

# EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY

## Project Information

1. **Proposal Title:**

EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY

2. **Proposal applicants:**

CHRISTIAN C. ELIAS , Santa Clara Valley Water District  
PHIL RIEGER, ENVIRONMENTAL SCIENCE ASSOCIATES  
CRAIG BREON, SANTA CLARA VALLEY AUDOBON SOCIETY

3. **Corresponding Contact Person:**

CHRISTIAN C. ELIAS  
SANTA CLARA VALLEY WATER DISTRICT  
5750 ALMADEN EXPRESSWAY SAN JOSE, CA 95118  
408 265-2600  
celias@scvwd.dst.ca.us

4. **Project Keywords:**

**Fish, Anadromous  
Habitat Restoration, Riparian  
Nonnative Invasive Species**

5. **Type of project:**

Research

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

No

7. **Topic Area:**

Non-Native Invasive Species

8. **Type of applicant:**

Local Agency

9. **Location - GIS coordinates:**

Latitude: 37.36

Longitude: -121.82

Datum:

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

The proposed project will implement an adaptive management standard to evaluate the fisheries and fish habitat effects (benefits or impacts) of the eradication of non-native invasive plant species in riparian habitats. Concentrating on currently planned and independent funded *Arundo donax* (giant reed) removal projects in Santa Clara County, we propose to compare characterizations of fisheries habitat and populations before and after vegetation removal at selected project sites. Data would be collected from surveys of fish and invertebrate populations, and of water quality and sediment characteristics at locations where invasive species have substantially altered stream habitat. At a minimum, the proposed CALFED grant will provide useful, replicable and cost-effective information about the pre- and post-project conditions. It will be a major step in forming necessary future hypotheses and promoting future research to adaptively manage complex and costly restoration efforts.

**10. Location - Ecozone:**

Code 16: Inside ERP Geographic Scope, but outside ERP Ecozones

**11. Location - County:**

Santa Clara

**12. Location - City:**

Does your project fall within a city jurisdiction?

Yes

If yes, please list the city: San Jose

**13. Location - Tribal Lands:**

Does your project fall on or adjacent to tribal lands?

No

**14. Location - Congressional District:**

CA-16

**15. Location:**

**California State Senate District Number: 13**

**California Assembly District Number: 23**

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

2

17. **Requested Funds:**

a) Are your overhead rates different depending on whether funds are state or federal?

No

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

Single Overhead Rate: 106.03

Total Requested Funds: \$68,730.00

b) Do you have cost share partners already identified?

No

c) Do you have potential cost share partners?

No

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

No

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

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

No

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

Yes

If yes, identify project number(s), title(s) and CALFED program.

<b>61</b>	<b>Almaden Reservoir Watershed Restoration Project</b>	<b>CALFED Watershed Program</b>
<b>103</b>	<b>Stewardship Plans for the West Valley, Guadalupe, and Lower Penninsula Watersheds</b>	<b>CALFED Watershed Program</b>
<b>WUE01-046</b>	<b>Landscape and Agricultural Area Measurement and Water Use Budgets</b>	<b>CALFED Water Use Efficiency program</b>

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

**No**

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

No

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

No

**Please list suggested reviewers for your proposal. (optional)**

<b>PAUL AMOTO</b>	<b>SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD</b>	<b>510-622-2429</b>	<b>pa@rb2.swrcb.ca.gov</b>
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21. **Comments:**

# Environmental Compliance Checklist

## EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY

### 1. CEQA or NEPA Compliance

- a) Will this project require compliance with CEQA?

No

- b) Will this project require compliance with NEPA?

No

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

The proposed aquatic resource survey effort does not require either CEQA or NEPA compliance and will be conducted in conjunction with the SCVWD's invasive species removal activities, which have already received CEQA/NEPA review and compliance.

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

CEQA Lead Agency:

NEPA Lead Agency (or co-lead):

NEPA Co-Lead Agency (if applicable):

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

#### CEQA

- Categorical Exemption
- Negative Declaration or Mitigated Negative Declaration
- EIR
- None

#### NEPA

- Categorical Exclusion
- Environmental Assessment/FONSI
- EIS
- None

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

### 4. CEQA/NEPA Process

- a) Is the CEQA/NEPA process complete?

Not Applicable

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

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

#### **LOCAL PERMITS AND APPROVALS**

Conditional use permit

Variance

Subdivision Map Act

Grading Permit

General Plan Amendment

Specific Plan Approval

Rezone

Williamson Act Contract Cancellation

Other

#### **STATE PERMITS AND APPROVALS**

Scientific Collecting Permit      Required

CESA Compliance: 2081

CESA Compliance: NCCP

1601/03

CWA 401 certification

Coastal Development Permit

Reclamation Board Approval

Notification of DPC or BCDC

Other

#### **FEDERAL PERMITS AND APPROVALS**

ESA Compliance Section 7 Consultation

ESA Compliance Section 10 Permit

Rivers and Harbors Act

CWA 404

Other

#### **PERMISSION TO ACCESS PROPERTY**

Permission to access city, county or other local agency land. Required  
Agency Name: To be determined.

Permission to access state land.  
Agency Name:

Permission to access federal land.  
Agency Name:

Permission to access private land. Required  
Landowner Name: To be determined

**6. Comments.**

5. The SCVWD has access to stream habitat in which the project would occur. In areas that require access permission from private landowners, the SCVWD will obtain their permission for access and vegetation removal. This permission would include access and permission for the fisheries surveys proposed in this scope of work.

## **Land Use Checklist**

### **EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY**

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

No

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

No

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

No

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

This is a research and monitoring project

4. **Comments.**



# **Conflict of Interest Checklist**

## **EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY**

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

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

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

### **Applicant(s):**

CHRISTIAN C. ELIAS , Santa Clara Valley Water District  
PHIL RIEGER, ENVIRONMENTAL SCIENCE ASSOCIATES  
CRAIG BREON, SANTA CLARA VALLEY AUDOBON SOCIETY

### **Subcontractor(s):**

Are specific subcontractors identified in this proposal? No

### **Helped with proposal development:**

Are there persons who helped with proposal development?

Yes

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

**Leslie Moulton    Environmental Science Associate**

### **Comments:**

# Budget Summary

## EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY

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

### Independent of Fund Source

Year 1												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	Site Selection				250		7280		500	8030.0		8030.00
2	Pre-project surveys				1500		15800	3,000	250	20550.0		20550.00
3	Post-project Surveys									0.0		0.00
4	Data Analysis						2,400		100	2500.0		2500.00
5	Report Preperation									0.0		0.00
		0	0.00	0.00	1750.00	0.00	25480.00	3000.00	850.00	31080.00	0.00	31080.00

Year 2												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Year 3												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	Site selection									0.0		0.00
2	Pre-project Surveys									0.0		0.00
3	Post-Project Surveys				1500		14600	3000	250	19350.0		19350.00
4	Data Analysisl						8000		250	8250.0		8250.00
5	Report Preparation				200		8600		1250	10050.0		10050.00
		0	0.00	0.00	1700.00	0.00	31200.00	3000.00	1750.00	37650.00	0.00	37650.00

**Grand Total=68730.00**

**Comments.**

## **Budget Justification**

### **EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY**

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

These are matching contributions by the Santa Clara Valley Water District.

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

Marc Klemencic 100 hours \$156/hour

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

Marc Klemencic In house District Labor (32.19% benefit)

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

\$1,700 for consultant travel, primarily for tasks 2 and 3, pre- and post- plant removal project surveys (involving approximately 30 field survey days), and also for team meetings at key milestones.

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

\$0.00

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

Consultant = Environmental Science Associates (ESA): All tasks to be performed are listed in the attached PDF file. Estimated consultant staff hours total 832. Hourly rates are: Technical Associate II @ \$115/hour = Phil Reiger (Project Manager); Senior Associates @95/hour = Mike Podlech and Brian Pittman; Field Technician @ \$70/hour; and WP/Graphics staff @ \$75/hour.

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

NA - Equipment costs shown are for leasing of electro-shocker equipment and microscope.

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

Santa Clara Valley Water District will manage this Project at a cost of \$15,600, which represents approximately 20% committed by the District.

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

\$1,750 is budgeted for other direct costs which include report printing, communications, and acquisition of aerial photographs.

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

Santa Clara Valley Water District's overhead rates include costs associated iwht general office requirements such as rent, phones, furniture, general office staff, accounting, human resources,payroll, purchasing, vehicle pool, etc. at 73.84%.

## **Executive Summary**

### **EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY**

The proposed project will implement an adaptive management standard to evaluate the fisheries and fish habitat effects (benefits or impacts) of the eradication of non-native invasive plant species in riparian habitats. Concentrating on currently planned and independent funded *Arundo donax* (giant reed) removal projects in Santa Clara County, we propose to compare characterizations of fisheries habitat and populations before and after vegetation removal at selected project sites. Data would be collected from surveys of fish and invertebrate populations, and of water quality and sediment characteristics at locations where invasive species have substantially altered stream habitat. At a minimum, the proposed CALFED grant will provide useful, replicable and cost-effective information about the pre- and post-project conditions. It will be a major step in forming necessary future hypotheses and promoting future research to adaptively manage complex and costly restoration efforts.

# **Proposal**

**Santa Clara Valley Water District**

## **EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY**

CHRISTIAN C. ELIAS , Santa Clara Valley Water District  
PHIL RIEGER, ENVIRONMENTAL SCIENCE ASSOCIATES  
CRAIG BREON, SANTA CLARA VALLEY AUDOBON SOCIETY

## CALFED ERP PROPOSAL

### EFFECTS OF RIPARIAN NON-NATIVE INVASIVE SPECIES REMOVAL ON FISHERIES IN SANTA CLARA VALLEY

#### A. Project Description

The proposed project will develop and implement an adaptive management standard that will evaluate the restoration benefits of eradicating non-native invasive species. This project provides an instrument for the CALFED Multi-species Conservation Strategy and Implementation Plan to truly assess the benefits of implementing a variety of stream restoration projects.

#### *Problem*

The presence of non-native plant species in riparian corridors has long been considered an unmitigated malady, with eradication the only cure. The commonly held land management opinion regarding its effect on wildlife is reflected in such positions as the California Native Plant Society's statement of policy for wetlands, Adopted August 1991:

*Non-native plants modify wildlife habitat, altering the species composition, sometimes drastically. Riparian areas, which are crucial breeding and foraging areas for both common and endangered birds, have become dominated by giant reed grass and salt cedar. Many species of birds don't use stands of these species in part because they support few insects, so food supply for insectivorous birds is poor.*

For aquatic resources the consensus is not as clear. *Arundo donax* (giant reed, giant cane), a non-native invasive species, is considered to alter stream morphology and cause deflection of flows and bank erosion, but the contention is more a hypothesis than a consensus at this time. Associating giant reed removal with aquatic, and especially fisheries habitat, improvement is not yet an established restoration principle. It has, however, begun to appear more and more frequently as mitigation in California Environmental Quality Act (CEQA) documents and as a focus of the restoration activities of non-profit conservation groups.

At the same time, not all fisheries biologists believe that all giant reed removal is an unalloyed benefit (Abel, SCVWD, Personal Communication, October 2001).

In the Santa Clara Valley, invasive species are present in every watershed. Non-native species removal is contemplated for several wide-ranging mitigation programs, including two involving the Santa Clara Valley Water District (SCVWD): the Stream Maintenance Program's *Giant Reed Control Mitigation and Monitoring Plan* and the Santa Clara Valley Audubon Society's associated *Invasive Plant Monitoring Project*. These efforts are driven by mitigation requirements for vegetation management by SCVWD. Vegetation removal may well also appear as a component of actions recommended by the



SCVWD's Fisheries and Habitat Collaborative Effort (FAHCE), which has an emphasis on the restoration of anadromous fisheries.

The CALFED Ecosystem Restoration Plan (ERP), Multispecies Conservation Strategy (MSCS) and ERP Implementation Plan have identified goals, objectives, and priorities for the protection, management, and restoration of aquatic habitats. The presumptive benefits of giant reed removal may be straightforward and defensible; removal might not achieve its goals; a removal program may have unintended consequences. The objective of this study is to develop models of stream response to giant reed removal that can be used in future management and restoration of riparian and stream ecosystems.

Specifically, this study proposes to estimate the effects of non-native invasive plant removal, primarily giant reed and tamarisk (*Tamarix* sp.), on local fisheries resources. We propose to derive information for this determination by comparing characterizations of fisheries habitat and populations before and after vegetation removal at selected project sites. Data that provide these characterizations would be collected from surveys of fish and invertebrate populations and of water quality and sediment at locations where extensive growths of giant reed and other invasive species have substantially altered stream habitat in Santa Clara Valley.

### ***Justification***

Riparian and stream habitats, and the fluvial processes that determine the structure and function of those habitats, have been severely modified due to anthropogenic land use modifications. Beyond dams and diversions, stream channels have been straightened, cleared and stabilized. As a secondary phenomenon, non-native plants arrived to colonize the new niches provided. The result has been streams without multiple aquatic, emergent and hydrophytic plants, and with a simplified physical structure. The natural processes of sedimentation and erosion have been inadvertently re-designed in many places toward the support of single-species stands, many times consisting of giant reed. CALFED has identified the need for Ecosystem Restoration to benefit plant and animal species through the restoration of their habitats and returning the ecological processes that allow these species to become self-maintaining.

Restoration programs, viewed objectively, are just another form of landscape manipulation. Without a better understanding of how restoration itself affects stream systems and the development of appropriate monitoring protocols, the removal of giant reed and other non-native plants runs the risk of joining other failed stream improvement programs of the past.

### ***Approach***

The objective of the study is to estimate the effects of non-native invasive riparian plant removal, primarily giant reed, on local fisheries resources. We will coordinate closely with the Santa Clara Valley District's on-going invasive species removal and stream management effort and the Santa Clara Valley Audobon Society's invasive species mapping program. We propose to derive information for this determination by

comparing characterizations of fisheries habitat and populations before and after vegetation removal at selected project sites. Data that provide these characterizations would be collected from surveys of fish and invertebrate populations and of water and sediment quality at locations where extensive growths of giant reed and other invasive species have substantially altered stream habitat.

### **Task 1 – Site Selection**

Removal of non-native vegetation in the SCVWD watersheds is proposed to begin in 2001 and continue for at least ten years as a long-term removal/maintenance program. An initial phase of the District's program will be to map and quantify invasive non-native species, particularly, giant reed (the mapping is not to be funded through this CALFED grant). Under this scope of work, we would select a representative group of proposed removal sites to compare fisheries information pre- and post-removal from analysis of vegetation maps and field reconnaissance. Approximately twelve (12) sites are envisioned to provide sufficient data for comparisons. Sites would be selected that have sufficient giant reed growth to allow for a substantial alteration in the stream habitat from the removal operation (i.e., where fisheries effects are most likely, as opposed to small, isolated sites where effects would be minimal). An attempt may be made to select sub-sets of habitat types for analysis – i.e., four replicates of three kinds of site scenarios – if the sites are available for such a stratified approach. Within each sub-set, or within the entire set of sites, an attempt to select sites with basic pre-project similarities would determine the selection process.

### **Task 2 - Pre- project Surveys**

Pre-project surveys would be conducted in late summer 2002 prior to giant reed eradication. Data would be gathered for pre- project surveys using the methods as described under Task 3.

### **Task 3 - Post-project Surveys**

We propose to conduct the post-project surveys in late summer 2004 – the year following the giant reed removal. Data would be gathered for post- project surveys using the following methods.

*Fish Surveys and Analysis.* Fish surveys would be conducted with a hand-held “backpack” electrofishing unit and/or a standard two-person beach seine. The exact collection strategy will be developed upon examination of the variety of habitats to be sampled. Sampling protocol would be established as appropriate to each or all study sites to provide a well-defined Catch Per Unit of Effort (CPUE) for each sample to ensure equal treatment of observations both within and among sample sites (see replicates below). Fish collected would be identified and measured. Size/age structure of all species would be estimated from these data. Changes in fisheries populations would be assessed primarily from comparisons of fish structure attributes from pre- and post-project surveys in the project area(s). Attributes would be selected to allow results to

estimate any detrimental or beneficial effects on any fishes found in the area – emphasis would be placed on native resident and anadromous species. Fish surveys (and other surveys noted below) would be conducted in late summer or fall to allow samples to include easily recognition young-of-year (YOY) fish for accurate population age structure characterizations and because of generally more favorable sampling conditions (i.e., less flow).

*Invertebrate Surveys and Analysis:* Invertebrate collections and characterizations would be made according to EPA Rapid Bioassessment Protocol (RBP). These protocols provide field techniques and analytical guidelines for evaluations of stream invertebrates that do not require expensive laboratory species-level identification. Identification to order or family taxonomic level is performed in the field, and a set of analysis procedures provide a summary characterization of the population in the form of indices for comparison. Indices can be compared to other sites to show differences in populations, or, to “ideal” or “representative” indices, for an indication of impairment, improvement, or other factors that may be influencing the populations. We propose to compare several indices of invertebrate population health at each study site from before and after surveys of the project area(s) as evidence of changes in the invertebrate populations in the study area.

*Water and Sediment Quality Monitoring:* A variety of water and sediment quality parameters would be measured at the time and location of each fish and invertebrate survey. A variety of watershed activities and normal background variability in water quality will probably obscure localized long-term water quality effects of vegetation removal at an isolated location along a stream corridor. It is, however, important to know the water quality conditions at survey sites as evidence that water quality, rather than vegetation removal, is not affecting observed changes in fish or invertebrate populations. Conversely, temporary contamination from an upstream source, unrelated to the vegetation removal, might degrade water or sediment quality at a survey site and depress fish or invertebrate populations regardless of onsite vegetation changes. Without knowledge of potential water quality causes and effects from other sources, the change in biota might be attributed to the vegetation removal creating poor habitat. Water quality would be characterized at each study location and time through measurements of temperature, dissolved oxygen, pH, turbidity, and % fines in sediment samples.

#### **Task 4 - Data Analysis**

Each project location survey would be represented by three replicates of each sample. Each replicate sample would be collected from different locations within a feasible area of effect at that removal site. The replicates would allow statistical analysis of differences in fish populations, invertebrate indices, or water quality between each site before and after the removal operations. Evidence of changes in fisheries populations or habitat would be made from the significance of any differences in performance measures as estimated from the statistical analysis. We propose to use Analysis of Variance (ANOVA) methodology to show the significance of any observed differences.

## **Task 5 – Report Preparation**

We will prepare a written report, with appropriate text and graphics, to present the methods, findings and conclusions of the analysis. We will prepare a draft report for District and agency review and incorporate comments to prepare a final study report. We will prepare 25 copies of the final report for distribution.

### ***Feasibility***

The vegetation removal project will occur at numerous locations along several streams in the Santa Clara Valley. From among the twelve sites proposed for evaluation, there will likely be some variability in transition from pre to post project conditions – we may choose sites purposefully to attempt to capture more than one likely habitat response. Many sites may require repeated applications over a period of years to manage and control invasive species, and other sites may stabilize very quickly. The ultimate selection of sample sites will depend upon the relative occurrence and availability of the variety of kinds of habitats where vegetation removal is planned. As such, we expect that our twelve sites may provide a mix of responses to the vegetation removal. While this mix may dilute our sample size within one treatment (i.e., one kind of removal response), that scenario will provide for a representative range of likely treatment scenarios to measure. We expect that the twelve sites will result in at least three samples from similar post-project scenarios – and that each of these groups will contain at least three sub-samples. This design would require only nine total sample sites; we have, however, allocated a study for twelve sites to allow for up to three sites that may not provide replicable circumstances for comparison.

Santa Clara Valley encompasses streams with known or historic steelhead populations. Steelhead responses to vegetation removal are unknown, and a focus on the estimates of any changes would be to estimate that change on steelhead populations or habitat in the area. A permit to sample fish population in steelhead streams is required from California Department of Fish and Game (CDFG) and National Marine Fisheries Service (NMFS). These permits would be required prior to implementation of the study. The SCVWD has access to stream habitat in which the project would occur; in areas that require access permission from individual landowners, the SCVWD would obtain their permission for access and vegetation removal. This permission would include access and permission for fisheries surveys.

### ***Performance Measures***

The objective of the study is to determine what kinds of effects the removal of non-native invasive riparian vegetation (primarily giant reed, some tamarisk) has on fisheries populations and habitat. Changes in fisheries populations would be directly estimated and described from comparisons of population attributes before and after project implementation. Population attributes will be compared from replicated samples of relative occurrence (i.e., from CPUE) of each species and age class. An ANOVA would determine the significance of any differences between any levels of occurrence or proportion of size classes.

Invertebrate samples would provide indices that are designed to numerically quantify the “health” of the sample population. The RBP analysis provides indices designed for comparative analysis. The indices will be compared from pre- and post- project samples to determine any changes in invertebrate population. Any observed changes in invertebrate populations will supplement fish change data to further describe and understand any differences observed (or not observed) in the fish populations.

Water quality information would supplement observed changes in fish populations or invertebrates by substantiating whether water quality or other factors (i.e., direct responses to habitat alterations from the vegetation removal) are consistent with observed changes in fish or invertebrate populations.

### ***Data Handling and Storage***

Field data would be collected on permanent field data forms then entered into a computer spreadsheet for archive and future data retrieval. Site selection criteria, summaries of field raw data, and analysis would be provided in a study report. If the results of this study are determined valuable to the decision-makers, then attempts will be made to publish the results in appropriate professional journals and/or present them at meetings and seminars.

### ***Expected Products/Outcomes***

Adaptive management is a process that allows the development and implementation of land management in the face of some degree of biological and socioeconomic uncertainty. It embraces two basic tenets:

1. A commitment to a continual learning process, a reiterative evaluation of goals and approaches, and redirection based on an increased information base (Jensen et al., 1996); and
2. Explicit hypotheses about system structure and function, and about anticipated ecosystem response (Walters, 1986).

Implementing policies as experiments is an innovation in resource management. Like any method, the adaptive approach implies revised ends as well as novel means: as its name implies, adaptive management promotes learning to high priority in stewardship (Lee, 1999).

There are uncertainties about both the benefits of exotic vegetation removal and in any system that attempts to track cause and effect. At a minimum, this proposed CALFED grant will provide useful, replicable and cost-effective information about SCVWD’s actions at the baseline and immediate post-project stages. While not promising to explicitly and fully test the hypothesis of anticipated outcomes, it will be a major step in *forming* necessary future hypotheses and promote future research in adaptively managing these complex expensive and restoration efforts.

### ***Work Schedule***

The proposed project will be completed in three years. The proposed schedule can be achieved and takes into consideration appropriate review processes for sampling permits, participation by SCVWD management and staff, and minor changes in scheduling of removal efforts.

### **B. Applicability to CALFED ERP and Science Program Goals and Implementation Plan and CVPIA Priorities**

#### ***ERP, Science Program and CVPIA Priorities***

Goal 2: Ecosystem Processes and Biotic Communities

Goal 4: Habitats- Protect, restore functional habitat types

#### ***Relationship to Other Ecosystem Restoration Projects***

For many years and in some detail, the SCVWD has been studying the fisheries and habitats of the streams under its jurisdiction. As noted above, the SCVWD will be implementing a Giant Reed Control Mitigation and Monitoring Plan and will be finalizing the Fisheries and Habitat Collaborative Effort (FAHCE) in 2002, which will attempt to implement habitat improvement projects to compensate for the effects of water management in a major, and rapidly urbanizing, San Francisco Bay watershed. These efforts, independently funded, will bear a close relationship to the proposed project and will be enriched by its results.

#### ***System-Wide Ecosystem Benefits***

This project will address actions being taken on wetland habitat issues throughout the Delta and Bay Regions. The results of the studies will assist land managers in planning (and justifying) restoration projects which involve vegetation manipulation--but which equally affect streams and their biotic resources.

### **C. Qualifications**

**Dr. Phillip Rieger** is ESA's Senior Fisheries Biologist with experience on several California and Bay Region stream systems. He will serve as project manager for this study. His relevant impact assessment experience includes fisheries assessment (including special status anadromous species) for water supply diversion on the Russian River, for dam and sediment removal and restoration on the Merced River and Alameda Creek, and analysis for several hydroelectric project re-licensing procedures. Dr. Rieger is now beginning work with Santa Clara Valley Water District to prepare an EIR/EIS on its overall fisheries management program. Dr. Rieger's academic qualifications include: Ph.D. Fisheries Biology, Iowa State University, 1995; M.S. Aquatic Ecology, Oklahoma State University, 1976; and B.S. Biology & Geography, NW Okla. State. College, 1974.

**Mr. Podlech**, Aquatic Ecologist, has experience in the investigation of biological, physical, and chemical conditions of streams, rivers, lakes, and lagoons throughout

Northern California. He has extensive experience in the identification of sensitive aquatic resources, habitat assessments, stream restoration, impact analyses, and compliance monitoring. He is also a highly qualified aquatic entomologist skilled in the use of benthic invertebrates as indicators of environmental disturbance. He is currently working on the San Francisquito Creek Bank Stabilization and Revegetation Plan, analyzing ways to optimize the restoration design for steelhead habitat enhancement. His academic qualifications include: M.S., 1996, Aquatic Ecology, University of San Francisco; B.S., 1993, Environmental Science, University of San Francisco. He also holds a California Department of Fish & Game Permit # 801041-03 (including electrofishing MOUs).

Brian Pittman, Senior Ecologist, has expertise in wildlife and restoration ecology, and environmental law. He received a master's degree from San Jose State University in Environmental Studies; his master's thesis focused on ecological restoration in San Francisco Bay Area wetlands. He has fisheries and fish habitat assessment experience including instream steelhead and salmon monitoring and habitat assessments using portable electro-fishing equipment in Scott Creek and Waddell Creek, Santa Cruz County and electro-fishing surveys of San Lorenzo Creek in Hayward in support of endangered species permitting for the Livermore-Amador Valley Water Management Agency's Export Pipeline Facilities Project. For a wetland restoration project in the North Bay, he conducted a multi-year baseline analysis of vertebrate and aquatic species in North Slough. Fish species (including steelhead) were collected in several portions of this estuarine slough using a large seine. Mr. Pittman also examined both inbenthic (soil living) and pelagic (free swimming) invertebrate populations using a grab sampler and plankton net and performed species identifications. His academic experience includes: M.S., Environmental Studies, San Jose State University; and B.A., Biology, University of California, Santa Cruz. He also holds a California Scientific Collecting Permit #801090-01 and has taken a Wetland Delineation Training Course, U.S. Army Corps of Engineers.

#### **D. Cost**

The total cost of this proposal will be \$68,730 and include a three-year program to develop and implement the tasks identified in this proposal.

No other funding commitments or cost-sharing are proposed for this work. The Santa Clara Valley Water District and the Santa Clara Valley Audubon Society will provide project management oversight without compensation through this grant.

#### **E. Local Involvement**

The principal applicant is the Santa Clara Valley Water District of Santa Clara County, California. The proposal team will coordinate with the Santa Clara Valley Audubon Society and its Invasive Plant Monitoring Project.

**F. Compliance with Standard Terms and Conditions**

The project will comply with all state and federal terms and conditions as identified in the CALFED Proposal Solicitation Package Attachments D and E.

**G. Literature Cited**

Jensen, M.E., Bourgeron. P., Everett, R. and I. Goodman, 1996. Ecosystem Management: A Landscape Ecology Perspective. Water Resources Bulletin. Vol. 32 (2), pp. 203-216.

Lee, K. N. 1999. Appraising adaptive management. Conservation Ecology 3(2): 3.

Walters, C. 1986. Adaptive Management of Renewable Resources. Macmillan, New York.