

**i. Proposal number:**#2001-F209\*

**ii. Short proposal title** #Evaluation of BAC as Selenium Indicator\*

**APPLICABILITY TO CALFED ERP GOALS AND IMPLEMENTATION PLAN**

**1a1. Link to ERP Strategic Goals: What Strategic Goal(s) is /are addressed by this proposal? List the letter(s) of all that apply.**

**A. At-risk species**

**B. Rehabilitate natural processes**

**C. Maintain harvested species**

**D. Protect-restore functional habitats**

**E. Prevent non-native species and reduce impacts**

**F. Improve and maintain water quality**# A, D, F\*

**1a2. Describe the degree to which the proposal will contribute to the relevant goal. Quantify your assessment and identify the contribution to ERP targets, when possible.**# A. at risk species. This study is aimed in part at protection of the Sacramento Splittail. The PSP states that the splittail are thought to be impacted by selenium. Concentration based water quality criteria have not proven entirely effective to protect the splittail and others. This proposal examines the accuracy of an indicator in place of concentration based limits.

D. Protect functional habitat. The elimination of bioavailable selenium would improve the habitat for the Splittail and other species. Selenium is a reproductive toxin and its presence can impair habitat for all trophic levels.

F. Improve or maintain water quality. Elimination of bioavailable selenium is an improvement in water quality. While this study does not remove the selenium, it helps to identify what types of selenium need to be removed. This allows the Water Quality Program to address the most cost effective selenium control measures.\*

**1b. Objectives: What Strategic Objective(s) is/are addressed by this proposal? List Objective (from the table of 32 objectives) and describe potential contribution to ERP Goals. Quantify your assessment, when possible.**# Goal 1, Objective 1. Achieve recovery then self sustaining populations. Selenium toxicity may impair reproduction of the splittail (and possibly others) to the extent that proper habitat would be insufficient to achieve recovery. It may be necessary to eliminate bioavailable selenium. This project is the first step in doing so.

Goal 4, objective 1. Protect functional habitat. The elimination of bioavailable selenium would improve the habitat for the Splittail and other species. Selenium is a reproductive toxin and its presence can impair habitat for all trophic levels.

Goal 6, Objective 1. Improve Water Quality. Elimination of bioavailable selenium is an improvement in water quality. While this study does not remove the selenium, it helps to identify what types of selenium need to be removed. This allows the Water Quality Program to address the most cost effective selenium control measures.\*

**1c. Restoration Actions: Does the proposal address a Restoration Action**

**identified in Section 3.5 of the PSP? Identify the action and describe how well the proposed action relates to the identified Restoration Action.** # Yes, this proposal addresses Contaminants in the Central Valley, Selenium Studies. This is a selenium study that addresses the adequacy of concentration based discharge limits for selenium and evaluates the applicability of an indicator. This could be the missing link between the protection levels that regulatory agencies have been able to achieve and what the environment really needs to regain health. This study fits well with other CALFED Water Quality projects to eliminate selenium, and to prevent excursions above ambient water quality criteria concentrations.\*

**1d. Stage 1 Actions: Is the proposal linked directly, indirectly or not linked to proposed Stage 1 Actions? If linked, describe how the proposal will contribute to ERP actions during**

**Stage 1.** # The proposal is directly linked to stage 1 actions. Stage 1 actions call for a Real Time monitoring system that predicts when assimilative capacity will be available in the San Joaquin River such that salinity and selenium may be discharged. This study addresses the potential deficiencies in using concentration based limits to control the amounts of selenium released. In effect, this proposal may determine the appropriate measures on which the real time monitoring program should rely in allowing discharges of selenium.\*

**1e. MSCS: Describe how the proposal is linked to the Multi-Species Conservation Strategy and if it's consistent with the MSCS Conservation measures. Identify the species addressed and whether the proposal will "recover", "contribute to recovery" or "maintain" each species.** # This proposal could contribute to recovery of splittail. It could also protect piscivorous fish and birds from selenium poisoning.\*

**1f. Information Richness/Adaptive Probing related to the proposal: Describe the degree to which the proposal provides information to resolve one of the 12 scientific uncertainties (Section 3.3 of the PSP), and whether the proposal offers a prudent approach to answer these uncertainties.** # This proposal addresses the Contaminants in the Central Valley uncertainty. It may provide the tool by which selenium discharge limitations could be changed to be protective of wildlife. It lines up well with the other selenium proposals funded by CALFED to date. The timeline for the study lines up well with selenium elimination projects, thus offering a tool by which water treatment systems can measure effectiveness.

The proposal provides excellent documentation to support the hypothesis it is testing. Moreover, the proposal provides a clear and proven methodology for the assessments proposed.

The proposal is seen as a valuable component in the restoration of the environmental health of the San Joaquin River and the Delta.\*

**1g. Summarize comments from section 1a through 1f related to applicability to CALFED goals and priorities. Identify the strengths and weaknesses of the proposal, highlighting the applicability of the proposed project to CALFED and CVPIA goals and priorities. Focus on aspects of the proposal that may be important to later stages in the project review and selection process.** # This proposal is a very strong proposal to address a scientific uncertainty surrounding the regulation of selenium. In attempting to define a better regulatory tool that would be protective of aquatic organisms, this proposal could bring us closer to an evaluation of our selenium reduction measures. It could

save remediation dollars by indicating what types of selenium needs to be treated. It may save monitoring dollars by giving us a readily identified indicator of selenium impacts on the ecosystem. It will add to the understanding of the selenium impacts on splittail. It dovetails nicely with previous CALFED Selenium work.

Its strengths are the citations used to back up its hypothesis for testing. Test facilities have already been built and are being used. The test methodologies have been used and are proven. This is a timely proposal, in that the questions that need to be answered will be answered about the time that remediation results may be in from other programs.

Its only weakness is that it is only testing one type of indicator on two types of fish. But there is plenty of previous research that supports this method as a place to start.\*

### **APPLICABILITY TO CVPIA PRIORITIES**

**1i. Describe the expected contribution to natural production of anadromous fish. Specifically identify the species and races of anadromous fish that are expected to benefit from the project, the expected magnitude of the contribution to natural production for each species and race of anadromous fish, the certainty of the expected benefits, and the immediacy and duration of the expected contribution. Provide quantitative support where available (for example, expected increases in population indices, cohort replacement rates, or reductions in mortality rates).**#

The natural production of San Joaquin River fall-run chinook salmon and all races of Sacramento River-Basin chinook salmon, steelhead, white and green sturgeon, delta smelt, Sacramento splittail and various other species at all trophic levels in the Delta food web could benefit from this proposal. Although selenium contamination in the aquatic environment has been well documented as a causative agent in the decline of numerous populations of aquatic organisms the extent to which selenium affects aquatic species in the Delta is largely unknown. Therefore, neither the expected magnitude of the contribution to natural production nor the certainty of the expected benefits can be determined. This proposal will conduct research on two non-anadromous fish species, bluegill and Sacramento splittail, to determine ecotoxic (food chain mediated) mechanisms which are assumed to be similar for other top predator fish species. Other components of this proposal will involve identification of biochemical forms of selenium with the potential to be used as an early warning for selenium ecotoxicity and assessment of the level at which selenium exceeds the biological assimilatory capacity (BAC). The BAC test for selenium is simply an indication of the degree of selenium contamination a watershed can tolerate. This is based on knowledge of the process of selenium volatilization to the atmosphere and food chain transfer capacity. This proposal addresses food chain capacity. Test fish will be reared from the larval to the reproductive stages in a laboratory environment and will be fed diets of varying concentrations of selenium. When the fish reach reproductive stage gonads, liver and muscle tissues will be processed for histopathological purposes and for analyses of total selenium to determine the mechanisms by which selenium affects fish. Based on the results of the work above, the tissues from the laboratory-reared fish will be analyzed in greater detail to identify convenient assay techniques for those forms of selenium which appear to create the greatest contamination effects. Finally, the results from all the work above will be applied to develop a field collection program to collect the same species in the wild, analyze their tissues as in the lab-based program and compare the results. The proposal will conclude all work over a full three-year period, beginning in the first quarter of the State fiscal year. Therefore, the immediacy of the expected contribution (i.e. utilization of the information developed in this proposal) will be realized three fiscal years after the work in the proposal is initiated. The duration of the expected contribution cannot be determined until the research is completed.\*

**1j. List the threatened or endangered species that are expected to benefit from the project. Specifically identify the status of the species and races of anadromous fish that are expected to benefit from the project, any other special-status species that are expected to benefit, and the ecological community or multiple-species benefits that are expected to occur as a result of implementing the project.**

# Listed species, anadromous species and special status species with greatest residence time in the Delta/Estuary such as delta smelt and Sacramento splittail would be expected to be at greatest risk of exposure to selenium uptake; species such as steelhead and chinook salmon that typically have short residence time in the Delta/Estuary would be expected to be at lower risk. Sacramento splittail would be expected to particularly benefit from this proposal, since that species is one of the two species selected for the research.\*

**1k. Identify if and describe how the project protects and restores natural channel and riparian habitat values. Specifically address whether the project protects and restores natural channel and riparian habitat values, whether the project promotes natural processes, and the immediacy and duration of benefits to natural channel and riparian habitat values.**

# This project would protect and restore natural channel values and promote natural processes if the products to be developed in this project could ultimately be used in the implementation of measures to eliminate toxic effects associated with the presence of selenium in the aquatic environment. The results of the selenium contamination research in this proposal are directed at food web transfer mechanisms, identification of forms of selenium that can be readily identified in assays and critical concentrations of selenium in fish. In order to provide those benefits, selenium eradication/neutralization techniques would have to be identified and implemented; neither of these courses are prescribed in this proposal. The proposal will conclude all work over a full three-year period, beginning in the first quarter of the State fiscal year. Therefore, the immediacy of the expected contribution (i.e. utilization of the information developed in this proposal) will be realized three fiscal years after the work in the proposal is initiated. The duration of the expected contribution cannot be determined until the project is completed and all reports and data developed in the project become available.\*

**1l. Identify if and how the project contributes to efforts to modify CVP operations. Identify the effort(s) to modify CVP operations to which the proposed project would contribute, if applicable. Efforts to modify CVP operations include modifications to provide flows of suitable quality, quantity, and timing to protect all life stages of anadromous fish as directed by Section 3406 (b)(1)(B) of the CVPIA, including flows provided through management of water dedicated under Section 3406(b)(2) and water acquired pursuant to Section 3406(b)(3).**

# No evidence is presented to indicate whether/how the project would contribute to efforts to modify CVP operations. No such relationship is apparent.\*

**1m. Identify if and how the project contributes to implementation of the supporting measures in the CVPIA. Identify the supporting measure(s) to which the proposed project would contribute, if applicable. Supporting measures include the Water Acquisition Program, the Comprehensive Assessment and Monitoring Program, the Anadromous Fish Screen Program, and others.**

# The project does not obviously contribute to implementation of the supporting measures in the CVPIA.\*

**1n. Summarize comments from section 1i through 1m related to applicability to CVPIA priorities (if applicable, identify the CVPIA program appropriate to consider as the source of CVPIA funding [for example, the Anadromous Fish**

**Restoration Program, Habitat Restoration Program, Water Acquisition Program, Tracy Pumping Plant Mitigation Program, Clear Creek Restoration Program, Comprehensive Assessment and Monitoring Program, and Anadromous Fish Screen Program]). Identify the strengths and weaknesses of the proposal, highlighting the applicability of the proposed project to CALFED and CVPIA goals and priorities. Focus on aspects of the proposal that may be**

**important to later stages in the project review and selection process.**# This project is appropriate for funding support from the Anadromous Fish Restoration Program. The project could contribute to meeting the goal of the Anadromous Fish Restoration Program to increase the natural production of anadromous fish by reducing the toxic affects of selenium contamination in the Delta. The mechanistic understanding of selenium ecotoxicity and the development of assessment tools for estimating selenium impacts should be applicable to many fish species. By folding the biological impact mechanisms into the concept of exceedance of Biological Assimilatory Capacity (BAC), extends applicability to ecosystem levels. The BAC exceedance indicators will assist with management or remediation efforts associated with selenium discharge into the Bay-Delta. The proposal is consistent with Central Valley-Wide Action No.3 (Reduce toxic chemical and trace element.) in the Revised Draft Restoration Plan for the Anadromous Fish Restoration Program, May 30, 1997; this is identified as a high priority in the draft plan. The strength of the proposal is that the entire process from evaluation of the problem to the development of potential solutions will be done in one contiguous effort and under the singular control of one program manager. The weakness of the proposal is that it will only produce information that could ultimately be used in development of subsequent selenium remediation/management plan(s). There is no guarantee if/when funding to implement the measures in such a plan(s) will be secured.\*

## **RELATIONSHIP TO OTHER ECOSYSTEM RESTORATION PROJECTS**

**2a. Did the applicant explain how the proposed project relates to other past and future ecosystem restoration projects, as required on page 57 in the PSP? Type in yes or no.#yes\***

**2b. Based on the information presented in the proposal and on other information on restoration projects available to CALFED and CVPIA staff, describe how the proposed project complements other ecosystem restoration projects, including CALFED and CVPIA. Identify projects or types of projects that the proposed project would complement, now or in the future.**

**Identify source of information.**#This project is related to, and builds upon previous work for CALFED under 99N07, studying chronic toxicity in Sacramento splittail, and 97-C06, determining role of contaminants in the decline of delta smelt, by studying mechanisms to develop an indicator of ecosystem impacts of a contaminant, selenium, using biological assimilatory capacity (BAC) through the food chain. This project also complements other selenium research, including 98-2015000-00096, 98-B07, and 98B14. Developing a BAC exceedance indicator could be used to adaptively manage the system, similar to 98C08, which provides real-time water quality management in the San Joaquin River. Information source: proposal, CALFED tracking table.\*

## **RESULTS AND PROGRESS ON PREVIOUSLY FUNDED CALFED AND CVPIA PROJECTS, INCLUDING REQUESTS FOR NEXT-PHASE FUNDING**

**3a1. Based on the information presented in the proposal and on project reports and data available to CALFED and CVPIA staff, has the applicant**

**previously received CALFED or CVPIA funding? Type CALFED, CVPIA, both, or none.#CALFED\***

**3a2. If the answer is yes, list the project number(s), project name(s) and whether CALFED or CVPIA funding. If the answer is none, move on to item 4.#CALFED**

97C06- Contaminant Effects on Smelt

99N07- Chronic Toxicity of Environmental Contaminants in Sacramento Splittail - A Biomarker Approach

98C02 and 00B03 - Culture of Delta Smelt

97C05 - Effects of Wetlands Restoration on Methyl Mercury Levels

97-C12 - Alternative Practices for Reducing Pesticide Impacts on Water Quality

98C15 and 00B06 - Biological Assessment of Green Sturgeon in the Sacramento-San Joaquin Watershed

99F06 - Reducing Risk of Importation and Distribution of Non-native Invasive Species through Outreach and Education

00F08 - McCormack Williamson Tract Phase II Monitoring Project

99N02 - Fish Treadmill Developed Fish Screen Criteria for Native Sacramento-San Joaquin Watershed Fishes

99N05 - Reintroduction of Endangered Soft Bird's Beak to Restored Habitat

99N06 - Linked Hydrogeomorphic Ecosystem Models to Support Adaptive Management

99N07 - Chronic Toxicity of Environmental Contaminants in Sacramento Splittail - A Biomarker Approach\*

**3b1. Based on the information presented in the proposal and on project reports available to CALFED and CVPIA staff, did the applicant accurately state the current status of the project(s) and the progress and accomplishments of the project(s) to date? Type yes or no.#yes\***

**3b2. If the answer is no, identify the inaccuracies:##**

**3c1. Has the progress to date been satisfactory? Type yes or no.#yes\***

**3c2. Please provide detailed comments in support of your answer, including source of information (proposal or other source):#UCD projects initially experienced significant delays in getting contracts negotiated and signed, but are now all progressing well and producing some preliminary results. 98C02 and 98C15 are completed first phases which are now undertaking the second phase of work. Information source: Proposal, CALFED progress reports, Final first year analyses reports.\***

#### **REQUESTS FOR NEXT-PHASE FUNDING**

**3d1. Is the applicant requesting next-phase funding? Type yes or no.#no\***

**3d2. If the answer is yes, list previous-phase project number(s) here. If the answer is no, move on to item 4.##\***

**3e1. Does the proposal contain a 2-page summary, as required on pages 57 and 58 of the PSP? Type yes or no.##\***

**3e2. Based on the information presented in the summary and on project reports available to CALFED and CVPIA staff, is the project ready for next-phase funding? Type yes or no.##\***

**3e3. Please provide detailed comments in support of your answers, including source of information (proposal or other source):##\***

#### **LOCAL INVOLVEMENT**

**4a. Does the proposal describe a plan for public outreach, as required on page 61 of the PSP? Type yes or no.## No.\***

**4b. Based on the information in the proposal, highlight outstanding issues related to support or opposition for the project by local entities including watershed groups and local governments, and the expected magnitude of any potential third-party impacts.## Support for this proposal should come from entities faced with selenium-related contamination of aquatic resources.\***

#### **ENVIRONMENTAL COMPLIANCE**

**4d. List any potential environmental compliance or access issues as identified in the PSP checklists.## These experiments will be conducted on laboratory raised fish, therefore there are no compliance issues.\***

**4e. Specifically highlight and comment on any regulatory issues listed above that may prevent the project from meeting the projected timeline.## None.\***

#### **COST**

**5a. Does the proposal include a detailed budget for each year of requested**

**support? Type yes or no.# yes\***

**5b. Does the proposal include a detailed budget for each task identified?  
Type yes or no.# yes\***

**5c. Is the overhead clearly identified? Type yes or no.# yes\***

**5d. Are project management costs clearly identified? Type yes or no.# yes\***

**5e. Please provide detailed comments in support of your answers to questions  
5a - 5d.# All information requested has been provided by project proponent in  
a clear, concise, and understandable format.\***

#### **COST SHARING**

**6a. Does the proposal contain cost-sharing? Type yes or no.# no\***

**6b. Are applicants specifically requesting either state or federal cost  
share dollars? Type state, federal, or doesn't matter.#federal\***

**6c. List cost share given in proposal and note whether listed cost share is  
identified (in hand) or proposed.**

**6c1. In-kind:# n/a\***

**6c2. Matching funds:# n/a\***

**6c3. Show percentage that cost sharing is of total amount of funding  
requested along with calculation.# n/a\***

**6d. Please provide detailed comments in support of your answers to questions  
6a - 6c3.# n/a\***