MILLERTON LAKE WATER SUPPLY FORECAST AND FLOOD OPERATIONS
SAN JOAQUIN RIVER FORECASTING WORKSHOP

Mr. Antonio M. Buelna, P.E.
December 15, 2009
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.

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
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

<table>
<thead>
<tr>
<th>Reservoir</th>
<th>Total Capacity</th>
<th>December 14, 2009</th>
<th>% Capacity 2009</th>
<th>% Capacity 2008</th>
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<td>Kerckhoff Reservoir</td>
<td>3,592 AF</td>
<td>4,188 AF</td>
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<td>Mammoth Pool</td>
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<td>36%</td>
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<td>194,058 AF</td>
<td>520,500 AF</td>
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<td>Florence Lake</td>
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<td>94,705 AF</td>
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<tr>
<td>Total Upstream Storage</td>
<td>309,378</td>
<td>611,688</td>
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<td>42%</td>
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<tr>
<td>Millerton Lake Storage</td>
<td>194,058</td>
<td>520,500</td>
<td>37%</td>
<td>36%</td>
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<tr>
<td>Total Storage</td>
<td>503,436</td>
<td>1,132,188</td>
<td>44%</td>
<td>39%</td>
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</table>
Historical Information

• Average Huntington Lake Precipitation – 44.5 inches*

• Average Natural River Runoff – 1.9 million acre-feet*

* (WY 1977 – 2009)

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)
Millerton Lake Operations

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
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 than 650 TAF, then SCE combine storage for the end of September is 152.5 TAF.
  - If the April - July projected runoff is greater than 650 TAF, then SCE combine storage for the end of September varies upon last year’s storage.

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.
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”.

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.
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

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.
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.
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.

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.
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.

### Millerton Lake Daily Operations Report

<table>
<thead>
<tr>
<th>Date</th>
<th>Storage (af)</th>
<th>Change</th>
<th>Evaporation (af)</th>
<th>Temperature (°F)</th>
<th>Precipitation (in)</th>
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<tbody>
<tr>
<td>07/14/2099</td>
<td>125,000</td>
<td>20</td>
<td>8,000</td>
<td>75</td>
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### Upstream Lake Storages

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<tr>
<th>Location</th>
<th>Storage (af)</th>
<th>% Capacity</th>
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<tr>
<td>Thomas A. Edison Lake</td>
<td>125,000</td>
<td>51%</td>
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<tr>
<td>Friant Reservoir</td>
<td>84,000</td>
<td>54%</td>
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<td>Northstar Lake</td>
<td>50,000</td>
<td>75%</td>
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<td>Diamond Lake</td>
<td>125,000</td>
<td>75%</td>
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<td>McCloud Lake</td>
<td>24,000</td>
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<tr>
<td>Granite Valley Reservoir</td>
<td>43,000</td>
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<tr>
<td>Sacramento River</td>
<td>1,100,000</td>
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### Natural River

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<th>Type</th>
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<th>% Capacity</th>
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<td>Natural River</td>
<td>19,000</td>
<td>55%</td>
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<tr>
<td>Mendota Pool</td>
<td>1,000</td>
<td>54%</td>
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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.

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.
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.

### Most Probable Water Supply Forecast

**South-Central California Area Office (CVP)**

**Forecast of Millerton Lake Operations**

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<tr>
<th>District</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Total</th>
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<tr>
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<td>1577</td>
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*Note: All data on flow of water is preliminary and subject to change.*

**Source:** Data from California Department of Water Resources
### REPORT FOR DECEMBER CONTRACT YEAR 2009

#### RIVER MOUTH

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<th>Month</th>
<th>Sec.</th>
<th>Dose</th>
<th>Orange</th>
<th>BFlow</th>
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<tr>
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<tr>
<td>MAY</td>
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#### SAN JOAQUIN RIVER

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### MILLERTON LAKE

#### MADERA CANAL

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#### TRINITY KERN CANAL

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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.
### Flood Operations – Millerton Lake

#### Millerton Lake Operations

**Run Date:** December 15, 2020

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Typical Day at Millerton Lake

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

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

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

Flood Operations – Millerton Lake

<table>
<thead>
<tr>
<th>Stakeholders</th>
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<tbody>
<tr>
<td>Downstream Interest:</td>
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<tr>
<td>• Lower San Joaquin River Levee District</td>
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<td>• Land Owners</td>
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<td>• National Weather Service</td>
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</table>
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.

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.
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.
2006 Millerton Lake Operations

Storage

- 525,747 AF
- 520,823 AF
- 524,712 AF
- 26,000 CFS

Releases

- Madera Canal
- Triunfo/Kern Canal
- SJR Release
- Ideal SJR Release
2006 Operations - Forecasting Error

Department of Water Resources (DWR) - Millerton Lake - SJR Natural River (April - July Forecast) WY 2005

DWR 50% Forecast vs. Flood Volume 2006 Operations

Department of Water Resources 50% Forecast vs. Flood Volume WY 2005

“Monday Morning Quarterback”
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 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
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.

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.
**Water Supply Allocation**

**SJRRP:**

- Millerton Lake Operations includes various Operating Parameters.
- Reclamation incorporates data provided 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.

**Summary**
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