

## Appendix B

# Restoration Administrator Recommendations for 2012 Priority Monitoring and Assessment Actions

## Final 2012 Monitoring and Analysis Plan





# ***San Joaquin River Restoration Program Restoration Administrator***

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## **Memorandum**

Date: August 31, 2011

To: Erin Rice and Dave Mooney - USBR  
cc. Bill Luce, Monty Schmitt, Ali Forsythe, Kevin Faulkenberry, Robert Clarke  
Rhonda Reed, Gerald Hatler, Scott McBain, Chuck Hanson

From: Rod Meade – Restoration Administrator

Subject: RA Recommendation for 2012 Priority Monitoring and Assessment Actions

This memorandum conveys my recommendations regarding SJRRP monitoring and assessment actions that should be considered in developing the final *2012 Monitoring and Assessment Plan (2012 MAP)*. My recommendations include monitoring and assessment actions, along with study plans recommended to be completed during 2012 to prepare for important monitoring and assessment actions in future years. I also identify several monitoring and assessment actions that are not recommended for the *2012 MAP* but should receive ongoing consideration for completion in future years. Specific recommendations are contained in the Attachments to this memorandum and consist of five (5) tabular summaries that identify the study title, study description and rationale for recommending the action and its relative priority rating (see Attachments, Tables 1 through 5).

## **Background**

In February 2009 the TAC prepared *Recommendations on Monitoring and Evaluating Interim Flows to the Upper San Joaquin River* as recommendations to the RA (see Deister and Meade, February 2009). The 2009 TAC recommendations were designed to achieve three objectives: (1) identify processes needed to refine annual Interim Flow and Restoration Flow releases; (2) identify short-term monitoring, modeling and studies needed to address specific areas of uncertainty in implementing required actions of the Settlement; and (3) identify baseline monitoring needed to document and refine management objectives as well as assess the ecological and hydrologic responses to Interim Flow releases. The TAC report included thirty-one monitoring, study and assessment recommendations relating to hydrology and hydraulics, water quality, fisheries, geomorphology and riparian vegetation.

Since I submitted the 2009 TAC recommendations to the Program Manager in February 2009, the TAC has continued to reconsider and update its 2009 recommendations and provided advice to me as I prepared Interim Flow Program recommendations for 2009, 2010 and 2011. In 2011 the TAC continued to update its monitoring recommendations through preparation of a Priority Information Needs Matrix and recommendations to support the recommendations contained in my *2011 Interim Flow Program Real-time Management Recommendations* (Meade, April 2011). The TAC efforts in 2011 also focused on developing recommendations for priority information needs to support my preparation of monitoring and assessment recommendations for transmittal to the SJRRP for consideration in the *2012 MAP*.

Recommendations contained in the attached tables reflect monitoring, studies, and study plans currently or previously recommended by the agencies, the FMWG and the TAC. My recommendations reflect consultation with the TAC and Implementing Agencies through the spring and summer of 2011 during discussions of priority information needs. The TAC developed a matrix of priority information needs early in 2011 and requested input from the Implementing Agencies and FMWG. The TAC then revised the matrix to reflect initial comments received. The FMWG subsequently prepared its list of priority information needs for 2012, and discussed their priority information needs with the TAC during the August 2011 TAC meeting. Due to the improved consultation involving the FMWG and the RA/TAC, the recommended 2012 studies developed by the FMWG and TAC are largely complementary, and the RA concluded that it would be inefficient to prepare write-ups of recommendations that were largely identical to those prepared by the FMWG.

## **RA Recommended Monitoring and Assessment Recommendations**

### **High Priority Monitoring and Assessment Actions Recommended to Be Conducted in 2012**

As those familiar with the challenges facing the SJRRP know, the program information needs are great but budget and staffing resources are finite. Therefore, to assist the SJRRP in finalizing its *2012 MAP*, I have organized my recommendations in the following manner. First, I recommend high priority monitoring and assessment actions that should be conducted and reasonably can be expected to be completed during 2012, using the following four priority criteria:

- Priority 1 Criteria: Monitoring and assessment activities needed in 2012 to support the spring-run Chinook salmon reintroduction application, other regulatory approval applications (e.g., SWAMP) or legislation requirements (e.g., seepage impact monitoring).
- Priority 2 Criteria: Activities needed to support core monitoring and assessment that are either needed to sustain studies already in progress (e.g. salmon survival study) or need to be initiated during 2012 and sustained in future years to provide ongoing data for baseline and long-term monitoring purposes to enable the SJRRP to demonstrate achievement of quantitative objectives and whether progress is being achieved to implement the Restoration Goal.
- Priority 3 Criteria: Monitoring and assessment activities not already addressed as part of Priority 1 and 2 actions that are needed during 2012 to inform RA Recommendations and consultation required by Settlement (e.g., interim/restoration flows, Paragraph 11 and Paragraph 12 actions).
- Priority 4 Criteria: Some lower priority actions would be most effectively conducted in future years if preceded by completion of an integrated study plan to guide implementation and could involve combining individual but related monitoring/assessment actions now being considered, including actions identified as lower priority.

The recommendations addressing these priority criteria are contained in Tables 1 through 4 in the Attachments to my Recommendation (see Attachments, Tables 1 through 4). Each of the attached tables includes a study title, recommendation summary and brief rationale that links the study to the

applicable priority criterion. An effort has been made to organize the tabular summaries according to priority criteria, with each table addressing actions relating to the same priority criterion. Table 1 includes nine (9) actions that are based on Priority 1 Criteria; Table 2 includes five (5) actions based on Priority 2 Criteria; Table 3 includes nine (9) actions based on Priority 3 Criteria and Table 4 includes completion of four study plans. A total of twenty-three (23) monitoring and assessment actions are recommended for completion during 2012, along with the four (4) study plans; however, completion of all nine (9) of the Criteria 3 actions (Table 3) may not be possible due to budget and staff resource constraints. In the event that additional decisions need to be made with respect to prioritizing those actions included in Table 3, I am available, with the support of the TAC, to provide additional consultation.

The development of study plans and experimental designs for elements presented in Table 4 will be important over the long term to program development, including identification of additional monitoring that should be considered for 2013. Because these study plans represent a relatively low cost and staff commitment, and because of the long-term benefits associated with completing these study plans, I recommend that they be completed during 2012.

#### **Other RA Monitoring and Assessment Recommendations**

Other monitoring and assessment actions are not recommended as priorities for 2012. These future actions are related to Priority 5 Criteria (see Table 5).

Priority 5 Criteria: Lower priority monitoring and assessment actions that are not recommended as priorities for implementation during 2012 but should be identified for re-evaluation after completion of integrated study plans or as new information or changing conditions indicate that such action should be implemented during 2013 or subsequent years.

Sixteen (16) actions are included in Table 5 as lower priority efforts that should be re-evaluated next year to determine if a change in priority should be considered.

#### **Conclusions**

It should be noted that other Implementing Agency monitoring, studies, planning, and/or design efforts either are or will be proceeding independent of the actions contained in the *2012 MAP* and my recommendations are not intended to affect those efforts.

The design and implementation of the *2012 MAP* will depend on a variety of factors including the availability of financial and personnel resources. The RA recommendations for priority elements of the monitoring program outlined above are intended to provide guidance in the selection of potential monitoring elements that were considered by the TAC and RA to have the greatest benefits to the restoration program at this time. As noted above, these priorities are expected to change over time as new information becomes available, as conditions on and adjacent to the mainstem channel change and as various components of the restoration program are implemented.

My recommendations for the *2012 MAP* include all of those actions identified as meeting priority 1 through priority 4 criteria (see attached Tables 1 through 4). Depending on available program funding

and staff resources, all priority 3 actions (Table 3) may not be selected for funding in 2012. Because the actions contained in Table 3 are not ranked, in the event that funding and staffing constraints require decisions affecting implementation of actions contained in Table 3, I and the TAC will be available to discuss prioritization of specific actions contained in Table 3 if Reclamation should desire such consultation. Actions contained in Table 5 are not recommended as priorities by the RA to be part of the 2012 MAP; however, those actions will in many cases become priorities in 2013 and future years.

Thank you for this opportunity to participate in preparation of the 2012 MAP. I look forward to our meeting on September 8 when we will have an opportunity to meet and discuss the overall recommendations that you are receiving from SJRRP participants.

**Attachments:**

- Table 1: Priority Criteria 1 Monitoring/Assessment Actions Required to Address 2012 Regulatory and Legislative Requirements
- Table 2: Priority Criteria 2 Monitoring/Assessment Actions to be Initiated/Continued in 2012 to Addressing Long-term Core Information Needs
- Table 3: Priority Criteria 3 Monitoring/Assessment Actions Needed to Support RA Recommendations Required by the Settlement During 2012
- Table 4: Priority Criteria 4 Monitoring/Assessment Study Plans that Should Be Completed During 2012 in Preparation for Consideration for Implementation in 2013 or Subsequent Years
- Table 5: Priority Criteria 5 Lower Priority Monitoring/Assessment Actions for Continuing Consideration and Implementation

## ATTACHMENTS

**Table 1. Priority Criteria 1 Monitoring and Assessment Actions Required to Address 2012 Regulatory and Legislative Requirements.**

Study title	Summary of Recommendations	Rationale w/respect to criteria
Continue real-time flow monitoring	Continue existing real-time flow monitoring network, compare flow gains and losses with those assumed in Settlement Exhibit B. The TAC/RA recommends that this element of the 2012 study program receive high priority.	Required for program implementation and management.
Continue groundwater and seepage monitoring	Continue existing groundwater and seepage monitoring network, consider retiring monitoring stations that have been found to be insensitive to flow management actions. The TAC/RA recommends that this element of the 2012 study program receive high priority.	Required for program implementation and management.
Continue water quality monitoring	Continue water quality monitoring as required by the State Water Resources Control Board permit (e.g., SWAMP monitoring). The TAC/RA recommends that this element of the 2012 study program receive high priority.	Required for program implementation and management. Baseline SWAMP benthic macroinvertebrate monitoring is a permit requirement in 2012.
Continue water temperature monitoring	Evaluate 2010 and 2011 water temperature results, re-evaluate 2011 real-time water temperature management objectives and locations, and refine real-time and manually downloaded water temperature monitoring network. The TAC/RA recommends that this element of the 2012 study program receive high priority.	Required for program implementation and management. Water temperature monitoring for use in validating temperature model predictions and assessing habitat conditions for upstream migrating adult and downstream migrating juvenile salmon, rearing habitat, adult holding habitat, spawning and egg incubation conditions is a high priority for 2012. Results of the 2012 temperature monitoring (and earlier results) should be analyzed to determine if future water quality monitoring can be revised and reduced in scope and intensity.
Reintroduction methods testing	Test the ability to successfully collect viable salmon eggs from existing redds located in other watersheds to validate the proposed methods of egg take for spring-run salmon reintroduction. Also demonstrate the ability to successfully transport, deposit, and incubate salmon eggs within Reach 1 spawning gravels by using fall-run eggs for demonstration and refinement of techniques that would be employed for spring-run egg relocation. Similar testing may be done using other salmon life stages. The TAC/RA recommends that this element of the 2012 study program receive high priority.	Required for program implementation and management.

**Table 1. Continued.**

<p>Monitor juvenile salmon outmigration success as a function of SJR flow, Mendota Pool operations, Bifurcation structure operations, and water temperature</p>	<p>Repeat 2011 telemetry study, particularly for a drier water year where predation and other mortality factors may be more pronounced than the 2011 Wet water year. The TAC/RA supports the recommendation that this element of the 2012 study program receive high priority.</p>	<p>Results will be used to evaluate reach-specific juvenile survival as a function of river flow as part of a long-term baseline monitoring element. The proposed survival study in 2012 should use fall-run Chinook salmon. Acoustic tag detection array may need to be refined. Consider additional detectors in the mainstem of the San Joaquin River. Use results of 2011 and 2012 to develop reach-specific survival estimates and identify areas for more intensive monitoring.</p>
<p>Captive Rearing Program testing</p>	<p>The San Joaquin River Restoration Program (Program) is developing a captive rearing program that is anticipated to provide the bulk of the founding population for river restoration. The San Joaquin Salmon Conservation and Research Facility (Conservation Facility) is scheduled for completion in May 2014. During facility planning and construction, a modest interim facility has been developed to help refine techniques and protocols for rearing Chinook salmon through adulthood and provide a surrogate facility to help meet reintroduction timelines during full-scale facility development. The TAC/RA supports the recommendation that this element of the 2012 study program receive high priority.</p>	<p>Required for spring-run Chinook salmon reintroduction implementation and management. Provide a source of salmon for use in reintroduction as well as testing and monitoring.</p>
<p>Collection/transport from source stocks</p>	<p>Conduct assessment of collection and transportation methods of each life stage from potential donor streams (e.g., Feather River) or other streams (e.g., Merced River). Initial assessments likely to involve only fall run. The TAC/RA supports the recommendation that this element of the 2012 study program receive high priority.</p>	<p>The collection and successful transport of spring-run Chinook salmon from the donor stock location (assumed in this study to be the Feather River Fish Hatchery) to the San Joaquin River is a key element of the reintroduction program. There is considerable experience in the transport of various life stages of Chinook salmon within the Central Valley that should be used as the basis for this demonstration test. This test element can be combined with other studies (marking, genetics, and health assessment) to provide a more comprehensive investigation of potential transport of the donor stock.</p>



**Table 1. Continued.**

<p>Fish health assessments from source stocks</p>	<p>Conduct tissue sample collection from donors prior to transport, refine quarantine procedures, analysis of tissues as required by state agencies for inter-basin fish transfers, and associated pathology testing. The TAC/RA supports the recommendation that this element of the 2012 study program receive high priority.</p>	<p>The proposed fish health assessment is an important element of the reintroduction strategy. Extensive information is available from the CDFG and USFWS fish pathology laboratories as well as CDFG fishery management within the Central Valley that would form the basis for the initial elements of this assessment. It is recommended that information from these existing sources be compiled and synthesized in 2012. Existing data on the health and condition of spring-run Chinook from the potential donor stocks should also be assembled. Fish health sampling within potential donor stocks is not recommended in 2012. A study plan (priority 4) should be developed that integrates the existing information on fish health and disease management (including inter-basin transport) into a study that identifies the types of additional information that would be needed to support the reintroduction permit be deferred to a later date.</p>
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**Table 2. Priority Criteria 2 Monitoring and Assessment Actions to be Initiated or Continued in 2012 to Address Long-term Core Information Needs.**

Study title	Summary of Recommendations	Rationale w/respect to criteria
Define high quality floodplain rearing habitat	Develop conceptual model, illustrative examples, and/or quantitative criteria that define desirable floodplain rearing habitat (flood plain rearing habitat is currently poorly or undefined for the gravel bedded reach and downstream sand bedded reaches).	Monitoring element supports core monitoring and assessment and in support of designing restoration actions.
Estimate amount of floodplain rearing habitat needed to meet Restoration Goals	Using the most recent topography and hydraulic models, refine the flow-inundation curves. Update again when the 2-D hydraulic models are completed. Then compare amount of floodplain rearing habitat currently available with that needed during higher escapement (and fry production) years.	Floodplain rearing habitat located along the length of the lower San Joaquin River has been identified as an important factor in achieving the Restoration Goal and in restoration site design (e.g., Reach 2B an 4B). Identification of currently suitable floodplain habitat as a function of river flows will help assess the needs for additional floodplain habitat modification. The location of potentially suitable floodplain rearing habitat will likely be used as one factor in assessing land purchases and environmental easements.
Additional water surface elevation and/or air photos if we get flows at 8,000 cfs in 2012	Survey additional water surface elevation profiles and/or air photos if we get flows at 8,000 cfs in 2012. We have air photos at 5,000 cfs, and perhaps water surface elevations at higher flows. Need to have a contractor lined up in case we get flood control releases in 2012.	There is analytic value to document water surface elevation and inundation over a range of river flows. This study is opportunistic in obtaining photos and surveying water surface elevations if naturally occurring river flows in 2012 exceed 8,000 cfs. Interim Flow releases from Friant Dam will not be made specifically to support this study effort.

**Table 2. Continued.**

<p>Develop an individual based model (IBM) to supplement Ecosystem Diagnosis and Treatment model – Fisheries Models for Site Specific Projects</p>	<p>The FMWG selected a two-tiered approach for developing a quantitative fisheries model that included the Ecosystem Diagnosis and Treatment (EDT) model developed by ICF to provide a life cycle population model framework and the Individual Based Model (IBM), such as the one developed by Lang and Railsback to assess the effectiveness of the Program’s restoration projects (SJRRP 2008, Quantitative Model Section Process TM). The EDT model is a framework that must include individual survival models to evaluate the effects of flow, water temperature, diversions, predation at mine pits, and passage at structures. Conversely, the IBM is very useful for evaluating site-specific effects, but it cannot be expanded to the entire study area. Lang, Railsback &amp; Associates have created multiple IBMs and could modify their inSALMO model to the San Joaquin River Restoration Area. The California Department of Fish and Game (CDFG) is developing a separate model that will evaluate the effects of flow and water temperature in the Restoration Area. Both the IBM models and the DFG models could be incorporated into the EDT framework.</p> <p>The TAC/RA support the recommendation that site-specific IBM be developed for use in assessing habitat conditions, evaluating alternative actions, and to provide a framework for identifying monitoring needs. The TAC/RA recommend that further development of the EDT model framework be deferred pending development of the IBM, additional research on salmon survival, and consideration of alternative population-level lifecycle modeling.</p>	<p>Developing an IBM would provide a framework of prioritizing and analyzing monitoring results as well as evaluating site-specific alternative restoration actions and strategies. Development of IBM is recommended as a priority 2 study element. Expansion and refinement of an existing IBM for salmon (e.g., SALMOD) is preferable to developing new independent IBM. Expansion to the population level using EDT or other population-level models is a low (priority 5) action for 2012 but would be beneficial in the future.</p>
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**Table 2. Continued.**

<p>Real-time temperature monitoring of Millerton Reservoir</p>	<p>Based on the outcome of the 2010 and 2011 comparison between model results and measured results, as well as an evaluation of cold-water pool management options, evaluate whether recovering and re-establishing the second water quality monitoring string is needed, and evaluate whether bi-weekly water temperature profile data reporting is needed to inform cold-water pool management.</p>	<p>Water temperature is expected to be one of the major factors affecting habitat, growth, and survival of Chinook salmon on the San Joaquin River. Restoration priorities, strategies, uncertainties, and interim actions and monitoring are strongly linked to water temperature model predictions. The existing temperature models (reservoir and river) need to be reviewed further and model predictions tested using actual field data. Efforts to improve and refine use of the models in developing management strategies (e.g., seasonal timing and magnitude of releases) need to be validated. The potential use of real-time temperature profiles (using existing stationary monitoring or manual vertical profile measurements, downstream monitoring locations, etc.) should be confirmed as part of model development and implementation. Because of the importance of an accurate and reliable temperature predictions, model refinement and validation is a high priority for 2012.</p>
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**Table 3. Priority Criteria 3 Monitoring and Assessment Actions Needed During 2012 to Support RA Recommendations Required by the Settlement.**

Study title	Summary of Recommendations	Rationale w/respect to criteria
Evaluate cold-water pool and spawning/egg incubation temperatures	Evaluation of 2010-2011 predictions of release temperatures of Millerton Reservoir under Interim Flows compared to predicted values, Extend model time series to 1980-2011, evaluate if refinements to the reservoir temperature model is needed, couple output with SJR river temperature model, evaluate implications to egg survival using appropriate egg survival relationship, and if needed evaluate additional management actions that may help extend the cold-water pool through egg incubation period.	Needed for real time flow management and longer-term evaluation of flow management strategies. Preliminary findings suggest that water temperature during the egg incubation period could be problematic for fry and juvenile production in many years. This element relies on use of the reservoir and river temperature models identified above.
Evaluation of recent predictions of downstream water temperatures	Compare measured 2010 and 2011 water temperatures with SJR model predictions, and with consideration of expected predictive accuracy of water temperature models, evaluate if refinements to the existing temperature model is needed, or whether a new one is needed.	Needed for real time flow management and longer-term evaluation of flow management strategies. This element relies on use of the reservoir and river temperature models identified above under priority 2 tasks.
Real-time water temperature monitoring	Real time water temperature monitoring at USGS Mendota gage and in Fresno Slough (new) or James Bypass (JBP). Continue real-time water temperature monitoring at Delta-Mendota Canal Check 21.	Needed for real time flow management and longer-term evaluation of flow management strategies. This element relies on the reservoir and river temperature models identified above.
Evaluate low flow and high flow juvenile salmon rearing habitat evaluation in bypasses	Evaluate 2010 transects in bypasses and main channel using depth, velocity, and cover to evaluate and compare habitat quality and quantity at representative transects in the main channel and bypasses.	Will inform whether it is beneficial or harmful for juvenile spring-run to be routed through the bypasses versus the mainstem channel, as well as inform the RA on Reach 4B per Paragraph 11(a)(3) and 11(b)(1).
Evaluate adult fish passage at critical riffles in mainstem channel	Supplement ongoing DWR study of fish passage at structures by identifying critical riffles in Reach 2A and 4A, then conduct field reconnaissance to measure depths/velocities to relate flow to fish passage requirements.	With ongoing DWR study, will inform which structures will require modifications, and will inform local flow needs for successful adult migration to Reach 1A.
Evaluate bed mobility thresholds	Expand on DWR study by placing tracer rocks on pool tails, riffles, mid-channel bars, and/or point bars over a wider range of features in Reach 1A. Conduct an inventory of alluvial features in Reach 1A from 2009 aerial photos, classify geomorphic unit, then subsample from these units to get replicates.	Will inform peak flow release magnitude during Wet water years to achieve geomorphic objectives.
Coarse and fine bedload transport at Cottonwood Creek	Conduct bedload sampling on Cottonwood Creek to evaluate amount of fine bedload (sand) input to the river and evaluate with respect to mainstem fine sediment budget.	Will inform peak flow release magnitude and duration during Wet and Normal Wet water years to reduce fine sediment storage in Reach 1A spawning gravels. Will also inform potential fine sediment source control needs.

**Table 3. Continued.**

<p>Predict priority spawning habitat areas for spring-run and fall-run Chinook salmon</p>	<p>Predict spawner distributions for spring-run and fall-run under high and low escapement years to prioritize spawning areas, and help evaluate and prioritize restoration areas in Reach 1A.</p>	<p>The location, areal extent, and quality of suitable spawning gravels in Reach 1 are important factors affecting the carrying capacity of the reach for spawning by both spring-run and fall-run Chinook salmon. Spawning gravel surveys have been performed in the past using various levels of precision and assumptions. Results of this survey will help inform decisions regarding carrying capacity and need for additional spawning gravel augmentation and cleaning.</p>
<p>Evaluate mechanics of Salt and Mud slough temperature drop in spring 2011</p>	<p>Determine the causal mechanism of the 5-10 degree drop in daily average water temperatures in 2010 that appeared to be unrelated to meteorology, and evaluate whether this type of reduction can be achieved via water or land management activity in the future.</p>	<p>Given the challenge of achieving suitable outmigration water temperatures in the lower river, evaluating the causal mechanisms may enable an increase longevity of suitable outmigration and adult migration temperatures</p>

**Table 4. Priority Criteria 4 Monitoring and Assessment Study Plans that Should Be Completed During 2012 in Preparation for Possible Implementation in 2013 or Subsequent Years.**

Study title	Summary of Recommendations	Rationale w/respect to criteria
Develop study plan to quantify physical habitat as a function of flow	Develop study plan to quantify physical habitat as a function of flow, with emphasis for Reach 1A. The focus should be on the flexible flow period.	Need to clarify flexible flow period to inform the role this information would play in real-time RA flow recommendations.
Develop an overall predation management strategy, with emphasis on gravel mining reach and structures	Develop an overall study plan to evaluate predation impacts on juvenile production as a function of flow, water temperature, juvenile density, turbidity, spatial segregation, gravel pit filling, or other factors.	Predation during drier water years may substantially impair ability to achieve restoration goal, Paragraph 11(b)(3) directs priority gravel pit filling/isolation.
Evaluate spawning gravel quality data in Reach 1A, develop study plan to refine understanding of gravel quality	Review DWR reconnaissance report on gravel quality (including Tappel and Bjornn index), determine whether additional field sampling is needed, and identify priority sampling areas.	Need to inform whether additional gravel needs to be introduced, existing gravel cleaned, and/or fine sediment sources remediated.
Develop a long-term study plan for juvenile survival and migration monitoring	Develop a study plan that evaluates long-term information richness, statistical power, logistical needs, cost, and other factors of different juvenile tracking methods (acoustical tags, PIT tags, etc).	Developing quantitative estimates of the production of juvenile salmon in the San Joaquin River as well as information on the seasonal timing of juvenile migration and their survival (e.g., to Mossdale, Chipps Island, ocean fishery, adult escapement) are important metrics used in assessing the overall performance and success of the restoration program. Various techniques have been used in juvenile monitoring in other Central Valley rivers and elsewhere. A plan should be developed for initial testing in 2013 or later.

**Table 5. Priority Criteria 5 Lower Priority Monitoring and Assessment Actions for Continuing Consideration and Implementation After 2012.**

Study title	Summary of Recommendations	Rationale w/respect to criteria
Lateral and vertical water temperatures in gravel pits	Select subset of gravel pits that reflect a range of connection and mixing scenarios, place sensors to document spatial temperature variability, evaluate whether stratification occurs, measure heating through pit, and compare spatial differences between river temps and lateral areas in pits.	Defer until overall predation management study plan is completed (Table 4).
Monitor juvenile salmonid predator behavior and habitat use in gravel pits	Use PIT or acoustic tags on largemouth bass, smallmouth bass, and Sacramento pikeminnow to track their movement with flow, temperature, and channel features. Begin tracking bass populations at index reaches to evaluate changes in populations and age class structure with flows (done on Tuolumne River).	Defer until overall predation management study plan is completed (Table 4).
Fish species composition, distribution, and abundance for predatory species	Estimate species composition and abundance for species in gravel pits and downstream of structures that prey on juvenile salmon, and relate to species composition and abundance in SJR tributaries for comparative purposes, as well as to estimate risk/rate of predation.	Defer until overall predation management study plan is completed (Table 4).
Begin documenting changes in riparian vegetation in response to Interim Flows	Re-occupy some of the DWR riparian monitoring cross sections in Reach 2A and 2B (and other reaches), conduct band transects to document riparian vegetation species, age, extent, and canopy coverage, and compare to 2003 DWR survey for flood conveyance monitoring and restoration monitoring.	Defer until 2013 or 2014 when seepage constraints remedied and perennial flow can be re-established in all reaches.
Baseline fish species composition, distribution, and abundance	Fish sampling in index reaches within each of the 5 reaches to document pre-Restoration Flows fish assemblage, in order to document baseline conditions and measure progress towards "fish in good condition" definition.	Defer until 2013 due to workload constraints.
Investigate Reach 1 side channel juvenile rearing restoration opportunities	Survey side channel entrance topography to evaluate flow thresholds and evaluate potential lowering (restoration) opportunities, develop side channel restoration designs.	Defer until 2013 due to workload constraints and lack of juvenile salmon in Reach 1.
Develop relationship between flow and conveyance limitations in Reach 3	Need to relate water surface elevations to potential inundation thresholds of infrastructure, identify that infrastructure, and begin remedying those constraints in parallel with removing constraints in other reaches (e.g., seepage).	Remedying seepage impacts are priority for 2012, consider in 2013.
Construct pilot spawning gravel beds in Reach 1A	Based on the results of the spawning gravel quantity and quality evaluations, as well as predicted priority spring run spawning extent, recommend that conceptual designs be developed for different experiments, and construct one or more spawning riffles in 2013 based on that experimental design.	Important action but not essential to the initial reintroduction. Design and implementation is likely to be a higher priority in 2013.



**Table 5. Continued.**

<p>Tagging, marking, genetics from source stocks</p>	<p>The TAC/RA supports a recommendation that information be compiled from other studies on marking and tagging techniques for various salmonid life stages. Further field testing of alternative marking and tagging techniques is not recommended at this time.</p>	<p>There is extensive information available from other fishery studies in the Central Valley and Northwest that address issues of salmonid tagging and marking.</p>
<p>Evaluation of law enforcement needs and regulatory changes to limit harvest</p>	<p>The Department of Fish and Game is currently in the process of developing new SJR regulations for Chinook salmon reintroduction in 2012. The new regulations will likely include permanent and seasonal closure areas and fishing gear restrictions to protect potentially spawning, holding, and migrating Chinook salmon. There is a need to secure funding for public outreach, mitigation, and increased enforcement. The TAC/RA does not support the recommendation that this element be included in the 2012 study program at this time.</p>	<p>The priority for funding and schedule needs to be coordinated with the actual reintroduction and time when enhanced enforcement will be needed for species protection.</p>
<p>Ecosystem Diagnostic and Treatment Model</p>	<p>The Ecosystem Diagnostic and Treatment Model (EDT) is a proprietary model that integrates information on habitat conditions and expected salmon survival into a population-level prediction. The model can be used to identify assumptions and uncertainties as well as to inform adaptive management decisions. Recommend that further development of an EDT type model be deferred, and preference should be given to open-source models that can be used by program staff and others over the long-term of the restoration project.</p>	<p>Information on site-specific project elements included in the IBM model (Priority 1 above) as well as results of various monitoring efforts is needed before further development of an EDT type model. Several alternative population-level salmon models are potentially suitable for the San Joaquin River.</p>
<p>Assessment of predator abundance and distribution in mine pit habitat</p>	<p>Assess predator populations and available habitat conditions in mine pit complexes. This is needed to address the biological prioritization of mine pit restoration outlined in the settlement. The study proposes to assess vertical temperature profiles in the mine pits, and conduct a mark recapture experiment of predator populations in the mine pit habitats to determine population richness, abundance and distribution across mine pits, and determining predator movement between habitats.</p>	<p>Although predation mortality may be an important factor affecting juvenile salmon survival this study can be delayed. Results of acoustic tag survival studies and reach-specific information on mortality (Priority 1 above) will help establish the priority and location of predator studies. Defer until 2013 and be driven by study plan in Table 4.</p>

**Table 5. Continued.**

<p>Fish community assessment</p>	<p>The California Department of Fish and Game has conducted some preliminary fisheries investigations periodically throughout the Restoration Area. More standardized sampling protocols and more sampling sites are needed to assess changes in fish populations before, during and after restoration activities. This study will address the long term monitoring of all fish populations in the Restoration Area as a means to measure success on attaining 'good condition' for native fish assemblages. The TAC/RA recommends that this element of the 2012 study program receive a low priority.</p>	<p>Although information on the existing fish community inhabiting the lower San Joaquin River is useful as a baseline this study element is recommended as a lower priority (priority 3). Information has been collected that qualitatively describes the fish community currently inhabiting the river. Given limited program resources it is recommended that elements that focus on salmonid restoration be given a higher priority in 2012.</p>
<p>Real-time data collection from source stocks</p>	<p>Conduct real-time data collection on potential donor streams to provide data for input into the Annual Donor Stock Assessment Plan. Methods may include rotary screw trapping, video monitoring, and redd and carcass surveys in identified donor streams (Deer, Mill, Butte, and Feather).</p>	<p>Donor stock monitoring needs to be linked to terms and conditions of the reintroduction permit and current population conditions of spring-run Chinook salmon. Data from current and past monitoring in the donor streams needs to be evaluated used in initial stock assessment. This element should include a study plan developed in 2012 or 2013 (Priority 4) prior to implementation.</p>
<p>Evaluate spawning gravel quantity in Reach 1A</p>	<p>Review JSA and Stillwater gravel mapping methods and results, develop detailed spawning gravel criteria and mapping methods, and conduct mapping in Reach 1A to document baseline conditions and evaluate spawner capacity during high escapement years.</p>	<p>Need to inform whether additional gravel needs to be introduced per Paragraph 12. Important over time to increase spawning habitat availability and carrying capacity. However, given the low numbers of adult salmon expected in the river over the next several years, this study may not be essential to the initial reintroduction and could be deferred to 2013 or later (priority 5).</p>
<p>Coarse and fine bedload transport at Ledger Island</p>	<p>Conduct bedload sampling at Ledger Island to corroborate tracer rock data, measure sand transport for fine sediment budget, measure gravel transport for coarse sediment budget and gravel augmentation needs.</p>	<p>Will inform peak flow release magnitude and duration during Wet and Normal Wet water years to achieve geomorphic objectives and reduce fine sediment storage in Reach 1A spawning gravels. Will also inform potential future gravel augmentation needs. Need to reconsider this effort with the Sediment Management Workgroup to decide whether this location should be used in future.</p>

# ***San Joaquin River Restoration Program Restoration Administrator***

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## **Memorandum**

Date: September 14, 2011  
To: Dave Mooney - USBR  
From: Rod Meade - RA  
Subject: Final 2012 MAP Recommendations

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As a follow up to the September 8 MAP meeting in Turlock and our recent discussions, I am forwarding my updated and final recommendations concerning monitoring and assessment activities for 2012.

The attached *2012 Monitoring and Assessment (Map) Recommendations* are being forwarded after incorporating MAP comments provided by participants during the September 8 meeting and a final consultation with the TAC on September 12. Please let me know if you have questions or if I can be of further assistance.

Attachment: *2012 Monitoring and Assessment (Map) Recommendations*

**RESTORATION ADMINISTRATOR**  
**2012 MONITORING AND ASSESSMENT (MAP) RECOMMENDATIONS**

**Prepared by the RA**  
**In Consultation with the Technical Advisory Committee**

**Submitted to the SJRRP Program Manager**

**September 14, 2011**

Proposal number	Title	Priority	Comments
2	Historical and water year gage record analysis	3	The effort for this task should be low. Most of this analysis has already been completed. The relationships are likely to change in future in response to sustained releases and changes in groundwater conditions.
3	Flow travel time for all reaches within the Study Area.	2	The scope of the study should be expanded to address all reaches within the Study Area.
4	Lateral gradient water table	1	Results of this analysis will be helpful in interim flow implementation and groundwater monitoring and management. The scope should be expanded to also address solutions to seepage problems and identify priority locations for management actions (easements, purchase, etc.). This is needed to implement re-introduction and supporting instream flow management. This analysis also should consider sources of groundwater decline, including tile drain, return seepage, pumps, and other sources. Should address redundancy with Proposal 5 by combining Proposals 4 and 5.
5	Terrain comparison between wells and fields	2	Use results of this analysis to refine groundwater management and solutions. Link this study to study 4. Combine with Proposal 5.
6	Changes in salinity from interim flows	2	Additional information is required to test the assertion that increased GW table by Interim Flow is pushing up salts into root zone. Should also assess salinity changes associated with flood control releases
7	Flow restriction due to seasonal groundwater	1	Link this study to a Study Plan. Need to identify management solutions to groundwater seepage issues. The scope of this study should focus on identifying solutions and management plans rather than additional monitoring. More detail would help identify what would be done (e.g., "evaluate potential drainage solutions" and "identify new projects").
8	Monitoring well network optimization	5	Need the results of studies 4 and 7 as a basis for evaluating the monitoring well network. Defer to later if needed. Should also look for opportunities to reduce size of network (wells that have shown to be insensitive to flows, or stay below the warning elevation)
9	Vegetation monitoring	1/2	Study needed in 2012 to comply with regulatory requirement. Could use some more detail, here are some questions: 1. Are transect locations representative? Random? 2. How long are transects? Length determined by inundation extent?

			<p>3. If woody plant richness is a focus (in first objective?), then the seedlings will probably need to be monitored at the end of all seed dispersal periods in August-September rather than June-August.</p> <p>4. Point intercept is good for description but could be inadequate for sparse seedlings.</p> <p>5. Sampling points taken every 0.5 m could miss the beginning and ending of seedlings bands</p> <p>6. Confirm that transects will be placed roughly perpendicular to flow</p> <p>7. Seems like you could miss some things along infinitely small line- is 20 transects enough to generalize trends, particularly for flood conveyance assessment and detecting exotics? Seems like a more rigorous planform based approach would be needed for flood control and exotics</p> <p>8. Maybe it would be helpful to break methods into two sections- one that deals with the woody seedling survey (1m belt transects) and another that deals with the descriptive (point intercept) aspects. Need to be specific on how each method addresses the three objectives, because as I mention in the previous point, I don't think the methods will necessarily be rigorous enough to properly address the objectives.</p> <p>9. How are vegetation patterns going to be related to streamflows rather than distance downstream from Friant or time? An example of the analysis product would be helpful.</p>
10	Elderberry mapping	1/2	Appears to be a regulatory requirement. Conduct site-specific vegetation surveys where construction disturbance could occur in 2012. Probably 9 should be coordinated with study proposal 9.
11	Water quality and fish 2011	3	Preparation of a data report and synthesis of information developed from the monitoring program should be an integral part of every monitoring plan and not a separate effort. It is not clear how this effort differs from similar efforts by DWR, CDDFG and others regarding water quality reporting. Need to link to biological criteria and thresholds. This needs expansion. It is not clear what is intended or how the product will be used. Updating data monitoring reports should be a standard part of every element of the program.

12	Adult passage – non-structural passage impediments	3	<p>Use existing data and focus and link to interim flows. Question: what flow levels are needed to test where passage criteria are met? The passage study done by DWR in 2011 will inform which structures will require modifications, and will inform local flow needs for successful adult migration to Reach 1A. It is not clear whether this study is limited to analysis of existing information or if additional field data collection would also occur to assess passage conditions at critical riffles and other locations. The discussion should be expanded to provide additional information on what is proposed, the metrics used to evaluate conditions, and how the results are expected to be used. If additional field measurements are proposed is there a need to prescribe specific interim flows to support the study? We'll need to know soon whether there are natural (i.e., riffle crest) controls that we need to ensure minimum flows provide adequate passage</p>
13	Benthic macroinvertebrate bioassessment	5	<p>One year of baseline data has been collected. Application of the results to the interim flows and long-term flow management is not clear. This would have a high priority only if it is identified as a permit requirement. The linkage between this SWRCB BMI effort and the restoration program objectives is not clear. Based on this description it appears that there is already one year of "before" BMI data for a variety of locations within the river. It is not clear why additional "before" data is necessary. Also, it is not clear how the results of this study will be used now or in the future. The results of BMI studies such as that proposed are difficult to evaluate since a reduction in the index suggesting impaired conditions can reflect a number of causes that cannot be assessed (e.g., contaminants, sediment, reservoir operations affecting seasonal flows, water temperatures, and water quality, instream flows, and others can all have an effect in different ways on the resulting BMI. The work that is described below indicates that a study was done in 2011. Results of that study should be analyzed and only if data gaps are identified should subsequent "before" efforts be undertaken.</p>

14	Collection/transport from source stock	1	<p>The collection and successful transport of spring-run Chinook salmon from the donor stock location (assumed in this study to be the Feather River Fish Hatchery) to the San Joaquin River is a key element of the reintroduction program. There is considerable experience in the transport of various life stages of Chinook salmon within the Central Valley that should be used as the basis for this demonstration test. This test element can be combined with other studies (marking, genetics, and health assessment) to provide a more comprehensive investigation of potential transport of the donor stock. The value of this study is limited by constraining it to only handling fish from the Feather River hatchery. In the future efforts will need to be made to collect fish from the field and transport. Suggest that an overview of the experience mentioned above be used as a basis for this proposal (building from prior experience), and adding as perhaps a first priority is to conduct this experiment trapping adult fall run from Hills Ferry Barrier and trucking them to a location above Chowchilla Bifurcation structure and releasing them for upstream migration. This latter experiment would provide a much more robust learning experiment than the Feather River experiment, as the travel distance/time will be similar, but we'll also get information on subsequent in-river mortality, and perhaps obtain some information on spawning habitat preferences if enough fish are transported and survive to spawning.</p>
15	Fish health assessment from source stock	1	<p>The proposed fish health assessment is an important element of the reintroduction strategy. Extensive information is available from the CDFG and USFWS fish pathology laboratories as well as CDFG fishery management within the Central Valley that would form the basis for the initial elements of this assessment. It is recommended that information from these existing sources be compiled and synthesized in 2012. Existing data on the health and condition of spring-run Chinook from the potential donor stocks should also be assembled. Fish health sampling within potential donor stocks is not recommended in 2012. A study plan (priority 4) should be developed that integrates the existing information on fish health and disease management (including inter-basin transport) into a study that identifies the types of additional information that would be needed to support the reintroduction permit be deferred to a later date.</p>



16	Real-time data collection from source stocks	5	<p>Donor stock monitoring needs to be linked to terms and conditions of the reintroduction permit and current population conditions of spring-run Chinook salmon. Data from current and past monitoring in the donor streams needs to be evaluated used in initial stock assessment. This element should include a study plan developed in 2012 or 2013 (Priority 4) prior to implementation.</p> <p>There are currently monitoring programs that are established in each of these streams that provide data on adult escapement and juvenile production. The need for addition real-time data should be linked to specific decision points related to the reintroduction strategy and support the NMFS 10(a) permit for spring-run Chinook salmon collection and transport for reintroduction into the San Joaquin River. The need for further collections to assess stock conditions is not supported at this time. The existing monitoring program data should be used to the maximum extent possible. Specific data gaps need to be identified before this program is initiated.</p>
17	Egg survival year 2	1	<p>It would be helpful if results of the egg studies from earlier years were reported as background for the proposal to now expand this to include spring-run. What was the success of the fall-run egg study? Was the collection of fall-run eggs from instream gravel redds and relocation successful (% hatching success?)? There needs to be additional justification and linkages to support expansion of the program to collect and test spring-run salmon from the northern tributaries. The value and benefits need to be supported since there will be scrutiny regarding use of spring-run for testing. The experimental linkage to the interim flows and stability of flow management needs to be developed before implementation. More detail needed in describing scope of study (how many sites, will bulk samples be done to apply Tappel and Bjornn, etc). In addition to summarizing previous year study, also need to have this guided by an overall gravel quality evaluation (synthesis of available information, such as quantity mapping, previous bulk samples, fine sediment source evaluation)</p>

18	Fish community assessment	5	<p>This study is not required for re-introduction; however, it can be useful in addressing the “fish in good condition” definition as part of the Restoration Goal.</p> <p>Although information on the existing fish community inhabiting the lower San Joaquin River is useful as a baseline this study element is recommended as a lower priority (priority 3). Information has been collected that qualitatively describes the fish community currently inhabiting the river. Given limited program resources it is recommended that elements that focus on salmonid restoration be given a higher priority in 2012. When this is done in the future, need to discuss whether methods will be robust enough to detect future changes in fish community given inherent natural and sample variability. Suggest evaluating whether 2003-2005 data can be used in power analysis to inform sampling design that can detect future changes (if this is an objective).</p>
19	Juvenile salmon survival year 2	1	<p>Results will be used to evaluate reach-specific juvenile survival as a function of river flow as part of a long-term baseline monitoring element. The proposed survival study in 2012 should use fall-run Chinook salmon. Acoustic tag detection array may need to be refined. Consider additional detectors in the mainstem of the San Joaquin River and bypasses. Use results of 2011 and 2012 to develop reach-specific survival estimates and identify areas for more intensive monitoring.</p>
20	Assessment of predator abundance and distribution	5	<p>Results of this study are not needed for re-introduction or interim flow testing. Defer until overall predation management study plan is completed (Table 4).</p> <p>Although predation mortality may be an important factor affecting juvenile salmon survival this study can be delayed. Results of acoustic tag survival studies and reach-specific information on mortality (Priority 1 above) will help establish the priority and location of predator studies. Defer until 2013 and be driven by study plan in Table 4.</p>
21	Tagging, marking, genetics	5	<p>There is extensive information available from other fishery studies in the Central Valley and Northwest that address issues of salmonid tagging and marking.</p>
22	Captive rearing	1	<p>Required for spring-run Chinook salmon reintroduction implementation and management. Provide a source of salmon for use in reintroduction as well as testing and monitoring.</p>

23	Ecosystem diagnostic and treatment model	5	<p>The short-term focus should be on the study of site-specific modeling of restoration actions described in Study 25. The development of EDT should be deferred to a later date. Information on site-specific project elements included in the IBM model (Priority 1 above) as well as results of various monitoring efforts is needed before further development of an EDT type model. Several alternative population-level salmon models are potentially suitable for the San Joaquin River.</p>
24	Evaluation of law enforcement	5	<p>This activity is not required for 2012 re-introduction and can be deferred to a later date. The priority for funding and schedule needs to be coordinated with the actual reintroduction and time when enhanced enforcement will be needed for species protection.</p> <p>This study element seems to focus on warden funding rather than program needs at this point in time. The timing and need for additional enforcement should be linked to the actual fish protection needed within the river. There does not appear to be a need in 2012.</p>
25	Fisheries models of site-specific projects	2	<p>Developing an IBM would provide a framework of prioritizing and analyzing monitoring results as well as evaluating site-specific alternative restoration actions and strategies. Development of IBM is recommended as a priority 2 study element. Expansion and refinement of an existing IBM for salmon (e.g., SALMOD) is preferable to developing new independent IBM. Expansion to the population level using EDT or other population-level models is a low (priority 5) action for 2012 but would be beneficial in the future.</p> <p>The TAC/RA support the recommendation that site-specific IBM be developed for use in assessing habitat conditions, evaluating alternative actions, and to provide a framework for identifying monitoring needs. The TAC/RA recommend that further development of the EDT model framework be deferred pending development of the IBM, additional research on salmon survival, and consideration of alternative population-level lifecycle modeling.</p> <p>This is a good discussion. Rather than develop two (or three) IBM models, it seems that it would be better to focus on developing a consolidated IBM model that addresses instream flows, water temperatures, and habitat conditions such as spawning gravel. The SALMOD model provides an example of such a useful modeling tool that can be used to test “what if” conditions. Adaptation of the USBR egg mortality model to the San Joaquin River is also a useful element of this modeling effort. These modeling tools will be helpful in both assessing alternative management decisions and</p>

			priorities but also in guiding future data collection and analysis. The models need to be constructed to link with hydrologic models and water temperature models. The models also need to be developed in such a way as to retain information on variance and confidence that can be given to the results.
26	Temperature monitoring of Millerton Lake cold-water	Study Deleted	STUDY PROPOSAL DELETED DURING SEPT 8 MTG
27	Monitor spawning habitat and holding	2	The location, areal extent, and quality of suitable spawning gravels in Reach 1 are important factors affecting the carrying capacity of the reach for spawning by both spring-run and fall-run Chinook salmon. Spawning gravel surveys have been performed in the past using various levels of precision and assumptions. Results of this survey will help inform decisions regarding carrying capacity and need for additional spawning gravel augmentation and cleaning. This study should be completed before many of the other associated studies described below. Agree that the spawning habitat quantity be done first; the proposal should be modified to discuss and build from all the previous work. In a similar manner to the predator evaluation, recommend that all the gravel quantity/quality proposals be combined together to ensure they are integrated, fit together, and are not redundant or have critical gaps. In addition, this should prioritize Reach 1A, and perhaps not conduct any effort in Reach 1B (to save time and money) given the water temperatures. Regarding methods, hasn't the mesohabitat mapping already been done? The microhabitat evaluation needs discussion, as some of the methods could be improved, and appear disassociated with previous work. Lastly, the holding pool assessment should be separated out as a unique proposal, and significant description of why this needs to be done (e.g., what was wrong with the Stillwater Sciences 2002 assessment?)
28	Pilot gravel augmentation	3	Important action but not essential to the initial reintroduction. Design and implementation is likely to be a higher priority in 2013. Results of study 27 will provide a baseline for assessing the existing gravel quality and availability.  This is a good discussion. The presentation could be briefly expanded to discuss the performance evaluation and monitoring metrics that will be used to evaluate success of the different treatments. Information from the Mokelumne River, Stanislaus River, Merced River, Tuolumne River, and UCD gravel studies can also be used to help enhance this effort. It appears that what is being

			proposed is only Phase 1, so perhaps some conceptual designs for 2012 and initial planning would be a higher priority, if it was hardwired into the findings of Proposal 27 and 17
29	Temperature monitoring for adult migration	5	Data collected as part of the existing temperature monitoring network and water temperature modeling can be used to assess adult passage conditions without additional data collection or analysis. Expand on the linkage to seasonal interim flows to assess flow-temperature relationships in the future if modeling shows temperature is an impediment to adult migration. Need to discuss how results of the field monitoring will be used to validate temperature model predictions. There needs to be additional discussion on how results of this monitoring are planned to be used as part of the program. This task should include a synthesis of the current and prior temperature monitoring and an assessment of what those data tell us about habitat suitability for various lifestages and species of fish. Which reaches and during what times of the year are habitat conditions suitable? What do the results tell us about daily variation in temperature? Availability of cooler groundwater accretions that may provide micro-habitat refugia during migration? More specific rationale is needed to justify this expansion of effort.
30	Genetic analysis of source stocks	5	Data are available from prior genetics studies for several of the potential donor stocks. Need to establish re-introduction strategy and link to NMFS permit terms first. Defer to 2013. The application of these products to the program is not clear. How will this information be used? Is this limited to a synthesis of available genetics data? The scope and focus on fall-run salmon and rainbow trout is not clear. It seems that most of this work is already done. The application of these products to the program decisions and management needs currently is not clear. There also needs to be a stronger linkage between UCD and the NMFS genetics laboratory at Santa Cruz (and other investigators).
31	Water surface profile surveys	2/3	There is analytic value to document water surface elevation and inundation over a range of river flows. This study is opportunistic in obtaining photos and surveying water surface elevations if naturally occurring river flows in 2012 exceed 8,000 cfs. Interim Flow releases from Friant Dam will not be made specifically to support this study effort. The discussion indicates that the data are needed to calibrate the existing hydraulic models-is this true? Model results can be used to assess relationship between flows and passage conditions for juveniles and adults. We have good WSE data for flows between 350 cfs and 5,000 cfs or so. Assume this would be for flows

			greater than or equal to 8,000 cfs and for filling in the gaps with little in the way of new commitment of resources. A description of what data we've already collected, what gaps remain, and why it's important to fill those gaps would be helpful to prioritize this.
32	Water level recorder data location and relocation needs	5	Need for additional gages in Reaches 1 and 2 is not clear. Need to have results from study 31 to determine if there is a need for additional gages in the future. Defer to later date. Existing gage network is fine to evaluate flow routing model.
33	Monitoring cross-section surveys	5	Defer to later date. Results of this study are not needed now to implement interim flows. The dynamics will change in the future in response to interim and restoration flows. Assume that this is being done in 2011 to document the effects of the 2011 high flows. The proposal is conditional on high flows in 2012 (good), so may also want to add condition based on evaluation of 2011 flows. Also, it seems like the priority for this is reach 2A (general aggradation concerns), 2B (evaluate effect of new operations at bifurcation), and to document baseline conditions in the upper end of Reach 3 (prior to Mendota Pool Bypass). Also consider documenting the sediment basin in Chowchilla Bypass to see if sediment delivery begins to decrease with reoperation of the bifurcation structure. Lastly, see if there are ways to use terrestrial LiDAR to get a more comprehensive view of aggradation/degradation in Reach 2A and 2B
34	Reach 1 sand storage monitoring	3	Need results of egg survival studies and existing gravel quality surveys before additional sand storage monitoring. Defer to later date. Partially agree, see comments on the draft Sand Storage and Supply report. For Healthy Fry Production issue, really need to focus on the upper portion of Reach 1A; everything downstream of Highway 41 should be framed under the Channel Capacity problem statement and prioritized accordingly
35	Reach 2A channel response	3	Defer pending channel measurements and hydrologic model calibration. These results are not needed for re-introduction. This is being driven by potential 3 <sup>rd</sup> party impacts, which is a legislative criterion giving higher priority. Recommend combining with Proposal 33 with same conditions and evaluation of 2011 results.
36	Reach 1A spawning gravel mobility	3	Do not conduct additional study until results of the egg survival and gravel quality characterization has been completed. Defer to later date. Conduct opportunistically if naturally occurring high (e.g., flood control) releases are made. Need to inform whether additional gravel needs to be introduced per Paragraph 12. Important over time to increase spawning habitat availability and carrying capacity. However, given the low numbers of adult salmon expected in the river over the next several years, this study may not be essential to the initial reintroduction and could be deferred to 2013 or

			later (priority 5). This has been done for 2010 (lower flow year) and 2011 (higher flow year). Not sure if we need more data on this at these two sites. If this study proceeds, really need to expand/diversify the types of alluvial deposits being monitored beyond just the two sites done here, and build from what we've learned over the past two years. Many of the Anticipated Outcomes seem of lower priority for flow and/or spawning gravel management.
37	Scour and fine sediment effects on incubation habitat	5	Need results of egg survival and gravel quality studies before additional scour analysis. Conduct opportunistically if natural high flows occur; defer otherwise. This seems a bit too focused given all of the other uncertainties and limiting factors out there that need to be addressed. I could potentially see coordinating with Proposal 17 to conduct cross section surveys and scour chains at their sampling locations.
38	Effects of altered flows on channel morphology in Reach 1A	5	Defer until full interim flows have been implemented. Not needed for re-introduction at this time. Seems too focused given all the other potential limiting factors.
39	Reach 1A spawning gravel mobility improvement	5	Defer until results of egg survival and gravel quality studies are complete. Need to link together with other similar studies. Redundant as currently organized. Could inform peak flow release magnitude during Wet water years to achieve geomorphic objectives The gravel ripping has been done many times on other rivers, and while lowering of bed mobility likely occurs, it has not shown favorable results on spawning gravel quality if no done during a high flow event (e.g. "liberating" sand from the subsurface during low flows doesn't work). The fine gravel addition is something to consider in the future, and is being done to some degree on the Trinity. But it is still in an experimental phase, largely supported by model predictions. Would support Phase 2 of Proposal 28 as a first step, as benefits of that effort are guaranteed, whereas results of these approaches are less certain.
40	Reach 1A spawning gravel quality	5	Need results of egg survivals study and gravel quality study are completed. This is redundant with other similar study efforts. Need a comprehensive, integrated study plan for evaluating gravel quality and quantity
41	Monitor intergrade DO	3	Consolidate with egg survival study for cost reduction and improved program efficiency. Costs are currently high based on proposed study scope. Need to integrate into the survival study and reduce scope/cost.

42	Hills Ferry barrier evaluation	2	<p>As part of the river restoration and increasing anadromy for both spring-run and fall-run salmon it seems like the barrier should be removed and would no longer be needed once the restoration actions are in place. The idea of tagging and monitoring upstream migration of adult fall-run in the river has merit and may provide useful information on migration rates, impediments, and route selection. Such as study using adult fall-run would need to be coordinated with interim flows in the fall and channel migration conditions before being useful. The last two statements are high priority for restoration. I think we can also potentially begin to obtain information on spawning habitat selection as well. Am very supportive of item d, and could be for item c too if it was described in context with future monitoring need (i.e., establishing long-term escapement monitoring locations at Sack Dam and some other upstream location). Given that allowing fish to migrate past Hills Ferry Barrier is not proposed here, item c seems conflicting. Are items a and b needed for satisfying legislative requirements? If not, these are probably low priority since we eventually want to remove the barrier.</p>
43	SJ basin-wide PIT monitoring assessment	4 2 for study plan	<p>Need to develop study plan for how this PIT effort will be integrated into the more comprehensive long-term monitoring program. Overlaps with acoustic tag survival study for juvenile migration. Investing in a long-term large-scale PIT tagging and monitoring program is a major commitment of program resources, but can provide high value information that can be used in evaluating program performance for both juvenile production and survival but also for adult escapement. This element needs serious consideration since a major part of the value will be maintained and supporting this tagging and monitoring effort over many years. The PIT tagging element should be integrated and coordinated with other program elements including the proposed acoustic tagging of juveniles and adults. Rather than use both methods consideration should be given to the use of PIT tagging alone. This approach has been used successfully in the Northwest. The strength of the PIT tagging element is in the lower cost per tag, no battery life issues, and the ability to monitor juveniles and returning adults.</p> <p>The PIT tagging element of the proposed studies has a number of potential benefits despite the relatively high cost and long-term commitment to this technology. The collection and tagging of wild juvenile salmon can be a problem and adds cost. PIT tag detectors should also be deployed in other San Joaquin Basin tributaries and in hatcheries, carcass surveys, and fishery sampling (e.g., Mossdale and Chipps Island trawling) to provide</p>



			<p>additional information on adult straying and downstream juvenile migration. PIT tagging could be expanded to be part of fishery monitoring throughout the entire San Joaquin and Central Valley monitoring programs. Develop a comprehensive future monitoring program to avoid redundancies and improve cost effectiveness.</p>
44	Synthesis and review of predator impacts at screening and passage structures	5	<p>Much of this has been done by others (BDCP; Clifton Court predation). Not required for re-introduction or interim flows. This literature review seems premature given the prior study element to assess the potential predator species, abundance, and habitat use. Results of the predator study should be used to help guide additional consideration of management actions. Predator management actions are described in the literature and there have been prior literature reviews (BDCP and others) that have summarized many of the management actions and their success in other systems. This study element seems like a low priority currently.</p>
45	Central valley steelhead monitoring plan for SJ	1	<p>This appears to be a required study for reintroduction. Coordinate VAKI with Proposal 42</p>
46	Inventory fish abundance and diversity	4	<p>Defer until overall predation management study plan is completed (Table 4) and combine with study 18 to evaluate whether we are achieving fish in good condition. Need to discuss previous CDFG data, explain why that isn't sufficient for baseline conditions. What is probably more important is to develop a study plan that illustrates how fish in good condition will be evaluated, with clear linkages between study components and the criteria for the good condition definition, including spatial, temporal, and statistical considerations. Need clearer objectives for this proposal.</p>
47	Minimum floodplain requirements	2	<p>Monitoring element supports core monitoring and assessment and in support of designing restoration actions. Use existing topography mapping and modeling to assess existing floodplain and identify future habitat opportunities as a function of instream flows.</p> <p>Floodplain rearing habitat located along the length of the lower San Joaquin River has been identified as an important factor in achieving the Restoration Goal and in restoration site design (e.g., Reach 2B and 4B). Identification of currently suitable floodplain habitat as a function of river flows will help assess the needs for additional floodplain habitat modification. The location of potentially suitable floodplain rearing habitat will likely be used as one factor in assessing land purchases and environmental easements. This is a high priority, but there is no clear linkage how the three methods will be used to achieve the anticipated outcome (minimum floodplain required). Fish sampling alone doesn't translate into needed floodplain area. Need to</p>

			coordinate this better with the FMWG
48	Hydraulic habitat modeling	2	The underlying topographic and cover information in the existing hydraulic model is insufficient to quantify microhabitat. It is fine to use this for identifying general floodplain/bench inundation thresholds, but not microhabitat (see Mark Gard's criteria for microhabitat modeling). In addition, there first needs to be an integrated study plan for assessing microhabitat (see RA recommendations)
49	Bed material collection	5	Redundant with spawning gravel characterization. Defer to later date. Not needed for re-introduction or interim flows. Should also integrate with the sand storage/supply study
50	Tributary sediment transport and geomorphology	3	Will inform peak flow release magnitude and duration during Wet and Normal Wet water years to reduce fine sediment storage in Reach 1A spawning gravels. Will also inform potential fine sediment source control needs. Need results of egg survival and gravel quality surveys. Can be deferred to later date. Not needed for re-introduction or interim flows. Cottonwood Creek is highest priority given its proximity to Friant Dam and its role on spring-run spawning habitat. The Bunte traps are probably most appropriate, although they may get washed out during bigger floods. I'm not sure the delta surveys at Cottonwood Creek are going to be all that valuable because its outlet is confined, particularly if Friant Dam is releasing high flows at the same time. However, because flows on Cottonwood Creek are often out of phase with Friant Dam releases (winter versus spring), a topographic differencing approach in the SJR at and immediately below Cottonwood Creek could be a good one. Anyway, prioritize Cottonwood Creek, and prioritize inexpensive ways to get a better handle on sediment routing processes on Little Dry Creek (the extensive sampling may be premature)
51	USGS sediment monitoring	5	Defer until full interim flows are achieved. Not required for re-introduction. Complete gravel quality characterization first. This is apparently focused on the channel capacity problem, so it gets elevated (need to

			explain this in Statement of Need). If it is no longer needed for Channel Capacity, the greatly scale back and refocus on Reach 1A. The existing 5 sampling locations do little or nothing for the Restoration Goal, need to consider Ledger Island or similar location for the Restoration Goal application
52	Two dimensional temperature modeling in gravel pits in Reach 1A	5	Defer until overall predation management study plan is completed (Table 4). Need results of baseline temperature monitoring and modeling analyses prior further analysis of gravel pits. Temperature data is being collected in the pits. Perhaps could be done in parallel with study plan development.
53	Fish passage evaluation	1	Results of 2011 study need to be analyzed and synthesized to use existing data to determine if and where passage impediments or barriers exist. Need to link to interim flows. The existing data should be used to identify conceptual designs for passage improvements and for use as a basis to determine if additional data is needed or modeling. Need study plan that identifies solutions and information needed to refine solutions, if necessary, before implementation. Task 1 has been completed, and Task 2 is underway in 2011. If so, then this proposal is for Task 3, which is conditioned on the results of Task 1 and 2. If there are barriers that are impassable, then this (Task 3) is one of the highest priorities that should be done.