

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

Project Information

1. Proposal Title:

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

2. Proposal applicants:

Keith Swanson, California Department of Water Resources, Division of Flood Management

3. Corresponding Contact Person:

Keith Swanson
Dept. of Water Resources-DFM
3310 El Camino Ave. Sacramento, CA 95821
916 574-1302
kswanson@water.ca.gov

4. Project Keywords:

**Flood Plain and Bypass Management
Habitat Restoration, Riparian
Nonnative Invasive Species**

5. Type of project:

Implementation_Full

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:

State Agency

9. Location - GIS coordinates:

Latitude: 38.7222481

Longitude: -121.7912750

Datum:

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

Project location is banks and channel of lower Cache Creek in Yolo County, CA. North of Woodland, from 2 miles upstream of I-5 Crossing to intersection of Cache Creek with RD 102.

10. Location - Ecozone:

10.1 Cache Creek

11. Location - County:

Yolo

12. Location - City:

Does your project fall within a city jurisdiction?

No

13. Location - Tribal Lands:

Does your project fall on or adjacent to tribal lands?

No

14. Location - Congressional District:

3

15. Location:

California State Senate District Number: 4

California Assembly District Number: 2

16. How many years of funding are you requesting?

3

17. Requested Funds:

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

No

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

Single Overhead Rate: 102

Total Requested Funds: 1809000

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?

No

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

No

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

No

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

No

Please list suggested reviewers for your proposal. (optional)

- 21. Comments:**

Environmental Compliance Checklist

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

1. CEQA or NEPA Compliance

- a) Will this project require compliance with CEQA?

Yes

- 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.

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

CEQA Lead Agency: CA Department of Water Resources

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.

Maintenance of this channel precedes CEQA and is statutorily exempt.

4. CEQA/NEPA Process

- a) Is the CEQA/NEPA process complete?

No

If the CEQA/NEPA process is not complete, please describe the dates for completing draft and/or final CEQA/NEPA documents.

Notice of exemption will be filed if proposal is funded.

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

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

LOCAL PERMITS AND APPROVALS

Conditional use permit

Variance

Subdivision Map Act

Grading Permit

General Plan Amendment

Specific Plan Approval

Rezone

Williamson Act Contract Cancellation

Other

STATE PERMITS AND APPROVALS

Scientific Collecting Permit

CESA Compliance: 2081

CESA Compliance: NCCP

1601/03	Obtained
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CWA 401 certification

Coastal Development Permit

Reclamation Board Approval Required

Notification of DPC or BCDC

Other

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation

ESA Compliance Section 10 Permit

Rivers and Harbors Act

CWA 404

Other

PERMISSION TO ACCESS PROPERTY

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

Agency Name:

Permission to access state land.

Agency Name:

Obtained

Permission to access federal land.

Agency Name:

Permission to access private land.

Landowner Name:

6. Comments.

5. Necessary permits will be obtained by DWR. DWR has an 1601 MOU with CFG for flood maintenance projects. Working in the proximity of listed Elderberry bushes may require informal consultation with USFS, although none are planned for removal. Regional water quality permits, if required will be obtained. Area is covered under nation-wide 404

Land Use Checklist

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

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).

Work will be in the order of past flood control vegetation removal procedures, planting procedure should not alter the landscape from it's present use.

4. **Comments.**

Conflict of Interest Checklist

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

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):

Keith Swanson, California Department of Water Resources, Division of Flood Management

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):

Margie Graham DWR

Earle Cummings DWR

Al Romero DWR

Keith Swanson DWR

Jan Lowrie Cache Creek Conservancy

Rod Mayer DWR

Comments:

The listed individuals helped contribute to the plan by furnishing information, answering questions, reviewing documents, and encouragement.

Budget Summary

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

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

State Funds

Year 1												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	removal	2632	68494	11644		20000	383000	50000		533138.0	69862	603000.00
		2632	68494.00	11644.00	0.00	20000.00	383000.00	50000.00	0.00	533138.00	69862.00	603000.00

Year 2												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	removal	2632	68494	11644	0	20000	383000	50000		533138.0	69862	603000.00
		2632	68494.00	11644.00	0.00	20000.00	383000.00	50000.00	0.00	533138.00	69862.00	603000.00

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	removal	2632	68494	11694	0	20000	383000	50000		533188.0	69862	603050.00
		2632	68494.00	11694.00	0.00	20000.00	383000.00	50000.00	0.00	533188.00	69862.00	603050.00

Grand Total=1809050.00

Comments.

Budget Justification

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

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

Due to restricted periods (high water and rainy days) the estimated working period/year is about 9 months or 1584 hrs for each member of crew of 20.

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

Supervision 20.00/hr Labor 10.00/hr Consultants 55.00/hr

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

Estimate 10% for all classes/ staff benefits 10% for all classes/ indirect

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

No non-local travel costs are anticipated.

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

Chain saws 3 ea. \$1,200 Pole saws 10 ea. 200 Axes 10 ea 800 Shovels 10 ea 150 Misc safety 4,000
Ladders 4 ea 3,000 Ropes 1,000 gas 25 gal 50 oil 5 gal 80 herbicides 40 gal 3,600 office misc 1,000

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

Environmental staff will perform educational programs, attend watershed meetings, map occurrences of NIS, write reports, develop re-vegetation plan 55.00/hr

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.

dump truck 10 cu/yd. wood and brush chipper various transportation vehicles

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

engineering environmental services records management supervision 150,000/yr

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

native seeds and nursery plant stock- will be purchased from other funds not in budget proposal.

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.

support staff records management DWR management

Executive Summary

Combining Removal and Management of Tamarix spp. and Arundo donax with Flood Control Operations and Maintenance

Summary The purpose of this proposed project is to implement a non-native invasive species (NIS) removal program with flood channel maintenance activities. These two objectives can be consistent with one another. On Cache Creek, in Yolo County, California, two NIS, *Arundo donax* and *Tamarix* spp. are contributing to channel constriction, effecting stream velocities, and deflecting flood flows. NIS exclude native plants, degrade natural plant communities, promote faunal change and reduce biological diversity; fundamentally altering the riparian system. Since *Arundo* and *Tamarix* are so aggressive, Department of Water Resources, Division of Flood Maintenance (DFM) needs to undertake a massive removal and management program on Cache Creek. CALFED has funded *Tamarix* and *Arundo* removal programs upstream of the area DFM must maintain. DFM proposes to remove *Tamarix* and *Arundo* in the channel and on the banks and levees of a seven mile reach of Cache Creek. Removal methods will combine manual, mechanical, and chemical treatments over a three-year period. Where NIS have been removed, native species including grasses and low growing shrubs that still allow for levee inspection and flood fighting will be replanted. It has been determined that certain areas can be replanted with trees and red willow where they will not impede flood fighting capability. Other first year work will include plan development, and identifying suitable sites for tree and willow placement. Post-removal monitoring and follow-up treatments will be performed. Work with upstream and local interests to continue to develop plans and best methods for NIS management and removal on Cache Creek.

Proposal

California Department of Water Resources, Division of Flood Management

**Combining Removal and Management of Tamarix spp. and Arundo donax with
Flood Control Operations and Maintenance**

Keith Swanson, California Department of Water Resources, Division of Flood
Management

COMBINING REMOVAL AND MANAGEMENT OF *TAMARIX* SPP. AND *ARUNDO DONAX* ON CACHE CREEK WITH FLOOD CONTROL OPERATIONS AND MAINTENANCE

1. Project Description

Background

The Department of Water Resources (DWR) is responsible for maintaining at State expense certain channels of the major and minor tributaries of the Sacramento River. The California Water Code requires that DWR maintain and operate the levees of Cache Creek and the easterly and westerly levees of Cache Creek Settling Basin. In the Water Code, Cache Creek is classified as a “designated floodway” and DWR is charged with clearing and freeing these channels of debris as part of operation and maintenance duties. Channel clearing, debris removal, and levee maintenance practices can be incorporated with removal and management of noxious plant species and the restoration of native habitat.

The banks of Cache Creek have experienced great erosion and loss of native vegetation for the last several decades and especially as a result of flooding in 1983 and 1986. After 1986, a seven-year drought compounded the loss of native vegetation and aided the spread of *Arundo donax* and *Tamarix* spp. and other noxious plant species. These two non-native invasive species (NIS) have become well established on Cache Creek and shed hundreds of thousands of seeds per plant and sprout from small stem fragments. Star thistle (*Centaurea sp.*), tumbleweed (*Salsola sp.*), and tree tobacco (*Nicotiana glauca*) have also been noted to occur within this reach, although not to the extent that *Tamarix* and *Arundo* have. These tall resistant invaders will increase channel constriction, have an effect on stream velocities, and randomly deflect flood flows (See figure 1).

The State Reclamation Board policy states that vegetation on levees must not obscure or interfere with levee integrity inspections or with flood fighting activities. *Tamarix* spp. and *Arundo* grow quickly and will block structural inspections. Department of Water Resources, Division of Flood Management is proposing that CALFED help fund NIS removal and post-removal revegetation for lower Cache Creek. It is in the interest of DWR’s long-term flood management objectives to remove both of these two species as part of their flood channel maintenance activities and control re-establishment by implementing a revegetation plan and cooperating with other organizations with the same goals.



Figure 1. *Tamarix* and *Arundo* in Cache Creek constrict channels, effect stream velocities, and randomly deflect flood flows.

Watershed Partners

Tamarix and *Arundo* removal and management programs have been undertaken by several organizations and government agencies that have jurisdiction or interests in the Cache Creek watershed. Yolo County, Yolo County Flood Control Agency, Yolo Resource Conservation District, the Wildlife Conservation Board, Bureau of Land Management, the Cache Creek Conservancy, local landowners, and others are involved in efforts to remove these plant pests from the watershed. DWR's involvement in this effort will lend continuity by expanding the effort into the reach that it maintains.

Expanding the scope of exotic plant eradication on Cache Creek is in accordance with CALFED goals for the Sacramento Region. This proposal is a feasible method to prevent the spread of and control or reduce the impacts of non-native species within the region. The Cache Creek Conservancy obtained a CALFED grant for this purpose in 1999 and has begun its work. The Capay Valley Watershed Improvement Program will apply this year for a similar grant. The Department of Water Resources, Division of Flood Management proposes to partner with the agencies and groups listed above in *Tamarix* and *Arundo* removal.

The Proposed Project

The Department of Water Resources (DWR), Division of Flood Management proposes to remove approximately seven miles of Tamarix and Arundo on the banks and in the channel of lower Cache Creek. This reach lies directly north of the town of Woodland. The north bank of Cache Creek is leveed, from 2 miles upstream of Interstate 5 to five miles downstream to the Cache Creek Settling Basin (see Figure 2) with maintenance and flood protection performed by DWR.

Since DWR is responsible for channel maintenance and levee inspection no new access or permission to proceed will need to be obtained from local landowners. DWR staff will obtain other local and State permits. The proposed project will improve and restore in-stream aquatic and shaded riverine environments while contributing to immediate flood relief. Long-term flood control goals for the watershed will be met by improving flow characteristics and bank stabilization of the creek.

Task 1 *Tamarix* and *Arundo* Removal

The project proposes to remove approximately 7 miles of Tamarix and Arundo on lower Cache Creek beginning at the upstream end and working downstream. Work will be done under the supervision of DWR's Sacramento Maintenance Yard that maintains and inspects this leveed section of the creek. The removal plan will include mechanical, chemical, and manual means to remove *Tamarix* and *Arundo* from this reach. It has been proposed that the initial effort will take at least 3 years. Due to the steep banks within this reach, it would be difficult to stage equipment and obtain access to the channel and banks with large equipment. Manual laborers with hand tools and a backhoe will perform most of the work in the first years. Stumps will be chemically treated and biomass will be removed from the site and burned. The ability to remove all of the Arundo and Tamarix for seven miles in one year is doubtful. In the second and third years tasks will be split to include areas of initial removal and areas for follow-up. Post removal methods will include a combination of chemical and hand removal of any new regenerative growth. Combining DWR maintenance inspection program with NIS monitoring on at least an annual basis will guarantee that post-removal actions will be timely.

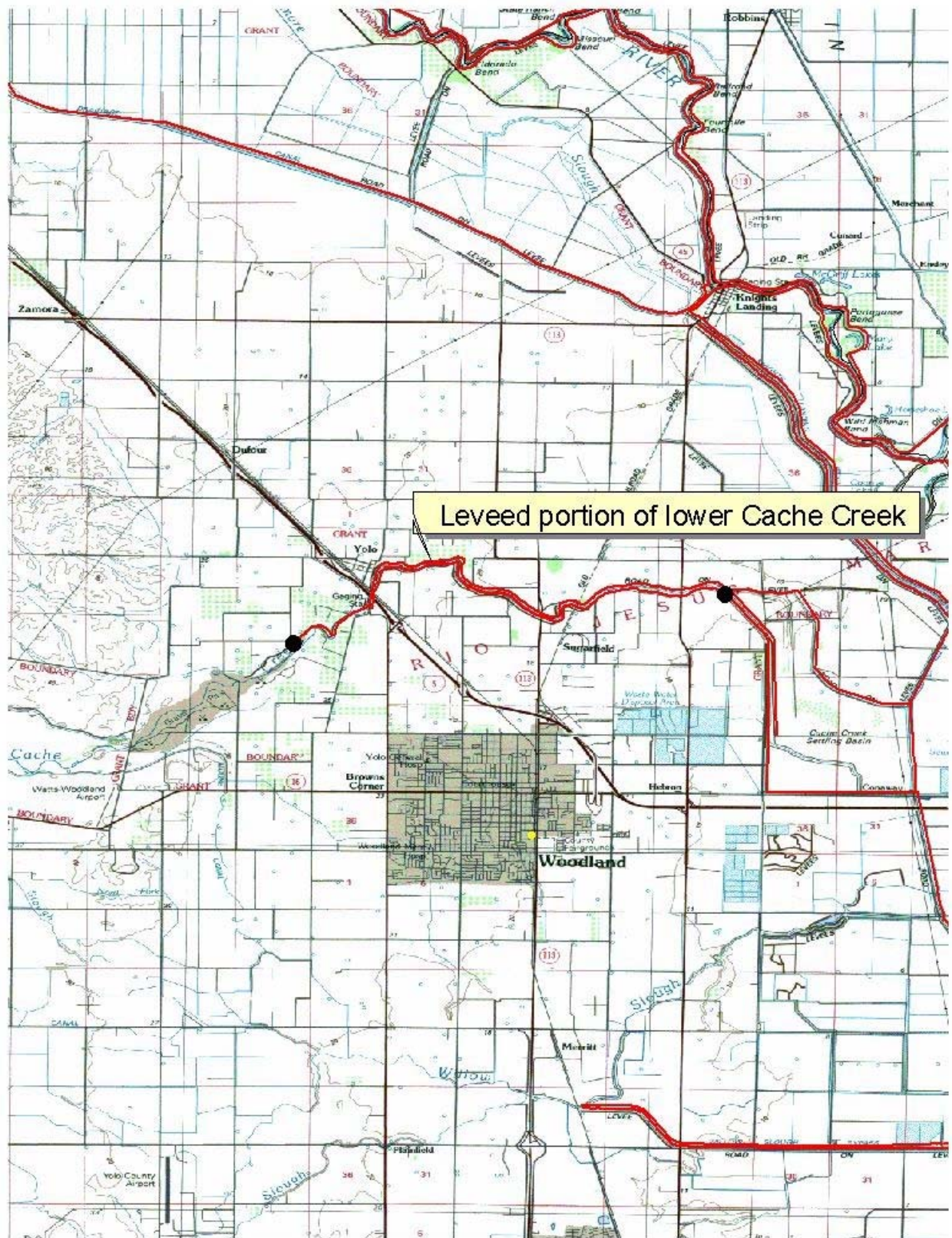


Figure 2. Project location map.

Task 2 Monitoring

Maintenance workers will be trained to positively identify and report new or previously unidentified occurrences of these species to their supervisors. A DWR maintenance worker education program on exotics will be implemented at the Sacramento Maintenance yard. DWR will work with the other stakeholders to continue post removal prevention and eradication of regenerative growth. Channel clearing activities for flood control discourages the presence of red willows within the channel; however, certain areas may be suitable for planting red willow. Native grasses and other low growing deciduous shrubs will be planted to discourage colonization by other weedy plant species. Levee maintenance and channel clearing inspections will provide an opportunity to identify areas of re-infestation by NIS and observe restoration site conditions. Quarterly monitoring reports by the Environmental Compliance, Analysis and Planning Branch of Flood Management and annual work plans prepared for Department of Fish and Game coordination will be copied and submitted to CALFED. DWR will not use grant monies to fund task 2.

Task 3 Community Outreach

Watershed partnerships and worker education programs that are initiated for this project will demonstrate the willingness of DWR 's Flood Management staff to cooperate with the community and local agencies in order to achieve common goals. DWR will not use grant monies to fund task 3. Alternative funds will be located.

2. **Qualifications and Readiness to Implement the Project.**

2a. The Department of Water Resources, Division of Flood Management will administer the funds and conduct the project.

2b. The Department of Water Resources will be responsible for the environmental compliance and land use issues.

2c. The Department of Water Resources will implement this NIS removal project in conjunction with flood management activities. The effort will be well documented so that it may contribute to the knowledge of treatments and methods for use by others.

3. **Budget** - see entries in proposal solicitation package

4. **Technical Feasibility**

4a. Several years ago, DWR cleared large amounts of *Tamarix* and *Arundo* from the banks of Cache Creek near levee mile 0.5 using hand crews and chemical methods. The photo below illustrates that with little or no follow-up, sites tend to become re-infested rather quickly (see Figure 2). DWR will undertake an aggressive approach to eradication by involvement with experts and others in the field of *Tamarix* and *Arundo* biology and management. This aggressive approach will allow for flexibility in follow-up treatments based on the best knowledge available and is consistent with flood management objectives.



Figure 2. *Tamarix* spp. on banks of Cache Creek. This site lies about 2 miles downstream of the town of Yolo, CA.

4b. DWR has hired manual laborers in the past for channel clearing activity using local farm laborers and the California Conservation Corps. DWR Sacramento Maintenance Yard will oversee and direct the removal operation. Since DWR is responsible for flood control channel and levee maintenance in this section of Cache Creek, it is in an ideal position to administer this project.

5. Monitoring

The goal of this project is to remove *Tamarix* and *Arundo* from that portion of lower Cache Creek that DWR maintains. Maintenance inspectors and environmental staff will perform post project follow-up, including new site identification, prescribe and schedule further removal treatments.

Performance measures will be established and results furnished to CALFED in quarterly reports

6. Scientific Basis for Restoration Action

6a. Tamarix and Arundo have been in the Cache Creek Watershed for decades, but their levels have increased significantly in the last 10 years. The Yolo County Flood Control and Water Conservation District (YCFCWCD) was the first organization to recognize the problem because the *Tamarix* had begun to impede water flow. By the mid-1990s several assessments had been completed which documented the threat of NIS on the creek: Draft Cache Creek Environmental Restoration Study (US Fish and Wildlife Service 1995), Reconnaissance Report: Cache Creek Environmental Restoration (US Army Corps of Engineers 1995) and Technical Studies and Recommendations for the Lower Cache Creek Resource Management Plan (Yolo County Community Development Agency, 1995). In 1997 Yolo County and the Cache Creek Conservancy began their aerial color photography of the creek timed to show *Tamarix* in full bloom. These surveys have continued annually since then. A visual assessment of the increase in *Tamarix* in many areas of the creek could be made just from looking at the photos, but now USDA-ARS has computerized them, and they will be able to conduct a quantitative assessment of the increase in infestation. In 1999 CALFED published its Strategic Plan for Ecosystem Restoration and listed control or eradication of non-native riparian plants and revegetation with native plants as a Stage 1 Action for Cache Creek (p.83).

6b. DWR has used and will use the assessments listed in 6a to help establish its goals and objectives for this NIS management proposal. These assessments all document the fact that NIS are detrimental to the creek for a wide variety of reasons and need to be removed. The solution, however, is complex, and DWR will study projects carried out on Cache Creek and other waterways throughout the country in developing its protocol. For example, in 1992 YCFCWCD employed crews to cut down large infestations of *Tamarix* along a two-mile stretch of the creek, but they didn't follow up with herbicide applications or replant with natives. The non-natives, including *Arundo*, returned in greater numbers than ever within three seasons. In 1997, DWR employed workers to remove Tamarix and Arundo from several areas of infestation, upstream of Interstate-5 in the same manner as YCFCWCD. Results were slightly different, but equally unsuccessful, Arundo became established where Tamarix was removed.

6c. The following are among the scientific assumptions, with sample references, that were used to develop our project.

NIS decrease native plant diversity (Faull, 1998)

NIS colonize rapidly in disturbed habitats (Bell 1997) (Rieger and Kreager 1989)

NIS are not good for bank stabilization (Wiesenborn, 1996)

NIS decrease animal diversity (Di Tomaso 1998, Vartanian, 1998)
NIS alter stream flows (Dudley et al. 2000, Di Tomaso 1998)

These assumptions have been documented at various sites, and the scientific community by and large accepts them as reality. According to representatives of the Cache Creek Conservancy some landowners want to keep NIS along their banks for erosion control. The Cache Creek Conservancy has held a number of landowner meetings over the last two years and has gained almost complete buy-in for their NIS removal and management project. The adoption of tested removal methods and the involvement and participation of DWR's Flood Management Division in watershed wide efforts will aid in the success of these efforts.

6d. The management and community outreach actions we are proposing to CALFED are consistent with the scientific assumptions, previous assessments, and research made by other stakeholders regarding the Cache Creek Watershed. This area of lower Cache Creek was chosen for this removal effort for several reasons. First; it is heavily infested by both NIS species; second, support of the stakeholders and willingness of local landowners to participate; third, maximum immediate flood relief for the city of Woodland; fourth, the direct connection to areas upstream where similar work is underway; and five, infrastructure is in place for long term management and monitoring." The "top down" is the ideal, but the realities are more complex. Community support is a critical component of the success of this action. We believe that with a good management program in place and continued landowner participation that NIS can be controlled on the lower creek. Meanwhile, other control programs that we discussed are getting started farther upstream and will dovetail with ours. Realities cited above and the ability of this reach of Cache Creek to introduce *Tamarix* and *Arundo* into the Yolo Bypass make the project a priority for DWR.

6e. The post-removal NIS management actions we are proposing for funding by CALFED consists of two parts: respraying of NIS resprouts and revegetation with native species where appropriate. Our extensive search of the literature, participation in organizations such as CA Exotic Pest Plant Council, Team *Arundo* del Norte and the Salt Cedar Consortium, and our partnership with leading experts in the field of NIS control have provided the project with virtually all the baseline knowledge available. Details of how to implement our actions will vary from other projects due to site specific circumstances. The long-term monitoring aspect of the project should provide data that substantially enhances the basic knowledge now available.

7. Meeting CALFED Objectives

7a. *Tamarix* and *Arundo* have reached a critical mass on lower Cache Creek. A coordinated effort and management plan is essential to the successful control of NIS in the watershed. NIS problems will eventually appear in the Delta. Our

proposed NIS removal and management program fits most closely with the CALFED objective of ecosystem quality, but it touches on all four objectives. The project is in direct response to CALFED's Ecosystem Restoration Program goal #5: "Prevent establishment of additional non-native species and reduce the negative biological and economic impacts of established non-native species." (SPER 1999, p.27). More specifically:

"Of particular importance is the control of the spread of tamarisk and giant reed, two introduced species that displace native flora, offer marginal value to fish and wildlife, and cause channel instability and reduced floodway capacity. Some rivers, such as Stony Creek and Cache Creek and the lower San Joaquin River, have undergone large expansions in the past 10-15 year. A combination of large-scale eradication pilot projects and targeted research on several streams will help to temporarily reduce the rate of expansion of their range, identify the most vulnerable stream environments, and determine whether valley-wide eradication or suppression measures are warranted or feasible." (SPER, 1999, p.44).

Heavy infestation of NIS can affect the hydrology of the creek by increasing sediment deposition, which, in turn, can substantially reduce channel capacity, increasing the potential for levee overtopping and subsequent failure. Of most immediate concern is the City of Woodland, but the developing scenario on Cache Creek is a preview of what could happen to the waterways and levees in the Delta with a heavy build-up of NIS there.

In terms of water quality *Arundo* especially provides little shading over the creek, which results in higher water temperatures and altered water chemistry. The shaded riverine habitat offered by native willows and cottonwoods improves the aquatic environment for fish and the riparian environment for a wide variety of wildlife. In addition, both species use large amounts of water. For example, it has been estimated that *Arundo* uses about 5.6 acre-feet per year, while native species use only about one third of this amount (Iverson, 1993). This is water that could be available for other beneficial uses like groundwater recharge and ultimately drinking water. A program to manage NIS upstream will reduce the potential for infestation in the Yolo Bypass and eventually the Delta.

7b. DWR will join with the Cache Creek Stakeholders Watershed Group, with Cache Creek Conservancy taking the lead role, and will seek other sources of funding to control NIS. The Conservancy has worked out many of the management details by funding and implementing a removal project at the Cache Creek Nature Preserve, and, as a result, we now have the support of the great majority of landowners on the lower portion of the creek to implement a larger NIS removal and management plan. These facts will contribute to the success of this proposal. We are working closely with other proposed NIS plans in the upper watershed, and we are partnering with local, state and federal agencies on this project. As stated above, the project fits very well with the overall as well as the specific goals and objectives for CALFED.

7c. The lead agency for environmental compliance on this project will be Department of Water Resources.

8. Other Important Aspects

Cache Creek Conservancy has been working for some four years to form a coalition of landowners, agencies, local government and state government to fund and implement this project. DWR believes that this is a positive step toward eradicating Tamarix and Arundo from lower Cache Creek while looking at long term flood management goals. These efforts will be rewarded if we can keep these species from infesting the Delta.