RECLAMATION

Managing Water in the West

MILLERTON LAKE WATER SUPPLY FORECAST AND FLOOD OPERATIONS

SAN JOAQUIN RIVER FORECASTING WORKSHOP

Mr. Antonio M. Buelna, P.E.

December 15, 2009

U.S. Department of the Interior
Bureau of Reclamation

RECLAMATION

Reclamation Mission Statement

Is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

RECLAMATION

Overview

- Upstream Storage Facilities
- Friant Dam
- Millerton Lake Operating Parameters
- Water Supply Data
- Water Supply Forecast
- Flood Operations
- 2006 Millerton Lake Operations
- Upper San Joaquin Basin Model
- Water Supply Allocation
- Summary

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Upstream Storage Facilities

Southern California Edison (SCE)

- Edison Lake
- Florence Lake
- Huntington Lake
- Shaver Lake
- Mammoth Pool
- Redinger Lake

Pacific Gas & Electric (PG&E)

- Crane Valley Reservoir
- Kerckhoff Reservoir

Crane Valley Powerhouse

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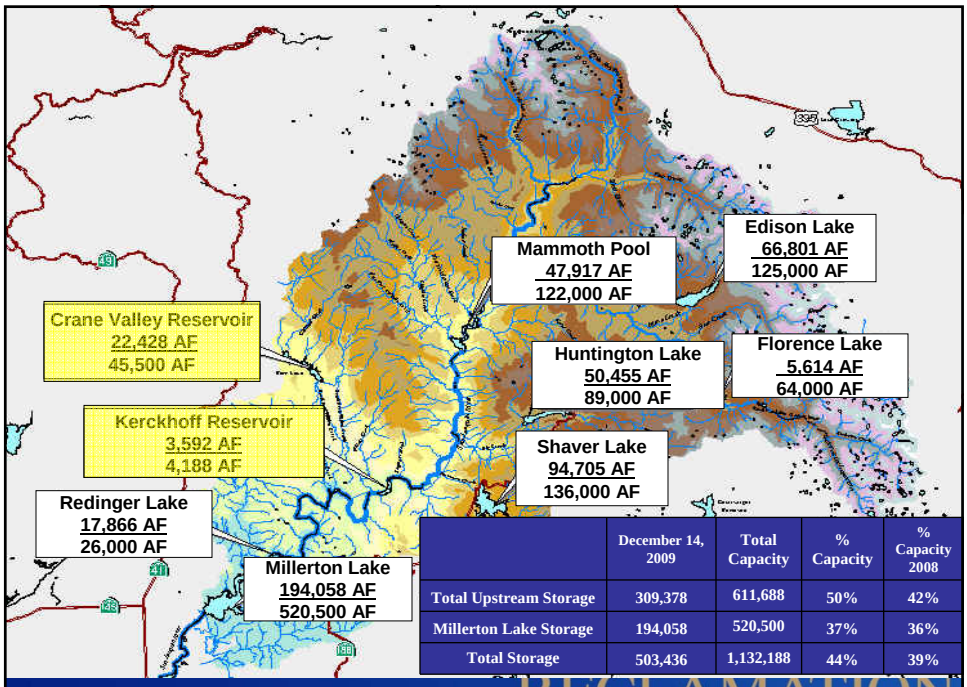

	December 14, 2009	Total Capacity	% Capacity	% Capacity 2008
Total Upstream Storage	309,378	611,688	50%	42%
Millerton Lake Storage	194,058	520,500	37%	36%
Total Storage	503,436	1,132,188	44%	39%

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Historical Information

- Average Huntington Lake Precipitation – 44.5 inches*
- Average Natural River Runoff – 1.9 million acre-feet*

* (WY 1977 – 2009)

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Friant Dam

- Storage Capacity: 520,500 AF
- Dead Pool: 135,000 AF
- Used for Flood Control & Water Conservation to meet demands.
  - Irrigation
  - Municipal
  - Industrial
- Downstream Release Points:
  - San Joaquin River (8,000 CFS)
  - Friant-Kern Canal (5,000 CFS)
  - Madera Canal (1,250 CFS)

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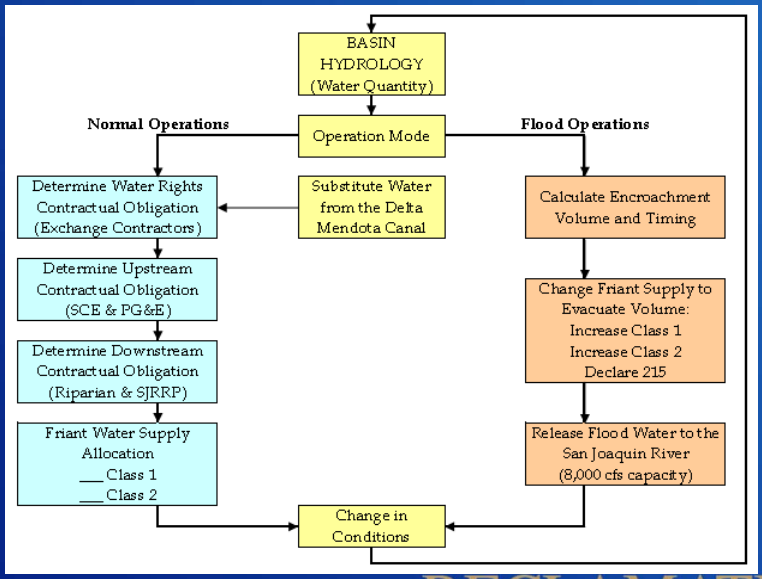
Millerton Lake Operations



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Millerton Lake Operating Parameters

- Mammoth Pool Agreement
- Miller-Lux Agreement
- State Water Control Board
- Army Corps of Engineers
- Friant-Kern Canal
- Madera Canal
- San Joaquin River
- State of California Fish Hatchery

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Millerton Lake Operating Parameters

Mammoth Pool Agreement

- The agreement is a contract between SCE and Reclamation, which determines how SCE will operate their facilities.
  - Six major dams located upstream of Friant Dam
- A Water Plan with month storage forecast is submitted based on:
  - If the April - July projected runoff is less then 650 TAF, then SCE combine storage for the end of September is 152.5 TAF.
  - If the April - July projected runoff is greater then 650 TAF, then SCE combine storage for the end of September varies upon last year's storage.

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Millerton Lake Operating Parameters

Miller-Lux Agreement

- Is a contract between PG&E and Reclamation, which determines how PG&E will operate the Crane Valley Project (Bass Lake).
- A Water Plan is submitted based on:
  - On October 1st the storage should be at 60 percent of capacity (45,500 AF).
  - On November 1st the storage should be at 50 percent of capacity.

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Millerton Lake Operating Parameters

State Water Control Board

- Operating Permit number 11886 indicates that Reclamation can not store water at Friant Dam from August 1st - November 1st.
- Stored water is “any water that is held for 30 days or longer is considered stored water”.

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Millerton Lake Operating Parameters

Army Corps of Engineer Reservoir Regulation for Flood Control

- Allows Millerton Lake Reservoir to have a storage of 435,000 AF at the end of February.

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Millerton Lake Operating Parameters

Long-Term Contracts

- Friant Water Authority (FWA)
  - Friant-Kern Canal
- Madera-Chowchilla Water & Power Authority (MCWPA)
  - Madera Canal

Class 1: 800,000 AF

Class 2: 1,400,000 AF

Section 215: Contracts

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Millerton Lake Operating Parameters

San Joaquin River

- Reclamation required to provide 5 CFS passing at Gravelly Ford.

State of California Fish Hatchery

- Reclamation required to provide 30 - 35 CFS passing through the fish hatchery.

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Water Supply Data

Department of Water Resources (DWR)

- DWR will update the forecast on a weekly basis until July and post the information on California Data Exchange Center (CDEC).
- Provides forecast:
  - Annual Natural River Runoff by month.
  - April – July Natural River Runoff.
  - Snow Measurements from Feb 1st – May 1st.

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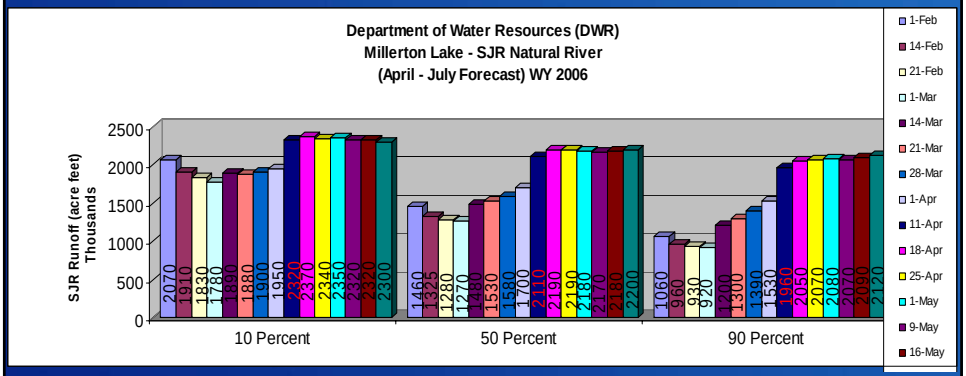
Water Supply Data

DWR's Bulletin 120 Forecast



	1-Feb	14-Feb	21-Feb	1-Mar	14-Mar	21-Mar	28-Mar	1-Apr	11-Apr	18-Apr	25-Apr	1-May	9-May	16-May	23-May
10 Percent	2070	1910	1830	1780	1890	1880	1900	1950	2320	2370	2340	2350	2320	2320	2300
50 Percent	1460	1325	1280	1270	1480	1530	1580	1700	2110	2190	2190	2180	2170	2180	2200
90 Percent	1060	960	930	920	1200	1300	1390	1530	1960	2050	2070	2080	2070	2090	2120

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Water Supply Data

Pacific Gas & Electric (PG&E)

- In accordance with the Miller-Lux Agreement, PG&E will provide a Crane Valley Water Plan on or about February 1st.
  - The plan will project the end of the month storage for Bass Lake.
  - PG&E may request a variance to their contract.
    - The request provides recreational water for the residence of Bass Lake.

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Water Supply Data

Southern California Edison (SCE)

- In accordance with the Mammoth Pool Agreement, SCE will provide a Big Creek Water Management Plan on or about February 1st.
  - The Plan will produce the end of the month combined storage for the Big Creek Project.
- Provides weather data for precipitation and temperature at Huntington Lake.

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Water Supply Data

Reclamation generates a Millerton Lake Daily Operations Report that includes:

- **Storage, inflow, and total average releases are calculated every morning.**
- **Provides weather data at Friant Dam, which includes evaporation, temperature, and precipitation.**
- **Incorporates Upstream Lake Storages, Mendota Pool and Gravelly Ford information.**
- **Calculates Natural River.**

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MILLERTON LAKE DAILY OPERATIONS REPORT

Readings are for the following date as of 24:00 midnight (except as noted): DATE 12/14/2009

RUN DATE: 12/15/2009

MILLERTON LAKE

492.42	ft. Res. ELEV.	STORAGE	194,058 AF	CHANGE	0 AF	INFLOW	634 CFS
		CAPACITY	520,500 AF	% CAPACITY	37.3 %	ACCUM. INFLOW	10,883 AF
0	cfs, Average SPILLWAY Discharge for 24 hours					WY ACCUM. INFLOW	83,053 AF
122	cfs, Average SAN JOAQUIN RIVER Outlets Discharge for 24 hours					ACCUM. SJR	3,366 AF
0	cfs, Average MADERA CANAL Discharge for 24 hours					ACCUM. MC	0 AF
507	cfs, Average FRIANT-KERN CANAL Discharge for 24 hours					ACCUM. FKC	3,370 AF
629	cfs, TOTAL Average Release from Friant Dam for 24 hours						
0.06	Inches, EVAPORATION at Friant Dam for 24 hours ending at 07:00 the current day (report date + 1)						
5	cfs, EVAPORATION at Friant Dam for 24 hours ending at 07:00 the current day (report date + 1)						

PRECIPITATION AND TEMPERATURES

0.00	Inches, PRECIP at FRIANT DAM for 24 hours ending 06:00 the current day (report date + 1)		
0.00	Inches, PRECIP at CRANE VALLEY		
0.00	Inches, PRECIP at HUNTINGTON LAKE		
60	maximum	42	minimum, TEMPERATURES at FRIANT DAM
53	maximum	32	minimum, TEMPERATURES at CRANE VALLEY
39	maximum	15	minimum, TEMPERATURES at HUNTINGTON LAKE

PRECIPITATION TOTALS	
Month	WY
2.36	4.10
6.77	15.06
4.24	10.44

UPSTREAM LAKE STORAGES

		CAPACITIES		% CAPACITY
66,801	AF, THOMAS A. EDISON LAKE	125,000	AF	53 %
5,614	AF, FLORENCE LAKE	64,000	AF	9 %
50,455	AF, HUNTINGTON LAKE	89,000	AF	57 %
94,705	AF, SHAVER LAKE	136,000	AF	70 %
47,917	AF, MAMMOTH POOL	122,000	AF	39 %
17,866	AF, REDINGER LAKE	26,000	AF	69 %
22,428	AF, CRANE VALLEY RESERVOIR	45,500	AF	49 %
3,592	AF, KERCKHOFF RESERVOIR	4,188	AF	86 %
217,575	AF, TOTAL for EDISON, FLORENCE, HUNTINGTON, & SHAVER	414,000	AF	53 %
283,358	AF, TOTAL for SOUTHERN CALIFORNIA EDISON COMPANY	562,000	AF	50 %
309,378	AF, TOTAL UPSTREAM STORAGE	611,688	AF	51 %
503,436	AF, TOTAL STORAGE	1,132,188	AF	44 %

NATURAL RIVER

1,213	CFS, NATURAL RIVER	ACCUM. NATURAL RIVER	19,641 AF
		WY. ACCUM. NATURAL RIVER	95,359 AF

MENDOTA POOL AND GRAVELLY FORD

0	CFS, DELTA-MENDOTA CANAL 24 hr Avg. delivery to Mendota Pool	ACCUM. DELTA-MENDOTA CANAL	0 AF
28	CFS, FLOW at GRAVELLY FORD for current day (report date+1) @ 06:00	ACCUM. GRAVELLY FORD	367 AF
6.00	FT, GAGE HEIGHT at MENDOTA POOL		

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Water Supply Forecast

Reclamation incorporates the following data into the Forecast of Millerton Lake Operations (Forecast).

- **DWR, PG&E, SCE, FWA, and MCWPA**
- **Includes DWR Natural River Runoff for the period between March 1st through September 30th.**
- **Uses the historical lower Natural River Runoff quartile from October 1st through the end of February.**

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Water Supply Forecast

Forecast is generated based on the:

- **90 Percent Exceedence**
- **50 Percent Exceedence**
- **10 Percent Exceedence**
  - **The information is generated into a monthly report.**

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Water Supply Forecast

On or about February 20th, Reclamation notifies each Friant Division District (Districts) of the projected water supply available for the Contract Year (Mar-Feb).

- **The Districts then submit water delivery schedules showing the quantities of water each district plans to use each month during the Contract Year.**

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Most Probable Water Supply Forecast
South-Central California Area Office (CVP)
Forecast of Millerton Lake Operations

REPORT FOR DECEMBER CONTRACT YEAR 2009

MONTHS		SAN JOAQUIN NATURAL RIVER RUNOFF	UPSTREAM OF MILLERTON LAKE			MILLERTON LAKE																		
							SAN JOAQUIN RIVER				MADERA CANAL					FRIANT-KERN CANAL								
			SCE	PG&E	Change	Inflow	Water House Plus Losses	Riparian	SJR Interim Flows	Total SJR Release	Class 1 Water	Class 2 Water	Uncontrolled Season/215	Carryover	Total MC Releases	Class 1 Water	Class 2 Water	Uncontrolled Season/215	Carryover	Total FKC Releases	Loss	Evap	Total Releases	Storage
EOM FEB			244.2	30.7																				298.4
MARCH	R	139.4	289.7	31.9	26.7	112.6	0.0	7.9	0	7.9	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	7.0	7.2	3.9	1.1	16.0	390.9
APRIL	R	231.2	343.6	34.3	76.2	155.4	0.0	9.3	0	9.3	0.0	0.0	0.6	0.135	0.7	11.6	0.0	2.9	26.5	41.0	7.3	2.0	51.0	406.0
MAY	E	491.7	482.8	34.4	139.5	352.3	0.0	12.4	0	12.4	4.8	0.0	48.6	0.0	53.4	53.0	0.0	167.7	20.1	240.9	10.4	3.2	306.6	518.1
JUNE	R	222.8	496.3	34.1	12.2	210.6	0.0	12.4	0	12.4	39.9	0.0	6.2	0.0	46.1	118.0	0.0	22.2	0.0	140.1	6.8	3.2	198.6	520.0
JULY	R	96.4	441.6	34.1	-53.7	150.2	0.0	13.8	0	13.8	56.1	0.0	0.0	0.0	56.1	157.0	0.0	0.0	0.0	157.0	9.1	4.1	227.0	430.1
AUGUST 15	R	18.5	404.2	33.7	-37.8	56.2	0.0	6.9	0	6.9	18.0	9.0	0.0	0.0	27.0	60.0	17.0	0.0	0.0	77.0	4.8	1.4	110.9	369.2
AUGUST 31	R	9.4	351.2	33.5	-53.2	62.6	0.0	6.9	0	6.9	2.0	8.3	0.0	0.0	10.3	41.0	16.6	0.0	0.0	57.6	4.7	1.4	74.8	350.9
SEPTEMBER	R	10.0	264.0	29.3	-91.5	101.3	0.0	11.7	0	11.7	15.1	0.0	0.0	0.0	15.1	58.0	13.3	0.0	0.0	71.3	1.4	2.4	90.0	350.4
SUB-TOTALS		1219.4			18.4	1201.1	0.0	81.1	0.0	81.1	135.9	17.3	55.4	0.1	208.8	498.7	46.9	192.8	53.7	792.1	48.3	18.8	1091.9	
OCTOBER 15	E	28.4	250.3	27.5	-15.6	45.4	0.0	4.8	5.4	10.1	7.1	0.0	0.0	0.0	7.1	20.0	4.2	0.0	0.0	24.2	1.2	0.7	41.4	352.5
OCTOBER 31	E	25.5	262.1	24.0	8.4	17.8	0.0	5.1	6.0	11.1	0.0	2.6	0.0	0.0	2.6	16.7	12.0	0.0	0.0	28.7	0.1	0.5	42.4	327.3
NOVEMBER	E	22.3	277.1	20.6	11.6	9.0	0.0	8.8	15	23.4	1.5	14.7	0.0	0.0	16.2	61.8	41.1	0.0	0.0	102.9	3.2	0.5	142.5	190.1
DECEMBER	E	20.0	285.0	21.5	8.8	11.2	0.0	7.0	0	7.0	0.0	0.0	0.0	0.0	0.0	9.2	0.0	0.0	0.0	9.2	1.8	1.0	16.2	182.3
JANUARY	E	30.0	295.0	21.0	9.5	20.5	0.0	6.0	0	6.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	3.4	1.4	1.0	9.4	191.0
FEBRUARY	E	50.0	310.0	21.0	15.0	35.0	0.0	6.0	14	19.9	3.5	0.0	0.0	0.0	3.5	50.2	0.0	0.0	0.0	50.2	3.4	2.9	73.6	146.1
SUB-TOTALS		176.1			37.7	138.8	0.0	37.6	39.9	77.6	12.1	17.3	0.0	0.0	29.4	161.3	57.3	0.0	0.0	218.6	11.0	6.6	325.6	
TOTALS		1395.5			56.1	1339.9	0.0	118.7	39.9	158.6	148.0	34.6	55.4	0.1	238.1	660.0	104.2	192.8	53.7	1010.7	59.3	25.4	1407.5	

FORECAST

FORECAST DWR	RUNOFF WATER YEAR	RUNOFF PERCENT OF AVG WATER YEAR	APRIL-JULY RUNOFF	APRIL-JULY PERCENT OF AVG RUNOFF
10% EXCEEDANCE	1,453	83%	1040	82%
MOST PROBABLE	1,455	83%	1042	83%
90% EXCEEDANCE	1,323	75%	910	72%

NOTES/ASSUMPTIONS:

1. All Storage Values are End of Month
2. E = Estimate, R = From Operational Records
3. Units in Thousand Acre-Feet (TAF)
4. Forecast Based on DWR's Water Supply Forecast Dated 06/9/09
5. SCE EOM Storages Based on June 9, 2009 water plan
6. PG&E EOM Storages Based on 2009 Water Plan Dated 02/09/2009
7. Canal Deliveries Based on Schedules
8. Natural River from October thru February (AF) = 236,100
9. Millerton Lake Inflow from October thru March (AF) = 340,347

DRAFT RESTORATION ALLOCATION

Water Year Index	Critical Low	Critical High	Dry	Normal Dry	Normal Wet	Wet
Buffer Flows					28,410	
Unexpected Seepage Losses	40,000	40,000	40,000	40,000	40,000	40,000
Runoff Range Low	-	400,000	670,000	930,000	1,450,000	2,500,000
Runoff Range High	400,000	670,000	930,000	1,450,000	2,500,000	4,642,000
Forecast Water Year					1,455,455	
Riparian Allocation					116,900	
Restoration Allocation					284,100	
Total SJR Allocation					401,000	

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REPORT FOR DECEMBER CONTRACT YEAR 2009

MONTHS		SAN JOAQUIN NATURAL RIVER RUNOFF	UPSTREAM OF MILLERTON LAKE				SAN JOAQUIN RIVER			
			SCE	PG&E	Change	Inflow	White House Plus Losses	Riparian	SJR Interim Flows	Total SJR Release
EOM FEB			244.2	30.7						
MARCH	R	139.4	269.7	31.9	26.7	112.5	0.0	7.9	0	7.9
APRIL	R	231.2	343.5	34.3	76.2	155.4	0.0	9.3	0	9.3
MAY	E	491.7	482.8	34.4	139.5	352.3	0.0	12.4	0	12.4
JUNE	R	222.8	495.3	34.1	12.2	210.6	0.0	12.4	0	12.4
JULY	R	96.4	441.6	34.1	-53.7	150.2	0.0	13.8	0	13.8
AUGUST 15	R	18.5	404.2	33.7	-37.8	56.2	0.0	6.9	0	6.9
AUGUST 31	R	9.4	351.2	33.5	-53.2	62.6	0.0	6.9	0	6.9
SEPTEMBER	R	10.0	264.0	29.3	-91.5	101.3	0.0	11.7	0	11.7
SUB-TOTALS		1219.4			18.4	1201.1	0.0	81.1	0.0	81.1
OCTOBER 15	E	28.4	250.3	27.5	-15.6	45.4	0.0	4.8	5.4	10.1
OCTOBER 31	E	25.5	262.1	24.0	8.4	17.8	0.0	5.1	6.0	11.1
NOVEMBER	E	22.3	277.1	20.6	11.6	9.0	0.0	8.8	15	23.4
DECEMBER	E	20.0	285.0	21.5	8.8	11.2	0.0	7.0	0	7.0
JANUARY	E	30.0	295.0	21.0	9.5	20.5	0.0	6.0	0	6.0
FEBRUARY	E	50.0	310.0	21.0	15.0	35.0	0.0	6.0	14	19.9
SUB-TOTALS		176.1			37.7	138.8	0.0	37.6	39.9	77.6
TOTALS		1395.5			56.1	1339.9	0.0	118.7	39.9	158.6

RECLAMATION

MILLERTON LAKE

MADERA CANAL					FRIANT-KERN CANAL								
Class 1 Water	Class 2 Water	Uncontrolled Season/215	Carryover	Total MC Releases	Class 1 Water	Class 2 Water	Uncontrolled Season/215	Carryover	Total FKC Releases	Loss	Evap	Total Releases	Storage
													298.4
0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	7.0	7.2	3.9	1.1	15.0	390.9
0.0	0.0	0.6	0.135	0.7	11.6	0.0	2.9	26.5	41.0	7.3	2.0	51.0	486.0
4.8	0.0	48.6	0.0	53.4	53.0	0.0	167.7	20.1	240.9	10.4	3.2	306.6	518.1
39.9	0.0	6.2	0.0	46.1	118.0	0.0	22.2	0.0	140.1	6.8	3.2	198.6	520.0
56.1	0.0	0.0	0.0	56.1	157.0	0.0	0.0	0.0	157.0	9.1	4.1	227.0	430.1
18.0	9.0	0.0	0.0	27.0	60.0	17.0	0.0	0.0	77.0	4.8	1.4	110.9	369.2
2.0	8.3	0.0	0.0	10.3	41.0	16.6	0.0	0.0	57.6	4.7	1.4	74.8	350.9
15.1	0.0	0.0	0.0	15.1	58.0	13.3	0.0	0.0	71.3	1.4	2.4	98.0	350.4
135.9	17.3	55.4	0.1	208.8	498.7	46.9	192.8	53.7	792.1	48.3	18.8	1081.9	
7.1	0.0	0.0	0.0	7.1	20.0	4.2	0.0	0.0	24.2	1.2	0.7	41.4	352.5
0.0	2.6	0.0	0.0	2.6	16.7	12.0	0.0	0.0	28.7	0.1	0.5	42.4	327.3
1.5	14.7	0.0	0.0	16.2	61.8	41.1	0.0	0.0	102.9	3.2	0.5	142.5	190.1
0.0	0.0	0.0	0.0	0.0	9.2	0.0	0.0	0.0	9.2	1.8	1.0	16.2	182.3
0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	3.4	1.4	1.0	9.4	191.0
3.5	0.0	0.0	0.0	3.5	50.2	0.0	0.0	0.0	50.2	3.4	2.9	73.6	146.1
12.1	17.3	0.0	0.0	29.4	161.3	57.3	0.0	0.0	218.6	11.0	6.6	325.6	
148.0	34.6	55.4	0.1	238.1	660.0	104.2	192.8	53.7	1010.7	59.3	25.4	1407.5	

RECLAMATION

BUREAU OF RECLAMATION
SOUTH-CENTRAL CALIFORNIA AREA OFFICE (CVP)
FORECAST OF MILLERTON LAKE OPERATIONS

REPORT FOR DECEMBER CONTRACT YEAR 2009 — 10:42 AM

		MARCH Aug 15	Aug 16 Sep 30	TOTALS
Calculated Uncontrolled San Joaquin River Runoff	+	1200	19	1219
Storage Retained in Upstream Reservoir Above Friant Dam	-	103	-145	18
Released into the San Joaquin River From Friant Dam	-	63	19	81
Deliveries from the San Joaquin River From Friant Dam	+	1	0	1
Losses in the Friant-Kern and Madera Canals	-	42	6	48
Calculated Evaporation from Millerton Lake	-	15	4	19
Supply Retained in Millerton at End of February above 136,000 AF	+	163	0	163
Soquel Water Supplied into System	-	4	4	8
Friant Dam Operational Spill Through Canals	-	0	0	0
White House Plus Lose		0	0	0
San Joaquin River Restoration Program Interim Flows	-	0	40	40
Contract Supply Scheduled by Contractors after September 30th.	+	0	73	73
Section 215 Contract Supply		0	0	0
Uncontrolled Season	-	248	0	248
2008 Water Supply - Rescheduled	-	54	0	54
Total Available Supply		775	165	940
		82%	18%	100%

CLASS 1

TOTAL CLASS 1 AVAILABLE = 800 - 800.0 = 100%

Percent Class 1 Declared = 100%

CLASS 2

TOTAL CLASS 2 AVAILABLE = 140 - 1400.0 = 10%
Total Contract Entitlement for Class 2 is 1,400,000 Acre-Feet

Percent Class 2 Declared = 10%

TOTAL UNCONTROLLED CLASS 2 = 240 - 1400.0 = 18%
Total Contract Entitlement for Class 2 is 1,400,000 Acre-Feet

Percent Class 2 Delivered = 18%

RECLAMATION

Water Supply Forecast

Water Supply Forecast meetings are held during the first Friday of every Month to discuss the Forecast of Millerton Lake Operations.

- **The Districts are encouraged to submit a revised water delivery schedule ten days after the meeting.**

A Board of Directors meeting is held by the Friant Water Users Authority (FWUA)/FWA on the Fourth Thursday of each Month.

- **Reclamation provides an update on the water supply conditions.**

RECLAMATION

U.S. Bureau of Reclamation - Mid Pacific Region
South-Central California Area Office
Central Valley Project - Friant Division
Water Year Comparison Report

Run Date: December 15, 2009

12/14/2009	WY-2010	% of AVG	WY-2009	WY-2008	WY-2007	WY-2006	WY-2005	75 - 05 AVG	WY-1977	WY- 1983
High Temperature on this Day (F)										
Friant Dam	60	107%	51	58	65	51	51	56	66	57
Crane Valley	53	100%	39	51	59	44	61	53	62	54
Huntington Lake	39	93%	28	26	35	31	45	42	50	41
Low Temperature on this Day (F)										
Friant Dam	42	120%	28	36	43	37	46	35	31	32
Crane Valley	32	94%	30	29	39	30	33	34	32	32
Huntington Lake	15	58%	10	21	30	24	30	26	31	15
Precipitation on this Day (inches)										
Friant Dam	0.00	0%	0.50	0.00	0.00	0.00	0.00	0.08	0.00	0.00
Crane Valley	0.00	0%	0.40	0.00	0.00	0.00	0.00	0.13	0.00	0.00
Huntington Lake	0.00	0%	0.13	0.00	0.00	0.00	0.00	0.17	0.00	0.00
Precipitation to date for Month (inches)										
Friant Dam	2.36	311%	0.72	0.62	1.05	1.06	1.00	0.76	0.00	0.19
Crane Valley	6.77	345%	0.51	1.79	1.74	0.00	1.58	1.96	0.00	1.25
Huntington Lake	4.24	186%	0.63	1.76	1.78	5.27	2.15	2.28	0.00	1.39
Precipitation to date for Water Year (inches)										
Friant Dam	4.10	131%	2.53	1.25	1.98	1.47	5.49	3.12	2.40	5.78
Crane Valley	15.06	182%	4.82	3.13	3.33	0.50	12.46	8.28	1.19	18.63
Huntington Lake	10.44	111%	7.00	2.91	4.74	8.53	13.30	9.42	1.80	20.00
Flows on this Day (cfs)										
Millerton Lake Inflow	634	67%	414	657	282	1,645	1,316	949	282	2,858
Calculated Natural River	1,213	189%	192	147	411	365	379	642	86	1,676
Millerton Lake Evaporation	5	100%	13	7	4	2	1	5	5	4
San Joaquin River	122	52%	131	130	145	110	124	236	70	2,992
Spillway	0	0%	0	0	0	0	0	0	0	0
Madera Canal	0	0%	0	0	0	0	0	19	0	0
Friant-Kern Canal	597	457%	0	0	490	126	0	111	0	112
Total Release to Canals	597	390%	0	0	490	126	0	130	0	112
Total of all Releases	629	172%	131	130	635	236	124	366	70	3,104
Flows to date for Month (af)										
Millerton Lake Inflow	10,885	36%	13,717	13,285	16,788	29,385	36,052	30,640	3,446	85,268
Calculated Natural River	19,641	39%	7,132	5,560	10,425	28,168	17,086	13,938	3,474	62,559
Millerton Lake Evaporation	202	146%	130	166	338	162	170	138	156	98
San Joaquin River	3,366	38%	3,620	3,856	4,124	3,916	3,396	8,860	2,650	100,552
Spillway	0	0%	0	0	0	0	0	0	0	0
Madera Canal	0	0%	0	0	1,268	0	0	696	0	0
Friant-Kern Canal	3,371	115%	2,319	0	14,289	6,639	0	2,923	0	2,186
Total Release to Canals	3,371	93%	2,319	0	15,557	6,639	0	3,619	0	2,186
Total of all Releases	6,737	54%	5,939	3,856	15,681	10,555	3,396	12,479	2,650	102,738

RECLAMATION

Flood Operations – Millerton Lake

RECLAMATION

Typical Day at Millerton Lake

RECLAMATION

Flood Operations – Millerton Lake

Stakeholders

Downstream Interest:
- Lower San Joaquin River Levee District
- Land Owners

Private Utilities:
- Southern California Edison (SCE)
- Pacific Gas and Electric (PG&E)

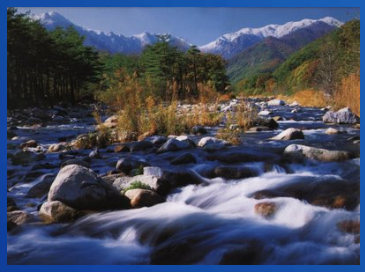
United States Federal and State Agencies:
- Army Corps of Engineers
- Department of Water Resources (DWR)
- National Weather Service

Water Users:
- 28 Districts
  - Irrigation, Municipal, Industrial

RECLAMATION

Flood Operations – Millerton Lake

- Upper San Joaquin River Floods occurs about 4 out of 10 years.
- Rain Floods: results of intense rainfall in the Sierra Mountains.
  - Period typically: November to March
  - January 2, 1997: largest rain flood estimated maximum daily flow of 77,500 cfs and a 7-day volume of 416,700 AF.



RECLAMATION

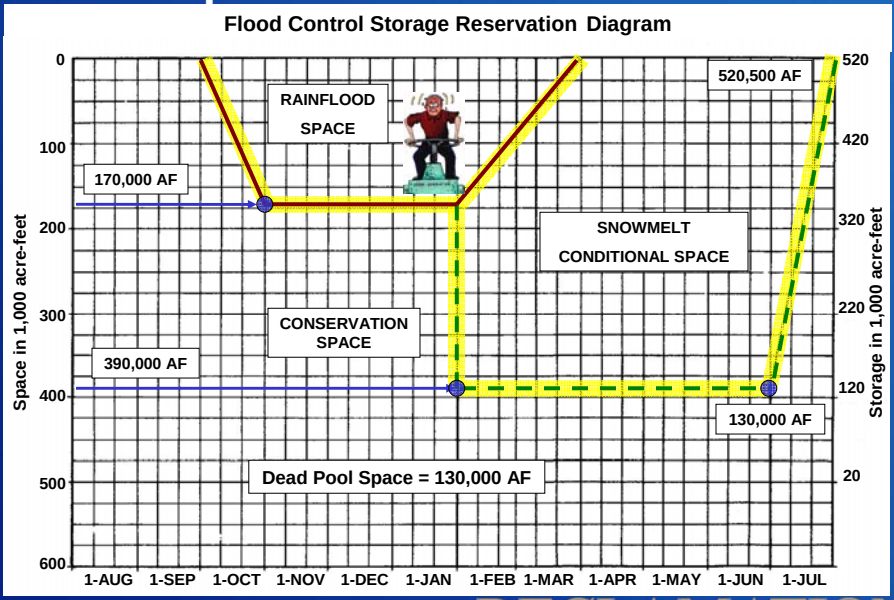
Flood Operations – Millerton Lake

- Snowmelt Floods: results of mountain snowmelt.
  - Period typically: February to July
  - Snowmelt floods are sustained, moderate flows for 2 – 3 months, resulting in large volumes of runoff.
  - Snowmelt produces ~70% of annual water supply.

  - 1906: largest snowmelt flood with a maximum daily flow of 26,300 cfs and a volume of 3.34 million AF.

RECLAMATION

Flood Operations – Millerton Lake



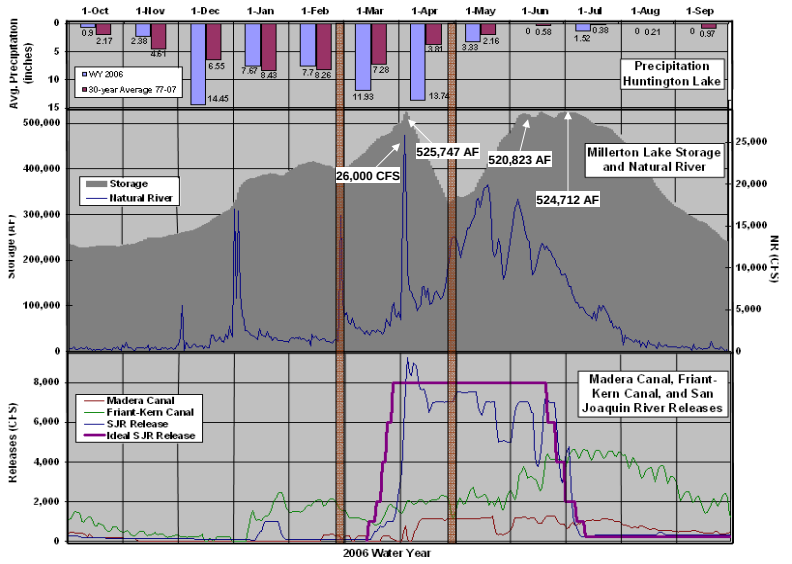
RECLAMATION

2006 Millerton Lake Operations

- March 1, 2006, the San Joaquin River basin hydrologic conditions were at the historic average and the DWR 50 Percent exceedance forecast was 1.27 million AF.
- By early April, storage capacity was at 95 percent.
- First week of April produced 10 inches of rain.
  - April's 100-year average precipitation is 3 inches.
  - More than 300 percent of normal conditions.

RECLAMATION

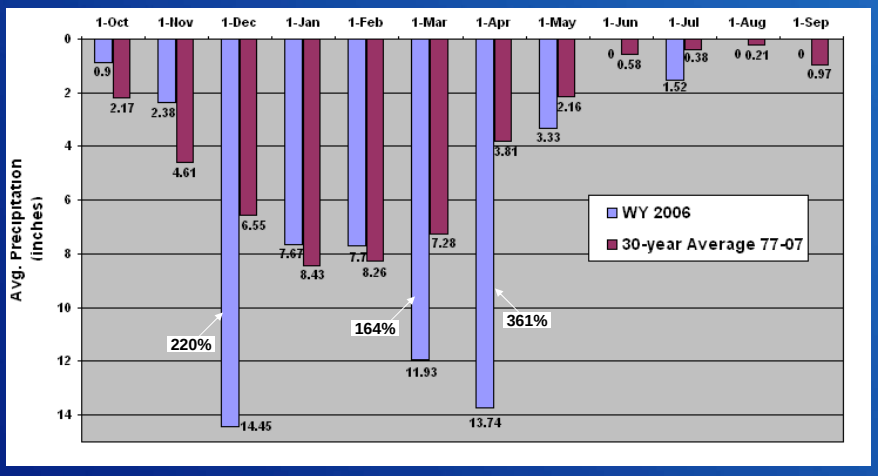
2006 Millerton Lake Operations



RECLAMATION

2006 Millerton Lake Operations

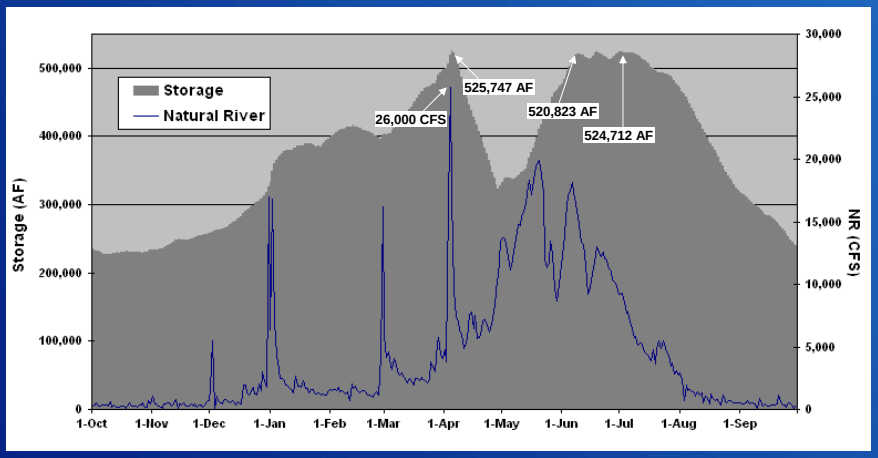
Precipitation



RECLAMATION

2006 Millerton Lake Operations

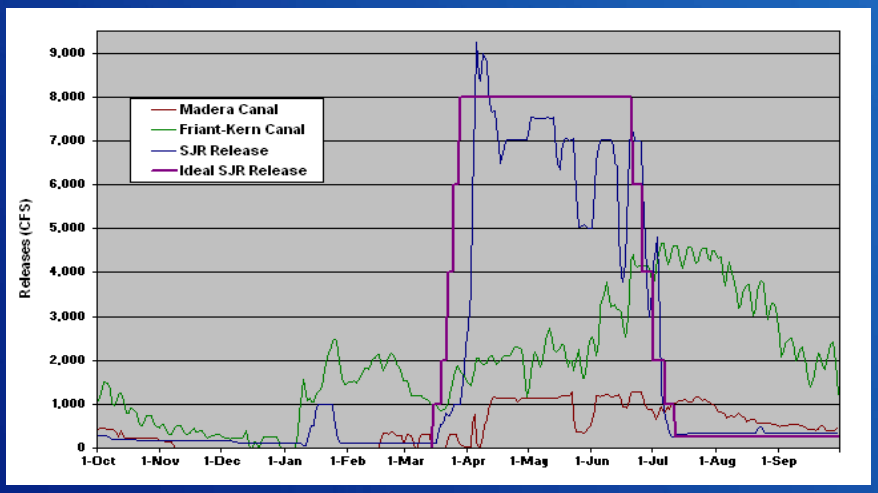
Storage



RECLAMATION

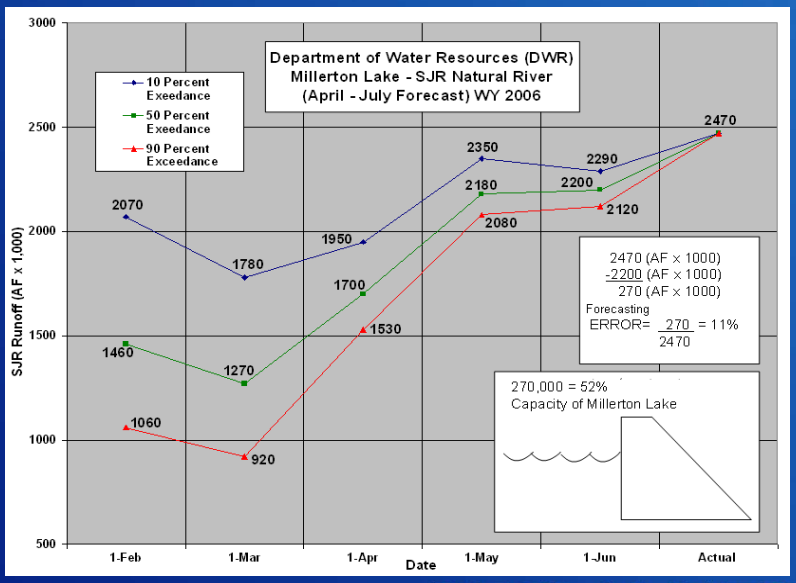
2006 Millerton Lake Operations

Releases



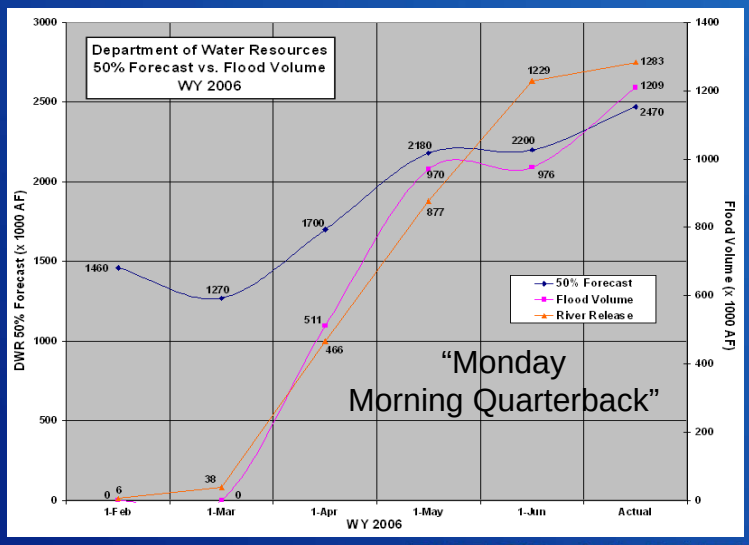
RECLAMATION

2006 Operations - Forecasting Error



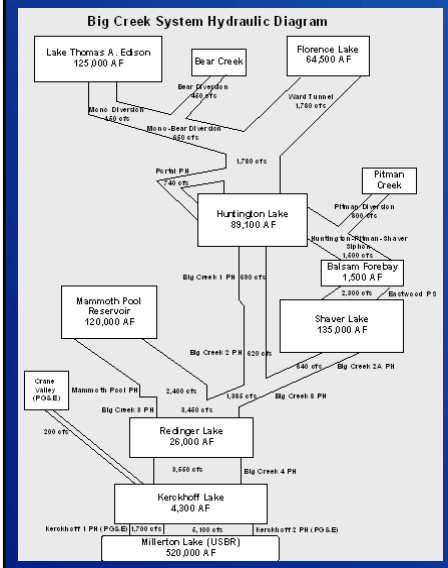
RECLAMATION

DWR 50% Forecast vs. Flood Volume 2006 Operations



RECLAMATION

Upper San Joaquin Basin Model (USAN)



- **The USAN model was developed to study re-operation of the upstream reservoirs to enhance the Friant Division water supply.**
  - **Improve Friant Division operations.**
  - **Simulates Reservoir Operations from 1896 to present.**
  - **Uses daily operations data to produce short-term reservoir operations (storage, deliveries, releases, etc.)**
- **USAN uses daily operational data to project future operations based on historic unimpaired flow data.**

RECLAMATION

Upper San Joaquin Basin Model (USAN)

- **USAN limitations:**
  - **Operational decisions based on forecasts.**
  - **Millerton Lake February 1st storage plus the February – July unregulated flow forecast to determine the amount of water available for deliveries each year.**
  - **Distribution of snowmelt, to varying conditions of water years, may cause variations in over 100,000 AF.**
    - **Normal Wet vs. Wet years**

RECLAMATION

Water Supply Allocation

Class 1:

- 800,000 AF

Class 2:

- 1,400,000 AF

Surplus Water:

- Temporary supply of water, other than Class 1 or Class 2, made available to the Contractors in addition to water provided pursuant to water service contracts, including water made available that is not subject to acreage limitation pursuant to Section 215 of the Reclamation Reform Act of October 12, 1982 (96 Stat. 1263), as amended.

RECLAMATION

Water Supply Allocation

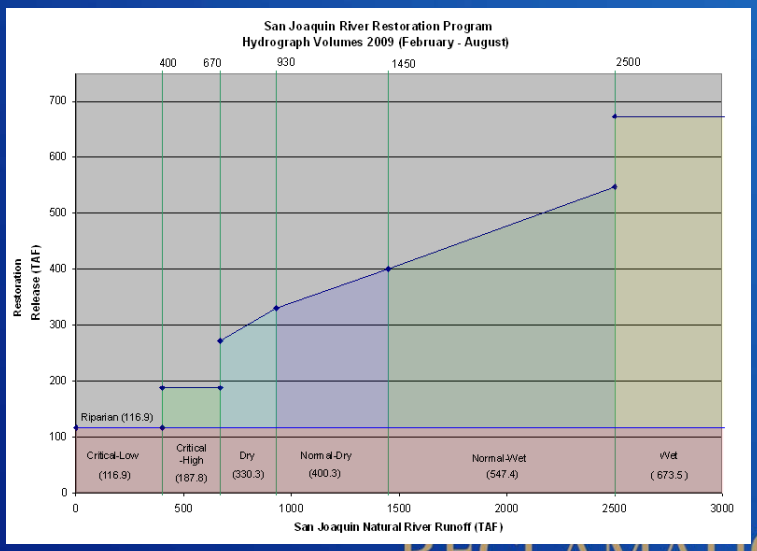
Uncontrolled Season:

- Any time during the Contract Year the Contracting Officer determines that a need exists to evacuate water from Millerton Lake in order to prevent or minimize spill or to meet flood control criteria, taking into consideration, among other things, anticipated upstream reservoir operations and the most probable forecast of snowmelt and runoff projections for the upper San Joaquin River.

RECLAMATION

Water Supply Allocation

SJRRP:



RECLAMATION

Summary

- Millerton Lake Operations includes various Operating Parameters.
- Reclamation incorporates data provide by DWR, PG&E, SCE, FWA, MCWPA, NWS, and Downstream Interest.
  - Then develops a Forecast of Millerton Lake Operations.

- The San Joaquin River has two major runoff seasons
  - November through March is predominately rain
  - April through July is predominately snowmelt
- Snowmelt produces ~70% of annual water supply.
- Managing Friant Division Water Supply considers:
  - The speculative nature of some information (early in the season)
  - The importance of providing protection from floods
- A mission that requires close communication and coordination with many parties and a significant amount of professional judgment.

RECLAMATION

Questions?

Arago's Admonition (1845)

"Never, no matter what may be the progress of science, will honest scientific men who have regard for their reputations venture to predict the weather."

Thank You

Power Point By:
Robert Campbell and Rufino Gonzalez

RECLAMATION