LOWER DEER CREEK RESTORATION AND FLOOD MANAGEMENT

Feasibility Study and Conceptual Design

Form I - Project Information

1. **Proposal Title:**
Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design
2. **Proposal applicants:**
Deer Creek Watershed Conservancy
3. **Corresponding Contact Person:**
Bill Berens
Deer Creek Watershed Conservancy
P.O. Box 111 Vina, CA 96092
530 384-2737
lmmutual@shasta.com
4. **Project Keywords:**
At-risk species, fish
Flood Plain and Bypass Management
Habitat Restoration, Instream
5. **Type of project:**
Planning
6. **Does the project involve land acquisition, either in fee or through a conservation easement?**
No
7. **Topic Area**:
Floodplains and Bypasses as Ecosystem Tools
8. **Type of applicant:**
Private non-profit
9. **Location - GIS coordinates:**
Latitude: 39.947
Longitude: -122.053
Datum: WGS84
Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.
Tehama County, Town of Vina, California, on State Highway 99, 11 miles of stream channel
10. **Location - Ecozone:**
3.2 Red Bluff Diversion Dam to Chico Landing, 7.4 Deer Creek
11. **Location - County:**
Tehama
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:**
California, 3rd
15. **Location:**
California State Senate District Number: 04
California Assembly District Number: 02
16. **How many years of funding are you requesting?**
2
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: 0
Total Requested Funds: $1,519,200
b) Do you have cost share partners already identified?
There are two sources of matching funds (in-kind).
The Sacramento and San Joaquin River Basins Comprehensive Study, a partnership of the USACE and California Reclamation Board, supplied both aerial photography and photogrammetry that overlapped with their study area. This information provides the topographic base layers required for detailed mapping and hydraulic modeling. The cost of developing this information was at least $100,000.
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?
Yes
If yes, identify project number(s), title(s) and CALFED program.
F237 Watershed Planning ERP
0049 Rangeland and Riparian Management Watershed
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?**
No
Please list suggested reviewers for your proposal. (optional)
Earle Cummings California Department of Water Resources, Division of Land Management 916/227-7519

Harry Rectenwald California Department of Fish and Game 530/225-2368 103424.2422@compuserve.com

21. **Comments:**

17a. DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, will not charge CALFED any overhead.

Environmental Compliance Checklist

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

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. No construction activities in this phase. A portion of the proposed project is to develop documentation for CEQA compliance for later implementation.

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

CEQA Lead Agency: *None*

NEPA Lead Agency (or co-lead): *None*

NEPA Co-Lead Agency (if applicable): *None*

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

CEQA

-Categorical Exemption

XNegative Declaration or Mitigated Negative Declaration

-EIR

-none

NEPA

-Categorical Exclusion

XEnvironmental Assessment/FONSI

-EIS

-none

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?

Not Applicable

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: USFWS Required
Permission to access private land.
Landowner Name: Various Landowners Required, Obtained

6. **Comments.**

Need for permits and approvals will be determined during the feasibility study as part of proposed project.

Land Use Checklist

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

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?**

Yes

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).

Monitoring, feasibility evaluations, and public involvement.

4. **Comments.**

Conflict of Interest Checklist

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

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):

Bill Berens, Deer Creek Watershed Conservancy

Subcontractor(s):

Are specific subcontractors identified in this proposal? Yes

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

Maurice Hall CH2M HILL
Tim Hamaker CH2M HILL
Mark Oliver CH2M HILL
Ken Iceman CH2M HILL
Mark Tompkins CH2M HILL
Mathias Kondolf U.C. Berkeley
Michael McWilliams Stanford Unitversity

Helped with proposal development:

Are there persons who helped with proposal development?
Yes

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

Stacy Capello California Department of Water Resources
Randy Benthin California Department of Fish & Game
Colleen Harvey Arrison California Department of Fish & Game
Rob Titus California Department of Fish & Game
Trisha Brasher California Department of Fish & Game
Ernie Ohlin Tehama County Flood Control

Comments:

Also Helped with Proposal Development: Mary Hall CH2M HILL; Dick Daniels CH2M HILL; Bill Berens Deer Creek Watershed Conservancy; Diane Gaumer Deer Creek; Watershed Conservancy; Bill Paris O'Loughlin and Paris, LLP; Chris Leininger Deer Creek Watershed Conservancy

Budget Summary

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

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.

Independent of Fund Source

To be responsive to reviewers' concerns, we have included a detailed budget in a format different than the one provided with the standard forms. The standard forms did not provide a means for dividing tasks among the various participants.

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

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

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

Grand Total= $1,519,000

Comments.

Deer Creek Proposal Subtask Detail Budget

11/10/02 ver Assume September 1, 2003 Start Date

10:45 PM

Task

Subtask	Approx. Start	Approx. End	Approx. Duration (weeks)	CH2M HILL Labor	CH2M HILL Expenses	CH2M HILL Subcontracts	Total CH2MHILL including Subconsultants	DCWC Contract Staff and Accounting	DCWC Expenses	Major Task Subtotals
PROJECT MANAGEMENT	09/01/03	09/02/05	105	**$49,100**	**$47,300**		**$96,300**	**$104,100**	**$30,000**	**$230,400**
PHASE I - FEASIBILITY										
Stakeholder Involvement	09/01/03	01/01/05	70	$117,400	$15,900	$13,700	$146,900			
Chartering Session	10/15/03	10/16/03	0.285714	$24,800	$3,300	$3,400	$31,500			
Assemble Existing Data	09/01/03	11/02/03	9	$32,200	$4,400	$2,700	$39,300			
Monitoring Plan Development	11/02/03	12/30/03	8	$17,800	$2,400	$2,700	$23,000			
Public workshop	01/15/04	01/15/04		$21,300	$2,900	$2,700	$26,900			
Preliminary Model Setup	01/01/04	03/01/04	9	$27,200	$3,700	$5,500	$36,300			
Additional Data Collection	03/01/04	05/01/04	9	$25,200	$3,400		$28,600			
Mapping Evaluation	01/01/04	05/01/04	17	$27,000	$3,700	$700	$31,300			
Modeling Scenarios	05/01/04	08/01/04	13	$64,000	$8,700	$5,500	$78,200			
Review of Possible Flood Control Measures	08/01/04	08/15/04	2	$13,100	$1,800	$8,200	$23,100			
Select Alternatives	08/15/04	11/01/04	11	$76,900	$10,400	$10,900	$98,200			
Workshop Alternatives	11/15/04	11/15/04		$21,700	$2,900	$5,500	$30,100			
Conferences/Other Mtgs	11/15/04	01/01/05	7	$12,300	$1,700		$14,000			
Documentation	08/01/04	01/01/05	22	$66,700	$9,000	$2,700	$78,500			
Subtotal	**09/01/03**	**09/02/05**	**105**	**$547,600**	**$74,200**	**$64,200**	**$685,900**	**$40,000**		**$725,900**
PHASE II - CONCEPT DES										
Concept. Design	01/01/05	07/01/05	26	$320,200	$42,100	$7,400	$369,600			
Public Workshops	01/01/05	06/01/05	22	$22,300	$2,900	$14,700	$39,900			
Subtotal	**01/01/05**	**06/01/05**	**22**	**$342,500**	**$45,000**	**$22,100**	**$409,500**	**$40,000**		**$449,500**
Ongoing MONITORING	09/01/03	09/01/05	104	**$54,500**	**$8,000**	**$50,900**	**$113,400**			**$113,400**
TOTAL										**$1,519,200**

Feasibility Study and Conceptual Design

(Proposal #53DA)

Revised Budget Justification Form

The following revised Budget Justification Form provides additional information that may help to further clarify the budget request. The additional information is primarily intended to clarify the handling of costs incurred by the Conservancy's consultants and contract employees.

Budget Justification
Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

Direct Labor Hours. *Provide estimated hours proposed for each individual.*
DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, CALFED will not be charged for direct labor. See information below under "Services or Consultants" for information on consultant hours and rates.

Salary. *Provide estimated rate of compensation proposed for each individual.*
DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, CALFED will not be charged for salaries. See information below under "Services or Consultants" for information on consultant hours and rates.

Benefits. *Provide the overall benefit rate applicable to each category of employee proposed in the project.*
DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, CALFED will not be charged for benefits. The cost of benefits for contract and consultant staff are included in the hourly rates listed for those staff (described below under "Services or Consultants").

Travel. *Provide purpose and estimate costs for all non-local travel.*
DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, CALFED will not be charged directly for travel, but travel expenses will be incurred and charged by consultants and contract staff and will be itemized on invoices. Travel expenseswill includethose incurred for travel between normal work locations (primarily Redding) and the project area, travel to selected non-local project-related meetings, and travel of key project staff to conferences or scientific and professional meetings for the purpose of presenting or discussing project-related work.

The following table summarizes the proposed travel cost. Non-local meetings include meetings that are related to project business but that, due to convenience or location of other participants, may be in Sacramento or other suitable location. For scientific or professional meetings, it is anticipated that up to 10 project participants may attend meetings, primarily for the purpose of presenting reports on project progress or findings, participating in information exchange workshops, etc.

	Local Travel	Non-Local Project-Related Meetings	Scientific/ Professional Conferences
Phase I	$6,300.00	$1,400.00	$7,000.00
Phase II	$1,200.00	$1,400.00	$2,900.00
Monitoring	$500.00	$500.00	$2,800.00
Project Management	$600.00	$600.00	$1,400.00
Project Total	$8,600.00	$3,900.00	$14,100.00

Supplies & Expendables. *Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.*
DCWC has no permanent staff and will hire consultants and contract staff and contract staff to perform the duties under the contract. It is anticipated that supplies and expendables necessary for conducting the activities of the project will be purchased primarily by the consultants or contract employees as they are needed and CALFED will not be charged directly for supplies and expendables. The cost for supplies and expendables would be incurred by the contractors and passed through to DCWC through the invoicing process. If cost or functional benefit is found from direct purchase of some supplies by DCWC, this purchase route can be used. Total supplies and expendables are anticipated to be less than $5,000.

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.*
Phase I
CH2MHILL and Subcontractor total labor cost = $612,000 (approx. 6,000 hours); Phase I CH2MHILL expenses = $74,000 (Includes Phase I portion of travel and phase I portion of "other direct cost" listed below plus communications and computer service charges)
Deer Creek Contract Staff = $40,000.

Phase II
CH2MHILL and Subcontractor total labor cost = $365,000 (approx. 3,700 hours); Phase II CH2MHILL expenses = $45,000 (Includes Phase II portion of travel and phase II portion of "other direct cost" listed below plus communications and computer service charges)
Deer Creek Contract Staff = $40,000

Monitoring

CH2MHILL and Subcontractor labor = $105,000 (approximately 1,100 hours); CH2MHILL expenses = $8,000 (Includes Monitoring portion of travel and Monitoring portion of "other direct cost" listed below plus communications and computer service charges)

Hourly Rates

Hourly 2002 rates for selected senior project team are as follows: Deer Creek Contract Staff $77.00; Maurice Hall $114.50/hour; Ken Iceman $131.58/hour; Tim Hamaker $111.20/hour; Mark Tompkins $87.26/hour; Mathias Kondolf/$125.

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.*

No equipment items with an acquisition cost in excess of $5,000 per unit are anticipated. A vehicle for local transportation of project personnel will be leased rather than purchased (see "other direct costs" below).

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 presentations, response to project specific questions and necessary costs directly associated with specific project oversight.*

Project Management

- Deer Creek Contract Staff $104,000
- Deer Creek Direct Expenses $30,000 (See discussion under "Other Direct Costs" below)
- CH2MHILL Labor $49,000
- CH2MHILL Expenses $47,300 (Includes Reprographic/Printing Services reported below under "Other Direct Costs" since these are associated primarily with preparation of annual project reports and are not associated with any other particular task)

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

DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; Anticipated Direct Cost for vehicle lease, computer equipment, software, office equipment, and other miscellaneous costs incurred directly by DCWC – $30,000 (note: this $30,000 is budgeted under the Project Management Task since it covers expenses not directly attributable to any other single task).

Other cost items to be incurred by contractors not already mentioned include:

Postage & Freight	$500
Misc. Field Equipment Rental	$27,300
Reprographic/Printing Services	$37,100
Business and Group Meals	$7,200

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.*

DCWC has no permanent staff and will hire consultants and contract staff to perform the duties under the contract; therefore, CALFED will not be charged for indirect costs. Indirect costs for consulting and contracting employees are incorporated into their hourly rates.

Executive Summary

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

Deer Creek drains the west slope of the southern Cascades and joins the Sacramento River near the town of Vina in Tehama County. It is one of only three streams in the Central Valley still supporting wild populations of threatened spring-run chinook salmon, steelhead trout, and fall-run chinook salmon. The lower reaches have historically supported spawning by fall-run chinook and provided rearing habitat for other runs. Instream habitat quality has declined since levee construction in 1949. The levees have since failed repeatedly, and the potential exists for catastrophic levee failure. The goal of the proposed long-term project is to improve habitat while developing feasible solutions to the flooding problem on lower Deer Creek. These solutions will emphasize improving conditions for passage, spawning, and/or rearing of chinook salmon and steelhead. This goal will be achieved in an atmosphere of respect for private property and cooperation with willing participants. The general objective of this proposed project (Feasibility Study and Conceptual Design) is to develop a conceptual design for a flood control alternative for lower Deer Creek that uses managed floodplain inundation as a restoration tool. The main hypothesis is: The restoration of Deer Creeks access to its floodplain will result in more natural fluvial and floodplain processes in the main channel while preserving established uses of bordering lands. Implementation of the project will help CALFED achieve ERP strategic goals 1, 2, and 4, as well as its Science Program Goal. This type of project is listed as a milestone for the ERP Multi-species Conservation Strategy for the Sacramento River Basin; and this project directly addresses Sacramento Region priorities 1, 2, 3, 4, and 7 as described in the Draft Stage 1 Implementation Plan (2001). The general approach and schedule are: --Baseline Monitoring months 1 - 24 --Phase 1 Feasibility Study and Identification of Project Elements months 1- 18 --Phase 2 - Conceptual Design of Initial Project Elements months 19-24 -- Phases 3-6 Implementation, Monitoring, and Adaptive Management are not included in this funding request The total requested budget is $1,519,200

Proposal

Deer Creek Watershed Conservancy

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

Deer Creek Watershed Conservancy

Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

A Project Description: Project Goals and Scope of Work

1. Problem

Deer Creek drains the west slope of the Sierra Nevada Mountains, beginning just south of Mount Lassen, flowing westward through bedrock canyons until it reaches the Sacramento Valley floor, and then flowing across its alluvial fan to join the Sacramento River near the town of Vina in Tehama County. Deer Creek is one of only three streams in the Central Valley still supporting wild populations of the federally threatened spring-run chinook salmon (Campbell and Moyle, 1991) (NMFS, 2000). It also supports the threatened steelhead trout and fall-run chinook salmon, the mainstay of California's sport and commercial salmon fishery. Spring-run chinook spawn in upstream reaches. The lower reaches have historically supported spawning by fall-run chinook and provided rearing habitat for various runs from Deer Creek and rearing of fish from other drainages.

The quality of instream habitat in lower Deer Creek has declined visibly since the early 1900s. This habitat decline is likely due in part to the construction of a flood control project by the U.S. Army Corps of Engineers (COE) in 1949. The project involved straightening and simplifying the channel, and constructing levees along 10 miles of lower Deer Creek. The levees eliminated Deer Creek's natural ability to absorb high flows on its floodplain. By restricting the stream to an unnaturally narrow channel, flood waters flow quickly to the downstream reaches inhibiting channel meander, disrupting sediment transport, preventing floodplain inundation, scouring the channel, uprooting native habitat and increasing the flood risk downstream endangering private property, including the Abbey of New Clairvaux.

Because the levees concentrate flow and increase flow depths and shear stress, the potential for catastrophic levee failure is ever present. The levees have failed repeatedly, twice in the last two decades (including 1997) at a point about 1,000 feet downstream of the Leininger Rd. Bridge. The 1997 levee breach allowed concentrated floodwaters to rush onto the floodplain, damaging farmland. However, by allowing some of the floodwaters to occupy the natural floodplain and relieving pressure on the main channel, the levee breach may have prevented serious flood damage to the Abbey downstream.

In addition to the direct, mechanical channel modification that resulted from the construction of the flood control system, the levees also concentrate flow in a narrow channel and increase depth and shear stress. The high shear stresses tend to wash out gravels and irregularities driving the channel to a simple geometry, with correspondingly low habitat values.

To respond to the flooding and habitat problems in lower Deer Creek, the Deer Creek Watershed Conservancy (DCWC) has explored the concept of deliberately using the floodplain of Deer

Creek to accommodate part of the flood flows, but in a controlled fashion. With careful planning and adequate protection for vulnerable property and infrastructure, such an approach should reduce the risk of levee failure and eliminate the need for the channel of Deer Creek to accommodate the entire flood flow, thereby allowing the channel to reestablish some of its irregular, hydraulically rough, and ecologically complex pre-levee condition.

The low intensity of development in the lower Deer Creek watershed is unique among major Sacramento tributaries. However, encroachment of suburban development from the Chico area to the South has rapidly increased in recent years. The DCWC recognizes that the range of options for addressing the habitat and flooding concerns in lower Deer Creek is rapidly narrowing, and an immediate plan and quick implementation is needed to avoid further degradation of the chinook populations and significantly reduce further flood damage.

Review of Past Studies

In the Deer Creek Watershed Management Plan (DCWC, 1998), DCWC, in cooperation with numerous stakeholders and agency personal, carried out an assessment of the watershed and subsequently developed the watershed management strategies that outline the needed implementation measures for continued, responsible resource management in the watershed. The Plan outlines eight strategies for meeting these goals. This proposed floodplain project is one of those strategies that came directly from this organized effort.

The Deer Creek Watershed Management Plan provides background information on hydrology, geomorphology, and the existing flood control project, documenting the inadequacy of the current flood control facilities and the suspected impact of the current flood control project on the geomorphologic processes of the main channel of lower Deer Creek. Following the damaging floods of 1997, Dr. Mathias Kondolf of U.C. Berkeley and staff from the California Department of Water Resources (DWR) conducted a preliminary field reconnaissance of lower Deer Creek and prepared a preliminary estimate of the extent and nature of the flooding (Figure 1).

The CALFED Bay-Delta Program Strategic Plan for Ecosystem Restoration (1999) cites Deer Creek and chinook salmon as an example of adaptive management using conceptual models. In that discussion, several alternative measures are presented including mechanical ripping of the gravelbed, artificial addition of smaller gravel, installation of log structures, and planting of riparian trees. However, the long-term viability of any of these measures is highly uncertain as long as the current flood-control system remains unchanged.

Goals, Objectives, and Hypotheses

The overarching goal of the proposed project is to improve aquatic and terrestrial habitat while developing feasible solutions to the flooding problem on lower Deer Creek that are sensitive to the needs and values of the local landowners. These solutions will have a particular emphasis on improving conditions for passage, spawning, and/or rearing of chinook salmon and steelhead. This goal will be achieved in an atmosphere of respect for private property and cooperation with willing participants.

The general objective of this proposed project (Feasibility Study and Conceptual Design) is to develop a conceptual design for a flood control alternative for lower Deer Creek that uses managed floodplain inundation to meet the above-described habitat restoration goals. Inseparable from this general objective are these associated objectives:

- Develop an integrated, long-term, adaptive flood management plan for lower Deer Creek and a comprehensive monitoring plan to support the adaptive flood management program.
- Incorporate the considerable landowner and stakeholder knowledge and values into the design of the restoration and flood control elements and provide a model process demonstrating the value of the stakeholder resource in restoration.
- Educate other stakeholders and the region's public about the need and rationale for the plan and project.
- Provide critical information to improve understanding of biologic and hydrologic processes in the Bay-Delta System and disseminate that information for the benefit of other restoration efforts and the greater CALFED Bay-Delta program.

The hypotheses on which this proposal is based are described in Section A2 Justification.

2. Justification

The proposed actions and expected outcomes for this project are based on the conceptual model illustrated in Figure 2. Under existing conditions, much of lower Deer Creek is confined by levees, and the channel is frequently maintained to provide flood control and passage, which also damages the integrity of the aquatic and riparian habitat. Spring- and fall-run chinook salmon and steelhead trout production may be limited by this degraded habitat. And despite these flood control efforts, flooding still occurs because of repeated levee failures, resulting in unexpected and significant damage to private property.

This project will investigate the feasibility of allowing flood flows in Deer Creek to access the floodplain in a controlled manner to improve habitat and flood control. The conceptual model illustrates the hypothesized nested set of benefits of this situation. Testing these hypotheses will generate insights as to how ecological restoration can be implemented, how restoration can be integrated into existing land uses, and how ecological performance can be measured and monitored. Appendix C presents biological benefits expected from this project.

Hypotheses

The overarching hypothesis is: The restoration of Deer Creek's access to its floodplain will result in more natural fluvial and floodplain processes in the channel of Deer Creek while preserving the economic viability of the bordering lands.

Related hypotheses include:

- Providing floodplain capacity to absorb flood flows will reduce (though perhaps not eliminate) the need for channel maintenance and allow diverse and complex aquatic and riparian habitat to become established in Deer Creek.
- A program of managed floodplain inundation for flood control on lower Deer Creek will reduce flood damage and flood management costs.
- Restoring floodplain access to lower Deer Creek will decrease the magnitude of in-channel shear stresses associated with high flow events and allow diverse and complex aquatic and riparian habitat to be formed and maintained by natural fluvial processes.

- Increased aquatic and riparian habitat complexity and diversity will increase the food productivity, improve water temperature and rearing conditions resulting in increased survival, improved growth, and body conditions for natal fry and yearling fall, late-fall, and spring-run chinook salmon and fry, and juvenile steelhead in lower Deer Creek. , dependent on Deer Creek.

- Restoring and improving floodplain access to lower Deer Creek will decrease the upstream migration time for adult spring-run chinook salmon and steelhead due to reduced number and size of gravel bar obstructions, potentially increasing the survival of adults of these species reaching and holding in the upper watershed.

As this project moves through the Feasibility Study process of gathering information and modeling to test alternatives (described in Section A3 Approach), the above hypotheses will be scrutinized and revised to help identify preferred alternatives for implementation.

3. Approach

Developing a plan and implementing a channel restoration and flood management project for lower Deer Creek flood will require a multi-step process. These steps may be thought of as loosely chronologically sequenced phases with considerable overlap and exchange of information between the phases. This proposal is for the first two chronological phases of the larger project, Phase I (Feasibility Study – approximately 1.5 years) and Phase II (Conceptual Design – approximately 8 months) and for the first two years of monitoring to support an adaptive management decision process, which is to be conducted simultaneously with all the other phases.***Ongoing Monitoring for an Adaptive Management Process*. (Concurrent with All Other Phases)** Monitoring will be conducted throughout the project period and beyond to establish baseline conditions, refine the conceptual model for the system, and support adaptive management refinements of the preferred alternative.

Phase I. Feasibility Study and Identification of Project Elements for Initial Implementation. This will include identifying, through detailed mapping, geomorphic analyses, and hydraulic and hydrologic modeling. physical alternatives for relieving flood flows on lower Deer Creek and the basic requirements for implementing these options; and in cooperation with stakeholders and responsible agencies, developing a preferred alternative that combines physical and fiscal soundness and responsiveness to local public and private values.

Phase II. Conceptual Design of Initial Implementation Project Elements. The selected alternative from Phase I will be refined so that environmental documentation can be completed, construction costs estimated, and implementation funding sources pursued.

Future Phases III – VI. <u>Not included in this funding request.</u>

III. Environmental Documentation of Implementation of Initial Project Elements
IV. Detail Design of Initial Implementation Project Elements
V. Construction of Initial Implementation Project Elements
VI. Future Adaptive Management of Implementation Projects

As indicated, this proposal requests funding for the ongoing baseline monitoring and Phases I and II of the Deer Creek restoration project. More details of these phases are given below. The later phases of the program will incorporate knowledge gained from the activities of these first phases, and the details for these future phases will be developed at a later time.

Due to length limitations of the proposal, additional information on scope extent and corresponding budget rationale is included in Appendix ??, Budget Rationale.

Key Parallel Functions

During development of the lower Deer Creek project idea, three primary functions surfaced that encompass most of the required tasks. The three functions, **Science/Engineering, Public/ Stakeholder Involvement, and Monitoring to Support Adaptive Management** must be conducted simultaneously and cooperatively, as illustrated in Figure 3, to realize the desired goal. Only with continuous, effective information exchange between the functions can the diverse activities converge on a single path forward. The hydrologic modeling activities and engineering scenario evaluations can suggest many potential structural and non-structural options to restore a more natural flow regime to the lower Deer Creek channel. However, landowner and public interests must feed into the scenario development and evaluation, or all the "preferred" engineering solutions may not be implementable.

Project Team Organization

The team organized by the DCWC Board for execution of the proposed is briefly described here and is formulated to ensure timely and quality execution in close cooperation with the local landowners and responsible agencies.

Deer Creek Watershed Conservancy – The DCWC will hire a program coordinator approximately half-time for the duration of the project. The program coordinator's time will be approximately equally divided between task activities (primarily stakeholder involvement in the Feasibility Study and Conceptual Design) and project management duties (consultant oversight, documentation, and internal communication). Potential candidates for the coordinator position have been identified. DCWC has retained an accounting firm that has provided similar support on previous and ongoing projects to handle project administration functions.

Primary Consultant – DCWC has solicited the services of CH2M HILL as the primary science and engineering contractor for conduct of the proposed project. CH2M HILL will provide stakeholder involvement support and fill the principal role in hydrologic and biologic evaluations, computer modeling, monitoring planning, and conceptual design efforts.

Subconsultants – Key subconsultants have been solicited to assist in the project due to their unique qualifications. Key contributors include Dr. Mathias Kondolf of the University of California at Berkely, Michael McWilliams of Stanford University, and California Department of Fish and Game Aquatic Biomonitoring Laboratory. Other subconsultants may be hired for specific tasks such as conducting specialized monitoring.

Technical Advisory Committee – A technical advisory committee (TAC) will be assembled to advise the project team on institutional, scientific, and engineering aspects of the program. The TAC will review significant science and engineering findings and recommendations of the project. The committee will consist of approximately four to six members who have unique expertise in either lower Deer Creek -watershed issues or the science and engineering concepts involved in this study. The committee members will attend selected key milestone presentations and will review project reports and products to ensure direction and outcomes adhere to high standards and are consistent with the objectives of the ERP.

Those listed below have agreed to serve on the TAC:

- Ernie Ohlen, Water Resources Manager, Tehama County Flood Control and Water Conservation District
- Stacy Cepello, California Department of Water Resources
- Andy Cory, Californai Department of Water Resources, Northern District

Up to four additional representatives will be sought if the proposed project is funded including potential representation from the CALFED Science Panel.

Ongoing Monitoring to Support Adaptive Management. Biological and geomorphology monitoring will consist of pre-project baseline monitoring and post-project hypothesis testing to support adaptive management. Both are discussed here to provide reviewers a sense of what can be done to test the hypotheses associated with this proposal. As this is, however, a feasibility study, the hypothesis-testing plan cannot be finalized until the preferred project is defined.

Baseline Monitoring: Terrestrial. Field surveys, aerial photography, and GIS mapping, will be used to document existing plant species diversity, particularly riparian vegetation, and percent cover in the area likely to be affected, including areas of potential floodplain restoration. Except in areas where impacts or land use changes are possible outcomes of the lower Deer Creek project, only plants will be monitored. Species composition, linear extent, and patch size will be documented and mapped. The exact extent of the pre-project vegetation mapping will be developed as part of the initial project. It will likely cover the lower 11 miles of Deer Creek and all of the potential floodplain. Additional field surveys, coordinated with the geomorphology monitoring described below, will establish baseline hydraulic conditions on the floodplain along Lower Deer Creek where flood flow storage might be feasible. These surveys will be designed as extensions of the geomorphology monitoring transects. The information collected in these surveys will include sediment size distributions on floodplains, the presence and role of large wood on floodplains (e.g., as a contributor to roughness or as potential instream habitat), and variations in floodplain topography that could affect floodplain flow paths when a floodplain storage scenario is implemented.

Baseline Monitoring: Aquatic. Existing aquatic monitoring on Deer Creek focuses on chinook salmon management life-history questions and issues. Using various methods, adult escapement has been estimated for spring-run and fall-run chinook salmon since 1986. CDFG currently maintains an electronic fish counter to monitor and estimate the number of adult salmon migrating into Deer Creek. The Department also monitors outmigrant salmonids using rotary screw traps to evaluate pre-smolt and smolt outmigration timing and size at emigration. In the past, electro-fishing to estimate juvenile abundance and distribution has been conducted. Snorkel surveys in the upper watershed for holding spring-run chinook adults have been conducted during summer months since 1995. This monitoring effort has been carried out by the California Department of Fish and Game (CDFG) in cooperation with the U.S. Forest Service, Sierra Pacific Industries, and the U.S. Fish and Wildlife Service (USFS). Funding for these surveys has come, in part, by the CAMP program of the Anadromous Fisheries Restoration Program. The USFS has recently conducted spring-run salmon carcass surveys in the upper watershed. USFS personnel also obtain tissue samples from these carcasses for further genetic and age composition studies. All existing monitoring and salmonid restoration activities are conducted in cooperation with the Deer Creek Watershed Conservancy (DCWC). Many, if not most, of the existing monitoring programs are likely to continued to be funded through the AFRP CAMP program, CALFED, and other funding mechanisms.

For this Feasibility Study, additional aquatic monitoring tasks are planned to establish pre-project baseline ecosystem conditions. These tasks include benthic aquatic invertebrate assessments (benthic biomonitoring). This monitoring will utilize the CDFG's California Aquatic Bioassessment Protocols to establish pre- and post-project benthic community structure, species composition, and guild function. Additionally, pre- and post-project zooplankton biomass will be estimated through monitoring at selected locations to establish baseline and monitor post-project zooplankton productivity.

Post-Project Performance: Biological Monitoring. This lower Deer Creek project offers an exciting opportunity to implement and evaluate a project to test the ecological value of restoring riparian habitat and floodplain function to an otherwise intact ecosystem. The similarities between Deer Creek and Mill Creek could make it possible to conduct a paired stream experiment and offers the chance to evaluate and document ecological changes. If this project is approved, the planning would start immediately so that detailed project performance and adaptive management monitoring could be included in a subsequent proposal. The monitoring protocols will follow CALFED's terrestrial and aquatic monitoring plans included in the Program's Comprehensive Monitoring and Research Plan.

Geomorphology Monitoring to Support Adaptive Management. A unique opportunity exists to measure the performance of the eventual preferred project by comparing the existing geomorphic conditions (determined from recent air photographs and supplementary field studies), the pre-flood control system geomorphic conditions (determined from 1938 aerial photographs (Figure 4), and the post-project geomorphic conditions (determined by on-going monitoring). The evaluation of existing and pre-levee conditions will be conducted with funding requested in this proposal. Post-project conditions will, naturally, be conducted after later implementation of an alternative, and will be conducted with other funds.

The pre-disturbance (1938) aerial photos (Figure 4) clearly show riparian and channel conditions, such as alternating pools and riffles, and overhanging riparian vegetation, and will enable us to quantify aquatic and riparian habitat present in the system before the construction of the 1949 flood control levees on Deer Creek. These historical conditions can then be compared with current conditions and will provide a basis for estimating the fraction of the original (pre-1949) habitat restored by implementing this project.

Documentation of the existing geomorphic conditions of lower Deer Creek will be initiated at the outset of this project, as site-specific geomorphic information will be needed to assess existing and post-project conditions. The geomorphic investigations will include studies of the streambed topography to determine existing pool and riffle habitat extent and distribution and surveys of shaded riparian habitat and large wood. Permanent and recoverable channel cross sections will also be established to provide a basis for direct comparison of current and post-project channel geometry. A standard set of geomorphic measurements will be made at each monitoring cross section to establish a record of pre-project physical conditions. Measurements will include the following:

- Cross section survey (including relevant floodplain areas)
- Long profile survey (at least 10 channel widths in length)
- Photo point establishment
- Reach map sketch
- Surficial bed material sampling (e.g., pebble counts)

- Bed load and suspended load sampling
- Floodplain and terrace feature descriptions
- Riparian vegetation descriptions
- Large wood descriptions

A schedule of photogrammetric surveys will also be established to continuously update the record of conditions in the watershed. Once aerial photography targets are established and maintained, and once the initial year's photogrammetry is undertaken, subsequent flights and updates of the photogrammetric topography are relatively inexpensive and provide a record of conditions over a broad area of channel and floodplain. The monitoring program will also incorporate a detailed "event-driven" monitoring protocol to capitalize on the information to be gained from storm events that significantly change conditions in Deer Creek.

On the floodplain, specific habitat types will be catalogued and coverage will be determined from aerial photographs and additional field surveys as described above.

Phase I. Feasibility Study

The Feasibility Study phase will include significant stakeholder/landowner involvement. Bringing affected landowners and other stakeholders into the project early on and inviting them to become a part of the project team through workshops and other activities will coalesce diverse opinions into a positive approach that recognizes the individual interests and common good while minimizing obstacles in later phases. This involvement will include workshops and formal and informal meetings between stakeholders and DCWC representatives and stakeholders and technical team members.

The general approach of the science/engineering function of Phase I is to identify a range of possible project elements that could be implemented to restore more natural flow conditions to the lower Deer Creek channel in concert with landowner values. Then, simulations will be used to evaluate the effects and benefits of these possible elements on distribution of flow depths, velocities, and shear stresses in the channel and on the floodplain and combine the information gained from the modeling with stakeholder input to arrive at a set of "possible" alternatives. Simulations of this smaller suite of alternatives will then be conducted to more fully describe the conditions that would result from implementation. The resulting simulation output will be used in an iterative workshop setting with key stakeholders to arrive at a preferred implementation alternative for conceptual design in Phase II.

Following is a brief outline of the major activities and some selected milestones of Phase I. The primary function(s) of each activity are given in parentheses. Note that all public meetings and minor steps are not explicitly described for sake of brevity. Level of effort assumptions for budget development are described in Appendix A, Budget Rationale.

Chartering with Stakeholders (Involves all three primary functions – See Figure 3) – A chartering meeting will be held to ensure all project participants have a common understanding of project scope and objective and have a clear understanding of their respective responsibilities and the roles of other project participants. The chartering meeting will bring together key project team members including key landowners, agency personnel, technical team leaders, and other cooperators. The proposal, funding conditions, conceptual model, and overall plan will be reviewed. The Technical Advisory Committee will also be included in the chartering meeting to

improve familiarity with the team and objectives and to provide guidance on the execution of initial project tasks.

Assembling/Reviewing Existing Data/Information (All three primary functions) – A significant amount of historical data (physical and biological) exists for Lower Deer Creek. A focused effort will be made to collect and arrange this information and make it available to the project team. Digital terrain models developed from recent aerial photographs of the Deer Creek Basin will be used to establish the existing physical conditions. In addition, institutional knowledge of contentious issues and specific concerns will be collected and documented, and the team will begin making key stakeholder contacts.

Monitoring Plan Development and Initiation (Monitoring) – The general monitoring plan will be detailed and initiated to supplement existing data and augment ongoing monitoring. A physical monitoring plan will be developed to establish a firm understanding of existing conditions and enable informative assessments of post-project performance with respect to the formation of aquatic and riparian habitat through natural processes. Specific elements of this plan are detailed in the Ongoing Monitoring to Support Adaptive Management Section.

Workshop with Participants/Stakeholders/Agencies (Public/Stakeholder Involvement) – Approximately 1-2 months after the chartering session, an informational workshop including poster presentations will be conducted to educate a broader group of interests on the project goals and plan.

Preliminary Modeling Setup (Science) – A modeling framework will be developed to support flood-flow simulations of various implementation elements. This will include HEC-RAS modeling, to investigate the effects of potential project elements on average in-channel velocities, flood water surface elevations, and flood extent. Michael McWilliams at Stanford University has applied a 3-D hydraulic model, named UN-TRIM on similar streams and has recently begun adapting it for use on the unique conditions of lower Deer Creek. This 3-D model will provide more precise, fine-scale flow velocities and flooding extent in Deer Creek associated with proposed project alternatives. Both models will require manipulations of existing topographic information from aerial photographs and will require sub-surface channel geometry along with more detailed data on channel particle size distribution.

Collection of Additional Data (Science) – Additional detailed data (topography, stream/ slough channel characteristics, levee conditions, etc.) will be collected as necessary to support development of detailed modeling. Some of this information will be collected as part of the geomorphology monitoring (e.g., channel cross sections and long profiles). Gaps in existing physical data will be filled, when possible, by collecting new data. This will likely include, but is not limited to, field surveys to better classify variables such as grain size and underwater contours within the channel, and vegetation and habitat types in riparian and terrestrial zones.

Hydrologic/Hydraulic Modeling Evaluation of Preliminary Scenarios (Science) – Basic simulations of a wide range of **project elements** (individual project features that together make up an **alternative**) that might be implemented will be conducted to identify those elements that offer reasonable benefit for improving the hydrologic conditions of the lower Deer Creek channel. Project elements that might be considered include: levee realignment; controlled levee bypass to historical distributary channels (along with restoration of these distributary channels); upgrading bridges/crossings; targeted in-channel maintenance; levee upgrades; ring levees; landuse modifications; and/or combinations of these and possibly other options.

Hydrologic/Hydraulic Analyses for Fluvial Geomorphology (Science) – Available historical hydrologic data for Deer Creek will be assembled and analyzed to support the assessment of past and current geomorphic conditions and to guide the development of hydrologic/hydraulic scenarios as described above. The analyses conducted on the hydrologic data will include, but not be limited to, the following:

- Historical flood frequency analysis
- Historical flood timing analysis
- Historical flood duration analysis
- Historical bed mobility frequency analysis

Review of Project Elements Versus Conceptual Model (Science) – A critical scientific review of the preliminary simulation results will be conducted to evaluate the value of the various project elements against the conceptual model. If the conceptual model is revised based on new monitoring or other new information, suggestions of additional or modified project elements will be entertained and reviewed. If additional preliminary modeling is deemed necessary, the scope of those simulations will be developed and the additional modeling will be conducted. This review process may be repeated if necessary.

Select Alternatives (Public/Stakeholder Involvement and Science) – Key stakeholders and team members (including key landowners) will be gathered in workshop settings to review the modeling and stakeholder process results to identify a set of project elements (alternatives) to be considered further. This will likely be an iterative process (assume two iterations as described in Appendix A, Budget Rationale) where various sets of promising project elements are combined, simulated, and brought back for consideration. Important aspects of this process will be up-front and continuous involvement of key landowners and stakeholders and clear presentation of results, including confidence intervals, data limitations and perceived risks. The outcome of this step will be a selected alternative or small set of alternatives that are recommended for further consideration in the conceptual design.

Workshop Alternatives and Evaluation (Public/Stakeholder Involvement and Science) – Thorough documentation and demonstration of the selected alternatives will be prepared including visual simulations and poster descriptions of the process. This documentation will be presented in two or three broad public forums to gain general support, identify any fatal flaws in the selected alternatives, and set the stage for the environmental documentation. At least one of these forums will be held in the Vina Community Center or other suitable local location.

Conferences and Other Meetings (Science and Monitoring) -- Project staff will attend other related local and regional meetings to ensure project activities are consistent with plans and activities in the surrounding region. In addition, key project staff will present key products, such as alternative plants and modeling results at professional meetings.

Document Alternatives and Monitoring – Feasibility Report and Monitoring Report (Science and Monitoring) – A cumulative documentation of the findings of the program phases thus far will be assembled from products of the individual tasks above, including a feasibility report describing the alternatives considered, a report of the monitoring findings, and a summary description of the revised conceptual model and path forward.

Phase II. Conceptual Design of Initial Implementation Project Elements

Conceptual Design of Selected Alternative(s) (Science) – The selected alternative will be refined, and a conceptual engineering design of the elements of the selected alternative will be produced. The design documentation will include area-wide layouts of new facilities and facility upgrades; finalized mapping of simulated flood extents; 15 percent engineering design of project elements; order-of-magnitude construction cost estimate; suggested phasing of construction; detailed performance objectives and monitoring plan; and an updated/refined adaptive management plan.

Public Presentation/Workshop of Conceptual Design(s) (Public Involvement) – The conceptual design will be presented in public forums. The key stakeholders will join the DCWC and the consultant in presenting the conceptual design and responding to questions. Included in one public forum will be a visit to the site of one or more major elements of the project along Deer Creek where key participants will discuss the alternatives considered and the perceived advantages of the selected alternative.

4. Feasibility

A number of attributes of Deer Creek and its watershed make this an ideal project for demonstrating the opportunities and results of controlled floodplain inundation for stream channel restoration. Many of these have been touched on earlier in this proposal including the reasonably undisturbed upper watershed and the low-intensity of development in the lower watershed, and the fact that Deer Creek still supports populations of both spring- and fall-run chinook and steelhead.

Local Support

Perhaps even more important than physical considerations is the broad support among lower Deer Creek landowners. As documented in the Deer Creek Watershed Management Plan (DCWC 1998), a broad coalition of watershed landowners support the concepts offered in this proposal and have already invested a lot of energy toward this goal. The proposed project recognizes the critical role of landowners and draws on their knowledge, enthusiasm, and coordination experience. In fact, many of the potentially impacted landowners have been involved in the development of this proposal and will work as part of the project team to meet and lead discussions with landowners who have expressed concerns about possible changes to the current facilities.

Coordination with Other Responsible Agencies

Another critical component of feasibility is the cooperation and support of other agencies that have jurisdiction or responsibilities in the project area. In the case of Deer Creek, agencies with significant interest in the process and outcome of the proposed project include Tehama County Flood Control and Water Conservation District (County Flood District), California Reclamation Board, the COE, and DWR. The DCWC recognizes the critical roles of these agencies and will involve them from the beginning.

The County Flood District has jurisdiction over local flood planning and is responsible for maintenance of the existing levee system. Accordingly, the Water Resources Manager for the County Flood Control and Water Conservation District will serve on the TAC, ensuring that an open exchange of information between the project and the County Flood District is maintained

and the District interests and concerns are incorporated into the feasibility evaluations. In addition, DCWC will keep the County Flood District Board informed of plans and progress as the project goes forward, beginning with District Board meeting on November 26, 2002.

Other agencies with flood control interests are the COE and the Reclamation Board. Both of these agencies have been contacted and have expressed considerable interest in the proposed work. The COE is considering the best means of staying involved in the effort, whether through direct representation on the TAC, through future partnerships as alternatives for implementation become more clearly defined, or through on-going informal coordination efforts. In either case, the COE will be kept informed of project progress. Similarly, the Reclamation Board is considering if a DWR Flood Management Division staff person is available to serve on the project's TAC to ensure open communication in the planning stage. In addition, Andy Cory, of the DWR Northern District Office will serve on the TAC and can provide liaison with DWR's Flood Management Division.

Technical Feasibility

Scientifically, reconnection of a stream with its floodplain is recognized as a valuable tool for restoring channel diversity and habitat, and reducing flood damage. Reusing floodplains to accommodate flood flows was adopted for the River Rhine, in France, where levees had cut off 95 percent of the former floodplain. Hydraulic engineers concluded that the most reliable and cost-effective way to reduce flood risk to downstream urban areas was to use the floodplain to store floodwater (Dister et al., 1990). Similarly, the committee appointed by President Clinton after the 1993 Mississippi River floods recommended moving settlements off floodplains so the floodplains could safely store water and reduce downstream flood risk (Interagency Floodplain Management Review Committee, 1994). The Sutter and Yolo bypasses along the Sacramento River embody the same approach of setting aside part of the floodplain that can still function as a floodplain (Kelley, 1986). The American Fisheries Society endorses this approach to floodplain management (Rasmussen, 1996).

Thus, the idea of using floodplains to accommodate flood flows is not new, but to do so to restore habitat conditions in the channel is innovative. Moreover, the companion goals of solving a persistent flood problem *and* restoring habitat should make the project eligible for restoration funding as well as flood control funding. The strategy is most feasibly implemented where a floodplain is largely uninhabited, as is fortunately still the case along Deer Creek. However, with each passing year, more development occurs and the potential conflicts with routing flood flows over the Deer Creek floodplain increase. Time is of the essence to explore these alternatives and evaluate the feasibility of their implementation.

A lot of mapping and data already exist to support rapid progress including detailed topography from 1999 mapping, historical aerial photography, and results from ongoing CDFG monitoring. The proposed project team includes participants in previous watershed work so that maximum benefit is gained from institutional knowledge. Against this background of physical setting, local control, and strong science, the requested funding should ensure steady progress toward long-recognized needs for restoration on lower Deer Creek.

Other Feasibility Considerations

For the tasks proposed in the current funding request, no permits are required beyond those already held by CDFG for biological monitoring. Access will be required for stream channel

condition assessment and for some spot surveying. Specific locations for this monitoring and surveying have not yet been identified, but numerous landowners, including those on the DCWC Board of Directors (Board), have agreed to allow access as necessary.

Permit requirements for later phases of the project (not included in this funding request) will be identified and pursued based on selected option(s) and conceptual design outcomes of the proposed project. In addition, any proposed modifications to the levees will be coordinated with the COE, DWR/Reclamation Board, and Tehama County.

The proposed time for the project as shown on the attached schedule (Figure 5) is reasonable and consistent with similar previous projects conducted by DCWC and its consultants. The time allotted should be adequate to accommodate any weather or related interruptions.

Possible sources of funding for later implementation phases include the Sacramento and San Joaquin River Basins Comprehensive Study and the Flood Protection Corridor Program, funded by Proposition 13.

5. Performance Measures

Because the proposed project includes the feasibility study, conceptual design, and baseline monitoring, but not the actual implementation of restoration measures, the performance measures will be successful completion of key project activities rather than environmental indicators. Performance measures for each project phase are described below.

Monitoring Program

The success of the baseline monitoring program will be demonstrated with a report to the DCWC Board, describing the biological and stream channel conditions in lower Deer Creek. This report will supplement the Deer Creek Watershed Management Plan (DCWC 1998), focusing on lower Deer Creek and will include a description of current channel conditions versus historical conditions as interpreted from historical photographs. The outcome of the monitoring program will also be presented publicly at one or more public workshops conducted as part of the Phase I Feasibility Study.

The monitoring program outcome will also be documented to an extent in the refined and/or revised conceptual model of the lower Deer Creek system, which will be documented in the Feasibility Study. This feedback from the monitoring and the hydraulic evaluations will be an important aspect of monitoring program performance.

Phase I. Feasibility Study

The feasibility study and landowner/public involvement process will have multiple measures of performance. For the landowner involvement process, a key performance measure will be the fraction of potentially impacted landowners that participate in the chartering meeting, the alternatives selection process, and other less formal landowner meetings. The target for participation is 100 percent of the potentially impacted landowners, and at least 50 percent of landowners in the lower Deer Creek watershed.

The performance of the broader public involvement process is more challenging to gauge, but is still measured by the number of people reached, and to a lesser extent, the amount of feedback received. This will be documented in reports to the DCWC Board for each organized public meeting. Regular updates will also be presented to the Board on informal engagements. Overall

activities and performance of the public involvement process will be summarized in the final Feasibility Report.

The performance of the modeling component of Phase I will be measured by modeling results showing flooding extent for various scenarios and corresponding estimates of resulting in-stream conditions. While not itself an accurate measure of project success, the actual number of alternatives evaluated will be reported to illustrate the variety of variables and conditions considered.

The most comprehensive performance measure of this Phase will be attaining consensus on a reasonable alternative or small set of alternatives. The agreed upon alternative, along with the intermediate performance measures, will be documented in the Feasibility Report prepared for the DCWC Board and presented at the public forums described above. Additional documentation and measures of performance for component activities in Phase I may include: presentations accepted at scientific meetings and forums; invitations for presentations by project staff and cooperators; requests from other watershed organizations for materials, information, and support; and acceptance of manuscripts for publication in peer-reviewed journals. Opportunities for these activities will be sought and supported by the project team.

Phase II. Conceptual Design of Initial Implementation Project Elements

The performance of Phase II will be demonstrated by production of a coherent conceptual design. The design will be documented in a set of conceptual design drawings and an accompanying summary report. The review by the technical review committee and other outside reviewers will ensure the quality of the design product. An additional measure of the performance will be the level of acceptance by public (expressed in response to the public workshops of the conceptual design) and acceptance by agency stakeholders.

6. Data Handling and Storage

For this project, a broad range of information management tools and systems will be employed. A large amount of spatial information will be acquired and developed including structure locations, vegetation characteristics, stream channel characteristics, and property ownership. The primary platform for storage and manipulation of spatial data will be Arc Info/Arc View GIS and related ESRI-supported data formats. Hydraulic modeling will be conducted with HEC-RAS and related software and with a developmental 3-D hydraulics model for velocity and flood extent simulations. Other data generated will include stream channel and biological monitoring and landowner-supplied information on flood extent, flood damage, and constraints on alternative implementation. This information will be collected in written and digital field notes and transferred as appropriate to computer documents, spreadsheets, and GIS coverages.

During the project, the main working database of technical project data and information will be housed at the CH2M HILL office in Redding, California. A duplicate database will be maintained on a DCWC computer. Portions of the work will be conducted at other locations including the University of California at Berkeley, Stanford University, and the CH2M HILL Sacramento office. At regular intervals, data and information at these locations will be downloaded to the main project database.

General information exchange and storage will be conducted with extensive use of E-mail with file attachments, Microsoft Office suite of desktop software, additional desktop applications and intranet-deployed reference material and project/client-specific web sites

7. Expected Products/Outcomes

The primary products of this project are: a feasibility study with a recommended alternative for implementation; a conceptual design of the selected alternative(s); and baseline monitoring records to serve as the foundation of a long-term monitoring and adaptive management program. But perhaps the most valuable products of phases I-III will be the clear documentation of the process and outcome that can feed back to the overall ERP strategy and provide a successful model for other similar projects within the CALFED program area and elsewhere.

In completing these products, numerous support products will also be developed. These include publications and presentations; technical reports, memoranda, and professional publications; maps; fact sheets and newsletters; press releases; workshops; educational materials; and a geomorphic and ecologic GIS database. All of these media will be used to share information assembled from the various project activities, including data gathering, baseline and ongoing biologic and geomorphic monitoring, workshops, and conceptual design.

Other possible avenues for sharing this information include: research publications in relevant scientific journals, presentations at professional technical conferences, and masters theses from university students on elements of the feasibility study and conceptual design, and educational materials.

Because this proposal does not include any physical implementation, no measurable physical or environmental outcomes are expected. However, there are anticipated community and social outcomes including stronger positive working relationships among the stakeholders.

8. Work Schedule

The proposed work schedule is summarized in Figure 5.

B Applicability to CALFED ERP and Science Program Goals and Implementation Plans and CVPIA Priorities

1. ERP, Science Program, and CVPIA Priorities

Implementation of the final proposed project (one of the outcomes of this proposed feasibility study) will help CALFED *achieve* ***ERP Strategic Goal 1, achieve recovery of at-risk species***, specifically spring-run chinook salmon and steelhead trout*;* ***Goal 2, rehabilitate natural (ecosystem) processes***, specifically instream and flood flows; *and* ***Goal 4: protect and/or restore functional habitat,*** specifically instream flows and spawning beds needed by spring run chinook salmon (goals from CALFED ERP Draft Stage 1 Implementation Plan (2001).

This type of project is listed as ***a milestone for the ERP Multi-species Conservation Strategy for the Sacramento River Basin Ecological Processes*****:** Develop floodplain management plans to restore and improve opportunities for rivers to inundate their floodplain …including the lower 10 miles of Deer Creek… (shortened from CALFED 2001). This proposal is a study of the feasibility of actions proposed under the ***Stream Meander And Floodplain*** section of ERP vol. 2 pages 249 and 250 (1999), specifically programmatic action 1B and Riparian and Riverine Aquatic Habitats target 2 and action 2A.

Additionally, this project will advance CALFED's achievement of its ***Science Program Goal*** of building on a body of knowledge to improve the effectiveness of restoration programs. The actions in this proposal parallel most of the actions listed in the ERP Draft Stage 1 Implementation Plan (CALFED 2001) to advance that goal: develop performance measures; conduct adaptive management experiments; advance process understanding; establish integrated science programs in complicated field settings, compare effectiveness of different restoration strategies; coordinate and extend existing monitoring; and take advantage of existing data.

This project directly addresses ***Sacramento Region (SR) priorities 1-4 and 7*** as described in the CALFED ERP Draft Stage1 Implementation Plan (2001).

SR-1: Develop and implement habitat management and restoration with local groups. Priority tributaries for riparian habitat and channel meander under this restoration action include Deer Creek; and this feasibility study project is being submitted by a local group: Deer Creek Watershed Conservancy.

SR-2: Restore fish habitat and fish and conduct passage studies. This project will naturally replenish spawning gravel and maintain gravel recruitment in lower Deer Creek by reducing flood flow scour.

SR-3: Conduct adaptive management experiments in regard to natural and modified flow regimes. This project will simulate flood flows and instream flows in response to various implementation alternatives. These simulations will aid in developing an ecologically-based plan for a more natural instream flow regime sufficient for restoring populations of spring-run chinook salmon and steelhead trout. Once the restoration project is implemented, modeling results will be combined with and compared to physical measurements of flow, sediment transport, and other fluvial processes. The potential also exists to pair Deer Creek with nearby Mill Creek to conduct a sophisticated paired stream analysis.

SR-4: Restore geomorphic processes. This proposal is for a feasibility study to construct setback levees to restore and improve opportunities for Deer Creek to inundate its floodplain.

SR-7: Develop conceptual models to support restoration. Project scientists will work with CDFG staff to improve understanding of the processes that support the communities and related ecosystem functions based on project and CDFG monitoring.

The proposed project is also consistent *with* ***CVPIA Section 3406 Fish, Wildlife, and Habitat Restoration (b)(1)(b)*** *First priority given to measures that protect and restore natural channel and riparian habitat values;* ***(e)(3)*** *measures to eliminate barriers to salmonid migration;* and ***(e)(6)*** *Other measures to protect, restore, and enhance natural production of salmon and steelhead in Central Valley tributary streams* (CALFED 2001). This proposal is a study of the feasibility of two actions proposed in a 1998 report to Congress on the feasibility of implementing measures addressing (e)(3) and (e)(6) ***Action 3:*** *Improve spawning habitats in lower Deer Creek for fall- and late-fall-run chinook salmon*; and ***Action 5:*** *Plan and coordinate required flood management activities with least damage to the fishery resources and riparian habitats of lower Deer Creek* (USFWS 1998).

2. Relationship to Other Ecosystem Restoration Projects

This proposal is an outgrowth of a previously funded CALFED project (see number 4 below) and complements other restoration projects in the area. Through a 1997 CALFED ERP grant

(project number F5) the U.S. Forest Service initiated a watershed improvement/sediment stabilization program on Deer Creek and two other streams. The proposed project is also complementary to efforts to provide critical passage flows for spring-run Chinook salmon funded by CDFG and the Department of Water Resources through the Delta Pumping Plant Fish Protection Agreement, and will complement *The Mill and Deer Creeks Protection and Stewardship* proposal of TNC, which is being prepared for 2002 ERP funding.

The DCWC and various partners have successfully completed other (non-CALFED) projects including the development of the 1998 Deer Creek Watershed Management Plan (DCWC, 1998) with funding support from the U.S. Fish and Wildlife Service (USFWS) and the State Water Resources Control Board (WRCB). Another USFWS grant ($98,000) has just been completed to reduce erosion and resulting sediment loads in Deer Creek and its tributaries from over 20 road sites in the upper watershed on mainly Collins Pine Co. lands and some "cost share" roads with the Lassen National Forest. These and other projects initiated by the DCWC are all complementary and in accordance with the strategies outlined in the well-conceived watershed management plan.

3. Request for Next-phase Funding

The proposed work is not a request for next-phase funding.

4. Previous Recipients of CALFED or CVPIA Funding

In 1997 the DCWC received $196,554 from the CALFED Bay-Delta Ecosystem Restoration Program for general watershed planning (project number F237). This previous grant funded the development of a fire plan, a Highway 32 spill plan and assessment, and a rangeland management plan for the watershed. The outcomes of all of these plans are documented in the DCWC's 2000 Annual Report. In addition, the preliminary plans developed from this previous grant have laid the foundation for other projects including a recently awarded Rangeland and Riparian Management Program under the CALFED Watershed Program (project number 0049). In addition, the concepts for this current proposal were developed from preliminary floodplain investigations conducted by Dr. G. Mathias Kondolf and DWR in association with (but not directly funded by) the 1997 ERP grant.

5. Systemwide Ecosystem Benefits

Synergistic, systemwide ecosystem benefits will result through the regeneration of the stream side riparian forest — providing habitat for wildlife and avian species, SRA (Shaded Riverine Aquatic, USFW Category 1. habitat), and a source of in-stream large woody debris — as well as the preservation of open space. Additionally, this project compliments other projects/programs in watershed as discussed in section B2 Relationship to Other Ecosystem Restoration Projects.

6. Proposals Containing Land Acquisition

The proposed project is a feasibility study to evaluate alternatives for possible future implementation, and therefore, does not require any land acquisition.

C Qualifications

The organization chart for the proposed project team is presented in Figure 6. Most of the team members have worked together on a variety of projects and have a proven successful track record. Individual team member qualification summaries are presented below.

Deer Creek Watershed Conservancy

The DCWC formed in 1994 to coordinate efforts in Deer Creek watershed protection. With landowner members represented by 10 board members, the DCWC relies on close communications between landowners and the board. That close communication, which has brought the DCWC to the organizational, political, and technical level that it can now conceptualize and coordinate this project, will be crucial to the successful implementation of the project. The DCWC has a proven track record of implementing complex watershed management projects and enjoys positive working relationships with key local and regional agencies and non-governmental organizations. DCWC's accounting firm is well versed in grant accounting processes and well-equipped to respond to the needs of the administering agency.

The DCWC Board of Directors will provide primary oversight of the proposed project and will be intimately involved in the stakeholder involvement facilitation. For this project, DCWC will seek a local program coordinator who has an established report in the community to directly manage the day-to-day activities of the project and participate routinely in the stakeholder involvement process.

Maurice D Hall, Ph.D.- Technical Project Management; Watershed Management
Ph.D., Watershed Sciences; B.S., Chemical Engineering

Dr. Hall is a project manager and water resources engineer at CH2M HILL with extensive experience in watershed management, water resources planning and management, and regional hydrologic modeling and GIS analysis. Dr. Hall was project manager for a $3 million design of irrigated managed vegetation and associated water conveyance facilities for dust control on more than 4 square miles of the Owens dry lakebed for the Los Angeles Department of Water and Power. He has been involved in numerous water resources projects in California and Oregon including the development of Sacramento Basin-Wide Management Plan, Water Supply Alternatives and Salinity Assessment for the Sacramento River Settlement Contractors and U.S. Bureau of Reclamation, California. Working extensively with farmers and other stakeholders, Dr. Hall developed a regional GIS-based model for linking land use with groundwater resources in northeastern Colorado.

Timothy L Hamaker - Fisheries Biologist
B. S., Fisheries Biology; American Fisheries Society - Certified Fisheries Scientist

Mr. Hamaker has more than 23 years of experience with CH2M HILL in fishery habitat and population inventory studies including channel and streambank realignment and restoration, and numerous fisheries studies under the Endangered Species Act and EIS/EIRs. Mr. Hamaker consulted in the development of wetland, aquatic, and riparian habitat in the realignment of Best Slough at Beale Air Force Base in northern California. He was task manager of the fisheries component of the Mainstem Trinity River Fisheries Restoration EIS/EIR for the U.S. Bureau of Reclamation. As part of the fisheries impact assessment team, he developed methods and analyzed the long-term consequences of implementing the 1992 CVPIA.

G. Mathias Kondolf, Ph.D. – Geomorphology/Stream Restoration
Ph.D., Geography and Environmental Engineering; MS, Earth Sciences; AB, Geology

Dr. Matt Kondolf is a fluvial geomorphologist whose research concerns environmental river management, influences of land-use on rivers (notably the effects of mining and dams on river systems), interactions of riparian vegetation and channel form, geomorphic influences on habitat for salmon and trout, alternative flood management strategies, and application of fluvial geomorphology to river restoration. Dr. Kondolf is an associate professor of Environmental Planning and Geography, affiliated faculty member of the Energy and Resources Group, and instructor in the Environmental Sciences Program at the University of California at Berkeley. He also is a past member of the CALFED Ecosystem Restoration Program (ERP) Science Board. He has conducted hydrologic, historical, channel stability, and spawning gravel analyses on numerous streams in California including the Lower Yuba River, Rush Creek, Lee Vining Creek, Battle Creek, Stony Creek, the Sacramento River between Deer Creek and Stony Creek, and others.

Kenneth R. Iceman, P.E. - Hydrologic Modeling
M.S., Engineering; B.S., Mathematics; Professional Engineer, California

Mr. Iceman has more than 28 years of experience with CH2M HILL in hydraulics, hydrology, and water quality, including the use of analytical, numerical, and statistical models and several field monitoring techniques for flood control, gradient restoration structures and fish passage improvement. Mr. Iceman directed all hydrology tasks and hydraulic modeling for the Indian Valley Flood Management Study and Indian Creek Watershed Management Plan for Plumas County. For Siskiyou County flood insurance studies, Mr. Iceman conducted three detailed mapping, hydrology, and hydraulics analyses.

Mark Tompkins – Hydrology, Geomorphology, and Stream Restoration
M.S., Environmental Engineering; B.S., Civil Engineering

Mr. Tompkins is a project engineer and stream restoration specialist at CH2M HILL where he developed the firm's national Stream Restoration Initiative. He has extensive project experience in ecological engineering, water resources engineering, hydrology, fisheries biology, fluvial geomorphology, and stream restoration. Mr. Tompkins has performed geomorphic assessments for stream restoration projects on Best Slough and Lower Silver Creek in California, and on Sugarland Run in Washington D.C. Mr. Tompkins has assessed the potential effects of potential changes in hydrology and sediment transport on the Sacramento River. Mr. Tompkins also has expertise with hydraulic and hydrologic models, and has completed detailed analyses of proposed channel modifications on major river systems in California.

D Cost

The proposed project costs are detailed in forms V and VI, Budget Summary and Budget Justification. The total requested budget is approximately $1.8 million.

E Local Involvement

The lower Deer Creek restoration project is the result of local involvement and will depend on extensive continued local involvement to carry it through to completion. The DCWC enjoys

cooperative relationships with Tehama County Flood Control and Water Conservation District, the Tehama County RCD, the Vina RCD, The Nature Conservancy, the USFWS, California State Parks, CDFG, CalTrans, DWR, Lassen National Forest, and numerous other local watershed groups.

To ensure ongoing communications between the project team, landowners, and stakeholders the DCWC will employ a project director/public liaison officer. This person will focus on the flow of information to and from project team members, landowners, and stakeholders. A few landowners have expressed some reservations about the project and they, in particular, will be sought out for feedback and participation throughout the project. Listening to the concerns from landowners and other stakeholders and capitalizing on their unequaled knowledge of the local system will be an integral part of the duties of the project director. In addition, the project director and other technical team members will spend considerable time with stakeholders, sharing information and listening to feedback.

As described in Section A3 Approach, the project will begin with Chartering that will include landowners and stakeholders. As information is gathered, several workshops with a broader assemblage of participants/stakeholders and agency representatives will be held to plan the next steps in the project. To reinforce that this is the landowners' and stakeholders' project, landowner project team members will present much of the new information at these meetings and chair many of the workshop sessions. The success of these workshops will depend on active participation from stakeholders. To help ensure large turnouts, these events will be widely publicized through newsletters, newspaper, and other media. An information update and plans for the coming workshops will be included in the publicity.

F Compliance with Standard Terms and Conditions

The Deer Creek Watershed Conservancy will comply with all standard terms and conditions presented in Appendix D and Appendix E of the ERP 2002 Proposal Solicitation Package.

G Literature Cited

Campbell, E.A. and P.B. Moyle. 1991. Historical and Recent Population Sizes of Spring-run Chinook Salmon in California. P. 155-216 in T.J. Hassler, editor. 1990. *Northeast Pacific Chinook and Coho Workshop Proceedings*. American Fisheries Society, Humboldt State University. Arcata, CA.

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Kelley, R. 1986. *Battling the Inland Sea*. University of California Press, Berkeley.

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Figures

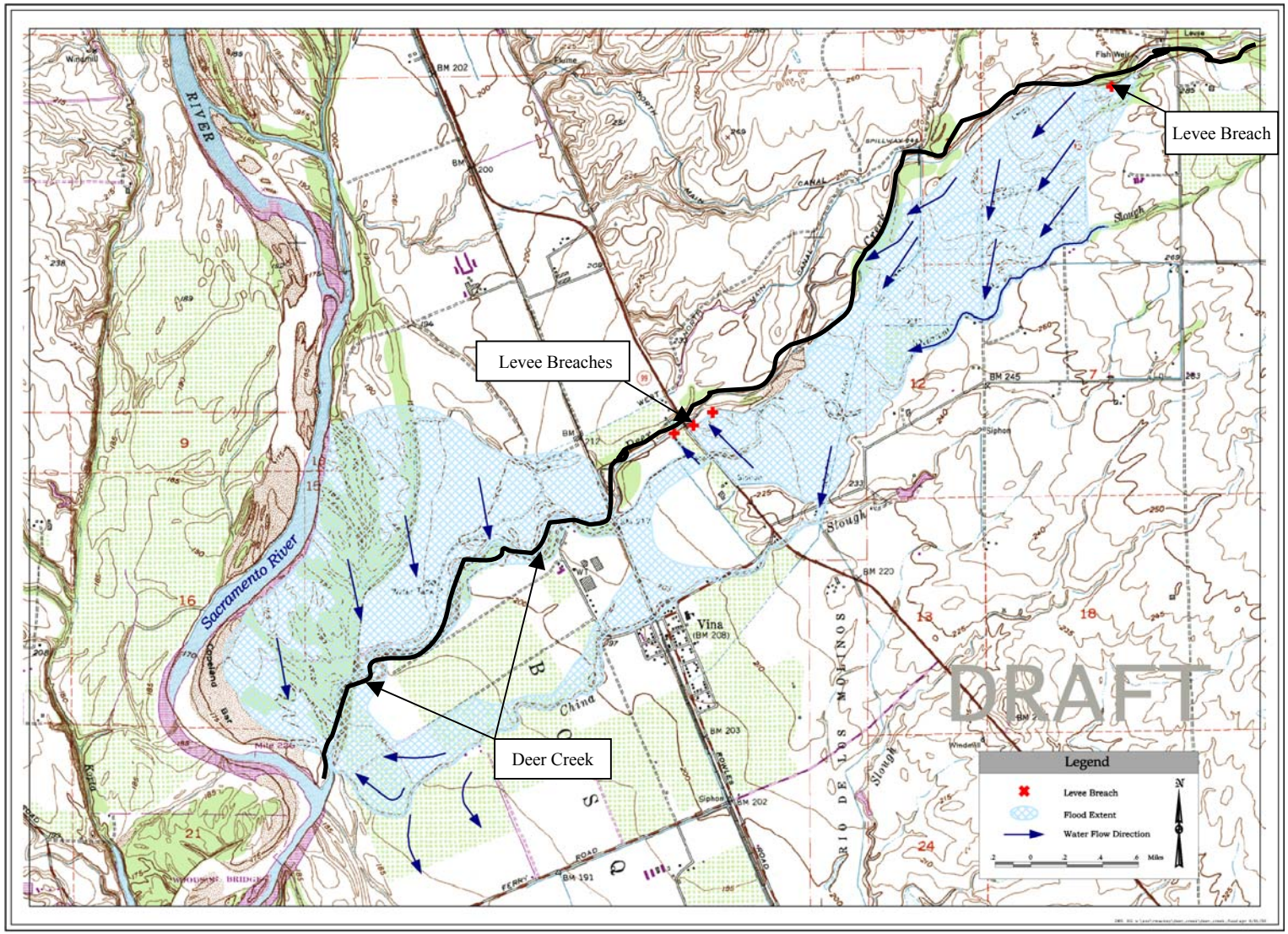
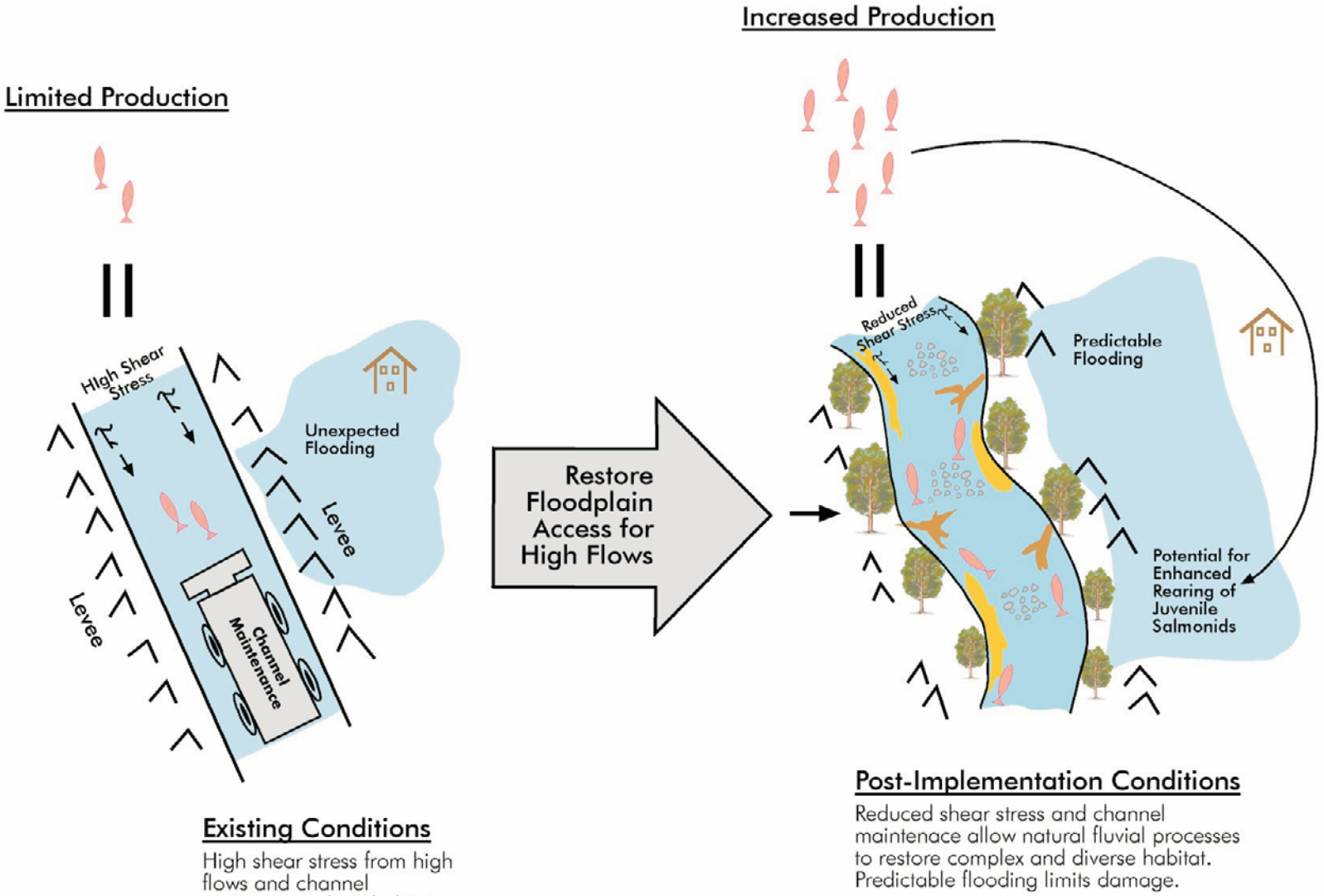


Figure 1. Approximate Flooding Extent along Lower Deer Creek, January, 1997 based on preliminary evaluations.
(Analysis and mapping provided by California Department of Water Resources.)



Existing Conditions

High shear stress from high flows and channel maintenance limit habitat complexity. Unexpected flooding causes significant damage.

Post-Implementation Conditions

Reduced shear stress and channel maintenace allow natural fluvial processes to restore complex and diverse habitat. Predictable flooding limits damage.

Figure 2
Deer Creek Flood Control Improvements Conceptual Model

Figure 3
Communications Between Key Functions for Phase I

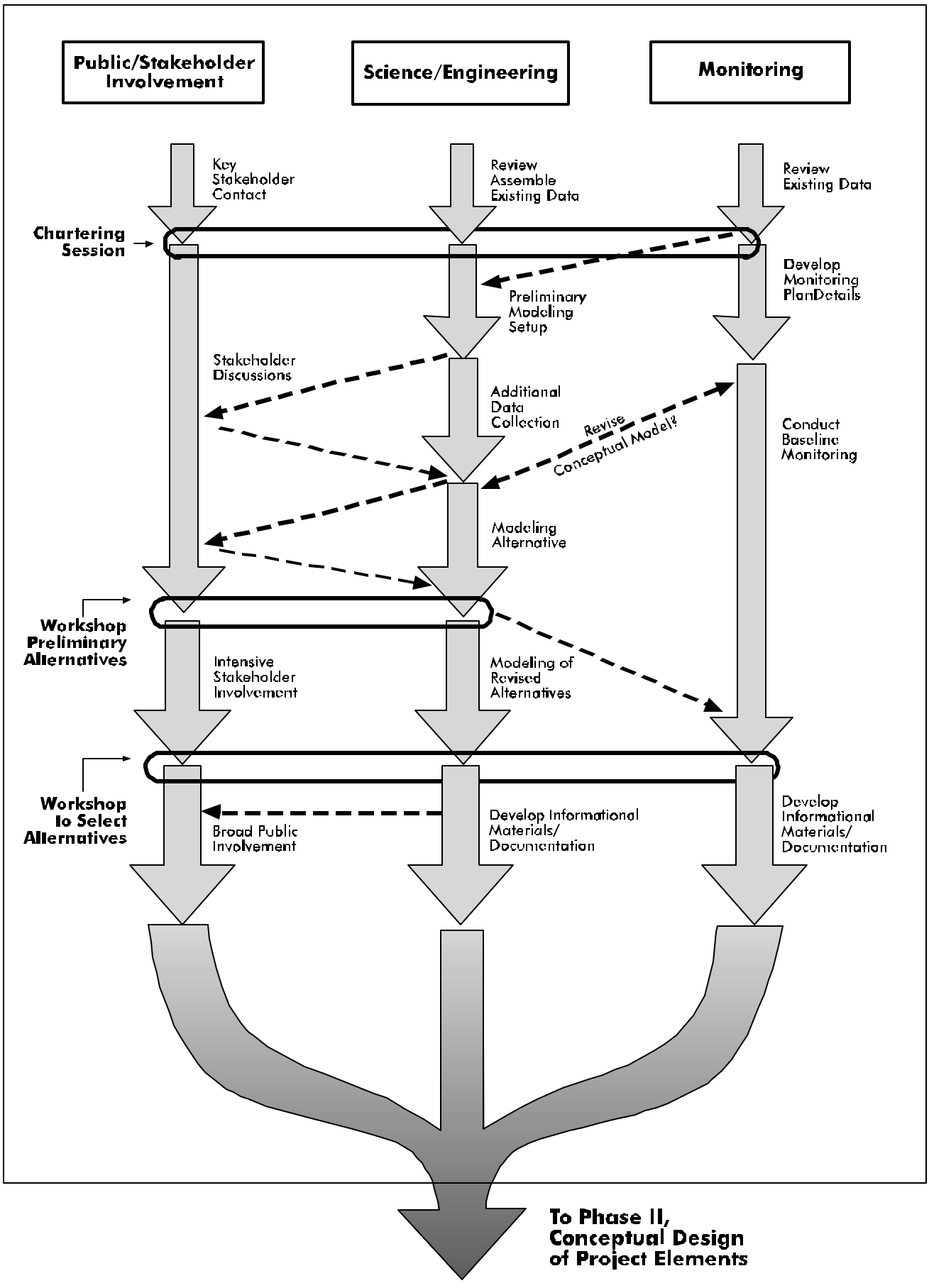


Figure 4
Pre-Disturbance (1938) Deer Creek

Activity Description	Early Start	Early Finish
Ongoing Tasks		
Project Coordination	01SEP03	02SEP05
Monitoring	01SEP03	02SEP05
Phase 1 - Feasibility		
Phase 1 - Feasibility	01SEP03	01JAN05
Phase 1 Start	01SEP03	
Stakeholder Involvement	01SEP03	01JAN05
Assemble Existing Data	01SEP03	02NOV03
Chartering Session	15OCT03	16OCT03
Monitoring Plan Development	03NOV03	30DEC03
Preliminary Model Setup	01JAN04	01MAR04
Mapping Evaluation	01JAN04	01MAY04
Public Workshop	15JAN04	15JAN04
Additional Data Collection	02MAR04	01MAY04
Modeling Scenarios	02MAY04	01AUG04
Review of Selected Elements	02AUG04	15AUG04
Select Alternatives	16AUG04	01NOV04
Workshop Alternatives	15NOV04	15NOV04
Conferences/Other/Mtgs	15NOV04	01JAN05
Documentation	02AUG04	01JAN05
Phase 2 - Concept DES		
Phase 2 - Conceptual Design	02JAN05	01SEP05
Conceptual Design	02JAN05	01SEP05
Public Workshop	01SEP05	01SEP05
Ongoing Monitoring		
Ongoing Monitoring	01SEP03	01SEP05

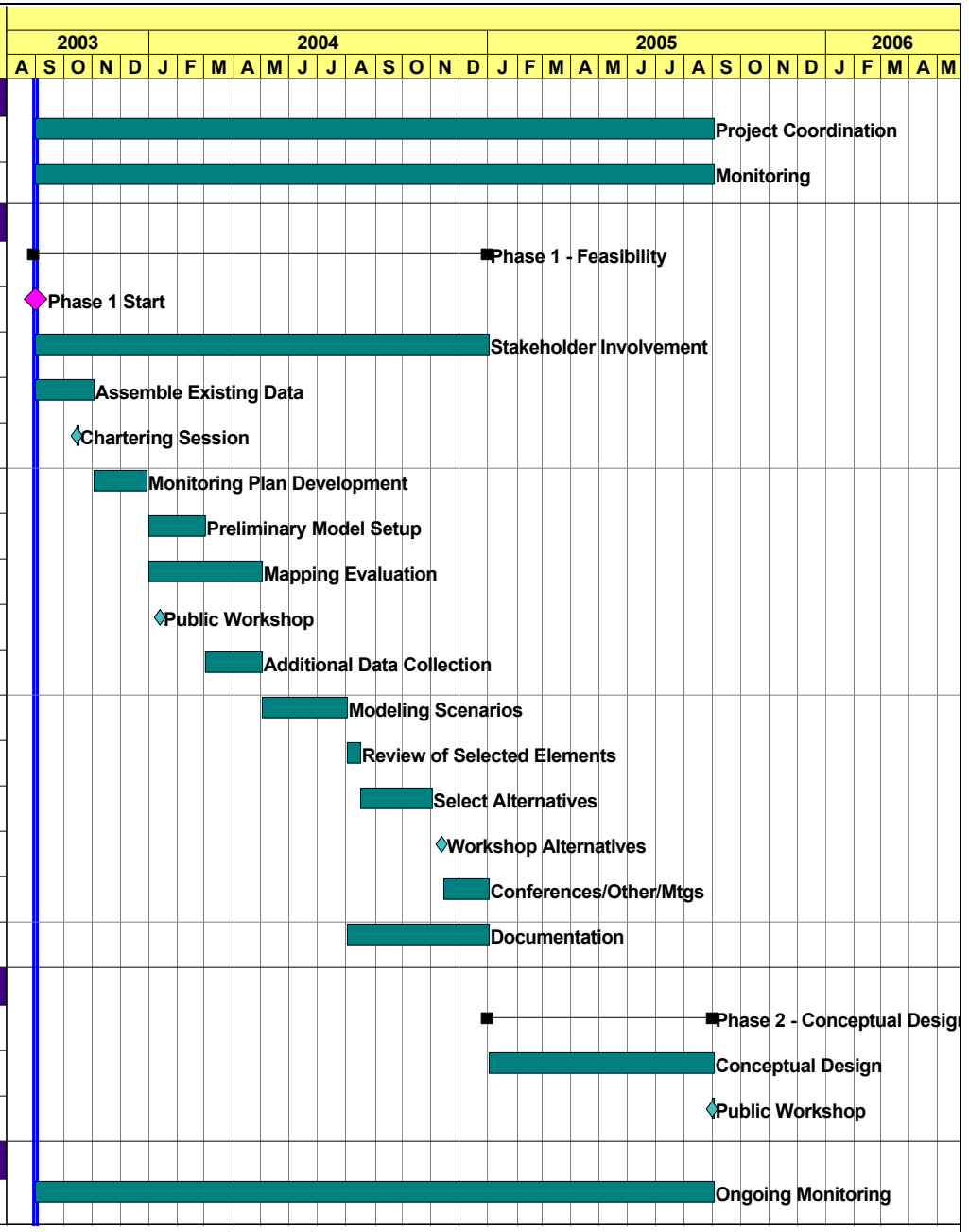


Figure 5
Lower Deer Creek Restoration & Flood Management
Feasibility Study & Conceptual Design
Proposed Project Schedule

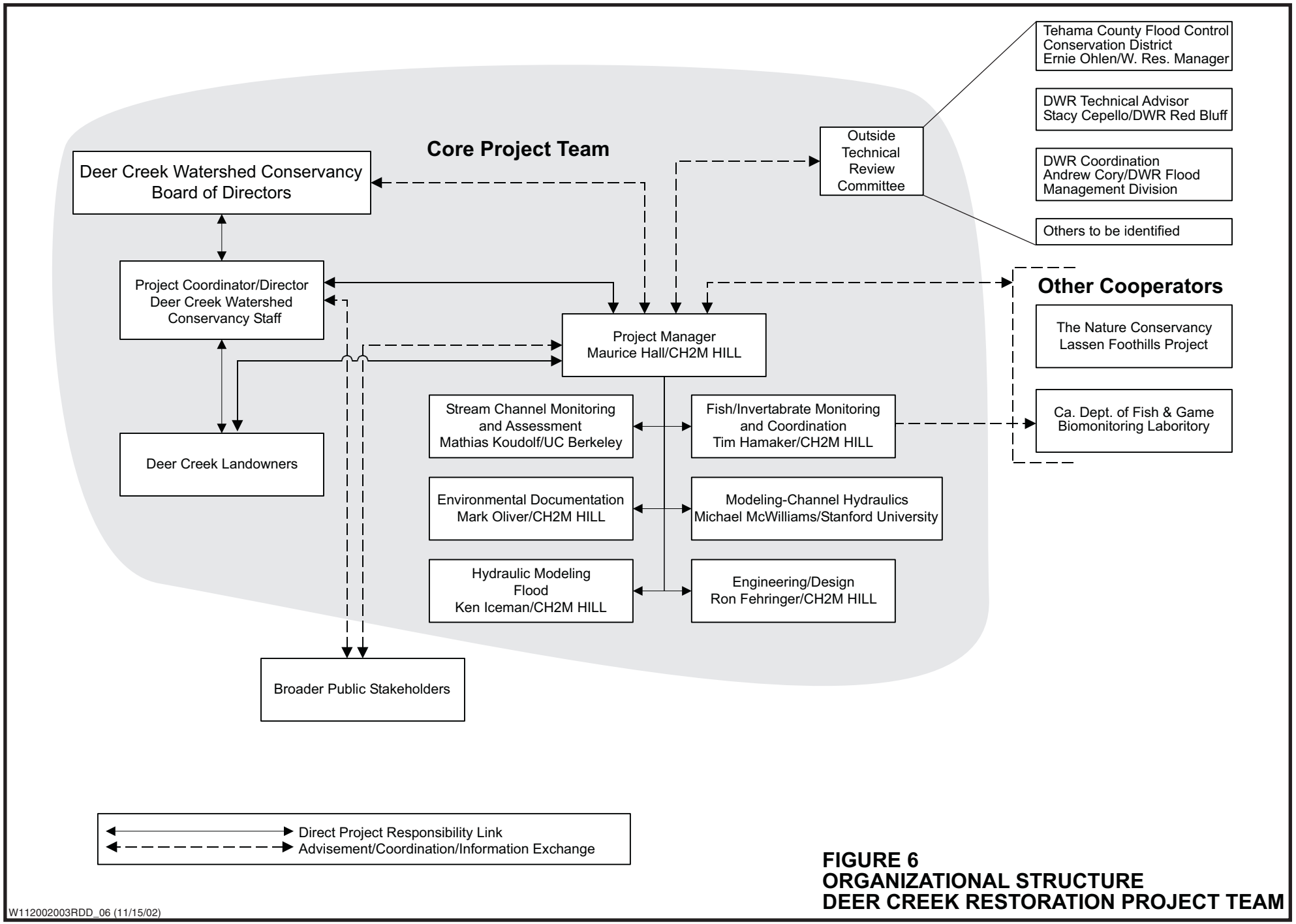


FIGURE 6
ORGANIZATIONAL STRUCTURE
DEER CREEK RESTORATION PROJECT TEAM

W112002003RDD_06 (11/15/02)

Appendix A Budget Rationale

APPENDIX A

Budget Rationale

Introduction

This appendix provides supplemental information on assumptions related to scope extent and corresponding budget for the proposed project. The detailed budget is included at the end of this appendix. Because of the nature of the proposed project, where a wide range of stakeholders with uncertain concerns and interests affect the project outcome, the level of effort required is somewhat uncertain. To develop the requested budget, expectations of reasonable levels of effort have been developed for the individual tasks through consultation with parties familiar with the watershed and through comparison with similar tasks on other projects. The following lists assumptions used in developing the listed budgets, and appropriate diligence will be exercised to constrain project variables to keep costs within the proposed budget. If circumstances develop such that it appears the level of effort may exceed those described here, CALFED will be notified, and adjustment of product expectations or realignment of budgeted resources may be needed.

Overview of Project Execution

Deer Creek Watershed Conservancy– The DCWC will contract a program coordinator approximately halftime for the duration of the project. The program coordinator's time will be approximately equally divided among task activities (primarily stakeholder involvement in the Feasibility Study and Conceptual Design) and project management duties (consultant oversight, documentation, and internal communication). Potential candidates have been identified contingent on funding availability and project timing. DCWC will enlist the support of an accounting firm that has provided similar support on previous and ongoing projects to handle project administration functions.

Primary Consultant– DCWC has solicited the services of CH2M HILL as the primary science and engineering contractor to conduct the proposed project. CH2M HILL will provide stakeholder involvement support along with the principal hydrologic and biologic evaluations, computer modeling, monitoring planning, and conceptual design efforts.

Subconsultants – Several subconsultants have been solicited to assist in the project due to their unique qualifications. Key contributors include Dr. Mathias Kondolf of the University of California at Berkeley, Michael McWilliams of Stanford University and California Department of Fish and Game Aquatic Biomonitoring Laboratory. Other subconsultants may be hired for specific tasks such as conducting specialized monitoring.

Technical Review Committee – A technical review committee, representing agencies and other outside perspectives, will provide technical and institutional guidance throughout the process.

Task 1 – Phase I Feasibility Study

The feasibility study is an evaluation of the possible measures that might be implemented to achieve the dual objectives of stream habitat restoration and flood damage prevention. A range of measures will be developed and defined to a level adequate to support hydraulic modeling to determine the impact of flooding on stream channel habitat conditions. Both HEC-RAS and UN-TRIM (a three-dimensional [3D] model that provides estimates of flow velocities, bed stresses, and other variables not available from traditional flood-flow modeling) will be employed to evaluate the flood inundation area and resulting flow velocity conditions that affect long-term habitat characteristics of the system. Measures considered may include realigning levees to provide more active floodplain adjacent to the stream; enlarging bridge flow capacity; allowing flood flow bypass to historical distributary channels including accompanying improvements in distributary channel flow passage; constructing ring levees for protection of vulnerable infrastructure; construction of off-stream flood detention basins; adjustment channel maintenance practices; and reinforcement of existing levees. From the broad range of measures evaluated, a smaller set of viable measures will be identified, which constitute an alternative. To ensure that the alternatives developed are physically reasonable and acceptable to local stakeholders, the feasibility study includes extensive local stakeholder involvement. As part of this process, local landowners and key stakeholders will be involved in the feasibility study from the beginning, helping to clarify historical conditions, identify acceptable measures, and evaluate alternatives.

Subtask 1.1 – Stakeholder Involvement and Communication

DCWC and other project staff will meet with local landowners, local responsible agencies, and other key stakeholders and will maintain an ongoing dialogue with them to seek their input, explain possible measures and modeling results, and feed their insight and concerns into the evaluation process. DCWC sees this component of the project as absolutely critical to identifying a truly implementable alternative.

Budget Assumptions:

DCWC – Quarter-time project coordinator for first 18 months of the project. For budgeting purposes, one quarter of DCWC project coordinator time is accounted for in this task, although project coordinator will participate in multiple subtasks.

CH2M HILL – Assume 1 week per month total staff time for first 18 months of the project. Primary staff involvement includes Project Manager, Assistant Project Manager, Senior Biologist, Senior Hydrologist, Lead Hydrologist, and office support.

Products:

Onsite meetings and discussions; informational materials development; alternative measure development; modeling interpretation.

Subtask 1.2 – Chartering Session

The chartering meeting will bring together key project team members, and will include key landowners, key agency personnel, technical team leaders, and other key cooperators. The

proposal, funding conditions, conceptual model, and overall plan will be reviewed. The Technical Advisory Committee (TAC) will also be included in the chartering meeting to improve familiarity with the team and objectives and to provide guidance on the execution of initial project tasks.

Budget Assumptions:

CH2M HILL and Subcontractors: 10 hours each for 13 total participants plus additional time for preparation of program and informational materials. Primary staff Involvement includes Project Manager, Assistant Project Manager, Senior Biologist, Lead Biologist, Senior Hydrologist, Lead Hydrologist, Senior Modeler, Lead Modelers, Design Manager, Lead Engineer, and office support.

Subtask 1.3 – Review Existing Data

A significant amount of historical data (physical and biological) exists for lower Deer Creek. A focused effort will be made to collect and arrange this information and make it available to the project team. Digital terrain models developed from recent aerial photographs of the Deer Creek Basin will be used to establish the existing physical conditions. In addition, institutional knowledge of contentious issues and specific concerns will be collected and documented.

Budget Assumptions:

CH2M HILL and Subcontractors: 2 weeks for lead flood modeler; 1 week for lead hydrologist; 1 week for mapping assistance; ½ week each for: project manager, assistant project manager, senior modeler, senior biologist, lead biologist, GIS analyst, surveyor, and lead 3D modeler; plus office support.

Products:

Summary list of existing data reviewed and retained; useful data assembled in appropriate format (hardcopy or computer database).

Subtask 1.4 – Monitoring Plan Development

The general monitoring plan will be detailed and initiated to supplement existing data and augment ongoing monitoring. A physical monitoring plan will be developed to establish a firm understanding of existing conditions and enable informative assessments of post-project performance with respect to the formation of aquatic and riparian habitat through natural processes.

Budget Assumptions:

CH2M HILL and Subcontractors: 1 week each for lead biologist and lead hydrologist; 2 days each for project manager, lead modeler, and senior biologist; one-half week for GIS analyst; 1 day each for senior hydrologist.

Products:

Monitoring Plan.

Subtask 1.5 -- Public Workshop 1

Approximately 1 to 2 months after the chartering session, an informational workshop including poster presentations will be conducted to educate a broader group of interests on the project goals and plan.

Budget Assumptions:

CH2M HILL and Subcontractors: Preparation of Program and Informational Materials and Meeting Logistics – one-half week each for project manager, assistant project manager, lead modelers, lead biologist, GIS analyst, lead hydrologist, and office support; 1 week for graphics associate. Meeting Attendance – project manager, assistant project manager, senior modeler, senior biologist, lead biologist, lead hydrologist, and senior hydrologist.

Products:

Notification mailings; informational materials (maps, organizational charts, example figures); workshop.

Subtask 1.6 – Preliminary Modeling Setup

A modeling framework will be developed to support flood-flow simulations of various implementation elements. This will include HEC-RAS and 3D model setup.

Budget Assumptions:

CH2M HILL and Subcontractors: 4 ½ weeks for lead flood modeler;1 week for senior modeler; one-half week each for GIS analyst, senior hydrologist, and lead hydrologist; one-half week each for project manager, senior biologist, and office support.

Products:

Assembled base computer models with preliminary calibration. Summary memorandum describing model framework, additional data needs, and next steps.

Subtask 1.7 – Collection of Additional Data

Additional detailed data (topography, stream / slough channel characteristics, levee conditions) will be collected as necessary to support development of detailed modeling.

Budget Assumptions:

CH2M HILL and Subcontractors: 2.5 weeks for lead flood modeler; 1 week for GIS analyst and Surveyor; one-half week for senior modeler, lead 3D modeler, and office support; 1 day for project manager.

Products:

Additional information required for model refinement. Updated project database reflecting additional information obtained. Field notes.

Subtask 1.8 – Hydrologic/Hydraulic Analyses for Fluvial Geomorphology

Available historical hydrology data for Deer Creek will be assembled and analyzed to support the assessment of past and current geomorphic conditions and to guide the development of hydrologic / hydraulic scenarios as described above.

Budget Assumptions:

CH2M HILL and Subcontractors: 3 weeks for lead hydrologist; 1 week each for GIS analyst and surveyor; one-half week each for project manager, office support and graphics assistance.

Products:

Memorandum describing hydrologic and geomorphic analysis.

Subtask 1.9 – Modeling Scenarios

Basic simulations of a wide range of potential **project elements** (individual project features that together make up an **alternative**) will be conducted. The simulations will help identify those elements that offer reasonable benefit for improving the hydrologic conditions of the lower Deer Creek channel. Project elements that might be considered include levee realignment; controlled levee bypass to historical distributary channels (along with restoration of these distributary channels); upgrading bridges / crossings; targeted in-channel maintenance; levee upgrades; ring levees; landuse modifications; and / or combinations of these and possibly other options.

Budget Assumptions:

CH2M HILL and Subcontractors: 8 weeks for lead flood modeler; 2.5 weeks for senior modeler; 1 week each for project manager, lead hydrologist, GIS analyst, and 3D modeler; 2 days each for senior biologist, design manager, graphics assistance, and senior hydrologist; 1 day each for lead engineer, lead biologist, and permitting advisor

Products:

Baseline Flood flow simulations for a design flow for existing conditions and for up to five primary project elements (levee setback, bridge widening, levee bypass) with their associated minor elements (channel roughness modifications, resized culverts)

Subtask 1.10 – Review of Project Elements

A critical scientific review of the preliminary simulation results will be conducted to evaluate the value of the various project elements against the conceptual model. If the conceptual model is revised based on new monitoring or other new information, suggestions of additional or modified project elements will be entertained and reviewed. If additional preliminary modeling is deemed necessary, the scope of those simulations will be developed and the additional modeling will be conducted (modeling conducted as part of subtask 1.9, subject to scope description for that subtask).

Budget Assumptions:

CH2M HILL and Subcontractors: 3 days each for senior biologist, lead modeler, lead hydrologist, and senior hydrologist; 2 days each for project manager, senior modeler, and office support.

Subtask 1.11 – Selection of Alternative(s)

Key stakeholders and team members (including key landowners) will be gathered in workshop settings to review the modeling and stakeholder process results to identify a set of project elements (alternatives) to be considered further. This will likely be an iterative process where various sets of promising project elements are combined, simulated, and brought back for consideration. Important aspects of this process will be up-front and continuous involvement of key landowners and stakeholders and clear presentation of results, including confidence intervals, data limitations and perceived risks. The outcome of this step will be a selected alternative or small set of alternatives that are recommended for further consideration (conceptual design).

Budget Assumptions:

CH2M HILL and Subcontractors: 4 weeks lead modeler; 3 weeks total for meeting logistics and office assistance, 2 weeks each for project manager, assistant project manager, GIS analyst, and lead hydrologist; 1 week each for senior modeler and senior hydrologist; 2 days each for senior biologist, lead biologist, lead engineer, graphics development, and lead 3D modeler.

Products:

Simulation results for up to 3 different major alternatives. Up to 4 informal workshops. Plan view graphics showing alternatives considered and resulting flood extent.

Subtask 1.12 – Workshop Alternative(s)

Thorough documentation and demonstration of the selected alternatives will be prepared including visual simulations and poster descriptions of the process. This documentation will be presented in two public forums to gain general support, identify any fatal flaws in the selected alternatives, and set the stage for the environmental documentation. At least one of these forums will be held in the Vina Community Center or other suitable local location.

Budget Assumptions:

CH2M HILL and Subcontractors: Preparation of Program and Informational Materials and Meeting Logistics – ½ week each for project manager, assistant project manager, lead flood modeler, lead biologist, GIS analyst, lead hydrologist, and office support; 1 week for graphics assistance. Meeting Attendance – project manager, assistant project manager, senior modeler, senior biologist, lead biologist, lead hydrologist, 3D modeler, and senior hydrologist.

Products:

Posters and/or on-screen displays of modeled alternatives. Up to two public workshops.

Subtask 1.13 – Conferences/Other Meetings

Project staff will attend other related local and regional meetings to ensure project activities are consistent with plans and activities in the surrounding region. In addition, key project staff will present key products, such as alternative plants and modeling results at professional meetings.

Budget Assumptions:

CH2M HILL and Subcontractors: 7 days for project manager; 3 days for lead modeler; and 2 days each for lead biologist, lead hydrologist, and senior hydrologist.

Products:

Attendance at up to four conferences requiring regional travel (California) and five non-project sponsored meetings (requiring only auto travel).

Subtask 1.14 – Documentation

A cumulative documentation of the findings of the program thus far will be prepared including a feasibility report describing the alternatives considered, a report of the monitoring findings, and a summary description of the revised conceptual model and path forward.

Budget Assumptions:

CH2M HILL and Subcontractors: Approximately 400 hours total time divided between project manager, technical leads, editing, document processing, graphics, and GIS.

Products:

Summary report for Phase I.

Task 2 – Phase II Conceptual Design

Phase II will take the selected alternative from Phase I and refine the details to the point where environmental documentation can be completed, construction cost estimates can be made, and funding sources for implementation can be pursued.

Subtask 2.1 – Conceptual Design

The selected alternative will be refined, and a conceptual engineering design of the elements of the selected alternative will be produced. The design documentation will include area-wide layouts of new facilities, facility upgrades; finalized mapping of simulated flood extents; 15 percent engineering design of project elements; order-of-magnitude construction cost estimate; suggested phasing of construction; detailed performance objectives and monitoring plan; and an updated/refined adaptive management plan.

Budget Assumptions:

DCWC – ¼-time project coordinator for 6 months of this project phase. For budgeting purposes, ¼ of DCWC project coordinator time is accounted for in this task, although project coordinator will participate in multiple subtasks.

CH2M HILL and Subcontractors: Approximately 1200 hours of engineering and 1200 hours of drafting plus senior design review for each of 30 project elements, recognizing that some project elements will be much more complex (such as a bypass flow weir) and others will be much more simple (such as a new road culvert). Additional level of effort assumptions include 4 weeks for surveying; 2 weeks each for GIS, office support and project manager; 1 week each for senior biologist, lead biologist, mapping development; and two days for senior hydrologist, lead 3D modeler and assistant project manager.

Products:

Conceptual Design Drawings for up to 30 project elements; conceptual level engineers cost estimate

Subtask 2.2 – Public Workshops

The conceptual design will be presented to the public in public forums. The key stakeholders will join the DCWC and the engineer in presenting the conceptual design and responding to questions. It is assumed that two workshops will be held.

Budget Assumptions:

CH2M HILL and Subcontractors: Preparation of Program and Informational Materials and Meeting Logistics – ½ week each for project manager, assistant project manager, lead flood modeler, lead biologist, GIS analyst, lead hydrologist, and office support; 1 week for graphics assistance. Meeting Attendance – project manager, senior modeler, senior biologist, lead biologist, lead hydrologist, 3D modeler, and senior hydrologist.

Products:

Informational displays and printed materials; up to two public workshops in northern Sacramento Valley.

Task 3 – Monitoring

Biological and geomorphology monitoring for the current proposal will consist of pre-project baseline monitoring. Categories of monitoring include the following:

- Baseline Condition Monitoring – Terrestrial and Aquatic Biologic, and Geomorphology
- Targeted Condition Monitoring for Future Adaptive Management – Biologic and Geomorphology

Budget Assumptions:

CH2M HILL and Subcontractors: Total over two year project duration -- 10 weeks for lead hydrologist; 9 weeks total for terrestrial and aquatic biology field monitoring and documentation; 5 weeks for senior hydrologist; ½ week for project management.

Products:

Geomorphology Monitoring Memorandum; Biology Monitoring Memorandum; Field Notes; Data summary tables.

Task 4 – Project Management

The DCWC project coordinator will provide general oversight of the activities of the contractors and be the primary liaison with the DCWC Board. The project coordinator and the consultant project manager will coordinate activities of the technical review committee, provide primary liaison with the cooperating agencies, and track / manage budget and schedule. The consultant project manager will coordinate all activities of the technical team and provide secondary liaison with the DCWC board. General documentation and correspondence not directly covered under other tasks will be produced as part of the project management function.

Budget Assumptions:

DCWC – Halftime project coordinator for full 24 months of the project. (For budgeting purposes, one-half of DCWC project coordinator time is assumed to be in project management role, of the total DCWC project coordinator time, one-half is assumed to be in project management role, one-quarter is assumed to be accounted for in stakeholder involvement portion of Phase I, and one-quarter time is assumed to be accounted for in Phase II.) Budget administration $10,000 per month for the 24 month anticipated project duration. Major Expenses: Computer system and required software; lease of 4WD truck; other office equipment and supplies; travel expenses to regional meetings.

CH2M HILL – Approximately 3 hours per week for the project duration (total 300 hrs) for project manager, 200 total hours for office support. Major Expenses: travel expenses between Redding and Deer Creek; travel expenses between Redding and regional meetings; production of annual report summarizing the progress of the project and the integration of the project with other local and regional activities.

Deer Creek Proposal Subtask Detail Budget

11/10/02 ver Assume September 1, 2003 Start Date

10:45 PM

Task

Subtask	Approx. Start	Approx. End	Approx. Duration (weeks)	CH2M HILL Labor	CH2M HILL Expenses	CH2M HILL Subcontracts	Total CH2MHILL including Subconsultants	DCWC Contract Staff and Accounting	DCWC Expenses	Major Task Subtotals
PROJECT MANAGEMENT	09/01/03	09/02/05	105	**$49,100**	**$47,300**		**$96,300**	**$104,100**	**$30,000**	**$230,400**
PHASE I - FEASIBILITY										
Stakeholder Involvement	09/01/03	01/01/05	70	$117,400	$15,900	$13,700	$146,900			
Chartering Session	10/15/03	10/16/03	0.285714	$24,800	$3,300	$3,400	$31,500			
Assemble Existing Data	09/01/03	11/02/03	9	$32,200	$4,400	$2,700	$39,300			
Monitoring Plan Development	11/02/03	12/30/03	8	$17,800	$2,400	$2,700	$23,000			
Public workshop	01/15/04	01/15/04		$21,300	$2,900	$2,700	$26,900			
Preliminary Model Setup	01/01/04	03/01/04	9	$27,200	$3,700	$5,500	$36,300			
Additional Data Collection	03/01/04	05/01/04	9	$25,200	$3,400		$28,600			
Mapping Evaluation	01/01/04	05/01/04	17	$27,000	$3,700	$700	$31,300			
Modeling Scenarios	05/01/04	08/01/04	13	$64,000	$8,700	$5,500	$78,200			
Review of Possible Flood Control Measures	08/01/04	08/15/04	2	$13,100	$1,800	$8,200	$23,100			
Select Alternatives	08/15/04	11/01/04	11	$76,900	$10,400	$10,900	$98,200			
Workshop Alternatives	11/15/04	11/15/04		$21,700	$2,900	$5,500	$30,100			
Conferences/Other Mtgs	11/15/04	01/01/05	7	$12,300	$1,700		$14,000			
Documentation	08/01/04	01/01/05	22	$66,700	$9,000	$2,700	$78,500			
Subtotal	**09/01/03**	**09/02/05**	**105**	**$547,600**	**$74,200**	**$64,200**	**$685,900**	**$40,000**		**$725,900**
PHASE II - CONCEPT DES										
Concept. Design	01/01/05	07/01/05	26	$320,200	$42,100	$7,400	$369,600			
Public Workshops	01/01/05	06/01/05	22	$22,300	$2,900	$14,700	$39,900			
Subtotal	**01/01/05**	**06/01/05**	**22**	**$342,500**	**$45,000**	**$22,100**	**$409,500**	**$40,000**		**$449,500**
Ongoing MONITORING	09/01/03	09/01/05	104	**$54,500**	**$8,000**	**$50,900**	**$113,400**			**$113,400**
TOTAL										**$1,519,200**

Appendix B Response to Reviewers' Comments

Appendix B

Table B-1 summarizes primary comments from the reviewers of the original Deer Creek proposal and how our revised proposal responds to the reviewers' concerns. Additions and clarifications have been incorporated into the proposal and Appendix A Budget Rationale.

TABLE B-1
Responses to Primary Reviewer's Comments
Lower Deer Creek Restoration and Flood Management: Feasibility Study and Conceptual Design

Comment	Response
Increase coordination with U.S. Army Corps of Engineers, California Reclamation Board, and Tehama County	The DCWC along with our cooperators maintains close ties and positive working relationships with the responsible agencies in our region. We appreciate the reviewers' concern for a cooperative effort, as we too have seen promising efforts fall to pieces due to lack of appropriate communication or knowledge of institutional constraints. Therefore, in preparing the revised proposal, DCWC and our cooperators have increased the level of cooperation with the potentially affected responsible agencies. The COE, Reclamation Board, and Tehama County Flood District have been contacted, and all have expressed considerable interest in the proposed work. In some cases, the agency representatives did not feel that formal involvement was appropriate at this stage, but expressed their desire to be kept informed as the project progresses so that appropriate partnerships could be developed as potential alternatives take shape. Andy Cory, of the DWR Northern District Office will serve on the TAC and can provide liaison with DWR's Flood Management Division. Water Resources Manager for the Tehama County Flood Control and Water Conservation District will also serve on the TAC. The Corps of Engineers is considering the best means of staying involved in the Deer Creek effort, whether through direct representation on the TAC, through future partnerships as alternatives for implementation become more clearly defined, or through on-going informal coordination efforts. In either case, representatives of the COE planning division and other divisions as appropriate will be kept informed of project progress. Pages 11 and 12 of the proposal have been revised to reflect the substantial coordination that will occur with other responsible agencies.
Adjust to end with conceptual design	The budget, text, and schedule (Figure 5) have been revised to end with conceptual design.
Clarify budget and provide more detail	Appendix A contains the budget rationale and supporting documentation. The Budget Justification forms have been revised.
Improve description of monitoring	The text has been revised to better define planned monitoring. A standard set of geomorphic measurements will be made at each monitoring cross section to establish a record of pre-project physical conditions. The evaluation of existing and pre-levee conditions will be conducted with funding requested in this proposal. Post-project conditions will, naturally, be conducted after later implementation of an alternative, and will be conducted with other funds. A number of other clarifications of monitoring plans have been incorporated into the revised proposal.
Explain budget	Appendix A contains the budget rationale.

Appendix C Biological Benefits of the Proposed Project

APPENDIX C

Potential Biological Benefits of the Lower Deer Creek Restoration and Flood Management Project

Spring-run Chinook Salmon

1. Decreased upstream migration time for adults due to reduced number and size of gravel bar obstructions. Potential for increased survival of adults over-summering.

2. Increase survivorship of fry and smolt associated with increased cover and food supplies in lower rearing areas.

3. Increased survival of yearling spring run associated with improved habitat complexity, reduced temperatures and increased food supplies.

4. Improved body condition of smolts and yearlings associated with floodplain rearing. Potential increase in survivorship to migration to the ocean.

Fall-run Chinook Salmon

1. Increased spawning habitat (quantity and quality).

2. Increased survivorship of fry and smolt associated with increased cover and food supplies in rearing area.

3. Improved body condition of smolts associated with floodplain rearing. Potential for increased survivorship to migration to the ocean.

Steelhead Trout

1. Reduced upstream migration time for adults due to reduced number and size of gravel bar obstructions.

2. Potential increase in survival of juvenile and yearling steelhead trout associated with increased cover, food supplies and decreased temperature in lower rearing areas.

3. Potential increase in survival to the ocean associated with floodplain rearing.

Riparian Vegetation and Associates Species

1. Potential increase in species diversity and abundance.