Summary Information

University of California, Davis

Monitoring Sacramento perch populations in the Central Valley

Amount sought: $715,362

Duration: 36 months

Lead investigator: Ms. Kim Lamar, UCD

Short Description

This project is a logical follow−up to a present project (ERP 02−P34) to study the basic biology of Sacramento Perch (SP), which was listed as Milestone 117 by the CBDA (2004). This project will monitor four established experimental SP populations and of three others to be established in 2005. This project will establish and monitor at least three other sites in 2006 as additional fish become available. Ultimately, this project will monitor a minimum of ten pilot reintroduction sites in the Delta and Suisun Marsh to gather data that can be used to optimize management strategies for current and future restoration sites.

Executive Summary

The Sacramento perch (SP) is a native sunfish that once was once one of the most abundant fish in the Central Valley. It is now extirpated from virtually all of its former habitats. The SP would undoubtedly be listed as an endangered species if populations were not established outside its native range. This project is a logical follow−up for our present project (ERP 02−P34) to study the basic biology of SP, which was listed as Milestone 117 by the CBDA (2004). We plan to monitor four established experimental SP populations and of three others to be established in 2005. We will be establish and monitor at least three other sites in 2006 as additional fish become available. Ultimately, we will monitor a minimum of ten pilot reintroduction sites in the Delta and Suisun Marsh to gather data that can be used to optimize management strategies for current and future restoration sites. SP restoration sites are mostly associated with large CALFED restoration projects, so the long−term establishment of SP at these sites can be used as a measure of success of the projects. In addition we will determine the status of SP statewide by conducting surveys of all known SP populations. Our studies under ERP−02−P34 indicate that some of the populations are already extirpated.

The principal goal of the monitoring program is to track the numbers and genetic diversity of recently re−introduced populations of SP. Monitoring connected waterways will allow us to track the dispersal of SP into adjacent waters. Our experience here and in the statewide surveys will allow to us develop a monitoring procedure for existing populations. We will also use environmental information from our monitoring sites to determine why SP introductions are a success or a failure, to inform future management decisions, and to see if Sacramento perch can be used as a good indicator of successful ecosystem restoration. In particular, the information will be used to refine a bioenergetic model we have developed that should be useful in selecting future restoration sites by predicting their suitability for SP. More specific objectives of the project include: (1) determine the characteristics of successfully established Sacramento perch populations, (2) determine if water quality can be used to predict the success of SP introductions, (3) determine if SP become abundant outside of the reintroduction sites through source−sink dynamics, and (4) determine if SP will be a good indicator of success of CALFED ecosystem restoration projects. If we can demonstrate the potential for wide−scale SP restoration, then the SP will become a focal species for measuring the success of the CALFED restoration process. At the very least, we will have learned what is required to maintain populations of this rare endemic fish in its native range.

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A. Project Description: Project Goals and Scope of Work

I. Description of the problem to be addressed

Background

The Sacramento perch (SP) is a native sunfish that once was abundant, but is now extirpated from virtually all of its former habitats throughout the Sacramento-San Joaquin watershed (Tharratt and McKechnie 1966, Aceituno and Nicola 1976, Leidy 1984, Gobalet and Jones 1995, Moyle 2002). SP have been listed as a species targeted for recovery in the Delta Native Fishes Recovery Plan (Moyle et al. 1996), are listed by the Department of Fish and Game as a Species of Special concern (Moyle et al. 1995), and are classified by CALFED as an At-Risk (Priority Group 2) Species in the 2001 ERP (Goal 1, objective 2, pp.140). Our initial project (ERP 02-P34) to study the basic biology of SP was listed as Milestone 117 by the CBDA (2004). SP would undoubtedly be listed as an endangered species if there were not populations established outside its native range. Previously it was thought that populations in Clear Lake and in the Alameda Creek drainage were persisting, if tenuously. However we caught no SP in our sampling of Clear Lake and Calaveras Reservoir on Alameda Creek indicating that these populations have likely been extirpated.

The introduced SP populations in the upper Klamath watershed, in Pyramid Lake, Nevada, in the lower Walker River, and in the Owens River are probably secure because of their abundance and fairly broad distribution within these waters. However, natural extirpation of most populations established outside the SP's native range suggests that long-term persistence in these areas may be a problem (P. Crain, unpublished data). Extirpations of introduced populations are usually the result of changing conditions in managed waters, but precise causes are often not known. "There is thus a need to establish populations in places within their native range that can be closely monitored to be sure this species persists in the future. The reintroduction of SP into selected habitats in the Central Valley is closely linked to restoration of non-tidal perennial aquatic habitats, Delta sloughs, and elimination of inter-specific competitor or predator species (CBDA 2004)."

Knowledge that has been gained from ERP 02-P34 is currently being used to develop an adaptive management-based restoration strategy. We are using data on life history, physiology, and genetics to reintroduce SP to at least three pilot sites in summer 2005 (in addition to four current reintroduction sites). Other sites will be used as they and additional fish become available; at least 3 more are currently planned for 2006 based on sites and our rearing program for SP. Further data gathered from these reintroductions will be used to optimize restoration strategies in current and future restoration sites. The SP restoration sites are mostly associated with large CALFED restoration projects, so the establishment of the Sacramento perch at these sites can be used as a measure of success of these projects.

Present Problem

From our sampling of SP populations, we hypothesize that the SP is extirpated from its native range, except in a few sites into which it has been introduced (primarily in sites that would be outside the native range in terms of elevation). The largest introduced populations are in reservoirs or drainages outside the SP's original range. SP reintroduction to the Sacramento-San Joaquin Delta is a CALFED priority and is linked to the success of its restoration program. We have been and will be reintroducing SP to restoration sites in its native range in summer 2005 as part of ERP-02-P34 from captive and wild populations. Ensuring the success of these populations requires monitoring of reintroduction sites, and the development and implementation of an adaptive management plan based on monitoring data. We will use ten pilot reintroduction sites in the Delta and Suisun Marsh to optimize restoration strategies and develop a large-scale restoration plan

Delta Sites

Wood Duck Slough is an interior slough within the Cosumnes Preserve that floods from overflow from the Cosumnes floodplain, but is partially isolated by an earthen dam with flapper gate. The isolated section will be used for rearing perch (to be introduced in 2005), using the overflow as a mechanism for reintroduction of SP into non-tidal perennial aquatic habitats and tidal sloughs of the Cosumnes and Mokolumne Rivers. Potential competitors and predators will be reduced to maintain this population as a source population for the NE Delta area. Previous CALFED restoration projects that would benefit from this project include: **ERP-96-M06, ERP-97-N14, ERP-98-B17, ERP-98-F19, ERP-01-N10.** Many of these projects were for land acquisition or easements along the Cosumnes and Mokelumne Rivers corridors and reestablishment of SP would indicate the success in these projects in providing habitat for native fishes.

Barker Slough is a dead-end NW Delta Slough that connects to Cache Slough and is part of the Jepson Prairie-Prospect Island Corridor. The Corridor's watershed crosses three Ecological Management Zones from west to east: the Bay Region EMZ, the Sacramento EMZ and the Delta EMZ (CALFED 2001) The Corridor includes over eleven miles of sloughs, 614 acres of riparian and marsh habitat, 38 acres of mid-channel islands and over 14,000 acres of vernal pool/perennial grassland habitats. **ERP-97-N10** proposed that protection of these habitats will contribute to the protection of native freshwater fish assemblages, including SP. Because SP populations do not exist in Barker Slough (Pat Crain, pers. com.), we will introduce them there (in 2005) and monitor their spread into the Prospect Island region.

Suisun Marsh

Black Loch tidal marsh restoration project's (**ERP-01-C04)** listed objective was to acquire property in-Suisun Marsh and restore the area to a self-sustaining tidal wetland ecosystem that includes low-marsh, high-marsh, and upland transition zones. This process would increase the area and contiguity of saline emergent wetlands, thereby assisting in the recovery of at-risk species. We believe that the introduction of SP to the ponds (in 2005) on this property fulfills the goal of assisting an at-risk species. It also provides an opportunity to monitor the reintroduction of SP in an area that is relatively free from non-native centrarchid fishes, as compared to East Delta tributaries, which are dominated by these-species.

Floodplain Sites

SP were introduced into two ponds, one in Natomas Basin, Sacramento County (Wildlands Inc.) and one in the lower Yolo Bypass, Yolo County (Wildlands Pope Ranch). Both of these ponds were stocked with fish raised by Chris Miller (Contra Costa Mosquito and Vector Control) in 2004. These ponds and others in the area have the potential of over flooding, thus becoming natural vectors of SP to other areas in the Natomas and Yolo Wildlife areas. Monitoring these ponds and others will be useful in determining if SP can be maintained in a specific site while dispersing into outlying areas. We are working with Dr. Tom Cannon (affiliation) to find other floodplain sites for reintroduction of the perch.

UC Davis Ponds

Two ponds situated on the UCD campus (Curved Pond and Beaver Pond) were planted with SP in 1997 and were monitored with both light trapping and beach seining in 2004 as part of ERP-02-P34. During the fall of 2004, we began monitoring the water quality of these ponds for use in the development of restoration strategies. We will continue to monitor these ponds as they are a route for SP introductions into Putah Creek, Yolo County, and offer an opportunity for raising fish for transplanting to other waters.

Statewide

Although we have sampled a number of SP populations within the state as part of ERP-02-P34 (with disappointing results at some key sites), there is a need for a statewide survey of all alleged populations (most are listed in Moyle 2002). This survey will locate sites that still have SP and develop protocols for monitoring on a 3-5 year basis, to determine if these tenuous populations are self-sustaining.

B. Primary Project Goals

The principal goal of the monitoring program is to track the numbers and genetic variability of re-introduced populations of SP in CALFED project restoration sites and to determine factors leading to successes and failures. Monitoring surrounding areas will allow us to track the dispersal of SP into adjacent waters. In addition, we intend to determine the status of SP populations statewide establish a permanent monitoring procedure. Because the reintroduction of SP is linked to the success of the CALFED ERP, SP populations will indicate ERP success in restoring at-risk species.

2. Study Objectives

The basic objective of this study is to monitor newly established and existing populations of Sacramento perch to determine if they are likely to persist. Equally important, however, is to use the information to determine why SP introductions are successes to inform future management decisions and to link successful SP introductions to successful ecosystem restoration. Our more specific objectives are as follows:

Monitoring objective 1: Determine the characteristics of successfully established Sacramento perch populations.

Hypothesis 1. Successful SP populations have biological characteristics indicative of a healthy population (e.g., multiple age classes, age/length structure suggesting repeated spawning success, rapid growth rates and high condition factors of most individuals).

Hypothesis 2. Populations of SP are most likely to persist if they display high levels pf genetic variation.

Monitoring objective 2: Determine if water quality can be used to predict the success of SP introductions.

Hypothesis 3. Successful SP populations will exist only where water quality parameters are within the limits determined by studies in ERP-02-P34 (temperature, salinity, dissolved oxygen).

Hypothesis 4. SP reintroductions will be most successful at restoration sites that best fit SP's metabolic and performance responses to environmental variables. Our bioenergetic model (developed in ERP-02-P34) will be used to predict sites where SP can develop self-sustaining populations.

Monitoring objective 3. Determine if SP become abundant outside of reintroduction sites through over-flooding and movement down natural corridors..

Hypothesis 5. Interactions with non-native fishes limit SP populations.

Hypothesis 6. Populations of SP can become established away from managed restoration sites, despite presence of non-native fishes, if a continual supply of recruits is available from the introduction sites.

Monitoring objective 4. Determine whether successful SP area a good indicator of success of ecosystem restoration projects.

Hypothesis 7. Self-sustaining populations of SP will establish in restoration areas where aquatic conditions are managed, directly or indirectly, to favor native fishes.

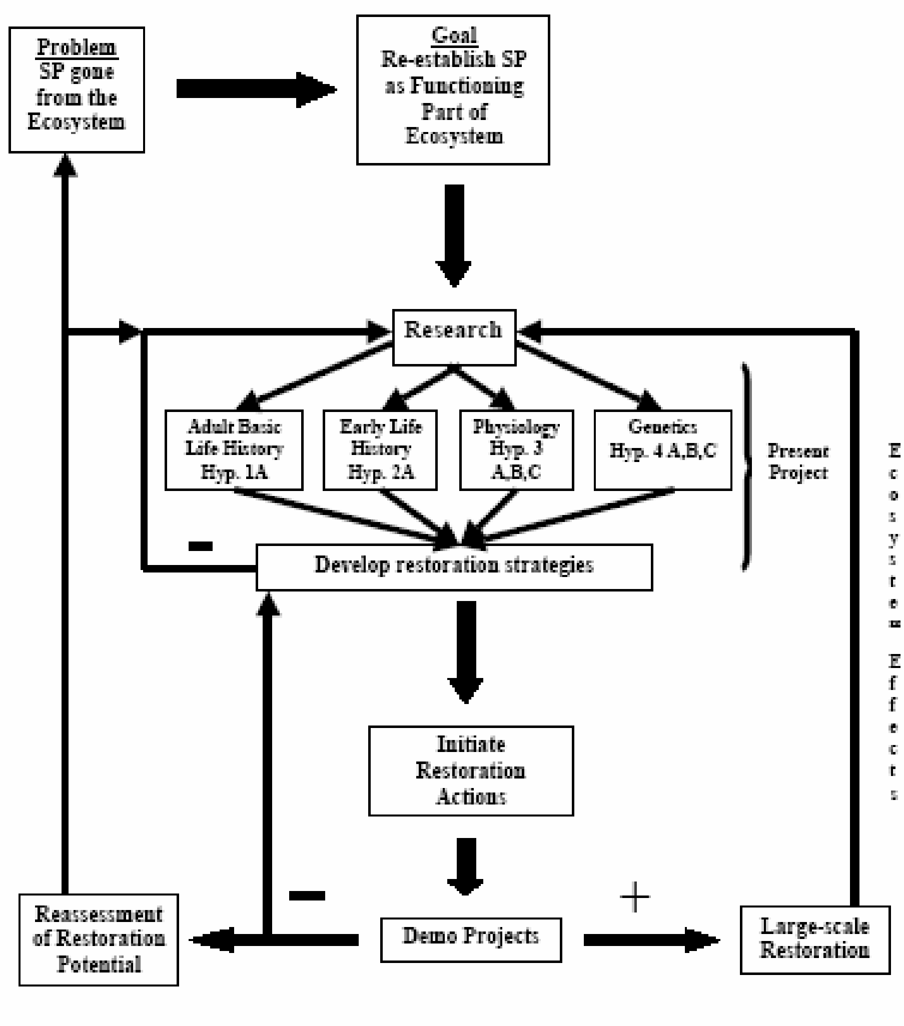
Justification

This program focuses on projects that have or will reintroduce SP to or near CALFED restoration sites. We are using our results from ERP-02-P34 on the biology, physiology, and genetics of SP to guide the restoration program. These reintroductions will return this species to its native range; they will also provide the basis for an adaptive management plan to optimize restoration strategies for this species on a larger scale (see Figure 1 for a conceptual model of our adaptive management plan. If the reintroductions are successful, the SP could become a focal species of the CALFED restoration process, integrating biology, physiology, and genetics into an adaptive management plan, and signaling the significance of these actions in the SF Estuary and surrounding region.

Conceptual Model for Proposed Work

In our current project (ERP-02-P34) we are gathering data on the life history, physiology, and genetics of SP (noted in Figure 1 as "present project") and are beginning to initiate restoration actions. In the proposed monitoring project we will implement the rest of the model up to the point of large-scale restoration. Monitoring provides us with essential data to understand the success and failure of SP introductions. Without these data the cycle of research-restoration strategies-restoration actions is broken and we wind up with SP not being present in restoration sites (or its native range).

Figure 1 Conceptual Model



Hypotheses See Objectives

Selection of Project Type

The proposed monitoring project is designed to inform adaptive management decisions on SP restoration and further the knowledge of SP population dynamics and habitat requirements The diversity of pilot reintroduction sites will provide information on the effectiveness of various restoration actions for SP.

3. Approach to project goals

Task 1.Monitoring of SP populations in restoration sites:

A. Monitoring of reintroduction sites

We have Sacramento perch populations in 4 ponds and anticipate establishing 3 other populations before this project begins. Additional populations will be established in 2006 after we have more fish available. At each site, juvenile and adult SP and other fish populations will be sampled at least two times per year using the appropriate fisheries methods (Murphy and Willis 1996). Preferred methods will be seines (10 x 1.5 or 15 x 2 m bag seines) or trap nets because they cause the least stress to the fish. In heavily vegetated areas, boat electrofishing may be needed. At each site, sampling will continue until we are convinced we have covered examples of appropriate habitat and have collected enough fish to be confident we have adequately sampled the population. All fish captured will be measured and returned to the water, although non-native centrarchids may be removed from isolated sites. Population success will be evaluated based on total catch, catch per effort, and age class structure. When SP derived from natural spawning are collected (based on size), fin clips from at least 30 individuals will be taken for genetic analysis. Where necessary, light traps will be set to determine the presence of SP larvae, a measure of spawning success. Previous studies have indicated that light traps are very successful at collecting SP larvae (P. Crain, unpublished). At new introduction sites, pre-introduction fish surveys will be conducted and alien centrarchids will be removed. For all sites, fish collections will also be made in nearby waters, once in late summer, that connect permanently or seasonally to the restoration sites to look for recruiting Sacramento perch. For Wood Duck Slough, Putah Creek (the UC Davis ponds), and Suisun Marsh this sampling will be part of current monitoring of the fish populations by UC Davis. The data collected at all sites, whether Sacramento perch are found or not, will contribute to the evaluation of the CALFED projects at the sites.

B. Selection of additional restoration sites

Sacramento perch will be introduced at least four additional sites in 2006 Sites will be chosen based on our bioenergetic model for optimal SP habitat and on their relationship to CALFED restoration sites. Initially 500 fish will be introduced into each new site; these fish will be from different source populations to maximize the genetic diversity at each restoration site. Introductions of varying genetic diversity will also serve in the development of a large-scale reintroduction and management program through the testing of differential success of source populations at restoration sites.

C. Monitoring other known populations

During the three year period, we will collect data on the status of the 28 known Sacramento perch sites in California listed in Moyle (2002). Some of these sites already have annual sampling programs in place, so we will mainly seek and compile existing data. Others will have to be sampled using the most appropriate technique (most likely boat electrofishing). We will sample all such sites at least once during the 3 yr period, as well as other sites that are reported to us. All fish sampled will be measured; fin clipped for genetic analyses, and returned to the water. Fish and environmental data (as in Task 2A) taken at each site will be used as part of a data base to determine the characteristics of successful SP introduction sites.

Task 2 Environmental Monitoring and Aquaculture

A. Development of SP populations for reintroduction
Until ERP-02-P34, little the methodologies and necessary factors for rearing Sacramento perch was poorly understood. . We will continue to expand operations (and knowledge) under this proposal~~.~~ Our experimental SP rearing facility at the Putah Creek Aquaculture Facility, UC Davis campus, has produced one successful season of breeding and raising SP for physiological experimental procedures. We expect to raise and release a minimum of 500 individuals for each new location and supplement existing locations (as required), rearing 10,000 individuals total. Currently, we have 5 genetically distinct populations which can produce genetically diverse SP for reintroduction. The facility is designed for natural photoperiods (including sunrise and sunset), maintenance of live feed (rotifers, *Artemia* and *Daphnia*), flow through conditions for the rearing tanks, and has the ability to mimic ambient water conditions.

B. Environmental monitoring
Environmental monitoring will be conducted at each restoration site for the duration of the project to establish monthly and seasonal changes experienced by the restored populations. Specifically, we will monitor the temperature, dissolved oxygen, conductivity, and pH using a calibrated YSI 556 handheld and flow with a handheld turbo-prop flow meter. In addition, water samples will be collected for laboratory titration to further analyze alkalinity, carbon dioxide, hardness, nitrogen, turbidity, and sulfates. This core set of indicators is monitored to provide watershed level information on the fundamental attributes of the aquatic environment. It can be used to assess the metabolic state and condition of SP based on known metabolic and performance measures (Woodley and Cech, unpublished). The water sampling will be conducted in accordance with EPA regulations for quality assurance (i.e. sampling depth, collection procedure, etc.). Water quality parameters will be analyzed using nonparametric statistics such as inter-quartile ranges and principle component analyses to look for seasonal trends and periodic events due to anthropogenic influences.

C. Using the Stressor-response Bioenergetic Model for Adaptive Management
We will continue to develop a simulation model to predict the growth of Sacramento perch subjected to varying levels of environmental stress (Appendix 1). The model is based on physiological data collected for larvae, juveniles and adults. The bioenergetic model incorporates a stressor-response subunit to predict individual growth in optimal and sub-optimal conditions. From the growth responses, we can forecast female fecundity. The model will assist

managers and biologists charged with the successful restoration of Sacramento perch to native habitat. Ultimately, the model will serve as a tool that can be applied to other species, using relevant habitat characteristics. Part of our monitoring strategy for this proposal is to use the model to help choose additional restoration sites and to predict success of other populations.

Task 3 Genetic Monitoring
To retain the genetic diversity of SP and prevent inbreeding depression, we believe that two or more source populations will be required for each restoration site, including those with established populations. Each of the source populations has lost genetic diversity as a result of a bottleneck or founder effect (Schwartz and May, unpublished; Appendix 2). We are unable to determine a priori the best source populations for each site based on genetic data, although we should have some idea from physiological testing. Therefore, we propose to monitor the genetic diversity of SP at each restoration site by genotyping offspring of SP introduced into each site and of adult SP surviving at each site. We will assign offspring to source populations using species specific microsatellite markers (Schwartz and May 2004) and population genetic software for assignment testing. These data will demonstrate the contribution of each source population to the success of the restored population (e.g., Grewe et al. 1994). We will also assign offspring to full sib families (Beyer and May 2003) to determine how many fish are actually contributing to the next generation. Based on these results we will add fish to the restoration site using optimal source populations and maximizing genetic diversity until the restored population is self sustaining and capable of surviving environmental variation over time. Genetic monitoring will also be conducted on populations maintained at the fish rearing facility to increase the sample size and power of our tests for differential success of source populations

4. Feasibility

This monitoring project focuses on recently reintroduced populations of SP and new reintroductions into CALFED restoration sites. We will be using knowledge gained about SP biology (ERP-02-P34) to determine the best way to approach. Although the focus of this project is monitoring pilot SP introductions, data will be gathered on other species in and around the proposed introduction sites. The resulting knowledge will be valuable in assessing restoration success and may lead to the use of SP as a "thermometer" for future restoration actions. The work will be done by three teams of scientists headed by Moyle (monitoring and reintroduction), Cech (aquaculture and water quality) and May (genetics) who worked on the initial project (SP biology, environmental tolerances, genetics). Moyle and his research associate Patrick Crain have successfully completed other monitoring projects (#99-N06, #99-B193). We have the tools personnel, and facilities to carry out this monitoring project and publish our results

5. Performance Measures

Quarterly reports will be submitted to CALFED with progress reports on each of the tasks as outlined.

Performance measures for monitoring SP at restoration sites:

- Activities: Monitor existing sites and connecting waters at least twice per year for three years using appropriate fish sampling gear; begin hatchery production of SP;

conduct pre-monitoring evaluation surveys of potential reintroduction sites, reintroduction of SP to new restoration action sites, monitor sites at least 2 times per year for three years; do monitoring surveys of know SP localities.

- Project Outputs: 5000 SP raised for reintroductions, , reports and manuscripts summarizing results, including restoration strategy for SP.

Performance measures for Environmental Monitoring of Restoration Sites

- Activities: monitoring water quality core indicators, use stressor model to predict growth of SP from water quality and physiological variables given the known age and genetic structure of the reintroduced population.
- Project Outputs: model of actors contributing to successful or failed introductions, reports and manuscripts summarizing results

Performance measures for Genetic Monitoring

- Project Activities: monitor genetic diversity at each restoration site and determine the number of fish contributing to the next generation using at least 13 species specific microsatellite loci (Schwartz and May 2004); determine the differential success of source populations at restoration sites.
- Project Outputs: genetically diverse SP in restoration sites, matching of successful source and restoration populations, reports and manuscripts summarizing results.

6. Expected Products and Outcomes

As active university scientists, with graduate students, staff, and postdoctoral researchers in our laboratories, we expect to be presenting results at scientific meetings and workshops as soon as we have results worth reporting. The three P.I.s have a history of working closely with agencies, disseminating quickly the information produced in our laboratories, and publishing results in a variety of places, including the IEP Newsletter. While we expect to publish results in peer-reviewed scientific journals, in the short term the key document will be the final report on monitoring and conservation strategies. When completed, copies will be sent to appropriate biologists, managers, and agencies for comment and possible action.

7. Data Handling and Storage, and Dissemination

This is a standard series of monitoring projects for our laboratories, so data will be handled in conventional means. Initial data is recorded on standard forms kept in notebooks. It is transferred to a spreadsheet on a PC, where it is backed up by standard means. Our intention is to publish results within a year of final data collection. Our data will be available on an IEP database after that time.

8. Public Involvement and Outreach

Reports and manuscripts will be made available to stakeholders as soon as they are available. Talks and posters will be given at Cal-Neva AFS and CALFED Science Conferences. Cooperation will continue with groups like: Wildlands Inc., Contra Costa Vector Control, Solano Land Trust, DWR, and CDFG. We will work with Dr Lisa Thompson, Cooperative Extension Fisheries Specialist, UC Davis, to find sites on private land for introduction of SP.

9. Work Schedule

Task 1. Management of project: Begin Month 1 with completion expected by Month 36. Cost $49,039.00

Task 2. Monitoring of SP populations at existing sites: Reintroduction of SP into new restoration sites and additional fish to established sites where needed: Begin Month 1, with completion expected by Month 36. Cost $239,436.00
Milestone: peer reviewed publication.

Task 3. Environmental Monitoring of Restoration Sites: Begin Month 1, with completion expected by Month 36. Cost $278,888.00
Milestone 1: introduction of SP into all sites.
Milestone 2: peer reviewed publication.

Task 4. Genetic Monitoring: Begin Month 1, with completion expected by Month 36. Cost $171,420.00
Milestone: peer reviewed publication.

B. ERP and CVPIA Priorities

1. This project specifically addresses SP as a CALFED at-risk species (PRP Strategic Goal 1, Objective 2). It will give a better understanding of the ecological dynamics of introducing SP into different habitats throughout the San Francisco Estuary region and the Central Valley. It will also develop a basic understanding of the number of SP needed for successful reintroduction, including which source populations are useful for reintroductions to maximize genetic diversity~~.~~ This will be done across multiple regions covering multiple restoration actions (Restoration Priorities for Multi-Regional Bay-Delta Areas No. 6, pg. 41). It will identify suitable locations for establishing additional populations of SP in or adjacent to the San Francisco Estuary (CALFED Conditional Studies and Surveys pg. 144 ERP Draft Stage 1 Implementation Plan August 2001).

2. Relationship to Other Ecosystem Actions, Monitoring Programs, or System-wide Ecosystem benefits

While this proposal is focused on Sacramento perch, the places we are monitoring are imbedded in part in various CALFED restoration projects. Looking for SP requires sampling all the fish in the area, so this program will provide some more general results on the effects of restoration actions on native fishes. It also links closely to other less-narrowly focused monitoring programs, such as the UC Davis IEP-funded monitoring program on Suisun Marsh and CALFED (and other agency) funded studies on the Cosumnes River and Yolo Bypass. These programs greatly increase the chance of detecting SP spreading from the introduction sites. Our SP study is designed to inform other planning and restoration efforts because it will determine what is needed to make a new project SP friendly. It is also designed to inform state and federal agencies as to whether or not SP should be listed as a threatened species and what actions can be taken to prevent listing or to bring SP populations to a point where the SP does not have to be considered for listing.

3. Additional Information for Proposals Containing Land Acquisition

None.

C. Qualifications

JOSEPH J. CECH, JR., Ph.D., Professor of Fisheries Biology, UC Davis, 1987 to present.
Five Selected Publications: 1. Swanson, C., P.S. Young, and J.J. Cech, Jr. 1998. Swimming performance of delta smelt: maximum performance, and behavioral and kinematic limitations on swimming at submaximal velocities. J. Exp. Biol. 201:333-345. **2.** Swanson, C., T. Reid, P.S. Young, and J.J. Cech, Jr. 2000. Comparative environmental tolerances of threatened delta smelt (*Hypomesus tranSPacificus*) and introduced wakasagi (*H. nipponensis*) in an altered California estuary. Oecologia 123:384-390. **3**. Myrick, C.A. and J.J. Cech, Jr. 2000. Swimming performances of four California streamfishes: temperature effects. Env. Biol. Fish. 58:289-295. **4**. Marine, K.R. and J.J. Cech, Jr. 2004. Effects of high water temperature on growth, smoltification, and predator avoidance in juvenile Sacramento River Chinook salmon. N. Am. J. Fish. Managem.24:198-210. **5**. Mayfield, R.B. and J.J. Cech, Jr. 2004. Temperature effects on green sturgeon bioenergetics. Trans. Am. Fish. Soc. 133:961-970.

BERNIE MAY, Ph.D., Adjunct Professor, Department of Animal Science, UC Davis, 1995 to present.
Five Selected Publications: 1. Beyer, J. and B. May. 2003. A graph-theoretic approach to the partition of individuals into full-sib families. Mol. Ecol. 12:2243-2250. **2.** May, B. Allozyme variation. 2003. In: Population Genetics: Principles and Applications for Fisheries Scientists, Ed. E. Hallerman. Amer. Fish. Soc. Pp. 23-36. **3.** Whitehead, A., S.L. Anderson, K.M Kuivila, J.L. Roach, and B. May. 2003. Genetic variation among interconnected populations of *Catostomus occidentalis*: implications for distinguishing impacts of contaminants from biogeographic structuring. Mol. Ecol. 12: 2817-2833. **4.** Cordes, J.F., J.A. Israel and B. May. 2004. Conservation of Paiute cutthroat: the genetic legacy of popultion transplants in an endemic California salmonid. CA Fish and Game. 90-101-118. **5.** Israel, J.A., J.F. Cordes, M.A. Blumberg, and B. May. 2004. Geographic patterns of genetic differentiation among collections of green sturgeon. N. Am. J. Fish. Man. 24:922-931.

PETER B. MOYLE, PhD. Professor of Fish Biology, University of California, Davis, 1972-present.
Five selected publications. **1**. Moyle, P. B. 2002. *Inland Fishes of California*. Revised and Expanded. Berkeley: University of California Press 502 pp. **2.** Matern, S. A., P. B. Moyle, and L. C. Pierce. 2002. Native and alien fishes in a California estuarine marsh: twenty-one years of changing assemblages. Transactions of the American Fisheries Society 131:797-816. **3.** Moyle, P. B., P. K. Crain, K. Whitener, and J. F. Mount. 2003. Alien fishes in natural streams: fish distribution, assemblage structure, and conservation in the Cosumnes River, California, USA. Envir. Biol. Fish. 6:277-288. **4.** Moyle, P.B., R. D. Baxter, T. Sommer, T. C. Foin, and S. A.

Matern. 2004. Biology and population dynamics of Sacramento Splittail (*Pogonichthys macrolepidotus)* in the San Francisco Estuary: a review. San Francisco Estuary and Watershed Science [online serial] 2(2):1-47. **5.** Crain, P.K., K. Whitener, P.B. Moyle. 2004. Use of a restored central California floodplain by larvae of native and alien fishes. Pages 125-140 in F. Feyrer, L.R. Brown, R.L. Brown, and J.J. Orsi, editors. Early life history of fishes in the San Francisco Estuary and watershed. American Fisheries Society Symposium 39, Bethesda, Maryland.

D. Cost

1. Budget

Total Cost $715,362.00

Tasks 1 and 2 are tied together as raising SP for introduction is essential for monitoring.

2. Cost sharing

None.

3. Long-term funding strategy

Additional and continuing funding for rearing and monitoring will be pursued through CDFG Delta fisheries stamp funds.

E. Compliance with standard terms and conditions

The University of California, Davis takes exception to the following proposed "standard" clauses:

Exhibit A – Scope of Work Section III, Project Officials (add Administrative Contact)
Exhibit B – Attachment 3 – State Travel & Per Diem Expenses Guidelines (Delete)
Exhibit C – General Terms and Conditions for ERP Grants (Replace with GIA 101)
Exhibit D – Special Terms and Conditions for ERP Grants (Replace with UC IP Clause)

Please note with the exception of Exhibit A the above has previously been negotiated with CALFED/GCAPS on behalf of the University of California and agreeable language has been included in the following current ERP agreements with UC Davis (ERP-02D-P31, ERP-02D-P32, ERP-02D-P33, ERP-02D-P35, and ERP-02D-P51).

Exhibit A – Scope of Work, Section III, Project Officials. We request that a third individual be added as the administrative contact and will act on behalf of the Grantee in lieu of the Project Director.

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F. Nonprofit Status

UCD has nonprofit status

G. Literature Cited

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Murphy B.R. and D.W. Willis editors. 1996. Fisheries techniques, second edition. American Fisheries Society, Bethesda, Maryland. USA.

Schwartz, R.S. and B. May. 2004. Characterization of microsatellite loci in Sacramento perch (*Archoplites interruptus*). Mol. Ecol. Notes. Online early.

Tharratt, R.C. and R.J McKechnie. 1966. Sacramento perch. pp. 373-375, In: A. Calhoun (ed.) Inland fishery management. Calif. Dept. Fish and Game. Sacramento.

Appendix 1: Basis of the Stressor-response Bioenergetic Model

Habitat quality in freshwater systems focuses primarily on the factors that influence water's chemical and physical characteristics (herein referred to as water quality). Subtle changes in water quality variables, such as pH and total dissolved solids, can have immense effects on fish metabolism (Wilkie and Wood 1996). If fish exhibit stress from acutely or chronically poor water quality, metabolic energy is reallocated from non-essential or tertiary processes (e.g., growth, reproduction) towards essential processes (e.g., metabolism, immune function). As a result, altered physiological and behavioral responses occur, such as endocrine and metamorphosis-related changes, foraging problems, and decreased growth, fecundity, egg size, and quality (Donaldson 1990, Johnston and Legget 2002). Although dramatically sub-optimal habitat can disrupt physiological homeostasis in Sacramento perch (Woodley and Cech unpublished), mildly sub-optimal water quality might provide sufficiently suitable habitat for Sacramento perch, yet exclude other non-native centrarchids.

Individual-based models, such as bioenergetic models, are useful tools for managers, which can be applied to a variety of ecological applications ranging from basic consumption and metabolism to the accumulation of contaminants, life history strategies, and predator-prey interactions (Figure 1). The bioenergetics concept is based on an energetic balance between the total food consumption, total metabolic and waste loss, and growth (somatic and/or gonadal). Bioenergetic models, if expanded to include more physiological details, are capable of predicating organism-level responses (e.g., growth) based on the primary (e.g., endocrine changes) and secondary physiological responses (e.g., metabolic changes) to a particular stressor. When a species' physiological optimal conditions and behavioral preferences are known, the bioenergetic model performs to confirm (or predict) optimal growth and metabolic homeostasis (Brown *et al*. 1990). If the model is constructed in a manner to include stressors that are known to disrupt homeostasis, then the model should predict growth to be less than optimal (Figure 1) during stressful events. Modified bioenergetic models that incorporate stressor responses would benefit managers and conservationists to predict fish growth in ambient water conditions.

The model was constructed in Stella 8.0 (High Performance Systems, Inc., 2003), a graphic based simulation program and is derived from the basic bioenergetic model presented by Brett and Groves (1979). There is one base equation for the energy budget that balances the fish consumption against the metabolic expenditures (respiration due maintenance metabolism and activity), specific dynamic action, and waste, with the resultant energy incorporated into body tissues (somatic and gonadal): $C = R + A + S + F + U + \Delta B$. Where C is food consumption; R is metabolism; A is activity; S is specific dynamic action (the metabolic costs associated with food digestion); F is egestion (or feces production); and U is excretion (or urine production); and ΔB is somatic and gonadal growth. We altered the routine metabolic respiration, R, to include standard metabolic rate, SMR, and activity. This is estimated as: RMR = R = SRM * Act. Where *RMR* is the routine metabolic rate (g O_2 * g $fish^{-1}$* day^{-1}) based on the standard metabolic rate and activity; *SMR* is the standard metabolic rate (g O_2 * g $fish^{-1}$* day^{-1}); and *Act* is an activity multiplier (unitless) of respiration to account for the additional respiration costs with activity. By splitting RMR from SMR, we can include the increased standard metabolic rate from water quality stress. An additional subunit is added to the metabolism that controls the metabolic shifts associated with changing water quality.

The stressor-response bioenergetic model currently functions on data collected from the physiological laboratory experiments. By 2005 we will have measured the critical tolerance levels of temperature, dissolved oxygen, pH and salinity, and routine metabolism, swimming performance and recovery metabolism at 4 temperatures of larval, juvenile and adult SP. Knowing the spawn date/age of the introduced fish, genetic structure, growth rates in the hatchery, and release size, in combination with the ambient water quality monitoring, we can verify the accuracy of the model responses to the restored fishes observed growth. Furthermore, by monitoring several locations for water quality and population growth and abundance, we can begin to compare and evaluate between restoration sites and management practices. Physiologically structured models provide a clear distinction between the individual and its environment, and the separation of the individual- and population-level responses. The model outputs individual performances (metabolism and growth) as they relate to the physiological characteristics of the individuals and the confines of the environmental. Where long term studies and experimental manipulations are not possible, in this case due to replication problems, representative models can assist to fill in knowledge gaps. Though the model was developed for Sacramento perch, it can be applied to other species.

There has been a debate in ecology that the increasing complexity of community level processes produces an increasing stability versus the theory that increasing complexity begets instability not stability. With the latter theory, communities then persist despite not because of their complexity. It is not surprising then that stress responses observed at the population and community levels are very complex. To best deal with this complexity, the consideration of organismal level responses allows for the first step in understanding population and community level stress responses. This approach requires the linkage of sub-organismal and/or organismal level responses to metrics that are useful in population and community models (Adams 1990). Most importantly, we feel that the addition the environmental stressor subunit allows for a more exacting tool for restoration and conservation efforts.

LITERATURE CITED

Adams SM. 1990. Status and use of biological indicators for evaluating the effects of stress on fish. American Fisheries Society Symposium 8: 1-8.

Brett JR, and Groves TDD. 1979. Physiological energetics. *In*: Fish Physiology (eds) Hoar WS, Randall DJ, Brett JR. Academic Press, New York, pp 599-675.

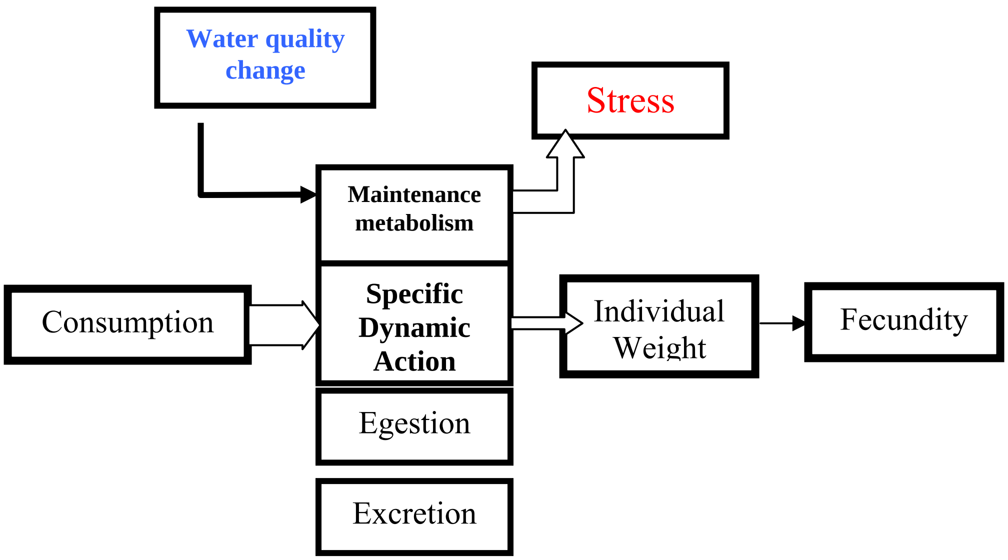
Brown PB, Neill WH, and Robinson EH. 1990. Preliminary evaluation of whole body energy changes as a method of estimating energy needs of fish. Journal of Fish Biology 36: 107-108.

Donaldson EM. 1990. Reproductive indices as measures of the effects of environmental stressors. American Fisheries Society Symposium 8: 145-166.

Johnston TA, and Leggett WC. 2002. Maternal and environmental gradients in the egg size of an iteroparous fish. Ecology 83: 1777-1791.

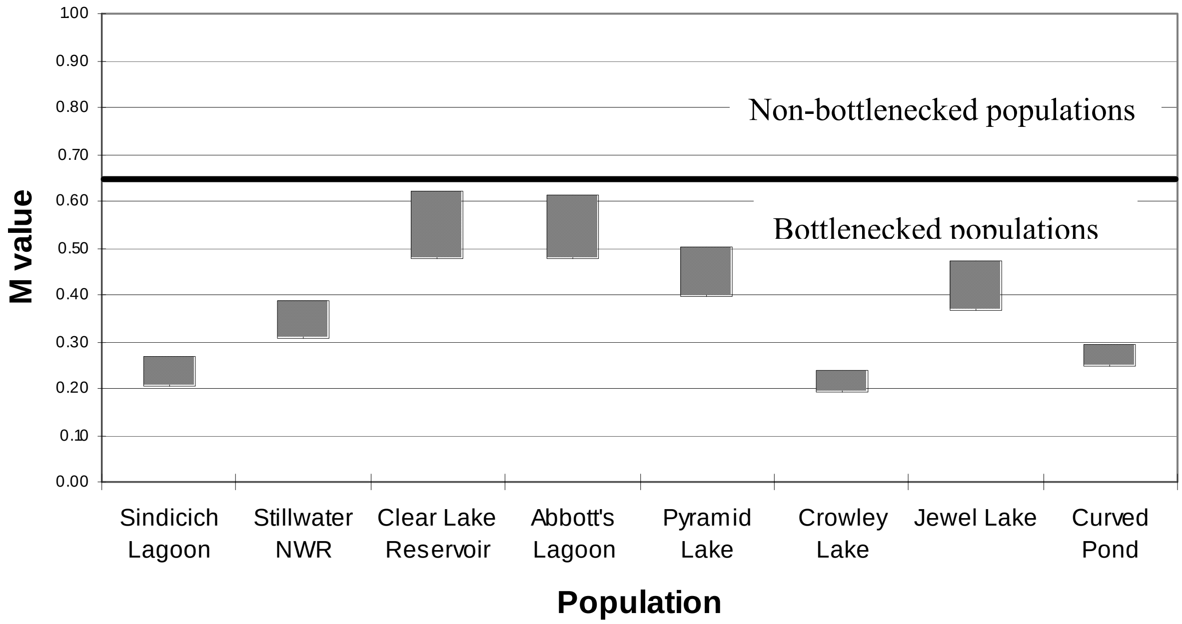
Wilkie MP, and Wood CM. 1996. The adaptations of fish to extremely alkaline environments. Comparative Biochemistry and Physiology Part B 113: 665-673.

Figure 1. Conceptual model representing the bioenergetics with the incorporation of “stress” related to water quality changes. Stress is defined as the disruption of homeostasis within a fish with the end result of metabolic energy reallocation away from maintenance metabolism. The size of the block arrows indicates magnitude of energy transfer.



Appendix 2 How much are SP populations bottlenecked?

M value of extant populations of Sacramento perch. The M value defines the degree to which the population has undergone a bottleneck and recovered, where M<0.65 reflected a bottlenecked population (Garza and Williamson 2001). The range of M values for each population reflects potentially different mutation models of microsatellite genetic markers; the range covers the most to least conservative value of M. All populations have clearly undergone bottlenecks. (Schwartz and May, unpublished).



Tasks And Deliverables

Monitoring Sacramento perch populations in the Central Valley

Task ID	Task Name	Start Month	End Month	Deliverables
1	Project Management	1	36	Semiannual and final reports. Periodic invoices
2	Monitoring of SP populations at existing sites:	1	36	Quarterly reports on progress Final Report,with peer reviewed publication, presentations and posters at annual AFS and CALFED Science conferences
3	Environmental Monitoring of Restoration Sites:	1	36	Quarterly reports on progress Final Report,with peer reviewed publication presentations and posters at annual AFS and CALFED Science conferences
4	Genetic Monitoring:	1	36	Quarterly reports on progress Final Report,with peer reviewed publication presentations and posters at annual AFS and CALFED Science conferences

Comments

If you have comments about budget justification that do not fit elsewhere, enter them here.

Information from the project will be dissimenated through presentations at local and national conferences. New information will be presented to local agencies and workgroups through talks and other meetings that specifically address each restoration action. Information gained from the project will be put into peer reviewed publications at the end of the project. Data will be uploaded into a IEP Database throughout the project and made available to the public after all peer reviewed publications are finished.

Budget Summary

Project Totals

Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
$330,056	$85,691	$0	$135,650	$0	$0	$0	$26,114	$577,511	$137,851	$715,362

Do you have cost share partners already identified?
No.

If yes, list partners and amount contributed by each:

Do you have potential cost share partners?
No.

If yes, list partners and amount contributed by each:

Are you specifically seeking non−federal cost share funds through this solicitation?
No.

Monitoring Sacramento perch populations in the Central Valley

Monitoring Sacramento perch populations in the Central Valley

Year 1 (Months 1 To 12)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total

1: project management (12 months)	9742	2785	0	600	0	0	0	0	$13,127	3282	$16,409
2: Monitoring of SP populations at existing sites: (12 months)	38886	10900	0	13000	0	0	0	0	$62,786	15697	$78,483
3: Environmental Monitoring of Restoration Sites: (12 months)	52891	11088	0	30000	0	0	0	8407	$102,386	23495	$125,881
4: Genetic Monitoring: (12 months)	25932	7780	0	12000	0	0	0	0	$45,712	11428	$57,140
Totals	**$127,451**	**$32,553**	**$0**	**$55,600**	**$0**	**$0**	**$0**	**$8,407**	**$224,011**	**$53,902**	**$277,913**

Year 2 (Months 13 To 24)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
1: project management (12 months)	9742	2785	0	450	0	0	0	0	$12,977	3244	$16,221
2: Monitoring of SP populations at existing sites: (12 months)	39556	11118	0	13500	0	0	0	0	$64,174	16044	$80,218
3: Environmental Monitoring of	29608	5744	0	15500	0	0	0	8707	$59,559	12713	$72,272

Restoration Sites: (12 months)											
4: Genetic Monitoring: (12 months)	25932	7780	0	12000	0	0	0	0	$45,712	11428	$57,140
Totals	**$104,838**	**$27,427**	**$0**	**$41,450**	**$0**	**$0**	**$0**	**$8,707**	**$182,422**	**$43,429**	**$225,851**

Year 3 (Months 25 To 36)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
1: project management (12 months)	9742	2785	0	600	0	0	0	0	$13,127	3282	$16,409
2: Monitoring of SP populations at existing sites: (12 months)	40246	11342	0	13000	0	0	0	0	$64,588	16147	$80,735
3: Environmental Monitoring of Restoration Sites: (12 months)	21847	3804	0	13000	0	0	0	9000	$47,651	9663	$57,314
4: Genetic Monitoring: (12 months)	25932	7780	0	12000	0	0	0	0	$45,712	11428	$57,140
Totals	**$97,767**	**$25,711**	**$0**	**$38,600**	**$0**	**$0**	**$0**	**$9,000**	**$171,078**	**$40,520**	**$211,598**

Budget Justification

Monitoring Sacramento perch populations in the Central Valley

Labor

Task 1 -- Project Administration Analyst 1 mo @$4230 Coordinator 1 mo @$5512 Task 2 -- Fish monitoring SRA 2 50% @ 3722/mo Jr. Specialist 1 6 mo @ 2759 Task 3 -- Rearing and environmental monitoring Jr. Spec. @ 100% Yr 1; 25% Yr 2 GSR 7.5 mo @ 2913/mo Task 4 -- Genetics (May) Adjunct faculty IV 2 mo @8250 SRA II 6 mo @2947

Benefits

Analyst 1 @ 35% Coordinator 1 @ 24% SRA II step 16 @ 33% Jr Specialist @ 23% GSR @ 17% Adjunct Faculty @ 30% SRA II step? @ 30%

Travel

No travel

Supplies And Expendables

Task 1 -- Project Administration Supplies &Expense Local Travel yr 1 $200, yr 2 150, yr 3 $200 Copying, phone, meeting exp yr1 $400, yr 2 $300, yr 3 $400 Task 2 -- Fish monitoring Supplies &Expense UC Vehicle rental yr1 $5,000, yr2 $5,500, yr3 $6,000 Expendible supplies yr1 $2,500, yr2 $2,500, yr3 $2,500 Nets and equipment repair yr1 $4,000, yr2 $4,000, yr3 $3,000 Publication costs yr1 $1,500, yr2 $1,500, yr3 $1,500 Task 3 -- Rearing and environmental monitoring UC Vehicle rental yr1 $5,000, yr2 $5,500, yr3 $6,000 Expendible supplies yr1 $10,000, yr2 $4,000, yr3 $4,000 Meters and repairs yr1 $5,000, yr2 $2,000, yr3 $1,000 Water, Tank and Vet charges for 6 tanks yr1 $10,000, yr2 $4,000, yr3 $2,000 Task 4 -- Genetics Equipment maintenance yr1 $3,000, yr2 $3,000, yr3 $3,000 PCR and gel supplies yr1 $9,000, yr2 $9,000, yr3 $9,000

Services And Consultants

None

Equipment

None

Lands And Rights Of Way

None

Other Direct Costs

Other Direct Costs in this budger are fee remission costs for a graduate student in Task 2. They are as follows and have step increases buit in anticipating increasing graduate student fees. yr1 $8,407, yr2 $8,707, yr3 $9,000

Indirect Costs/Overhead

University of California Indirect Cost policy.

Rates. For contracts with Federal agencies, the University of California uses rates based on OMB Circular A−21; the research rate in effect until June 30, 2005 is 48.5%, after which it increases to 51.5 until June 30, 2007, and then to 52% until June 30, 2008. For contracts with all State Agencies except the Department of Food and Agriculture, the University applies a rate of 25%. (A special 10% rate for State Resources agencies which has been in effect in recent years was revoked by the Office of the President on May 9,2003 via Operating Guidance memo No. 03−02.)

Application. These rates are applied to modified total direct costs (MTDC), which consists of all salaries and wages, fringe benefits, materials and supplies, services, travel, subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract. Equipment and student fee remissions are excluded

from the MTDC.

Comments

Task 2 has a YSI water quality meter incorporated into supplies and expenses. This is because the definition of equipment is different in CALFED vs UC Davis. To get the approval of the budget through the Office of Research we used the UC definition of equipment which requires an item to cost over $5,000 vs CALFED which is $1,000.

Environmental Compliance

Monitoring Sacramento perch populations in the Central Valley

CEQA Compliance

Which type of CEQA documentation do you anticipate?
X none
− negative declaration or mitigated negative declaration
− EIR
− categorical exemption

If you are using a categorical exemption, choose all of the applicable classes below.
− Class 1. Operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. The types of "existing facilities" itemized above are not intended to be all−inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.
− Class 2. Replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.
− Class 3. Construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. The numbers of structures described in this section are the maximum allowable on any legal parcel, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 4. Minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 6. Basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies. These may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not

yet approved, adopted, or funded.
– Class 11. Construction, or placement of minor structures accessory to (appurtenant to) existing commercial, industrial, or institutional facilities, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

Identify the lead agency.

Is the CEQA environmental impact assessment complete?

If the CEQA environmental impact assessment process is complete, provide the following information about the resulting document.

Document Name

State Clearinghouse Number

If the CEQA environmental impact assessment process is not complete, describe the plan for completing draft and/or final CEQA documents.

NEPA Compliance

Which type of NEPA documentation do you anticipate?
X none
– environmental assessment/FONSI
– EIS
– categorical exclusion

Identify the lead agency or agencies.

If the NEPA environmental impact assessment process is complete, provide the name of the resulting document.

If the NEPA environmental impact assessment process is not complete, describe the plan for completing draft and/or final NEPA documents.

Successful applicants must tier their project's permitting from the CALFED Record of

Decision and attachments providing programmatic guidance on complying with the state and federal endangered species acts, the Coastal Zone Management Act, and sections 404 and 401 of the Clean Water Act.

Please indicate what permits or other approvals may be required for the activities contained in your proposal and also which have already been obtained. Please check all that apply. If a permit is *not* required, leave both Required? and Obtained? check boxes blank.

Local Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
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	Required?	Obtained?	Permit Number (If Applicable)
scientific Collecting Permit	X	X	SC-003096
CESA Compliance: 2081	–	–	
CESA Complance: NCCP	–	–	
1602	–	–	
CWA 401 Certification	–	–	
Bay Conservation And Development Commission Permit	–	–	
reclamation Board Approval	–	–	
Delta Protection Commission Notification	–	–	
state Lands Commission Lease Or Permit	–	–	

action Specific Implementation Plan	–	–	
other Stocking Permit	X	–	

Federal Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
ESA Compliance Section 7 Consultation	–	–	
ESA Compliance Section 10 Permit	–	–	
Rivers And Harbors Act	–	–	
CWA 404	–	–	
other	–	–	

Permission To Access Property	Required?	Obtained?	Permit Number (If Applicable)
permission To Access City, County Or Other Local Agency Land Agency Name	–	–	
permission To Access State Land Agency Name	–	–	
permission To Access Federal Land Agency Name	–	–	
permission To Access Private Land Landowner Name TNC	–	X	

If you have comments about any of these questions, enter them here.

TNC permit has no number accept gate combinations

Land Use

Monitoring Sacramento perch populations in the Central Valley

Does the project involve land acquisition, either in fee or through easements, to secure sites for monitoring?
X No.
– Yes.

How many acres will be acquired by fee?

How many acres will be acquired by easement?

Describe the entity or organization that will manage the property and provide operations and maintenance services.

Is there an existing plan describing how the land and water will be managed?
– No.
– Yes.

Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?
– No.
X Yes.

Describe briefly the provisions made to secure this access.

`Permit has be aquired from The Nature Conservancy`

Do the actions in the proposal involve physical changes in the current land use?
X No.
– Yes.

Describe the current zoning, including the zoning designation and the principal permitted uses permitted in the zone.

Describe the general plan land use element designation, including the purpose and uses allowed in the designation.

Describe relevant provisions in other general plan elements affecting the site, if any.

Is the land mapped as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance under the California Department of Conservation's Farmland Mapping and Monitoring Program?

X No.
– Yes.

Land Designation	Acres	Currently In Production?
Prime Farmland		**–**
Farmland Of Statewide Importance		**–**
Unique Farmland		**–**
Farmland Of Local Importance		**–**

Is the land affected by the project currently in an agricultural preserve established under the Williamson Act?

X No.
– Yes.

Is the land affected by the project currently under a Williamson Act contract?

– No.
– Yes.

Why is the land use proposed consistent with the contract's terms?

Describe any additional comments you have about the projects land use.