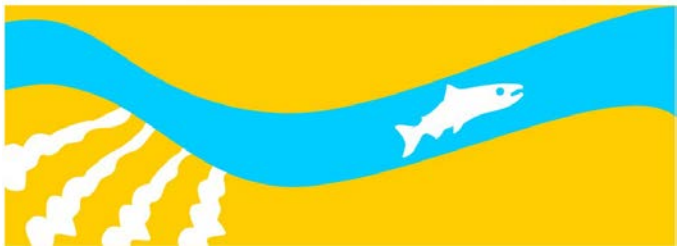
Study 1

Flow Gage Record Analysis

Public Draft
2013 Monitoring and Analysis Plan

SAN JOAQUIN RIVER
RESTORATION PROGRAM



September 2012

1.0 Flow Gage Record Analysis

1.1 Statement of Need

Assumed losses along the San Joaquin River inform both release requirements for Gravelly Ford flow targets, and the acquisition and release of purchased water to make up for Unexpected Seepage Losses.

1.2 Background

Interim Flow releases relied upon Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.* (Settlement) assumptions about losses for meeting flow targets at Gravelly Ford. The pattern of losses assumed by Exhibit B was calculated from average monthly releases during periods when diversions were being met by Friant Dam releases, incidental of the conditions at Gravelly Ford. The record of calculated losses varies considerably about the monthly averages.

This study synthesizes water year (WY) 2012 flow gage data for each reach in an attempt to improve estimates of losses in each reach for use in the San Joaquin River Restoration Program (SJRRP) operations during Restoration Year 2013. In addition, this study will discuss uncertainties in the estimated losses.

1.3 Anticipated Outcomes

The WY 2012 flow gage record analysis will be presented in tables and graphs, as outlined below. Total losses that occurred from by reach will be compared to Exhibit B assumed losses (Table 1-1).

Table 1-1.
Losses by Reach

Reach2	Computed Losses (TAF)	Exhibit B Assumed Losses (TAF)
1 – Friant Dam to Gravelly Ford		
2A – Gravelly Ford to Below Bifurcation		
2B – Below Bifurcation to San Mateo		
3 – Near Mendota to Sack Dam		
4A – Sack Dam to Washington Road		

Key:
TAF = thousand acre-feet

Figures will be provided to show daily flow for the upstream and downstream portions of each reach, as well as the average flow over each bench period. The figures will also show daily differences in flow, and the average difference in flow for each bench period.

Computed losses by reach for each of the benched release periods during WY 2012 will also be provided (see Table 1-2 for Reaches 1 and 2A example).

Table 1-2.
Example Losses by Reach During Benched SJRRP Release Periods

Benched Period		Average Friant Release (cfs)	Reach 1 Losses		Reach 2A Losses	
From	To		(cfs)	(TAF)	(cfs)	(TAF)

Key:
cfs = cubic feet per second
SJRRP = San Joaquin River Restoration Program
TAF = thousand acre-feet

Average losses during benched periods will also be graphed to identify any possible trends between losses and releases.

1.4 Methods

This study will look at differences in flow by reach using information collected from quality assured, quality controlled (QA/QC) final daily average flows from the flow monitoring gages along the San Joaquin River. The following reaches will be analyzed (Figure 1-1):

- **Reach 1 – Friant Dam to Gravelly Ford** – Friant Dam river releases (MIL) and Little Dry Creek (LDC) and Cottonwood Creek (CTK) inflows were compared with Gravelly Ford (GRF) flows for each bench period.

$$Reach\ 1\ Losses = MIL_{avg} - CTK_{avg} - LDC_{avg} - GRF_{avg}$$

- **Reach 2A – Gravelly Ford to Chowchilla Bypass Bifurcation** – Gravelly Ford (GRF) flows were compared with Below Bifurcation (SJB) flows, with consideration of diversions into the Chowchilla Bypass (CBP).

$$Reach\ 2A\ Losses = GRF_{avg} - CBP_{avg} - SJB_{avg}$$

- **Reach 2B – Below Bifurcation to San Mateo** – Below Bifurcation (SJB) flows were compared with San Mateo flows, with no inflows or outflows in this reach.

$$Reach\ 2B\ Losses = SJB_{avg} - San\ Mateo_{avg}$$

- **Reach 3 – Near Mendota to Sack Dam** – Near Mendota (MEN) flows were compared with Sack Dam (SDP) flows plus San Luis Canal Company (SLCC) diversions.

$$Reach\ 3\ Losses = MEN_{avg} - SDP_{avg} - SLCC_{avg}$$

- **Reach 4A – Sack Dam to Washington Road** – Sack Dam (SDP) flows were compared with Washington Road (SWA) flows, with no inflows or outflows in this reach.

$$Reach\ 4A\ Losses = SDP_{avg} - SWA_{avg}$$

Losses downstream from Washington Road will not be included because Reach 4B1 of the San Joaquin River does not route flows and there are several ungaged inflows to the Eastside Bypass on the San Joaquin River.

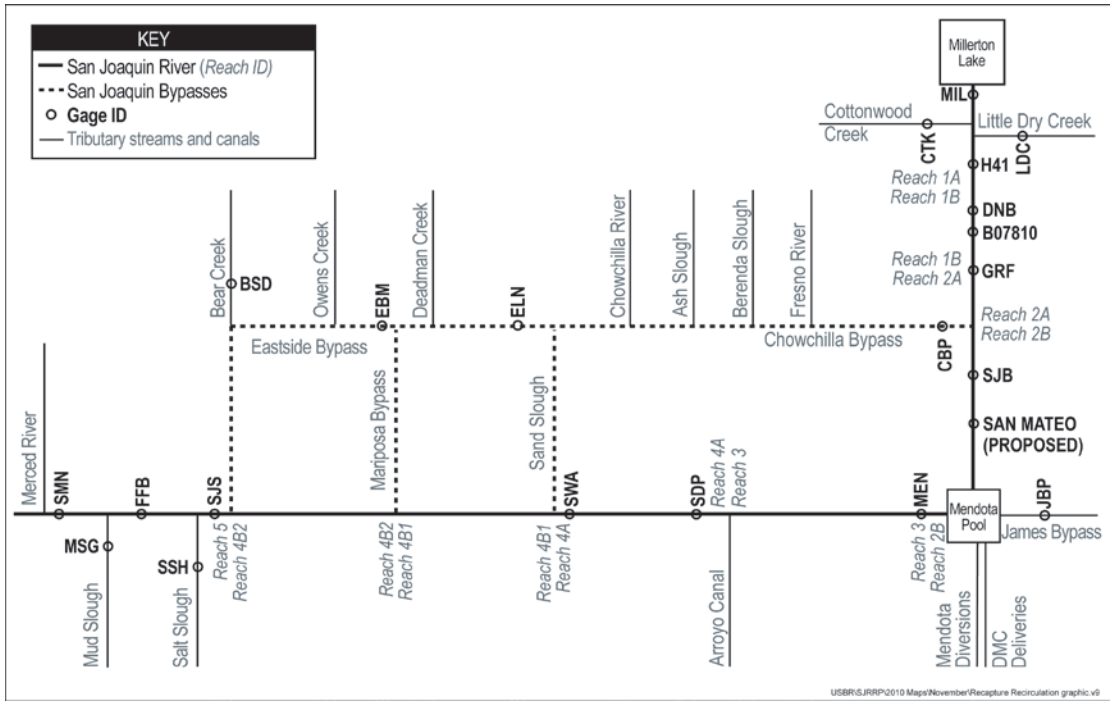


Figure 1-1.
Location of Gaging Stations and Reaches

Losses will be calculated by taking the difference in flow between upstream and downstream gaging locations, with inclusion of inflows and diversions, as described above.

If flood releases are made, losses will be computed separately as an opportunity to learn how the system operates under flood conditions.