C1051

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF GEOLOGY
Phone: 530-752-7092
e-mail: mount@geology.ucdavis.edu

DAVIS, CALIFORNIA 95616
Fax: 530-752-0951
message: 752-0350

July 2, 1998

CALFED Bay-Delta Program
1416 9th St., Suite 1155
Sacramento, CA 95814

Dear CALFED Bay-Delta Program:

Please find enclosed 10 copies of the proposal entitled: The impact of non structural floodcontrol measures on riparian vegetation: The Cosumnes River floodplain, submitted for the ERPP. Final copies of signed data sheets and attachments are being forwarded to you under separate cover by the University of California, Davis Office of Research.

Thank you for your consideration of this proposal.

Sincerely,

Jeffrey Mount
Professor and Chair

C 1051

ATTACHMENT H
COVER SHEET May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Proposal Title: The impact of non structural floodcontrol measures on riparian vegetation: The Cosumnes River floodplain

Applicant Name: Dr. Mark W. Schwartz and Dr. Jeffrey F. Mount

Mailing Address: Center for Integrated Watershed Science and Management
University of California, Davis, CA 95616

Telephone: (530) 752-7092

Fax: (530) 752-0951

Amount of funding requested: $ 92,293 for 2 years

Indicate the Topic for which you are applying (check only one box). Note that this is an important decision: see page __ of the Proposal Solicitation Package for more information.

___ Fish Passage Assessment
___ Fish Passage Improvements
_X_ Floodplain and Habitat Restoration
___ Gravel Restoration
___ Fish Harvest
___ Species Life History Studies
___ Watershed Planning/Implementation
___ Education
___ Fish Screen Evaluations - Alternatives and Biological Priorities

Indicate the geographic area of your proposal (check only one box):

___ Sacramento River Mainstem
___ Delta
___ Suisun Marsh and Bay
___ Landscape (entire Bay-Delta watershed)
___ San Joaquin River Mainstem
___ Sacramento Tributary:_____
_X_ East Side Delta Tributary: The Cosumnes River
___ San Joaquin Tributary: _____
___ Other:_____
___ North Bay: _____

Indicate the primary species which the proposal addresses (check no more than two boxes):

_X_ San Joaquin and East-side Delta tributaries fall-run chinook salmon
___ Winter-run chinook salmon
___ Spring-run chinook salmon
___ Late-fall run chinook salmon
___ Fall-run chinook salmon
___ Delta smelt
___ Longfin smelt
___ Splittail
___ Steelhead trout
___ Green sturgeon
___ Striped bass
_X_ Migratory birds

Indicate the type of applicant (check only one box):

___ State agency
___ Federal agency
___ Public/Non-profit joint venture
___ Non-profit
___ Local government/district
___ Private party
_X_ University
___ Other:

Indicate the type of project (check only one box):

_X_ Planning
___ Implementation
___ Monitoring
___ Education
___ Research

By signing below, the applicant declares the following:

(1) the truthfulness of all representations in their proposal;

(2) the individual signing the form is entitled to submit the application on behalf of the applicant (if applicant is an entity or organization); and

(3) the person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section II.K) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

6-29-98

(Signature of Applicant)

II. Executive Summary

A. Project Title: The impact of non structural floodcontrol measures on riparian vegetation: The Cosumnes River floodplain.

A. Applicants: Mark Schwartz and Jeffrey Mount in collaboration with Richard Reiner

B. Project Description and Primary Biological/Ecological Objectives: The purpose of this habitat restoration demonstration project is to provide information on the impacts of levees and existing non structural alternatives, such as levee breaches and levee set backs, on woody riparian vegetation in the Cosumnes River watershed. This will be accomplished by creating a spatially explicit vegetation patch dynamic model and linking it to an existing physics-based meander migration model. The vegetation model will be based on the historic relationship between patterns of flood inundation and observed vegetation establishment. The combination of this relationship and the rate of riparian successional change will allow us to predict the distribution of vegetation in the future. The model will be designed to enable decisionmakers and watershed stakeholders to predict the benefits of potential levee modification projects on woody riparian vegetation. The methodologies and conclusions developed in this study will be directly applicable to a broad range of watersheds throughout the Central Valley.

C. Approach/Tasks/Schedule: In order to develop a linked vegetation/meander model for the Cosumnes River basin we envision a two year project which will include the following five tasks: 1) Acquire, interpret, digitize, and analyze historic aerial photographs, 2) Correlate forest establishment and hydrologic data, 3) Create, calibrate, and validate vegetation model, 4) Integrate vegetation and meander models, 5) Summarize findings in reports. This project will start in January 1999 and continue through December 2000.

D. Justification for Project and Funding by CALFED: Woody vegetation plays a major role in riparian systems throughout California. Riparian forests provide food and spawning habitat for aquatic organisms during the wet season and create shaded riverine aquatic (SRA) habitat during the dry season. Tree roots increase channel complexity and bank stability, and eventually provide the large woody debris and other organic material that forms the base of the aquatic food web. During floods vegetation acts as a filter by decreasing flow velocities and traping sediments and debris.

Water supply reliability is a particular concern in the Cosumnes watershed because studies by the California Department of Fish and Game (CDFG) and data assembled by TNC indicate that the decline in fall run Chinook salmon within the basin is due primarily to declines in fall flows. During the later part of this century the length of time that key reaches remain dry in the fall has increased, limiting access to spawning gravels. Riparian forests play an important role in attenuating flood peaks and spreading the discharge out over a longer period of time. Given the pivotal role

that woody vegetation plays in the riparian ecosystem it is crucial to understand the effects of structural and non structural flood management measures have on regeneration.

E. Budget Costs and Third Party Impacts: This project seeks $ 92,293 for a two year project. No negative third party impacts are anticipated with this proposed project.

Task 1: Acquire, interpret, digitize, and analyze historic aerial photographs.	$32,099
Task 2: Field work, correlating establishment of trees and hydrologic data.	$23,445
Task 3: Calibrate, apply and validate vegetation model.	$22,901
Task 4: Create vegetation model and integrate it with the meander models.	$ 9,370
Task 5: Summarize findings in reports.	$ 4,478
Total Costs:	$92,293

F. Applicant Qualifications: The applicants and named collaborator from the University of California and The Nature Conservancy are all Ph.D. level researchers with national and international reputations in fundamental and applied research in watershed issues. All UC Davis participants are experienced in conducting and directing research projects and in supervising graduate student assistants. Dr. Mount and Dr. Schwartz will coordinate and track the project. The field work and model development will be carried out by Wendy Trowbridge, a graduate student at UC Davis with experience working for both the University and The Nature Conservancy on riparian restoration projects in the Central Valley.

G. Monitoring and Data Evaluation: The funding currently requested is intended to develop a spatially explicit vegetation model. The field sites established for this demonstration project will form the baseline for a long term monitoring and evaluation of the impacts of changes in floodcontrol infrastructure or land use on riparian forest in the Cosumnes watershed. The Cosumnes Consortium was established to create a long term monitoring program in basin. Separate funding will be requested for the long term implementation of a monitoring program.

The results of this work will be published in refereed scientific journals and in reports to CALFED. In addition, the Muir Institute, in association with the UC Davis Information Center for the Environment, will prepare a summary of results for distribution on the web. These results will be intended to guide regional and local decision making throughout the Sacramento / San Joaquin watershed.

H. Local Support/Coordination with other Programs/compatibility with CALFED objectives: This project is affiliated with the Cosumnes Consortium a partnership made up of the University of California, Davis and seven agency and non profit partners dedicated to evaluation and monitoring of ecosystem conservation and restoration efforts, and supporting the information needs of adaptive management in the Cosumnes River watershed. The Consortium is also seeking funding to hire a watershed science coordinator who will work with community based organizations to make scientific data available to them in an accessible format.

III. Title Page

A. Title of Project:

The impact of non structural floodcontrol measures on riparian vegetation: The Cosumnes River floodplain.

B. Applicants

Mark W. Schwartz
Center for Population Biology, University of California, Davis, CA 95616, phone: (530) 752-0671, email: mwschwartz@ucdavis.edu

Jeffrey F. Mount
Center for Integrated Watershed Science and Management, University of California, Davis, CA 95616, phone: (530) 752-0951, email: mount@geology.ucdavis.edu

C. Type of organization and tax status:

Institution of higher education / tax exempt

D. Tax identification number: 94-6036494-W

E. Project Participant

Wendy B. Trowbridge
Wildlife Fisheries and Conservation Biology, University of California, Davis, CA 95616 Phone: (530) 758-7432, email: wbtrowbridge@ucdavis.edu

Collaborators:

Richard Reiner, Cosumnes River Preserve, The Nature Conservancy, 13501 Franklin Blvd., Galt, CA 95632

IV. Project Description

A. Project Description and Approach:

The field of floodplain management is at an important juncture. As we have realized the critical role that riparian habitats play in the landscape, we have attempted to relieve some of the stressors on these habitats through non structural floodplain management techniques, such as levee set backs, levee breaches, and restoration of channel meander dynamics. On the community level many of these projects seem successful, but we have yet to examine their long term impacts on a watershed scale. As more of these projects are planned it is vital to have the appropriate tools to assess which of these measures are likely to be the most effective.

The non structural flood control demonstration projects implemented on the Cosumnes River Preserve create an excellent opportunity for evaluation. The recent floods have tested both their effectiveness in flood contol and their role in ecosystem restoration. Periodic floods play a major role in riparian systems by creating and destroying patches of habitat. Dams and levees have drastically altered channel migration by reducing flood frequency, and size, and by restricting flow. Since the Cosumnes is the only major river in California without a substantial dam it represents an unparalleled opportunity to demonstrate the impacts of levees on riparian vegetation structure.

The proposed demonstration project will lead to the creation of a vegetation model that will predict the impacts of future changes in the levee infrastructure. The purpose of this study is to link the biological responses to an existing physical model to develop a predictive vegetation model. The specific objectives are to: 1) demonstrate the impacts of structural and non structural floodcontrol measures on vegetation establishment, 2) model the dynamic process of vegetation establishment and dynamics under various floodcontrol alternatives, 3) integrate the vegetation model with a meander model created by Dr. Eric Larsen (Larsen, 1995) to create a model that will predict the effects of future levee modifications, and 4) identify lands within the watershed which would benefit from non structural floodplain management. To accomplish this we will use historic aerial photographs and field data to reconstruct the relationship between flooding, vegetation establishment, and channel/floodplain dynamics. We will then evaluate the impacts of recent levee breaches and set backs. Equipped with this vegetation model based on historical data, we can make predictions about vegetation regeneration based on proposed modification to the existing levee system.

This project is part of the Cosumnes Consortium, a partnership created by University of California, Davis, in association with the seven agency and non-profit partners of the Cosumnes River Preserve (description attached). The mission of this consortium is to evaluate and monitor ecosystem conservation and restoration efforts and support the information needs of adaptive management in the Cosumnes River watershed. The first phase of the partnership involves the development of a linked surface water-groundwater model for the entire Cosumnes River watershed. This phase, which builds upon research conducted by The Nature

Conservancy and the US Geological Survey, has been funded by a US Fish and Wildlife Service Anadromous Fisheries Restoration Program grant for $300k and is scheduled to begin July 1, 1998, with model completion expected by June 2000. The second phase involves the coordination of agency, foundation, and university research and monitoring activities, evaluation of current restoration efforts, design and implementation of long-term environmental and ecological monitoring and modeling programs, and development of outreach and decision-support programs for stakeholders and agencies currently active within the watershed. Initial funding of $500k has been sought from the Packard Foundation to support a portion of this effort for a period of two years. The remainder of the funding is being sought through a series of smaller proposals to CALFED and other organizations.

B. Proposed Scope of Work:

The proposed project has been subdivided into 5 co-dependent tasks. The project is supported by a river meander model created by Dr. Eric Larsen (Larsen, 1995) which combines a model for the velocity of flow field (Johannesson and Parker,1989) and bank erosion (Ikeda et al., 1981). Data from a linked surface water-groundwater model currently being constructed by Professors Graham Fogg and Levent Kavvas with USFWS AFRP funding will also be used.

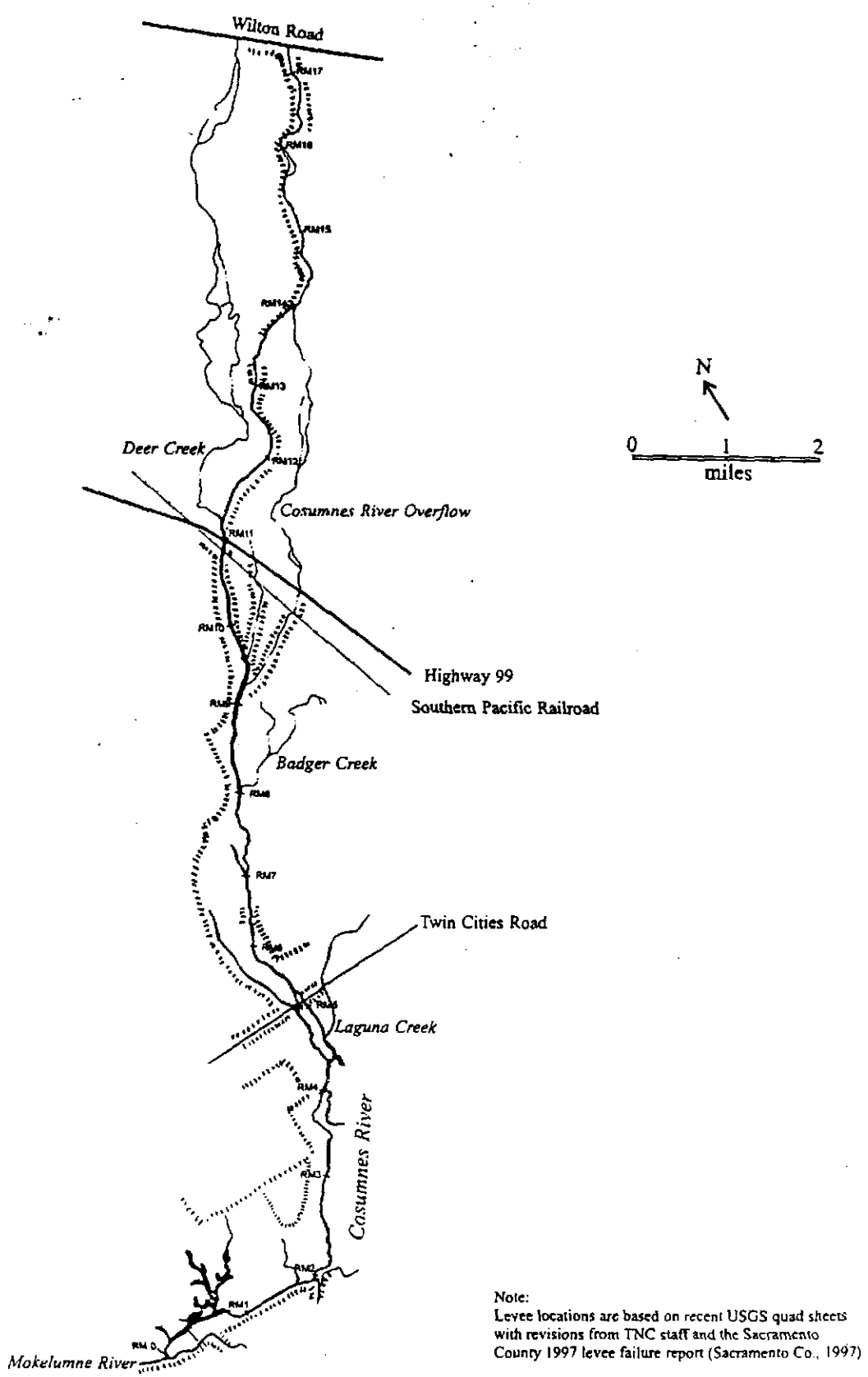
Task 1: Acquisition, interpretation, and digitizing of historic aerial photographs:

In 1937 the only levee visible from aerial photographs extended two miles south of highway 99 (Fig. 1). Now the river is completely confined between a levee on the west and a high bluff on the east. Fourteen complete series of photographs from this time period are available. The photographs that include the study site, the eleven river miles of the lower Cosumnes from the Mc Connel gaging station at highway 99 to the confluence with the Mokelumne River, will be purchased. These photographs will be digitized to create GIS coverages in ARC/INFO. To the extent that it is possible patches of even aged stands of pioneer tree species will be delineated. The coverages will then be overlayed to determine the rate of patch transition in areas of different levee configuration and to improve patch delineation.

Task 2: Correlating tree establishment with historic hydrologic data:

Field data will be collected at sites throughout the Cosumnes River Preserve to ground truth the GIS coverages from task 1. These sites will be permanently marked to allow long term monitoring. At each site tree ring analysis will be used to determine the age of trees and even aged patches of pioneer tree species will be delineated. Both pioneer species, cottonwood and willow, and climax species, valley oaks, will be measured and a rate of succession will be calculated. The hydrologic conditions in the year of patch establishment will allow us to correlate the spatial and temporal variation in the historic establishment of woody vegetation in the study reach to hydrologic conditions.

Figure 1 : Map of the Study Area



Adapted from Philip Williams & Associates, 1997

Task 3: Create, calibrate, and validate vegetation model:

The vegetation data from the aerial photographs and from the field data will be coded by age class and vegetation type. The rate of creation and extinction of patches from the aerial photographs will then be calibrated to the rate determined by field work in task 2. This calibrated data will be used to create a matrix based transition model of patch creation, extinction, and succession.

Task 4: Integrate vegetation model with meander model:

An integrated model will be developed to forecast several possible scenarios for channel migration and flooding regime over the next century. Alternative trajectories, including levee breach and various levee set back alternatives, will be explored using a meander model in conjunction with the vegetation model. Lands within the watershed which would benefit from levee set backs or breaches will be identified.

Task 5: Summarize findings :

The project results will be summarized and incorporated into Cosumnes Consortium's GIS to make them available to community based groups and other researchers and present results to CALFED.

C. Location and Geographic Boundaries of the Project:

The study area is located in southern Sacramento county on the lower Cosumnes River. The Cosumnes watershed heads at 7,500 ft. in mixed conifer forests of the Sierra Nevada, in El Dorado and Amador Counties, and terminates at 5 ft. in tidal fresh water marshes where it joins the Mokelumne River as it flows into east side of the Bay- Delta estuary (Fig. 1). The emphasis of this project will be on the lower eleven river miles of the Cosumnes where suitable fall-run Chinook salmon habitat has been noted and where The Nature Conservancy has implemented non structural floodcontrol measures.

D. Expected Benefits:

The primary expected benefits of this project are: 1) an improved ability to predict the effects of both structural and non structural flood control measures on riparian vegetation and 2) an improved ability to restore riparian vegetation. This will enhance the ability of managers like the Nature Conservancy, USFWS, and Army Core of Engineers (ACOE) to restore the regeneration potential within the riparian zone. Such improved restoration projects would create such secondary ecological benefits as: increased food supplies for fish and wildlife, creation of shaded riverine aquatic (SRA) habitat, moderation of water temperatures, increased channel complexity, and improved cover, forage, and nesting habitat for migratory birds. The tools that this model provides would allow managers to restore

ecosystem function and create the diverse mosaic of habitats that vital to the continued survival of CALFED targeted species.

This project will also benefit non-ecosystem CALFED objectives such as water quality and water supply reliability. Healthy riparian forests act as a filter during flood events, trapping sediments and debris. Forested floodplains also store water during floods attenuating the flood peaks and spreading the discharge out over a longer period of time. Water supply reliability is a particularly important issue on the Cosumnes River because recently the length of time during the fall that key reaches have remained completely dry has increased, limiting access of fall run Chinook salmon to spawning gravels.

E. Background and Ecological/Biological/Technical Justification:

Within the Sacramento/San Joaquin River basin, the Cosumnes River constitutes one of the finest natural laboratories for the study of watershed-scale physical and biological systems. Forming a natural, uninterrupted link between the Sierra Nevada and the Bay-Delta Estuary, this river has been the centerpiece of an ambitious public/private restoration and conservation effort. At 1,265 sq. miles, the drainage area of the Cosumnes River is relatively small, making it appropriate and accessible for detailed study. With limited urbanization, and no significant dams, the Cosumnes hydrologic system remains largely intact, affording a unique opportunity for monitoring and evaluation of the impacts of land use change on ecosystem and watershed function. For the past decade, The Nature Conservancy has been acquiring and managing land within the Cosumnes River watershed. The initial efforts of the Conservancy concentrated on the lower floodplain reaches of the river where extensive tracts of riparian woodland remain. These land acquisitions have culminated in the Cosumnes River Preserve, which has become the focus of national and international attention, and has encouraged the financial participation of a range of state, federal, and private partners, including the U.S. Bureau of Land Management , U.S. Geological Survey, U.S. Army Corps of Engineers, California Department of Fish and Game, Wildlife Conservation Board, Sacramento County, Ducks Unlimited, and California Department of Water Resources.

Recognizing that ecosystem health is tied to hydrologic and ecological processes throughout the watershed, the Conservancy has expanded its goals for the Cosumnes River. The Conservancy's innovative 1992 Cosumnes River Watershed Project is committed to restoring or maintaining a functioning ecosystem on a watershed scale, rather than on a patchwork, local scale. Natural rivers are a mosaic of different habitats. As the river moves during the wet season it destroys some habitat and creates new habitat for pioneer species to colonize. This is a dynamic process, but on a landscape scale it reaches an equilibrium mosaic of pioneer and climax species. This diversity of habitat types is crucial for the fish and wildlife that depend on riparian ecosystems (Auble et al., 1994).

As we have built levees throughout California we have altered this dynamic equilibrium. Levees along the lower Cosumnes have changed it from a broad meandering river channel to a narrow constricted channel. This constriction has

had profound impacts on both the aquatic an terrestrial ecology of the riparian corridor, Since the same volume of water is forced through a smaller area the flow velocity increases. This increase in velocity creates smooth conditions within the channel and washes refuges and food for aquatic organisms downstream.

Channel constrictions and the resulting increase in scour impact the terrestrial riparian communities in two primary ways. First , levees sever the connection between the river and much of its historical floodplain. This decreases groundwater recharge and further increases peak flows. Second, because the new channel created by levees is relatively immobile the only positions safe from frequent flood scouring are high on the bank. As a result only the largest flows are capable of scouring or depositing the bare moist soils necessary for pioneer tree species such as cottonwoods (*Populus fremontii*) and willows (*salix spp.*) to establish (Van Splunder et al., 1995). In meandering systems the channel moves in small increments as a result of relatively frequent medium sized flows. In the new constricted system, however, it takes much larger less frequent flows to regenerate new trees and wash large woody debris into the channel (Scott et al., 1997). These impacts have combined to push species such as the Chinook salmon, western yellow-billed cuckoo, and valley elderberry longhorn beetle toward extinction throughout the Sacramento / San Joaquin River watershed.

Non structural flood control techniques relieve these stressors in two primary ways: levee breaches and levee set backs. Levee breaches involve creating a break in the levee and allowing water to flow through during floods. As the flood waters flow through the open field outside the levee the flow velocity falls and the sediments are dropped creating excellent conditions for the establishment of an even aged stand of riparian trees. Levee set backs allow the river to regain some of its meandering characteristics. Set backs do not create the large stands created by breaches, but over time the river continues to create suitable sites for establishment.

Such non structural floodcontrol measures form the basis of a more process based approach to riparian restoration. In the past restoration projects have often been structurally based, focusing on site specific mitigation activities directed and a single species (Sparks 1995). These projects have not adequately considered the underlying watershed processes that create the larger landscape mosaic of diverse habitats that the fish and wildlife depend on. As a result these structurally based projects have not been successful in restoring ecosystem function (Kondolf and Micheli, 1995 and Stanford et al., 1996). To the extent that levee set backs and breaches allow the restoration of natural physical processes they represent a more permanent solution to the current decline in the health of riparian ecosystems. The goal of this demonstration project is to evaluate whether these non structural methods restore these physical processes.

The project objectives are consistent with the following ERPP objectives (Vol. 1):

- restore hydraulic conditions (page 27)
- maintain, improve, and restore natural stream meander processes (page 37)
- modify channel and basin configuration to improve floodplain function (page 45)

- maintain, improve and restore nutrients (page 63)
- restore riparian habitat along rivers (page 110)
- maintain, improve, and restore water temperature regimes (page 149)
- reduce concentration and loading of contaminants in the aquatic environment (page 154)
- assist in the recovery of or restore the distribution of the following species - Chinook salmon (page 160), Valley elderberry longhorn beetle (page 268), western yellow-billed cuckoo (page 165), bank swallow (page 166), Swainson's hawk (page 232), other neotropical migratory birds (page 264)
- increase the connection of upstream spawning habitat and rearing habitat with mainstem rivers (page 280)
- reestablish or reactivate geomorphological processes in artificially confined channel reaches (page 284)
- reduce the effect of invasive riparian plants (page 311)

F. Monitoring and Data Evaluation:

The funding currently requested is intended to develop a spatially explicit vegetation model. The field data collected for this model will form the baseline for a long term monitoring and evaluation of the impacts of changes in floodcontrol or land use on riparian forest in the Cosumnes watershed. The Cosumnes Consortium was established to create a long term monitoring program in basin. Separate funding will be requested for implementation of a long term monitoring program.

The results of this work will be published in refereed scientific journals and in reports to CALFED. In addition, the Muir Institute, in association with the UC Davis Information Center for the Environment, will prepare a summary of results for distribution on the web. These results will be intended to guide regional and local decision making throughout the Sacramento/San Joaquin watershed.

G. Implementability:

The development of the model will be closely coordinated with other similar projects in the Cosumnes River watershed and on the mainstem of the Sacramento River. The field sampling sites will take place on the Cosumnes River Preserve or with the written permission of landowners, as necessary. This will allow permanent marking of sample plots to allow resampling in context of monitoring No threatened or endangered species will be collected or harmed.

V. Cost and Schedule to Implement Proposed Project

A. Budget Costs

Project Phase & Task	Direct Labor Months	Direct Salary and Benefits (benefits @ 1.4%)	Overhead (46% of all direct costs)	Student Fee Remission	Material and Acquisition Contracts	Misc. & Other Direct Costs	Total Cost
Task 1: Acquire, and analyze aerial photos Year 1	7 months @ 50%	$ 8,989	$ 8,735	$ 4,375	Photo Printing: $10,000		$32,099
Task 2: Field work Year 1	3 months @ 50% 3 months @ 100%	$11,558	$ 7,387		Sampling Materials: $ 2,000	Travel: $2,500	$23,445
Task 3: Model validation Year 2	3 months @ 100% 1 month @ 50%	$ 8,989	$ 5,837	$ 4,375	Film, Developing: $ 1,200	Travel: $2,500	$22,901
Task 4: Integrate Models Year 2	5 months @ 50%	$ 6,418	$ 2,952				$ 9,370
Task 5: Summarize Findings Year 2	2 months @ 50%	$ 2,567	$ 1,411		Report Repro: $ 500		$ 4,478
TOTAL	2 years	$38,521	$26,322	$ 8,750	$13,700	$ 5,000	$92,293

The UC Davis Center for Integrated Watershed Science and Management will supply office space, computers, system support, site licenses, and administrative support. In addition, the University will support the salary of the project director during the academic year.

B. Schedule Milestones:

Task 1: Acquire, interpret, digitize, and analyze historic aerial photographs (January 1999 - July 1999).

Task 2: Field work, correlating establishment of trees and hydrologic data (July 1999 - January 2000).

Task 3: Calibrate, apply and validate vegetation model (May 2000 - August 2000).

Task 4: Create vegetation model and integrate it with the meander models (February - April, September, and October 2000).

Task 5: Summarize findings in reports (November and December 2000).

C. Third Party Impacts

No negative third party impacts are anticipated with this proposed project. The model and demonstration tools will be utilized by a broad range of stakeholders and agencies, including CALFED, in analysis of alternative non structural flood management options.

VI. Applicant Qualifications

Mark W. Schwartz, Center for Population Biology, UC Davis. Mark Schwartz received B.A.'s in Biology and Chemistry from the University of St. Thomas in St. Paul, MN in 1980, received and M.S. in Ecology from the University of Minnesota in 1985 and a Ph.D. in Biology from Florida State University in 1990. From 1990 to 1994 he was a research scientist at the Illinois Natural History Survey and has been an assistant research scientist at UC Davis since 1994. During this time Dr. Schwartz has conducted research on the effects of disturbance and global change on forest and grassland vegetation in Florida, Illinois, and more recently, California. In particular, he has developed experience in forest dynamic models through a demographic monitoring study of a streamside forest in northern Florida, now in its 12th year. Much of this research on vegetation dynamics has focused on the role of fire as an agent of disturbance in altering vegetation dynamic processes.

During his 8 years as a research faculty member Dr. Schwartz has supervised two postdoctoral associates and 9 graduate students. He has also successfully managed over 15 grants from both state and federal granting agencies, including National Science Foundation, USDA Forest Service, US Fish and Wildlife Service and The Nature Conservancy. He is currently the principle investigator on a National Science Foundation grant. Also during this 8 year period, Dr. Schwartz has edited a book on conservation in fragmented landscapes, is the co-author of a textbook on Plant Ecology, and has published 28 refereed articles and 26 non-refereed technical reports, book reviews and proceedings contributions.

Professor Jeffrey F. Mount, Department of Geology, UC Davis. Jeffrey Mount received a BA in Geology from the University of California, Santa Barbara in 1976, an MS in Earth Science from UC Santa Cruz in 1978 and a Ph.D. in Earth Science from UC Santa Cruz in 1980. From 1980 to the present he has been a professor in the Department of Geology at UC Davis. During this time he has conducted research on

stratigraphy and sedimentation, with an emphasis on process sedimentology of marine and non marine depositional systems. His current research interests include: analysis of the hydrgeomorphic evolution of rivers in response to changing land use conditions, geochemical and petrologic identification of anthropogenic sediment sources with the Sacramento River watershed, and mechanics of geomorphic recovery from riverine systems affected by catastrophic sedimentation events.

During his 17 years at UC Davis he has supervised more than 15 graduate students and successfully managed nine large Nation Science Foundation grants and several American Chemical Society grants. He is currently the Principal Investigator or Co-Principle Investigator on three federally funded, multidisciplinary grants that focus on watershed issues in the state of California. During the past five years he has been actively involved in science education and research on this state's rivers, culminating in the recent publication of his book titled "California Rivers and Streams: The Conflict Between Fluvial Process and Land Use" (Mount, 1995). He served as a member of several multiagency task forces focusing on floodplain management within the state, is currently Chair of the Department of Geology at UC Davis, and is the lead organizer of the UC Davis Center for Integrated Watershed Science and Management.

Dr. Schwartz and Dr. Mount will coordinate and track the project. The field work and model development will be carried out by Wendy Trowbridge, a graduate student at UC Davis with experience working for both the University and The Nature Conservancy on riparian restoration projects in the Central Valley. Richard Reiner of the Nature Conservancy will provide program support.

References:

Auble, G.T., J.M. Friedman and M.L. Scott (1994) Relating riparian vegetation to present and future streamflows. Ecological Applications 4:544-554.

Johannesson, H. and Parker, G. (1989) Linear Theory of River Meanders: Ikeda, S. and Parker, G V. 1, (7):p. 181-213. River Meandering, American Geophysical Union, Water Resources Monograph 12: Washington DC.

Kondolf, G.M. and E.R. Micheli (1995) Evaluating Stream Restoration Projects, Environmental Management 19(1) 1-15.

Larsen, E.W. (1995) The mechanics and modeling of river meander migration: Ph.D Dissertation, University of California at Berkeley.

Mount, J.F. (1995) California Rivers and Streams: The Conflict Between Fluvial Process and Land Use. University of California Press, Berkeley, pg. 304-309.

Philip Williams and Associates, (1997) Analysis of Opportunities for restoring a natural flood regime on the Cosumnes River floodplain, Philip Williams and Associates, Sacramento.

Scott, M.L., G.T Auble, and J.M. Friedman (1997) Flood Dependency of cottonwood establishment along the Missouri River, Montana, USA, Ecol. App. 7(2) 677-690.

Sparks R.E. (1995) Need for ecosystem management of large rivers and their floodplains, BioScience 45(3) 168-182.

Stanford, J.A., J.V. Ward, W.J. Liss, C.A. Frissell, R.N. Williams, J.A. Lichatowich, and C.C. Coutant (1996) A general protocol for restoration of regulated rivers. Regulated Rivers. 12, 391-413.

Van Splunder, I., H. Coops, L.A.C.J. Voesenek and C.W.P.M. Blom (1995) Establishment of alluvial forest species in floodplains: the role of dispersal timing, germination characteristics and water level fluctuations. Acta Bot. Neerl. 44(3) 269-278.

Appendix I

Executive Summary
The Cosumnes Consortium
Submitted to:
The David and Lucille Packard Foundation Conservation Program

The University of California, Davis, in association with the 7 agency and non-profit partners of the Cosumnes River Preserve, proposes to establish the Cosumnes Consortium: a coordinated university/agency/foundation partnership dedicated to evaluation and monitoring of ecosystem conservation and restoration efforts, and supporting the information needs of adaptive management in the Cosumnes River watershed. The partnership will focus on achieving five mutually supportive goals:

1) Provide technical analysis and decision-support for land and water rights acquisitions under consideration by the Cosumnes River Preserve partners, with an initial emphasis on the lower floodplain reaches of the Cosumnes and Mokelumne Rivers.
2) Develop and implement baseline studies, monitoring strategies, and new analytic methods that allow the partnership to provide long-term (10-20 year) evaluation of the success of this large conservation and restoration effort. Emphasis would be placed on monitoring that charts the progress of restoration projects as well as providing decision-support for adaptive management.
3) Communicate the results of this work, including new methods and findings, to a wide range of decisionmakers and stakeholders in the Sacramento/San Joaquin basin with the intent to improve and guide the management and understanding of linked watershed-scale ecosystem function.
4) Establish infrastructure, baseline data, and monitoring resources within the Cosumnes watershed that will attract researchers and agencies wishing to conduct fundamental and applied watershed research and education.
5) Educate and train the next generation of watershed scientists and planners by closely involving university students in all phases of this partnership.

The first phase of this project involves development of a linked surface water-groundwater model for the entire Cosumnes River watershed. This phase, which builds upon research conducted by The Nature Conservancy and the US Geological Survey, has been funded by a US Fish and Wildlife Service Anadromous Fisheries Restoration Program grant for $300k and is scheduled to being July 1, 1998, with model completion expected by June, 2000.The second phase involves the coordination of agency, foundation, and university research and monitoring activities, evaluation of current restoration efforts, design and implementation of long-term environmental and ecologic monitoring and modeling programs, and development of outreach and decision-support programs for stakeholders and agencies currently active within the watershed. Initial funding of $500k is sought from the Packard Foundation to support a portion of this effort for a period of two years. This support is intended to encourage additional financial participation of private and public agencies with long-term restoration interests in the Cosumnes watershed and the Sacramento/San Joaquin basin. Annual reports, bi-annual meetings, and final reports will focus on evaluations of, and recommendations for, long-term restoration strategies and monitoring within the Cosumnes watershed.

This project will be administered through the UC Davis Center for Integrated Watershed Science and Management. The University will provide in-kind services to support this research, including office space, faculty salaries, equipment, and system support.

ITEM 3

Agreement No. _____

Exhibit _____

STANDARD CLAUSES -
INTERAGENCY AGREEMENTS

Audit Clause. For contracts in excess of $10,000, the contracting parties shall be subject to the examination and audit of the State Auditor for a period of three years after final payment under the contract. (Government Code Section 8546.7).

Availability of Funds. Work to be performed under this contract is subject to availability of Category III funds through the State's normal budget process.

Interagency Payment Clause. For services provided under this agreement, charges will be computed in accordance with State Administrative Manual Section 8752.

Termination Clause. Either State agency may terminate this contract upon 30 days advance written notice. The State agency providing the services shall be reimbursed for all reasonable expenses incurred up to the date of termination.

Attachment E

U.S. Department of the Interior

Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying

Persons signing this form should refer to the regulations referenced below for complete instructions:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions - **The prospective primary participant further agrees by submitting this proposal that it will include the clause titled, "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.** See below for language to be used or use this form for certification and sign. (See Appendix A of Subpart D of 43 CFR Part 12.)

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions - (See Appendix B of Subpart D of 43 CFR Part 12.)

Certification Regarding Drug-Free Workplace Requirements - Alternate I. (Grantees Other Than Individuals) and Alternate II. (Grantees Who are Individuals) - (See Appendix C of Subpart D of 43 CFR Part 12)

Signature on this form provides for compliance with certification requirements under 43 CFR Parts 12 and 18. The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of the Interior determines to award the covered transaction, grant, cooperative agreement or loan.

PART A: Certification Regarding Debarment, Suspension, and Other Responsibility Matters - Primary Covered Transactions

---

CHECK__IF THIS CERTIFICATION IS FOR A PRIMARY COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

PART B: Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

---

CHECK__IF THIS CERTIFICATION IS FOR A LOWER TIER COVERED TRANSACTION AND IS APPLICABLE.

(1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

DI-2010
June 1996
(This form replaces DI-1953, DI-1954, DI-1956, DI-1958 and DI-1963)

PART E: Certification Regarding Lobbying
Certification for Contracts, Grants, Loans, and Cooperative Agreements

CHECK__IF CERTIFICATION IS FOR THE AWARD OF ANY OF THE FOLLOWING AND THE AMOUNT EXCEEDS $100,000: A FEDERAL GRANT OR COOPERATIVE AGREEMENT; SUBCONTRACT, OR SUBGRANT UNDER THE GRANT OR COOPERATIVE AGREEMENT.

CHECK__IF CERTIFICATION IS FOR THE AWARD OF A FEDERAL LOAN EXCEEDING THE AMOUNT OF $150,000, OR A SUBGRANT OR SUBCONTRACT EXCEEDING $100,000, UNDER THE LOAN.

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

As the authorized certifying official, I hereby certify that the above specified certifications are true.

_____

_____

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL

_____

TYPED NAME AND TITLE

DATE

DI-2010
June 1995
(This form replaces DI-1963, DI-1964, DI-1965, DI-1966 and DI-1963)