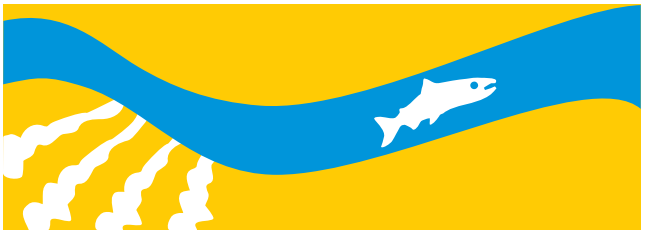
Appendix B

Restoration Administrator 2013 Monitoring and Analysis Plan Recommendations

Public Draft
2013 Monitoring and Analysis Plan

SAN JOAQUIN RIVER
RESTORATION PROGRAM



September 2012

The Restoration Administrator provided recommendations on the studies provided in the administrative draft *2013 Monitoring and Analysis Plan.* Since then, additional studies were included or removed. A revised list of the study numbering is presented in Table B-1.

Table B-1.
Studies Included in Appendices A and B

2013 MAP Appendix A Study	Study	2013 MAP Appendix B (Notes)
1	Flow Gage Record Analysis	1
2	Lateral Gradient of Water Table	2
3	Changes in Soil Salinity Conditions Resulting from Interim Flows	3
4	Influence of Paleochannels on Seepage	4
5	Temperature Monitoring of the Cold Water Pool in Millerton Lake	5
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12	Fall-run Captive Rearing Study – Year 3	12
13	Levee Geotechnical Exploration	13
14	Central Valley Steelhead Monitoring Plan	14
15	San Joaquin River PIT Tag Monitoring and Site-specific Technology Development	15
	Sturgeon Passage and Occurrence	16 (Removed study)
16	Floodplain Quality	17
17	Bed Material Data Processing and Evaluation	18
18	Continuous Surrogate Measurement of Bedload Sediment Transport using Hydrophone Installations on the San Joaquin River, California	19
19	Two-Dimensional Temperature Modeling of Gravel Pits in Reach 1A	20
20	Adult Passage	- (Added study)
	Water Quality	21 (Removed study)
21	USGS Sediment Monitoring	22
22	USGS San Joaquin River Tributary Sediment and Geomorphology Study	23
23	Vegetation Monitoring	24
24	Additional Water Level Recorders	- (Added study)
25	Monitoring Cross-Section Resurveys	- (Added study)
26	Effect of Altered Flow Regime on Channel Morphology in Reach 1A	- (Added study)
27	Effect of Scour and Deposition on Incubation Habitat in Reach 1A	- (Added study)
28	Reach 1A Spawning Area Bed Mobility	- (Added study)
29	Thermal Conditions in Riverine Pools	- (Added study)

Key:
- = New study since Reclamation Administrator recommendations were prepared.
MAP = Monitoring and Analysis Plan
PIT = passive integrated transponder
USGS = U.S. Geological Survey

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RA 2013 Monitoring and Analysis Plan Recommendations

In accordance with the *Draft Restoration Flow Guidelines* and as illustrated in *Figure 1-1* (Monitoring and Report Schedule) in the *Draft 2013 Monitoring and Analysis Plan* (Draft *MAP*), the Restoration Administrator (RA) is responsible for reviewing the Draft *MAP* prepared by the Program team and submitting comments and recommendations prior to finalizing the *MAP* for the next year. My comments and recommendations are intended to reflect and to be consistent with the requirements set forth in the Settlement, Public Law 111-11, and relevant environmental compliance and permits.

Under my direction, the Technical Advisory Committee (TAC) completed a review of the Draft *MAP* to provide me with comments and suggestions concerning the scope and substance of the monitoring and analysis actions and studies proposed for implementation by the Program next year. I discussed the comments prepared by the TAC with them and, based on those discussions, I am submitting the following comments and recommendations for consideration.

Recommendation Overview

Before offering specific comments and recommendations on the twenty-four actions and studies included in the 2013 *MAP*, I have a several broader observations and recommendations that I hope will provide perspective for the more detailed comments that follow. These general comments and recommendations include the following:

- Each year the format and substance of the *MAP* continues to improve and the Draft 2013 *MAP* is a significant improvement over the 2012 *MAP*. The TAC and I agree that the Program team is on the right trajectory in terms of the planning for long-term monitoring and analyses in compliance with the Settlement, Public Law 111-11 and relevant compliance/regulatory requirements.
- Use of the themes contained in the *Draft Framework for Implementation (Framework)* provides a good organizational tool for the *MAP* studies and use of the thematic organization should help to maintain continuity and track progress for *MAP* activities over the coming years relative to progress achieved toward implementing the *Framework*.
- Inclusion of Figure 2-1 (Monitoring and Analysis Schedule) and Table C-1 (Study Budget) are helpful because they improve the ability of reviewers to understand both timing and the scope of work envisioned for each of the proposed studies.
- In many instances the study descriptions provide more detail than in prior years; however, some of the studies could benefit by providing more information on the purpose and objectives of proposed work. In looking back at the information provided in the 2012 *MAP* the lack of detail made it difficult in several instances to determine whether some 2012 efforts were continuing as a part of any 2013 study proposal.

- An important next step in preparation of study proposals would be to provide more detailed study designs so that outcomes and uncertainties are clearly linked to improved management capabilities, including quantifying uncertainty and articulating how uncertainty in study results would be used in decision making. Improved study designs would help to shift the focus of the ATR reporting process from documentation to data analysis, communication and sharing. We see the 2013 *MAP* as the starting point in a transition to a *MAP* and ATR approach that makes it easier to operate in an adaptive management mode.
- An explanation of the transition from the 2012 *MAP* (54 studies considered) to the draft 2013 *MAP* (24 studies) would benefit by adding a flow chart or table to illustrate how the 2013 studies relate to the 2012 *MAP* studies. For instance, the summary could explain which of the 2012 *MAP* studies were completed, continued or deleted in the 2013 *MAP*. From year to year, such a transition summary would be useful in demonstrating continuity and linkages among monitoring and analysis efforts over time.
- Based on the Draft ATR for each preceding year, a summary of progress on studies that either were initiated or were continuing during the prior year would be helpful so that reviewers were able to understand what had been accomplished and what was incomplete.
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- The Draft 2013 *MAP* does not address my 2012 *MAP* recommendation to complete four "study plans" during 2012 to coordinate proposed individual *MAP* studies. My recommendation reflected the TAC conclusion that certain studies would be more productive if coordinated monitoring and analyses were conducted under the umbrella of a broader study approach (see 2012 RA *MAP* Recommendations, Table 4). The study plans I recommended for completion during 2012 included approaches for: (a) quantifying physical habitat as a function of flow; (b) predation management; (c) spawning gravel quality; and (d) long-term juvenile salmon survival and migration. I continue to recommend that these study plans be prepared this year for the benefit of relevant 2013 *MAP* studies.
- Finally, the overall Program approach to determining future amount and location of floodplain habitat capable of supporting the target salmon population is premised on the adequacy of Reach 1 to support juveniles. Question: Is the conclusion that Reach 1 contains sufficient habitat based on an adequate assessment of food supply capability in Reach 1?

Specific RA Recommendations

With the preceding general observations and recommendations in mind, I am submitting the following specific comments and recommendations relating to the twenty-four proposed studies and actions included in the Draft 2013 *MAP*. The recommendations and comments included below also are transmitted based on my consultation with TAC members; however, as is normally the case, these recommendations do not necessarily reflect the opinion of all TAC members.

Study #1 – Flow Gage Record Analysis

Category	*Sub Category*
Program Actions and Studies	*Flow Management*

Study Objective: To inform efforts to achieve the requirement to meet Gravelly Ford target flows and the possible need to acquire and release purchased water to make up for Unexpected Seepage Losses.

This study will use 2012 flow gage data for each reach to quantify seepage losses between reaches. However, this study also appears to have the potential to inform seepage management and reduce current limitations on restoration flows imposed because of seepage. Therefore, this study should be more clearly linked to Studies 2, 3, and 4 as part of a "study plan" that also is tied into the Seepage Management Plan. In addition, this study description concludes with the statement, "If flood releases are made, losses will be computed separately as an opportunity to learn how the system operates under flood conditions." This element of the study should be more clearly articulated and it should describe any implications for seepage management.

Study #2 – Lateral Gradient of Water Table

Category	*Sub Category*
Program Actions and Studies	*Conveyance*

Study Objective: To inform understanding of lateral extent of influence from surface water flow in Reach 4A on the near river shallow groundwater system response; relationships of surface water flows to other groundwater influences, including rainfall, irrigation of fields, and canal conveyance facilities; and changes in the soil salinity profile and the movement of salts from different sources.

Prior to implementation, I suggest that this study be addressed as part of a broader study plan that:

- Provides clearer links to Studies 1, 3, and 4;
- Describes the approach to addressing the uncertainty of results;
- Identifies timeline and duration of study tasks, including translation to seepage management thresholds; and
- Describes linkages to implementation standards so that we understand when and how findings from this study will allow changes in seepage management thresholds.

Study #3 – Changes in Soil Salinity Conditions Resulting from Interim Flows

Category	*Sub Category*
Program Actions and Studies	*Conveyance*

Study Objective: To establish baseline soil salinity levels for seepage-prone areas, and quantify salinity changes over time so that the presence of shallow groundwater during Interim Flows may be understood in relation to existing conditions.

Prior to implementation, I suggest that this study be addressed as part of a broader study plan that:

- Provides clearer links with Studies 1, 2, and 4;
- Describes approach to uncertainty of results;
- Describes how results will be translated into elimination of constraints to the release of restoration flows when salinity represents background conditions unrelated to Interim Flows; and
- Describes linkages to implementation standards so that we understand when and how findings from this study will allow changes in seepage management thresholds.

Study #4 – Influence of Paleochannels on Seepage

Category	*Sub Category*
Program Actions and Studies	*Conveyance*

Study Objective: To provide an appropriate methodology to identify shallow soil texture differences and seepage, and to determine approximate locations of sand stringers along the San Joaquin River, their depths and widths, how they may influence seepage from the SJRRP, and potential design considerations when developing conveyance projects in these areas.

Prior to implementation, I suggest that this study be addressed as part of a broader study plan that:

- Provides a clearer link with Studies 1, 2, and 3;
- Describes approach to uncertainty of results;
- Describes how results will be translated into elimination of constraints to the release of restoration flows and used in design of conveyance projects; and
- Describes linkages to implementation standards so that we understand when and how findings from this study will allow changes in seepage management thresholds.

Study #5 – Temperature Monitoring of the Cold Water Pool in Millerton Lake

Category	*Sub Category*
Program Actions and Studies	*Flow Management*

Study Objective: To evaluate the relative importance of the various factors that combine to produce observed stream temperatures, to evaluate the impact of new flow schedules anticipated by the SJRRP on stream temperatures, to inform decisions regarding methods for Chinook salmon reintroduction that could reduce thermal impacts, and to assist the SJRRP in making recommendations on specific actions relating to adaptive management of the SJRRP.

This monitoring activity should be linked with a more robust analysis of all the data collected on this issue to help focus on next steps. It needs a stronger technical foundation based on analysis of temperature data to date.

Study #6 – Trap and Haul of Adult Fall Run Chinook

Category	*Sub Category*
Program Actions and Studies	*Fish Passage, Fish Reintroduction*

Study Objective: To develop protocols to achieve successful trap and haul of adult salmon in order to achieve the restoration goal of reintroducing salmon in a timely manner.

This study is needed to help fill an important knowledge gap, so I recommend leveraging as much as possible from this study. To maximize the likelihood of adequate numbers of study fish, adult fall run Salmon for the translocation should be collected at the following locations: 1) downstream of the Hills Ferry Barrier, 2) upstream of the Hills Ferry Barrier, and locations in 3) Mud Slough and 4) Salt slough. Collection should be initiated at some point (TBD) around the mid-point of the run in order to avoid capturing the more productive, early spawning fish.

Collection should be initiated in all locations simultaneously and continue until the total number of fish (at a 50/50 sex ratio) approved for use in the study has been collected (approval to occur as a function of safe take from the Merced based on projected returns). Once the approved number of fish has been obtained, trapping downstream of the Hills Ferry Barrier could cease. Trapping in the three other locations, for fish otherwise "lost" to the system could continue, however, through the duration of the run. Fish trapped in other locations, subsequent to the study target being met, may be released in the SJR as additions to the study sample group, or "rescued"/ released downstream of the Hills Ferry Barrier and Merced confluence. Decision about fish release location could be determined on a case by case basis, based on run estimates, etc.

As mentioned above, the number of fish available for research should initially be calculated as a percentage of the estimated returns/ run size. Percentages should be in relation to total return and may decrease in steps associated with ranges of total returns, (see example provided by TAC) including a

minimum total return number below which no fish will be available for research. In the case where run size is not a limiting factor, a maximum number of fish for use in research should be established based on maximum capacity for trapping and transport given existing resources. The research design should be scaled to match the range of potential available study fish, for each of the return size associated steps/ target numbers, in such a way as to a) optimize study design for statistical rigor/ significance of findings and b) allocate sample fish to higher priority research components first, in the case where there are not an adequate number of fish to accomplish all proposed components of the research plan.

Once adult returns begin to appear in the river, initial return estimates should be ground- truthed against actual numbers, at which point, return estimates may be adjusted. This could in-turn result in adjustments (in either direction/ in accordance with the scaled system) to the number of fish available for the study. In order to maximize the opportunity provided by the translocated fish, several other potential studies should be coupled with this effort including:

1. Artificial spawning of a subset (percentage TBD) of translocated adults and streamside rearing of juveniles should, in addition to supporting egg studies, also support/ facilitate juvenile PIT tagging and downstream tracking study upon release.

2. Pilot juvenile trap and haul program designed to accomplish the discrete but complimentary goals of a) testing the efficacy of juvenile trap and haul, including different trapping methodologies, trapping locations, etc. and b) providing passage to juvenile fish further downstream to create the potential for outmigration success and associated tracking/ data collection through downstream reaches.

If possible, this study should also be used to help determine whether there is capacity in the pilot hatchery to hold and rear fry and smolts for experimental purposes. Results of studies in the ATR showed problems of reduced egg viability. Need to identify the problems and test solutions to ensure good egg hatching when this is done with spring-run. This should also be linked with collection and release of adult fall-run into upstream habitat to test migration rate and spawning site selection.

Study #7 – Juvenile Salmon Holding - No RA Comments

Study #8 – Egg Survival (Fall 2012)

Category	*Sub Category*
Program Actions and Studies	*Spawning and Incubation*

Study Objective: To determine egg survival under current spawning conditions, to indicate the relationship between egg survival and several environmental parameters, to provide the Program with critical information on the suitability of spawning habitat for egg survival, and to help the FMWG make decisions on how to best manage and/or recommend restoration actions in the perceived spawning areas in the Restoration Area.

I suggest that this study consider plotting measured survival from this year's study against computed survival from Tappel and Bjornn to see if the favorable relationship from 2012 is consistent.

Study #9 – Fish Assemblage Inventory and Monitoring

Category	*Sub Category*
Monitoring Status and Trends	*N/A*

Study Objective: To Inventory and monitor fish communities within the five reaches of the Restoration Area to provide baseline data of fish assemblages present during quarterly field samplings and to evaluate the long-term efforts of the Restoration Program.

This study was also done last year and appears to focus on fish assemblages, not population estimates. It seems like a lot of effort and cost ($500k) to not get population estimates in different reaches and mesohabitats. This study should more clearly describe how this study will be used to inform fish population comparisons in the future. If it is simply species presence/absence, it seems like there is a much cheaper way of doing it. If it is population estimates, then this study won't get us there. It would help if there was better explanation of how this study will help us evaluate if the "fish in good condition" criteria are being met (individual, population, community).

Study #10 – Juvenile Survival and Migration (year 3 – telemetry)

Category	*Sub Category*
Program Actions and Studies	*Predation*

Study Objective: To determine Reach specific survival rates, migration rates, and route selection of fish released below Friant Dam, and (if the river does not have connectivity) at the uppermost end of the downstream connected river. Also, to determine survival rates, and migration rates through the mine pit reach of the Restoration Area.

This study would benefit from more detailed objectives. Additionally, this study should be integrated with a juvenile trap and haul pilot study to: a) increase distance over which fish can be tracked/survival estimated; and b) test feasibility of juvenile trap and haul, and optimal design. This latter will be critical given the high likelihood of the need for juvenile trap and haul in order to support successful outmigration for the duration of the period where downstream connectivity/passage remains an issue, as well as in low water years even after passage/connectivity issues have been resolved. Further, this study needs to be linked to results of last year's PIT tagging. Investigators should work closely with the RA and TAC in study design and interim flow management to link to specific study objectives. Finally, this study should answer whether or not a pit tag array works for fish in the 40-80mm range. Otherwise, acoustic tags and 100 mm fish will be required.

Study #11 – Assessment of Predator Abundance and Distribution in Mine Pit Habitat in the San Joaquin River Restoration Area (ongoing)

Category	*Sub Category*
Program Actions and Studies	*Predation*

Study Objective: To develop predator species distribution, richness and abundance estimates in the mine pit habitat in the Restoration Area, to determine if predator populations move across mine pits, or maintain resident populations within each mine pit, to characterize the available predator habitat, temperature, depth, water clarity, etc. regime in existing mine pits in the Restoration area to assess predator habitat suitability and prioritize mine pits for restoration, to use the above information to develop a prioritization ranking of existing mine pits for restoration actions, and to determine predation rates on tagged juvenile salmon.

This study should be integrated with an overall predator assessment plan for program. In addition, this study should include a review of similar efforts on San Joaquin River tributaries for useful findings and lessons learned about study methods.

Study #12 – Fall-run Captive Rearing Study – Year 3

Category	*Sub Category*
Program Actions and Studies	*Fish Passage, Fish Reintroduction*

Study Objective: To continue Interim Facility development, practice tracking ova development, continue to practice growth rate modulation, and cryopreserve semen from Jacks. In addition, to introduce a second group of either spring- or fall-run Chinook

Captive rearing should include fall run fish as well as spring run fish. If adequate conservation hatchery facility space is not available for captive rearing of fall run at or near the existing hatchery then captive rearing should include net-pen or some other streamside captive rearing, beginning in early 2013, so as to not lose the opportunity for research and critical data on outmigrating juveniles. Further, this study should identify whether any of the captive fall-run been successfully spawned and the viability of eggs and fry from past rearing.

Study #13 – Levee Geotechnical Exploration

Category	*Sub Category*
Program Actions and Studies	*Conveyance*

Study Objective: To catalog geotechnical characteristics throughout the levee system and allow more informed decisions on the release of restoration flows. Secondarily, to inform future evaluation and design of potential remediation measures to safely convey Restoration flows.

This study should be coordinated with Studies 1, 2, 3, and 4, especially as it pertains to decision-making about restoration flows. In addition, investigators should provide rationale and objectives of focusing on impacted levee lengths at 2,000 cfs (as opposed to other flows). Finally, this study should supplement previous years' ground surveys (last documented in 2012 Midyear ATR Report #12) with actual seepage monitoring at problem sites in Reach 2B at flows of 810 cfs.

Study #14 – Central Valley Steelhead Monitoring Plan

Category	*Sub Category*
Environmental Compliance	*N/A*

Study Objective: To monitor for adult CV Steelhead on the San Joaquin River from Sack Dam to the Merced River confluence and to relocate CV steelhead to more suitable habitat below the confluence of the Merced River.

This is an expensive study without a clear linkage to key knowledge gaps and Spring run reintroduction. Is this study necessary to address a permit requirement?

Study #15 – San Joaquin River PIT Tag Monitoring and Site-specific Technology Development

Category	*Sub Category*
Monitoring Status and Trends	*N/A*

Study Objective: To design effective flat plate PIT tag arrays and low profile antennae that can be used at structures and within the river where recreationists and debris can freely float over them without incidence, to determine migration scenarios with the greatest survival for a variety of flow conditions and water year types, and to identify locations with high predation and fish losses.

This study should indicate whether a pit tag array works for fish in the 40-80mm range. Otherwise, acoustic tags and 100 mm fish will be required.

Study #16 – Sturgeon Passage and Occurrence in the San Joaquin River Restoration Area

Category	*Sub Category*
Program Actions and Studies	*Fish Passage*

Study Objective: To review information on historical and present occurrence of white and green sturgeon within the Restoration Area, document habitats within the Restoration reaches that sturgeon would travel if instream barriers permitted them, determine if sturgeon utilize bypasses, identify life-cycle requirements in the Restoration Area and the time of year and frequency between years of river use, and develop a range of scenarios to aid management decisions on sturgeon use in the Restoration Area.

Consider deprioritizing or eliminating this study given that white sturgeon are: a) difficult to study; b) already known to occur in the system and recently sighted; and c) already being incorporated into

designs for passage. Additionally, white sturgeon behavior will likely change significantly once full consistent restoration flows are achieved, habitat is upgraded, and passage impediments are removed/ bypassed. With that in mind, current behavior of white sturgeon in the Restoration Area is probably not a good indicator of future behavior and would not be an adequate basis for design alterations. Instead, given existing evidence of past and present occurrence in the system, design should simply move forward accounting for sturgeon passage.

Study #17 – Floodplain Quality

Category	*Sub Category*
Program Actions and Studies	*Rearing Habitat*

Study Objective: To increase the confidence in the previous SRH-2D simulations of fish floodplain habitat. The field surveys of the habitat will also provide information for the revegetation and floodplain designs that are ongoing in Reaches 2B and 4B1.

There is a need to explain how this study fits within the ongoing floodplain habitat needs assessment that is nearing completion and to relate the study to the specific floodplain design processes for the Reach 2B/Mendota Pool Bypass and Reach 4B/Eastside Bypass/Mariposa Bypass projects. To that end, I suggest that this study provide for a more robust second phase that:

- further defines and identifies suitable rearing habitat considering habitat distance from channel, temperature, connectivity with channel, and duration of inundation as criteria;
- assigns a productivity value to shallow/productivity habitat based on duration of inundation and factors in changes to the habitat suitability score for rearing habitat adjacent to the productivity habitat; and
- incorporates into ESHE a floodplain trajectory (with several sub trajectories within it) that increases growth and survival, disperses fish, slows outmigration, and increases diversity in the range of size and timing of outmigration.

All of these additions should be equally prioritized with the development of cover as a habitat criteria (if not prioritized above cover).

Additionally, cover and other habitat suitability criteria should be consistent throughout the project and between reach 2b and 4b efforts and habitat modeling. This study or future related studies should also begin to evaluate invertebrate (or other food) production to get a better understanding of biological processes contributing to food supply (March time frame) and incremental contribution of floodplain inundation on downstream water temperatures (April timeframe).

Study #18 – Bed Material Data Processing and Evaluation

Category	*Sub Category*
Program Actions and Studies	*Spawning and Incubation*

Study Objective: To inform the program on how the bed material gradations and sand content within the bed have changed over the last 3 years, provide evidence to support mobilization, sand storage, and spawning gravel quality studies, detect evidence of change in the gravel-sized gradation and percent of fine sands, and, ultimately, to manage sediment within Reach 1 and evaluate the objectives outlined in the Sediment Management Plan as well as to inform future modeling activities.

The potential to achieve these study objectives appears to be very low for several reasons, including:

- Interim Flows in the next few years will not been high enough to induce significant geomorphic change.
- There have been no mechanical gravel cleaning efforts and no change in fine sediment supply.
- The sampling scheme employed in 2009 was a reconnaissance-level survey, and was not rigorous enough to detect changes over time, even if changes had occurred since 2009.

Therefore, I recommend that the resources devoted to this effort should be used to develop a thorough summary of available gravel size information, summarize expected spawner distribution given gravel resources and water temperatures, and to draft a study plan to assess gravel quality in Reach 1A. I also recommend a discussion with the RA and TAC about whether detecting changes in bed sediment characteristics should be a priority, or whether ongoing analyses of existing gravel quality and associated limits on smolt production might be more useful and facilitate development of an augmentation and/or rehabilitation plan to remedy gravel quality problems, including addressing upstream fine sediment sources.

Regardless of the final scope of this study, it should be integrated with the translocation of adult fall run Chinook. Spawning site selection and distribution should be modeled as a function of substrate, temp, and surface/ hyporheic flow dynamics, and results compared with spawning site selection/ red distribution from translocated fall run adults (assuming adequate numbers).

Study #19 – Continuous Surrogate Measurement of Bedload Sediment Transport using Hydrophone Installations on the San Joaquin River, California

Category	*Sub Category*
Monitoring Status and Trends	*N/A*

Study Objective: To evaluate the use of hydrophone stations for estimating coarse bedload sediment transport dynamics at high temporal resolutions (e.g. hourly or finer) on the mainstem San Joaquin River downstream of Friant Dam for water years 2013 and 201 and to spatially locate bedload movement within the stream, using calibrated time-of-travel techniques.

I recommend focusing this experiment on Cottonwood Creek rather than Little Dry creek because Cottonwood creek fine bedload contribution is delivered directly into the San Joaquin, and at the primary spawning location for spring run and fall run Chinook salmon. I also recommend considering adding the Ledger Island site, since this is where previous bedload sampling occurred in 2011, where additional sampling should occur, and because it is in the primary spawning reach. Finally, I recommend that all bedload sampling efforts be moved to relevant upstream reaches. Based on TAC input, I question the contribution to achieving Program goals that would result by conducting bedload sampling from Highway 41 downstream.

Study #20 – Two-Dimensional Temperature Modeling of Gravel Pits in Reach 1A

Category	*Sub Category*
Program Actions and Studies	*Predation*

Study Objective: To develop a tool that can be utilized by Program managers to assist in identifying which gravel pits are most negatively influencing water temperature. Additionally, in combination with water temperature monitoring, to discern the existence of patterns between temperature, hydraulic conditions, and predation.

This study is pertinent to the goals of the Program but needs to be guided by overall predator evaluation study plan, as noted in my general comments/recommendations. The recommended study plan should cite any data or documentation supporting the need for more side channel rearing habitat in Reach 1.

Study #21 – Water Quality and Fish

Category	*Sub Category*
Environmental Compliance	*N/A*

Study Objective: To add to and improve on previous water quality reports.

This environmental compliance monitoring needs to be addressed in a manner where past results are used to revise future monitoring activities. This capability will satisfy regulatory compliance requirements and it will improve data collection with respect to Program goals and long-term adaptive management. Water quality monitoring results from previous years should be critically reviewed in context with biological thresholds established from the literature. Concentration thresholds for all monitored parameters should be developed for a) different life stages and b) invertebrate food base and used to determine when and where water quality problems exist. For those parameters that have remained stable or are well below levels of concern, I recommend deleting or reducing sampling frequency. In addition, constituents should also be identified where grab sampling is not adequate to establish a dose response. Finally, a response protocol/adaptive management plan/ process should be outlined as part of this study in the event that water quality parameters exceed established thresholds.

Study #22 – USGS Sediment Monitoring, and
Study #23 - USGS San Joaquin River Tributary Sediment and Geomorphology Study

Category	*Sub Category*
Monitoring Status and Trends	*N/A*

Study Objective: To continue ongoing sediment monitoring program to develop overall sediment budget for the Program (Study 22) and to quantify the sediment input from two major tributaries, Cottonwood Creek and Little Dry Creek (Study 23).

These studies are needed; however, I recommend that these studies transition to a threshold-based monitoring approach so that Program resources are focused only on flows expected to exceed sediment mobility thresholds and are not used to sample low flow conditions. The study designs should also be more specific about the selection of stations and their relevance to the Restoration Goal. I also recommend that the investigators engage the RA and TAC in a discussion of the topographic methods proposed for this study and potential challenges associated with applying these methods on Cottonwood Creek, as there is no sediment delta there and sediment transport measurements might be required in this location. Topographic monitoring should also be explained in more detail for Little Dry Creek.

In addition, last year's results from these studies showed reduced egg viability as a function of exposure to elevated interstitial water temperatures. This is a major finding and it warrants higher priority and more investigation. These studies need to address egg incubation conditions in potential spawning areas in September and October. The response of interstitial temperature to reservoir release flow rates and temperatures also needs further investigation and analysis. I recommend considering expansion of these studies (or development of a complimentary study) to incorporate consideration of the risk of direct predation on eggs by crayfish and other predators into egg survival estimates.

Study #24 – Vegetation Monitoring

Category	*Sub Category*
Monitoring Status and Trends	*N/A*

Study Objective: To provide riparian vegetation recruitment and survival data to inform Friant Dam flow scheduling, detect spread of invasive species which inhibit establishment of native vegetation, and understand how changes in vegetation may affect O&M needs to maintain flood control capacity.

This study could provide information pertinent to the Program, provided that baseline vegetation conditions in all reaches have been well documented. I recommend modifying the long term plan for this study to include sampling less frequently than every year (e.g. every five years or after significant flows such as a wet year that included implementing Riparian Recruitment Flows) and more targeted sampling (e.g. of recruitment on previously identified geomorphic surfaces with high riparian vegetation recruitment potential). This study should also explain the justification for including sampling in the Chowchilla Bypass.