

C1042

**Department of Biological Sciences
California State University
Hayward, California 94542 (510) 881-3471 FAX (510) 888-4747**

7/1/98

CALFED Bay/Delta Program Office
1416 Ninth St. Suite 1155
Sacramento CA 95814

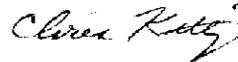
Dear Colleagues,

Thank you again for your assistance with Delta restoration. Here are the 10 official, university etc.-approved copies of our new proposal: *(attached)*
Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay Ecological Zone: an Ecosystem Approach to Improve Effectiveness of Bay/Delta Restoration.
-by CSUH, Contra Costa Mosquito and Vector Control, and US F&W Service San Pablo Bay National Wildlife Refuge.

We prepared the package according to your recent, instructive RFP and associated meeting. Thank you for making all this possible. Feel free to contact me for any further information that may be helpful to you.

Best wishes for the review process.

sincerely,



Christopher L. Kitting, Ph.D.
Professor

Attachment H

COVER SHEET (PAGE 1 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay Ecological
Proposal Title: Zone: An Ecosystem Approach to Improve Effectiveness of Bay/Delta Restoration.

Applicant Name: (C. Kitting et al.) California State Univ. Hayward (w/ CC County and USE&WS)

Mailing Address: Carlos Bee Blvd. Hayward CA 94542

Telephone: (510) 885-3001

Fax: (510) 885-4747

Amount of funding requested: \$ _____ for 3 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
- Floodplain and Habitat Restoration
- Fish Harvest
- Watershed Planning/Implementation
- Fish Screen Evaluations - Alternatives and Biological Priorities
- Fish Passage Improvements
- Gravel Restoration
- Species Life History Studies
- Education

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

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

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

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

COVER SHEET (PAGE 2 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

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

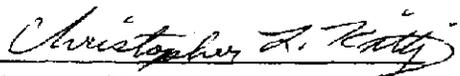
- | | |
|--|---|
| <input type="checkbox"/> State agency | <input type="checkbox"/> Federal agency |
| <input type="checkbox"/> Public/Non-profit joint venture | <input type="checkbox"/> Non-profit |
| <input type="checkbox"/> Local government/district | <input type="checkbox"/> Private party |
| <input type="checkbox"/> University | <input checked="" type="checkbox"/> Other: <u>State University with County and USF&WS</u> |

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

- | | |
|-------------------------------------|--|
| <input type="checkbox"/> Planning | <input checked="" type="checkbox"/> Implementation |
| <input type="checkbox"/> Monitoring | <input type="checkbox"/> Education |
| <input type="checkbox"/> 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.


(Signature of Applicant)

CALFED PROPOSAL- CATEGORY 3 FUNDING: HABITAT RESTORATION

Section II: Executive Summary

a. Title: Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay Ecological Zone: an Ecosystem Approach to Improve Effectiveness of Bay/Delta Restoration

Applicant Names: Drs. Rees, Kitting, McGinnis, Environmental Research Center and Dept. of Biological Sciences, Cal State Univ. Hayward; and Mr. Karl Malamud-Roam, Contra Costa Mosquito and Vector Control, in collaboration with Dr. Joy Andrews, Chemistry, CSUH, and Ms. Louise Vicencio, USFWS San Pablo Bay National Wildlife Refuge.

b. Project Description and Primary Biological/Ecological Objectives: Our proposed project will biologically restore, maintain, and monitor at least three major eastern San Pablo Bay and southern Suisun Bay restorations within a single CALFED-defined ecological zone (Suisun Bay/North San Francisco Bay), and compare and improve these restorations through an integrated monitoring program. Using areas recently acquired and designated for restoration (Tubbs Island Setback, between Novato and Vallejo, and Shell Marsh, near Martinez), our primary biological objectives are to restore emergent and immersed marshland, monitor the restored ecosystems, and seek to improve restoration success. Emphasis will be placed on the provision and maintenance of suitable habitats for priority fish species. Our proposed program will enable completion of the planned provision of water circulation at each of these sites, as required monitoring has not been previously funded. The Mare Island Site is adjacent to a recent CALFED Restoration (on Tolay Creek), which also requires monitoring. Taken together, our project areas form fragments of marshlands with a range of salinities (including freshwater), which formerly rimmed North San Francisco Suisun Bays. This Suisun Bay/North San Francisco Bay ecological zone shares most of the characteristics of the Sacramento/San Joaquin Delta ecological zone: emergent and submerged marsh flora and fauna, slough meanders, endangered anadromous fish, and other native and introduced aquatic species. In proximity to our proposed sites we have found fish species of primary concern in CALFED's restoration goals: chinook salmon (all runs), steelhead, delta smelt, green and white sturgeon, splittail, and others.

c. Approach/Tasks/Schedule. Our 3-year proposed project includes: Small-scale, followed by larger-scale biological restoration, including transplantings of native vegetation and animals in our Suisun Bay sites (Tasks 1&2: years 1-2, eventually as a Demonstration Marsh), and integrated, non-destructive physical-chemical-biological monitoring of replicate stations throughout each restoration (and adjacent older marshes) to evaluate and improve restoration success (Tasks 3&4: yrs. 1-3). The combined tasks will enable adaptive management and ecological maintenance of these marshes. Marshes will be restored in association with the USFWS (San Pablo Bay Wildlife Refuge), and with Contra Costa Mosquito and Vector Control (in Suisun Bay), and coordinated with the Delta Science Center, including the East Bay Regional Park District. Our proposed monthly monitoring will include the following parameters at replicate sites within each restoration: sedimentation rates, analysis of heavy metals* (*encouraged or required by SPBNWR), emergent vegetation, submerged vegetation (including seagrasses), fish migration and colonization (including CALFED priority species), planktonic foods and fish larvae, birds (including *clapper rail), *salt marsh harvest mouse, and sediment invertebrates. We also will monitor temperature, salinity, turbidity, and water flow rates. Abundances of fish populations in our restored areas will be compared with nearby offshore sites sampled monthly for fish species by Cal Fish and Game and the USFWS. Our monitoring program will provide a measure of both specific and overall successes of restoration efforts in the Suisun Bay/North SF Bay over the proposed monitoring period, and will indicate useful improvements for future restorations and monitoring within other CALFED designated ecological zones.

d. Justification for Project. Our proposed project addresses CALFED's mission and specific RFP concerns for habitat restoration: (a) improvement of aquatic habitats and ecological functions in the Bay/Delta, reduction of risk to land use (through flood control), (b) restoration of priority habitats (tidal perennial freshwater habitat, saltwater tidal habitat, instream aquatic habitat, shaded riverine aquatic habitat), and priority species: all migratory runs of local salmon, delta smelt, splittail, migratory birds, and resident endangered bird species.

e. Budget Costs and Third Party Impacts. Total project budget request is \$772,667 for 3 years. It covers personnel (for four agencies), expenses, and reduced indirect costs. Matching funds are provided by CSUH and in-kind matching from SPBNWR. Land and physical restorations are being provided by SPBNWR and CCMVCD. Due to the nature of our proposed work (biological restoration and monitoring of previously acquired, designated land) we anticipate no third party negative impacts.

f. Applicant Qualifications (1) *Chris Kitting, Ph.D.*, Professor, Biological Sciences at CSUH; 24 years of experience in aquatic ecology; received a recent US EPA Excellence award for storm water marsh program in Alameda County; received a local Environmental Achievement nomination for his Delta education program; has made related conference presentations internationally; has published over 25 related works in major journals (2) *John T. Rees, Ph.D.*, Adjunct Professor, Biol Sciences at CSUH; heads CSUH's Environmental Research Center at Alameda Point; 20 years experience in the environmental field, including 10 years field and research experience in California freshwater habitats; has published over 30 peer-reviewed journal articles and other significant contributions on fresh, estuarine, and marine ecology, pollution control, and introduction of exotic aquatic species. (3) *Sam McGinnis, Ph.D.*, Professor, Biol. Sciences at CSUH; has published over three dozen papers, book chapters, and books dealing with the ecology of California wildlife, recently emphasizing endangered and threatened plants and animals; researched and wrote the Plant and Animal Resources section of the Contra Costa County General Plan Conservation Element in 1988; has conducted field studies and written reports for the biological sections of environmental impact reports for over 100 projects since 1979, including 25 in Contra Costa County. (4) *Karl Malamud-Roam, M.A.*, has been the marsh restoration specialist for CCMVC for 6 yr, has completed several successful restorations already, is a doctoral candidate at UC Berkeley, conducting his dissertation on hydrology/ecology at these sites, and already has authored a book chapter and four articles on this area.

g. Monitoring and Data Evaluation. Monitoring will be an essential and integral part of the proposed marsh restorations. Analysis of species colonization, migration and other environmental parameters will take place throughout (and beyond) the 3-year project. Our program will follow the scientific protocol of similar successful biological restoration work carried out elsewhere (e.g., Zedler's PERL handbook). We would submit quarterly reports throughout the project, and final reports after the completion of each year's restoration and monitoring. Results of our work will be prepared and presented to local and national conferences and agencies, where our oral presentations will provide immediate feedback from colleagues. We plan to publish our work in academic and applied journals.

h. Local Support/Coordination with other Programs/Compatibility with CALFED objectives. The USFWS is providing sites in the North Bay, Contra Costa Mosquito and Vector Control District is providing sites in Suisun Bay, with Shell Marsh Advisors. We are also coordinating our program with Ducks Unlimited (North Bay), and the Delta Science Center and its affiliated agencies, such as Fast Bay Regional Parks. We plan to share information with the USFWS and Cal Fish and Game (fish monitoring in outer North Bay and Suisun Bay, out of the Stockton office), Shell Marsh Management Advisory Committee, San Francisco Estuary Institute, and other programs. Activities of all these programs/agencies/organizations are compatible with CALFED objectives.

Section III: Title Page

a. Title of Project: Biological Restoration and Monitoring in the Suisun Marsh/North San Francisco Bay Ecological Zone: an Ecosystem Approach to Improve Effectiveness of Bay/Delta Restoration

b. Names of applicants:

Christopher L. Kitting, Department of Biological Sciences (ckitting@csu Hayward.edu)

John T. Rees, Department of Biological Sciences (johntrees@aol.com)

Samuel M. McGinnis, Department of Biological Sciences (70730.1051@compuserve.com)

California State University Hayward

Hayward CA 94542

(510) 885-3471

FAX (510) 885-4747

Affiliation: California State University, Hayward (CSUH)

Karl Malamud-Roam, Contra Costa Mosquito and Vector Control (kmalamudroam@value.net).

155 Mason Circle, Concord CA 94520. Phone: (925) 685-9301 x107; FAX (925) 685-0266.

Affiliation: Contra Costa Mosquito and Vector Control (CCMVC)

in collaboration with Joy C. Andrews, Department of Chemistry, CSUH (andrews@csu Hayward.edu), and Louise Vicencio US Fish and Wildlife Service (louise_vicencio@fws.gov)

US Fish and Wildlife Service, San Pablo Bay Wildlife Refuge, PO Box 2012, 1404 Mesa Rd. Mare Island, CA 94592 Phone: (707) 562-3000; FAX (707) 562-3001

Affiliation: US Fish and Wildlife Service (USFWS)

c. Type of organization: CSUH: State agency/university (tax status: state agency); CCMVC (tax status: County Agency); US Fish and Wildlife Service: Federal agency (tax status: federal agency)

d. Tax identification number: (CSUH Foundation's Federal Tax ID # is 94-1524922)

e. Participants/Collaborators in Implementation. The US Fish and Wildlife Service and Ducks Unlimited are collaborating with us on the Northeast San Pablo Bay restoration and monitoring site. The Delta Science Center, along with its affiliated agencies, particularly East Bay Regional Parks and the Contra Costa Mosquito and Vector Control District are collaborating with us in the implementation of the Suisun Bay projects. The Shell Marsh Management Advisory Committee also is integral in this work. Contra Costa Mosquito and Vector Control District, which is undertaking extensive tidal restoration led by Karl Malamud-Roam, is providing access to the Shell Marsh areas, which will be restored to tidal action.

Section IV. Project Description

a. Project Description and Approach

Our proposed project will conduct biological restorations and monitoring in three areas of the Suisun Marsh/North San Francisco Bay Ecological Zone: North San Pablo Bay (Tubbs Island Setback and associated marshes, Figs. 1AB) and southern Suisun Bay (Shell Marsh areas in southern Suisun Bay; Figs. 2AB). Our biological restorations will retrieve native vegetation and animals during excavations of the area, then reestablish the native vegetation and animals along newly created shorelines, especially near Shell Marsh. These plants may then accumulate needed sediment and clear the water, as elevations are generally too deep in murky water initially for most vegetation. Establishing vegetation also is expected to increase colonization rates by fishes, their food resources, and other wildlife, eventually as a Demonstration Marsh. We also propose to monitor key biological and other environmental parameters at these sites over a period of three years, maintaining circulation and suitable animal habitats with the use of our sampling equipment, such as in sweeping sediments to and from suitable locations with our nets.

Project Description. (1) Tubbs Island Setback Restoration. The Tubbs Island Restoration and Maintenance plan consists of two parts. Marsh restoration will occur on Upper Tubbs Island and levee maintenance will occur on Lower Tubbs Island. The purpose of the Upper Tubbs Island Marsh Restoration Project is to restore 72 acres of tidal marsh habitat for the benefit of endangered and threatened species and for a variety of waterbirds, fish, and other estuarine organisms. The purpose of the maintenance project is to repair and maintain a two-mile levee enclosing a 248-acre muted tidal marsh. These adjacent projects are located approximately 3 miles south of the Highway 37/121 intersection within the San Pablo Bay National Wildlife Refuge in Sonoma County, California (Figs. 1AB). Sonoma Creek is to the north of both sites.

(2) Shell Marsh Areas, Suisun Bay includes approx. 200 acres being restored to tidal action, near Hwys 4 and 680 (Figs. 2AB). Pacheco Creek is at the east margin. Contra Costa Mosquito and Vector Control District is prepared to provide us with extensive shore areas newly restored to tidal action, near the previously constructed wetlands of the Mount View Sanitary District in Martinez. Prior to, during, and after physical restoration of these sites to tidal action, we propose to approach the monitoring of these sites in an integrated manner. Due to their location within the same CALFED ecological zone, these sites can be considered as parts of a larger ecological whole: estuarine emergent and submerged wetlands along San Pablo and Suisun Bays. This ecosystem is at the mouth of, and in many ways an extension of, the Delta wetlands ecosystem, and is host to all CALFED fish priority species, in both their juvenile and adult stages.

Project Approach. Biological restoration is the logical goal of habitat restoration, and as a science is in its infancy. The aim of habitat restoration is to restore appropriate habitat for species which have either become rare, endangered, or have disappeared entirely from a given habitat. Biological restoration can accelerate the process of habitat recolonization. In aquatic restorations, restored native plants provide habitat for native animal colonists, stabilize sediment, and may increase sedimentation rates and increase water clarity. The manner in which species of concern repopulate restored habitats varies from one restoration project to another. In previous restoration projects, such as Project Eden, alien species were intentionally removed and replaced with desired native species. In others, such as those encouraged by CALFED in the Bay/Delta, it is anticipated that native species and species of concern will repopulate restored wetlands areas. However, non-native species could prove to be the primary colonizers in Bay Delta restorations, and ultimately, the only colonizers, unless continued pro-active

restorative steps are taken. In disturbed terrestrial habitats, for example, recolonization and ultimate community dominance by less-desirable, so called "weed" species, is a well-documented phenomenon. Certain of these non-natives, such as crab species, can burrow into levees and weaken them, but removing such non-natives from this corridor between the Delta and Bay can retard their anticipated colonization of the Delta. In removing non-natives during our monitoring, we would use them in laboratory courses at the University.

Plant and animal succession in wetland and estuarine and aquatic habitats is less well understood than in terrestrial habitats. Succession in disparate parcels of restored wetlands in the Bay/Delta could proceed in entirely different ways, depending upon the interaction of a host of factors, including size of restoration, geographic location, previous use of restored area, amount of water circulation, invasive abilities of introduced species, and physical environmental parameters such as dissolved oxygen concentration, temperature, and presence or absence of toxic metals and other compounds. Restoration efforts in the Bay/Delta are also confounded by a lack of a reference point or site: the wetlands in the Bay/Delta have been altered to such a complete extent that few, if any, appropriate sites can be used as an unaltered reference. Only by integrating and drawing conclusions from a significant body of data can a meaningful model be established for improving success in Bay/Delta restoration efforts. Bay/Delta restoration efforts could be delayed unless the local ecosystem dynamics of restoration and recolonization are more completely understood and improved. The underlying hope of local habitat restoration is restoration of the native ecosystems which once rimmed the Bay/Delta. Only with monitoring and suitable maintenance of restored areas can successful marsh restoration and recolonization by valuable species be assured. Such a biologically restored marsh may then become useful as a Demonstration Marsh. This area as the mouth of the Delta may be particularly important to attracting and supporting migratory fishes. Yet if a restoration is not proceeding as desired, alternatives will need to be investigated and implemented. Through results of our restorations and resulting monitoring data, we could propose alternatives for more successful attempts in subsequent Bay Delta restorations. Only through comparing systematic monitoring results of similar restored sites, as we have proposed, can progress in restoration efforts be improved.

b. Proposed Scope of Work

Incremental Phases of the Project. Phase I. Marsh Restoration. The Tubbs Island Setback restoration will be ongoing over the next 3-6 months. Suisun Marsh restorations will proceed for the next 1-2 years. We will be actively involved in both sets of restorations, including consultation with the parent agencies, retrieving and transplanting of native emergent vegetation and animals (at Shell Marsh areas, eventually as a Demonstration Marsh), and monitoring and removing non-native invasives, as appropriate. Restoration success in one area of restoration may determine the pace of other restorations, particularly within Shell Marsh.

Phase II. Monitoring of Restored Marshes. We propose to approach the task of monitoring Bay/Delta restoration succession systematically and at the ecosystem level. Appropriate sampling stations within each of the restored sites will be established and monitored on a monthly basis. Analogous habitats of significance included within these sites, such as seasonal emergent wetlands, and submerged wetlands and saline emergent wetlands. The following habitat types will be monitored as appropriate: emergent vegetation, submergent vegetation, sub-tidal benthic, and open-water planktonic. The following groups of organisms and/or species of concern will be monitored: vegetation type, fish species: salmon (all migratory races), steelhead, Delta smelt, splittail), benthic invertebrates, planktonic invertebrates; and terrestrial vertebrates: birds, salt marsh harvest mouse. We will perform monthly sampling at

replicate stations within each restored area over a period of 3 years. Data gathered over each of the three years will be used to modify, expand, or otherwise alter our monitoring plan so as to gather as much critical information as possible, avoiding redundancies and/or unnecessary monitoring. If, for example, very few changes are noted at similar sites within each of the three restored areas, those monitoring efforts will be relaxed. Other sites, where changes in populations are occurring rapidly, may warrant more frequent bi-weekly sampling. We expect shallow, sub-tidal areas, particularly planktonic communities in these areas, to change relatively quickly, particularly during warmer, summer months. Subtidal and tidal areas of each restored area will be emphasized in our monitoring efforts, as it is in these areas in which we expect most changes to occur in the shortest time interval, and that the priority fish species would most likely benefit from restoration efforts, especially small species and juveniles of larger fish species. Annual reports and oral presentations of our results to date will enable appropriate feedback so that appropriate modifications can be made to ongoing monitoring efforts. To insure proper handling of field samples, a quality assurance monitoring plan (QAPP) will be available prior to project initiation. Our photo-quadrats and illustrations will provide documentation.

Project Implementation - Specific Tasks, Schedules, Budgets, and Deliverables

Task 1. Small-scale vegetation establishment. Retrieval of scattered vegetation and associated animals as levees are breached and channels are established at Shell Marsh areas. Seasonal, experimental planting of native emergent vegetation along environmental gradients at Shell Marsh; Schedule: year 1; Budget: \$60,000/14mo; Deliverables: Quarterly and Final reports

Task 2. Large-scale vegetation restoration and reporting Based on growth of above pilot plantings, extensive seasonal planting and maintenance of native emergent vegetation and animals, particularly at Shell Marsh sites. Schedule: years 1- 2.5; Budget: \$211,226; Deliverables: Quarterly and final reports.

Task 3. Ecosystem Monitoring, Data Synthesis and Reporting. Work to be completed includes appropriate physical and biological monitoring of each site: Monthly monitoring of environmental parameters, including depth, sediment accumulation in sediment traps, water temperature, salinity, enumerations of known species, live collection and identification of unknown species, species identification, bi-monthly review of data, modifications in monitoring (as appropriate), data synthesis, preparation of quarterly reports.

Schedule: monthly for 3 yr; Budget: \$432,635 /3yr; Deliverables: Quarterly and final reports.

Task 4. Monitoring of sediment and plants for heavy metals. Work to be completed includes determination of heavy metal concentrations in sediments and emergent marsh vegetation before, during, and after restoration. Schedule: bi-monthly for 2.5yr; Budget: \$68,806 /3 yr; Deliverables: Quarterly and final reports

Tasks Separated If Only Part of the Work Can Be Funded: Task 1. Small-scale vegetation establishment; Task 2. Large-scale vegetation restoration and reporting; Task 3. Ecosystem monitoring and reporting; Task 4. Monitoring sediment and plants for heavy metals - determine levels before, during, and after marsh restoration.

c. Location and/or geographic boundaries of project (see Figs. 1AB, 2AB)

- (1) Tubbs Island Setback Restoration (Lat. N 38° 7.3' Long. W 122° 26.6' 72 acres) - Sonoma County, Sonoma Creek Watershed. Figs. 1AB.
- (2) Shell Marsh Area Restoration (Lat. N 38° 1.3' Long. W 122° 6.3' 200 acres) plus nearby Pt. Edith Restoration (Lat. N 38° 2.5' Long. W 122° 3.5' 140 acres) - Contra Costa County. Pacheco Creek is on eastern edge of Shell Marsh (Fig. 2A), near western Point Edith (Fig. 2B).

d. Expected benefits

Primary stressors, species, and habitats which are our project focus The primary stressors which are effecting priority species and habitats in our proposed restored, monitored areas include alteration of flows (restoring tidal flow in Tolay Creek to the access the Tubbs Island setback.), floodplain changes (eliminating the hydrological and physical isolation of floodplain or marshplain in Tubbs Island Setback and Shell Marsh, channel form changes (restoration of side channels in both areas), and water temperature (lower water temperatures in Tolay Creek and Tubbs Island Levy Setback). The primary species which are the project focus are spring run chinook, fall run chinook, delta smelt, steelhead, winter run chinook salmon, splittail, and migratory birds. The primary habitats of project focus include seasonal wetlands and aquatic habitat (both areas), saline emergent wetlands habitat (tidal, both areas), and North Bay agricultural wetlands and perennial grasslands (Tubbs I. Levy Setback). Identification and quantification of expected benefits. Monitoring of the restored areas in the North San Pablo Bay will begin to determine if restoration efforts here will achieve what has been envisioned for this ecological zone, and by extension, the more critical Sacramento-San Joaquin Delta Ecological Zone: improvement in the natural production of marine, estuarine, and fresh water habitats for anadromous and other fish species of concern (including foraging and resting areas for migratory runs of chinook salmon, delta smelt, sturgeon, splittail, striped bass), migrating waterfowl, and special status animals such as the salt-marsh harvest mouse and California Clapper Rail. A quantitative analysis of our monitoring data should provide a yardstick for measuring restoration successes in most CALFED ecological zones.

Primary Benefits and Secondary Benefits. Primary benefits of the project as proposed would include restoration of priority habitats: seasonal wetland and aquatic habitat, saline emergent wetlands habitat (tidal), mid-channel islands and shoal habitat, and North Delta agricultural wetlands and perennial grasslands. These restored habitat types are vital for the increase of healthy populations of priority fish species within the Bay/Delta: chinook salmon (all migratory runs), steelhead trout, delta smelt, and green sturgeon. Secondary benefits would include habitat restoration for secondary priority species, such as striped bass, migratory birds, and American shad. Elimination of stressors would also provide both primary and secondary benefits to both priority habitats and species: hydrological connections of floodplains and marshplanes (both sites), physical connections of floodplain (Tubbs Is Setback), provision of fine sediment replenishment (both sites), and improvement in water quality (increase in tidal wetlands which act as pollution-cleansing systems; both sites).

Benefits to Third Parties, Other Ecosystem Restoration Programs, and CALFED Non-ecosystem Objectives. Our restorations will provide additional habitat for waterfowl, of interest to Ducks Unlimited, and for juvenile and adult fishes, which would benefit sports fishermen. Assisting the recovery of sensitive species certainly will benefit local, state, and federal agencies, and private enterprise, in using resources wisely. Results of our monitoring program will provide the data necessary to provide the decision-making capability for similar restoration efforts in the North Bay, and elsewhere in the Bay/Delta. Monitoring would provide the necessary baseline for determining if subsequent pilot or full-scale channelization efforts being considered by local agencies (such as the USFWS in the Hwy 37 strip marsh) would have a beneficial result. We envision our monitoring results as providing a beginning template by which to improve the success of restoration efforts elsewhere in other ecological zones. By providing additional (and somewhat separate) habitats for priority fish species, restored Suisun Bay/North SF Bay marshes will reduce pressure on the expected mismatch between Delta water supplies and projected beneficial uses for humans and biological communities.

e. Background and Biological/Technical Justification

Need for Project and Comparison with Similar Approaches: The need for systematic monitoring in conjunction with Bay/Delta restoration efforts is critical to the overall success of the strategic plan for ecosystem restoration proposed and promoted by CALFED. The 3-year monitoring plan we are proposing in these three restored North Bay sites would help develop a standard gauge for assessing Bay/Delta restoration efforts.

Fulfillment of ERPP Objectives (with page #'s): North San Pablo Bay and Suisun Bay are considered in the CALFED Ecosystem Restoration Program Plan as part of the "Suisun Marsh/North San Francisco Bay Ecological Zone" (described in ERPP Appendix Vol II, Ecological Zone Visions, pp. 81-124). ERPP ecological process implementation objectives for this ecological zone are targeted in the three areas of restorations proposed for comparative monitoring, including: modification of natural floodplains (Tubbs I. Setback and Shell Marsh) (p.101), increase area of tidal perennial aquatic habitat (both areas) (p.103), increase area of saline emergent wetlands [both areas] (p.104), restore seasonal wetlands (both areas) (p.104), and restore riparian and riverine aquatic habitats (Shell Marsh Area) (p.106). Species implementation objectives would be to monitor those species anticipated to benefit from the restorations, including recovery of the delta smelt (p.112), longfin smelt (p.112), splittail (p.113), white sturgeon and green sturgeon (p.113) chinook salmon (all migratory runs) (p.114), steelhead trout (p.114), striped bass (p.115), other marine/estuarine fishes and large invertebrates (p.116), Bay-Delta aquatic foodweb organisms (p.118), California clapper rail (p.119), salt marsh harvest mouse (p.120), and waterfowl (p.121).

List of specific targets met by the proposal: Our restorations also would more closely emulate natural seasonal freshwater flow...to North SF Bay (p.100); Expand floodplain area... (p.101); Develop 1,600 acres of deeper (3-6 feet deep) open water areas... (p.103); Restore slough habitat for fish and associated wildlife... (p.103); Restore tidal action to 500-1000 acres in N. San Pablo Bay ecological units... (p.104); restore 10-15 miles of riparian habitat... (p.106); and Aid recovery of delta smelt (p.112), longfin smelt (p.112), splittail (p.113), white sturgeon and green sturgeon (p.113), chinook salmon (all migratory runs) (p.114), steelhead trout (p.114), striped bass (p.115), marine/estuary fishes and large invertebrates (p.116), bay delta aquatic foodweb organisms (p.118), California clapper rail (p.119), salt marsh harvest mouse (p.120), and waterfowl (p.121)

Manner in which the Project addresses the AFRP and CVPIA: The anadromous Fish Restoration Project will be addressed through providing new habitat for priority anadromous fish species (especially salmonids), particularly in their juvenile stages. The Central Valley Project Improvement Act will be addressed through providing alternative habitat for priority and other commercial fish species, thus potentially relieving pressure on water draw-downs for the entire Central Valley.

Nature and Basis for Durability of the Benefits Resulting from the Project: The restorations in northeast San Pablo Bay and Suisun Bay proposed for restoration and monitoring are the first in what is envisioned as a gradually expanding restored area of marshes and sloughs in this ecological zone. It is expected that these three restored areas will provide additional habitat for most fish species of concern, as well as threatened and endangered bird, mammal and plant species. Enhanced ecosystem functioning of the restored areas should occur and should be permanent, able to expand or contract with moderate Bay water level changes.

Current status of the Projects: Tubbs Is Setback will be restored through inundation over the next 3-6 months; the Shell Marsh sites will be restored sequentially over the next 1-2 years. Both will be continuing projects. Some physical restoration has been accomplished near both areas, but no monitoring has been performed. Expenditures for these particular projects to date are negligible other than for planning, acquisition, and permitting expenses for the physical restoration, which is totaling

approximately \$1 million at Tubbs Island and \$2 million at these Shell Marsh and Pt. Edith Suisun areas. Tubbs Is Setback requires monitoring once restored. In the case of Shell Marsh/Pt. Edith, monitoring is required prior to further restoration efforts. Supporting documentation for both projects is up-to-date.

f. Monitoring and Data Evaluation

Nature and Extent of Monitoring. Monitoring forms a major focus of the project. Sediment accumulation after restoration will be beneficial to restoring historic elevations at Tubbs Island, and will be monitored with permanent stadia rods and sediment traps. Corresponding, concise analyses of mercury, selenium, and lead will indicate improvements or degradation of sediment and plant contamination. Plant and animal populations will be identified and enumerated in standardized replicate quadrats, 24-hr live traps and flumes, net samples, and sonar transects. Bird censuses will be available from the USFWS. CALFED-funded staff would assist USFWS, particularly with salt marsh harvest mouse sampling. Our additional monitoring will emphasize plants (seasonally), and monthly monitoring of fishes, benthos, and plankton. If the project is funded, a specific ecological and biological monitoring plan will be submitted. Progress reports will be submitted quarterly during monitoring and restoration. All results will be tabulated, illustrated, and integrated into a final report.

Comparison with Similar Projects. Our monitoring methods are similar to those used in the successful "Project Eden" on Shark Bay, Western Australia. We plan to use non-destructive methods for sampling and monitoring, including a portable fish finder, as described by Kitting (1993). The fishfinder can quantify broad distributions and abundances of fishes of several size classes across the spectrum, identified in traps and net samples. Our large and small nets and 24-hr "crayfish" traps and flumes will quantify small fishes and other animals throughout the food web, as documented by publications beginning with Huh and Kitting in 1985. Upon sampling, augmented with photographic documentation, virtually all animals are released unharmed. Initial observations at our project site suggest that several species of vertebrates at the water's edge may be quite common, and can be indicators of excellent habitat values. Night-time sampling will supplement day-time sampling, to detect limiting factors in water conditions such as stratification and oxygen depletion, and limits on population distributions. Significant publications and other successful projects by each of the participants document the feasibility of this necessary monitoring work.

All monitoring will be referenced to base maps with a global positioning system, for efficient use with GIS. Oral presentations at scientific and agency meetings will provide immediate feedback from colleagues. Resulting improvements in Delta restorations, with the use of adaptive management as analyses become available, will also provide an important model for public environmental education. With quarterly reports, we propose two major data reviews in the first year, and one each in the second and third years based on the reports prepared and presented in appropriate venues, including such local agencies as the San Francisco Estuarine Institute (SFEI).

g. Implementability The investigators will renew their Refuge and Fish and Game scientific permits during this project. Shell Marsh restorations are approved for implementation, to benefit from our proposed monitoring. Tubbs Island restoration is in the process of being approved for implementation, pending final permits, with the proposed required biological monitoring. The US Fish and Wildlife Service, San Pablo Bay Wildlife Refuge, has requested monitoring of the Tubbs Island Setback Site. Ducks Unlimited has encouraged and cosponsored marsh restoration at Tubbs Island and surrounding restored marshes.

Section V. Costs and Schedule to Implement Proposed Project.

Budget Costs. See attached tables, consistent with CALFED's format suggested in the RFP

Budget Justification:

Our proposed tasks are scientifically integrated but are separated for CALFED budgetary purposes. Progress in each task will benefit from sharing several separated costs, such as mobile laboratory costs. Any reductions in one task would still require the operational costs of that task, in partial support of other tasks.

Each budget item has been approved by CSUH as a valid expense for this extensive work. The university pays academic faculty salaries based on teaching, which necessitates outside funding of summer/overload salary and for any other release time from class instruction. The latter (release time) will be matched by the university, as noted in the budget.

Delta Science Center and its affiliates are continuing their in kind contributions to our restoration and related education programs. No further subcontracting is required, except as noted for two staff in the attached budget.

a. Schedule Milestones

Year 1				Year 2				Year 3			
qrt 1	qrt 2	qrt 3	qrt 4	qrt 1	qrt 2	qrt 3	qrt 4	qrt 1	qrt 2	qrt 3	qrt 4

Task 1. Small-scale vegetation establishment

Task 2. Large scale vegetation restoration; reporting

Task 3. Ecosystem monitoring; reporting

Task 4.
Monitoring Sediment and Plant Metals. Determine levels before, during and after marsh restoration

b. Third Party Impacts

Due to the natural biological processes merely accelerated in our proposed work, we do not anticipate any third party negative impacts from the project.

SUMMARY

TASKS 1 & 2: Pilot and Major Marsh Community Restoration (and reporting)			
in preparation for a Demonstration Marsh here in Suisun Bay			
		<u>REQUEST</u>	<u>MATCH</u>
Salaries			
Chris Kitting	Academic year request	\$23,970	
	Academic year match		\$23,970
	Summer/overload request	\$26,391	
John Rees	Calendar year request (17% time per year)	\$52,356	
Student Asst.		\$15,115	
Technical Asst. (for E. Bay Regional Pks / Delta Science Center staff)		\$22,672	
Fringe Benefits			
Chris Kitting	Academic year release rate = 33%	\$7,911	
	Academic year release rate = 33%		\$7,911
	Summer/overload rate = 10%	\$2,639	
John Rees	Adjunct faculty rate = 10%	\$5,236	
Student Asst.	Student benefit rate = 10%	\$1,512	
Technical Asst. (for E. Bay Regional Pks / Delta Science Center staff)	Part-time benefit rate = 37%	\$8,389	
Subtotal, Salaries, Wages and Benefits:		\$166,191	\$31,881
Other Direct Costs (Tasks 1&2)			
	Equipment and supplies	\$8,800	
	Repairs	\$3,500	
	Transportation Costs	\$6,000	
	Trailer use for lab space (\$600/mo)	\$6,000	
	Plant and animal acquisition	\$19,000	
	Office expenses (phone, fax, copies, etc.)	\$6,500	
	Publication costs	\$990	
Subtotal, Other Direct Costs		\$50,790	\$0
Total Direct Costs, Tasks 1&2		\$216,981	\$31,881
Indirect Costs (25% of total direct costs)		\$54,245	\$38,849
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.			
Total, Tasks 1&2		\$271,226	\$70,730
			\$341,956

SUMMARY

TASK 3: Physical and Biological Monitoring (and Reporting)					
Salaries			REQUEST	MATCH	TOTAL
Chris Kitting	Academic year request		\$23,220		\$23,220
	Academic year match			\$23,220	\$23,220
	Summer/overload request		\$32,931		\$32,931
Sam McGinnis	Academic year request		\$23,725		\$23,725
	Academic year match			\$23,725	\$23,725
	Summer/overload request		\$20,969		\$20,969
John Rees	Calendar year request (30% time per year)		\$96,605		\$96,605
Student Assist.			\$27,585		\$27,585
Technical Assist.	(San Francisco Bay Wildlife Society)		\$27,582		\$27,582
Lab Assist.			\$11,316		\$11,316
Fringe Benefits					
Kitting	Academic year release rate = 33%		\$7,663		\$7,663
	Academic year release rate = 33%			\$7,663	\$7,663
	Summer/overload rate = 10%		\$3,293		\$3,293
McGinnis	Academic year release rate = 33%		\$7,829		\$7,829
	Academic year release rate = 33%			\$7,829	\$7,829
	Summer/overload rate = 10%		\$2,096		\$2,096
John Rees	Adjunct faculty rate = 10%		\$9,242		\$9,242
Student Assist.	Student benefit rate = 10%		\$2,758		\$2,758
Technical Assist.	Part-time benefit rate = 37%		\$6,572		\$6,572
	(San Francisco Bay Wildlife Society)				
Lab Assist.	Student benefit rate = 10%		\$1,132		\$1,132
Subtotal, Salaries, Wages and Benefits:			\$304,518	\$62,437	\$366,955
Other Direct Costs (Task 3)					
Equipment and supplies			\$6,000		\$6,000
Transportation Costs			\$7,500		\$7,500
* Trailer use for lab space (\$600/mo x 4 mo)			\$7,200		\$7,200
* Office expenses (phone, fax, copies, etc.)			\$4,900		\$4,900
Compound and low-power microscopes & camera access			\$15,000		\$15,000
Publication costs			\$990		\$990
Subtotal, Other Direct Costs			\$41,590	\$0	\$41,590
Total Direct Costs, Task 3			\$346,108	\$62,437	\$408,545
Indirect Costs (25% of total direct costs)			\$86,527	\$85,942	\$172,469
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.					
Total, Task 3			REQUEST \$432,635	MATCH \$148,379	TOTAL \$581,014

SUMMARY

TASK 4: Metals Pilot Monitoring of Sediments and Plants (and Reporting)				
		<u>REQUEST</u>	<u>MATCH</u>	<u>TOTAL</u>
Salaries				
Joy Andrews	Academic year request	\$9,564		\$9,564
	Academic year match		\$9,564	\$9,564
				\$0
John Rees	Calendar year request (8% time x 3 yr)	\$11,553		\$11,553
Student Asst.		\$15,115		\$15,115
Fringe Benefits				
Joy Andrews	Academic year release rate = 33%	\$3,156		\$3,156
	Academic year release rate = 33%		\$3,156	\$3,156
				\$0
John Rees	Adjunct faculty rate = 10%	\$1,155		\$1,155
Student Asst.	Student benefit rate = 10%	\$1,512		\$1,512
Subtotal, Salaries, Wages and Benefits:		\$42,055	\$12,720	\$54,775
Other Direct Costs (Task 4)				
	Equipment and supplies	\$7,500		\$7,500
*	Repairs	\$1,500		\$1,500
	Transportation Costs	\$3,000		\$3,000
	Publication costs	\$990		\$990
Subtotal, Other Direct Costs		\$12,990		\$12,990
Total Direct Costs, Task 4		\$55,045	\$12,720	\$67,765
Indirect Costs (25% of total direct costs)		\$13,761	\$11,983	\$25,744
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 4		\$68,806	\$24,703	\$93,509
GRAND TOTAL, ENTIRE PROJECT		\$772,867	\$243,812	\$1,016,479
* Operations and Maintenance budget item.				

TASKS 1 & 2: Pilot and Major Marsh Community Restoration (and Reporting)			
in preparation for a Demonstration Marsh in Suisun Bay			
Salaries		REQUEST	MATCH
			TOTAL
Chris Kitting	33 time x 1 Acad. Year qtr	\$7,223	\$7,223
(\$23,835/qr.)	Match: 1/3 time x 1 Acad. Year qtr		\$7,223
	50 time x Summer quarter/overload	\$11,918	\$11,918
John Reas	33 time x 12 months	\$28,748	\$28,748
(\$86,244/yr)			
Student Asst.	2 x \$10/hr x 6.5 hr/wk x 44 weeks	\$5,720	\$5,720
Technical Asst.	1 x \$15/hr x 13 hr/wk x 44 weeks	\$8,580	\$8,580
(for E. Bay Regional Pks / Delta Science Center staff)			
Fringe Benefits			
Chris Kitting	Academic year release rate = 33%	\$2,384	\$2,384
	Academic year release rate = 33%		\$2,384
	Summer/overload rate = 10%	\$1,192	\$1,192
John Reas	Adjunct faculty rate = 10%	\$2,875	\$2,875
Student Asst.	Student benefit rate = 10%	\$572	\$572
Technical Asst.	Part-time benefit rate = 37%	\$3,175	\$3,175
(for E. Bay Regional Pks / Delta Science Center staff)			
Subtotal, Salaries, Wages and Benefits:		\$72,387	\$9,607
Other Direct Costs (Tasks 1&2)			
Equipment and supplies		\$3,600	\$3,600
Repairs		\$1,500	\$1,500
Transportation Costs & boat use		\$2,000	\$2,000
Trailer use for lab space (\$600/mo x 4 mo)		\$2,400	\$2,400
Plant and animal acquisition		\$8,000	\$8,000
Office expenses (phone, fax, copies, etc.)		\$2,300	\$2,300
Publication costs		\$330	\$330
Subtotal, Other Direct Costs		\$20,130	\$0
Total Direct Costs, Tasks 1&2		\$92,517	\$9,607
Indirect Costs (25% of total direct costs)		\$23,129	\$15,408
CSUH Federal rate is 47% of salaries, wages & benefits.			
The University will match with the unrecovered IDC.			
		REQUEST	MATCH
Total, Tasks 1&2		\$115,646	\$25,015
			TOTAL
			\$140,661

TASK 3: Physical and Biological Monitoring (and Reporting)				
Salaries		REQUEST	MATCH	TOTAL
Chris Kitting (\$23,835/qr.)	33 time x 1 Acad. Year qtr Match: 1/3 time x 1 Acad. Year qtr 50 time x Summer quarter/overload	\$7,223	\$7,223	\$7,223 \$7,223 \$11,918
Sam McGinnis (\$23,185/qr.)	33 time x 1 Acad. Year qtr Match: 1/3 time x 1 Acad. Year qtr 33 time x 2 mo, Summer quarter	\$7,728	\$7,728	\$7,728 \$7,728 \$5,152
John Rees (\$86,244/yr)	33 time x 12 months	\$28,748		\$28,748
Student Assist.	3 x \$10/hr x 6.5 hr/wk x 44 weeks	\$9,580		\$9,580
Technical Assist. (San Francisco Bay Wildlife Society)	1 x \$15/hr x 13 hr/wk x 44 weeks	\$8,580		\$8,580
Lab Assist.	\$6/hr x 10 hr/wk x 44 weeks	\$3,520		\$3,520
Fringe Benefits				
Chris Kitting	Academic year release rate = 33% Academic year release rate = 33% Summer/overload rate = 10%	\$2,384	\$2,384	\$2,384 \$2,384 \$1,192
Sam McGinnis	Academic year release rate = 33% Academic year release rate = 33% Summer/overload rate = 10%	\$2,550	\$2,550	\$2,550 \$2,550 \$515
John Rees	Adjunct faculty rate = 10%	\$2,875		\$2,875
Student Assist.	Student benefit rate = 10%	\$858		\$858
Technical Assist. (San Francisco Bay Wildlife Society)	Part-time benefit rate = 37%	\$3,175		\$3,175
Lab Assist.	Student benefit rate = 10%	\$352		\$352
Subtotal, Salaries, Wages and Benefits:		\$95,350	\$19,885	\$115,235
Other Direct Costs (Task 3)				
Equipment and supplies		\$2,000		\$2,000
Transportation Costs & boat use		\$2,500		\$2,500
Compound and low-power microscopes & camera access.		\$15,000		\$15,000
* Trailer use for lab space (\$600/mo x 4 mo)		\$2,400		\$2,400
* Office expenses (phone, fax, copies, etc.)		\$2,300		\$2,300
Publication costs		\$330		\$330
Subtotal, Other Direct Costs		\$24,530	\$0	\$24,530
Total Direct Costs, Task 3		\$119,880	\$19,885	\$139,765
Indirect Costs (25% of total direct costs)		\$29,970	\$24,190	\$54,160
CSUH Federal rate is 47% of salaries, wages & benefits.				
The University will match with the unrecovered IDC.				
Total, Task 3		REQUEST \$149,850	MATCH \$44,075	TOTAL \$193,925

TASK 4: Metals Pilot Monitoring of Sediments and Plants (and Reporting)				
		<u>REQUEST</u>	<u>MATCH</u>	<u>TOTAL</u>
Salaries				
Joy Andrews (\$14,876/qtr.)	10 time x 2 Acad. Year qtr Match: 1/10 time x 2 Acad. Year qtr	\$2,975	\$2,975	\$2,975
John Rees (\$66,244/yr)	.04 time x 12 months	\$3,594		\$3,594
Student Asst.	2 x \$10/hr x 6.5 hr/wk x 44 weeks	\$5,720		\$5,720
Fringe Benefits				
Joy Andrews	Academic year release rate = 33%	\$982		\$982
	Academic year release rate = 33%		\$982	\$982
John Rees	Adjunct faculty rate = 10%	\$359		\$359
Student Asst.	Student benefit rate = 10%	\$572		\$572
Subtotal, Salaries, Wages and Benefits:		\$14,202	\$3,957	\$18,159
Other Direct Costs (Task 4)				
Equipment and supplies		\$4,000		\$4,000
* Repairs		\$500		\$500
Transportation Costs & boat use		\$1,000		\$1,000
Publication costs		\$330		\$330
Subtotal, Other Direct Costs		\$5,830		\$5,830
Total Direct Costs, Task 4		\$20,032	\$3,957	\$23,989
Indirect Costs (25% of total direct costs)		\$5,008	\$3,527	\$8,535
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 4		\$25,040	\$7,484	\$32,524
<hr/>				
		<u>REQUEST</u>	<u>MATCH</u>	<u>TOTAL</u>
GRAND TOTAL, YEAR ONE		\$280,636	\$76,674	\$367,110
<hr/>				
* Operations and Maintenance budget item.				

TASKS 1 & 2: Pilot and Major Marsh Community Restoration (and Reporting)				
in preparation for a Demonstration Marsh here in Suisun Bay				
		REQUEST	MATCH	TOTAL
Salaries				
Chris Kitting	3 time x 1 Acad. Year qtr	\$7,651		\$7,651
	Match: 1/3 time x 1 Acad. Year qtr		\$7,651	\$7,651
(\$25,503/qtr.)	3 time x Summer quarter/overload	\$7,651		\$7,651
John Rees	1/6 time x 12 months	\$15,380		\$15,380
(\$92,281/yr)				
Student Asst.	2 x \$10.70/hr x 6.5 hr/wk x 44 weeks	\$6,120		\$6,120
Technical Asst.	1 x \$16.05/hr x 13 hr/wk x 44 weeks	\$9,181		\$9,181
	(for E. Bay Regional Pks / Delta Science Center staff)			
Fringe Benefits				
Chris Kitting	Academic year release rate = 33%	\$2,525		\$2,525
	Academic year release rate = 33%		\$2,525	\$2,525
	Summer/overload rate = 10%	\$765		\$765
John Rees	Adjunct faculty rate = 10%	\$1,538		\$1,538
Student Asst	Student benefit rate = 10%	\$612		\$612
Technical Asst.	Part-time benefit rate = 37%	\$3,397		\$3,397
	(for E. Bay Regional Pks / Delta Science Center staff)			
Subtotal, Salaries, Wages and Benefits:		\$54,820	\$10,176	\$64,996
Other Direct Costs (Tasks 1&2)				
	Equipment and supplies	\$3,600		\$3,600
*	Repairs	\$1,500		\$1,500
	Transportation Costs	\$3,000		\$3,000
*	Trailer use for lab space (\$600/mo x 4 mo)	\$2,400		\$2,400
	Plant and animal acquisition	\$10,000		\$10,000
*	Office expenses (phone, fax, copies, etc.)	\$3,300		\$3,300
	Publication costs	\$330		\$330
Subtotal, Other Direct Costs		\$24,130	\$0	\$24,130
Total Direct Costs, Tasks 1&2		\$78,950	\$10,176	\$89,126
Indirect Costs (25% of total direct costs)				
		\$19,737	\$10,811	\$30,548
CSUH Federal rate is 47% of salaries, wages & benefits.				
The University will match with the unrecovered IDC.				
		REQUEST	MATCH	TOTAL
Total, Tasks 1&2		\$98,687	\$20,987	\$119,674

TASK 3: Physical and Biological Monitoring (and Reporting)				
Salaries		REQUEST	MATCH	TOTAL
Chris Kitting (\$25,503/qtr.)	3 time x 1 Acad. Year qtr Match: .3 time x 1 Acad. Year qtr 5 time x Summer quarter/overload	\$7,728 \$12,752	 \$7,728	\$7,728 \$7,728 \$12,752
Sam McGinnis (\$23,185/qtr.)	1/3 time x 1 Acad. Year qtr Match: 1/3 time x 1 Acad. Year qtr 2/3 time x 2 mo, Summer quarter	\$7,728 \$10,304	 \$7,728	\$7,728 \$7,728 \$10,304
John Rees (\$92,281/yr)	1/3 time x 12 months	\$30,760		\$30,760
Student Assist.	3 x \$10.70/hr x 6.5 hr/wk x 44 weeks	\$9,181		\$9,181
Technical Assist. (San Francisco Bay Wildlife Society)	1 x \$16.05/hr x 13 hr/wk x 44 weeks	\$9,181		\$9,181
Lab Assist.	\$8.56/hr x 10 hr/wk x 44 weeks	\$3,766		\$3,766
Fringe Benefits				
Chris Kitting	Academic year release rate = 33%	\$2,550		\$2,550
	Academic year release rate = 33%		\$2,550	\$2,550
	Summer/overload rate = 10%	\$1,275		\$1,275
Sam McGinnis	Academic year release rate = 33%	\$2,550		\$2,550
	Academic year release rate = 33%		\$2,550	\$2,550
	Summer/overload rate = 10%	\$1,030		\$1,030
John Rees	Adjunct faculty rate = 10%	\$3,076		
Student Assist.	Student benefit rate = 10%	\$918		\$918
Technical Assist. (San Francisco Bay Wildlife Society)	Part-time benefit rate = 37%	\$3,397		\$3,397
Lab Assist.	Student benefit rate = 10%	\$377		\$377
Subtotal, Salaries, Wages and Benefits:		\$108,673	\$20,556	\$124,053
Other Direct Costs (Task 3)				
	Equipment and supplies	\$2,000		\$2,000
	Transportation Costs & boat use	\$3,000		\$3,000
*	Trailer use for lab space (\$600/mo x 4 mo)	\$2,400		\$2,400
*	Office expenses (phone, fax, copies, etc.)	\$1,300		\$1,300
	Publication costs	\$330		\$330
Subtotal, Other Direct Costs		\$9,030	\$0	\$9,030
Total Direct Costs, Task 3		\$115,603	\$20,556	\$133,083
Indirect Costs (25% of total direct costs)		\$28,901	\$29,404	\$58,305
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 3		\$144,604	\$49,960	\$191,388

TASK 4: Metals Pilot Monitoring of Sediments and Plants (and Reporting)				
Salaries		REQUEST	MATCH	TOTAL
Joy Andrews	1/10 time x 2 Acad. Year qtr	\$3,183		\$3,183
(\$15,917/qtr.)	Match: 1/10 time x 2 Acad. Year qtr		\$3,183	\$3,183
John Rees	1/24 time x 12 months	\$3,845		\$3,845
(\$92,281/yr)				
Student Asst.	2 x \$10.70/hr x 6.5 hr/wk x 44 weeks	\$6,120		\$6,120
Fringe Benefits				
Joy Andrews	Academic year release rate = 33%	\$1,050		\$1,050
	Academic year release rate = 33%		\$1,050	\$1,050
John Rees	Adjunct faculty rate = 10%	\$385		\$385
Student Asst.	Student benefit rate = 10%	\$612		\$612
Subtotal, Salaries, Wages and Benefits:		\$15,195	\$4,233	\$19,428
Other Direct Costs (Task 4)				
	Equipment and supplies	\$2,000		\$2,000
	Repairs	\$500		\$500
	Transportation Costs & boat use	\$1,000		\$1,000
	Publication costs	\$330		\$330
Subtotal, Other Direct Costs		\$3,830		\$3,830
Total Direct Costs, Task 4		\$19,025	\$4,233	\$23,258
Indirect Costs (25% of total direct costs)		\$4,756	\$4,375	\$9,131
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 4		\$23,781	\$8,608	\$32,389
GRAND TOTAL, YEAR TWO				
		\$266,972	\$78,555	\$343,451
* Operations and Maintenance budget item.				

TASKS 1 & 2: Pilot and Major Marsh Community Restoration (and Reporting)				
in preparation for a Demonstration Marsh here in Suisun Bay				
		REQUEST	MATCH	TOTAL
Salaries				
Chris Kitting	1/3 time x 1 Acad. Year qtr	\$9,096		\$9,096
	Match: 1/3 time x 1 Acad. Year qtr		\$9,096	\$9,096
(\$27,288/qtr.)	1/4 time x Summer quarter/overload	\$6,822		\$6,822
John Rees	1/6 time x 6 months	\$8,228		\$8,228
(\$98,741/yr)				
Student Asst.	2 x \$11.45/hr x 6.5 hr/wk x 22 weeks	\$3,275		\$3,275
Technical Asst.	1 x \$17.17/hr x 13 hr/wk x 22 weeks	\$4,911		\$4,911
(for E. Bay Regional Pks / Delta Science Center staff)				
Fringe Benefits				
Chris Kitting	Academic year release rate = 33%	\$3,002		\$3,002
	Academic year release rate = 33%		\$3,002	\$3,002
	Summer/overload rate = 10%	\$682		\$682
John Rees	Adjunct faculty rate = 10%	\$823		\$823
Student Asst.	Student benefit rate = 10%	\$328		\$328
Technical Asst.	Part-time benefit rate = 37%	\$1,817		\$1,817
(for E. Bay Regional Pks / Delta Science Center staff)				
Subtotal, Salaries, Wages and Benefits:		\$38,984	\$12,098	\$51,082
Other Direct Costs (Tasks 1&2)				
Equipment and supplies		\$1,600		\$1,600
* Repairs		\$500		\$500
Transportation Costs & boat use		\$1,000		\$1,000
* Trailer use for lab space (\$800/mo x 2 mo)		\$1,200		\$1,200
Plant and animal acquisition		\$1,000		\$1,000
* Office expenses (phone, fax, copies, etc.)		\$900		\$900
Publication costs		\$330		\$330
Subtotal, Other Direct Costs		\$6,530	\$0	\$6,530
Total Direct Costs, Tasks 1&2		\$45,514	\$12,098	\$57,612
Indirect Costs (25% of total direct costs)		\$11,379	\$12,630	\$24,009
CSUH Federal rate is 47% of salaries, wages & benefits.				
The University will match with the unrecovered IDC.				
		REQUEST	MATCH	TOTAL
Total, Tasks 1&2		\$56,893	\$24,728	\$81,621

TASK 3: Physical and Biological Monitoring (and Reporting)				
Salaries		REQUEST	MATCH	TOTAL
Chris Kitting (\$27,268/qr.)	3 time x 1 Acad. Year qtr Match: 3 time x 1 Acad. Year qtr 3 time x Summer quarter/overload	\$8,269 \$8,261	\$8,269	\$8,269 \$8,269 \$8,261
Sam McGinnis (\$24,808/qr.)	1/3 time x 1 Acad. Year qtr Match: 1/3 time x 1 Acad. Year qtr 1/3 time x 2 mo. Summer quarter	\$8,269 \$5,513	\$8,269	\$8,269 \$8,269 \$5,513
John Rees (\$98,741/yr)	1/3 time x 12 months	\$32,914		\$32,914
Student Assist.	3 x \$11.45/hr x 6.5 hr/wk x 44 weeks	\$9,824		\$9,824
Technical Assist. (San Francisco Bay Wildlife Society)	1 x \$17.17/hr x 13 hr/wk x 44 weeks	\$9,821		\$9,821
Lab Assist.	\$9.16/hr x 10 hr/wk x 44 weeks	\$4,030		\$4,030
Fringe Benefits				
Chris Kitting	Academic year release rate = 33% Academic year release rate = 33% Summer/overload rate = 10%	\$2,729 \$826	\$2,729	\$2,729 \$826
Sam McGinnis	Academic year release rate = 33% Academic year release rate = 33% Summer/overload rate = 10%	\$2,729 \$551	\$2,729	\$2,729 \$551
John Rees	Adjunct faculty rate = 10%	\$3,291		\$3,291
Student Assist.	Student benefit rate = 10%	\$982		\$982
Technical Assist. (San Francisco Bay Wildlife Society)	Part-time benefit rate = 37%	\$0		\$0
Lab Assist.	Student benefit rate = 10%	\$403		\$403
Subtotal, Salaries, Wages and Benefits:		\$98,412	\$21,996	\$120,408
Other Direct Costs (Task 3)				
Equipment and supplies		\$2,000		\$2,000
Transportation Costs & boat use		\$2,000		\$2,000
* Trailer use for lab space (\$500/mo x 4 mo)		\$2,400		\$2,400
* Office expenses (phone, fax, copies, etc.)		\$1,300		\$1,300
Publication costs		\$330		\$330
Subtotal, Other Direct Costs		\$8,030	\$0	\$8,030
Total Direct Costs, Task 3		\$106,442	\$21,996	\$128,438
Indirect Costs (25% of total direct costs)		\$26,611	\$29,981	\$56,592
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 3		REQUEST \$133,053	MATCH \$51,977	TOTAL \$185,030

TASK 4: Metals Pilot Monitoring of Sediments and Plants (and Reporting)				
Salaries		REQUEST	MATCH	TOTAL
Joy Andrews (\$17031/qr.)	1/10 time x 2 Acad. Year qtr Match: 1/10 time x 2 Acad. Year qtr	\$3,406	\$3,406	\$3,406
John Rees (\$98,741/yr)	1/24 time x 12 months	\$4,114		\$4,114
Student Asst.	2 x \$11.45/hr x 6.5 hr/wk x 22 weeks	\$3,275		\$3,275
Fringe Benefits				
Joy Andrews	Academic year release rate = 33%	\$1,124		\$1,124
	Academic year release rate = 33%		\$1,124	\$1,124
John Rees	Adjunct faculty rate = 10%	\$411		\$411
Student Asst.	Student benefit rate = 10%	\$328		\$328
Subtotal, Salaries, Wages and Benefits:		\$12,658	\$4,530	\$17,188
Other Direct Costs (Task 4)				
Equipment and supplies		\$1,500		\$1,500
Repairs		\$500		\$500
Transportation Costs & boat use		\$1,000		\$1,000
Publication costs		\$330		\$330
Subtotal, Other Direct Costs		\$3,330		\$3,330
Total Direct Costs, Task 4		\$15,988	\$4,530	\$20,518
Indirect Costs (25% of total direct costs)		\$3,997	\$4,081	\$8,078
CSUH Federal rate is 47% of salaries, wages & benefits. The University will match with the unrecovered IDC.				
Total, Task 4		\$19,985	\$8,611	\$28,596
GRAND TOTAL, YEAR THREE		\$209,931	\$85,316	\$295,247
* Operations and Maintenance budget item.				

Section VI. Applicant Qualifications

Dr. Christopher L. Kitting, Professor of Biological Sciences, CSUH

Professor Kitting earned his Biological Sciences Ph.D. in 1979 with a Stanford University Fellowship. His major role in the presently proposed project would be to guide the field sampling, marsh community expansion, and animal monitoring.

Kitting's CSUH program provides non-destructive comparisons of plants and resident animal populations in various bay area shorelines, and the natural importance of particular wetlands habitats. Kitting is an active member of 10 major ecological organizations, and currently serves on several scientific panels for reviewing environmental effects on aquatic organisms. He presents principles of limiting resources with wide recognition in undergraduate and graduate classrooms and laboratories/field exercises, in grant reports, at international research meetings, and in 25 major publications, most of which emphasize effects of vegetation on animal populations.

Kitting serves on the Board of Directors at the San Francisco Bay National Wildlife Refuge and Program Committee of the Delta Science Center. He also was an invited speaker at three Regional Bay Vegetation Research Workshops, a 1991 Estuarine Research Fed. Symposium on Advances in Ecological Methods, and Educators Conference at the Cal Academy of Sciences. Recently, he has given invited presentations on marsh restoration at three International ecology conferences. During the past 6 years, his marsh research has been funded primarily through Cal State University, Union Sanitary District (\$47,000), National Marine Fisheries Service (\$25,000), National Science Foundation programs in Undergraduate Education (\$15,000), E Bay Regional Pks Foundation/Delta Science Center (\$35,000), and Alameda County Clean Water Program (\$100,000). Earlier, he prepared a major habitat restoration at Carmel River Lagoon, with other agencies.

Relevant, recent examples of Kitting's publications: (His grad students recently have published four other major articles.) (1) Kitting, C.L., C.C. Ouverney, and F. Canabal. Small Fishes Concentrated During the First Five Years Outside an Experimental Wastewater Marsh in San Francisco Bay. Proc. Soc. Wetl. Sci. 1994. DM Kent and JJ Zentner, Eds. pp. 90-103. (2) Kitting, C.L. 1994. Shallow populations of small fishes in local eelgrass meadow food webs. Alameda Naval Air Station's Natural Resources and Base Closure. Audubon Society, Berkeley, CA pp 65-83. (3) Kitting, C.L. 1996. Comparing naturally occurring population, as field bioassays of environmental health. in D.M. Kent and J. Zentner, Eds. Proc. Soc. Wetl. Sci. II. (80-83) (extended abstr). (4) Kitting, C.L. and D.E. Morse 1997. Feeding effects of postlarval red abalone, Haliotis rufescens (Mollusca: Gastropoda) on encrusting coralline algae. Molluscan Res. 18:183-196. (5) Ouverney, C.C. and C.L. Kitting. (for Bull. Environ. Contam. Toxicol.) Field Bioassays on Common Epibenthic Organisms Near a Treated Wastewater Marsh in South San Francisco Bay. (6) Kitting, C.L. Field bioassays throughout marshes receiving suburban stormwater runoff. (invited for Env. Engineering).

Dr. John T. Rees, Adjunct Faculty, Department of Biological Sciences and Environmental Research Center, CSUH

Dr. Rees received his Ph.D. in Zoology at the University of California at Berkeley in 1975, with a research emphasis in field population biology and invertebrate culture. He is at present holds an adjunct appointment at the University of California at Hayward in the Department of Biological Sciences, and heads the Environmental Research Center located at Alameda Point. Dr. Rees has had 20 years experience in environmental project management, and his career experience has been in both the public and private sectors. He has had nine years post-doctoral and senior scientist experience, performing field

ecological research, in the Energy and Environment Division at the Lawrence Berkeley Laboratory. Dr. Rees has had applied and basic research experience in general freshwater, estuarine, and marine ecology, ecological field sampling techniques and data analysis, and general water quality issues. He has had responsibility for the establishment and monitoring of laboratory and experimental field work to ascertain the effects of artificially induced perturbations (decrease in pH, increase in heavy metal loads) in freshwater laboratory microcosms. He has managed projects for clients in water quality assessment, site assessment and contaminated site remediation technologies, application of NEPA/CEQA regulations, and natural resource and endangered species management. Dr. Rees has experience in interpreting technical environmental regulations and guidelines at the federal, state, and local levels, and in interaction with appropriate environmental regulatory agencies.

Dr. Rees' principal contributions to the project would be in taking the lead in restoration and monitoring as proposed in the project. He would work with Drs. Kitting and Anderson in monitoring marsh fauna and flora, and in relating results obtained to the chemical and other environmental data.

Selected relevant publications of Dr. Rees: Rees, J. T. 1997. (1) Aquatic introductions into sensitive estuarine habitats: Two exotic hydromedusae invade the San Francisco Bay/Delta (to be presented at the International Hydrozoan Conference, Bodega Marine Lab, Aug-Sept, 1998) (2) Lyandres, S., J. Meardon, and J. Rees. 1988. Evaluation of membrane processes for the reduction of trace organic contaminants. *Env. Progress* 8(4): 239-244. (3) Harte, J., D. Levy, and J. T. Rees. 1983. Pelagic diatom populations in lentic freshwater microcosms. *Intern. Rev. Gesam. Hydrobiol.* 68:255-267. (4) Rees, J.T. 1982. The hydrozoan *Cladonema* in California: a possible introduction from Japan. *Pac. Sci.* 36:439-444. (5) Rees, J.T. and J. Oldfather. 1980. Small scale mass culture of *Daphnia magna* Straus. *Proc. World Maricul. Soc.* 11:202-210. (6) Rees, J.T. 1979. Community development in freshwater microcosms. *Hydrobiologia* 63:(2)113-128

Dr. Samuel M. McGinnis, Professor of Biological Sciences, CSUH

Dr. McGinnis is an ecologist who specializes in the aquatic and terrestrial wildlife and plants of the greater San Francisco Bay Area. He earned his Ph. D. from University of California, Berkeley in 1965, and has conducted courses and supervised graduate research in ichthyology and vertebrate natural history since 1964. His major role in the present project will be in fish sampling and habitat improvements.

His major activities in recent years have centered around endangered and threatened plant and animal species. The majority of this work has been conducted for government agencies such as the U S Fish and Wildlife Service, the California Department of Fish and Game, the California Department of Transportation, the California Department of Parks and Recreation, and the planning departments of San Mateo, Alameda, and Contra Costa Counties. With respect to the latter, he researched and wrote the the Plant and Animal Resources section of the Contra Costa Co. General Plan Conservation Element, 1988. Dr. McGinnis has conducted field studies and written independent reports or the biological sections of environmental impact reports for over 95 projects since 1979, including over 20 in eastern Contra Costa County. Funded by diverse agencies and clients.

For example, samples of his recent reports in environmental projects from 1993:

(1) A survey to determine the status of the California tiger salamander on a proposed land fill expansion site, Fairfield, CA. 1993. A study conducted for Wetlands Associates, San Rafael, CA (2) An evaluation of the lower reach of Tunitas Creek as a viable steelhead rearing site and habitat for other special status aquatic species 1993. Conducted for Caltrans, Oakland, CA.

Recently Dr. McGinnis has emphasized the ecology of California red-legged frog and marsh snakes, with several agencies. He has published over three dozen papers, book chapters, and books on a variety of subjects dealing with the ecology of California wildlife. As a professional herpetologist, the majority of these are concerned with the ecology of California lizard and snake species. He also authored Freshwater Fishes of California 1984 - a 316-page book covering all freshwater fish species in California. It discusses the ecology of each species and emphasizes the reduction in native species due to the introduction of exotics, and habitat manipulations which have occurred in this state during the past century. Published by the University of California Press, Berkeley, CA.

Contra Costa Mosquito & Vector Control District's Principle Investigator is **Karl Malamud-Roam**, CCMVCD's Marsh Specialist for over six years. He has designed and implemented eight tide marsh restoration and enhancement projects in the San Francisco Estuary, covering over 100 acres. He is the project manager for the million-dollar, 200-acre Shell Marsh Restoration Project; after six years of study and design, construction begins this year. He is also Project Manager for the 2000-acre Point Edith Marsh Project, and has overseen implementation and evaluation of two pilot projects to date. Currently he is developing a natural resources inventory and integrated natural resources management and restoration plan for the latter site.

Mr. Malamud-Roam is a doctoral candidate at UC-Berkeley, where he is writing a dissertation on the hydrology and ecology of muted-tidal marshes. His primary study sites are the marshes discussed in this proposal. He has a BA in Biology from Princeton University, an MA in Physical Geography from UC-Berkeley, and he is the author of one book chapter and four articles, all on the tidal hydrology and ecology of this area.

Other professional staff at CCMVCD who will be helping in the project include Dr. Charles Beesley (PhD Entomology, UC-Riverside, General Manager), Dr. Steven Schutz (PhD Entomology, Rutgers, Entomologist), and Mr. Chris Miller (BA Fisheries Sciences, HumboldtSU).

Associated Staff: Dr. Joy C. Andrews, Assistant Professor, Department of Chemistry, CSUH

Dr. Andrews, an environmental chemist, received her PhD. D. in Biophysical Chemistry at the University of California, Berkeley in 1995, funded by a University Fellowship and a CSU Doctoral Incentive award. She was a Postdoctoral Associate at Lawrence Berkeley National Lab in 1995-1996. Her role in this project is to monitor changes in key heavy metals in the restored and control marshes.

She received three grants to begin her research at CSUH; from the Research Committee, Affirmative Action Development, and Faculty Development. She also finished a National Science Foundation project begun at UC Berkeley. Dr. Andrews has taught water quality courses involving field studies, laboratory analyses and biological remediation at UC Berkeley and CSUH. She is supervising several graduate students in water quality analysis projects involving ion chromatography, atomic absorption spectroscopy and x-ray absorption spectroscopy, with studies in remediation of heavy metals by plants.

While at LBNI, Dr. Andrews served on the Environmental Safety and Health Committee from 1992-1995, and won an Outstanding Graduate Instructor award in 1990. She has been a member of the American Chemical Society since 1988, with subdivision memberships in environmental chemistry and biological chemistry. Before entering the academic field she was employed at Environmental Analytical Laboratories in Richmond, CA specializing in heavy metals analysis of water, soil and air samples. She has co-authored a book on water quality analysis, "The Chemistry of Water," as well as 6 papers in leading chemistry journals and 2 conference proceedings on the analysis of manganese in plants.

Section VII. Compliance with standard terms and conditions

As government agencies, no further appendices apply at this time, as described in Appendix Table D-1 from CALFED

FAX TRANSMITTAL

of pages = 3

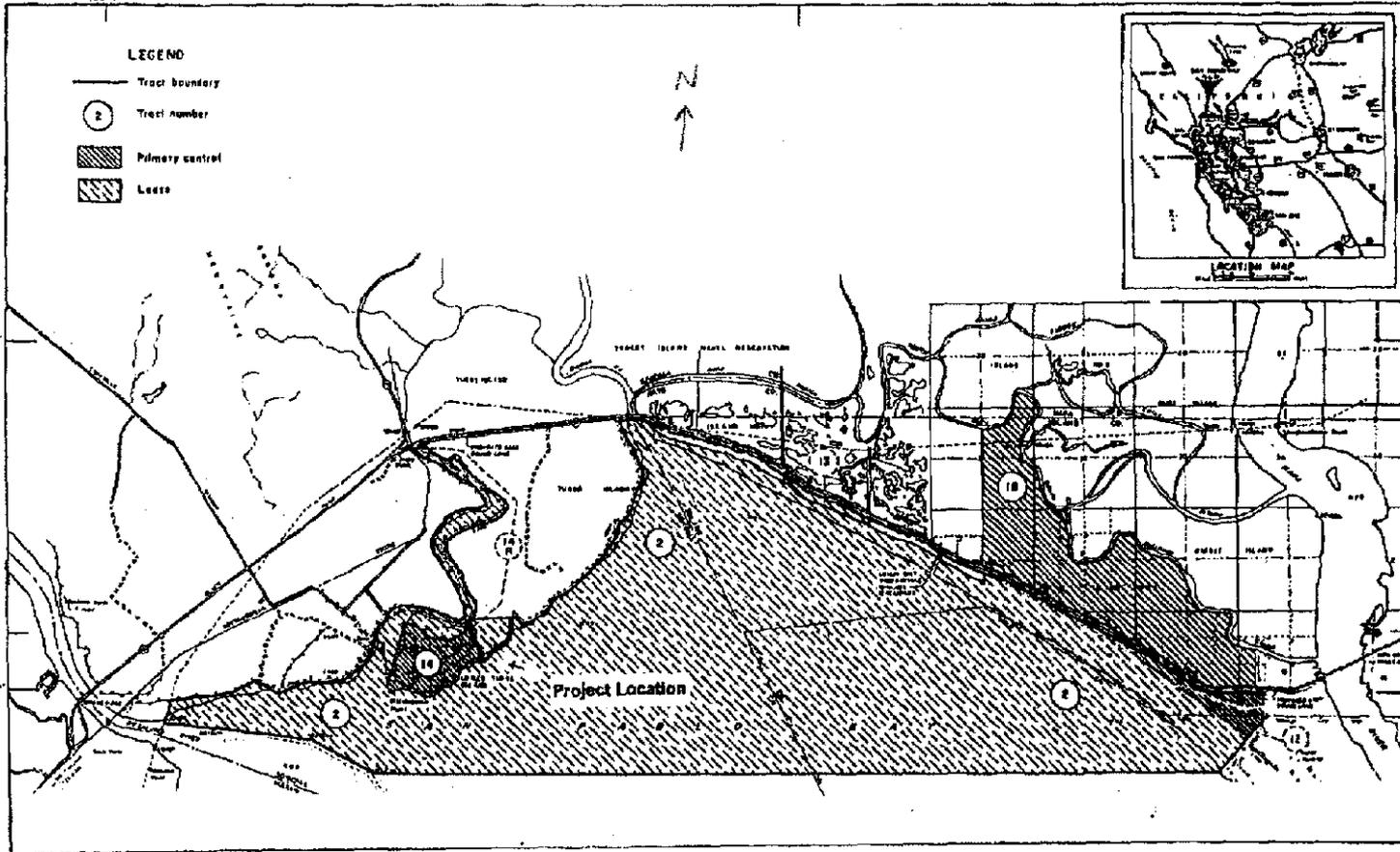
To Chris Kitting	From Louise Vicenello
Dept./Agency	Phone #
Fax # 510-885-4747	Fax # 707-562-3001
NSN 7540-01-517-7368	5099-101 GENERAL SERVICES ADMINISTRATION

PABLO BAY NATIONAL WILDLIFE REFUGE
SOLANO AND SONOMA COUNTIES, CALIFORNIA

UNITED STATES
FISH AND WILDLIFE SERVICE

UNITED STATES
DEPARTMENT OF THE INTERIOR

02° 02' R. 5 W. R. 4 W.



A.
Figure 1. Location of Lower Tubbs Island Maintenance and Tubbs Island Restoration Projects. (14)

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2

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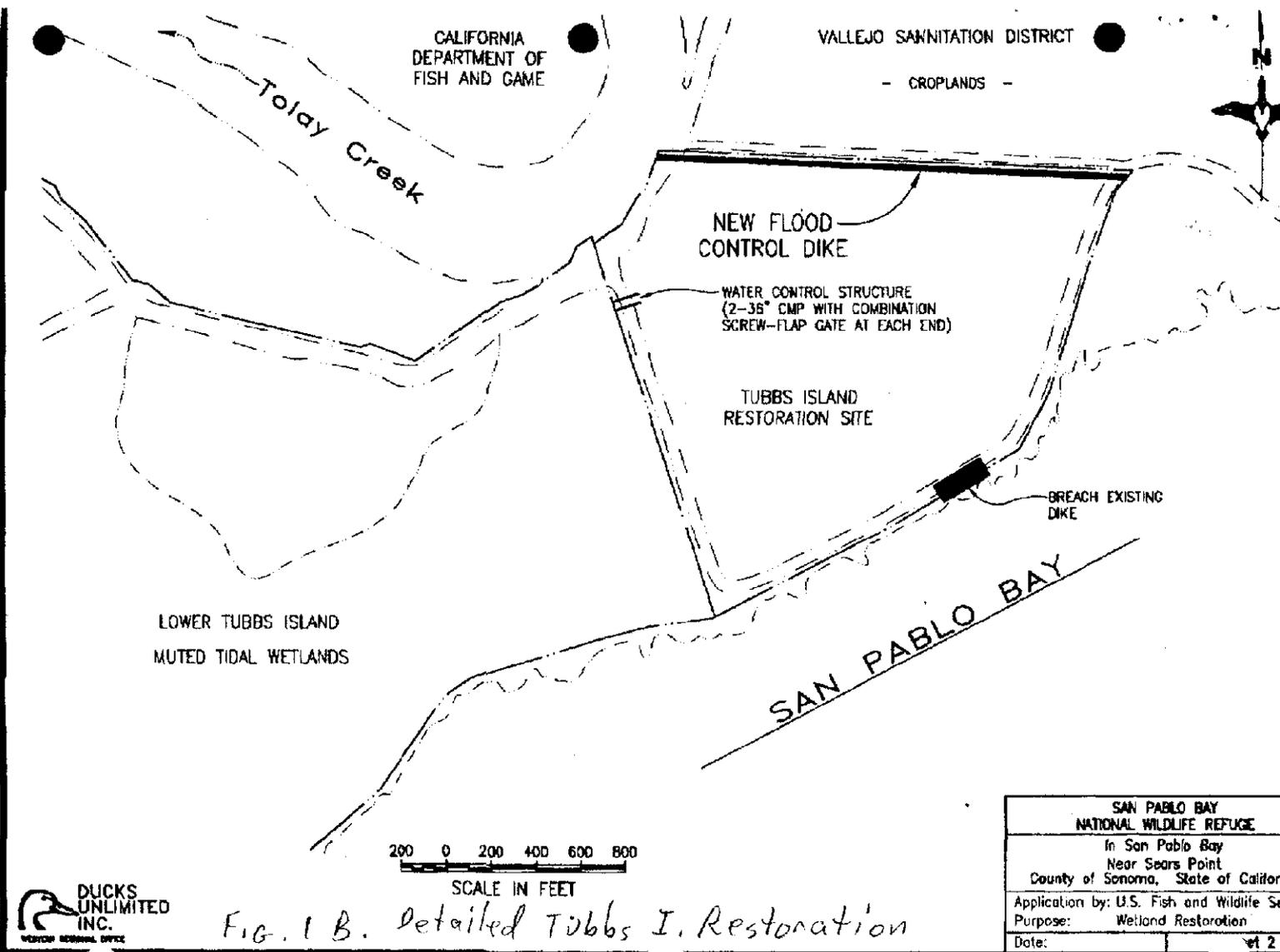
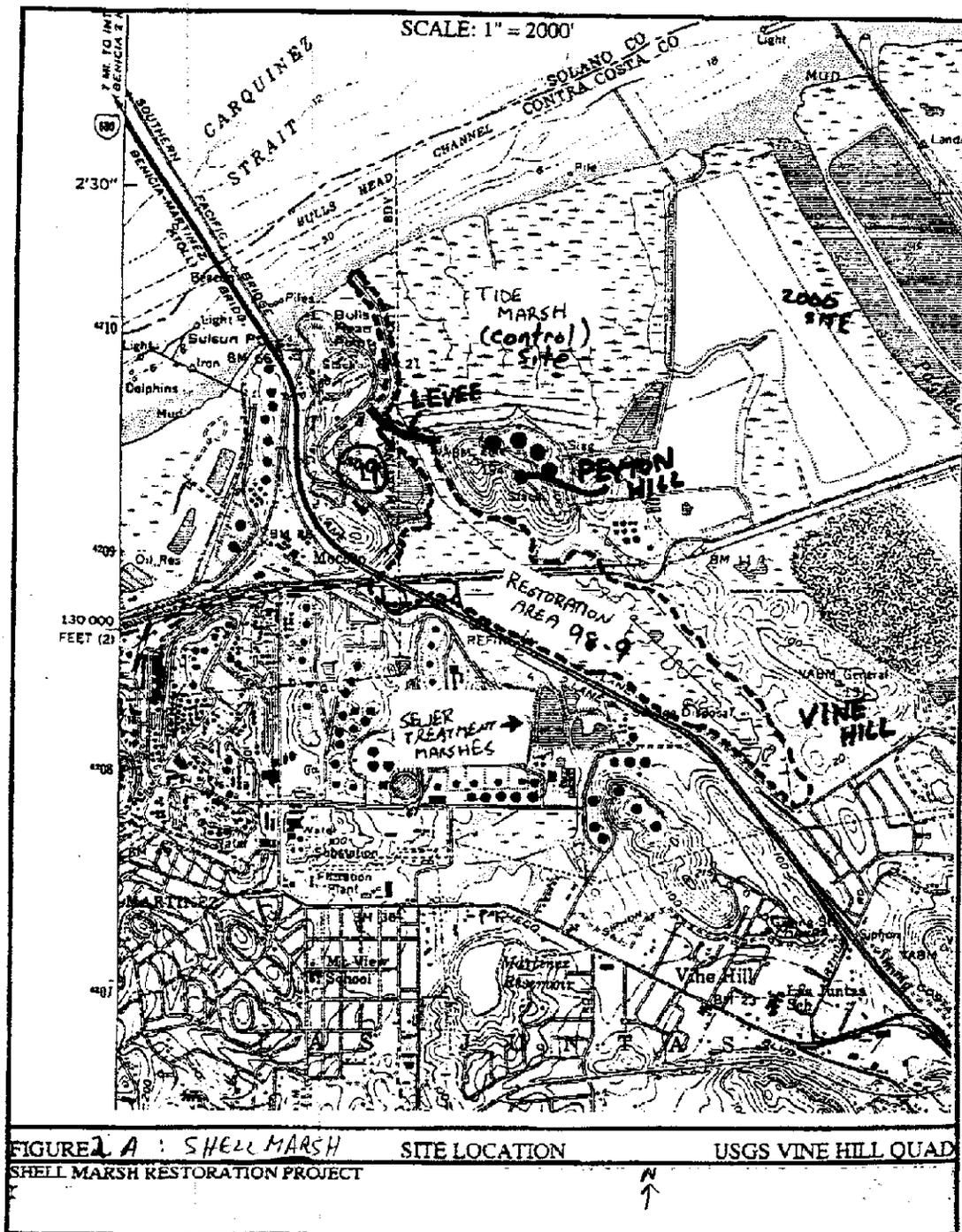


FIG. 1 B. Detailed Tubbs I. Restoration

SAN PABLO BAY NATIONAL WILDLIFE REFUGE	
In San Pablo Bay Near Sears Point County of Sonoma, State of California	
Application by: U.S. Fish and Wildlife Service	
Purpose: Wetland Restoration	
Date:	pt 2





2B The Point Edith Marsh Complex

Point Edith Restoration Project - Spring 1998 Progress Report