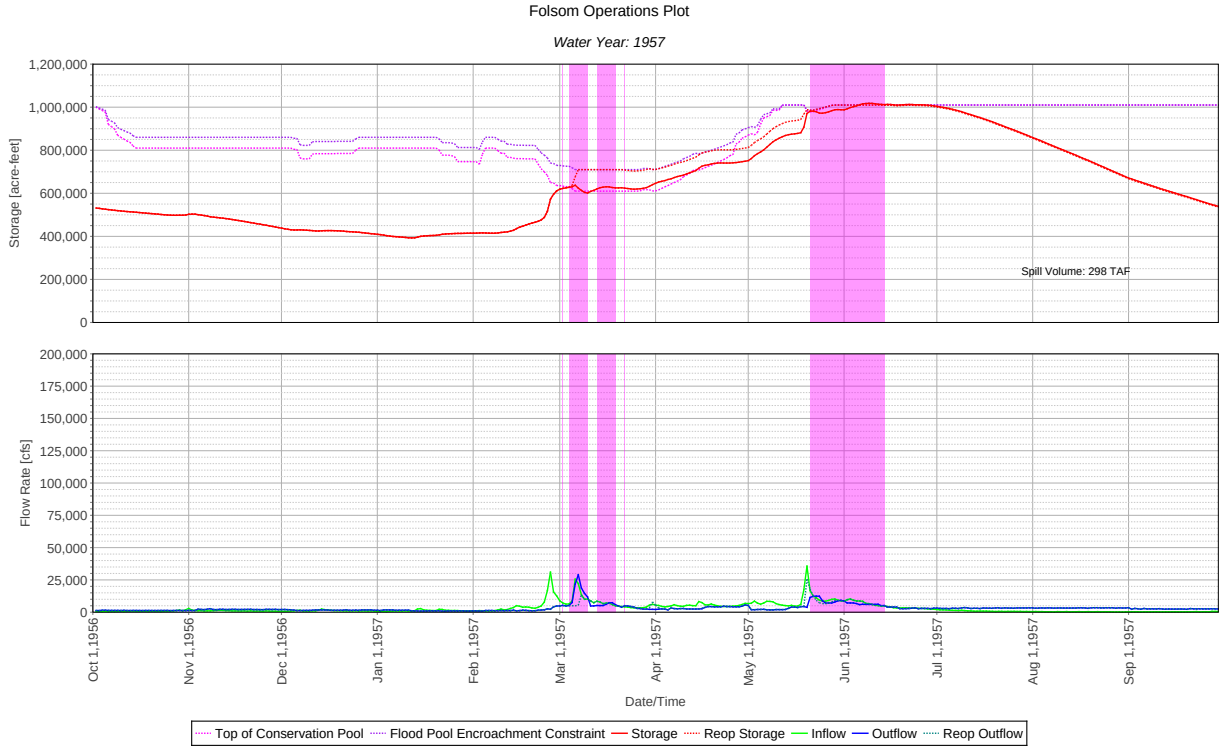

New Bullards Bar Operations Plot
Water Year: 2010
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2009
Nov 1,2009
Dec 1,2009
Jan 1,2010
Feb 1,2010
Mar 1,2010
Apr 1,2010
May 1,2010
Jun 1,2010
Jul 1,2010
Aug 1,2010
Sep 1,2010
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

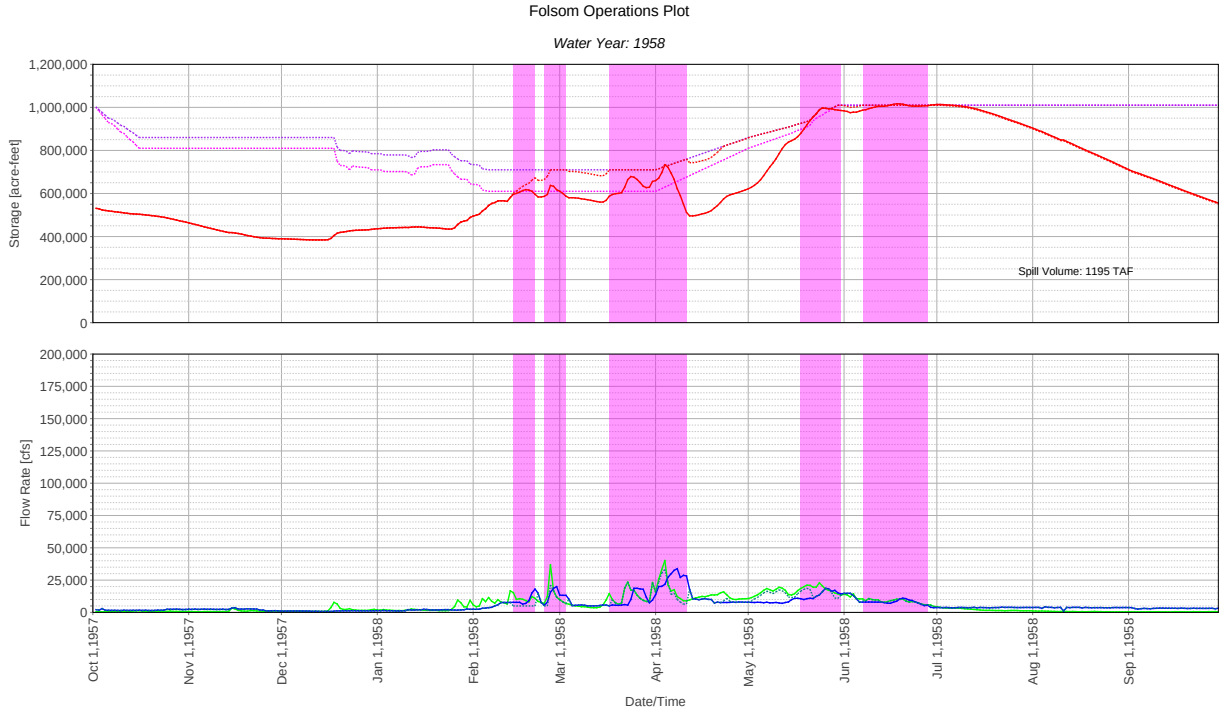

New Bullards Bar Operations Plot
Water Year: 2011
Storage [acre-feet]
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Spill Volume: 13 TAF
Flow Rate [cfs]
100,000
75,000
50,000
25,000
0
Oct 1,2010
Nov 1,2010
Dec 1,2010
Jan 1,2011
Feb 1,2011
Mar 1,2011
Apr 1,2011
May 1,2011
Jun 1,2011
Jul 1,2011
Aug 1,2011
Sep 1,2011
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

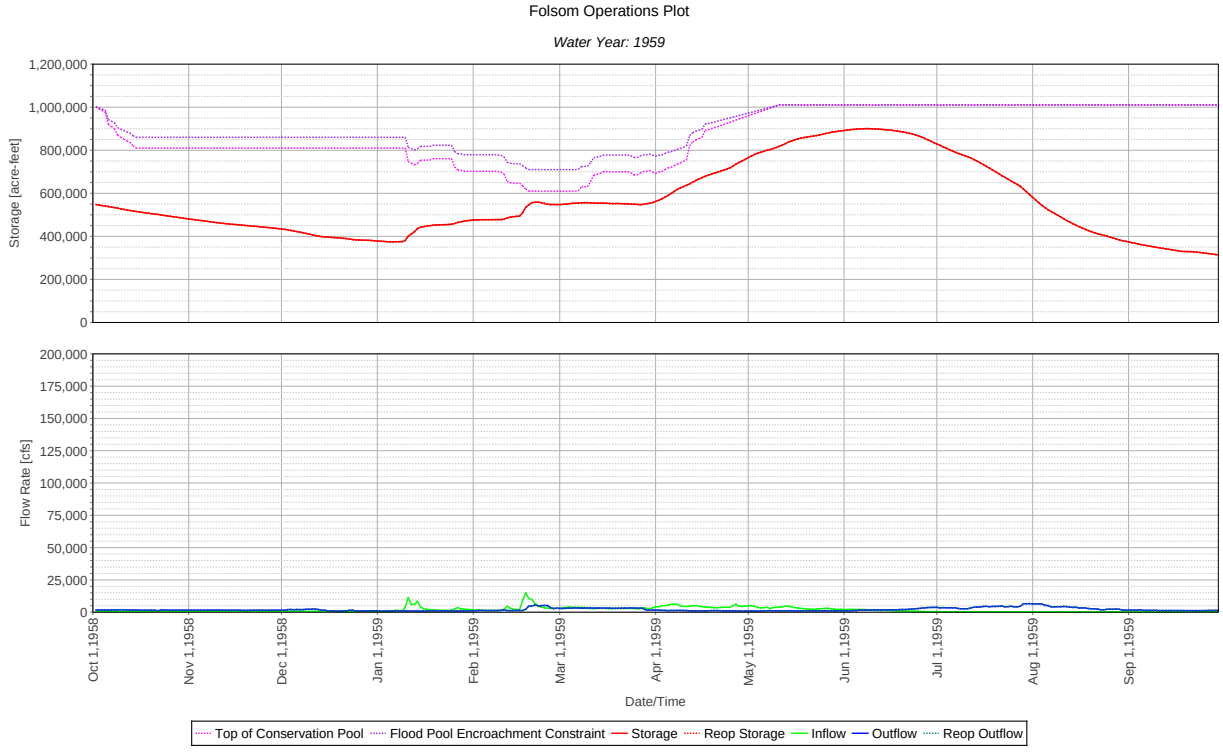
A.4 Folsom

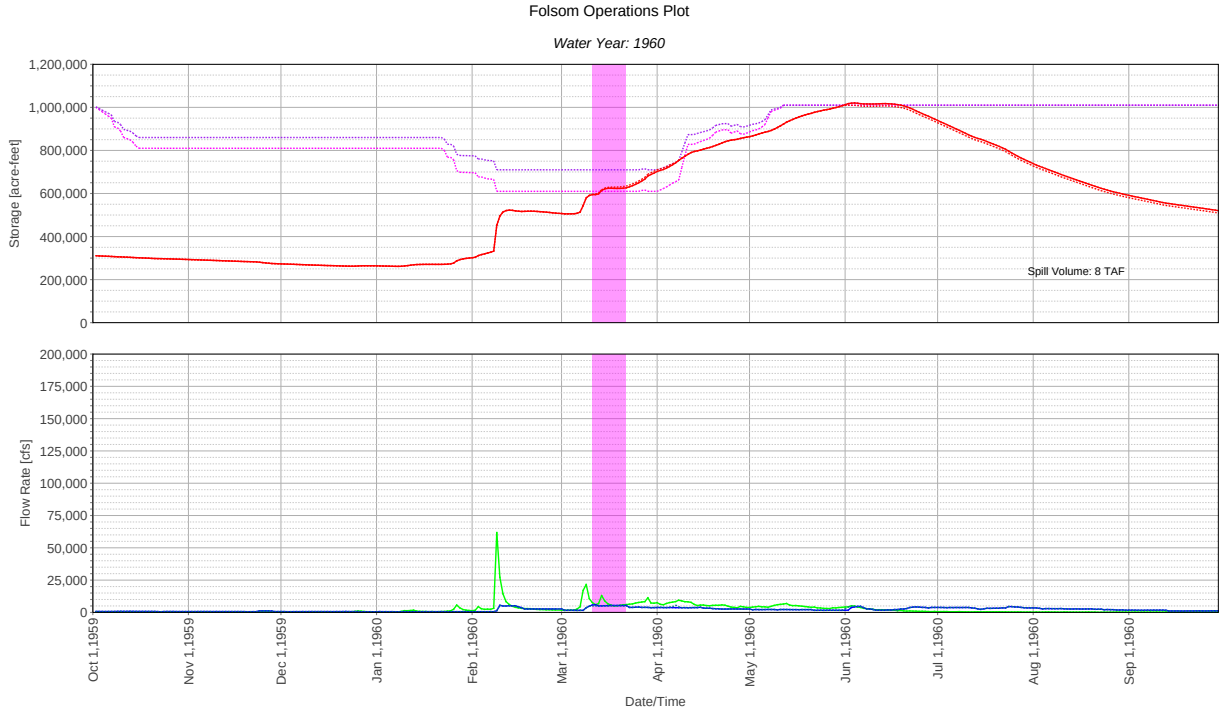
The following section includes the reoperation plots for Folsom Dam.

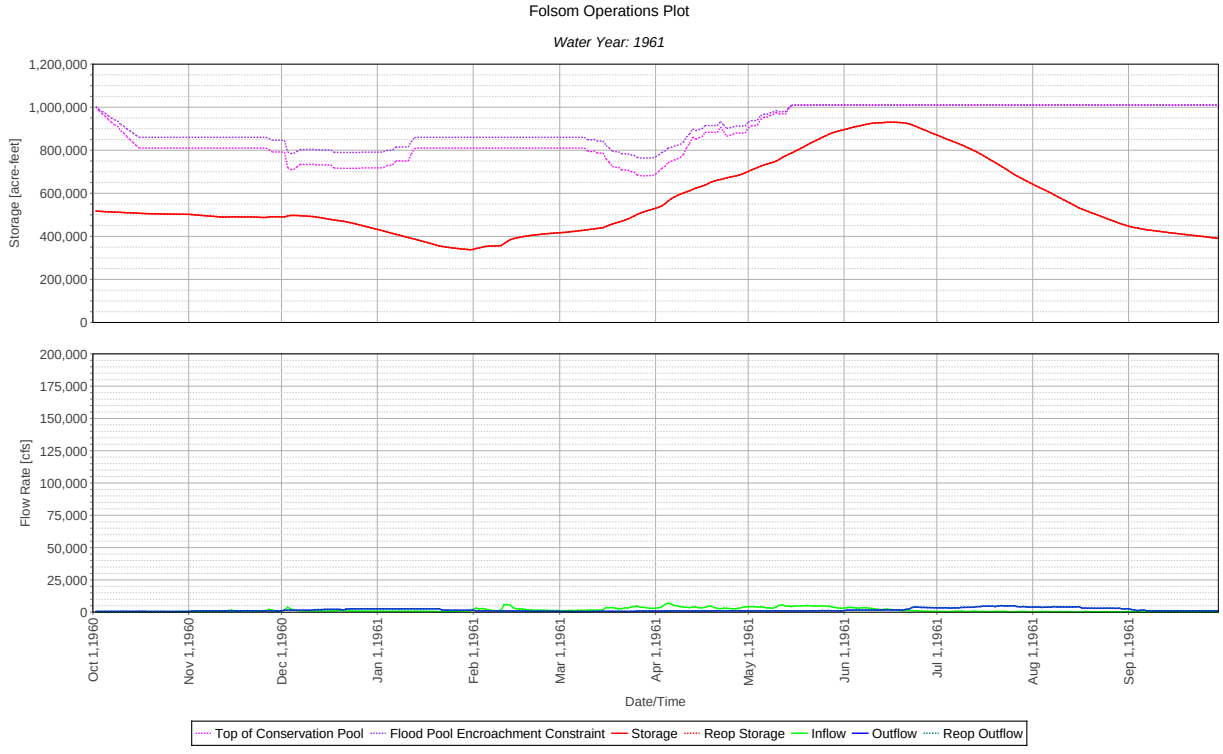

Folsom Operations Plot
Water Year: 1956
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1259 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1955
Nov 1,1955
Dec 1,1955
Jan 1,1956
Feb 1,1956
Mar 1,1956
Apr 1,1956
May 1,1956
Jun 1,1956
Jul 1,1956
Aug 1,1956
Sep 1,1956
Date/Time

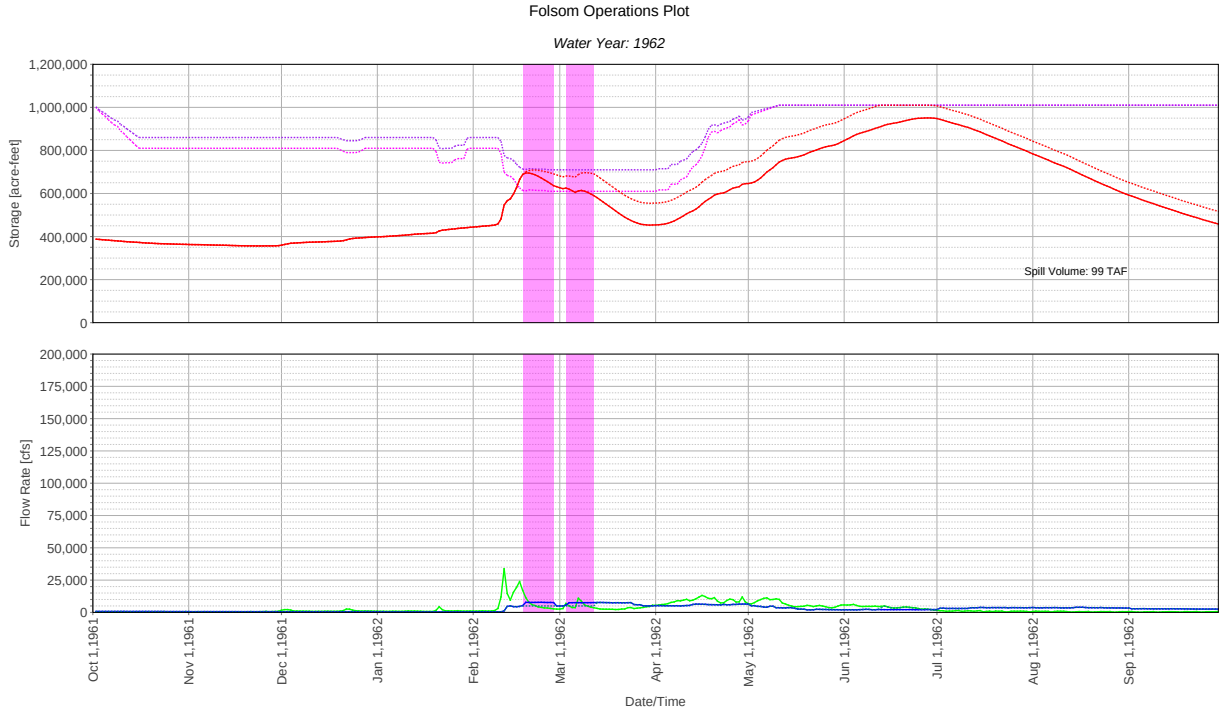

Folsom Operations Plot
Water Year: 1957
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 298 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1956
Nov 1,1956
Dec 1,1956
Jan 1,1957
Feb 1,1957
Mar 1,1957
Apr 1,1957
May 1,1957
Jun 1,1957
Jul 1,1957
Aug 1,1957
Sep 1,1957
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

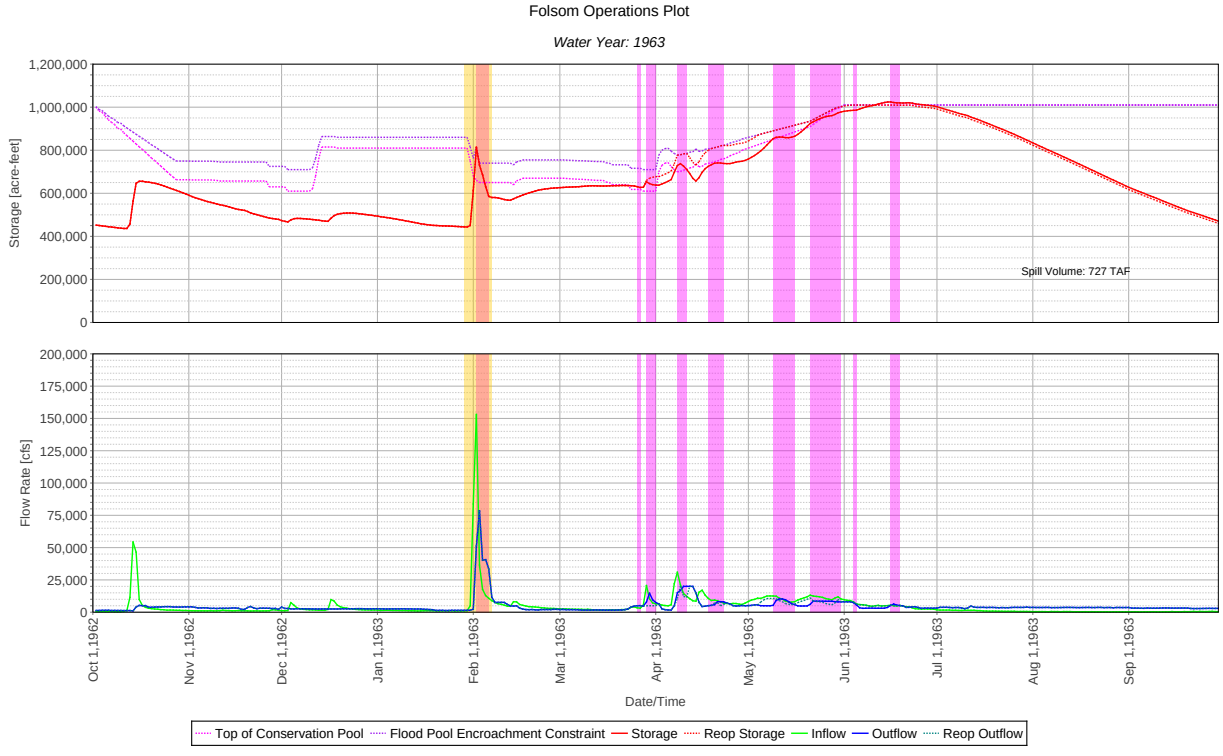

Folsom Operations Plot
Water Year: 1958
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1195 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1957
Nov 1,1957
Dec 1,1957
Jan 1,1958
Feb 1,1958
Mar 1,1958
Apr 1,1958
May 1,1958
Jun 1,1958
Jul 1,1958
Aug 1,1958
Sep 1,1958
Date/Time

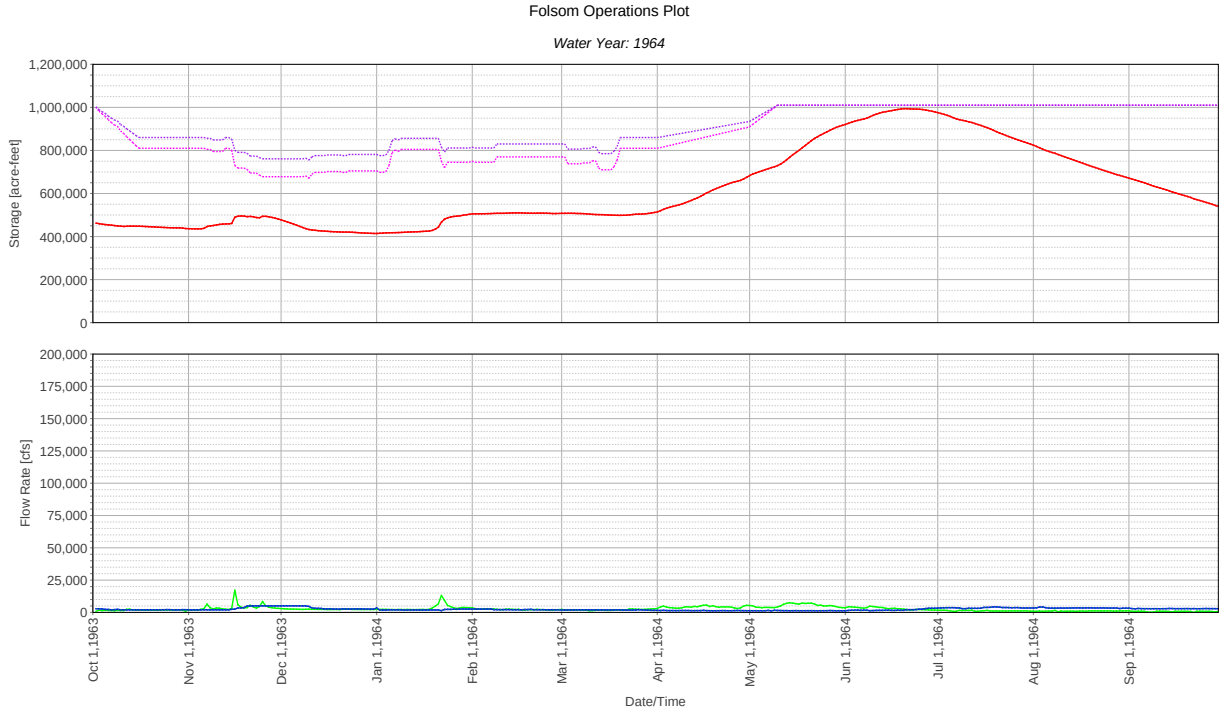

Folsom Operations Plot
Water Year: 1959
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1958
Nov 1,1958
Dec 1,1958
Jan 1,1959
Feb 1,1959
Mar 1,1959
Apr 1,1959
May 1,1959
Jun 1,1959
Jul 1,1959
Aug 1,1959
Sep 1,1959
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

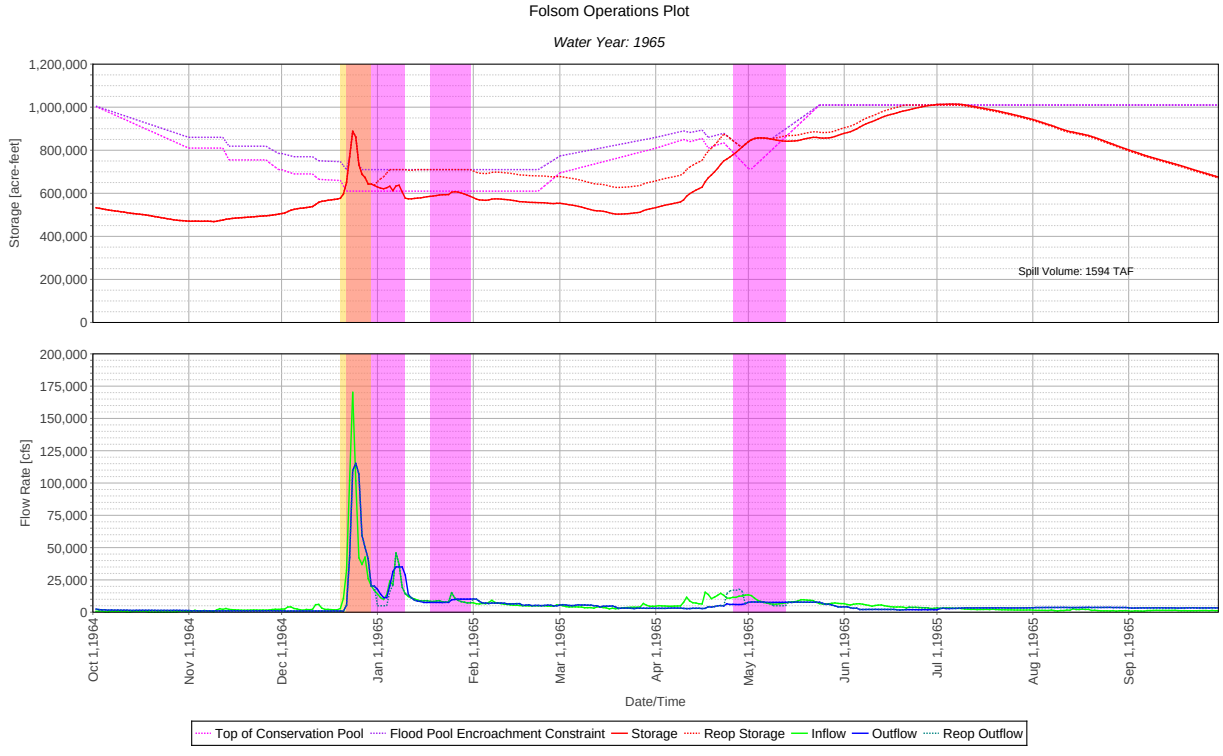

Folsom Operations Plot
Water Year: 1960
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 8 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1959
Nov 1,1959
Dec 1,1959
Jan 1,1960
Feb 1,1960
Mar 1,1960
Apr 1,1960
May 1,1960
Jun 1,1960
Jul 1,1960
Aug 1,1960
Sep 1,1960
Date/Time

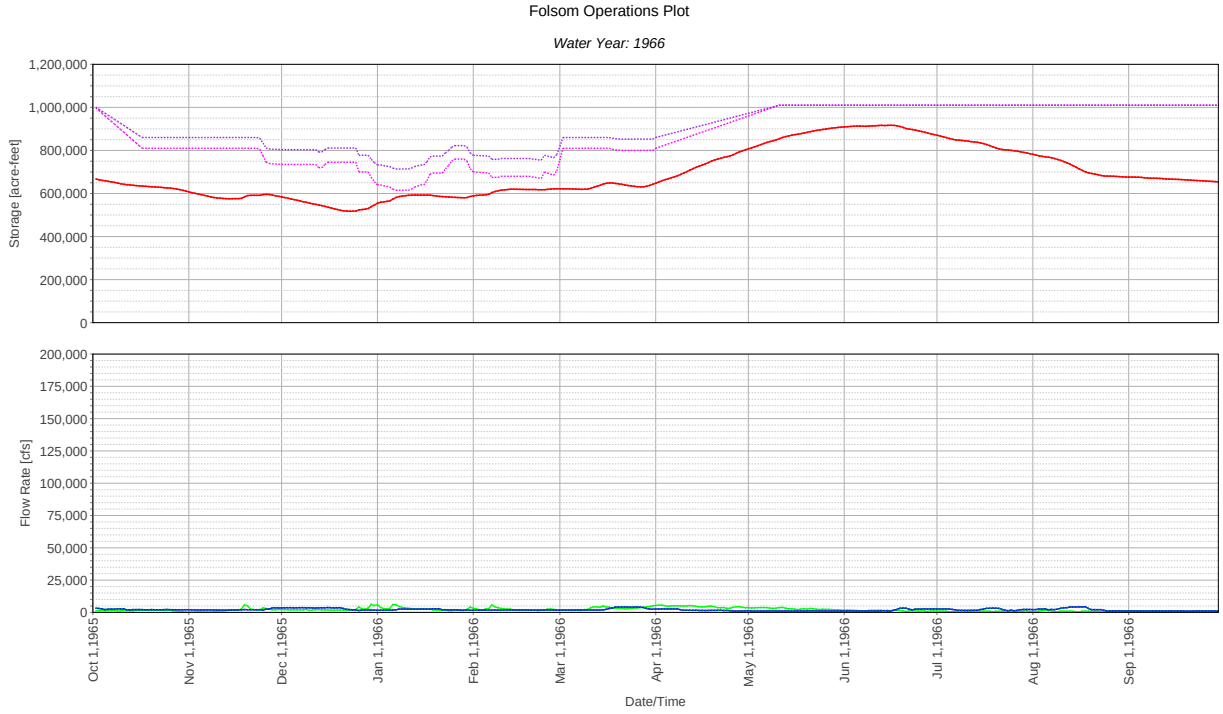

Folsom Operations Plot
Water Year: 1961
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1960
Nov 1,1960
Dec 1,1960
Jan 1,1961
Feb 1,1961
Mar 1,1961
Apr 1,1961
May 1,1961
Jun 1,1961
Jul 1,1961
Aug 1,1961
Sep 1,1961
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

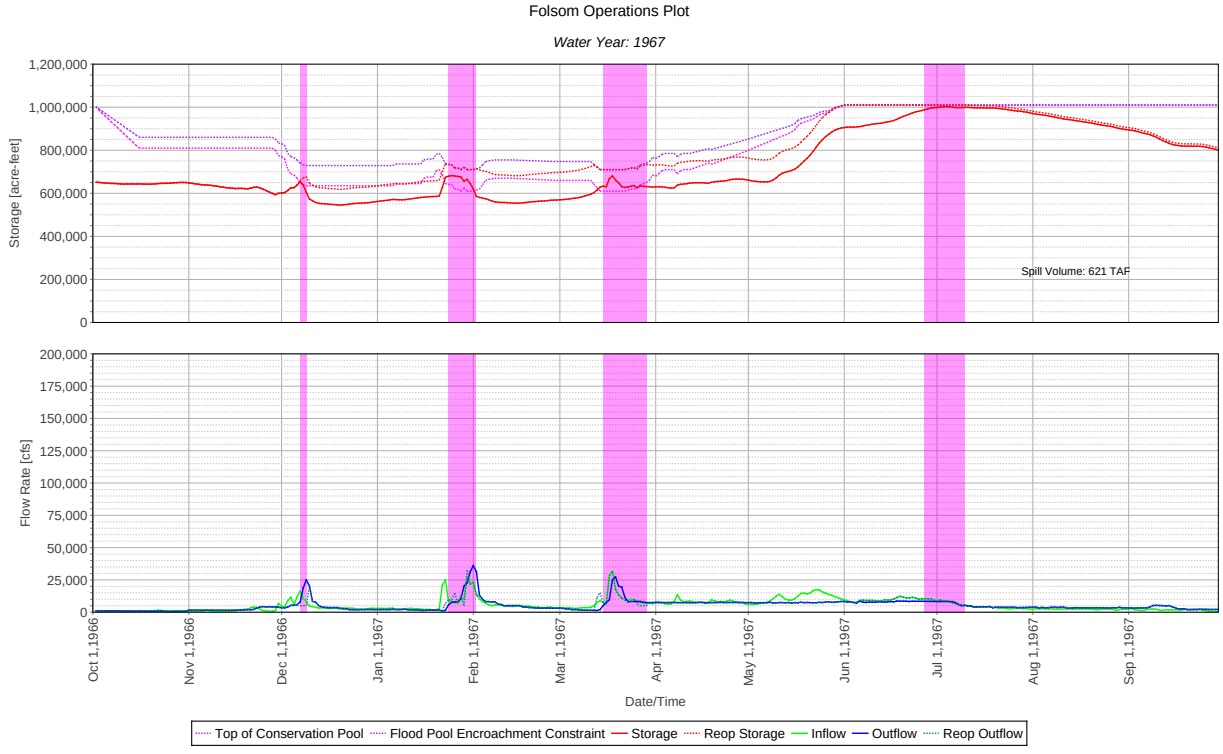

Folsom Operations Plot
Water Year: 1962
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 99 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1961
Nov 1,1961
Dec 1,1961
Jan 1,1962
Feb 1,1962
Mar 1,1962
Apr 1,1962
May 1,1962
Jun 1,1962
Jul 1,1962
Aug 1,1962
Sep 1,1962
Date/Time

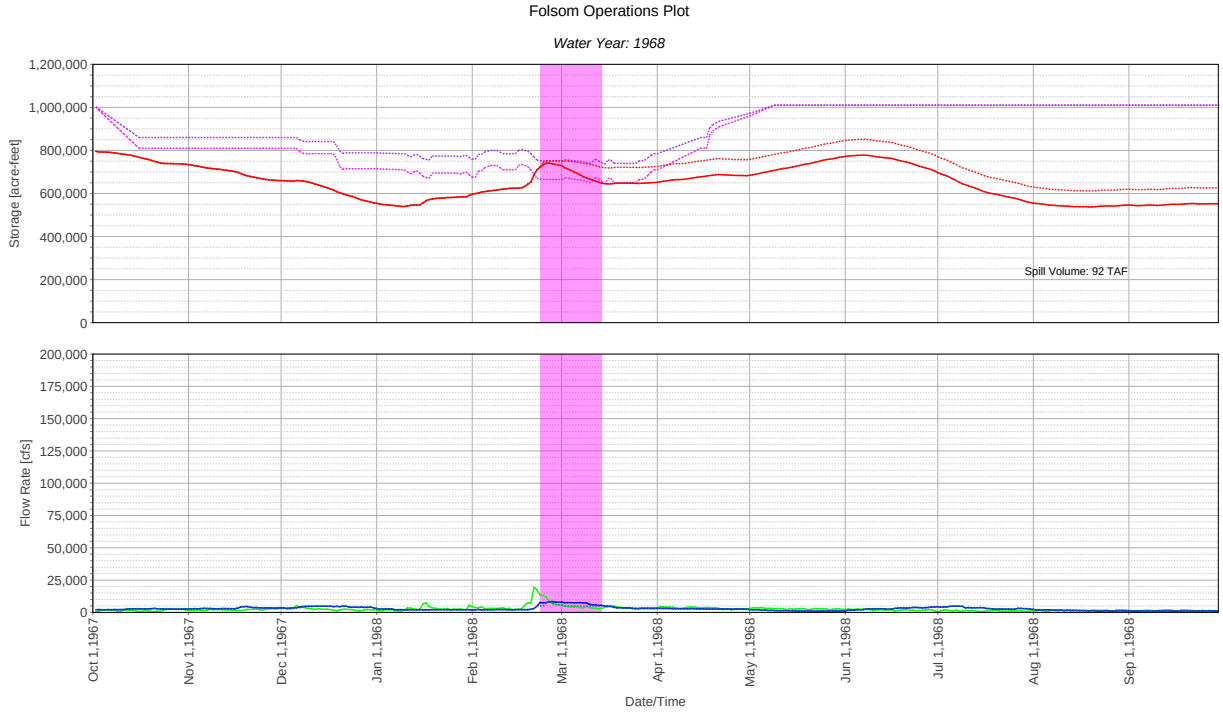

Folsom Operations Plot
Water Year: 1963
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 727 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1962
Nov 1,1962
Dec 1,1962
Jan 1,1963
Feb 1,1963
Mar 1,1963
Apr 1,1963
May 1,1963
Jun 1,1963
Jul 1,1963
Aug 1,1963
Sep 1,1963
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

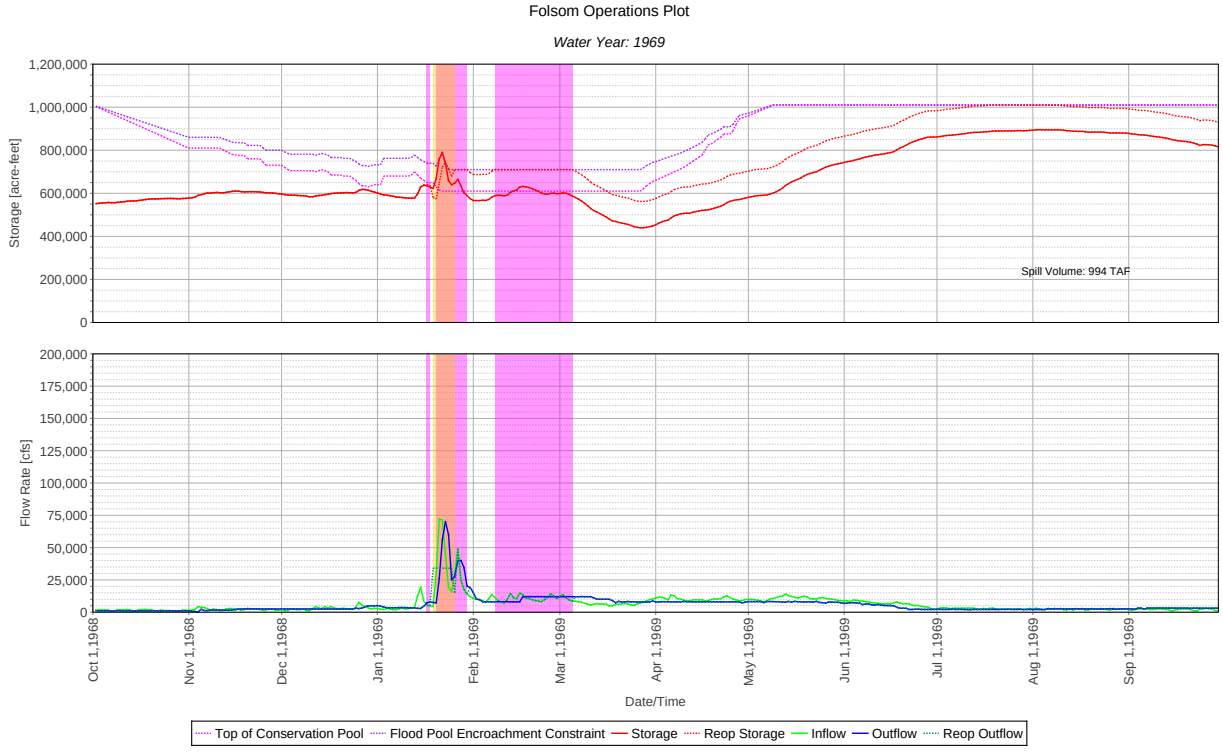

Folsom Operations Plot
Water Year: 1964
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1963
Nov 1,1963
Dec 1,1963
Jan 1,1964
Feb 1,1964
Mar 1,1964
Apr 1,1964
May 1,1964
Jun 1,1964
Jul 1,1964
Aug 1,1964
Sep 1,1964
Date/Time

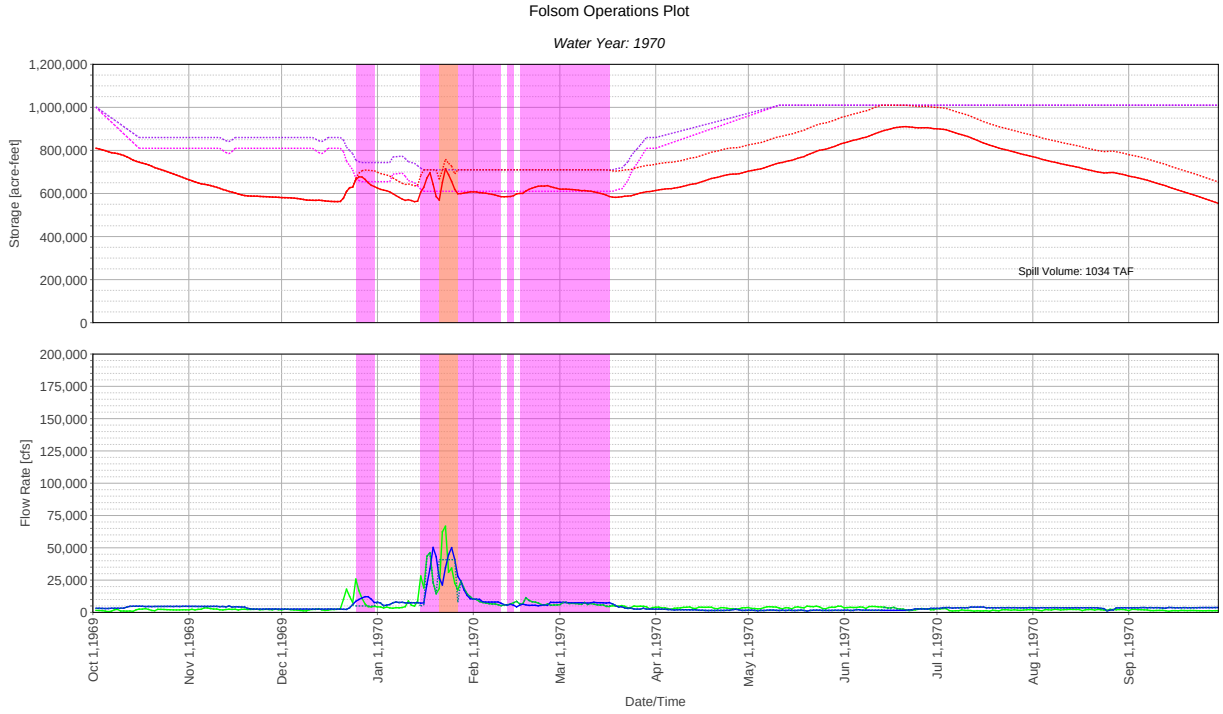

Folsom Operations Plot
Water Year: 1965
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1594 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1964
Nov 1,1964
Dec 1,1964
Jan 1,1965
Feb 1,1965
Mar 1,1965
Apr 1,1965
May 1,1965
Jun 1,1965
Jul 1,1965
Aug 1,1965
Sep 1,1965
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

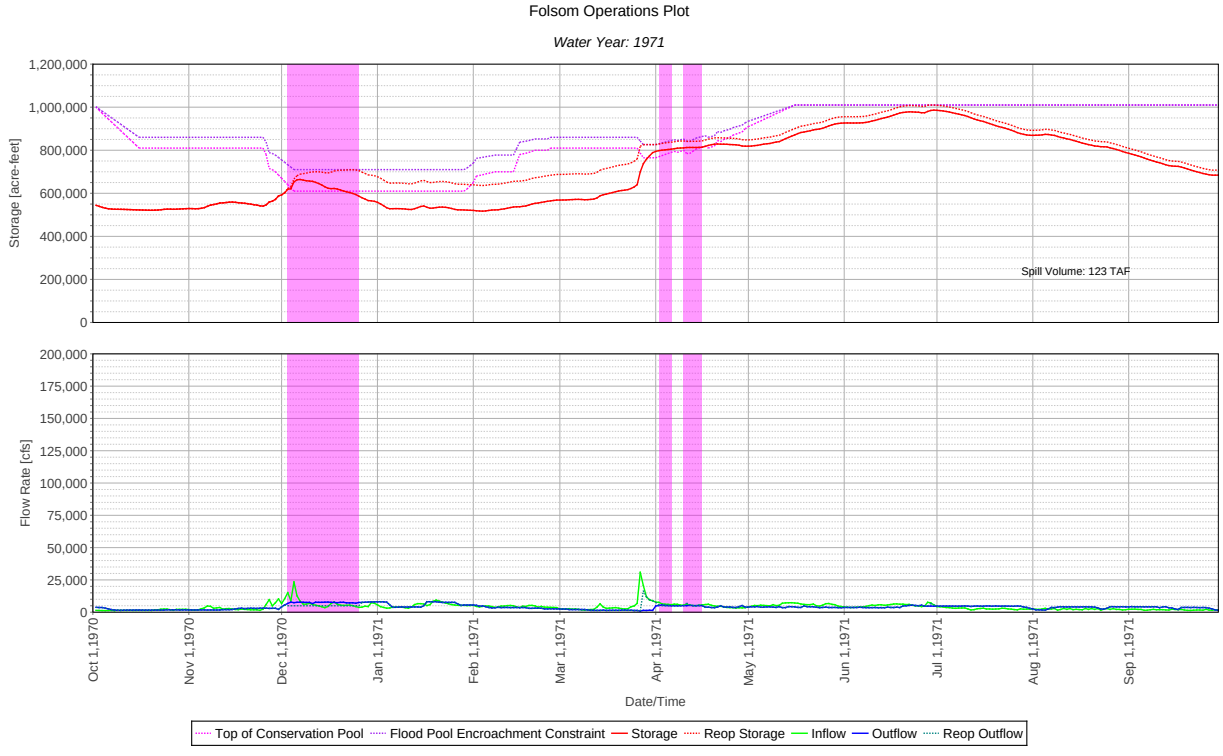

Folsom Operations Plot
Water Year: 1966
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1965
Nov 1,1965
Dec 1,1965
Jan 1,1966
Feb 1,1966
Mar 1,1966
Apr 1,1966
May 1,1966
Jun 1,1966
Jul 1,1966
Aug 1,1966
Sep 1,1966
Date/Time

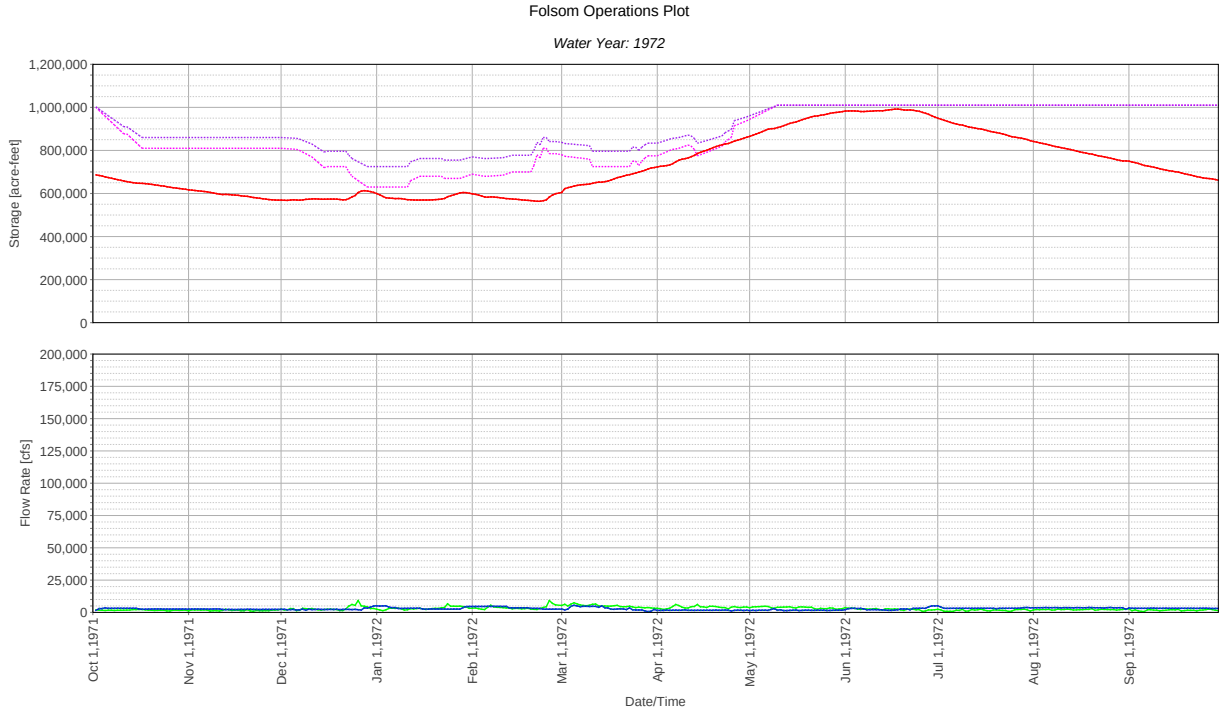

Folsom Operations Plot
Water Year: 1967
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 621 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1966
Nov 1,1966
Dec 1,1966
Jan 1,1967
Feb 1,1967
Mar 1,1967
Apr 1,1967
May 1,1967
Jun 1,1967
Jul 1,1967
Aug 1,1967
Sep 1,1967
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

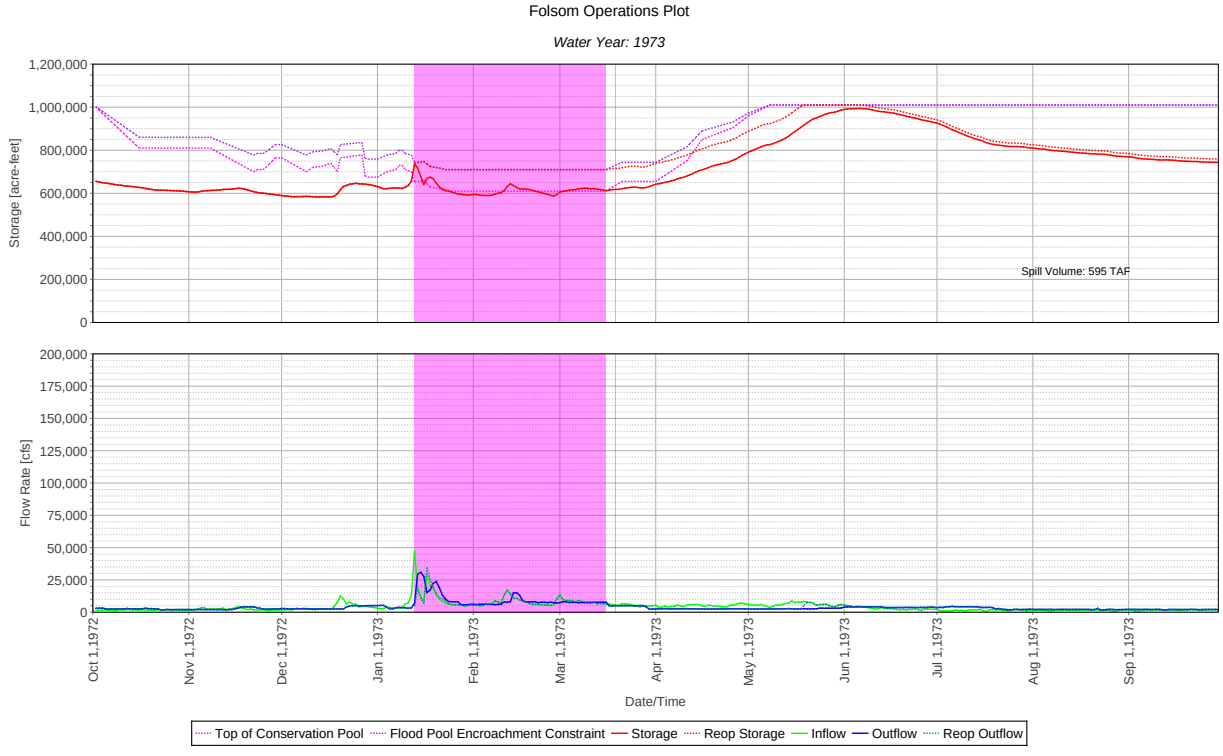

Folsom Operations Plot
Water Year: 1968
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 92 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1967
Nov 1,1967
Dec 1,1967
Jan 1,1968
Feb 1,1968
Mar 1,1968
Apr 1,1968
May 1,1968
Jun 1,1968
Jul 1,1968
Aug 1,1968
Sep 1,1968
Date/Time

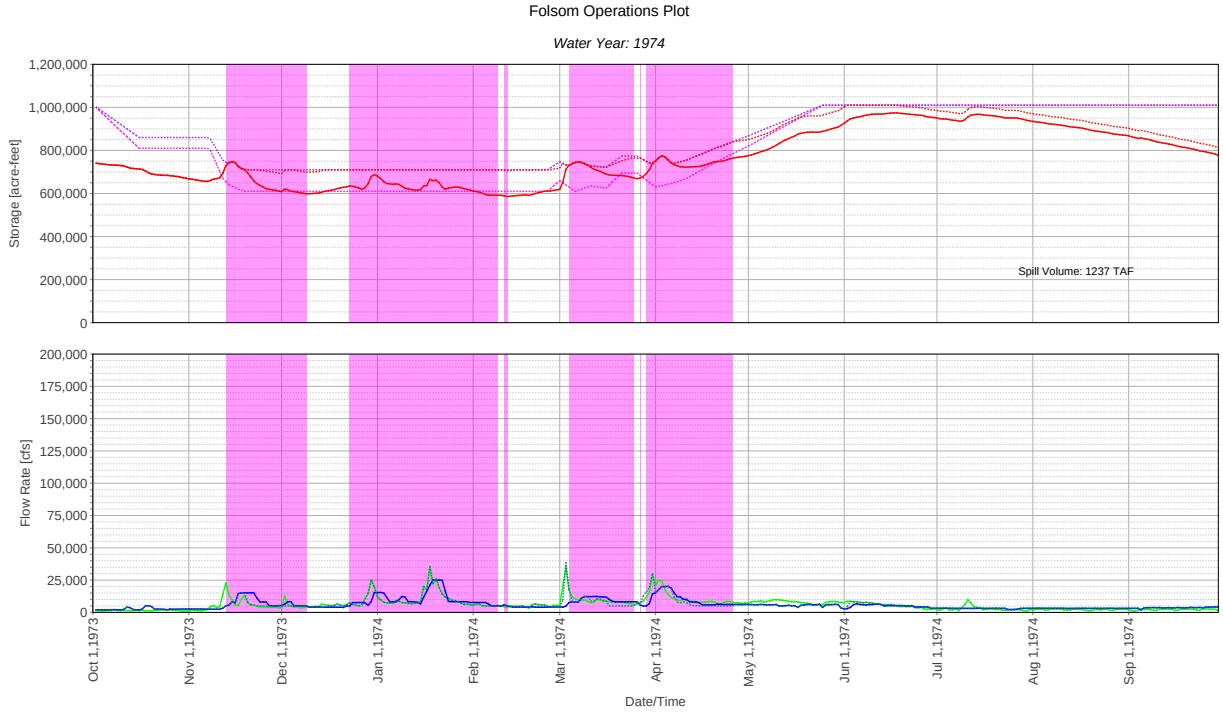

Folsom Operations Plot
Water Year: 1969
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 994 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1968
Nov 1,1968
Dec 1,1968
Jan 1,1969
Feb 1,1969
Mar 1,1969
Apr 1,1969
May 1,1969
Jun 1,1969
Jul 1,1969
Aug 1,1969
Sep 1,1969
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

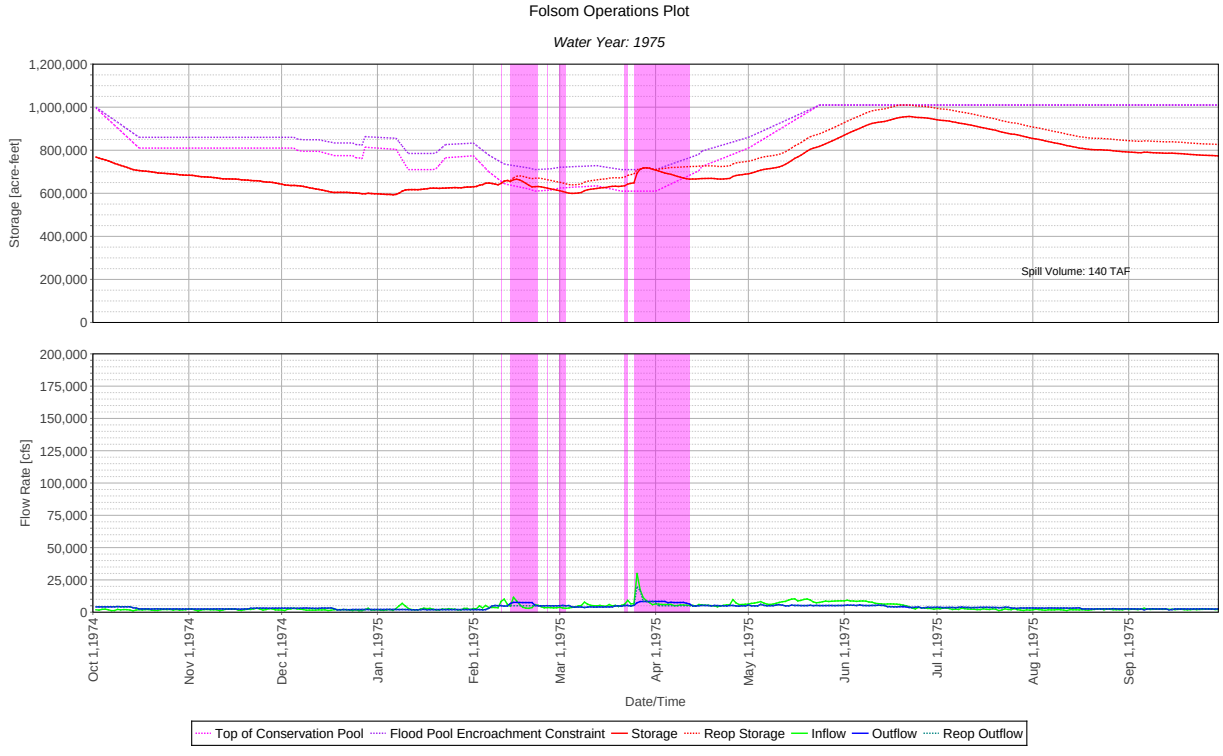

Folsom Operations Plot
Water Year: 1970
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1034 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1969
Nov 1,1969
Dec 1,1969
Jan 1,1970
Feb 1,1970
Mar 1,1970
Apr 1,1970
May 1,1970
Jun 1,1970
Jul 1,1970
Aug 1,1970
Sep 1,1970
Date/Time

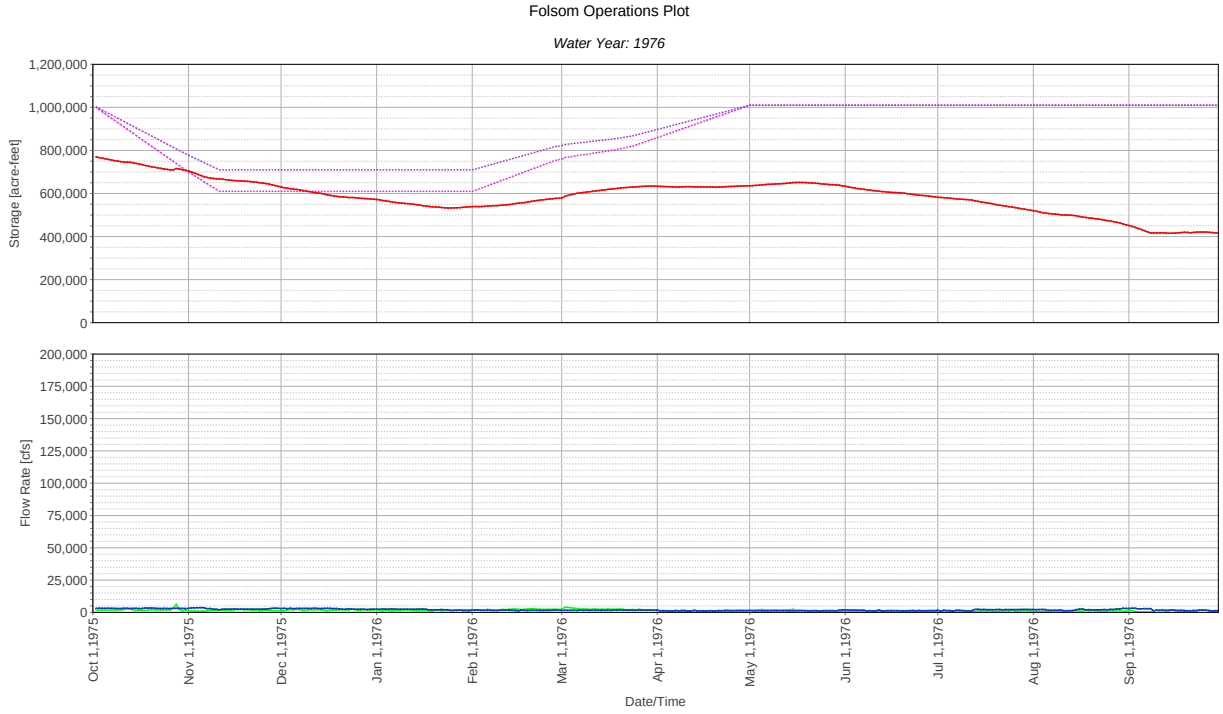

Folsom Operations Plot
Water Year: 1971
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 123 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1970
Nov 1,1970
Dec 1,1970
Jan 1,1971
Feb 1,1971
Mar 1,1971
Apr 1,1971
May 1,1971
Jun 1,1971
Jul 1,1971
Aug 1,1971
Sep 1,1971
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

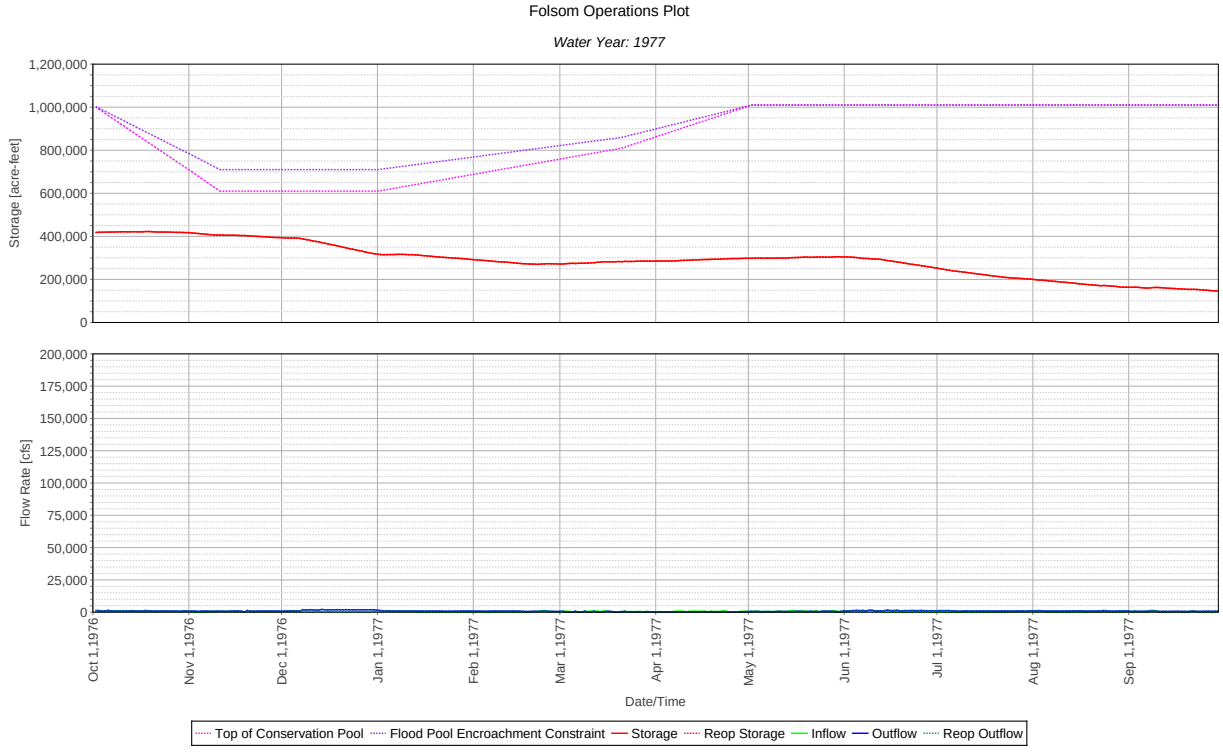

Folsom Operations Plot
Water Year: 1972
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1971
Nov 1,1971
Dec 1,1971
Jan 1,1972
Feb 1,1972
Mar 1,1972
Apr 1,1972
May 1,1972
Jun 1,1972
Jul 1,1972
Aug 1,1972
Sep 1,1972
Date/Time

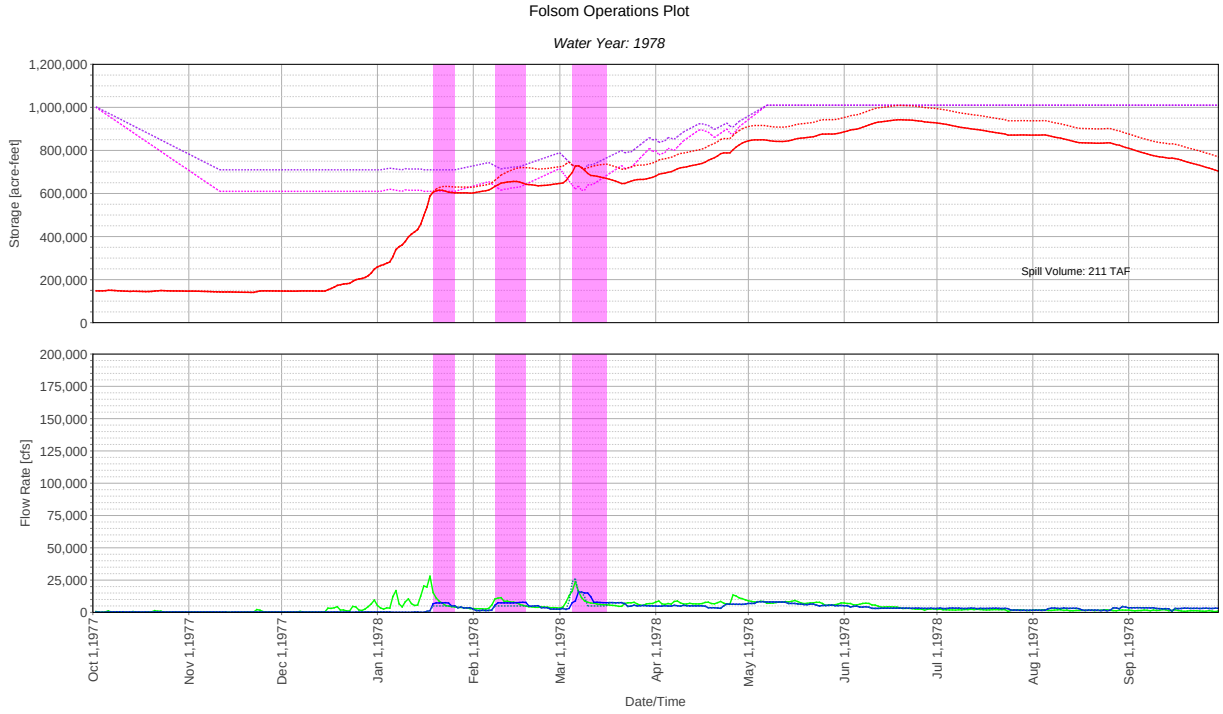

Folsom Operations Plot
Water Year: 1973
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 595 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1972
Nov 1,1972
Dec 1,1972
Jan 1,1973
Feb 1,1973
Mar 1,1973
Apr 1,1973
May 1,1973
Jun 1,1973
Jul 1,1973
Aug 1,1973
Sep 1,1973
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

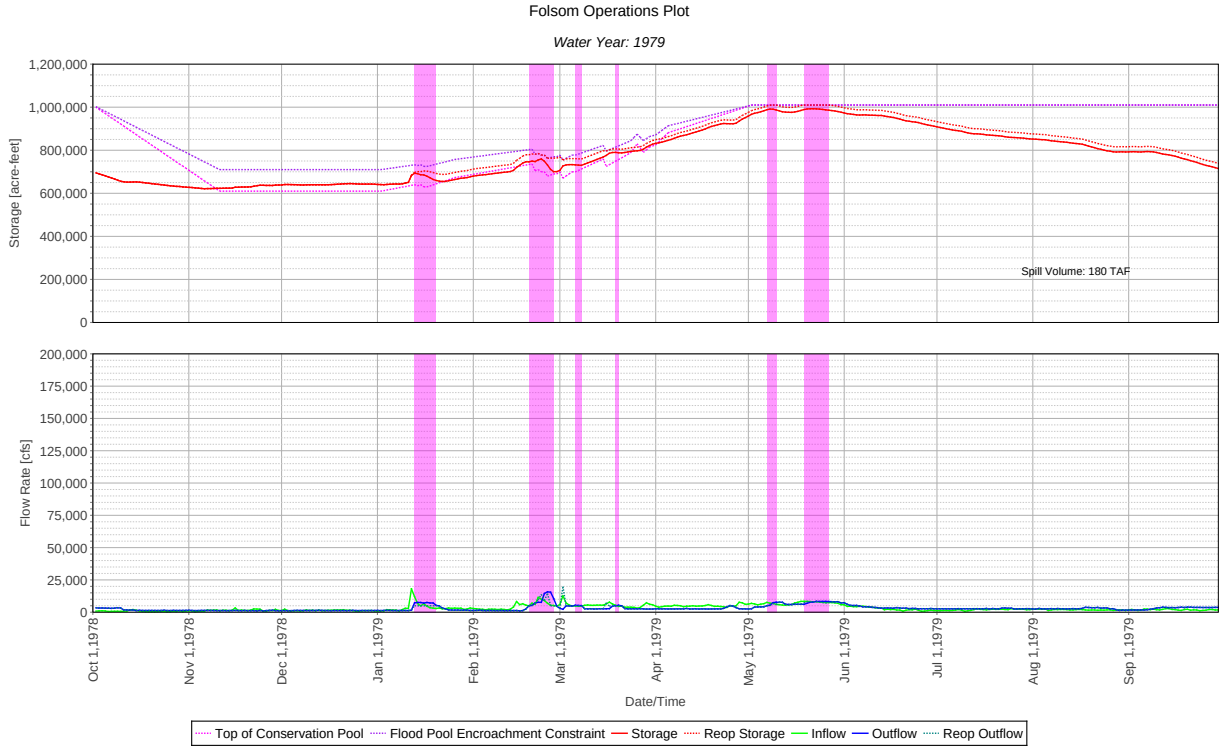

Folsom Operations Plot
Water Year: 1974
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1237 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1973
Nov 1,1973
Dec 1,1973
Jan 1,1974
Feb 1,1974
Mar 1,1974
Apr 1,1974
May 1,1974
Jun 1,1974
Jul 1,1974
Aug 1,1974
Sep 1,1974
Date/Time

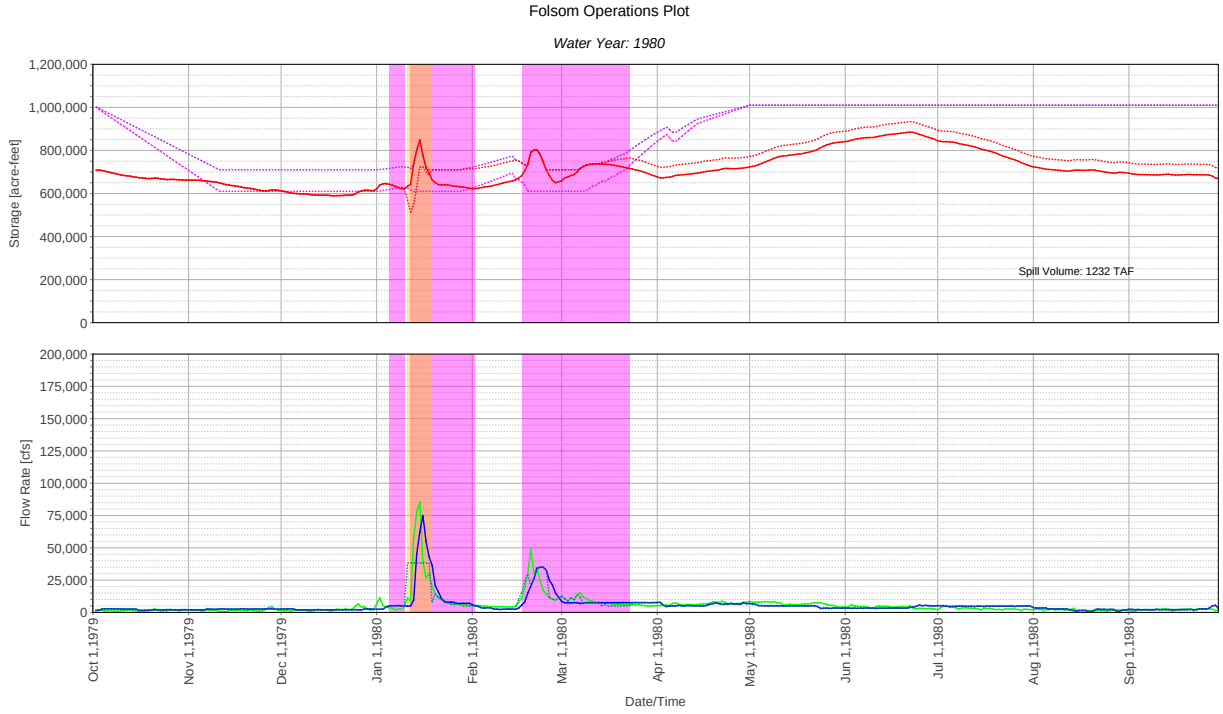

Folsom Operations Plot
Water Year: 1975
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 140 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1974
Nov 1,1974
Dec 1,1974
Jan 1,1975
Feb 1,1975
Mar 1,1975
Apr 1,1975
May 1,1975
Jun 1,1975
Jul 1,1975
Aug 1,1975
Sep 1,1975
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

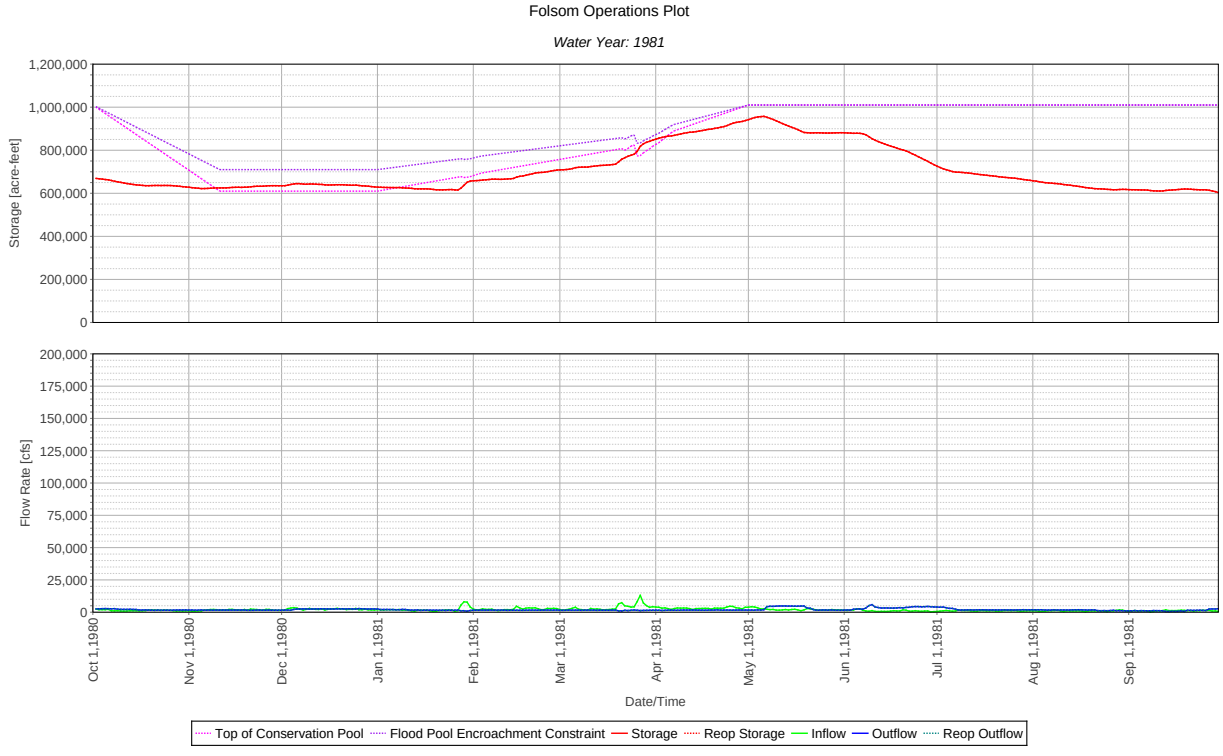

Folsom Operations Plot
Water Year: 1976
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1975
Nov 1,1975
Dec 1,1975
Jan 1,1976
Feb 1,1976
Mar 1,1976
Apr 1,1976
May 1,1976
Jun 1,1976
Jul 1,1976
Aug 1,1976
Sep 1,1976
Date/Time

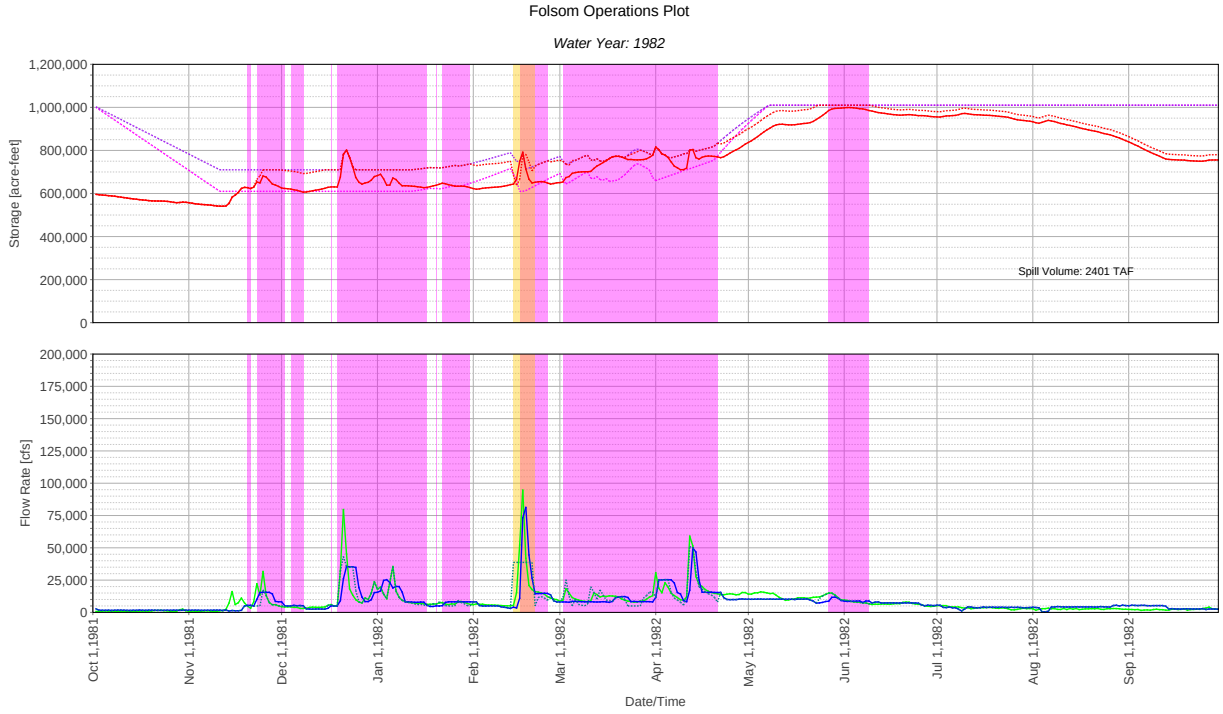

Folsom Operations Plot
Water Year: 1977
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1976
Nov 1,1976
Dec 1,1976
Jan 1,1977
Feb 1,1977
Mar 1,1977
Apr 1,1977
May 1,1977
Jun 1,1977
Jul 1,1977
Aug 1,1977
Sep 1,1977
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

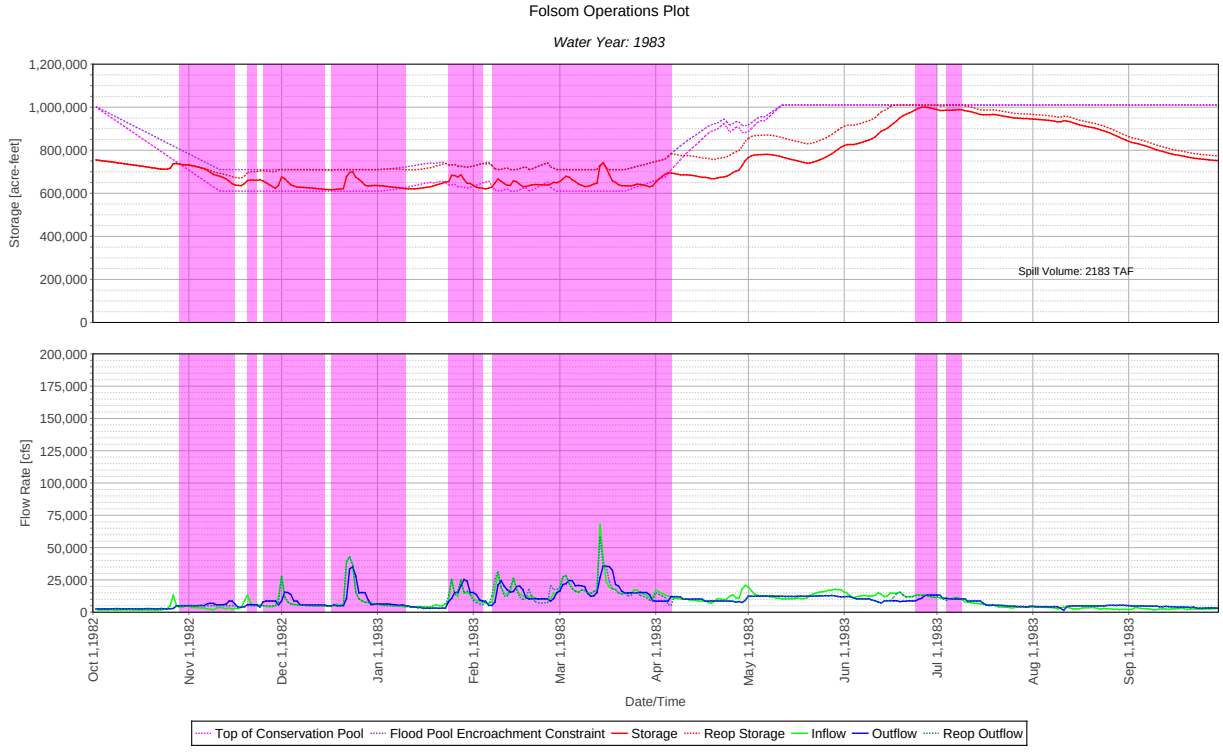

Folsom Operations Plot
Water Year: 1978
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 211 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1977
Nov 1,1977
Dec 1,1977
Jan 1,1978
Feb 1,1978
Mar 1,1978
Apr 1,1978
May 1,1978
Jun 1,1978
Jul 1,1978
Aug 1,1978
Sep 1,1978
Date/Time

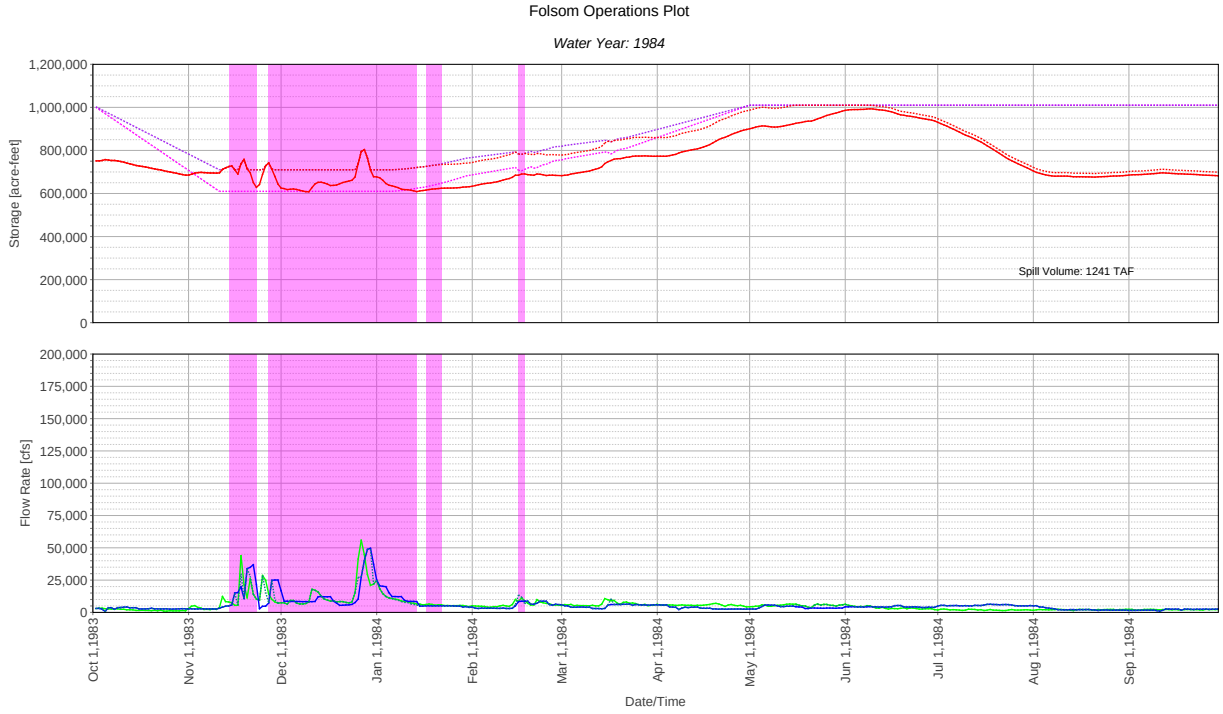

Folsom Operations Plot
Water Year: 1979
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 180 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1978
Nov 1,1978
Dec 1,1978
Jan 1,1979
Feb 1,1979
Mar 1,1979
Apr 1,1979
May 1,1979
Jun 1,1979
Jul 1,1979
Aug 1,1979
Sep 1,1979
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

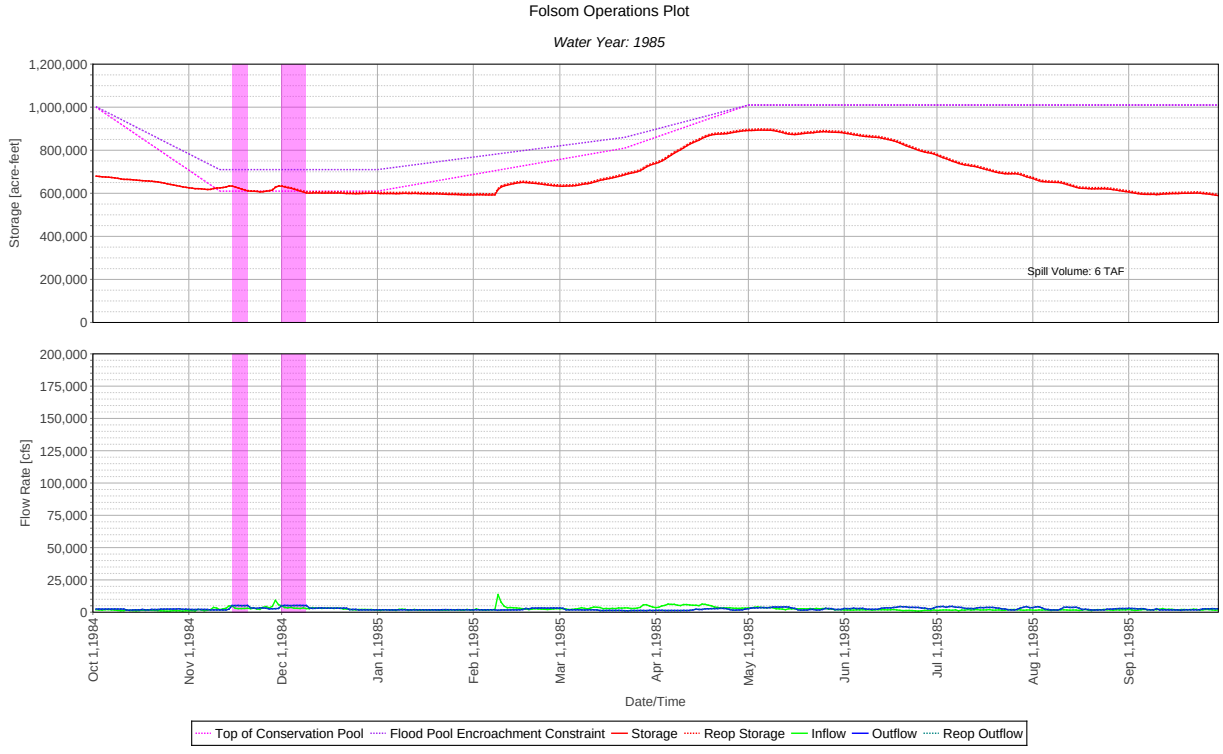

Folsom Operations Plot
Water Year: 1980
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1232 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1979
Nov 1,1979
Dec 1,1979
Jan 1,1980
Feb 1,1980
Mar 1,1980
Apr 1,1980
May 1,1980
Jun 1,1980
Jul 1,1980
Aug 1,1980
Sep 1,1980
Date/Time

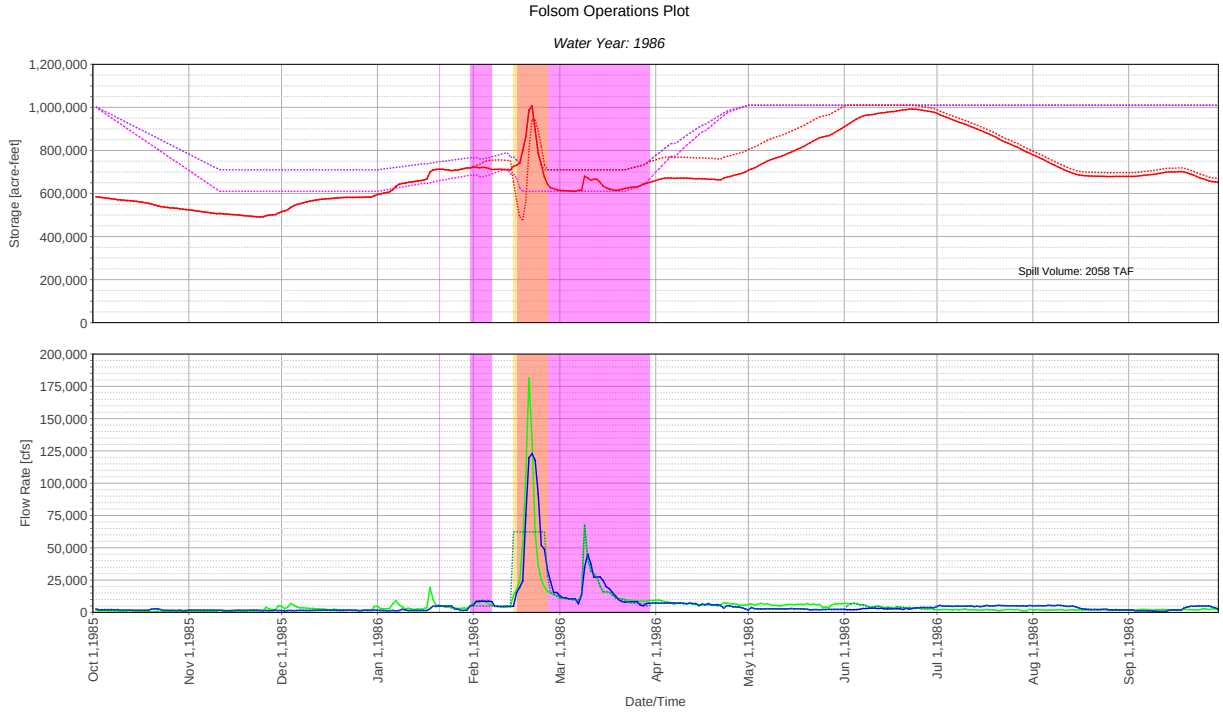

Folsom Operations Plot
Water Year: 1981
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1980
Nov 1,1980
Dec 1,1980
Jan 1,1981
Feb 1,1981
Mar 1,1981
Apr 1,1981
May 1,1981
Jun 1,1981
Jul 1,1981
Aug 1,1981
Sep 1,1981
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

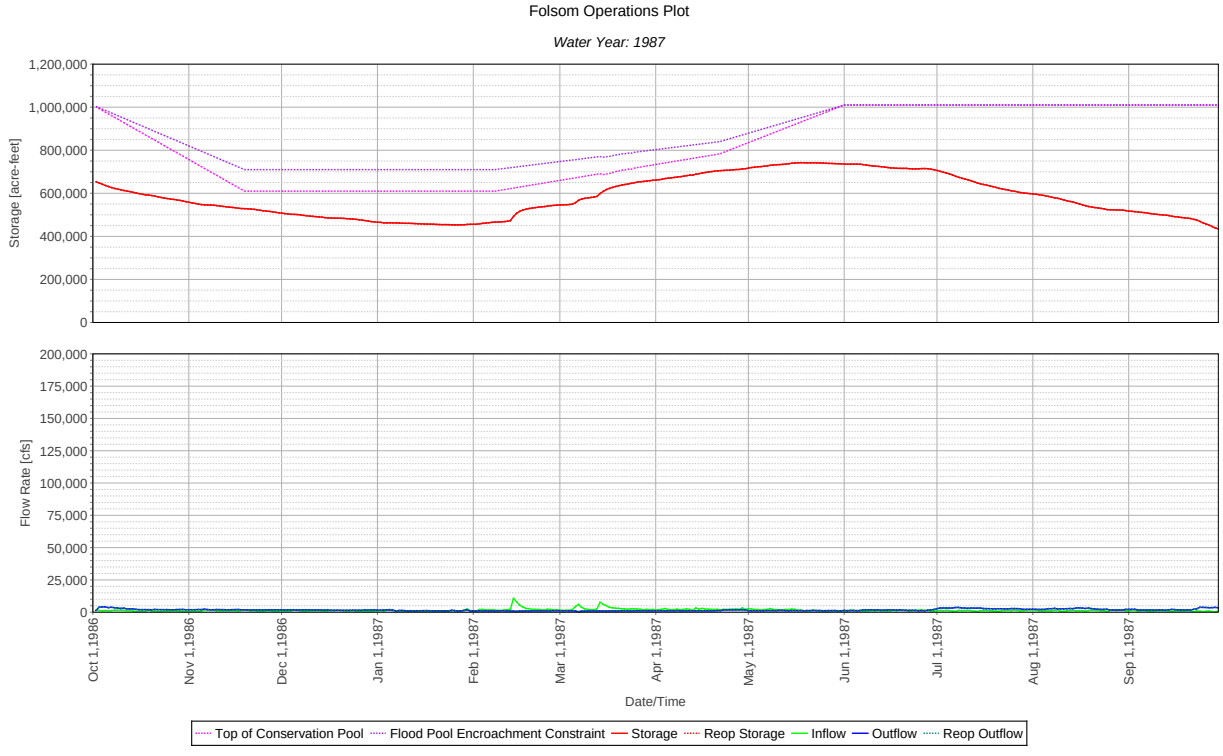

Folsom Operations Plot
Water Year: 1982
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 2401 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1981
Nov 1,1981
Dec 1,1981
Jan 1,1982
Feb 1,1982
Mar 1,1982
Apr 1,1982
May 1,1982
Jun 1,1982
Jul 1,1982
Aug 1,1982
Sep 1,1982
Date/Time

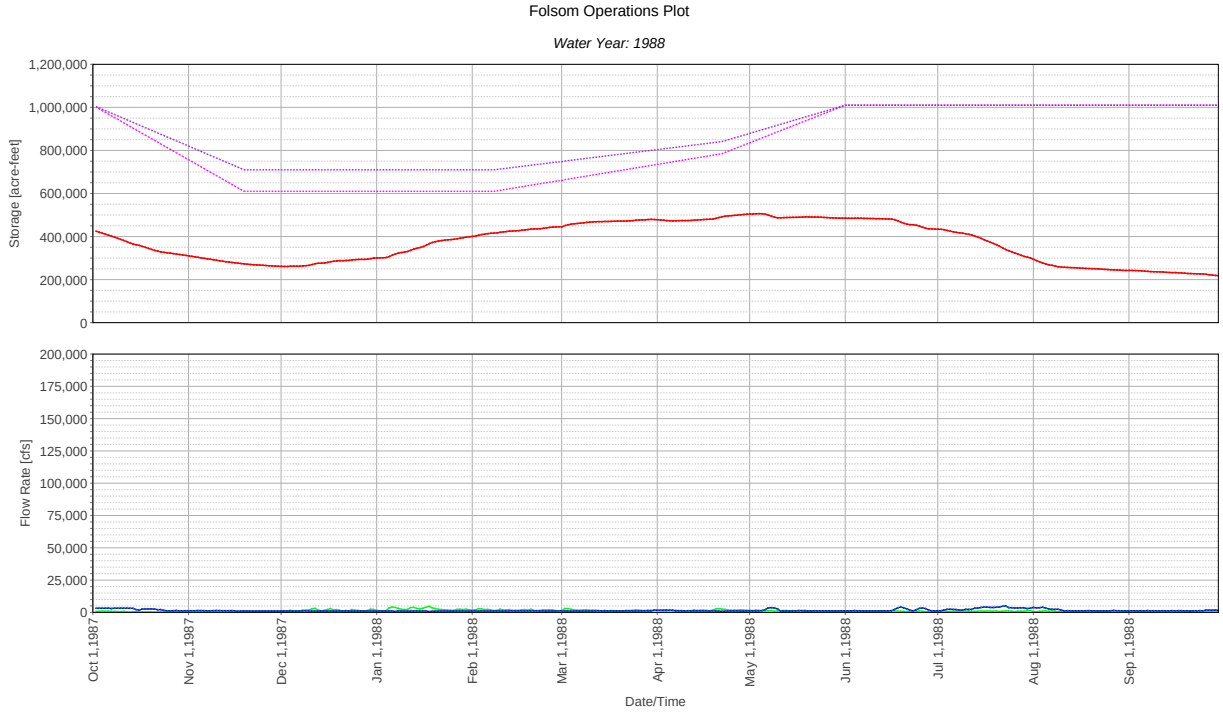

Folsom Operations Plot
Water Year: 1983
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 2183 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1982
Nov 1,1982
Dec 1,1982
Jan 1,1983
Feb 1,1983
Mar 1,1983
Apr 1,1983
May 1,1983
Jun 1,1983
Jul 1,1983
Aug 1,1983
Sep 1,1983
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

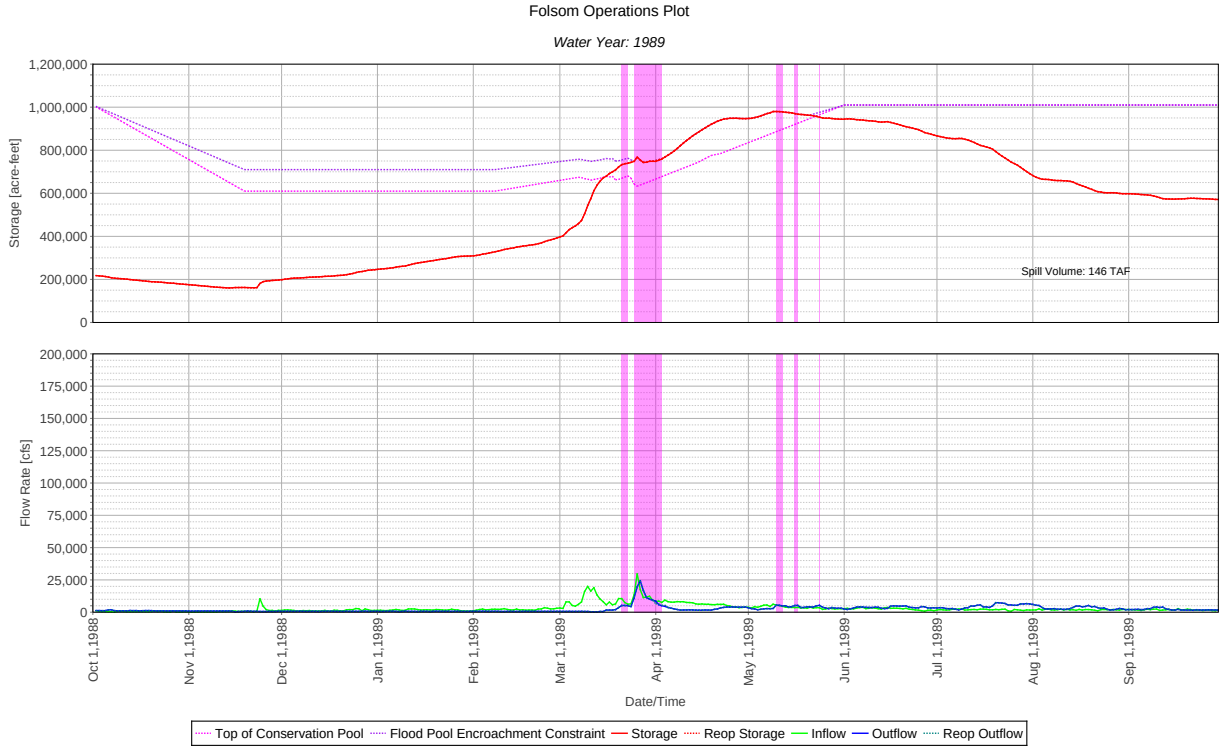

Folsom Operations Plot
Water Year: 1984
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1241 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1983
Nov 1,1983
Dec 1,1983
Jan 1,1984
Feb 1,1984
Mar 1,1984
Apr 1,1984
May 1,1984
Jun 1,1984
Jul 1,1984
Aug 1,1984
Sep 1,1984
Date/Time

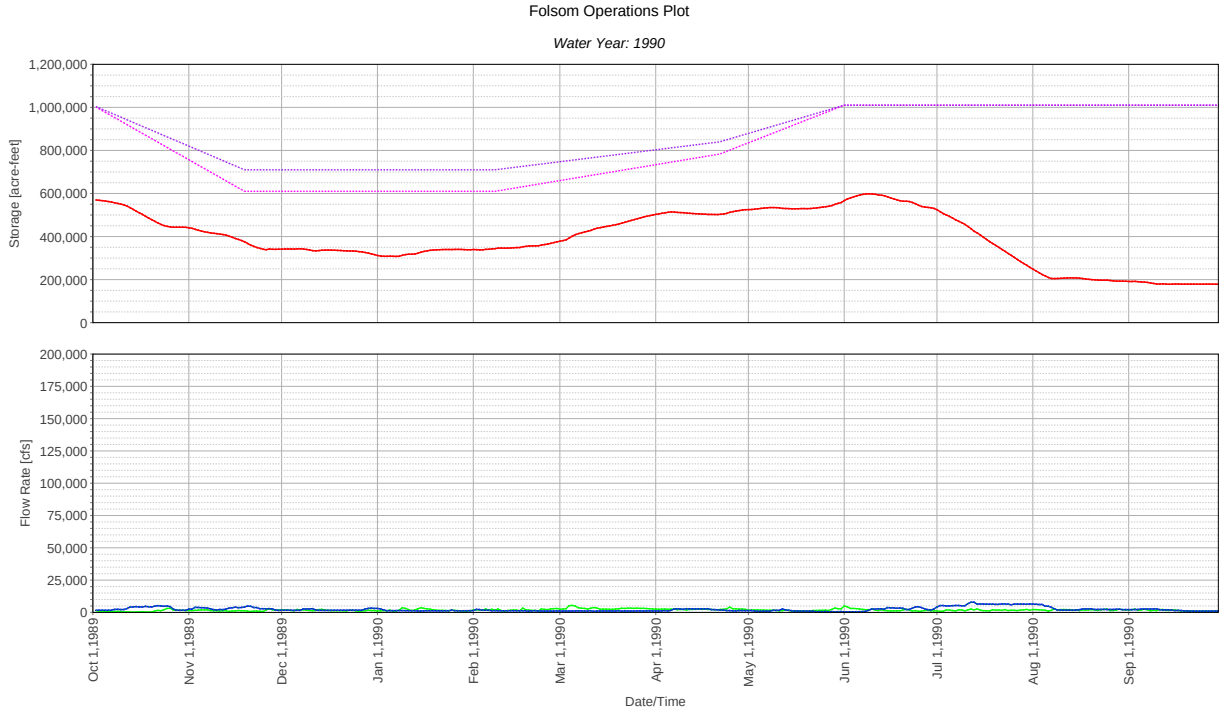

Folsom Operations Plot
Water Year: 1985
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 6 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1984
Nov 1,1984
Dec 1,1984
Jan 1,1985
Feb 1,1985
Mar 1,1985
Apr 1,1985
May 1,1985
Jun 1,1985
Jul 1,1985
Aug 1,1985
Sep 1,1985
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

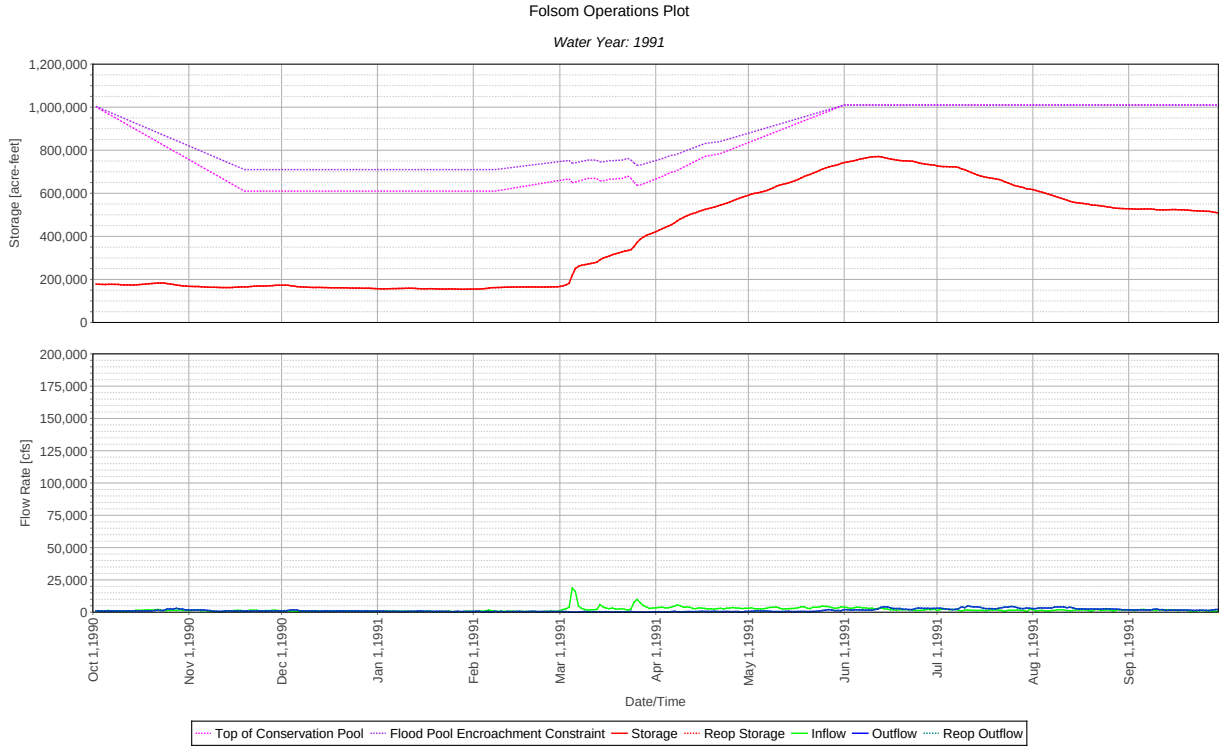

Folsom Operations Plot
Water Year: 1986
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 2058 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1985
Nov 1,1985
Dec 1,1985
Jan 1,1986
Feb 1,1986
Mar 1,1986
Apr 1,1986
May 1,1986
Jun 1,1986
Jul 1,1986
Aug 1,1986
Sep 1,1986
Date/Time

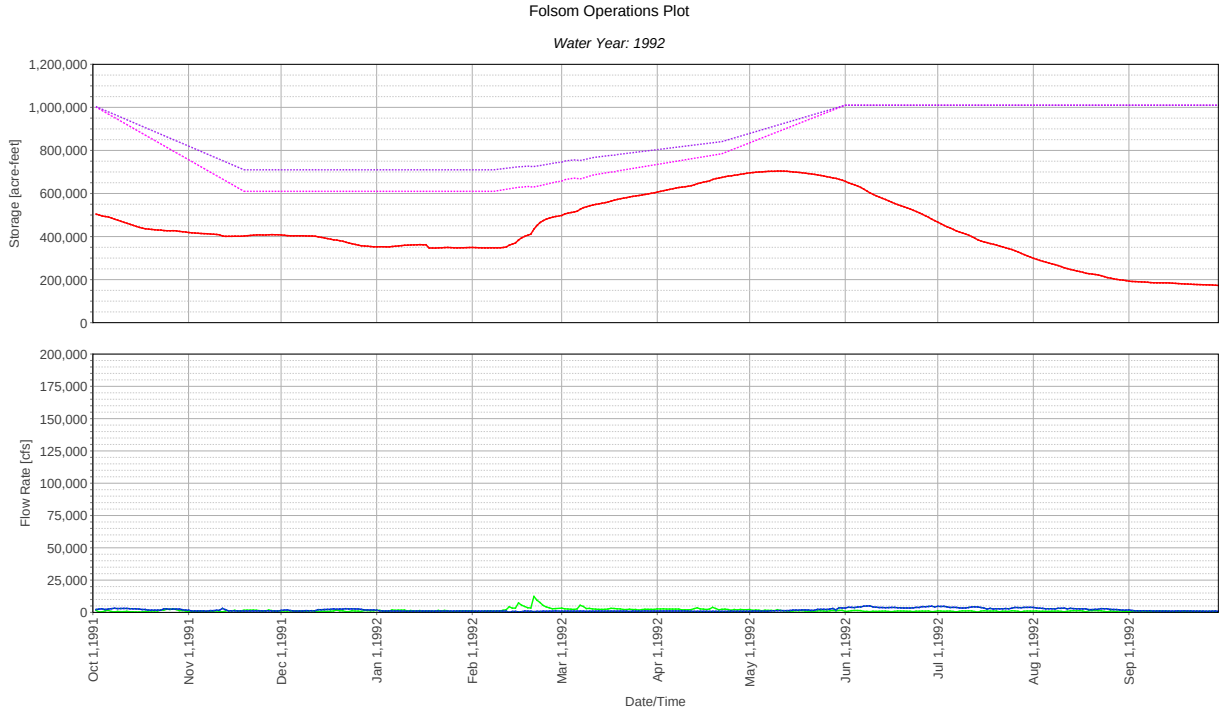

Folsom Operations Plot
Water Year: 1987
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1986
Nov 1,1986
Dec 1,1986
Jan 1,1987
Feb 1,1987
Mar 1,1987
Apr 1,1987
May 1,1987
Jun 1,1987
Jul 1,1987
Aug 1,1987
Sep 1,1987
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

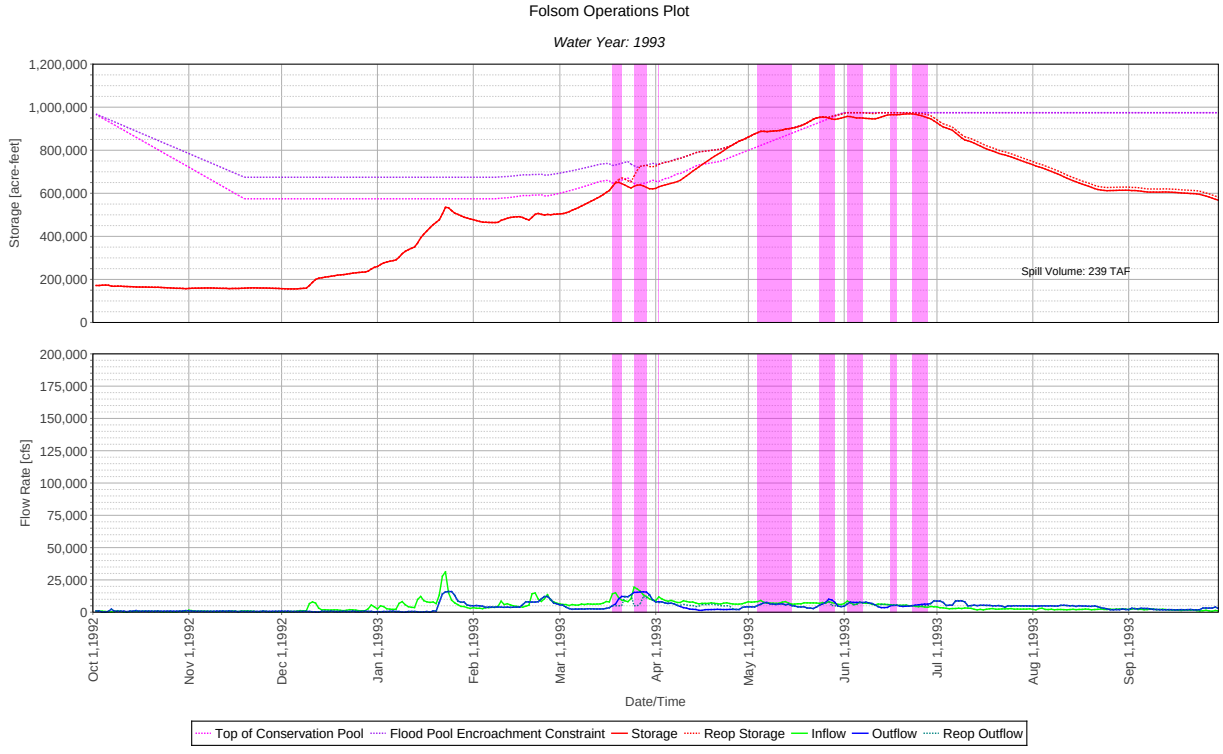

Folsom Operations Plot
Water Year: 1988
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1987
Nov 1,1987
Dec 1,1987
Jan 1,1988
Feb 1,1988
Mar 1,1988
Apr 1,1988
May 1,1988
Jun 1,1988
Jul 1,1988
Aug 1,1988
Sep 1,1988
Date/Time

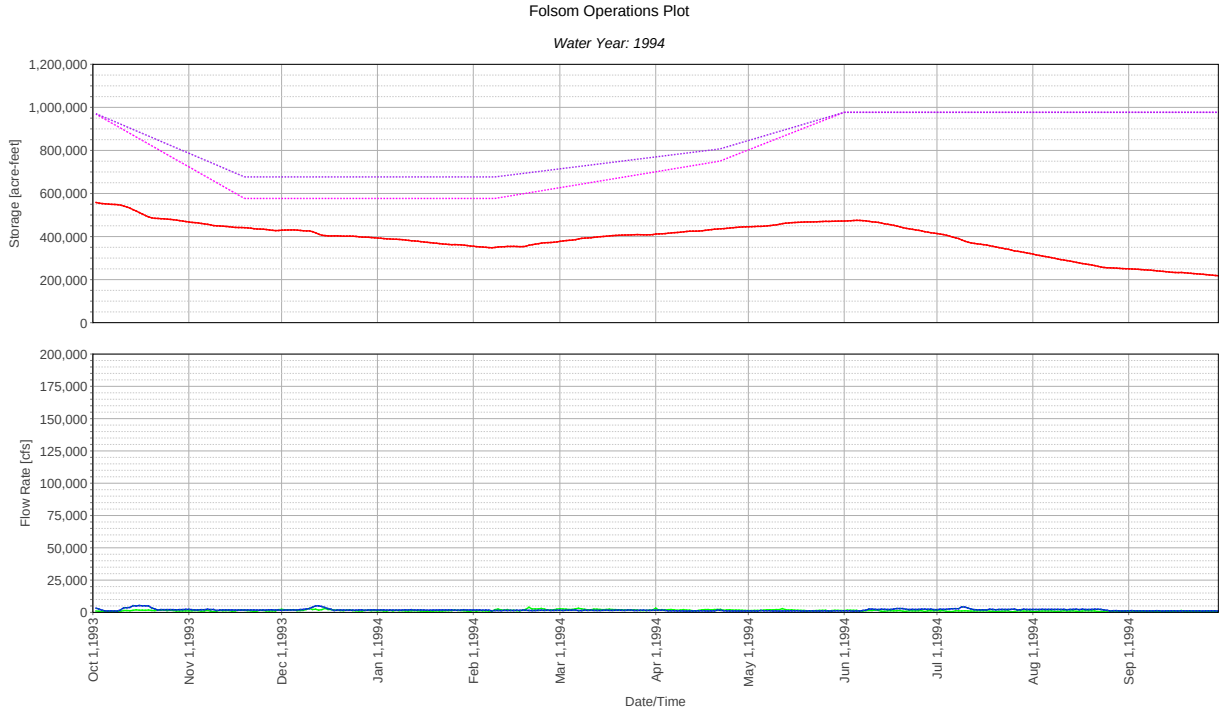

Folsom Operations Plot
Water Year: 1989
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 146 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1988
Nov 1,1988
Dec 1,1988
Jan 1,1989
Feb 1,1989
Mar 1,1989
Apr 1,1989
May 1,1989
Jun 1,1989
Jul 1,1989
Aug 1,1989
Sep 1,1989
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

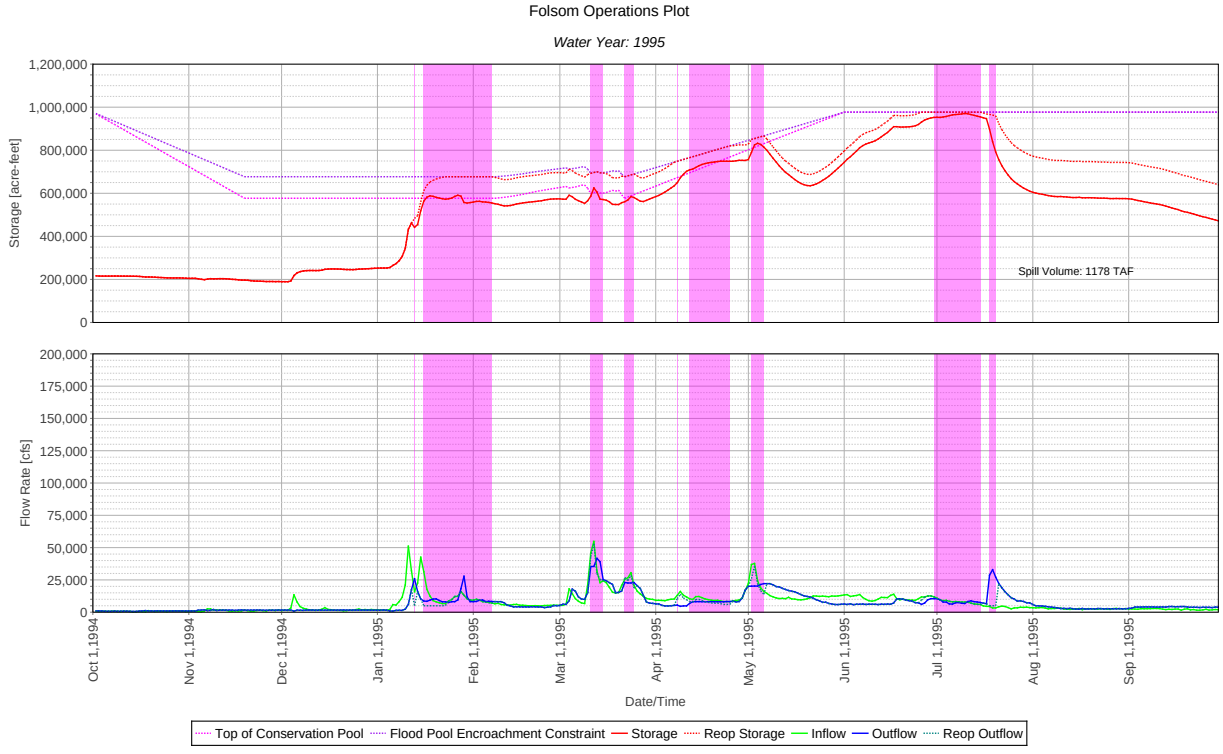

Folsom Operations Plot
Water Year: 1990
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1989
Nov 1,1989
Dec 1,1989
Jan 1,1990
Feb 1,1990
Mar 1,1990
Apr 1,1990
May 1,1990
Jun 1,1990
Jul 1,1990
Aug 1,1990
Sep 1,1990
Date/Time

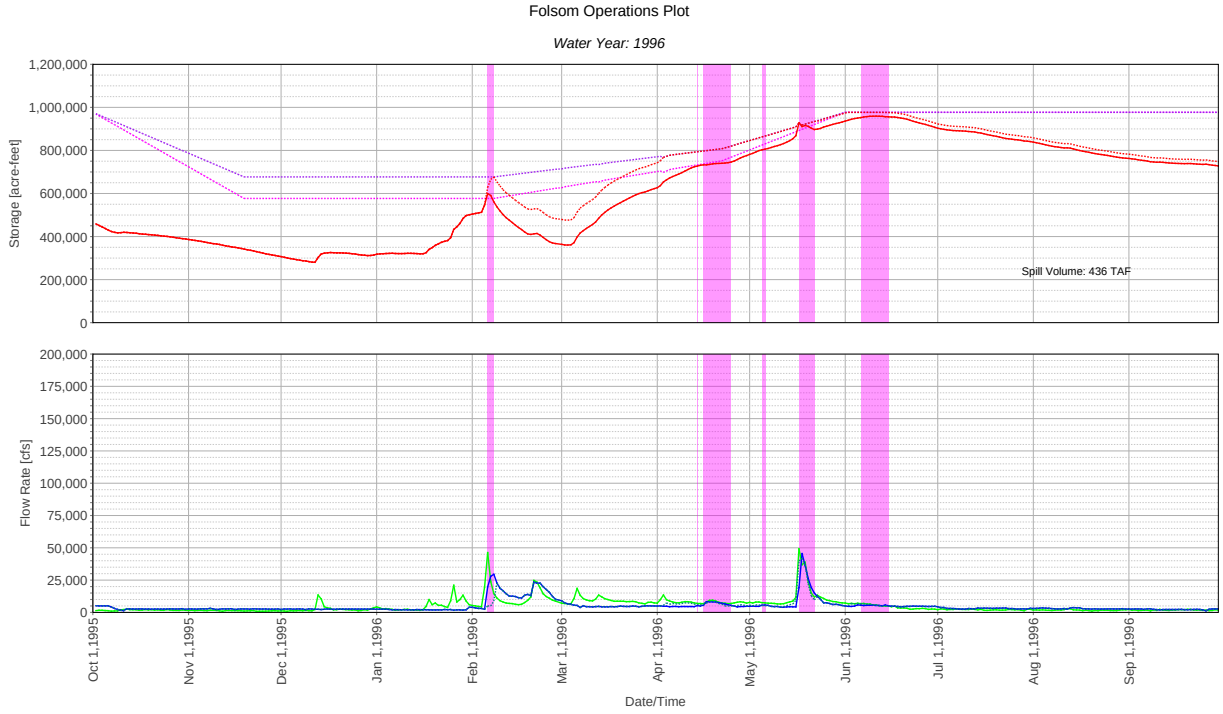

Folsom Operations Plot
Water Year: 1991
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1990
Nov 1,1990
Dec 1,1990
Jan 1,1991
Feb 1,1991
Mar 1,1991
Apr 1,1991
May 1,1991
Jun 1,1991
Jul 1,1991
Aug 1,1991
Sep 1,1991
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

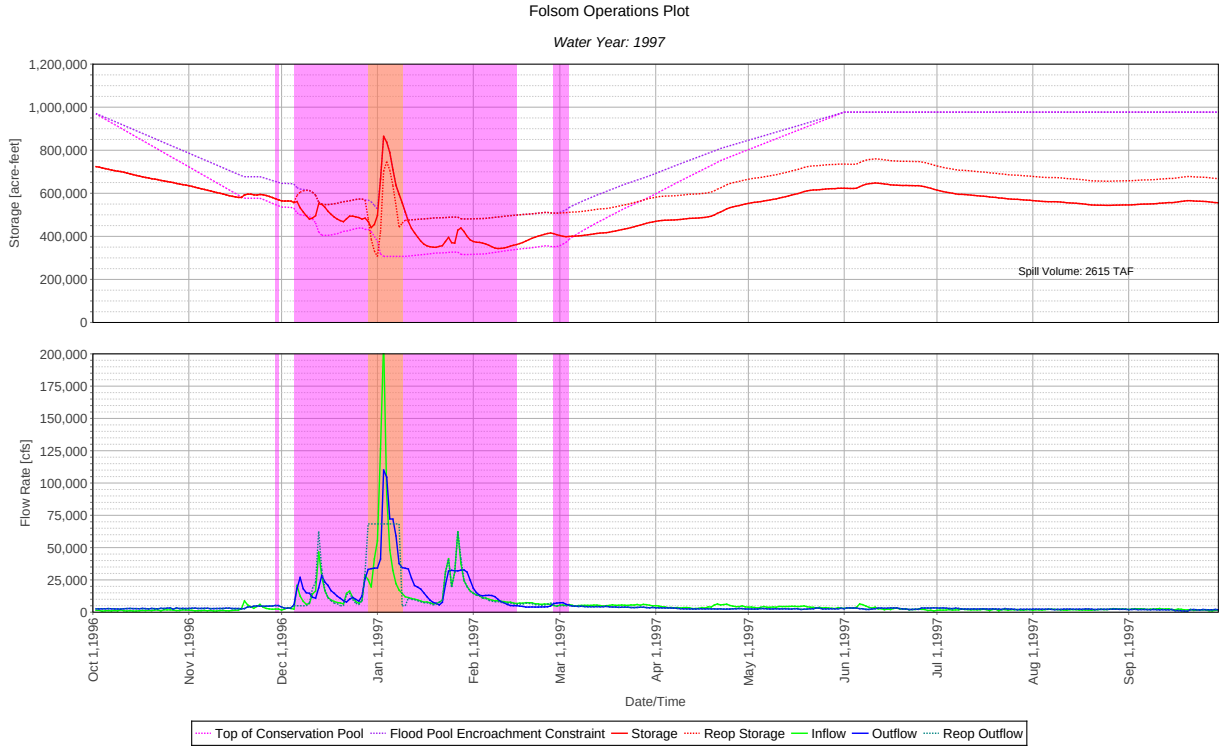

Folsom Operations Plot
Water Year: 1992
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1991
Nov 1,1991
Dec 1,1991
Jan 1,1992
Feb 1,1992
Mar 1,1992
Apr 1,1992
May 1,1992
Jun 1,1992
Jul 1,1992
Aug 1,1992
Sep 1,1992
Date/Time

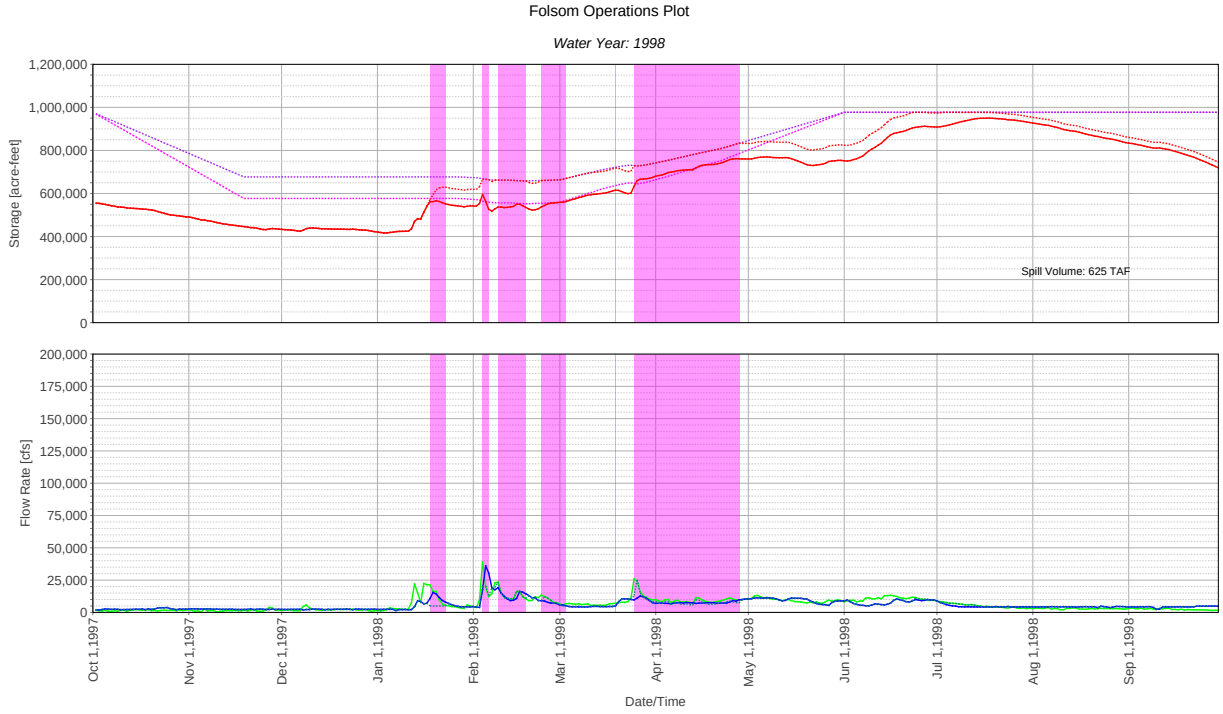

Folsom Operations Plot
Water Year: 1993
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 239 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1992
Nov 1,1992
Dec 1,1992
Jan 1,1993
Feb 1,1993
Mar 1,1993
Apr 1,1993
May 1,1993
Jun 1,1993
Jul 1,1993
Aug 1,1993
Sep 1,1993
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

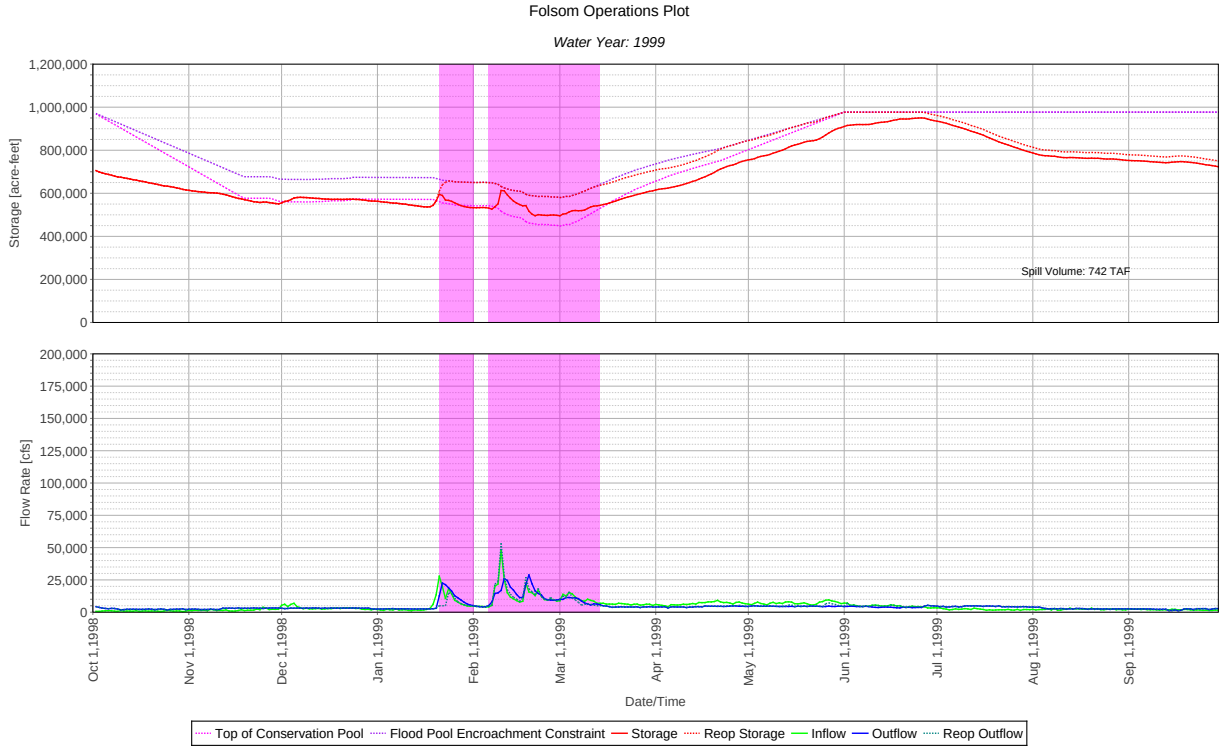

Folsom Operations Plot
Water Year: 1994
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1993
Nov 1,1993
Dec 1,1993
Jan 1,1994
Feb 1,1994
Mar 1,1994
Apr 1,1994
May 1,1994
Jun 1,1994
Jul 1,1994
Aug 1,1994
Sep 1,1994
Date/Time

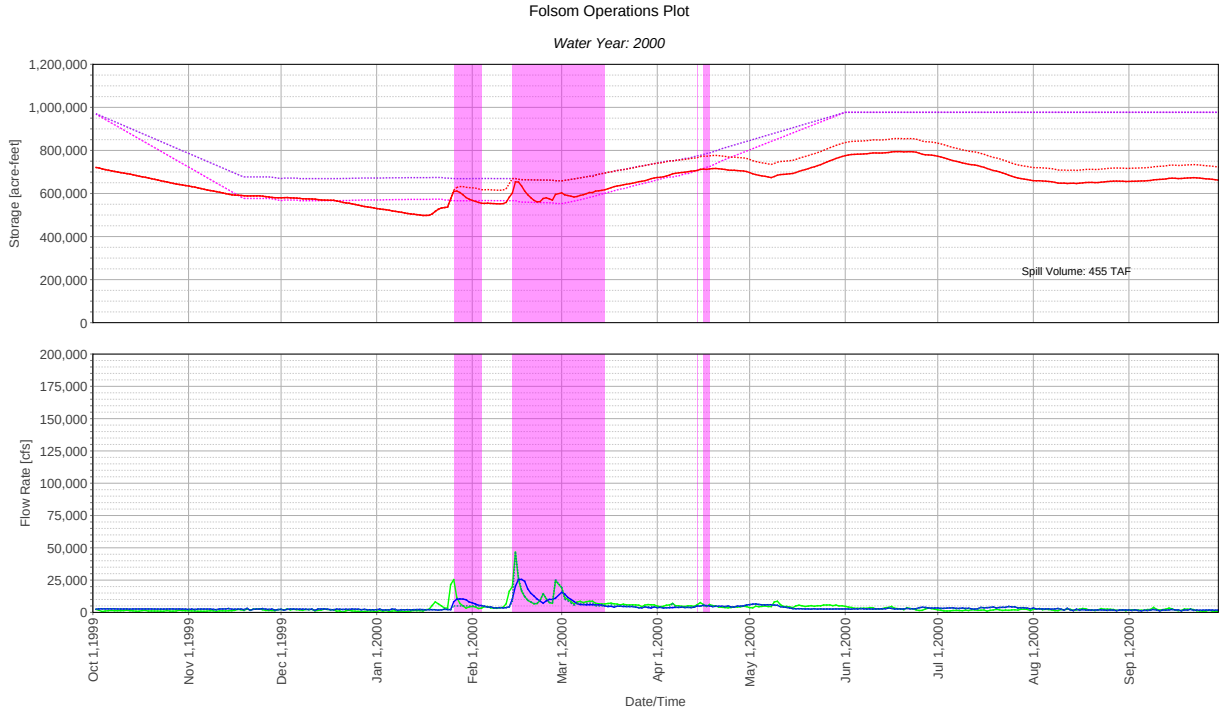

Folsom Operations Plot
Water Year: 1995
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1178 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1994
Nov 1,1994
Dec 1,1994
Jan 1,1995
Feb 1,1995
Mar 1,1995
Apr 1,1995
May 1,1995
Jun 1,1995
Jul 1,1995
Aug 1,1995
Sep 1,1995
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

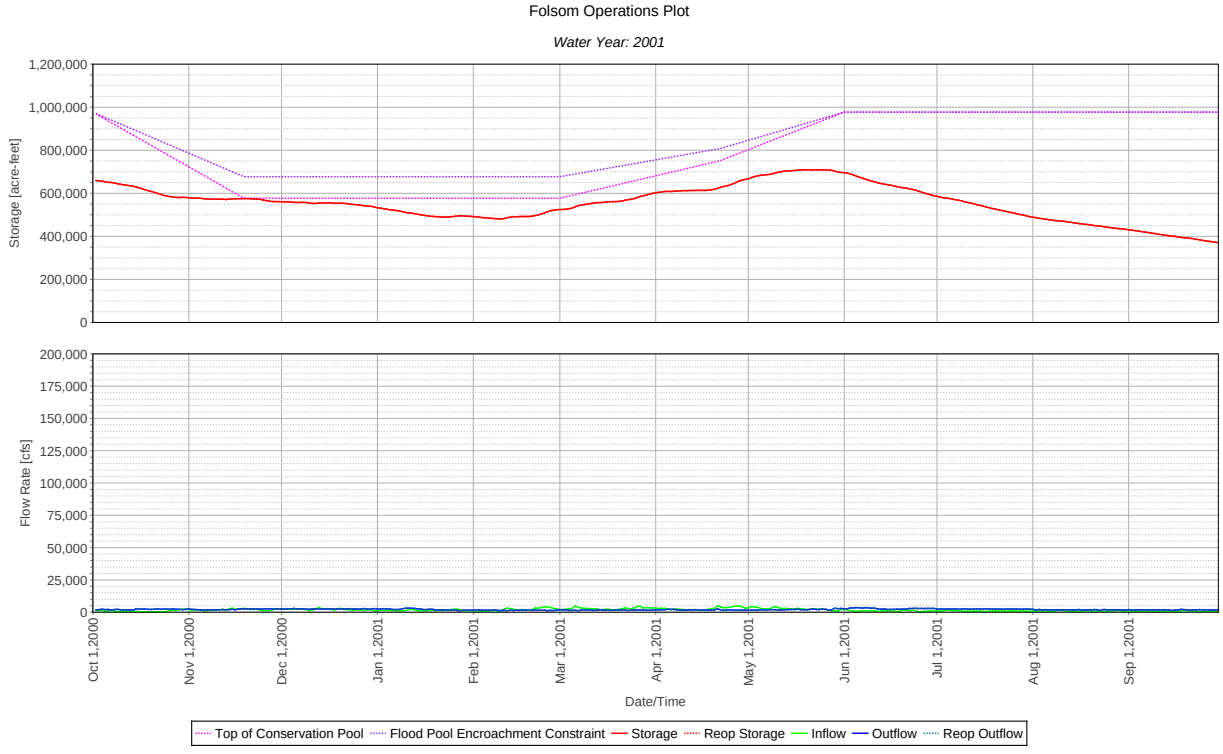

Folsom Operations Plot
Water Year: 1996
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 436 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1995
Nov 1,1995
Dec 1,1995
Jan 1,1996
Feb 1,1996
Mar 1,1996
Apr 1,1996
May 1,1996
Jun 1,1996
Jul 1,1996
Aug 1,1996
Sep 1,1996
Date/Time

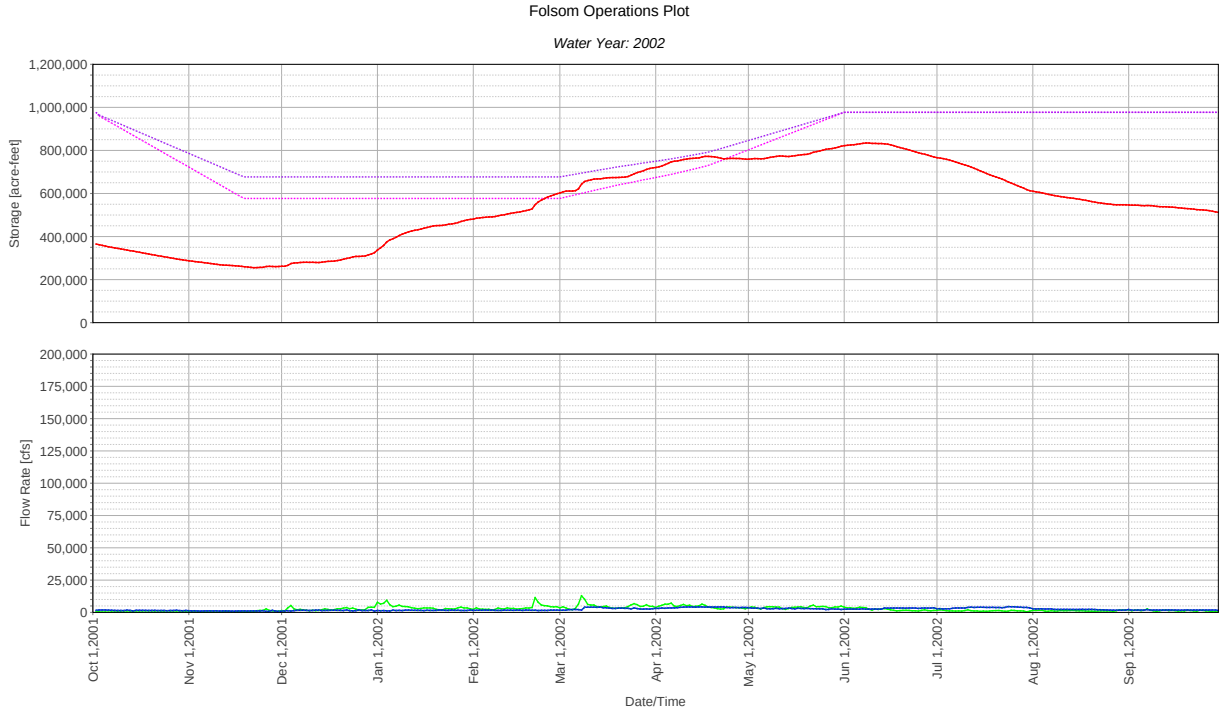

Folsom Operations Plot
Water Year: 1997
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 2615 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1996
Nov 1,1996
Dec 1,1996
Jan 1,1997
Feb 1,1997
Mar 1,1997
Apr 1,1997
May 1,1997
Jun 1,1997
Jul 1,1997
Aug 1,1997
Sep 1,1997
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

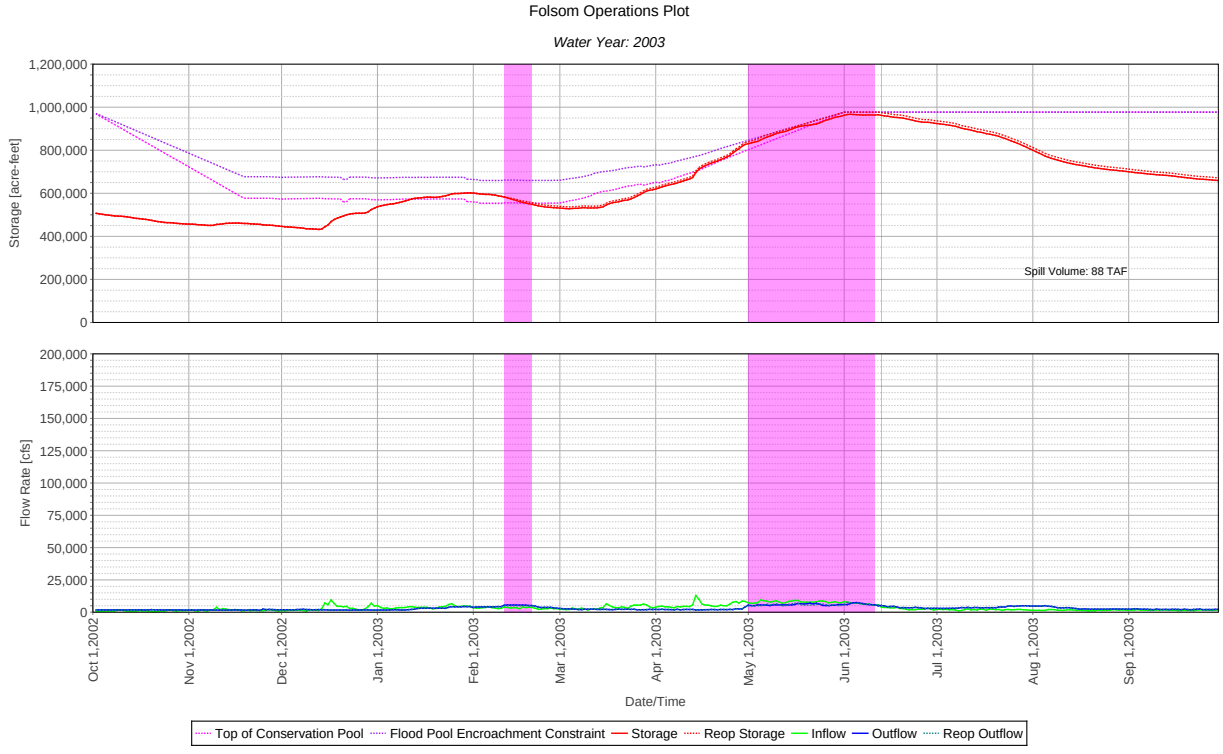

Folsom Operations Plot
Water Year: 1998
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 625 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1997
Nov 1,1997
Dec 1,1997
Jan 1,1998
Feb 1,1998
Mar 1,1998
Apr 1,1998
May 1,1998
Jun 1,1998
Jul 1,1998
Aug 1,1998
Sep 1,1998
Date/Time

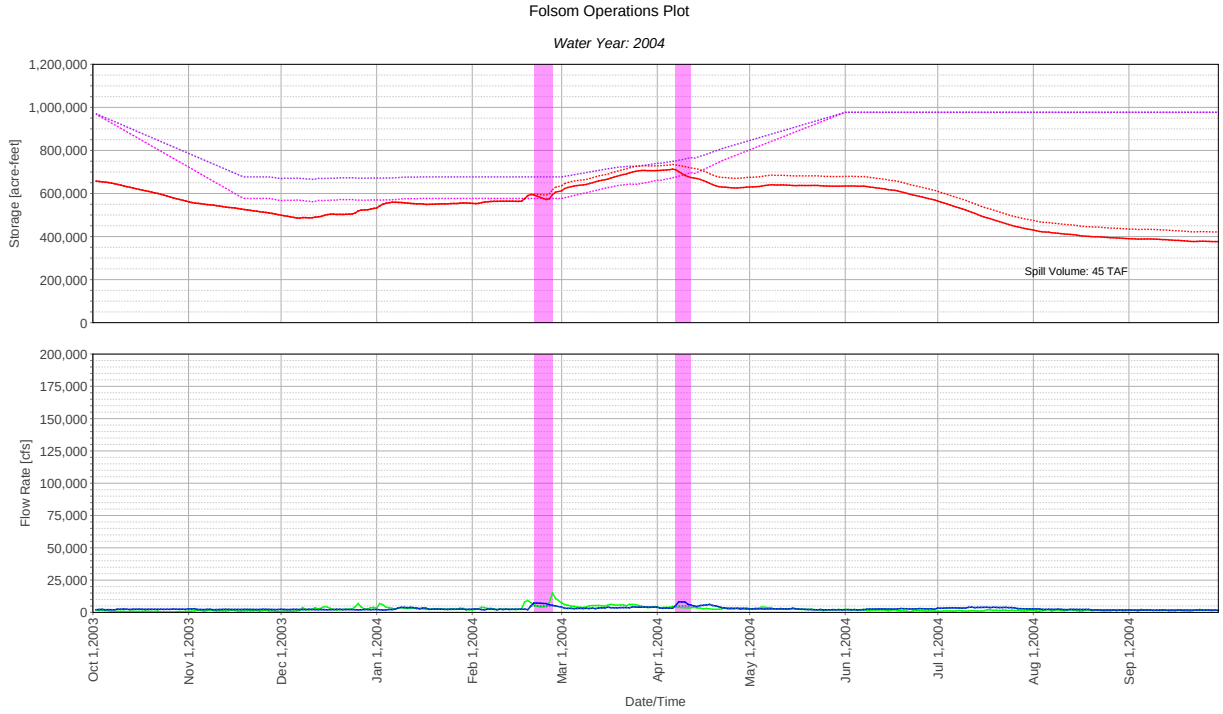

Folsom Operations Plot
Water Year: 1999
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 742 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1998
Nov 1,1998
Dec 1,1998
Jan 1,1999
Feb 1,1999
Mar 1,1999
Apr 1,1999
May 1,1999
Jun 1,1999
Jul 1,1999
Aug 1,1999
Sep 1,1999
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

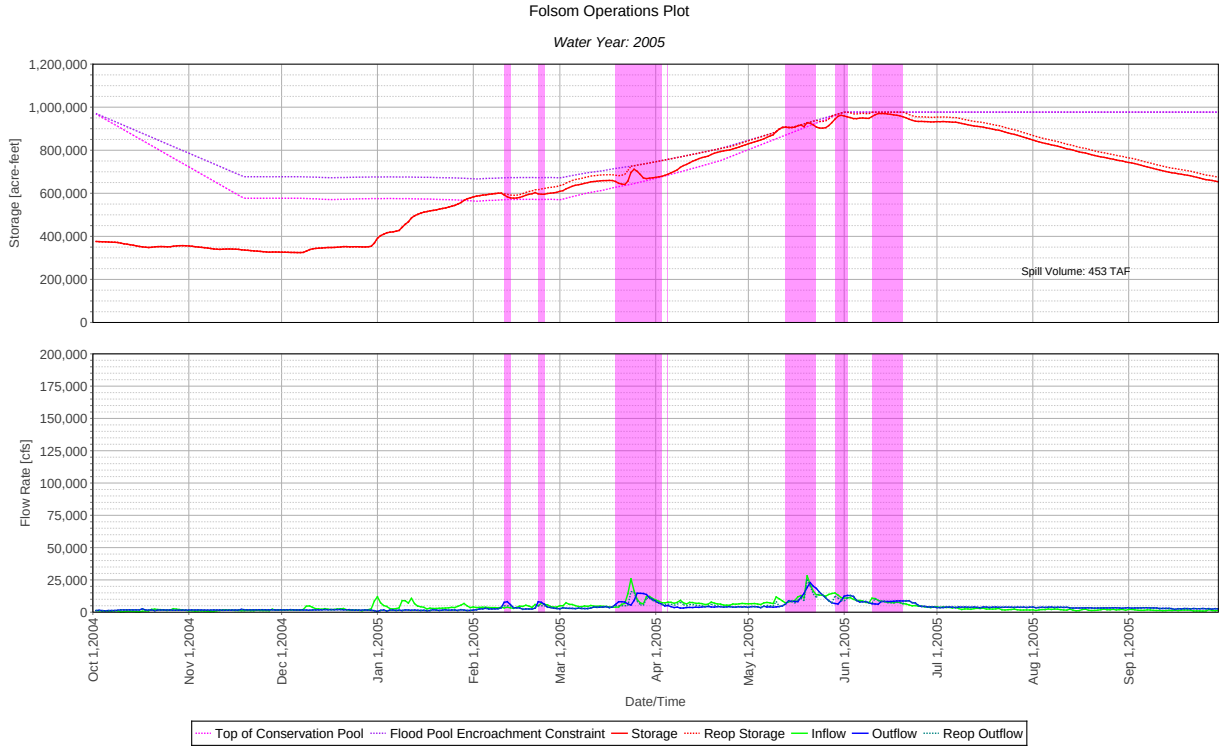

Folsom Operations Plot
Water Year: 2000
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 455 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,1999
Nov 1,1999
Dec 1,1999
Jan 1,2000
Feb 1,2000
Mar 1,2000
Apr 1,2000
May 1,2000
Jun 1,2000
Jul 1,2000
Aug 1,2000
Sep 1,2000
Date/Time

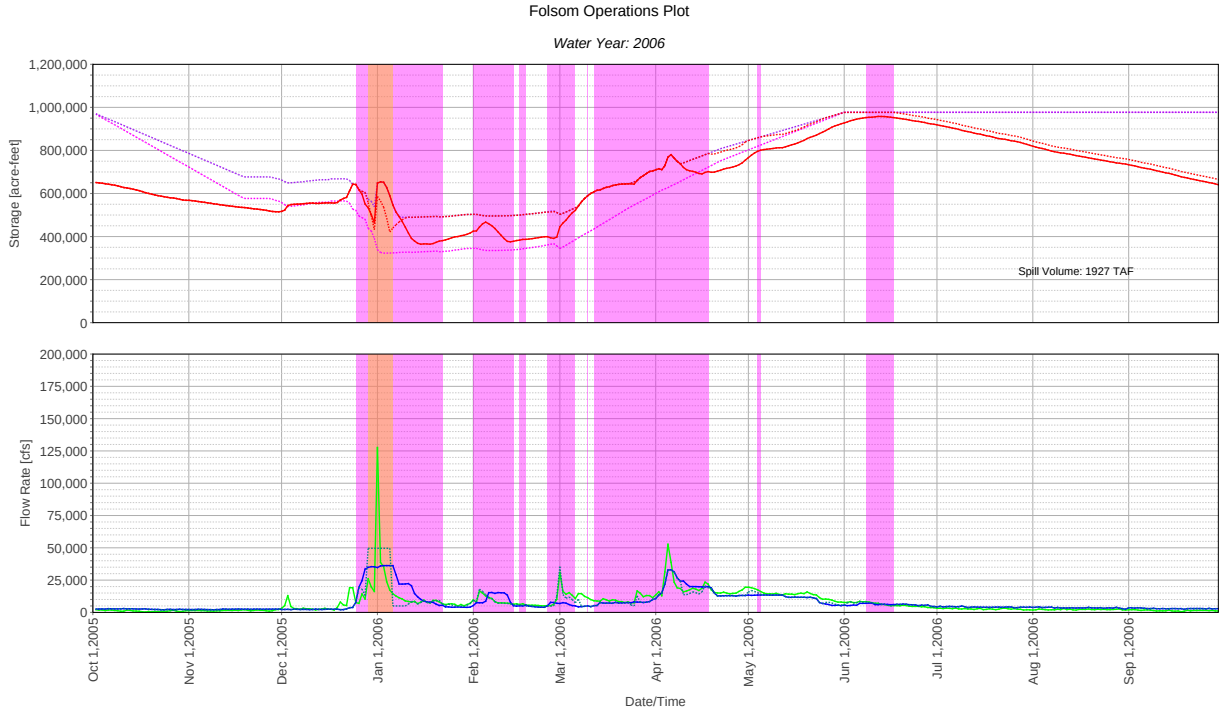

Folsom Operations Plot
Water Year: 2001
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2000
Nov 1,2000
Dec 1,2000
Jan 1,2001
Feb 1,2001
Mar 1,2001
Apr 1,2001
May 1,2001
Jun 1,2001
Jul 1,2001
Aug 1,2001
Sep 1,2001
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

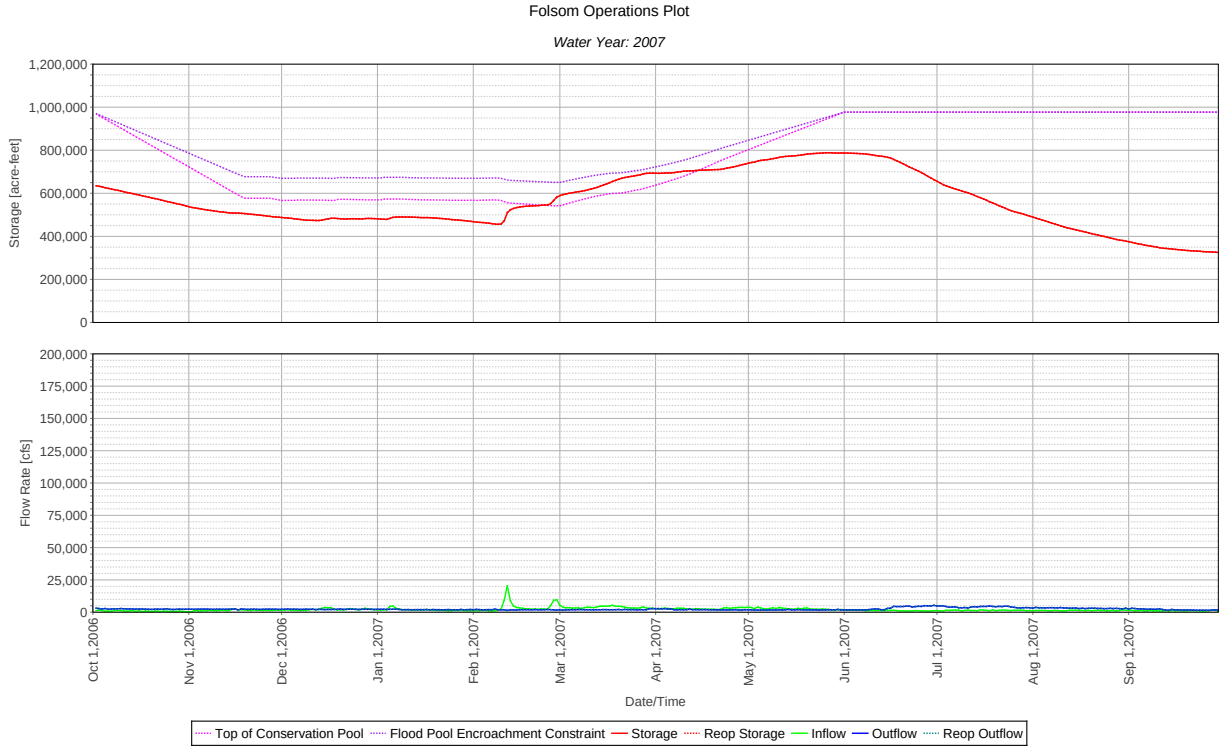

Folsom Operations Plot
Water Year: 2002
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2001
Nov 1,2001
Dec 1,2001
Jan 1,2002
Feb 1,2002
Mar 1,2002
Apr 1,2002
May 1,2002
Jun 1,2002
Jul 1,2002
Aug 1,2002
Sep 1,2002
Date/Time

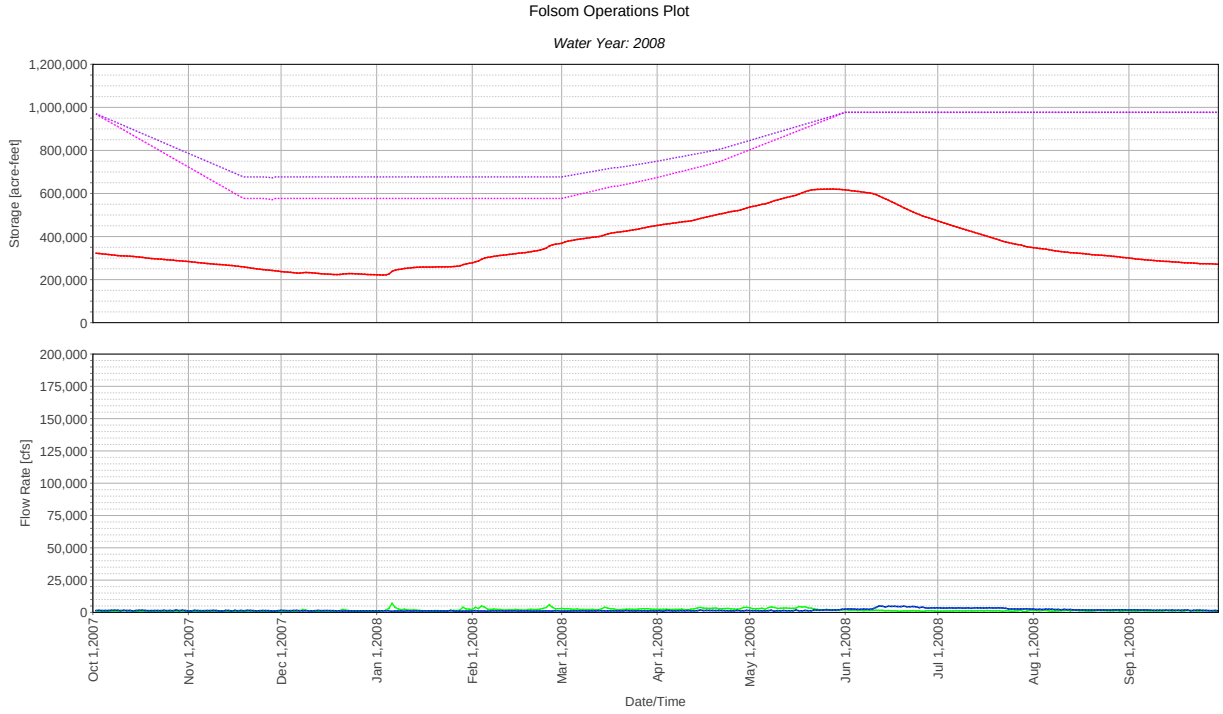

Folsom Operations Plot
Water Year: 2003
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 88 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2002
Nov 1,2002
Dec 1,2002
Jan 1,2003
Feb 1,2003
Mar 1,2003
Apr 1,2003
May 1,2003
Jun 1,2003
Jul 1,2003
Aug 1,2003
Sep 1,2003
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

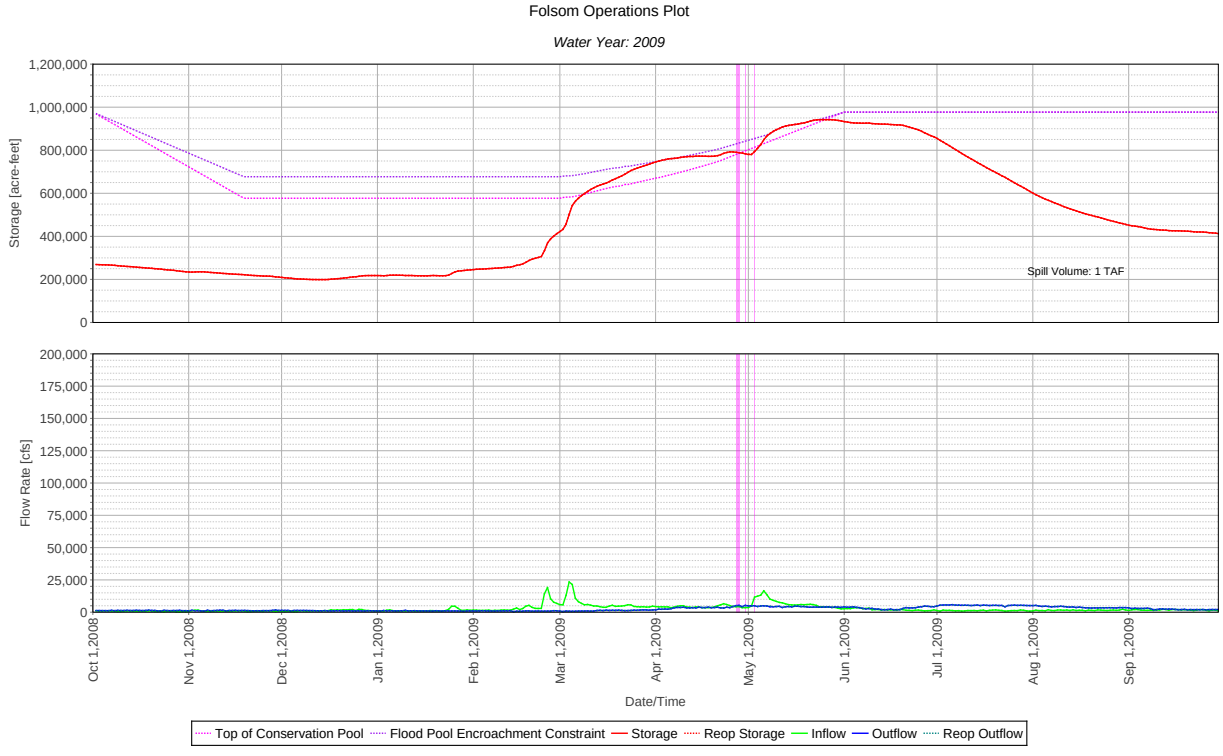

Folsom Operations Plot
Water Year: 2004
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 45 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2003
Nov 1,2003
Dec 1,2003
Jan 1,2004
Feb 1,2004
Mar 1,2004
Apr 1,2004
May 1,2004
Jun 1,2004
Jul 1,2004
Aug 1,2004
Sep 1,2004
Date/Time

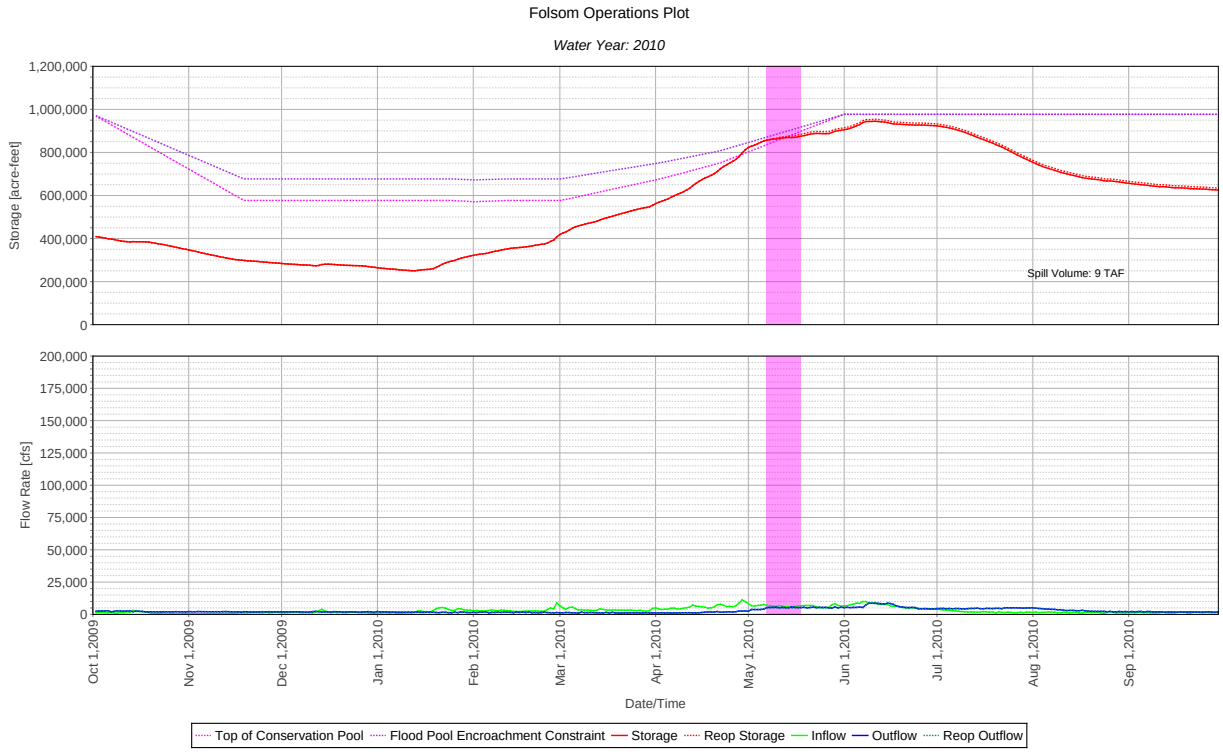

Folsom Operations Plot
Water Year: 2005
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 453 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2004
Nov 1,2004
Dec 1,2004
Jan 1,2005
Feb 1,2005
Mar 1,2005
Apr 1,2005
May 1,2005
Jun 1,2005
Jul 1,2005
Aug 1,2005
Sep 1,2005
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


Folsom Operations Plot
Water Year: 2006
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1927 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2005
Nov 1,2005
Dec 1,2005
Jan 1,2006
Feb 1,2006
Mar 1,2006
Apr 1,2006
May 1,2006
Jun 1,2006
Jul 1,2006
Aug 1,2006
Sep 1,2006
Date/Time


Folsom Operations Plot
Water Year: 2007
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2006
Nov 1,2006
Dec 1,2006
Jan 1,2007
Feb 1,2007
Mar 1,2007
Apr 1,2007
May 1,2007
Jun 1,2007
Jul 1,2007
Aug 1,2007
Sep 1,2007
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


Folsom Operations Plot
Water Year: 2008
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2007
Nov 1,2007
Dec 1,2007
Jan 1,2008
Feb 1,2008
Mar 1,2008
Apr 1,2008
May 1,2008
Jun 1,2008
Jul 1,2008
Aug 1,2008
Sep 1,2008
Date/Time


Folsom Operations Plot
Water Year: 2009
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 1 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2008
Nov 1,2008
Dec 1,2008
Jan 1,2009
Feb 1,2009
Mar 1,2009
Apr 1,2009
May 1,2009
Jun 1,2009
Jul 1,2009
Aug 1,2009
Sep 1,2009
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow


Folsom Operations Plot
Water Year: 2010
Storage [acre-feet]
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Spill Volume: 9 TAF
Flow Rate [cfs]
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Oct 1,2009
Nov 1,2009
Dec 1,2009
Jan 1,2010
Feb 1,2010
Mar 1,2010
Apr 1,2010
May 1,2010
Jun 1,2010
Jul 1,2010
Aug 1,2010
Sep 1,2010
Date/Time
Top of Conservation Pool
Flood Pool Encroachment Constraint
Storage
Reop Storage
Inflow
Outflow
Reop Outflow

B Monthly Effects Evaluation

This appendix details how CalLite was used to perform an approximation of the daily reoperation to enhance water supply and the resulting effects of that reoperation systemwide.

B.1 Modeling the Reoperation

This appendix details the monthly flow data thresholds used in the CalLite reoperation routine that will cause that reoperation to cease (termed deactivation) in CalLite. The deactivation of reoperation in CalLite is compared with occurrences of deactivation from the daily reoperation performed on historical data to ensure the results are consistent between the daily analysis and CalLite modeling.

B.1.1 Parameters

Shasta

The monthly flow threshold for deactivation the reopeation at Shasta Dam was determined to be 30,000 cfs. A 5-day inflow forecast exceeding 650 TAF was used as the threshold for the daily investigation.

Oroville

The monthly flow threshold for deactivation the reoperation at Oroville Dam was determined to be 32,500 cfs. A 5-day inflow exceeding 700 TAF was used as the threshold for the daily investigation.

New Bullards Bar

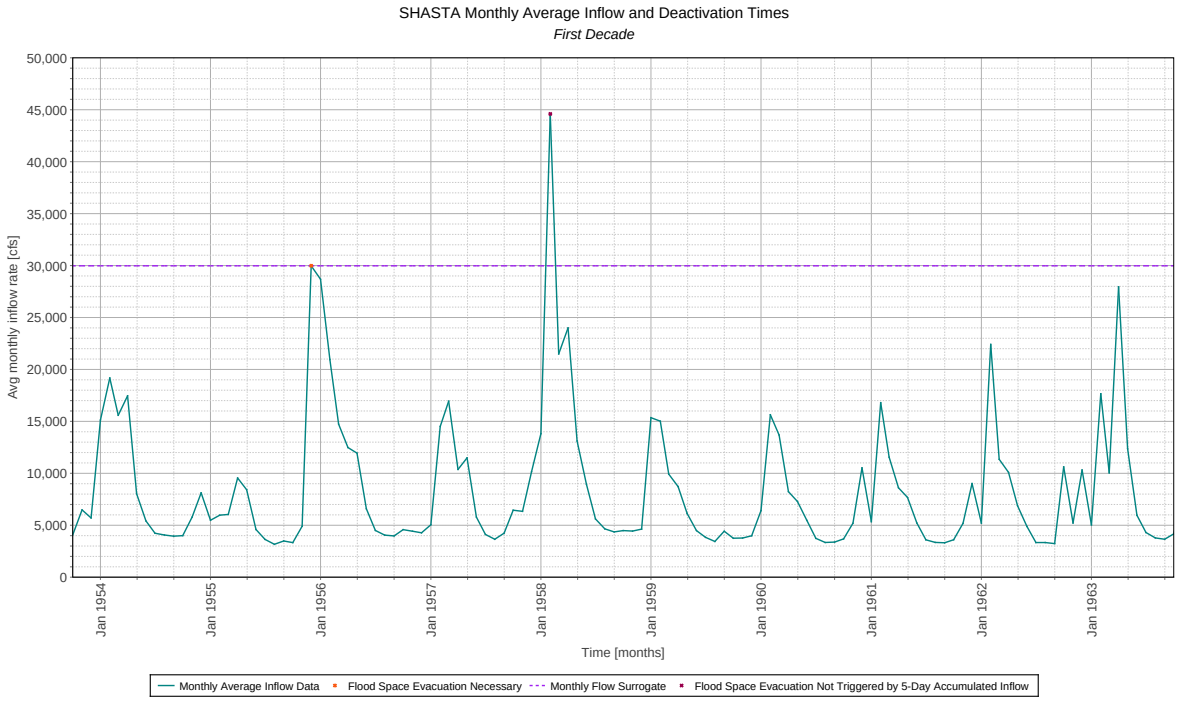
New Bullards Bar is not dynamically modeled in CalLite. Thus, the effects of its reoperation were not assessed at this time.

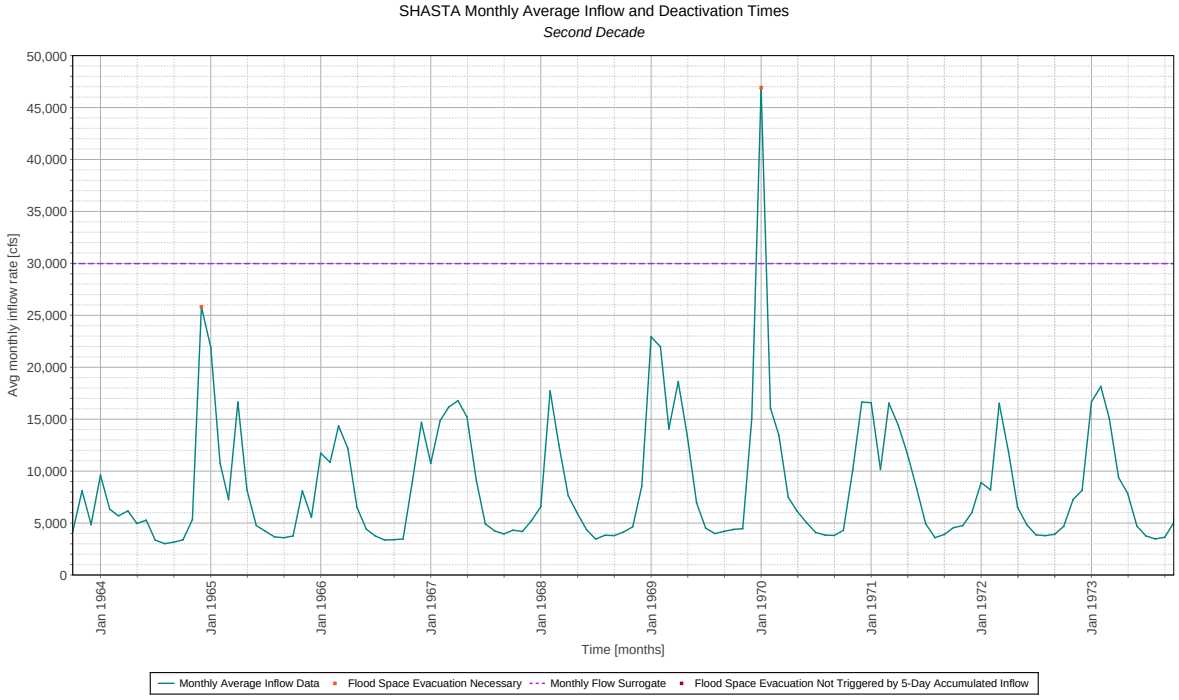
Folsom

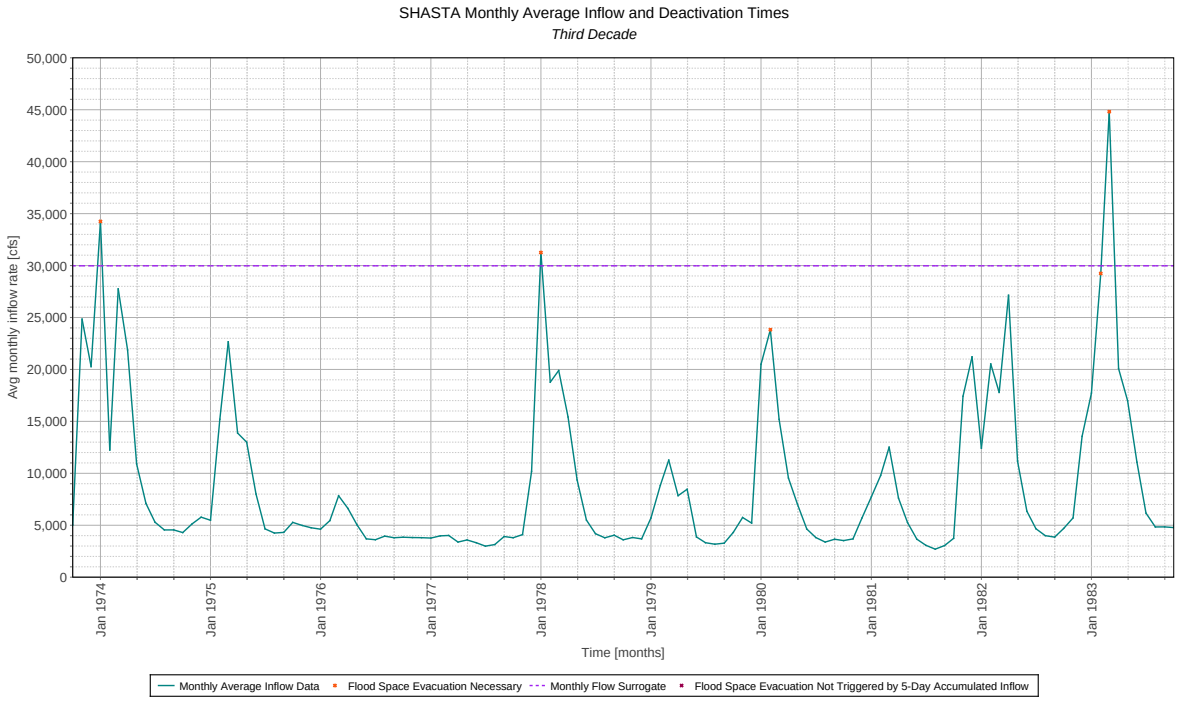
The monthly flow threshold for deactivation the reoperation at Folsom Dam was determined to be 15,200 cfs. A 5-day inflow exceeding 400 TAF was used as the threshold for the daily investigation.

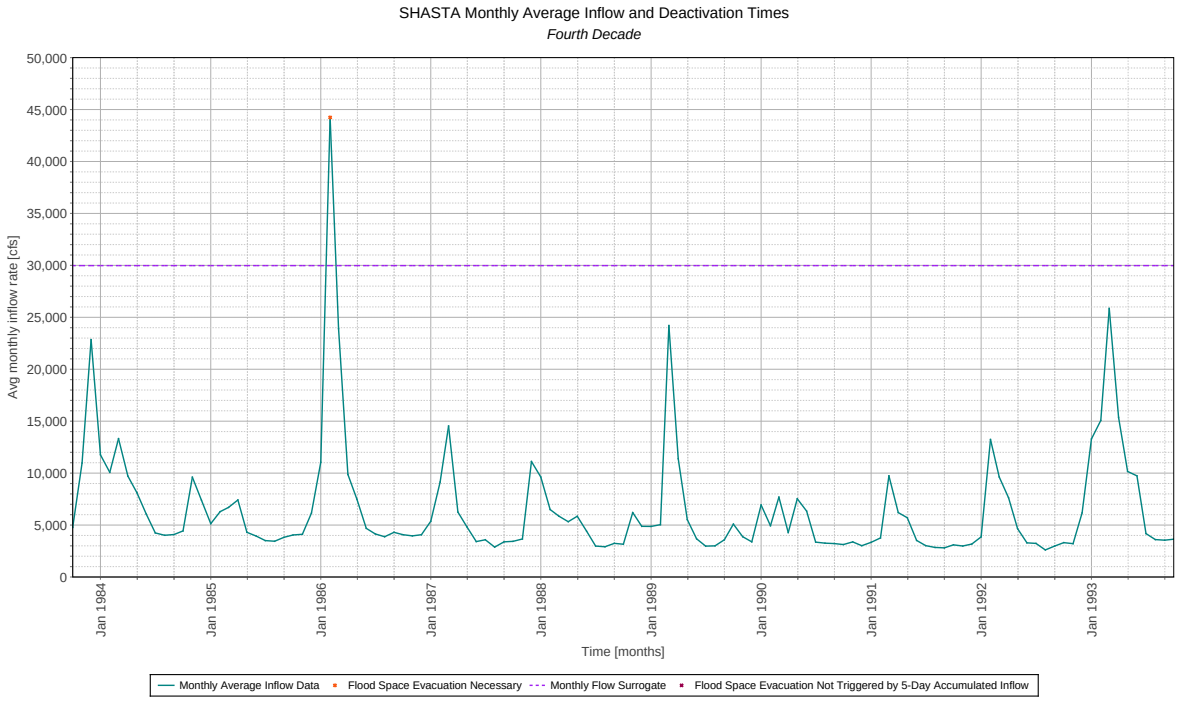
B.1.2 Plots

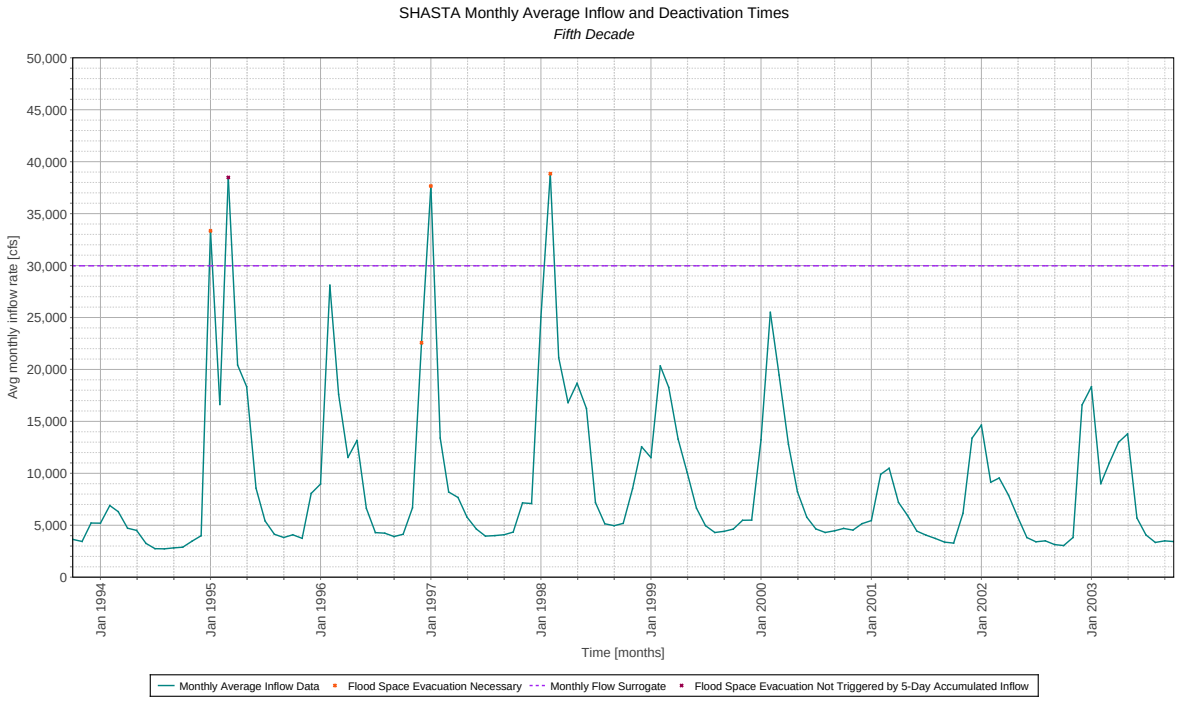
The following figures demonstrate the monthly flow data and deactivation thresholds for these reservoirs. Also shown are instances where the daily analysis of historical data for each reservoir indicated the cessation of reoperation was necessary due to an exceedingly large inflow forecast.

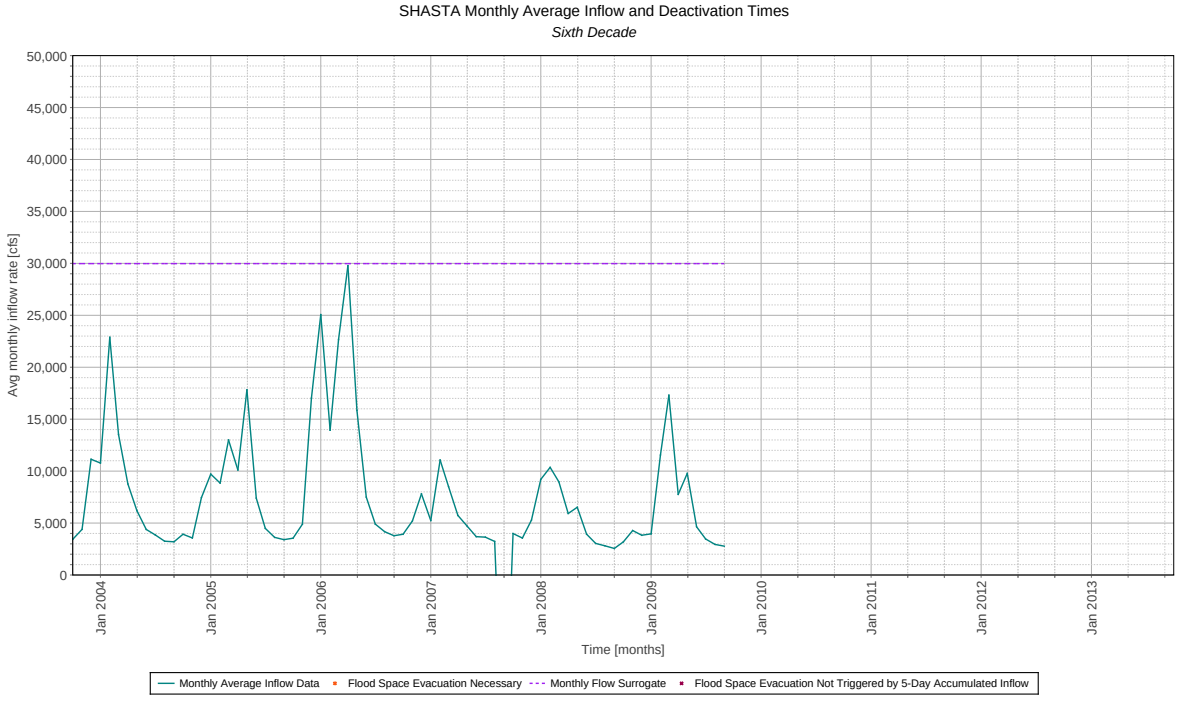

SHASTA Monthly Average Inflow and Deactivation Times
First Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1954
Jan 1955
Jan 1956
Jan 1957
Jan 1958
Jan 1959
Jan 1960
Jan 1961
Jan 1962
Jan 1963
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

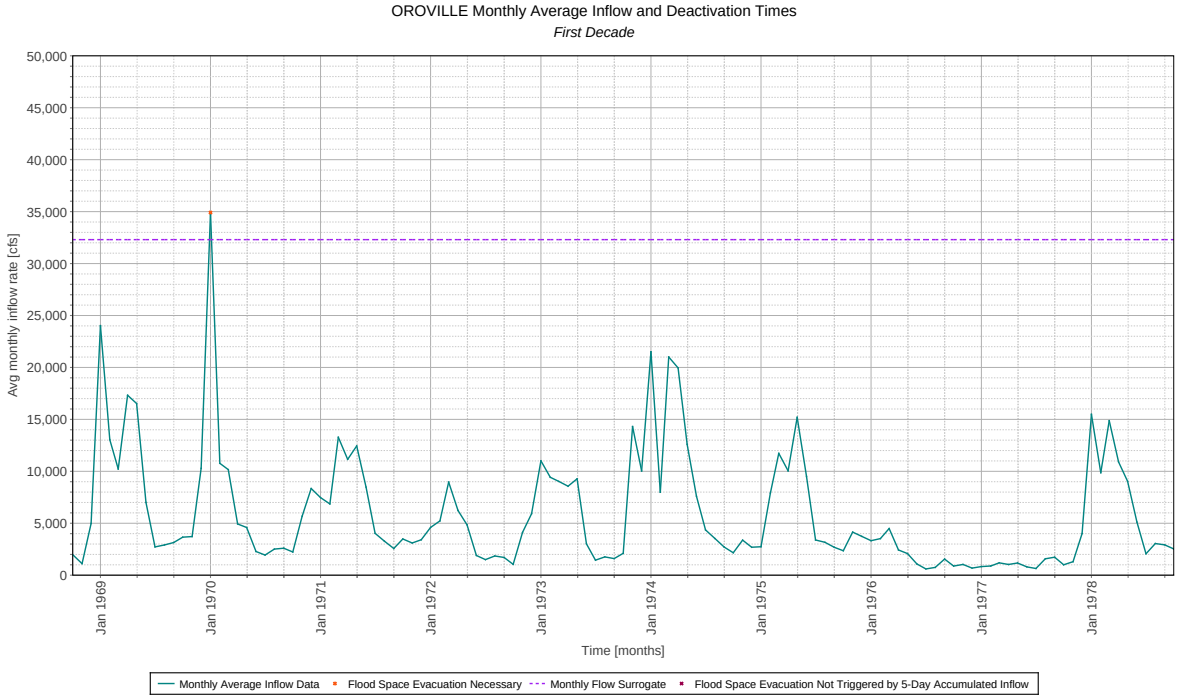

SHASTA Monthly Average Inflow and Deactivation Times
Second Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1964
Jan 1965
Jan 1966
Jan 1967
Jan 1968
Jan 1969
Jan 1970
Jan 1971
Jan 1972
Jan 1973
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

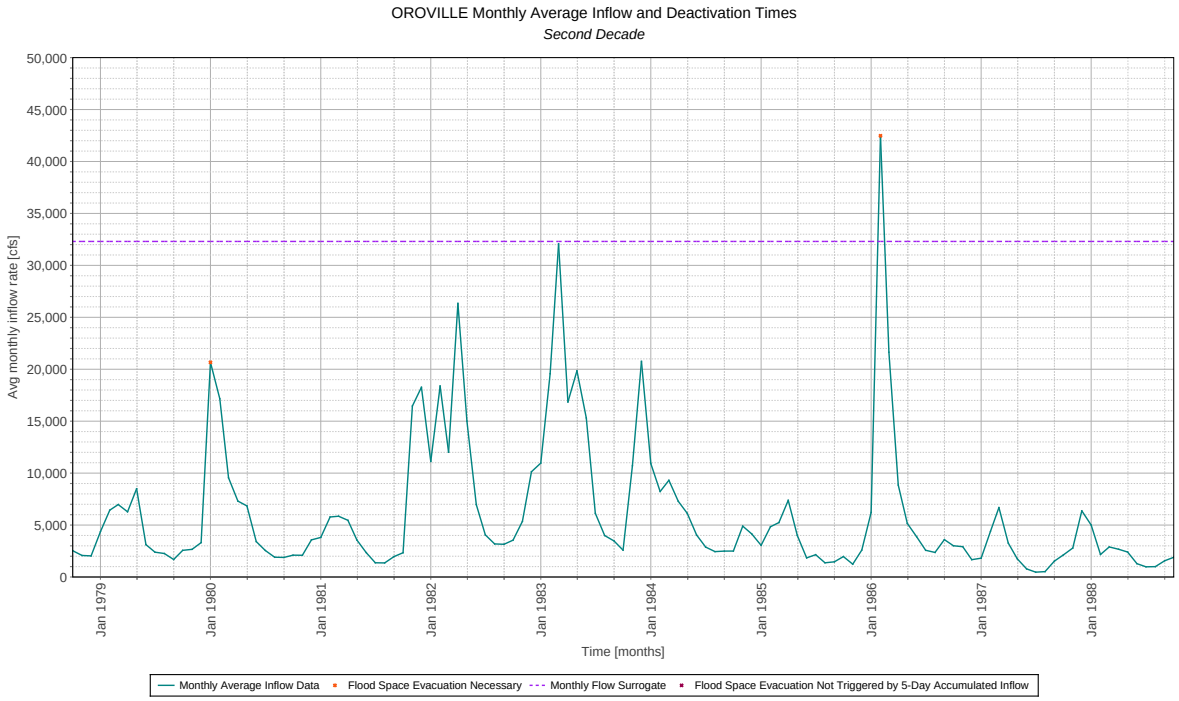

SHASTA Monthly Average Inflow and Deactivation Times
Third Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1974
Jan 1975
Jan 1976
Jan 1977
Jan 1978
Jan 1979
Jan 1980
Jan 1981
Jan 1982
Jan 1983
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

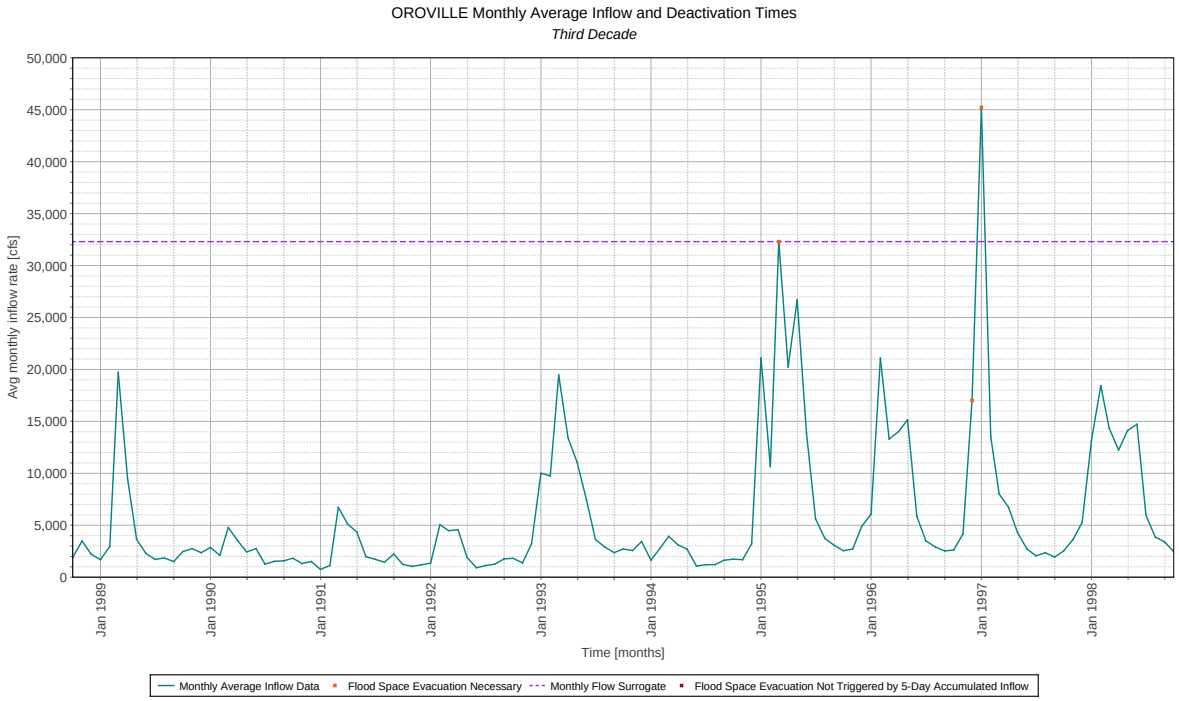

SHASTA Monthly Average Inflow and Deactivation Times
Fourth Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1984
Jan 1985
Jan 1986
Jan 1987
Jan 1988
Jan 1989
Jan 1990
Jan 1991
Jan 1992
Jan 1993
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

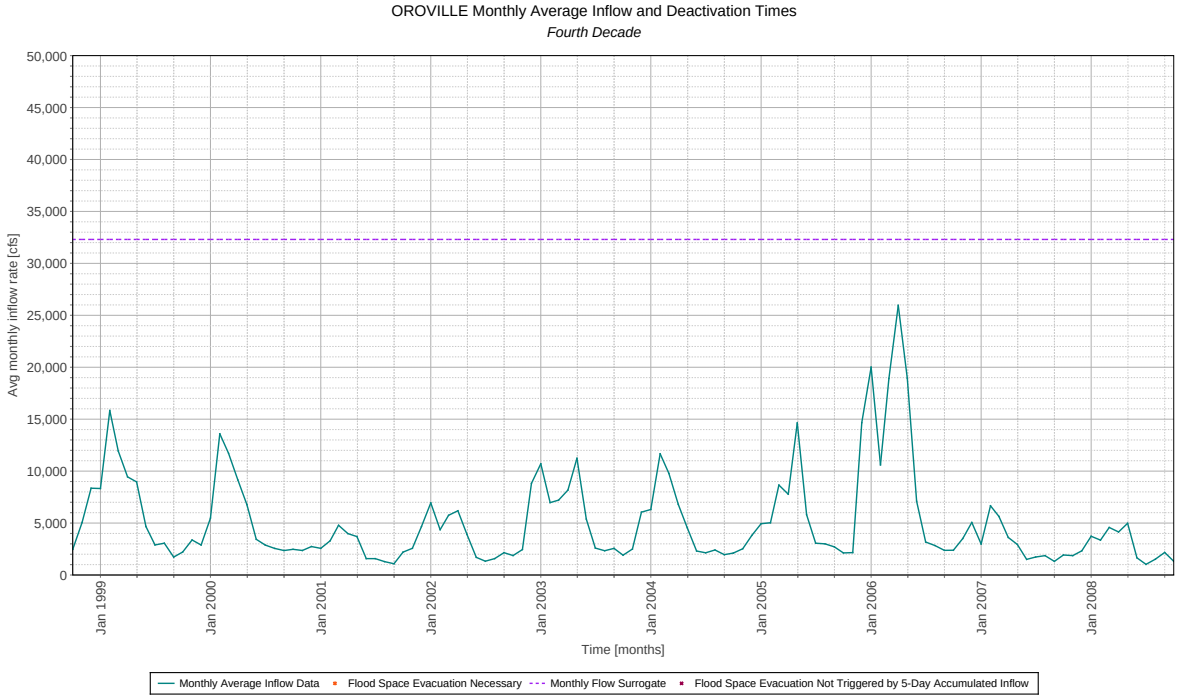

SHASTA Monthly Average Inflow and Deactivation Times
Fifth Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1994
Jan 1995
Jan 1996
Jan 1997
Jan 1998
Jan 1999
Jan 2000
Jan 2001
Jan 2002
Jan 2003
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

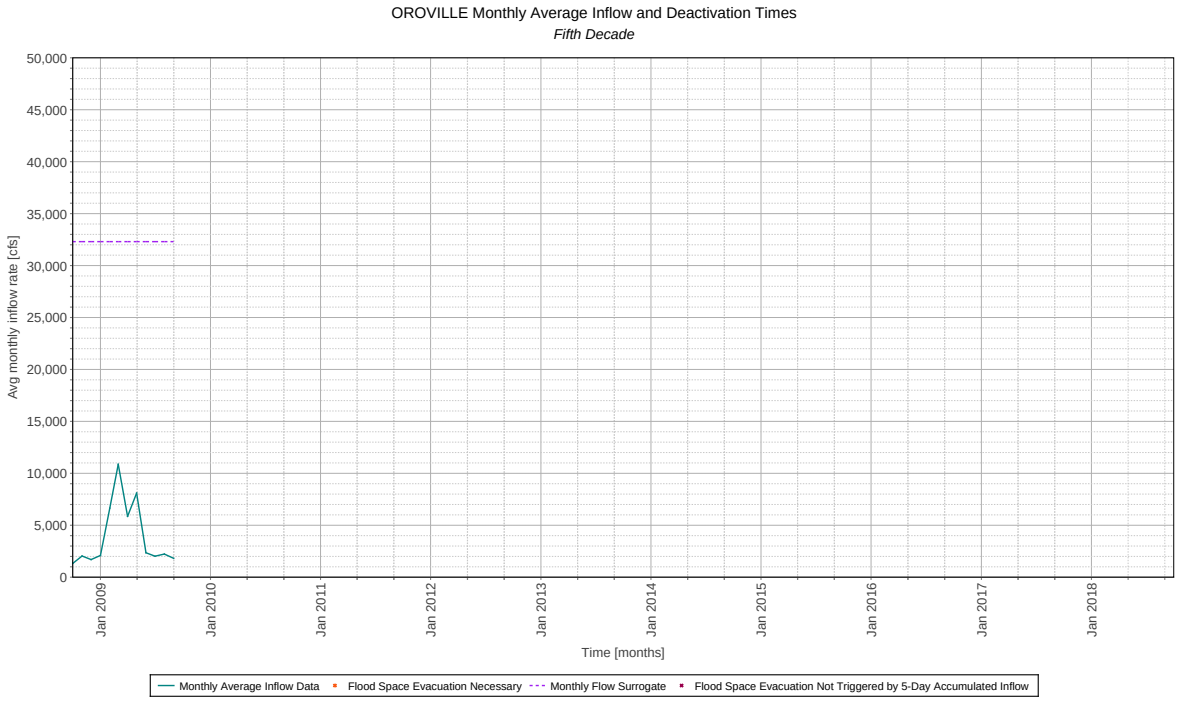

SHASTA Monthly Average Inflow and Deactivation Times
Sixth Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 2004
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

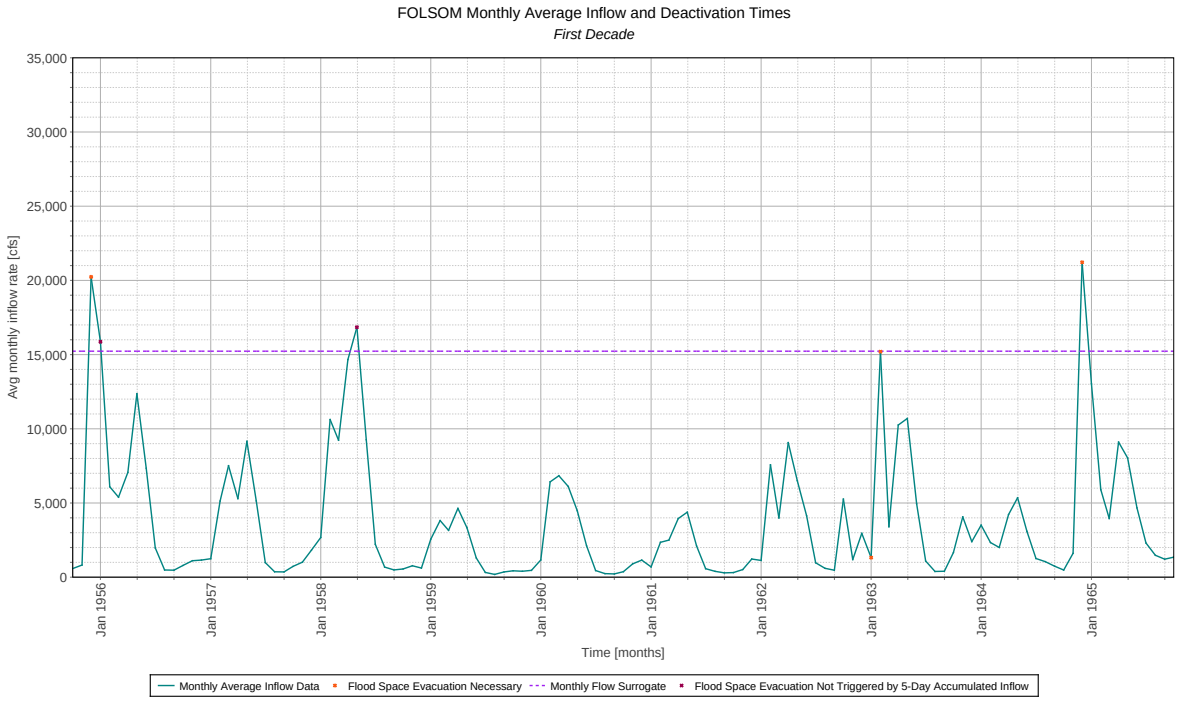

OROVILLE Monthly Average Inflow and Deactivation Times
First Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1969
Jan 1970
Jan 1971
Jan 1972
Jan 1973
Jan 1974
Jan 1975
Jan 1976
Jan 1977
Jan 1978
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

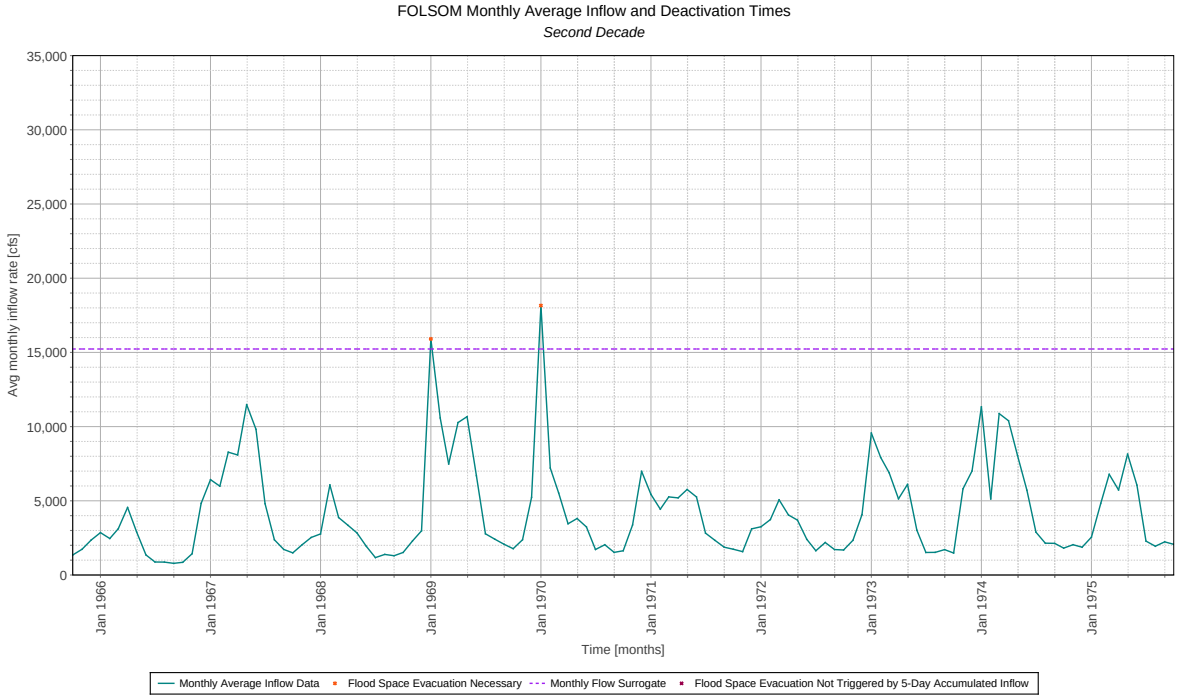

OROVILLE Monthly Average Inflow and Deactivation Times
Second Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1979
Jan 1980
Jan 1981
Jan 1982
Jan 1983
Jan 1984
Jan 1985
Jan 1986
Jan 1987
Jan 1988
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

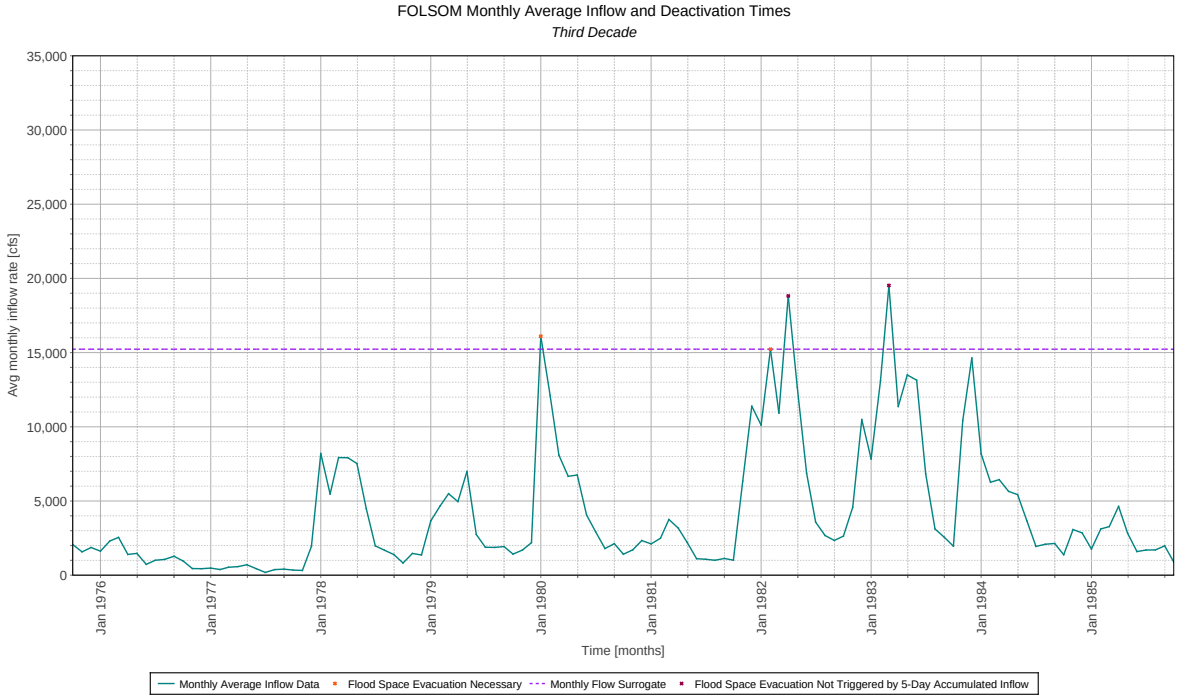

OROVILLE Monthly Average Inflow and Deactivation Times
Third Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1989
Jan 1990
Jan 1991
Jan 1992
Jan 1993
Jan 1994
Jan 1995
Jan 1996
Jan 1997
Jan 1998
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

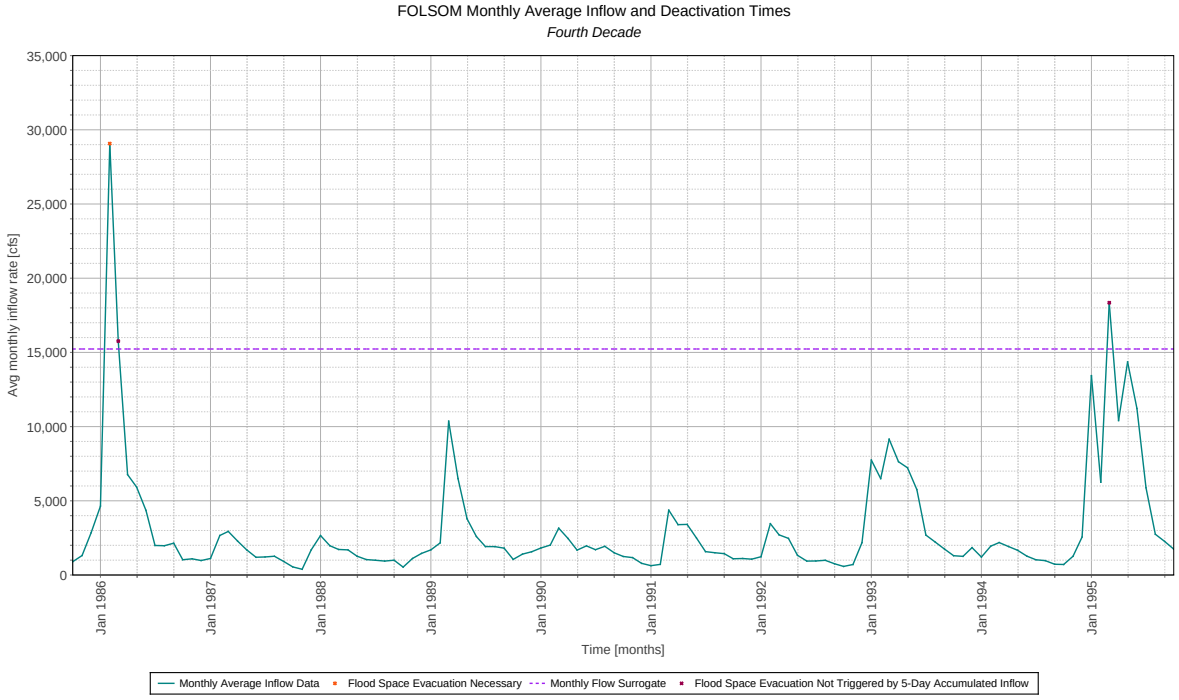

OROVILLE Monthly Average Inflow and Deactivation Times
Fourth Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1999
Jan 2000
Jan 2001
Jan 2002
Jan 2003
Jan 2004
Jan 2005
Jan 2006
Jan 2007
Jan 2008
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

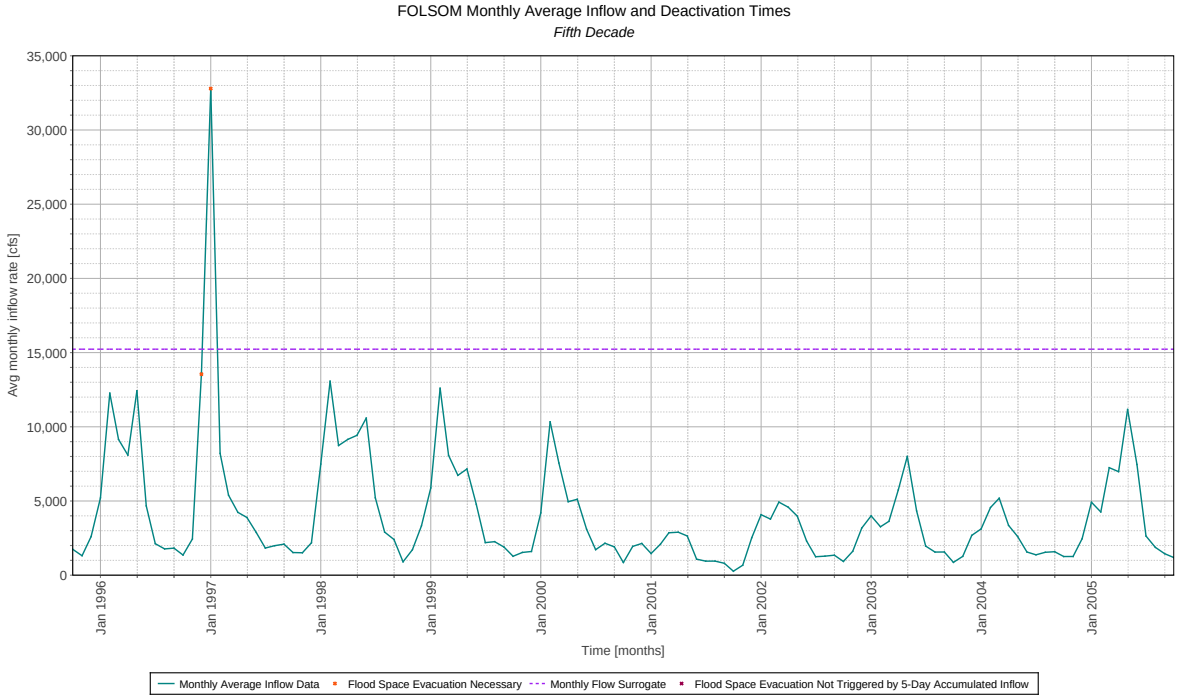

OROVILLE Monthly Average Inflow and Deactivation Times
Fifth Decade
Avg monthly inflow rate [cfs]
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

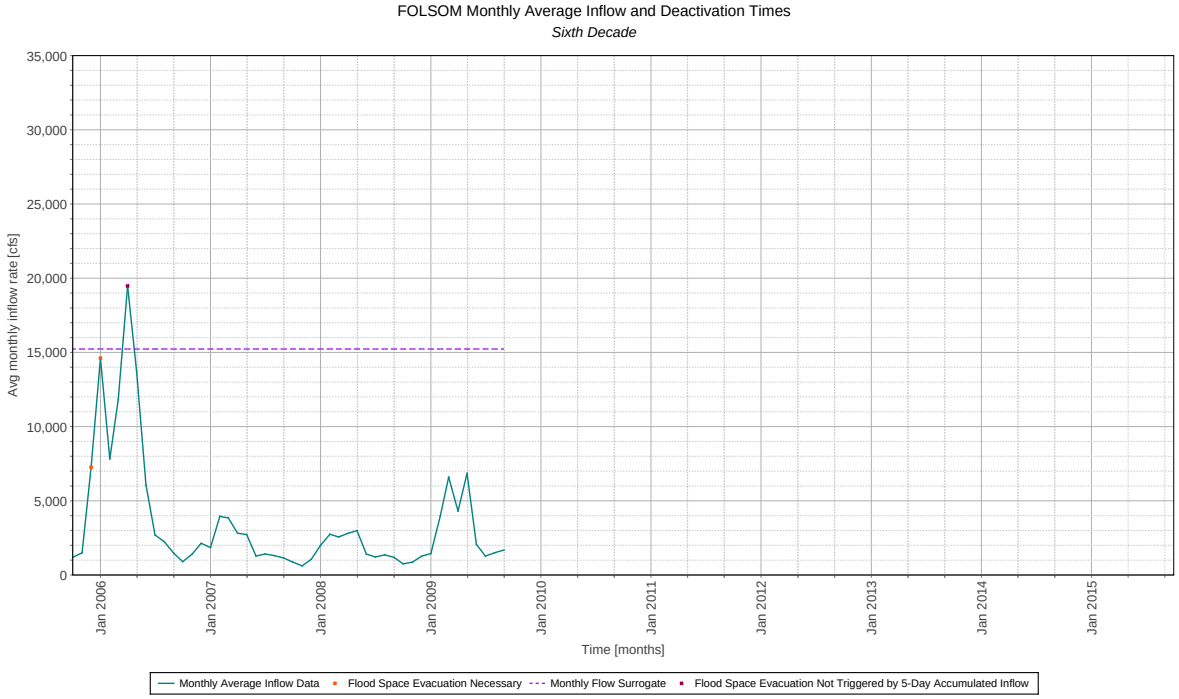

FOLSOM Monthly Average Inflow and Deactivation Times
First Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1956
Jan 1957
Jan 1958
Jan 1959
Jan 1960
Jan 1961
Jan 1962
Jan 1963
Jan 1964
Jan 1965
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow


FOLSOM Monthly Average Inflow and Deactivation Times
Second Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1966
Jan 1967
Jan 1968
Jan 1969
Jan 1970
Jan 1971
Jan 1972
Jan 1973
Jan 1974
Jan 1975
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow


FOLSOM Monthly Average Inflow and Deactivation Times
Third Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1976
Jan 1977
Jan 1978
Jan 1979
Jan 1980
Jan 1981
Jan 1982
Jan 1983
Jan 1984
Jan 1985
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow


FOLSOM Monthly Average Inflow and Deactivation Times
Fourth Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1986
Jan 1987
Jan 1988
Jan 1989
Jan 1990
Jan 1991
Jan 1992
Jan 1993
Jan 1994
Jan 1995
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow


FOLSOM Monthly Average Inflow and Deactivation Times
Fifth Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 1996
Jan 1997
Jan 1998
Jan 1999
Jan 2000
Jan 2001
Jan 2002
Jan 2003
Jan 2004
Jan 2005
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow


FOLSOM Monthly Average Inflow and Deactivation Times
Sixth Decade
Avg monthly inflow rate [cfs]
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Jan 2006
Jan 2007
Jan 2008
Jan 2009
Jan 2010
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Time [months]
Monthly Average Inflow Data
Flood Space Evacuation Necessary
Monthly Flow Surrogate
Flood Space Evacuation Not Triggered by 5-Day Accumulated Inflow

B.2 Effects

The following section includes plots from the CalLite simulation which attempt to show the key effects of the reoperation.

Caryover Storages

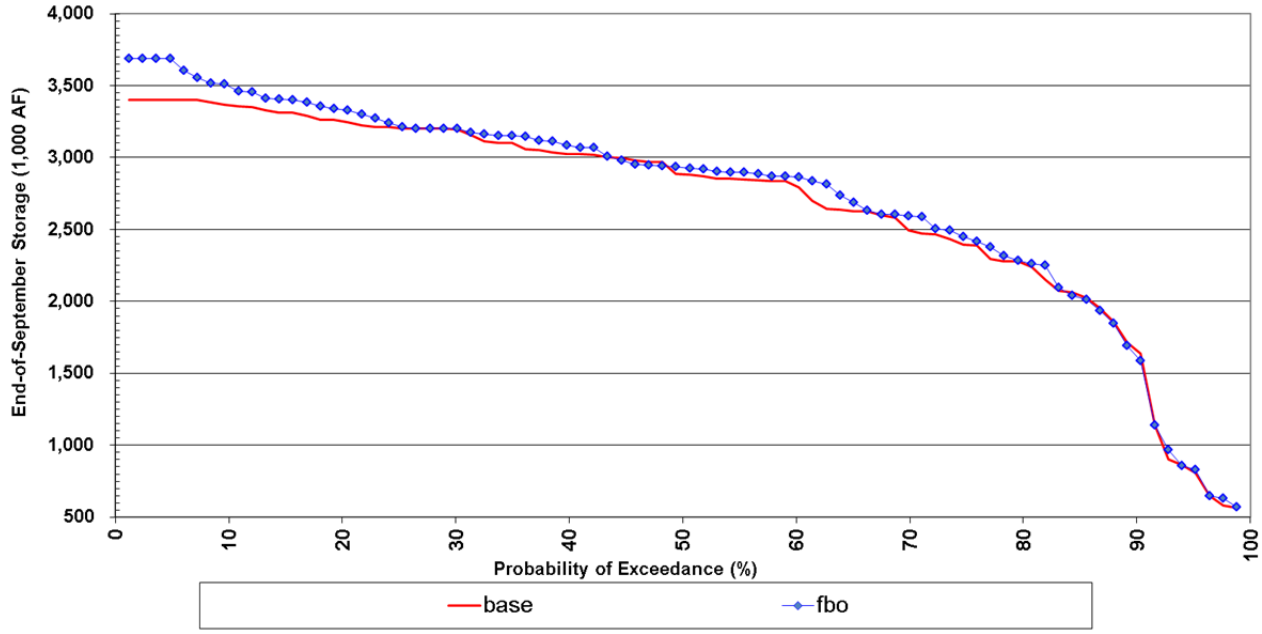


Figure 1. Shasta Reservoir End-of-September (FBO Scenario)

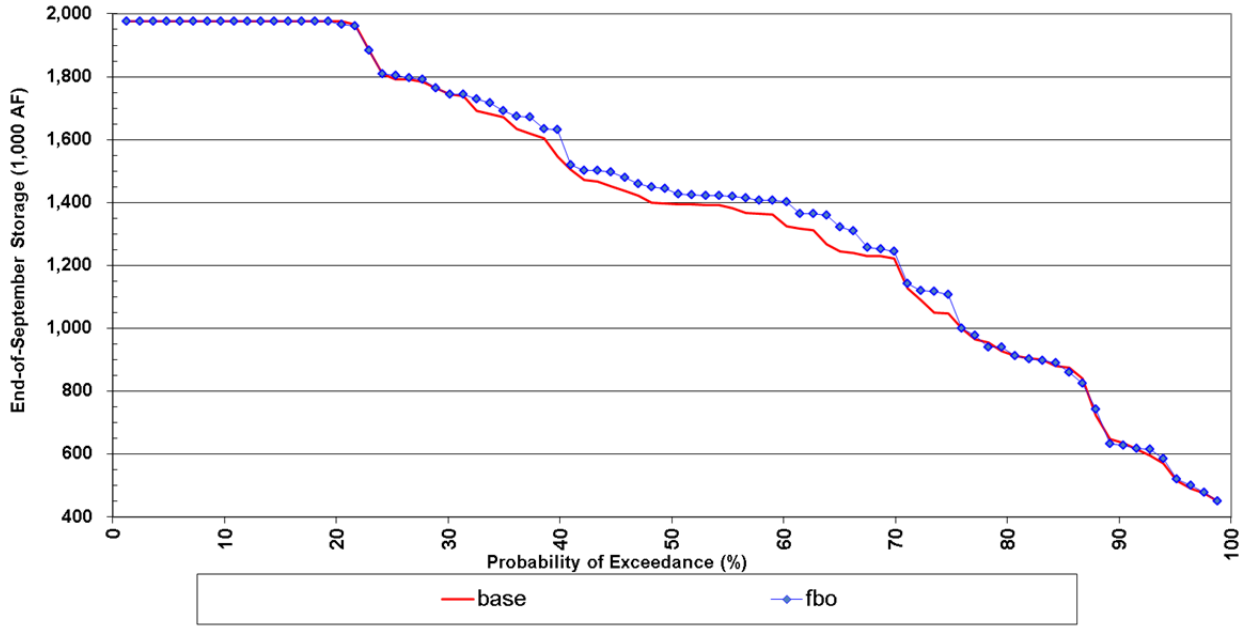


Figure 2. Trinity Reservoir End-of-September (FBO Scenario)

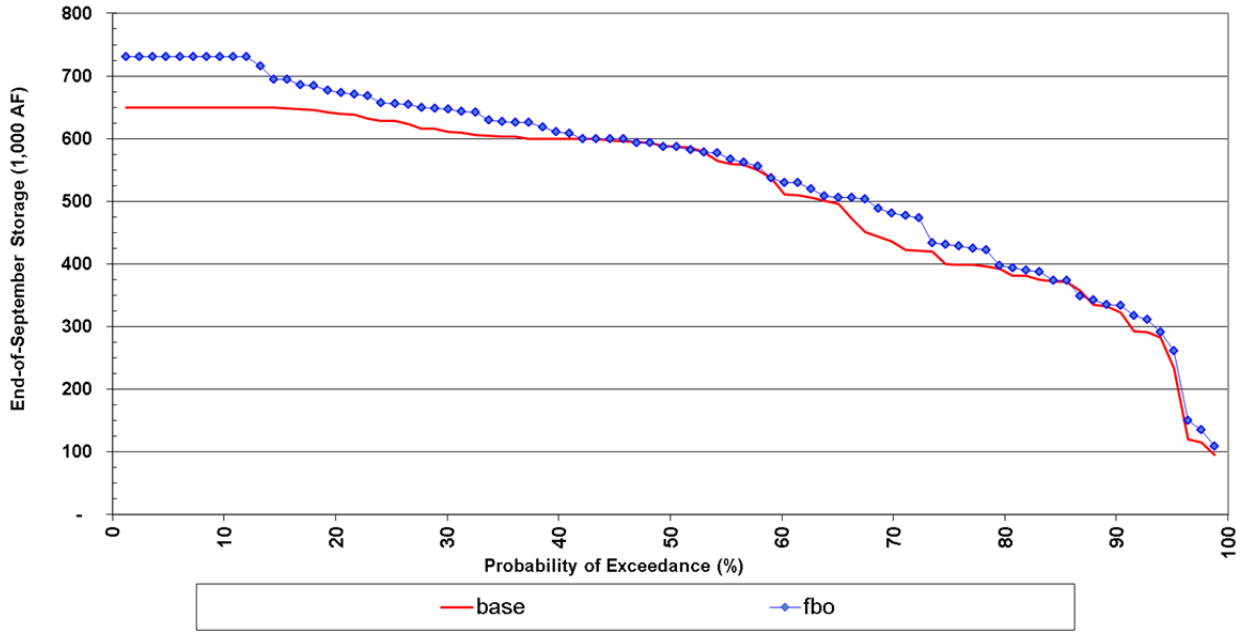


Figure 3. Folsom Reservoir End-of-September (FBO Scenario)

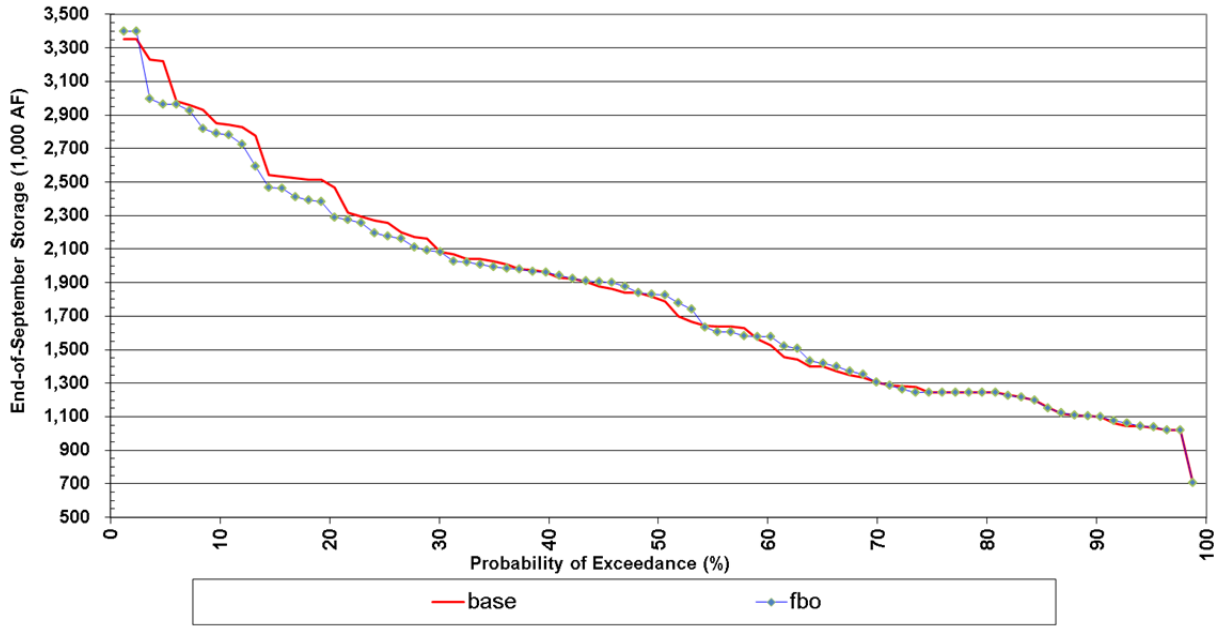


Figure 4. Oroville Reservoir End-of-September (FBO Scenario)

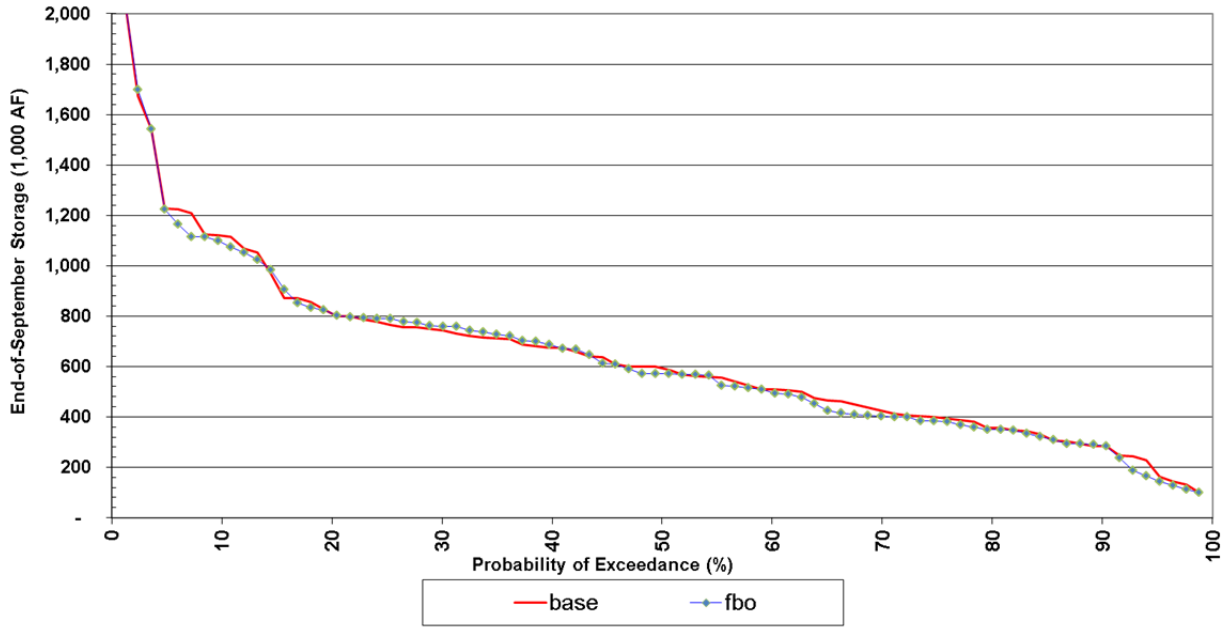


Figure 5. San Luis Reservoir End-of-September (FBO Scenario)

Shasta Flood Operations

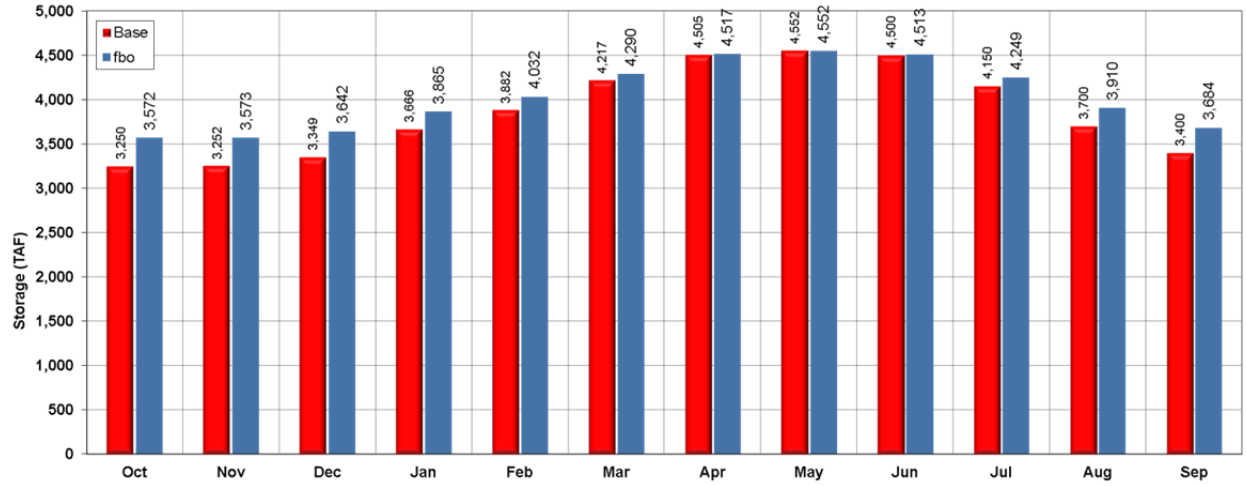


Figure 6. Shasta Top-of-Conservation Storage Level by Month

Upper Sacramento River System

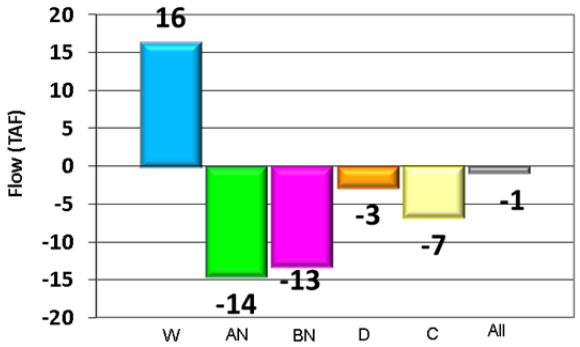


Figure 7. Changes in Average Annual Spring Creek Tunnel Diversions (Trinity Imports) by Water Year Type

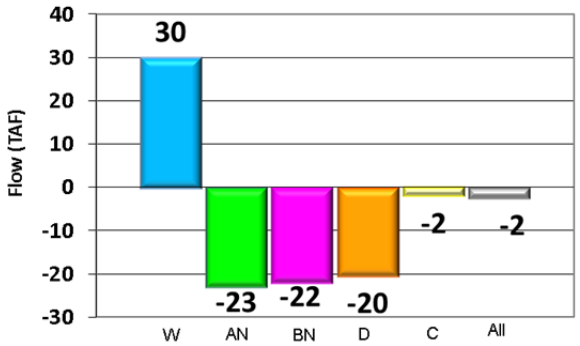


Figure 8. Changes in Average Annual Sacramento River Flow at Keswick by Water Year Type

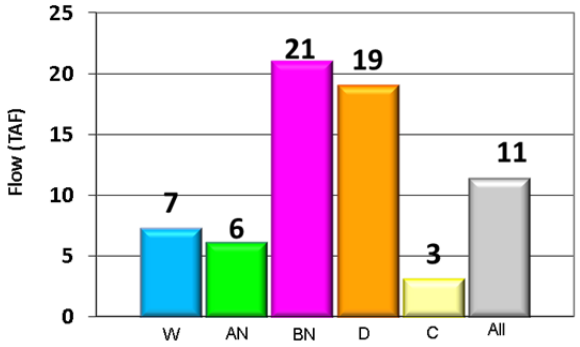


Figure 9. Changes in Average Annual TCCA Deliveries by Water Year Type

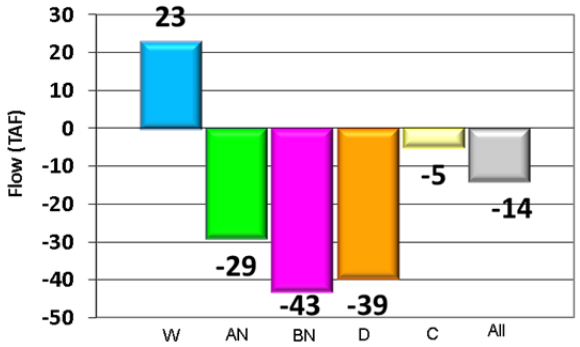


Figure 10. Changes in Average Annual Sacramento River Flow at Wilkins Slough by Water Year Type

Oroville Flood Operations

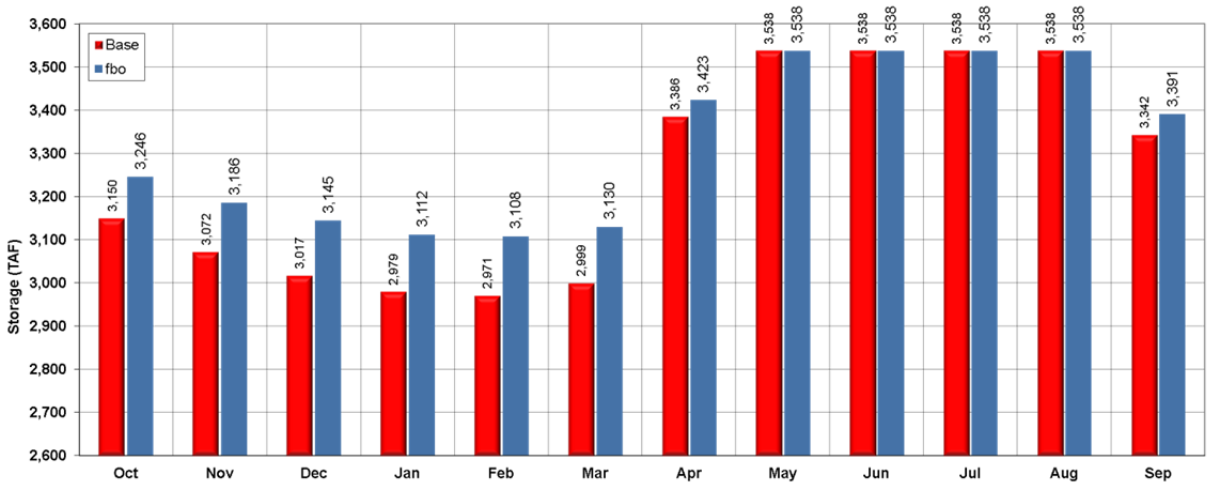


Figure 11. Oroville Top-of-Conservation Storage Level by Month

Feather River System

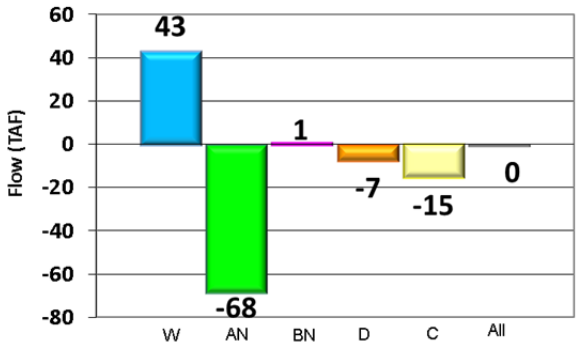


Figure 12. Changes in Average Annual Feather River Flow below Yuba River by Water Year Type

Folsom Flood Operations

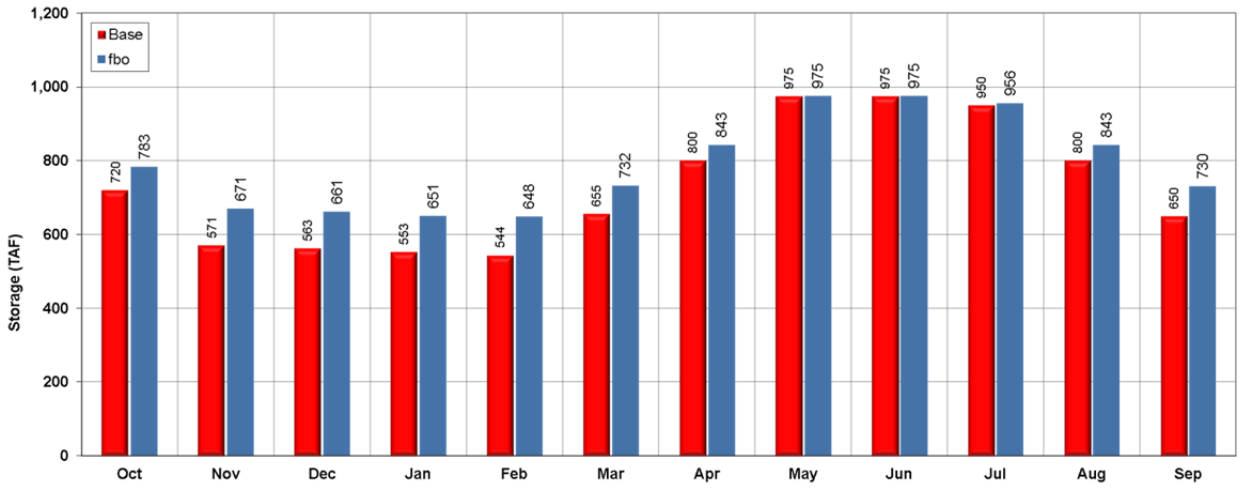


Figure 13. Folsom Top-of-Conservation Storage Level by Month

American River System

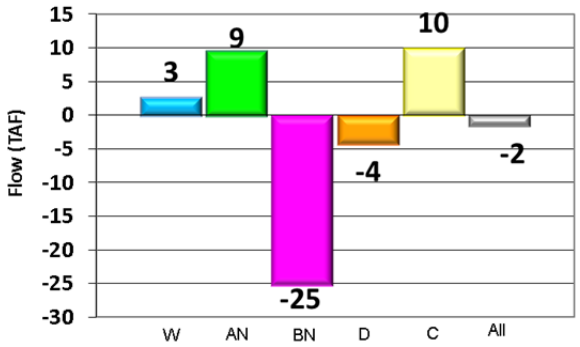


Figure 14. Changes in Average Annual American River Flow below Nimbus by Water Year Type

Lower Sacramento River System

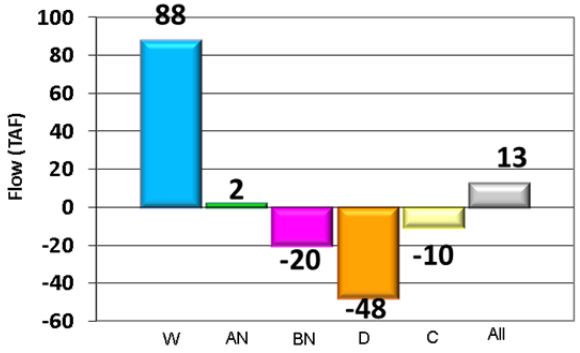


Figure 15. Changes in Average Annual Sacramento River Flow at Hood by Water Year Type

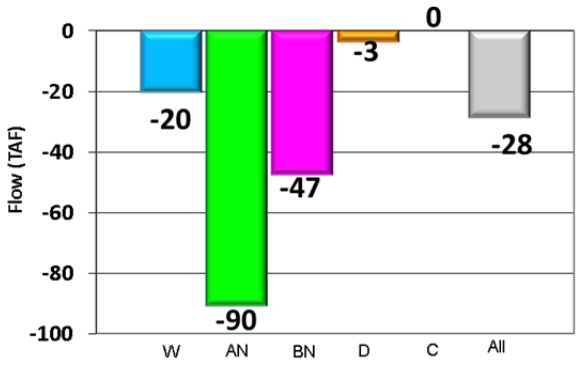


Figure 16. Changes in Average Annual Yolo Bypass Flows by Water Year Type

Delta

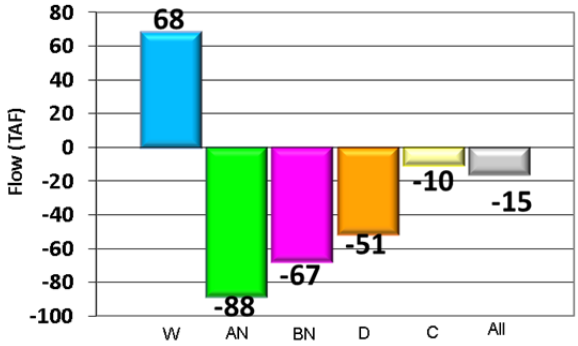


Figure 17. Changes in Average Annual Sacramento River at Hood and Yolo Bypass by Water Year Type

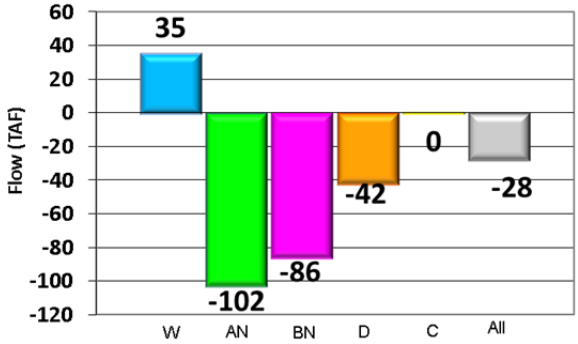


Figure 18. Changes in Average Annual Net Delta Outflow by Water Year Type

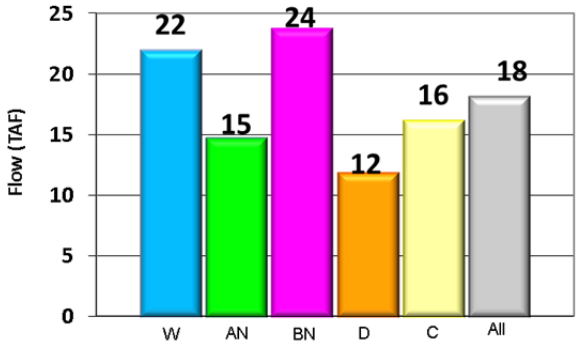


Figure 19. Changes in Average Annual CVP Exports by Water Year Type

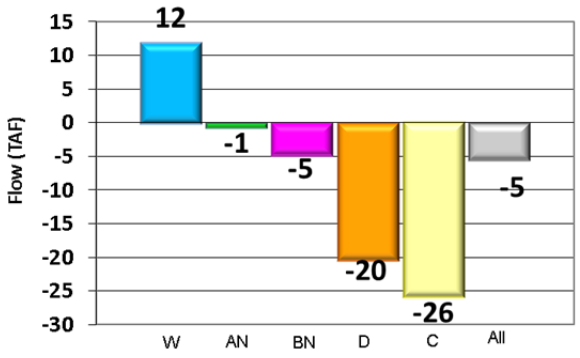


Figure 20. Changes in Average Annual SWP Exports by Water Year Type

	Change in Carryover Storage (TAF)				Average Annual Change in Flow (TAF)							
Scenario	Shasta EOS Storage	Trinity EOS Storage	Folsom EOS Storage	Oroville EOS Storage	Delta Inflow	Delta Outflow	Jones Pumping Plant	Banks Pumping Plant	NOD Ag Services Deliveries	North-of-Delta M&I	SWP Table A	Article 21
Base	2,680	1,396	517	1,836	17,913	15,802	2,252	2,630	233	85	2179	63
FBO-Base	60	20	28	-21	-16	-28	18	-5	11	1	-1	-3