

San Joaquin River Restoration Program Restoration Administrator

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 & 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>