Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Project Information

1. **Proposal Title:**

   Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

2. **Proposal applicants:**

   Steve Felte, Tri-Dam Project
   Avry Dotan, AD Consultants
   Dean Marston, California Department of Fish & Game

3. **Corresponding Contact Person:**

   Steve Felte
   Tri-Dam Project
   P.O. Box 1158 Pinecrest CA 95364
   209 965-4235
   sjf@tridamproject.com

4. **Project Keywords:**

   Fish Management
   Water Resource Management
   Watershed Management

5. **Type of project:**

   Planning

6. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

7. **Topic Area**:

   At-Risk Species Assessments

8. **Type of applicant:**

   Local Agency

9. **Location - GIS coordinates:**

Latitude:	37.76820
Longitude:	-120.85185
Datum:	

Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.

New Melones Reservoir, Tulloch Reservoir, Goodwin Pool, the Lower Stanislaus River from Goodwin Dam to the confluence with the San Joaquin River (approx. 60 miles of river), and the lower SJR from the confluence to Mossdale Bridge.

10. **Location - Ecozone:**

    12.1 Vernalis to Merced River, 13.1 Stanislaus River

11. **Location - County:**

    Calaveras, Stanislaus, Tuolumne

12. **Location - City:**

    Does your project fall within a city jurisdiction?

    No

13. **Location - Tribal Lands:**

    Does your project fall on or adjacent to tribal lands?

    No

14. **Location - Congressional District:**

    4

15. **Location:**

    California State Senate District Number: 12

    California Assembly District Number: 25

16. **How many years of funding are you requesting?**

    3

17. **Requested Funds:**
    a) Are your overhead rates different depending on whether funds are state or federal?

       No

       If no, list single overhead rate and total requested funds:

       Single Overhead Rate: 19.9

       Total Requested Funds: 661902

b) Do you have cost share partners already identified?

Yes

If yes, list partners and amount contributed by each:

US Bureau of Reclamation	**75000**
Oakdale Irrigation District, South San Joaquin Irrigation Disterict and Stockton East Water District	**85000**

c) Do you have potential cost share partners?

No

d) Are you specifically seeking non-federal cost share funds through this solicitation?

No

If the total non-federal cost share funds requested above does not match the total state funds requested in 17a, please explain the difference:

18. **Is this proposal for next-phase funding of an ongoing project funded by CALFED?**

No

Have you previously received funding from CALFED for other projects not listed above?

No

19. **Is this proposal for next-phase funding of an ongoing project funded by CVPIA?**

No

Have you previously received funding from CVPIA for other projects not listed above?

No

20. **Is this proposal for next-phase funding of an ongoing project funded by an entity other than CALFED or CVPIA?**

Yes

If yes, identify project number(s), title(s) and funding source.

12-98	**Stanislaus River Temperature Management Study**	**US Bureau of Reclamation, California Department of Fish and Game, Oakdale Irrigation District, South San Joaquin Irrigation District, Stockton East Water District**

Please list suggested reviewers for your proposal. (optional)

Stephen McCord	**Larry Walker Associates**	**(530) 753-6400**	**SAM@lwadavis.com**

21. **Comments:**

Environmental Compliance Checklist

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

1. **CEQA or NEPA Compliance**
   a) Will this project require compliance with CEQA?

      No

   b) Will this project require compliance with NEPA?

      No

   c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

      The project proposal is for computer modeling and feasibility study.

2. **If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies).** *If not applicable, put "None".*

   CEQA Lead Agency:
   NEPA Lead Agency (or co-lead:)
   NEPA Co-Lead Agency (if applicable):

3. **Please check which type of CEQA/NEPA documentation is anticipated.**

   CEQA
   -Categorical Exemption
   -Negative Declaration or Mitigated Negative Declaration
   -EIR
   Xnone

   NEPA
   -Categorical Exclusion
   -Environmental Assessment/FONSI
   -EIS
   Xnone

   If you anticipate relying on either the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that you believe covers this project.

4. **CEQA/NEPA Process**
   a) Is the CEQA/NEPA process complete?

      None

   b) If the CEQA/NEPA document has been completed, please list document name(s):

5. **Environmental Permitting and Approvals** (*If a permit is not required, leave both Required? and Obtained? check boxes blank.*)

LOCAL PERMITS AND APPROVALS

Conditional use permit

Variance

Subdivision Map Act

Grading Permit

General Plan Amendment

Specific Plan Approval

Rezone

Williamson Act Contract Cancellation

Other

STATE PERMITS AND APPROVALS

Scientific Collecting Permit

CESA Compliance: 2081

CESA Compliance: NCCP

1601/03

CWA 401 certification

Coastal Development Permit

Reclamation Board Approval

Notification of DPC or BCDC

Other

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation

ESA Compliance Section 10 Permit

Rivers and Harbors Act

CWA 404

Other

PERMISSION TO ACCESS PROPERTY

Permission to access city, county or other local agency land.
Agency Name:

Permission to access state land.
Agency Name:

Permission to access federal land.
Agency Name:

Permission to access private land.
Landowner Name:

6. **Comments.**

Land Use Checklist

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

1. **Does the project involve land acquisition, either in fee or through a conservation easement?**

   No

2. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

   No

3. **Do the actions in the proposal involve physical changes in the land use?**

   No

   If you answered no to #3, explain what type of actions are involved in the proposal (i.e., research only, planning only).

   Research and feasibility level study

4. **Comments.**

Conflict of Interest Checklist

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Please list below the full names and organizations of all individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal or who will benefit financially if the proposal is funded.
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Individuals not listed in the proposal who helped with proposal development, for example by reviewing drafts, or by providing critical suggestions or ideas contained within the proposal.

The information provided on this form will be used to select appropriate and unbiased reviewers for your proposal.

Applicant(s):

Steve Felte, Tri-Dam Project
Avry Dotan, AD Consultants
Dean Marston, California Department of Fish & Game

Subcontractor(s):

Are specific subcontractors identified in this proposal? Yes

If yes, please list the name(s) and organization(s):

Avry Dotan	AD Consultants
Donald Smith	Resource Management Associates
Michael Deas	Watercourse Eng.
Mike Gazit	Mike Gazit Eng.

Helped with proposal development:

Are there persons who helped with proposal development?

No

Comments:

Budget Summary

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Please provide a detailed budget for each year of requested funds, indicating on the form whether the indirect costs are based on the Federal overhead rate, State overhead rate, or are independent of fund source.

State Funds

Year 1												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1	Extend the existing model						51250			51250.0		51250.00
2	Refine the S-SJR Model using current data						45675			45675.0		45675.00
3	Perform operational studies						25375			25375.0		25375.00
4	Perform pre-feasibility studies						8450			8450.0		8450.00
5	Develop implementation plans						0			0.0		0.00
6	Collect, store and manage data	3360	57600		2500	7500	11250	1500		80350.0	13751	94101.00
7	Develop water temperature criteria				3000		46600			49600.0		49600.00
		3360	57600.00	0.00	5500.00	7500.00	188600.00	1500.00	0.00	260700.00	13751.00	274451.00

Year 2												
Task No.	**Task Description**	**Direct Labor Hours**	**Salary *(per year)***	**Benefits *(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1	Extend the existing model									0.0		0.00
2	Refine the S-SJR Model using current data						22188			22188.0		22188.00
3	Perform operational studies						62938			62938.0		62938.00
4	Perform pre-feasibility studies						76425			76425.0		76425.00
5	Develop implementation plans						0			0.0		0.00
6	Collect, store and manage data	3360	57600		2500	7500	7025	1500		76125.0	13751	89876.00
7	Develop water temperature criteria						0			0.0		0.00
		3360	57600.00	0.00	2500.00	7500.00	168576.00	1500.00	0.00	237676.00	13751.00	251427.00

Year 3													
Task No.	**Task Description**	**Direct Labor Hours**	**Salary** ***(per year)***	**Benefits** ***(per year)***	**Travel**	**Supplies & Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1	Extend the existing model									0.0		0.00
2	Refine the S-SJR Model using current data						12887			12887.0		12887.00
3	Perform operational studies						20387			20387.0		20387.00
4	Perform pre-feasibility studies						40675			40675.0		40675.00
5	Develop implementation plans						55950			55950.0		55950.00
6	Collect, store and manage data						6125			6125.0		6125.00
7	Develop water temperature criteria									0.0		0.00
		0	0.00	0.00	0.00	0.00	136024.00	0.00	0.00	136024.00	0.00	136024.00

Grand Total=661902.00

Comments.

The above budget reflects the California Department of Fish and Game (CDFG) cost for the first two years and the consultants cost for the entire three-year period. The CDFG costs are detailed in the Direct Labor Hours, Salary, Travel, Supplies & Expendable, Equipment, and Indirect Costs columns. The total consultants costs are provided in the Services or Consultants column only. However, in the Budget Justification forms we provided a breakdown of the cost for all the individuals in the project. It should be noted that we assumed that the CDFG cost for the third year would be covered either by the department itself or through additional grant.

Budget Justification

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Direct Labor Hours. Provide estimated hours proposed for each individual.

Hours per year Agency/Consultant Name yr1 yr2 yr3 CDF&G Steve Boumgartner 160 160 0 CDF&G Jason Guignard 1600 1600 0 CDF&G Seasonal 1600 1600 0 AD Consultants Avry Dotan 740 720 690 RMA Donald Smith 380 360 280 Watercourse Eng. Michael Deas 120 100 100 Mike Gazit Eng. Mike Gazit 0 270 0 Peer Review Panel TBD (5 members) 400 0 0

Salary. Provide estimated rate of compensation proposed for each individual.

Rates ($/hr) per year Agency/Consultant Name yr1 yr2 yr3 CDF&G Steve Boumgartner 30 31 0 CDF&G Jason Guignard 20 21 0 CDF&G Seasonal 13 13 0 AD Consultants Avry Dotan 110 115 120 RMA Donald Smith 125 130 135 Watercourse Eng. Michael Deas 135 135 135 Mike Gazit Eng. Mike Gazit 0 90 0 Peer Review Panel TBD (5 members) 100 0 0

Benefits. Provide the overall benefit rate applicable to each category of employee proposed in the project.

-- CDF&G staff Benefits are included in the salary. -- Consultants benefits are included in the hourly rates.

Travel. Provide purpose and estimate costs for all non-local travel.

Travel Expense ($) per year Agency/Consultant yr1 yr2 yr3 CDF&G: thermographs retrieval, temperature profiling in reservoirs, data transfer, training, and meetings 2500 2500 0 Consultants (all): Data gathering, site visits, meetings, and training 4000 1700 900

Supplies & Expendables. Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.

Supplies ($) per year Agency/Consultant Description yr1 yr2 yr3 CDFG: office supplies 500 500 0 computing 1000 1000 0 field supplies 6000 6000 0 Consultants (all): office supplies 500 500 500 computing 500 500 500

Services or Consultants. Identify the specific tasks for which these services would be used. Estimate amount of time required and the hourly or daily rate.

Note: Detailed breakdown for labor hours and rates for each consultant is provided in Direct Labor Hours and Salary above. The following are the total hours per task by year: Task Yr1 Yr2 Yr3 Total 1 420 0 0 420 2 380 180 100 660 3 220 510 160 890 4 60 700 320 1080 5 0 0 440 440 6 100 60 50 210 7 460 0 0 460 Total 1640 1450 1070 4160

Equipment. Identify non-expendable personal property having a useful life of more than one (1) year and an acquisition cost of more than $5,000 per unit. If fabrication of equipment is proposed, list parts and materials required for each, and show costs separately from the other items.

Equipment($) per year Agency/Consultant Description yr1 yr2 yr3 CDFG: temperature gages 1500 1500 0

Project Management. Describe the specific costs associated with insuring accomplishment of a specific project, such as inspection of work in progress, validation of costs, report preparation, giving presentatons, reponse to project specific questions and necessary costs directly associated with specific project oversight.

Project management costs are accounted for in the project as follows: Project Coordinator, Mr. Steve Felte (Tri-Dam): A minimum of 100 hours per year at no cost (in-kind contribution). CDFG Work Coordinator, Mr. Dean Marston (CDFG): A minimum of 200 hours per year at no cost (in-kind contribution). Project Manager, Mr. Avry Dotan (AD Consultants): A minimum of 120 hours per year. This cost is included in the Direct Labor Hours for AD Consultants. Detailed description of the work associated with project management is provided in the Qualification Section of our proposal.

Other Direct Costs. Provide any other direct costs not already covered.

None.

Indirect Costs. Explain what is encompassed in the overhead rate (indirect costs). Overhead should include costs associated with general office requirements such as rent, phones, furniture, general office staff, etc., generally distributed by a predetermined percentage (or surcharge) of specific costs.

Indirect costs are applied to the CDFG work only and are based on 19.9% of the Total Direct Costs.

Executive Summary

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Recognizing the need in analyzing the relationship between operational alternatives, water temperature regimes and fish mortality in the Stanislaus River, a group of stakeholders (cost-sharing partners) on the Stanislaus River initiated in December 1998, a cooperative effort for developing a water temperature model for the Stanislaus River and a supporting water temperature and meteorological data monitoring effort. The primary purpose of the existing model is to evaluate water temperature objectives at critical points in the river system that would enhance habitat conditions for fall-run Chinook salmon and Steelhead rainbow trout under alternative Stanislaus River system operations. The model is used to assess the magnitude and duration of temperatures throughout the lower Stanislaus, as well as cold-water supply and storage at New Melones Reservoir. To analyze the impacts of operations alternatives on fisheries over the entire river system, New Melones to the Bay Delta, the cost-sharing partners decided to extend the model downstream to include that portion of the San Joaquin River between the confluence and Mossdale Bridge. Extending the model will also implicitly provide insight on the effect of the operations on other tributaries of the San Joaquin River, Tuolumne and Merced, on the temperature regime in the lower San Joaquin River as it flows into the Bay Delta, consistent with the ERP Goal 1 and 2 and ERPP Vision for Ecological Processes in the East San Joaquin Basin Ecological Management Zone. The primary objective of our research and restoration project is to develop effective solutions for water temperature improvement on the Stanislaus River and the lower San Joaquin River by extending the existing model, and refining the results of the first phase of the study, Our hypothesis is that there is a relationship between water temperature in the Stanislaus / lower San Joaquin river system and the operations of New Melones Reservoir, Tulloch Reservoir and Goodwin Pool. The goal is to perform detailed modeling and analysis of various alternatives for water management in the Stanislaus River basin to achieve the following: 1. Validate our hypothesis. 2. Determine the relationship between water operations and river temperatures through Mossdale. 3. Refine and validate current water temperature criteria for Central Valley fall-run Chinook salmon and Steelhead rainbow trout. 4. Simulate water operational strategies to assess cost versus benefit ratios of various water operational alternatives. 5. Recommend a course of action. In order to achieve our goal we propose to investigate various mechanisms for water temperature improvements both through operational and/or structural measures at New Melones Reservoir, Tulloch Reservoir and Goodwin Pool, perform a pre-feasibility study of selected alternatives, and if one (or more) alternative(s) found to be feasible, develop a plan for the implementation of the alternative(s).

Proposal

Tri-Dam Project

Stanislaus - Lower San Joaquin River Water Temperature Modeling and Analysis

Steve Felte, Tri-Dam Project
Avry Dotan, AD Consultants
Dean Marston, California Department of Fish & Game

Stanislaus – Lower San Joaquin River Water Temperature Modeling and Analysis

A. Project Description: Project Goals and Scope of Work

1. Problem

A group of stakeholders on the Stanislaus River initiated a cooperative effort to develop a water temperature model for the Stanislaus River having recognized the need to analyze the relationship between operational alternatives, water temperature regimes and fish mortality in the Stanislaus River.

Members of the stakeholders group (cost-sharing partners) include the U.S. Bureau of Reclamation (USBR), Fish and Wildlife Service (USFWS), California Department of Fish & Game (CDFG), Oakdale Irrigation District (OID), South San Joaquin Irrigation District (SSJID) and Stockton East Water District (SEWD). In December 1998, the cost-sharing partners retained AD Consultants in association with its subconsultant Research Management Associates, to develop the model and perform a preliminary analysis of operational alternatives. In addition, the cost-sharing partners launched an extensive program for water temperature and meteorological data collection throughout the Stanislaus River Basin, in support of the modeling effort.

The extent of the current model includes the New Melones Reservoir, Tulloch Reservoir, Goodwin Pool, and approximately 60 miles of the Stanislaus River from Goodwin Dam to the confluence with the San Joaquin River (SJR)[1]. The model is driven by water temperature objectives at critical points in the river system that would enhance habitat conditions for fall-run Chinook salmon and Steelhead rainbow trout. The temperature objectives were developed by the California Department of Fish and Game[2] which identified three zones of water temperature conditions: Optimal, sub-lethal and critical. The range of temperatures for each zone varies by location and fish type.

The Stanislaus Water Temperature Model was used to simulate eleven different cases of Stanislaus River operation[3]. For each case the model estimated the magnitude and duration of water temperature conditions at critical points on the river[4], and the effect on water supply and storage at New Melones Reservoir.

[1] See Model Schematics, Attachment A

[2] Stanislaus River Temperature Monitoring/Modeling Project Water Temperature Criteria Development, January 17, 2001, Jason Guignard, California Department of Fish and Game

[3] See list of alternatives in Section 3, Table 1.

[4] See samples of model results in Attachment B.

In August 2001, the cost-sharing partners accepted the model as a valid tool for analyzing operational alternatives as they are related to meeting water temperature objectives for Chinook salmon and Steelhead trout in the Stanislaus River. Nevertheless, the group recognized that a more rigorous analysis of the operational alternatives would have to be carried out before they could adopt any alternative as an effective solution for enhancing water temperature conditions for these fish species.

Furthermore, a focused study of the hydrologic, hydraulic, and thermodynamic aspects of the lower Stanislaus and San Joaquin River system was deemed necessary to understand how changing water operations (e.g., minimum pool, greater release volume, changed release patterns etc.) in New Melones, Tulloch, and Goodwin reservoir complex to reduce water temperatures in the lower Stanislaus and/or San Joaquin Rivers would improve fishery habitat and reduce temperature related impacts to various life history stages of fall-run Chinook salmon and Steelhead rainbow trout, should they occur.

As such, the cost-sharing partners recommended extending the model downstream to include that portion of the San Joaquin River between the confluence and the Mossdale Bridge. By doing so, the model will provide a tool for analyzing fisheries impacts of operational alternatives over the entire river system connecting the Bay Delta to the operations of New Melones, Tulloch and Goodwin Pool. The model will also provide insight on the effect of the operations on other tributaries of the San Joaquin River, Tuolumne and Merced, on the temperature regime in the lower San Joaquin River as it flows into the Bay Delta.

The cost-sharing partners recommended to Tri-Dam to submit this proposal to CALFED in order to obtain the necessary financial support to allow continuation and successful completion of the water temperature modeling work.

The primary objective of our proposal is to refine the results of the first phase of the study and to develop effective solutions for water temperature improvement on the Stanislaus River.

Our hypothesis is that there is a relationship between water temperature in the Stanislaus / lower San Joaquin river system and the operations of New Melones Reservoir, Tulloch Reservoir and Goodwin Pool.

In this phase of the work it is our goal to continue with detailed modeling and analysis of various alternatives for water management in the Stanislaus River basin to achieve the following:

1. Validate our hypothesis
2. Determine the relationship between water operations and river temperatures through Mossdale
3. Refine and validate current water temperature criteria for Central Valley fall-run Chinook salmon and Steelhead rainbow trout

4. Simulate water operational strategies to assess cost versus benefit ratios of various water operational alternatives (e.g., minimum pool, greater release volume, changed release patterns etc.)
5. Recommend a course of action

In order to achieve our goal we propose to investigate various mechanisms for water temperature improvements both through operational and/or structural measures at New Melones Reservoir, Tulloch Reservoir and Goodwin Pool, perform a pre-feasibility study of selected alternatives, and if one (or more) alternative(s) found to be feasible, develop a plan for the implementation of this alternative(s).

In the next phases of the project, not covered under this proposal, we intend on implementing the plan through detailed feasibility study, design and construction (if applicable).

2. Justification

Background

Water temperature is one of the most important physical properties in aquatic ecosystems affecting nearly all biological and chemical processes. During spring, summer, and fall periods thermal loading, primarily due to solar insolation results in several thermal phenomenon. First, this seasonal loading results in thermal stratification for large reservoirs in temperate regions, forming a distinct surface layer termed the epilimnion and a cool bottom layer termed the hypolimnion, separated by a region of high temperature gradient called the thermocline. Water resource managers often take advantage of these conditions, utilizing cool hypolimnetic waters during summer and fall periods to maintain temperatures in downstream reaches for anadromous fish. A second phenomenon of seasonal thermal loading is the strong diurnal temperature signal imposed on Central Valley streams during the late spring through early fall period. Maximum and minimum daily temperatures can vary significantly from the daily mean temperature. This diurnal range is a function of several inter-related parameters, including water surface area, stream depth, riparian vegetation and topographic shading. Finally, small reservoirs, such as afterbays and forebays, respond to thermal loading in a fashion unlike large impoundments or river reaches – often exhibiting both reservoir and river characteristics. These bodies of water are relatively shallow and experience a short residence time, e.g., hours or days versus months in large impoundments.

Hypothesis

Thermal loading to reservoirs and rivers is well understood and has been modeled for several decades. From this body of knowledge it is well known that reservoir operations, river flows, channel and riparian vegetation maintenance and restoration can affect thermal conditions within a river basin. The fundamental hypothesis of this project is that water temperature control improvement can be attained through operations, structural modifications, and restoration measures in the Stanislaus River and lower San Joaquin River.

Conceptual Model and Physically-based Models

To assess the thermal regime in a river basin, the system is conceptually reduced into major components; in this case a system of serially connected reservoirs and river reaches. Each component is represented with an appropriate flow/operations and temperature model and simulation occurs in the downstream direction. To effectively represent the physical system and processes in these various components, physically based temperature models should be applied to the reservoir-river system. The previous application of STANMOD, CALSIM and HEC-5Q to the Stanislaus River clearly illustrates that such modeling tools can provide critical insight into the thermal response of reservoir-river systems to variable operations, hydrologic and meteorological conditions.

3. Approach

The project consists of seven inter-related tasks, including:

1. Extend the existing model to downstream San Joaquin River reaches to create a Stanislaus-San Joaquin River (S-SJR) Temperature Model.
2. Refine the S-SJR Water Temperature Model using current water temperature and meteorological data.
3. Perform operational studies.
4. Perform pre-feasibility studies of alternative management actions.
5. Develop implementation plans.
6. Collect, store and manage water temperature and meteorological data.
7. Develop water temperature criteria.

Each of these tasks is detailed below.

Task 1: Extend the existing model to downstream San Joaquin River reaches to create a Stanislaus-San Joaquin River (S-SJR) Temperature Model.

The first task is to extend the existing water temperature model for the Stanislaus River to include the lower San Joaquin River. This model will be capable of modeling water temperature regimes in New Melones Reservoir, Tulloch Reservoir, Goodwin pool and at defined critical points on the Stanislaus River between Goodwin Dam and the confluence with the San Joaquin River, as well as between the confluence to the San Joaquin River at Mossdale Bridge.

The following sub-tasks are required to implement this model extension:

1. Develop stream cross-section data and related stage versus flow relationships
2. Develop a relationship between environmental conditions (flow rate, meteorology, etc.) and San Joaquin River (above confluence) temperature.
3. Perform model calibration using the ambient temperature record at Vernalis and Mossdale Bridge.
4. Modify the GUI representation to include the model extension

By implementing this task the model will allow us to analyze the relationship between releases from New Melones and Tulloch and water temperature in the Stanislaus River and in the lower San Joaquin River. It will also allow us to look at various operational plans for New Melones and Tulloch reservoirs and the effects of those plans on downstream temperatures. Results from the model runs will provide the basis for further analysis of the relationship between reservoirs operations, water temperature variation and fish mortality in the Stanislaus and the San Joaquin rivers.

Task 2: Refine the S-SJR Water Temperature Model using current water temperature and meteorological data.

The second task is to refine the overall extended model using data gathered from January 1999 to present.

The original model relied on limited water temperature and meteorological data. At that time the only weather station that was available was the CIMIS station at Modesto. Data from this station had to be extrapolated to the rest of the basin in order to characterize the weather conditions throughout the basin. The data was adjusted to account for topological changes, heat exchange for open and sheltered water bodies, riparian shading, etc. As described in Section 6 below, the cost-sharing partners have launched an extensive program for water temperature and meteorological data collection throughout the Stanislaus River Basin.

Today, we have five active weather stations covering the area upstream of New Melones Reservoir to the confluence with the San Joaquin River. We also have twenty-three water temperature stations located in the river and tributaries that monitor water temperature on a continuous basis.

Data from these stations would be used to refine model calibration and as input to the models.

Task 3: Perform operational studies.

The third task is to analyze operational scenarios to enhance water temperature conditions on the Stanislaus River, and in return, the effect on the temperature regime on the lower San Joaquin River.

The cost-sharing partners have identified twelve scenarios to analyze. A preliminary study of these scenarios was conducted with the original model. In this task, we will perform a more rigorous analysis of these alternatives with the extended model by refining the hydrology using the updated CALSIM model (CALSIM is used to assess operations and the flow data is fed to HEC5-Q), temperature objectives criteria, model's time-step, and other parameters to improve the model's resolution.

Table 1 lists the alternatives that have been identified to date. Additional alternatives may be identified and incorporated in the study as necessary.

Table 1: Operational Alternatives identified to date.

Case	Description
Run 1	Historical Conditions (WY: 1983-1996)
Run 2	Simulated Base Case (WY 1983-1994) using CALSIM
Run 3a	Allocating up to 50 TAF to Meet Steelhead Objectives
Run 3b	Allocating up to 50 TAF to Meet Steelhead Objectives and operating New Melones' low level outlet in 1992
Run 4	Re-operating New Melones with minimum pool of 350 TAF
Run 5	Re-operating New Melones for Steelhead Objectives using existing outlet works
Run 6	Re-operating New Melones for Chinook Objectives using existing outlet works
Run 7	Re-operating New Melones for Steelhead using a new Temperature Control Device
Run 8	Re-operating New Melones for Chinook using a new Temperature Control Device
Run 9	Operating Goodwin using a new low level outlet
Run 10	Re-operating New Melones using existing outlet works and operating Goodwin using a new low level outlet
Run 11	Operating Tulloch to release cool water directly below Goodwin Dam, passing Goodwin Pool via newly constructed pipe.

Using the extended model, a subset of all alternatives will be identified for pre-feasibility studies.

Task 4: Perform pre-feasibility studies of alternative management actions.

The fourth task will examine the viability of selected alternative(s) on a pre-feasibility level basis. The study will involve investigating the various aspects of the preferred alternatives; this includes, but is not limited to, the impact on water supply, basin's firm yield, and reservoirs storage. The study will examine water rights issues, project costs and benefits, sources for funding, permits needed, and timetable for implementation. In cases where physical improvements to existing facilities or construction of new facilities are considered, the study will include preliminary layouts and control schemes, engineering criteria and cost estimate.

Task 5: Develop implementation plans.

The fifth task is to develop implementation plans for alternatives that provide effective, feasible, and acceptable improvements in water temperature control.

Implementation plans will identify the modifications to operations, physical structures, restoration measures, and institutional restrictions necessary to meet objectives identified under alternative management conditions. Operational changes may include altering reservoir storage management, delivery schedules, delivery quantity, and selective withdrawal from reservoirs, and releases to the lower Stanislaus River. Physical structure changes may include capital improvements to system components to expand operational flexibility, and changing diversion intake points and return flow discharge locations. Restoration measures may include establishing additional riparian vegetation adjacent to river reaches and channel improvements. Finally, certain alternatives may address changes in water rights, point of diversion, different uses, storage allocations, as well as myriad of other legal issues. Although this proposal does not intend to provide a legal basis for implementing alternative management actions, it is critical to identify that many alternative actions may require a modification to existing institutional conditions.

These implementation plans will provide specific recommendations for action, identifying the necessary elements to secure funds to design, permit, construct, and operate a selected alternative, as well as develop the requisite monitoring and project management plans.

Task 6: Collect, store and manage water temperature and meteorological data.

The sixth task is to continue the existing meteorological and water temperature monitoring effort that the cost sharing partners have instituted in the lower Stanislaus and San Joaquin River Basins to improve HEC-5Q model prediction reliability. For the last two years, the California Department of Fish and Game has contracted with the U.S. Bureau of Reclamation to monitor water temperatures in the New Melones, Tulloch, and Goodwin Reservoirs (e.g., reservoir profiling at ten locations), as well as in the Stanislaus River both up and downstream of the New Melones Reservoir complex (i.e., 23 thermographs). Additionally, the cost-sharing partners have purchased, installed, and are maintaining 5 meteorological stations which are located along the lower Stanislaus River basin. The contract between the U.S Bureau of Reclamation and the Department of Fish and Game will terminate on December 31, 2002.

Task 7: Develop water temperature criteria

The seventh task will include assembling a peer review panel (e.g., 5 to 7 members) to evaluate the biological merits, and application to the Stanislaus River, of the California Department of Fish and Game's water temperature tolerance criteria for Central Valley fall-run Chinook salmon and Steelhead rainbow trout.

The CDFG developed these criteria for evaluating the relative merits of the operational scenarios studied in the first phase of the modeling work.

4. Feasibility

As mentioned above, our proposed project is essentially a continuation of the first phase of water temperature modeling work on the Stanislaus River started over two and a half years ago. During that time period, the cost-sharing partners established already the task force to carry out the work, as well as the framework for working together on this project. In addition, there are neither permits required nor other restrictions that could hinder the study progress. As such, it is our belief that the project can move forward without any delays and should be completed in the time allotted.

5. Performance Measures

As with all modeling efforts, uncertainty is unavoidable, but quantification of uncertainty is highly relevant in how results are used. Existing simulation model results were compared with historical data to quantify the uncertainty associated with each component (reservoir or river reach) for various performance measures, e.g., daily mean, maximum, or minimum water temperature at selected locations[5]. Although model performance was deemed acceptable[6], one component of this project is to update the database with the latest field observations and improve the temperature model calibration. Performance measures will be developed with the support of stakeholders and may include maximum error, exceedance criteria, seasonal consideration, as well as others.

6. Data Handling and Storage

During the past two years, the cost-sharing partners established an elaborate and well-coordinated system for data collection, management, storage, and retrieval. The system consists of the following:

a) Water temperature stations in streams and reservoirs

b) Meteorological stations

c) Data management

[5] See examples of observed vs. simulated in Section 7, Task 2 of this proposal.

[6] Appraisal of the Application of HEC-5Q for Temperature Simulation of the Stanislaus River. Watercourse Engineering, Inc. July 20, 2001

The following is a brief description of each component of this program:

a) Water temperature monitoring program in streams and reservoirs

We currently operate and maintain twenty-three thermographs throughout the Stanislaus River and on the lower San Joaquin River[7]. All thermographs are programmed to measure water temperatures in the streams at 2-hour intervals. As shown in Figure 1, the thermographs are situated at the following key areas:

- Upstream of New Melones Reservoir. These thermographs measure the temperature inflow to New Melones from the three tributaries to the Stanislaus River: The North Fork, Middle Fork and South Fork Stanislaus, as well as water bypassing these tributaries via hydropower facilities (Collierville Powerhouse and Stanislaus Powerhouse).
- Immediately downstream of New Melones Dam and powerhouse, Tulloch Dam and powerhouse, and Goodwin Diversion Dam.
- In the Goodwin Pool measuring water temperature at two irrigation canals, diversion tunnel, and along the face of the dam at three depths. (The purpose of these thermographs is to examine the temperature regime in the Goodwin Pool in order to evaluate the merit of constructing a low level outlet in Goodwin Dam for cool water release downstream.)
- At critical points for fisheries on the main Stanislaus River: Knights Ferry, Orange Blossom Bridge, Oakdale Recreation area, and Riverbank.
- Around the confluence with the san Joaquin River: About 100 meters upstream of the confluence on the San Joaquin River, about 100 meters upstream of the confluence on the Stanislaus River, and about 4 miles downstream of the confluence on the San Joaquin River (at Durham Ferry).

In addition, we measure water temperature profiles at number of locations in New Melones Reservoir and Tulloch Reservoir once every two weeks.

b) Meteorological data collection

Currently, we operate and maintain five CIMIS like weather stations throughout the Stanislaus River Basin, at the following stations:

- Near Beardsley Dam on the Middle Fork Stanislaus River.
- On the south shore of New Melones Reservoir (at the premises of the USBR headquarter)
- On the north shore of Goodwin Pool (half way between Tulloch Dam and Goodwin Dam)

[7] A complete list of sites is provided in Attachment C of this proposal.

- By the river in the city of Oakdale, and
- By the river near the city of Ripon (this station will be moved to the confluence area in the near future).

The stations record air temperature, relative humidity, wind speed and direction, and solar radiation on a continuous basis.

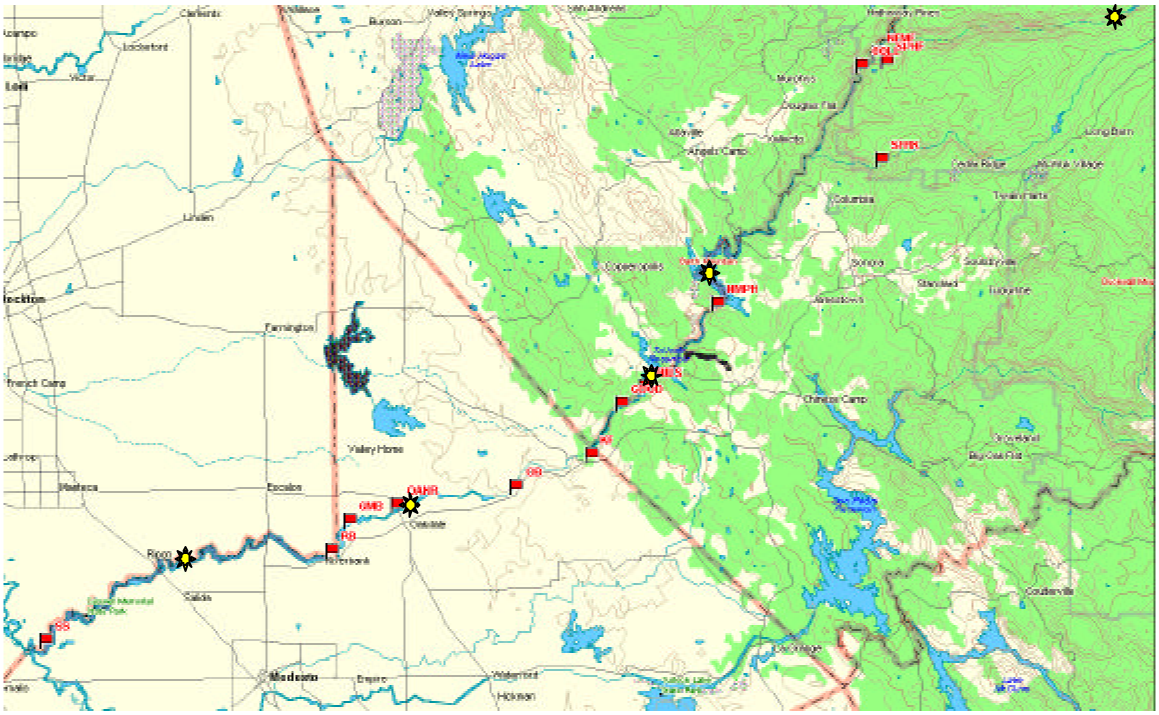
c) Data management

The CDFG staff is in-charge of collecting water temperature data and meteorological data from the above-motioned stations. The data is collected on a regular basis and then being stored in three databases:

- Stanislaus Temperature Database – a local database designed specifically for this project. The database was developed on Microsoft Access platform and can store both thermographs' data and profilers' data. The database is also a placeholder of historical data collected over the years by the CDFG and USBR. Data loaded into the database is filtered using built-in QA/QC features that allow checking data integrity and validity.
- CDEC database – a global database operated and maintained by the CDWR. Once a month, data from 14 stations in the local database are exported to CDEC for long-term storage and posting on the Internet.
- WINDS (Weather Information Network Display Software) - this is database and display software for remote data collection platforms, produced by the Weathernews Company. Approximately once every three months, meteorological data from the weather stations are downloaded and saved in this database.

In the this phase of the project, our objective is to process as an input for the Stanislaus – Lower San Joaquin River Water Temperature Model all the data stored in the databases mentioned above.

Figure 1 – Location of thermographs and weather stations on the Stanislaus River



Key:
Flags designate thermographs
Suns designate weather stations

7. Expected Products/Outcomes

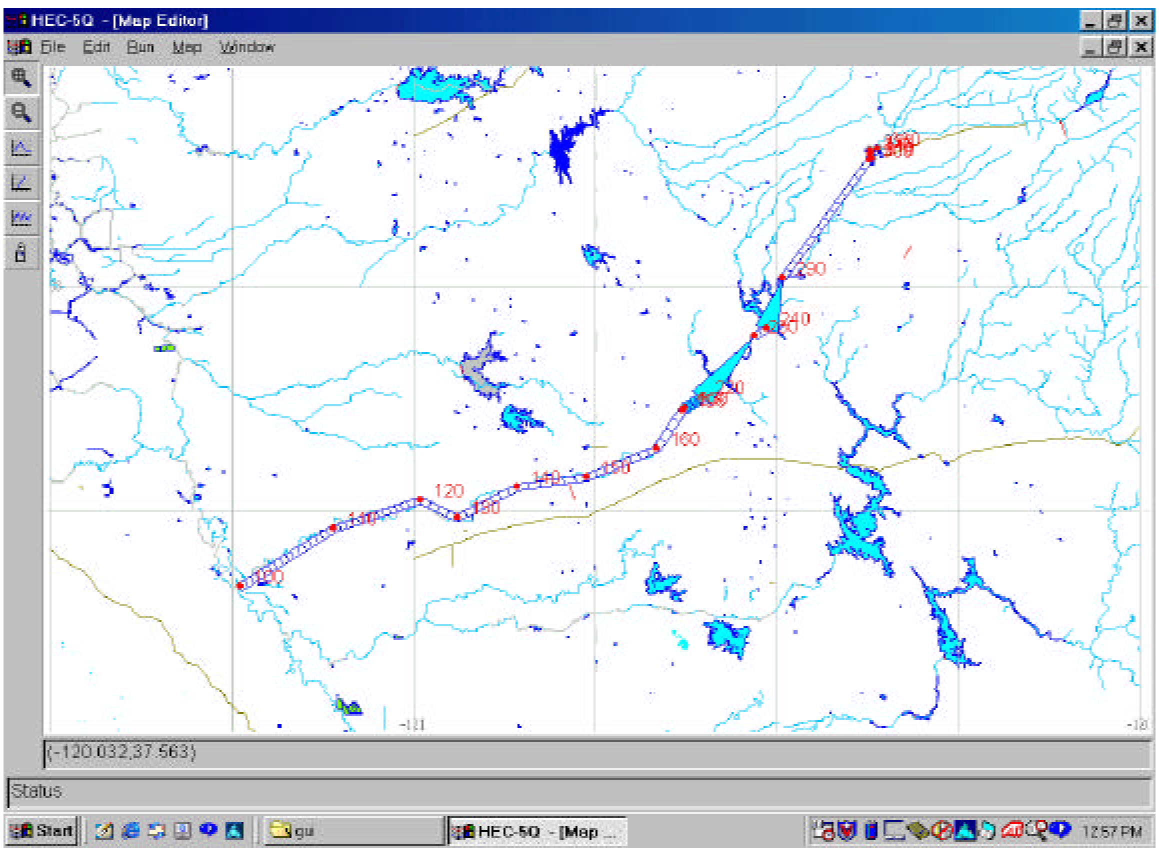
The expected products and outcomes for the proposed project will be consistent with the tasks outlined in Section A-3 above. Namely, a set of mathematical tools that characterize the Stanislaus reservoir-river system and the lower San Joaquin River, associated analysis, and implementation plans identifying potential actions for temperature control in the Stanislaus River. All relevant results and studies will be compiled into a single project report. In addition, quarterly reports will be submitted in accordance with the CALFED guidelines. Periodic status reports will be given to the cost-sharing partners and other interested parties of the Stanislaus watershed/stakeholder group. All field data will be available to interested parties.

One of the challenges associated with modeling and operations studies of this nature is the ability to convey the complexity of these water resources management problems that incorporate a vast amount of information in a concise and easy to grasp manner. Based on our experience in water temperature modeling and studies for the Stanislaus River, we have developed several concepts to effectively present results in presenting the results effectively. The following are short descriptions of the products and outcomes expected for the various tasks as well as examples of how we intend to present some of the results.

Task 1: Extend the existing model to downstream San Joaquin River reaches to create a Stanislaus-San Joaquin River (S-SJR) Temperature Model.

Each member of the cost-sharing partners will receive a copy of the HEC-5Q model for the Stanislaus River and lower San Joaquin River. The model will include a Graphical User Interface (GUI) allowing visualization of model results in a user-friendly manner. The model will also be accompanied by the input and output files for model calibration and at a later time for the operations studies to be conducted in Task 3. Figure 2 is an example of a screen capture of the GUI for Stanislaus Water Temperature Model. The GUI allows zooming on any reservoir or river segment and generating animation or static plots of time series for water temperature variations. The GUI allows also superimposing results from multiple locations, or from different studies at a single location, for the purpose of comparing different operating scenarios/alternatives.

Figure 2 –HEC-5Q Graphical User Interface



Task 2: Refine the S-SJR Water Temperature Model using current water temperature and meteorological data.

A description of the system, HEC5-Q model, modeling approach, and calibration methodology and results (e.g., Figures 3 and 4) will be presented in the project report. A peer review of the model will be included as well.

Figure 3 – HEC-5Q Model Calibration Results. Observed vs. Computed New Melones Reservoir Temperature Profile, July 14, 1999.

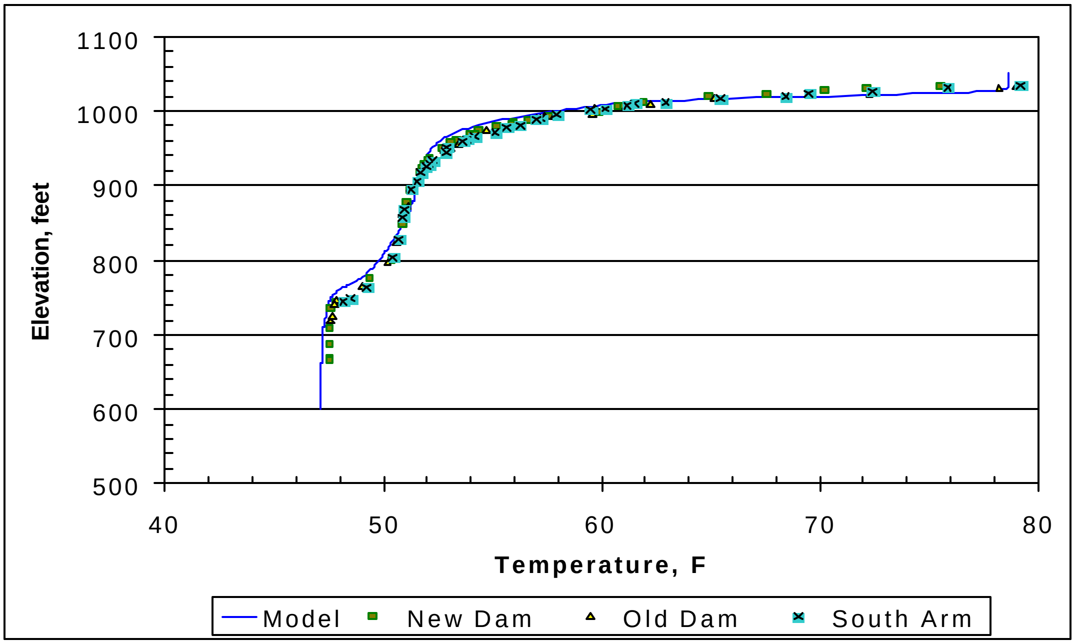


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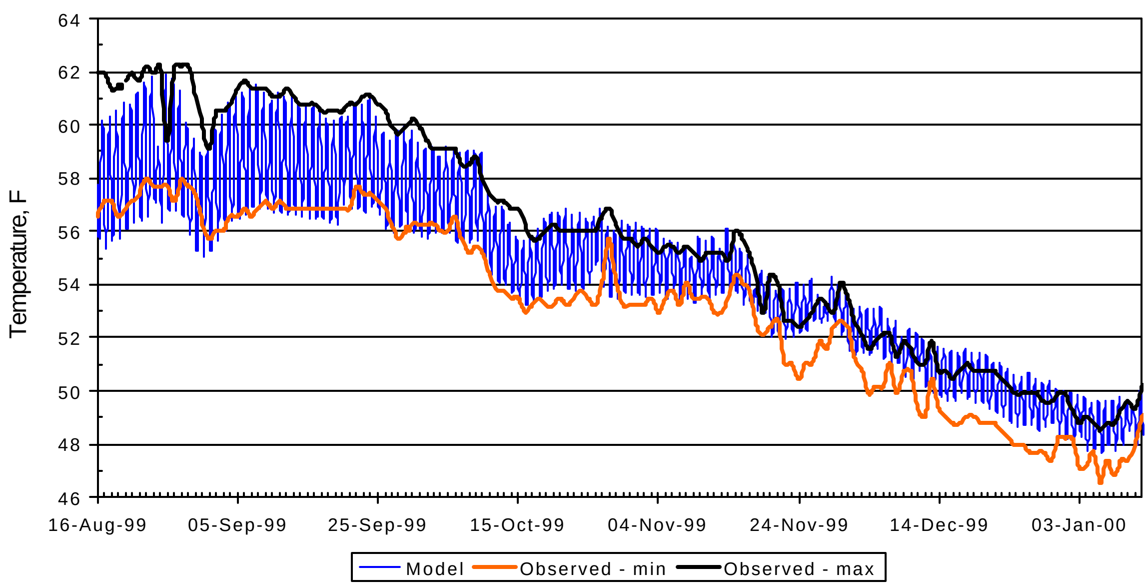
Figure 4 – HEC-5Q Model Calibration Results. Observed vs. Computed Stream Water Temperature at Orange Blossom Bridge in 1999.



Task 3: Perform operational studies.

The various alternatives analyzed including assumptions, methodology and results will be detailed in the final project report. Examples of data analysis and presentation are shown in Figures 5 and 6.

Figure-6 is a duration table for water temperature condition at critical control points in the system. In this example, the duration table shows the percent of the time optimal, sub-optimal and critical temperature conditions for Chinook salmon occur in the specified points.

Figure 5 – Temperature duration table for Chinook salmon.

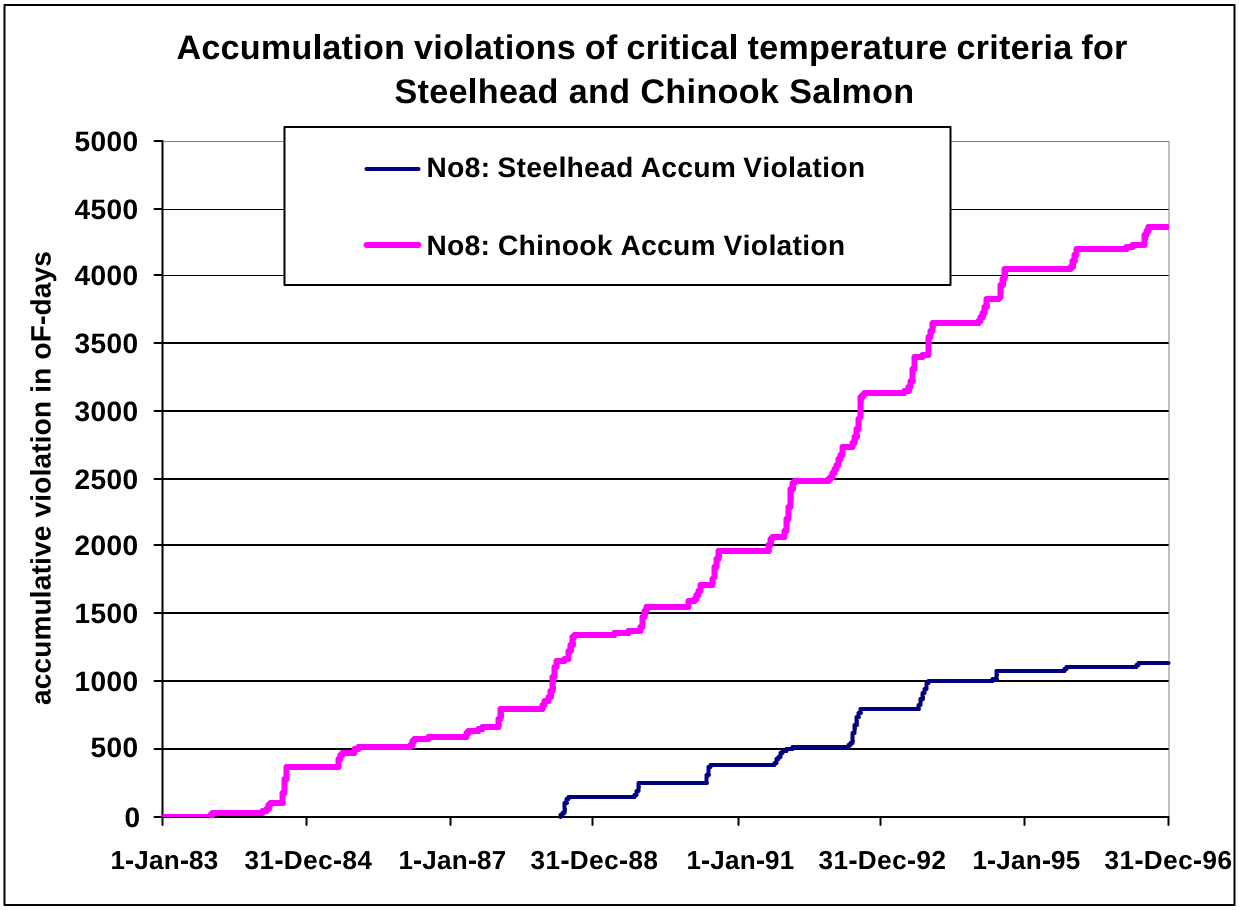
% of time Temp. is equaled to or less	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5%	43.7	45.5	50.7	54.7	56.8	59.2	52.3	52.6	63.7	52.0	46.0	43.2
10%	44.1	46.6	52.5	55.6	58.4	59.9	52.6	53.9	65.0	53.4	47.1	43.8
15%	44.7	47.8	53.6	56.5	59.2	63.8	53.0	54.0	66.1	54.0	48.9	44.5
20%	45.2	48.6	54.0	57.1	59.6	64.6	53.3	54.1	66.8	54.3	49.9	45.3
25%	45.7	48.9	54.7	57.9	60.2	65.3	53.6	54.4	67.6	54.7	50.7	45.8
30%	45.9	49.1	55.1	58.4	60.7	65.7	53.9	54.6	68.5	55.3	51.5	46.0
35%	46.4	49.4	55.7	59.0	61.4	66.2	54.2	54.9	69.1	55.8	51.9	46.7
40%	46.7	49.7	56.2	59.4	62.1	66.7	54.7	55.1	69.8	56.2	52.4	47.2
45%	47.1	49.9	57.0	59.9	62.7	67.2	54.8	55.7	70.4	57.5	52.7	47.8
50%	47.3	50.4	58.1	60.4	63.1	67.7	55.1	56.0	71.0	59.5	53.4	48.6
55%	47.6	50.8	58.8	61.0	63.6	68.2	55.4	56.4	71.5	61.5	53.8	49.4
60%	47.9	51.5	59.6	61.6	64.1	68.6	55.7	56.8	71.8	62.3	54.4	49.7
65%	48.1	51.9	60.4	62.1	64.4	69.5	56.0	57.0	72.2	63.4	54.9	50.3
70%	48.4	52.2	61.2	62.8	64.9	70.0	56.2	57.3	72.5	64.0	55.2	50.6
75%	48.6	52.7	61.9	63.2	65.6	70.5	56.4	57.5	72.9	64.8	55.7	50.9
80%	48.9	53.1	62.5	63.8	66.3	70.9	56.6	57.8	73.8	65.5	56.2	51.2
85%	49.4	53.8	63.1	64.3	66.9	71.3	57.0	58.7	74.4	65.9	57.0	51.5
90%	50.3	54.6	63.9	64.7	67.6	72.3	57.7	61.8	75.7	66.4	58.4	52.2
95%	51.3	56.2	65.3	66.2	68.5	74.0	60.3	64.3	76.2	69.9	60.1	52.8
100%	53.8	59.7	69.4	67.9	72.4	77.1	66.2	69.2	77.3	74.6	63.9	54.6
Temp. Criteria/location	RB	RB	CON	CON	CON	CON	KF	KF	CON	RB	RB	RB
Optimal -Max	54	54	55	55	55	55	60	60	54	54	54	54
Sub-Lethal	54-62	54-62	55-65	55-65	55-65	55-65	60-65	60-65	54-65	54-65	54-62	54-62
Critical	62	62	65	65	65	65	65	65	65	65	62	62
Optimal (%)	100%	85%	25%	5%	0%	0%	90%	85%	0%	15%	55%	95%
Sub-Lethal (%)	0%	15%	65%	85%	70%	20%	5%	10%	10%	60%	40%	5%
Critical (%)	0%	0%	10%	10%	30%	80%	5%	5%	90%	25%	5%	0%

Key:

RB	Riverbank
CON	Confluence with the SJR
KF	Knight's Ferry
OAK	Oakdale Recreation Area
(blue)	Optimal Temperature conditions
(white)	Sub-Lethal Temperature conditions
(yellow)	Critical Temperature conditions

Figure-5 is a plot showing the cumulative violation in degree-days of water temperature conditions with respect to the critical threshold for Chinook salmon and Steelhead trout under a given operating scenario.

Figure 6 – Water temperature violation.



Task 4: Perform pre-feasibility studies of alternative management actions.

Results of the pre-feasibility study will be presented in the project report describing, quantifying and qualifying the costs and benefits associated with the selected alternatives. The report will also include conceptual drawing of physical modification to existing facilities or new facilities.

Task 5: Develop implementation plans.

Implementation plans will be included in the final report. A timeline for implementation actions will be recommended.

Task 6: Collect, store and manage water temperature and meteorological data.

The deliverable of Task 6 will be the updated databases including all water temperature and meteorological data collected to date.

Task 7: Develop water temperature criteria

The deliverable of Task 7 will be a special Appendix to the project report summarizing the evaluations of the peer review panel regarding the CFDG's water temperature tolerance criteria for Central Valley fall-run Chinook salmon and Steelhead rainbow trout.

8. Work Schedule

The schedule for the project is presented in Figure 7. The schedule shows staff-hour estimate for each task, milestones and deliverables dates. The estimated time for executing task 1 through 4 and Task 7 is 30 months from notice to proceed until completion. Task 5 is contingent upon our decision to peruse one or more alternatives for implementation. Task 5 should take approximately 6 month to complete. Task 6 will take place on a continuous basis throughout the duration of the project.

The overall schedule may vary depending upon the need to develop additional data during the course of the work.

Figure 7 – Project Schedule for Stanislaus – Lower San Joaquin River Water Temperature Modeling & Analysis

	Year 1												Year 2												Year 3												
Month =>	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**Man-hours**
Task 1								*																													420
Task 2												*																								*	660
Task 3																										*											890
Task 4																														*							1080
Task 5																																				*	440
Task 6																																				*	6930
Task 7										*																											460
																																				Total	10880

Key:

▬ Duration of Task

•••••• On-going Task

* Milestone Date, Progress Report

Task 1: Extend the existing model to downstream San Joaquin River reaches to create a Stanislaus-San Joaquin River (S-SJR) Temperature Model
Task 2: Refine the S-SJR Water Temperature Model using current water temperature and meteorological data
Task 3: Perform operational studies
Task 4: Perform pre-feasibility studies of alternative management actions
Task 5: Develop implementation plans
Task 6: Collect, store and manage water temperature and meteorological data
Task 7: Develop water temperature criteria

B. Applicability to CALFED ERP and Science Program Goals and Implementation Plan and CVPIP Priorities

1. ERP, Science Program and CVPIA Priorities

Our proposal directly contributes the ERP Strategic Objective for creating flow and temperature regimes in regulated rivers that favor native aquatic species as stated in *Strategic Goal 1. At-risk Species as follows*: "Actions should focus upon research designed to help manage the hydrologic regime in the Bay-Delta watershed streams to improve streamflows, net Delta channel flows, and **temperatures for native anadromous** and estuarine fish species." (2001 PSP, p. 23) Also, the plan calls for: "Projects should include … assessment of **reservoir operations and/or the use of temperature control devices** to improve temperatures for chinook salmon spawning and steelhead rearing" (2001 PSP, p. 23). This is essentially the essence of our proposed work under Task 3 in our proposal.

The hypothesis and goal stated in our proposal (see A.1 above) is also consistent with the *Strategic Goal 2: Ecosystem Processes and Biotic Communities, Flow Evaluation and Simulation Modeling:* "Action should include…**evaluating flow-temperature relationships under a variety of conditions**; and understanding how non-native and native species respond to flows." (2001, PSP p. 27).

Task 5 in our proposal is compatible with the *Restoration Priorities for the San Joaquin Region, Stream Flow Management Plan*: "Projects should design and implement ecologically based streamflow and **temperature management plans** including geomorphic and biological criteria for water acquisitions for the San Joaquin, **Stanislaus**, Merced, and Tuolumne Rivers (Strategic Goal 2, natural flow regimes)." (2001, PSP p. 74)

In addition, our proposed project directly addresses the *ERPP Vision for Ecological Processes in the East San Joaquin Basin Ecological Management Zone*, as follows: "..**improving water temperatures** in the three rivers (**Stanislaus**, Tuolumne, and Merced) below the reservoirs in this zone related to the overall ecological health of the system and promote sustainable fisheries. …**The vision for water temperatures in these rivers is to provide sufficient summer and early-fall base flows in the river channels** and restore the riparian corridors and natural stream channel characteristics that limit heating of rivers. **Storing sufficient cool water in the reservoirs during drought** will also help maintain a minimum cool water habitat in the rivers." (ERPP v.2, p424-425).

2. Relationship to Other Ecosystem Restoration Projects

In the San Joaquin River Basin, several limiting factors have been identified (e.g., lack of suitable spawning habitat, insufficient flow, warm water temperatures etc.)

as potentially limiting populations of fall-run Chinook salmon and Steelhead rainbow trout. Current restoration actions have focused on improving fishery habitat by replenishing spawning gravels in the Stanislaus River and, providing increased minimum fishery habitat protection flows thru water purchases (e.g., VAMP and CVPIA-B2). This proposal seeks to improve fishery habitat by improving water temperature and, is intended to provide an end product in the form of a preferred restoration action that would, if implemented, lead directly to suitable water temperatures for fall-run Chinook salmon and Steelhead rainbow trout being provided in the lower Stanislaus River. Funding of this proposal would lead directly to the removal of water temperature as a possible limiting factor and, will result in precious limited available water supplies being used in the best beneficial use possible. Lastly, funding of this proposal will identify what temperature targets should be pursued elsewhere in the San Joaquin River Basin to further improve fishery habitat for fall-run Chinook salmon and Steelhead rainbow trout.

3. Requests for Next-Phase Funding

Not applicable

4. Previous Recipients of CALFED Program or CVPIA Funding

Not applicable

5. System-Wide Ecosystem Benefits

This project will result in a vastly improved understanding of the thermal regime of the Stanislaus River, the lower San Joaquin River, as well defining the effects of Stanislaus River reservoir operations on downstream river reaches. Water temperature is one of the most important physical properties in aquatic ecosystems, affecting nearly all biological and chemical processes.

Identification of the thermal regime in response to upstream water management operations throughout these river reaches is critical to anadromous fish restoration measures in the San Joaquin River and its tributaries. Further, any similar efforts to define the thermal regime on upstream reaches of the San Joaquin River and its tributaries could be readily integrated with the modeling tools identified herein.

6. Additional Information for Proposal Containing Land Acquisition

Not applicable

C. Qualifications

The consultants' approach to project organization is to have a simple structure comprised of a small but highly qualified team of experts. The work would be performed in a well-coordinated manner where each team member is assigned to well-defined tasks and a timetable. The following summarizes the qualifications and responsibilities of the key team members. Detailed breakdown of allocation of time to each team member by task is provided in the web forms in accordance with the PSP specifications.

Mr. Steve Felte – Project Coordinator
General Manager, Tri-Dam Project/ Tri-Dam Power Authority.
B.S. Chemistry (1973) – California State University, Sacramento
B.S. Sanitation (1973) – California State University, Sacramento

Mr. Felte is the general manager of hydroelectric facilities including 3 major Dams and 4 power-generating units on the Stanislaus River. He is responsible for overall operations of the Project including fiscal, personnel, power contract administration, coordinate with two Irrigation Districts and elected Board (Tri-Dam Partners). Currently directing FERC relicensing efforts of the Project. Mr. Felte was in-charge of administering the contract for Stanislaus River Water Temperature Model of behalf of the cost-sharing partners.

Relevant projects are:

- Administer the development and implementation of the Water Temperature Model for the Stanislaus River.
- Administer Lower Stanislaus Fish Studies including rotary screw trapping and radio tracking 1999-2001.
- Administer FERC relicensing studies for Middle Fork and main stem Stanislaus River of the Tri-Dam Hydroelectric Project 1999 to present.
- Administer FERC licensing, contracting and construction of the North Fork Stanislaus Hydroelectric Project.
- Administer Contract close out, claims settlement, contracting, contract administration, environmental compliance for Paradise ID Treatment and Pump Station.

Mr. Felte will administer the work and the budget for this project. He will interface with CALFED personnel and with the cost-sharing partners. Mr. Felte will be providing periodic (monthly or as appropriate) reports including budget and study effort status to all participants.

Mr. Avry Dotan – Project Manager
Principal, AD Consultants
M.S. Civil Engineering (1983) – University of Minnesota
B.S. Civil Engineering (1981) – Technion, Israel Institute of Technology

Mr. Dotan has over 20 years experience in modeling for water resources and hydroelectric projects. Mr. Dotan specializes in computer modeling of complex water supply projects, hydrology analysis, project operations, feasibility and economic studies, and FERC licensing and re-licensing. Mr. Dotan was the acting project manager for the development of the Stanislaus River Water Temperature Model.

Relevant projects are:

- In charge of the development and implementation of the Water Temperature Model for the Stanislaus River.
- Developed Water Temperature Database for the Stanislaus River.
- Analyzed (using STANMOD) the impact of the Stanislaus River operations on water quality parameters in the San Joaquin River at Vernalis, for the followings projects:
  - Interim Operations Plan between the USBR and California Department of Fish and Game
  - Vernalis Adoptive Management Plan (VAMP)
  - Water Transfer to the SEWD
  - South County Surface Water Supply Project

Mr. Dotan will manage the overall project. He will be in-charge of quality control of the deliverables and ensure that the project is prepared on schedule and within the agreed budget. Mr. Dotan will interface with the client's staff, attend technical and administrative meetings, prepare progress reports and respond to the client's information needs regarding the project. Mr. Dotan will be responsible to develop the hydrologic data for the model, the operation scenarios, and the feasibility studies. He will also participate in assembling input data for the model and preparing progress reports.

Mr. Donald Smith – Principal Modeler
Principal, Water Resources Management, Inc. (RMA)
B.S. Civil Engineering (1965) – U.C. Berkeley

Mr. Smith has over 30 years experience in modeling water quality and temperature for estuaries, streams and reservoirs. Mr. Smith is the principal of RMA, a company specializing in development and application of one-, two- and three-dimensional computer models for streams, reservoirs and estuaries, including: water temperature models, hydrodynamic models, water quality models, and sediment transport. Mr. smith is the primary author of the HEC-5Q Model and one of the authors of the WQRRS Model.

Relevant projects are:

- Developed the HEC-5Q Water Temperature Model for the Stanislaus River.
- Analyzed using the HEC-5Q Model of TDS, nutrients, phytoplankton, dissolved oxygen, suspended sediments, PH and organic and heavy metal contaminates under aerobic and anoxic conditions, for the following projects:
  - Russian River, CA
  - ACT and ACF River Systems, AL, GA, FL
  - Osage River system, MO
  - Red River of the North, ND, MN
  - Lower Russian River, CA
  - Columbia / Snake River system, OR, WA, ID
  - Sacramento River system, CA
  - Alleghney River system, PA

Mr. Smith will be in-charge of the adaptation of the HEC-5Q model to the Stanislaus-San Joaquin River system. He will ensure the proper representation of system characteristics in the model, perform model calibration and implement the Graphical User Interface. He will also participate in assembling input data for the model, operations and feasibility studies, and preparing progress reports.

Dr. Michael Deas – Advisor
Principal, Watercourse Engineering, Inc.
Ph.D. Civil Engineering (2000) – University of California, Davis
M.S. Civil Engineering (1989) – University of California, Davis
B.S. Civil Engineering (1986) – University of California, Davis
Registered Engineer, State of California (1990)

Dr. Deas provides professional engineering services for water quantity and quality issues associated with river and reservoir systems. Dr. Deas is the principal of Watercourse Engineering, Inc, a company specializing water quality assessment, including system definition, monitoring, model construction and application, and analysis of system response to alternative management conditions. Dr. Deas provided peer review of the Stanislaus Water Temperature Model.

Relevant projects are:

- Developed and applied reservoir models for simulating temperature and/or water quality for several mainstem reservoirs in California, including Shasta Reservoir, Trinity Reservoir, Iron Gate Reservoir, and Keswick Reservoir.

- Developed and applied river models for simulating temperature and/or water quality, including the Sacramento River, Klamath River, and Shasta River.
- Other project work includes:
  - Temperature model review for the Central Valley, CA
  - Reconstruction of historic Sacramento River water temperature
  - Design, implementation, and management of the Klamath Basin monitoring program, CA/OR

Dr. Deas will have an advisory role during the course of this project. He will review results of model calibration, assist in defining operations and management alternatives, review assumptions for selected alternatives, and support interpretation and final assessment of alternatives.

Other members of the project include:

Mr. Jason Guignard – Fishery Biologist, CDFG. Mr. Guignard will be in-charge of all the fieldwork associated with water temperature and meteorological data gathering and management.

Mr. Steve Baumgartner – Associate Fishery Biologist, CDFG. Mr. Baumgartner will coordinate and supervise all the fieldwork associated with data gathering.

Mr. Dean Marston – Senior Fishery Biologist Supervisor, CDFG. Mr. Marston will coordinate the overall CDFG effort in the project and provide resource guidance.

Mr. Mike Gazit – Consulting Mechanical Engineer. Mr. Gazit will be in charge of the development of the required water outlet and control facilities in the feasibility and conceptual design phase.

D. Cost

1. Budget

Detailed budget for each year of requested support and budget justification are included in the web forms. Please note that the amount of requested funds (web Form I – Project Information, Item 17a) is in addition to the amount of money spent by the cost-sharing partners for the first phase of the project as well as the amount already committed for this phase of the project, as discussed in the following section.

2. Cost-Sharing

Our proposed project is essentially an extension of the water temperature modeling work for the Stanislaus River that started back in December 1998. As mentioned above, the work was initiated by a stakeholders group (cost-sharing partners) that include the following:

- U.S. Bureau of Reclamation (USBR)
- U.S. Fish and Wildlife Service (USFWS)
- California Department of Fish & Game (CDFG)
- Oakdale Irrigation District (OID)
- South San Joaquin Irrigation District (SSJID)
- Stockton East Water District (SEWD)

Collectively, the cost-sharing partners have spent over $300,000 thus far for model development, preliminary operations studies, water temperature and weather data gathering, and database management.

For this phase of the work, the cost-sharing partners have already committed some of the funds necessary to maintain project continuity: OID, SSJID and SEWD committed the funds for maintaining the weather stations through the physical year 2003-2004. The USBR and USFWS committed the fund to support the CDFG work of data acquisition through the physical year 2001-2002. A breakdown of the committed funds is provided on the web Form I – Project Information - Item 17b, as requested.

OID and SSJID are also committing to provide in-kind assistance with administering the project providing fiscal control and reporting, contract oversight and compliance with grant terms and conditions. CDFG is committing in-kind technical assistance and resource guidance throughout the project.

E. Local Involvement

The cost-sharing partners represent the principal water operators and agencies involved in the operations and management of the lower Stanislaus River. The continued active participation of these agencies will provide the core of public involvement, as each entity is representative of local, state and federal interests. The efforts of this program do not have direct impact on the resources; rather the output will provide a valuable tool in better managing the resources for the betterment of all interests. In addition, there is a long-standing and broader group, "the Stanislaus Stake Holders" that includes the cost-sharing partners and other interests including other agencies such as South Delta Water Agency, private property owner and non-government organizations such as Trout Unlimited. This group provides an additional forum to share the results of this effort and the ultimate operation of the water and management of all related resources.

F. Compliance with Standard Terms and Conditions

The applicant agrees to comply with all the standard State and Federal contract terms described in Attachment D and E of the 2002 PSP for the Ecosystem Restoration Program.

G. Literature Cited

Jason Guignard, January 17, 2001. Stanislaus River Temperature Monitoring/Modeling Project Water Temperature Criteria Development, California Department of Fish and Game

Michael Deas, July 20, 2001. Appraisal of the Application of HEC-5Q for Temperature Simulation of the Stanislaus River. Watercourse Engineering, Inc.

CALFED Bay-Delta Program. August 2001. Ecosystem Restoration Program, Draft Stage 1 Implementation Plan, At Risk Species Assessments, p. 23

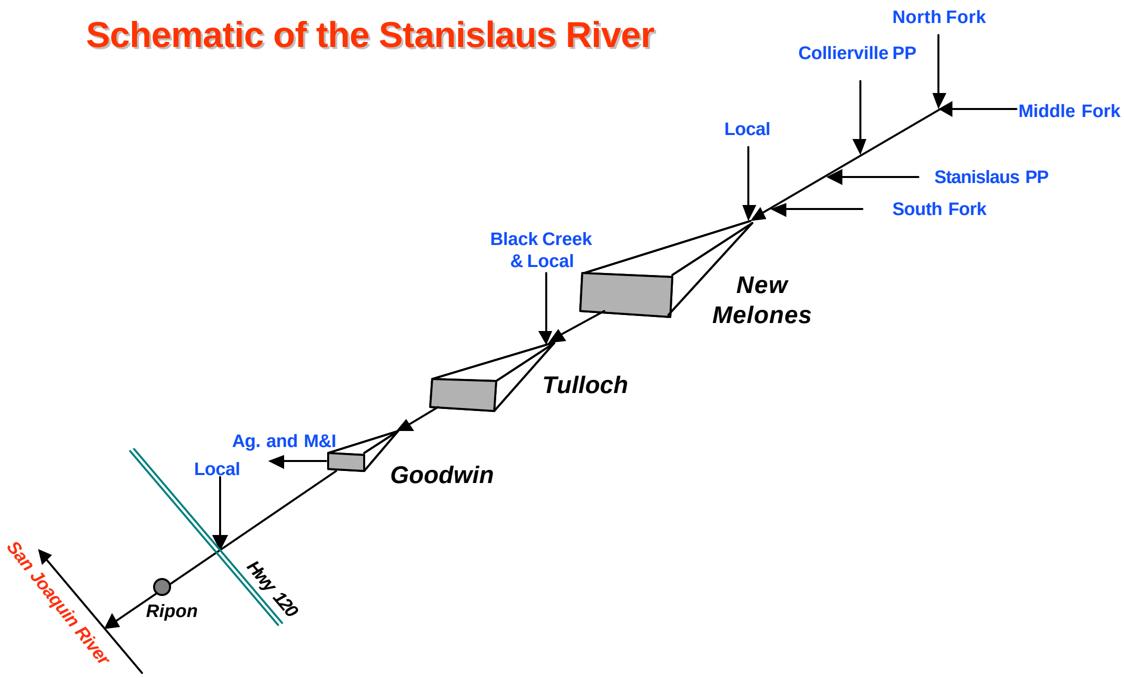
CALFED Bay-Delta Program. August 2001. Ecosystem Restoration Program, Draft Stage 1 Implementation Plan. Strategic Goal 2: Ecosystem Processes and Biotic Communities, Flow Evaluation and Simulation Modeling, p. 27

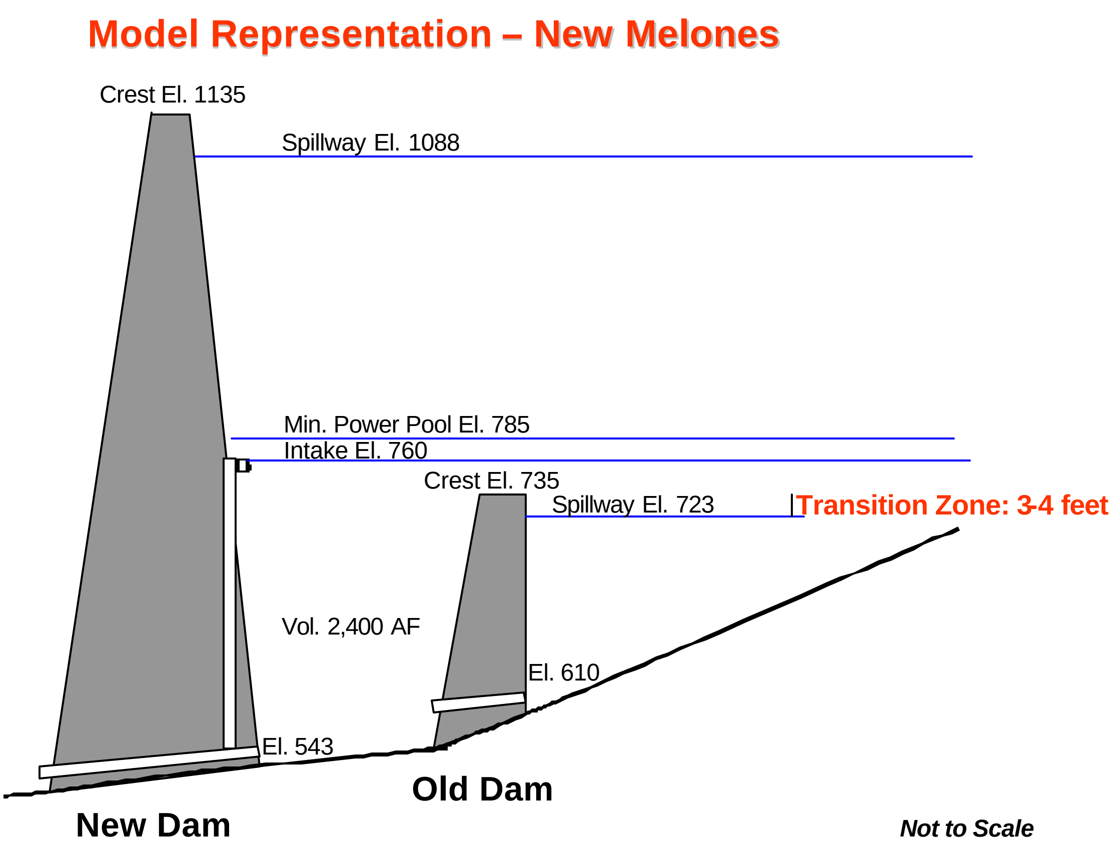
CALFED Bay-Delta Program. August 2001. Ecosystem Restoration Program, Draft Stage 1 Implementation Plan. Strategic Goal 2: Restoration Priorities for the San Joaquin Region, Stream Flow Management Plan, p. 74

CALFED Bay-Delta Program. 1999a. Ecosystem Restoration Program Plan, Strategic Plan for Ecosystem Restoration. Draft Programmatic EIS/EIR Technical Appendix. June 1999

H. Attachments

A. Stanislaus River Water Temperature Model:





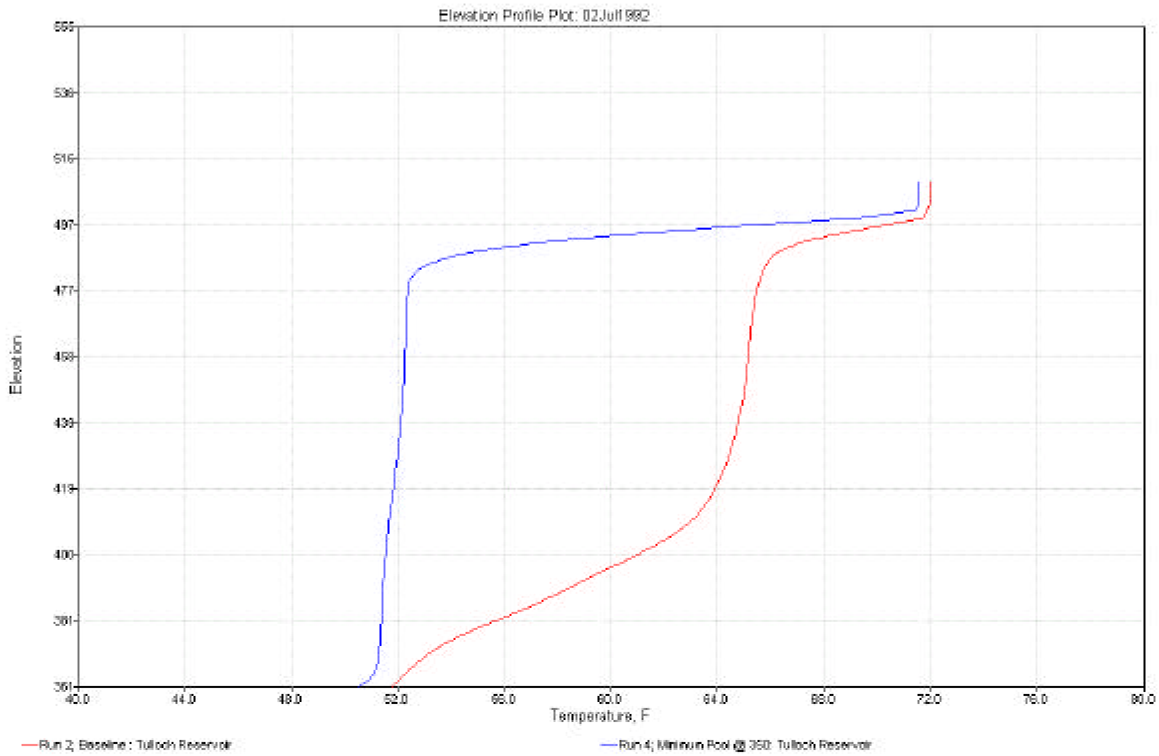
B. Samples of model results

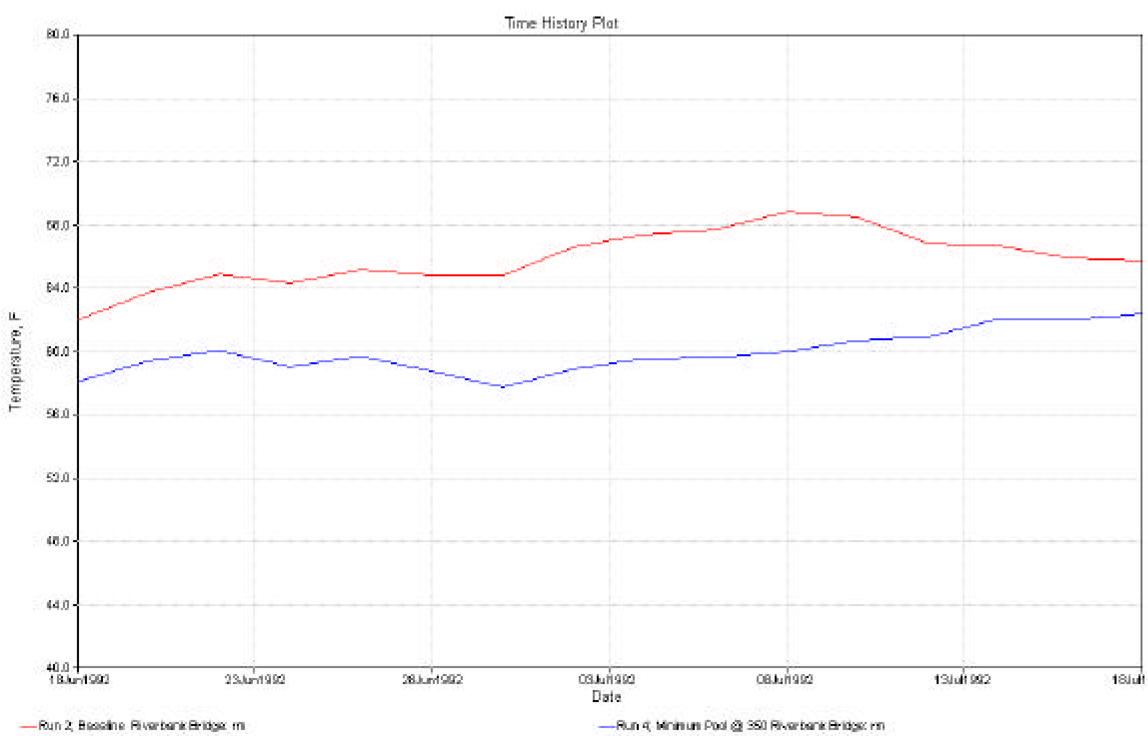
Stanislaus River Water Temperature Model
Summary of Operations Study

% of the time temperature objectives are achieved
Accumulative temperature violation in degree F (with respect to critical conditions)

			Steelhead					Chinook				
#	Run	Description	Optimal	Sub-Lethal	Sub Lethal	Critical	Violations deg F-day	Optimal	Sub-Lethal	Sub Lethal	Critical	Violations deg F-day
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Run 1	Historical Conditions (WY: 1983-1996)	59%	30%	89%	11%	1,445	46%	33%	79%	21%	5,650
2	Run 2	Simulated Base Case	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467
3	Run 3a	Allocating up to 50 TAF to Meet Steelhead Objectives	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972
4	Run 3b	Allocating up to 50 TAF to Meet Steelhead Objectives + Low Level Release in 1992	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806
5	Run 4	Re-operating New Melones with minimum pool of 350 TAF	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138
6	Run 5	Re-operating New Melones for Steelhead Objectives using existing outlet works	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346
7	Run 6	Re-operating New Melones for Chinook Objectives using existing outlet works	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238
8	Run 7	Re-operating New Melones for Seelhead using a new Temperature Control Device	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145
9	Run 8	Re-operating New Melones for Chinook using a new Temperature Control Device	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368
10	Run 9	Operating Goodwin using a new low-level outlet	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312
11	Run 10	Re-operating New Melones using existing outlet works and operating Goodwin using a new low-level outlet	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076

The effect of maintaining minimum pool of 350 TAF at New Melones on Tulloch Reservoir temperature profile and on water temperature in the Stanislaus River downstream at Riverbank Bridge.





Preliminary ranking of model results based on temperature threshold criteria.

	Steelhead					Chinook					
Run	**Optimal**	**Sub-Lethal**	**Optimal+Sub Lethal**	**Critical**	**Violations deg F-day**	**Optimal**	**Sub-Lethal**	**Optimal+Sub Lethal**	**Critical**	**Violations deg F-day**	**Total Violations**
A: Sorted by Violations for Steelhead											
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
B: Sorted by Violations for Chinook											
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
C: Sorted by Total Violations (Steelhead + Chinook)											
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
D: Sorted by Optimal for Steelhead											
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
E: Sorted by Optimal for Chinook											
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
F: Sorted by Optimal+Sub Lethal for Steelhead											
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 7	55%	41%	96%	4%	344	50%	26%	76%	24%	5,145	5,489
Run 8	58%	33%	91%	9%	1,146	39%	38%	77%	23%	4,368	5,514
G: Sorted by Optimal+Sub Lethal for Chinook											
Run 3b	67%	33%	100%	0%	-	48%	33%	80%	20%	3,806	3,806
Run 3a	67%	31%	98%	3%	264	48%	32%	80%	20%	3,972	4,236
Run 4	68%	30%	97%	3%	157	49%	31%	80%	20%	4,138	4,295
Run 10	69%	28%	97%	3%	384	48%	32%	80%	20%	4,076	4,460
Run 5	66%	30%	96%	4%	444	48%	32%	79%	21%	4,346	4,790
Run 6	66%	30%	97%	3%	442	48%	31%	79%	21%	4,238	4,680
Run 9	68%	29%	96%	4%	474	46%	32%	78%	22%	4,312	4,786
Run 2	65%	31%	96%	4%	534	46%	32%	78%	22%	4,467	5,001

C. List of water temperature monitoring stations currently being maintained by the cost-sharing partners on the Stanislaus - Lower San Joaquin River

#	Site ID	Site Name
1	COLL1	Collierville Powerhouse Tailrace
2	GMB1	Gambini Property immediately downstream of the pond at Oakdale Recreation Area
3	GOOD1	Goodwin Canyon immediately downstream of Goodwin Dam
4	GWNBTM	Goodwin Dam Log Boom (Bottom of the water column)
5	GWNMID	Goodwin Dam Log Boom (Middle of the water column)
6	GWNTOP	Goodwin Dam Log Boom (Top of the water column)
7	KF1	Knights Ferry at the Sonora Road Bridge
8	NFMF1	Below the confluence of the North and Middle Forks upstream of the Collierville Powerhouse
9	NMPH1	New Melones Powerhouse Tailrace
10	OAKR1	Oakdale Recreation Area (1/4 mile downstream of Hwy 120 Bridge)
11	OB1	1/4 mile downstream of Orange Blossom Bridge
12	OID1	Oakdale Irrigation District Canal just downstream of Goodwin Reservoir
13	RB2	Riverbank (Downstream end of Jacob Meyers Park)
14	SEWD1	Inflow to Stockton East Water District Canal at Goodwin Reservoir
15	SFRK1	South Fork of the Stanislaus approximately 2 miles upstream of New Melones
16	SPHF1	Stanislaus Powerhouse (In the Stanislaus canal immediately upstream of the forebay)
17	SS1	Approx. 1/4 mile upstream of the confluence with the San Joaquin River
18	SSJID1	Inflow to South San Joaquin Irrigation District Canal at Goodwin Reservoir
19	TULS1	Tulloch Dam Spillway
20	TULT1	Tulloch Powerhouse Tailrace
21	SJTR1	San Joaquin River above Two Rivers (approx. 100 meters above the confluence)
22	STTR1	Stanislaus River above Two Rivers (approx. 100 meters above the confluence)
23	SJDF1	San Joaquin River at Durham Ferry (4 miles downstream from the confluence)