

Appendix A

CRITERIA FOR "FIRST SORT" OF POTENTIAL RESTORATION ACTIONS

Instructions:

- To be categorized as "Include," a candidate project would need to meet all of Criteria (1) – (4) below.
- If it is unclear whether the candidate project meets the requirements for the "Include" category, it would be categorized as "Maybe Include." (Projects for which currently available information is insufficient to assess the fit with FISH Plan goals would be put in this category.)
- If it is clear that the candidate project does not meet the requirements for the "Include" category, it would be categorized as "Omit." However, TSC doubts regarding whether or not the candidate project meets Criteria #4 by itself is not sufficient to prevent its inclusion in the "Maybe Include" category. If the potential project is valuable from a scientific perspective, broader input regarding implementability should be elicited.
- Fish species "of priority management concern" are steelhead, fall-run chinook salmon, and splittail. Fish species "of management concern" include these as well as American shad, striped bass, and other native fish.

Criteria:

1. **Addresses Needs/Stressors of Priority Species.** Reviewers conclude that the project is likely to benefit LAR fish species of highest priority management concern. Projects can demonstrate this characteristic by:
 - (a) Reducing one or more variables causing considerable stress to LAR fish species of priority management concern (or being part of an inter-related set of actions that collectively do so); and/or
 - (b) Restoring or protecting natural processes, functions, or conditions of importance to priority fish species. This includes preventing relatively irreversible disruptive changes to the habitat of priority fish species and/or halting or avoiding negative impacts associated with the status quo. Generally, recommended projects should not preclude other key habitat enhancement opportunities.
2. **High Scientific Merit / Data Benefits/Learning Potential.** An explicitly-articulated conceptual model⁷ indicates that the proposed project is likely to make a significant

⁷ In this context, "conceptual model" refers to a basic explanation for why the proposed action is expected to produce benefits (e.g., the relationship of the proposed action to a particular stressor affecting a particular life stage of a particular species of fish). The conceptual model may be only a few sentences, but describes what is expected to result from the proposed action and why. It provides a reference point for learning and adaptive management based on the results obtained from carrying out the proposed action.

contribution to the scientific understanding and/or management of LAR aquatic habitat and/or LAR fish species of priority management concern.

3. **Geographic Scope.** Proposed action falls within the RCMP's geographic scope.⁸
4. **Public Support/Implementability/Ripeness.** Reviewers believe that the proposed action would enjoy broad public support and would be relatively manageable to implement, given regulatory, political considerations.

⁸ FISH Plan recommendations may include a section discussing/acknowledging potential actions outside the RCMP's geographic scope if the TSC believes they would have high positive impacts on LAR fish species of priority management concern.

Appendix B

CRITERIA FOR DETAILED SCORING OF POTENTIAL RESTORATION ACTIONS

Instructions:

- Each “Yes” or “Maybe” candidate project should be assessed with respect to each of the 9 detailed scoring criteria below.
- For each of the detailed scoring criteria, please assign a score between 0 (low) and 2 (high) for the candidate project based on available information. The items listed in bulleted form beneath each of the detailed scoring criteria represent some of the ways that a potential project might demonstrate that it met the criteria in question. These bulleted items should be considered by TSC members in assigning a score to the project regarding that particular criteria.
- Results will be used to inform TSC discussion, but will not be used as the sole determination of priorities.
- Following the scoring exercise, TSC professional judgment will be sought regarding whether the results are well-founded, based on the professional knowledge and experience of TSC members. The TSC recommendation subsequently will be submitted to the FWG for further discussion, drawing upon the professional knowledge and experience of FWG members (particularly with regard to implementability).
- Fish species “of priority management concern” are steelhead, fall-run chinook salmon, and splittail. Fish species “of management concern” include these as well as American shad, striped bass, and other native fish.

Criteria:

1. **Addresses Needs of Priority Species.** Score: ____ (0-2)
 - Project is likely to increase/preserve salmonid rearing habitat.
 - Project is likely to increase salmonid spawning habitat quantity.
 - Project is likely to increase salmonid spawning habitat quality and incubation success.
 - Project is likely to promote/preserve genetic integrity of salmonid populations.
 - Project is likely to improve salmonid outmigrant success.
 - Project is likely to significantly reduce or eliminate predator impacts on fish species of priority management concern.

- Project is likely to increase splittail spawning habitat.
- Project is likely to increase splittail rearing habitat.
- Project is expected to assist in the recovery of listed species.
- Project is unlikely to adversely affect listed species.

2. **Addresses Major Stressor.** Score: ____ (0-2)

- Project is likely to reduce temperature-related stressors on priority fish species (steelhead, fall-run chinook and/or splittail).
- Project is likely to reduce flow-related stressors on priority fish species.
- Project is likely to reduce physical habitat-related stressors on priority fish species.

3. **High Species Conservation Value.** Score: ____ (0-2)

- Without the project, impacts to LAR fish species of priority management concern are expected to be significant.
- Pursuit of this project would not preclude other key habitat enhancement opportunities.

4. **High Habitat Enhancement/Management Value.** Score: ____ (0-2)

- Project is likely to have high management value for priority fish species.
- Project is likely to have beneficial habitat values for priority fish species.

5. **High Scientific Merit.** Score: ____ (0-2)

- There is a strong scientific basis for anticipating that the project will have positive impacts on LAR fish species of priority management concern and/or their habitat (e.g., a high probability of success).

6. **High Data Benefits/Learning Potential.** Score: ____ (0-2)

- Project is likely to make a significant contribution to scientific understanding of LAR aquatic habitat and/or LAR fish species of priority management concern.
- Project is likely to make a significant contribution to management of LAR aquatic habitat and/or fish species of priority management concern.
- Project is likely to make a significant contribution that can be used to inform management decisions in a relatively short timeframe.

7. **Multiple and/or Leveraged Benefits.** Score: ____ (0-2)

- Project is likely to benefit multiple LAR fish species of management concern.
- Project is likely to leverage benefits to LAR aquatic habitat, fish species of priority management concern, and/or LAR ecosystem as a whole through linkages with other past, current, or anticipated restoration actions.

8. **Durability/Sustainability.** Score: ____ (0-2)

- Project is likely to be self-sustaining/self-maintaining at all anticipated flows.
- Project is likely to provide sustained benefits.
- Project is likely to provide systemic benefits.

9. **Project Implementation Criteria.** Score: ____ (0-2)

- Project is likely to enjoy broad public support (including the support of relevant landowners/entities with jurisdiction over affected resources).
- Project implementation would be manageable, given regulatory and political considerations.
- Project effectiveness can be monitored and evaluated.
- Project site is readily accessible.

Appendix C

Disposition of Brainstormed Suggestions for lower American River Fisheries & Aquatic Habitat Enhancement

No.	Suggestions*	Status**
1.1	Flow Management Plan	
1.1.1	Update the lower American River flow management plan.	In Recommendation #1.
1.1.2	Develop and implement a river management plan that meets AFRP flow objectives	Recommendation #1 addresses desired characteristics of an LAR stream flow regulation plan.
1.1.3	Develop and implement appropriate flow fluctuation criteria.	In Recommendation #1.
1.1.4	Reduce and control instream flow ramping rates and flow fluctuations.	In Recommendation #1.
1.1.5	Evaluate the effectiveness of pulse flows for facilitating successful juvenile salmonid outmigration	Recommendation #1.
1.1.6	Implement dry year pulse flow augmentation.	Addressed in Recommendation #1.
1.1.7	Minimize dewatering of salmon and steelhead redds by maintaining flows exceeding 2,500 cfs after the onset of chinook salmon spawning until April 30.	Recommendation #1.
1.1.8	Develop water allocation guidelines.	Addressed in Recommendation #1 and by Water Forum Agreement.
1.1.9	Enter into agreements with landowners and water districts to limit diversion of natural flows from creeks to improve streamflows.	Addressed in Recommendation #1 and by Water Forum Agreement.
1.1.10	Provide target flows by modifying CVP operations and acquiring water as needed from willing sellers, with consideration given to reservoir available carryover storage and flows needed to meet needs determined by the water temperature objective (65°F from June 1 through September 30 in the lower American River between Nimbus Dam and Watt Avenue).	In Recommendation #1.
1.1.11	Acquire water from willing sellers to augment river flow during dry years to provide fishery benefits.	In Recommendation #1.
1.1.12	Develop and implement an ecologically-based flow management plan for the lower American River. Recommended flows and temperature targets for the lower American River should be met, and its operations should be coordinated with flows that occur naturally in the Sacramento Valley and with storage releases from Shasta and Oroville Reservoirs.	Recommendation #1.

No.	Suggestions*	Status**
1.1.13	Increase flows for American shad migration, spawning, incubation and rearing From April to June, by modifying CVP operations, by using dedicated water, and by acquiring water from willing sellers, consistent with actions to protect chinook salmon and steelhead and when hydrologic conditions are adequate to minimize adverse effects to water supply operations.	Recommendation #1.
1.2	Water Temperature Regimes	
1.2.1	Maintain suitable lower American River water temperatures during critical lifestage periods.	Recommendation #2.
1.2.2	Maintain suitable mean daily temperatures during critical lifestages.	Recommendation #2.
1.2.3	Implement Folsom Dam target temperature releases.	Recommendation #2.
1.2.4	Construct a Folsom Dam Temperature Control Device (TCD).	Recommendation #3.
1.2.5	Implement Folsom Reservoir coldwater pool management.	Recommendation #2.
1.2.6	Coordinate techniques and tools to optimize use of coldwater pool.	Recommendation #2.
1.2.7	Evaluate the potential for creating thermal refuges for juvenile steelhead over-summer rearing in the lower American River.	Incorporated into Recommendation B.
1.2.8	Evaluate options to reduce releases of warmer surface waters of Lake Natoma through the turbines at Nimbus Dam into the lower American River.	Recommendation #2.
1.2.9	Evaluate operations of Nimbus Dam during occasional spill events to minimize the release of warm surface water from Lake Natoma.	Recommendation #2.
1.2.10	Determine and implement reservoir storage levels and releases at Folsom Reservoir necessary to maintain preferred temperatures for steelhead during summer and fall.	Recommendation #1.
1.3	Coarse Sediment Supply	
1.3.1	Replenish and/or restore spawning gravel in existing spawning grounds.	Incorporated into Recommendation #17.
1.3.2	Monitor spawning gravel conditions in the lower American River and identify specific sites where mechanical cleaning or gravel introductions would be beneficial to enhance or increase gravel spawning habitat.	Incorporated into Recommendation #17.
1.3.3	Develop a collaborative program to investigate erosion, bedload movement, sediment transport, and depositional processes and their relationship to the formation of point bars and riparian regeneration in the lower American River.	Recommendation #16.

No.	Suggestions*	Status**
1.3.4	Maintain, improve, or supplement gravel recruitment and natural sediment transport in the lower American River to maintain natural ecological processes linked to stream channel maintenance, erosion and deposition, maintenance of fish spawning areas, and the regeneration of riparian vegetation.	Incorporated into Recommendation #17.
1.3.5	Implement a spawning gravel management program.	Incorporated into Recommendation #17.
1.4	Natural Floodplain and Flood Processes	
1.4.1	Maintain and enhance floodplain overflow areas.	Incorporated into Recommendation #12.
1.4.2	Protect existing overflow areas from future reclamation.	Recommendation #12.
1.4.3	Expand existing floodplain overflow basins by obtaining easements of titles from willing sellers of floodplain lands.	Omitted. Outside FWG scope. Should be referred to ARPP update.
1.4.4	Maintain the existing stream meander configuration along the lower American River by working with involved parties to develop a floodplain management program consistent with flood control needs. These parties could include the Corps, California State Reclamation Board, Sacramento Area Flood Control Agency, Lower American River Task Force, and the Sacramento Area Water Forum.	Omitted. Vague. Underway as RCMP.
1.4.5	Enter into agreements with willing landowners and irrigation districts to set back levees and allow floodplain processes such as stream meander belts.	Omitted. Vague. Lacked sufficient information about suggestion to act on it.
1.4.6	Maintain mainstem and side channel habitats typical of a natural river that provide salmon and steelhead spawning and rearing habitat.	Recommendation #13.
1.4.7	Reduce or eliminate gravel mining from active stream channels.	Omitted. Non-responsive. TSC is unaware of current mining operations in LAR.
1.4.8	Excavate, reshape and plant riverbank.	Incorporated into Recommendation #8.
1.4.9	Maintain and monitor riparian plants.	Omitted. Outside FWG scope. BPWG lead.
1.4.10	Maintain and monitor riverbank revegetation and old rip-rap.	Omitted. Outside FWG scope. BPWG lead.
1.5	Aquatic, Riparian and Wetland Habitat	
1.5.1	Develop and implement a comprehensive watershed management plan for the lower American River to protect the channel (e.g., maintain flood control capacity and reduce bank erosion) and preserve and restore the riparian corridor.	Underway as RCMP for lower American River.
1.5.2	Establish and/or maintain a sustainable continuous corridor of riparian habitat along the lower American River.	Incorporated into Recommendation #21.
1.5.3	Develop riparian corridor restoration and management plan.	Underway as RCMP.

No.	Suggestions*	Status**
1.5.4	Enhance shaded riverine aquatic (SRA) habitat.	Recommendation #21.
1.5.5	Terminate or modify current programs that remove woody debris from the river and creek channels.	Incorporated into Recommendation #4.
1.5.6	Develop plan or policy for large woody debris.	Recommendation #4.
1.5.7	Achieve and enhance shoreline habitat consisting of instream cover (typically partially submerged large trees, and clusters of rocks), bank vegetation (typically large riparian trees that extend over the shoreline), and fine soil banks.	Incorporated into Recommendations # 6, 12, 20, 21, and 23.
1.5.8	Implement a spawning habitat management program.	Incorporated into Recommendations # 1, 12, 13, 17, H, 27, and 29.
1.5.9	Implement a Wetland/Slough Complex restoration.	Recommendation #11.
1.5.10	Improve levee management practices to protect and enhance riparian and SRA habitat.	Recommendation #5.
1.5.11	Restore side channels along the lower American River to provide additional riparian corridors for increasing fish and wildlife habitat.	Incorporated into Recommendation #13.
1.5.12	Fix gravel imbeddedness.	Incorporated into Recommendation #17.
1.5.13	Increase habitat complexity.	Recommendation #20.
1.5.14	Use structures to modify flow dynamics to create greater diversity of instream habitat; monitor progress.	Recommendation #22.
1.5.15	Create wetland filtration habitat on inflow point source discharges.	Recommendation #23.
1.5.16	Maintain and monitor plants in constructed seasonal wetland (Discovery Park).	Omitted. Outside FWG scope. BPWG lead.
1.6	Water Diversions	
1.6.1	Reduce losses of juvenile salmon and steelhead in the lower American River due to entrainment at water intake structures.	Already underway.
1.6.2	Evaluate the efficacy and modify the timing and rate of water diverted annually, if appropriate, considering flows and the maintenance and/or restoration of riparian and riverine aquatic habitats.	Omitted. Outside FWG scope. FMWG and Carmichael Water District lead.
1.6.3	Reduce chinook salmon and steelhead mortality due to municipal and industrial consumptive use diversions.	Incorporated into Recommendation #1.
1.6.4	Monitor effectiveness of existing and proposed fish screens.	Already underway.
1.6.5	Remove old water intake structures.	Incorporated into Recommendation #1.

No.	Suggestions*	Status**
1.7	Levees and Bank Protection	
1.7.1	Identify locations in the lower American River where existing revetments could be modified to incorporate habitat features such as scalloped embayments and associated hard points, multi-stage bench areas, SRA habitat and other features to aid in preservation and/or reestablishment of both berm and bank vegetation.	Recommendation #5.
1.7.2	For continuing and future bank protection projects, incorporate habitat features such as scalloped embayments and associated hard point, multi-stage bench areas, SRA habitat and other features.	Recommendation #5.
1.8	Invasive Riparian and Marsh Plant Species	
1.8.1	Reduce populations of invasive non-native plant species that compete with the establishment and succession of native riparian vegetation along the lower American River.	Omitted. Outside FWG scope. FMWG lead.
1.8.2	Develop a cooperative program to monitor the distribution and abundance of non-native plants and develop cooperative control programs as needed.	Omitted. Outside FWG scope. FMWG lead.
1.8.3	Herbicide giant reed regrowth.	Omitted. Non-responsive.
1.9	Harvest of Fish and Wildlife	
1.9.1	Control illegal harvest of chinook salmon and steelhead by increasing enforcement efforts.	Incorporated into Recommendation #25.
1.9.2	Further limit sport and commercial harvests of naturally-produced fish.	Incorporated into Recommendation #25.
1.9.3	Develop harvest management strategies for chinook salmon and steelhead populations of naturally-spawned fish to attain levels that fully use existing and restored habitat.	Omitted. Beyond FWG scope.
1.9.4	Develop harvest management plans for chinook salmon and steelhead with commercial and recreational fishery organizations, resource management agencies, and other stakeholders to meet target escapement and production goals for the lower American River.	Omitted. Beyond FWG scope.
1.9.5	Evaluate the efficacy of marking and selective harvest program for lower American River chinook salmon.	Recommendation #14.
1.10	Artificial Propagation of Fish	
1.10.1	Change hatchery procedures to benefit native stocks of salmonids.	Incorporated into Recommendation #18.

No.	Suggestions*	Status**
1.10.2	Evaluate hatchery production and stocking practices at the Nimbus and Feather River hatcheries that affect the lower American River to reduce the proportion of returning, hatchery-origin chinook salmon and steelhead that stray into non-natal streams.	Incorporated into Recommendation #18.
1.10.3	Adopt methods for selecting spawning adults for the hatchery production from an appropriate cross-section of the returning adult population available to the hatchery.	Incorporated into Recommendation #18.
1.10.4	Investigate replacing the Nimbus steelhead broodstock with the most genetically appropriate steelhead stock.	Incorporated into Recommendation #18.
1.10.5	Discontinue stocking fish produced from adults taken from other rivers that are genetically distinct from the native stock.	Incorporated into Recommendation #18.
1.10.6	Introduce steelhead above Nimbus and Folsom dams.	Omitted. Outside FWG scope.
1.10.7	Introduce spring-run chinook salmon above Nimbus and Folsom dams.	Omitted. Outside FWG scope.
1.10.8	Introduce fall-run chinook salmon above Nimbus and Folsom dams.	Omitted. Outside FWG scope.
1.10.9	Develop a hatchery temperature control program.	Incorporated into Recommendation #26.
1.10.10	Develop a collaborative program to coded-wire tag a representative proportion of fall-run chinook salmon produced at the Nimbus Hatchery.	Incorporated into Recommendations # 6 and 14.
1.10.11	Reduce reliance on stocking programs for meeting angler demands.	Incorporated into Recommendations #6 and 14.
1.10.12	Fix the training weir at the Nimbus Salmon and Steelhead Hatchery.	Recommendation #7.
1.10.13	Undertake a program to mark all, or a constant fractional number of hatchery produced steelhead.	Incorporated into Recommendation #14.
1.10.14	Provide a more direct supply of cold water to Nimbus Hatchery.	Incorporated into Recommendation #26.
1.11	Contaminants	
1.11.1	Reduce the application of herbicides, pesticides, fumigants, and other agents toxic to fish and wildlife on agricultural lands that have the greatest risk to fish and wildlife populations.	Recommendation #24.
1.11.2	Enter into conservation easements with willing landowners to modify agricultural practices in ways to reduce loads and concentrations of contaminants.	Incorporated into Recommendation #24.
1.11.3	Provide incentives to landowners to modify agricultural or other land use practices that contribute to the input of contaminants into waterways.	Incorporated into Recommendation #24.
1.11.4	Treat or increase treatment of urban runoff.	Incorporated into Recommendation #24.

No.	Suggestions*	Status**
1.12	Stranding	
1.12.1	Reduce or eliminate the stranding of juvenile salmonids on floodplains, shallow ponds, and levee borrow areas.	Recommendation #8.
1.12.2	Reduce or eliminate exposure/desiccation of salmonid redds.	Incorporated into Recommendation #1.
2.0	Systems Operations and Management Actions	
2.1	Folsom Dam and Reservoir	
2.1.1	Fix leaks in the power penstock inlet port, shutters, and guidance structure at Folsom Dam.	Incorporated into Recommendation #3.
2.1.2	Construct curtains at tributary inflows to Folsom Lake forcing cold water to lake bottom.	Incorporated into Recommendation #3.
2.1.3	Develop cold water isolation/pump back system.	Omitted – lacked sufficient information about this suggestion to act on it.
2.1.4	Evaluate current operations.	Incorporated into Recommendation #2.
2.1.5	Improve short-term management of shutter operations until permanent improvements are made	Incorporated into Recommendation #2.
2.1.6	Access low elevation coldwater pool with hydroelectric power generation — economically utilize coldwater pool below penstock intakes.	Incorporated into Recommendation #2.
2.1.7	Purchase water from upstream reservoirs.	Incorporated into Recommendation #1.
2.1.8	Raise or lower Folsom Dam.	Omitted. Outside FWG scope.
2.1.9	Recommend change in USBR standard operating practice regarding operation of Folsom Dam to release from the spillway gates first.	Incorporated into Recommendation #2.
2.1.10	Change Folsom Dam complex operations from peak to base-loading.	Omitted. Non-responsive.
2.1.11	Access cold water between the lower river outlet works and the penstocks.	Incorporated into Recommendation #3.
2.1.12	Install chillers in Folsom Dam.	Omitted. Lacked sufficient information about this suggestion to act on it.
2.1.13	Install and operate a fish counting weir.	Recommendation I.
2.1.14	Remove Folsom Dam.	Omitted. Outside FWG scope.
2.2	Nimbus Dam and Lake Natoma	
2.2.1	Remove Nimbus Dam.	Omitted. Outside FWG scope.

No.	Suggestions*	Status**
2.2.2	Construct a temperature control device for Nimbus Dam spillway bay(s).	Incorporated into Recommendation #3.
2.2.3	Install temperature curtain at plunge zone of Lake Natoma.	Incorporated into Recommendation #3.
2.2.4	Install temperature curtain around the Nimbus Dam powerplant intake.	Incorporated into Recommendation #3.
2.2.5	Modify channel in Lake Natoma, as needed.	Incorporated into Recommendation #3.
2.2.6	Move Natoma power powerplant and outlet to opposite side with TCD.	Omitted. Non-responsive.
2.2.7	Place cold water barrier in front of Folsom South Canal.	Omitted. Non-responsive.
2.2.8	Install a Pipe from Folsom tailrace to Nimbus Outlet.	Omitted. Might be a last resort. Would need to be a flexible bladder due to peaking.
2.2.9	Remove all, or part of, concrete debris wall in front of Nimbus powerplant.	Incorporated into Recommendation #3.
2.2.10	Change Nimbus Dam complex operations from peak to base-loading.	Omitted. Nimbus Dam already is a base-loading operation.
2.2.11	Improve efficiency of water transport through Lake Natoma.	Incorporated into Recommendation #2.
2.2.12	Install conduit from Nimbus Dam to upstream of Rainbow Bridge.	Omitted. Last resort. Would need to be a flexible bladder due to peaking.
2.2.13	Construct fish ladder at Nimbus Dam to make seasonal use of historic spawning habitat between Nimbus and Folsom dams.	Recommendation #28.
3.0	Other Potential Management and/or Restoration Actions	
3.1	Management Actions	
3.1.1	Provide ongoing long-term consultation/technical assistance.	Recommendation #15.
3.1.2	Establish mitigation/enhancement monitoring plan.	Underway as RCMP.
3.1.3	Construct Roseville reclamation pipeline.	Omitted due to feasibility considerations.
3.1.4	Develop an improved fire management plan.	Omitted. Outside FWG scope. BPWG or FMWG lead.
3.1.5	Re-evaluate statewide water supply policy.	Incorporated into Recommendation #9.
3.1.6	Increase the American River voice in Statewide water policies for meeting Delta needs.	Incorporated into Recommendation #9.
3.1.7	Effectively manage growth in Sacramento and Placer counties.	Omitted. Outside FWG scope.
3.1.8	Review zoning/land use plans to assess potential management opportunities.	Omitted. Outside FWG scope.
3.1.9	Install concrete boat ramp at Howe and Watt avenue access points.	Omitted. Underway or done.

No.	Suggestions*	Status**
3.1.10	Trench and install a tunnel for water main crossing (under the American River and through Discovery Park).	Omitted. Underway or done.
3.1.11	Develop and implement educational program that explains the natural history of the lower American River, as well as current and foreseeable management and restoration actions.	Omitted. Outside FWG scope. RWG lead.
3.2	Restoration Actions	
3.2.1	Identify off-site mitigation opportunities.	Omitted. Lacked sufficient information about this suggestion to act on it.
3.2.2	Build off-site habitat downstream of Nimbus Dam for steelhead.	Recommendation #19.
3.2.3	Establish areas where riparian vegetation is likely to occur naturally, and therefore should be managed by studying historic hydrographs regarding river stage elevation.	Incorporated into Recommendation #21.
4.0	Studies in Progress	
4.1	Surveys	
4.1.1	Conduct adult chinook salmon stock escapement estimation.	Incorporated into Recommendation I.
4.1.2	Conduct chinook salmon aerial redd surveys	Incorporated into Recommendation H.
4.2	Monitoring and Evaluation	
4.2.1	Monitor water temperature of the lower American River, and develop a comprehensive basin-wide monitoring program.	Recommendation #2.
4.2.2	Evaluate flow fluctuations and develop ramping criteria for the lower American River.	Incorporated into Recommendation #1.
4.2.3	Evaluate current monitoring practices and temperature monitoring program.	Incorporated into Recommendation #2.
5.0	Research Actions	
5.1	Studies and Analyses	
5.1.1	Evaluate tailrace habitat utilization.	Recommendation #28.
5.1.2	Conduct feasibility and cost/benefit analysis of all potential actions.	Omitted. Expected to occur at project-specific level, vs. in FISH Plan.
5.1.3	Conduct watershed optimization analysis.	Incorporated into Recommendation #2.
5.1.4	Conduct a temperature sensitive, radio transmitter tag study of juvenile fall-run chinook salmon to study rearing habitat and thermal history in relation to growth.	Incorporated into Recommendation B.
5.1.5	Radio tag juvenile steelhead to determine their fate below Watt Avenue.	Incorporated into Recommendations #14 and 18.
5.1.6	Investigate impact of nitrogen inflow on production.	Incorporated into Recommendation #2.

No.	Suggestions*	Status**
5.1.7	Evaluate splittail habitat availability.	Incorporated into Recommendations #12.
5.1.8	Investigate stranding impact on populations of fall-run chinook salmon and steelhead.	Incorporated into Recommendation #8.
5.1.9	Investigate impact of flow on invertebrates.	Omitted. Non-responsive.
5.1.10	Conduct a bathymetric thermal sink survey of Lake Natoma.	Incorporated into Recommendation #2.
5.1.11	Conduct a topographical survey of Lake Natoma.	Incorporated into Recommendation #2.
5.1.12	Conduct a limnologic survey of Lake Natoma.	Incorporated into Recommendation #1.
5.1.13	Investigate impact of enlarging outlets.	
5.1.14	Identify limiting factors to habitat and prioritize opportunity for enhancement.	Omitted. Underway as FISH Plan.
5.1.15	Investigate the potential for the toxic plume from Aerojet Corporation to infiltrate the lower American River.	Omitted. Done.
5.1.16	Investigate impact of "first flush" urban runoff events to riverine water quality.	Incorporated into Recommendation #23.
5.1.17	Study the impact of motorboat use on water quality.	Omitted. Done in Baseline Report.
5.1.18	Explore other methods of studying fall-run chinook salmon.	Underway and incorporated into draft FISH Plan recommendations throughout.
5.1.19	Conduct a temperature mapping study of the lower American River.	Incorporated into Recommendation D.
5.1.20	Evaluate impacts on listed species of using Folsom Reservoir preferentially to meet Delta water quality standards and export demands.	Incorporated into Recommendation #9.
5.1.21	Determine contribution of estuary reared fish to the total spawning population.	Recommendation #18.
5.1.22	Conduct watershed optimization analysis.	Incorporated into Recommendation #2.
5.1.23	Evaluate production demands on lower American River water supply needs for urban/municipal use.	Omitted. Non-responsive.
5.1.24	Examine ways to increase yield from American River watershed.	Omitted. Outside FWG scope because key opportunity to increase yield resides in groundwater.
5.1.25	Conduct a cost/benefit and feasibility study on the reintroduction of anadromous fish above Nimbus and Folsom dams.	Omitted. Outside FWG scope.
5.1.26	Conduct a thermal refugia utilization study.	Incorporated into Recommendation B.
5.1.27	Undertake study to determine in what month are flows likely to be most closely correlated with juvenile emigrant population size.	Omitted. Done in Baseline Report.

No.	Suggestions*	Status**
5.1.28	Undertake a rigorous analysis of confidence intervals and estimations of error in current methodologies.	Omitted. Will be done in FISH Plan's Monitoring Strategy.
5.1.29	Evaluate alternative study methodologies: <ul style="list-style-type: none"> ▪ Monitor in-river production rather than escapement as a measure of the lower ▪ American River fall-run chinook salmon fishery health; ▪ Use of a fish weir or counting gate system to quantify escapement populations; ▪ Conduct hydro-acoustic sampling; and ▪ Separate hatchery influences from in-river production measurements. 	Omitted. Will be done in FISH Plan's Monitoring Strategy.
5.1.30	Conduct a rigorous (perhaps 100%) coded wire tag program for fall-run chinook salmon to track contribution of hatchery reared fish to in-river spawning populations. Methods for recovering tagged fish need to be investigated (i.e., creel survey, seining).	Omitted. Will be done in FISH Plan's Monitoring Strategy.
5.1.31	Conduct an emergence study controlling gravel and water temperatures. The emergence study conducted on the Tuolumne River should be consulted.	Incorporated into Recommendation #17.
5.1.32	Investigate the eventual fate of fish entrained in screw traps and subsequent comparison of emigration timing and screw trap counts to escapement population size. Estuarine/Delta rearing may be the key factor determining the number of returning adults.	Omitted. Done in Baseline Report.
5.1.33	Evaluate suggested alternative methods of estimating outmigrant population (e.g., use of egg deposition numbers, number of fish spawning, and sex ratios, in conjunction with an emergence survival model).	Underway, but also incorporated into Recommendations E and I.
5.1.34	Estimate striped bass abundance in the lower American River and effects on steelhead and chinook salmon populations.	Incorporated into Recommendation E, assuming that E includes development of a relative habitat suitability index for striped bass.
5.1.35	Estimate American shad abundance in the lower American River and effects on juvenile steelhead and chinook salmon populations.	Omitted. Non-responsive.
5.1.36	Make annual estimates of the number of steelhead spawning in the American River below Nimbus Dam.	Incorporated into Recommendation #6.
5.2	Model Development	
5.2.1	Develop automated temperature selection model for Folsom Dam.	Incorporated into Recommendation #2.
5.2.2	Establish database of lower American River research to support model development.	Incorporated into Recommendation #11.
5.2.3	Develop in-river production model.	Incorporated into Recommendation E.
5.2.4	Develop fish health index.	Incorporated into Recommendation B.

No.	Suggestions*	Status**
5.2.5	Create steelhead mortality model.	Incorporated into Recommendation F.
5.2.6	Create multi-point water temperature model with daily forecasting capabilities.	Recommendation C.
5.2.7	Develop a rigorous analysis of error and confidence intervals associated with population estimations (spawning stock escapement and emigrant juvenile).	Omitted. Done in Baseline Report.
5.2.8	Establish relationship between storm event and incidence of contamination. Use data gathered at Fairbairn Water Treatment Plant.	Omitted. Addressed in Baseline Report. County has related effort underway.
5.2.9	Establish the role of the lower American River regarding salmonid life history, particularly in the ocean (e.g., through creel surveys and/or scale analysis).	Omitted. Outside FWG scope.

* Recommendations in this column refer to the numbering system in the "sorting matrix form" used at 3/7/01 TSC meeting.

** Recommendation numbers in this column refer to numbering system used in the September 2001 draft FISH Plan recommendations (Chapter 6).