Monitoring Sacramento perch populations in the Central Valley

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Initial Selection Panel Review

Not Recommended

Amount Sought: **$**715,362

Fund This Amount: $**0**

Brief explanation of rating:

This proposed project would continue a previously funded project that studied the basic biology of Sacramento perch, a non−listed species identified as a species for which the ERP is responsible for contributing to recovery. Although the proposed project would likely contribute to our understanding of the biology of Sacramento perch, and could contribute directly to the recovery of the species in that the proposal includes pilot reintroductions of Sacramento perch in habits throughout the Delta and Suisun Bay, it is not adequately linked to monitoring of previous restoration projects and does not make the case that Sacramento perch should be a focal species for evaluating the success of restoration projects on a wide scale. The Technical Review Panel gave the proposal an adequate rating and noted that it was vague in implementation. Concerns were also raised about regulatory compliance and permits associated with incidental take of listed species and purposeful removal of sportfish from some reintroduction sites. The Selection Panel does not recommend funding for this proposal at this time.

Technical Panel Review

Technical Review Panel's Overall Evaluation Rating:
Adequate

Explanation Of Summary Rating

The basic idea is strong, but it is not very well developed. As one of the external reviewers noted: “This group of PIs is exceptional, but the proposal is not”. The proposal has technical deficiencies and appears to have only a medium regional value. While there are some administrative concerns, these could probably be solved.

Goals And Justification

The goals and objectives are clearly described in this proposal, and the proposal is internally consistent. The investigators provide a model that shows how research activities and restoration activities are related to each other, but it is not a conceptual model explaining the basis of the work or tying the components together. The authors list 4 monitoring objectives with a total of 7 hypotheses. These hypotheses are pretty extensive and cover the research, but are not in such a form that it is clear how they will be evaluated. Some hypotheses are pretty trivial; e.g."Successful SP populations have biological characteristics indicative of a healthy population". And: "Populations of SP are most likely to persist if they have high levels of genetic variation". The proposal provides ample justification for research on factors affecting the success of SP reintroductions. But there is no justification for making SP a focal species for evaluating the success of CALFED restorations on a wide scale.

Approach

The approach is well designed, using a combination of bioenergetics,genetic diversity and population/environmental monitoring. There is general agreement among the external technical reviewers that this multi−pronged approach is in general very attractive. However, there are various problems with the application of this approach here. First, the three components are not integrated and merely carry on existing activities. Without stronger integration, the research will only advance the field in a limited way. And without this integration, success or failure of a population can not be tied to any specific factor. Second, population monitoring may be sufficient to determine whether reproduction has occurred, but insufficient to tie population declines to specific environmental variables (that vary on shorter spatial scales than the 2 times/year population sampling). Sampling could also be improved by considering other approaches such as mark/recapture. Third, the approach is very vague overall and does not explain how each hypothesis will be tested. Description of methodology is very limited (e.g. on how the actual introductions will be done). It is also not clear what populations will be used as a baseline. The preliminary work shows a low amount of genetic variation in the established source populations, but one can not determine if this level of genetic variation is normal for this species without having baseline information.

Feasibility And Likelihood Of Success

The various components of the project are all very feasible, and a substantial amount of preliminary work has been done. The scale of the project is limited, with only 10 introductions (of 500 fish). With this number of introductions, and these being established as mixtures of the eight different source populations) it will be hard to derive at any firm conclusions on which source populations are the most successful. And it will make it impossible to determine the influence of stocking population size (which is one goal mentioned in the proposal). Neither is it likely that the influence of physiochemical differences among the habitats on

restoration success can be adequately evaluated (just too many variables for a total n=10). Introductions are limited by the capacity to raise the fish. It may be worth while to partner with state fish hatchery in order to expand scale of the project. The regional panel did not identify any local circumstances that would impede the project. The environmental compliance review indicated an unrecognized need for CEQA/NEPA compliance/permits, and noted that the issue of eradicating non−native centrarchids (proposed for some sites) may be a serious impediment (being in conflict with CDFG sportfish policies).

Performance Measures

The data collected should adequately document the success/failure of the fish introductions, but it is unlikely that success/failure can be attributed to a specific cause. These results will provide some benefit for CALFED restoration monitoring and SP success, but it is unclear how "success" is defined and what the rationale is for many of the project's measures (including "why use SP population performance as a measure of success of CALFED restoration projects?")

Products

The project will lead to some information that is useful to resource managers, other decision makers and scientists. Useful information will come from the three components (environmental monitoring, energetics modeling, and genetics) and results are expected to be of sufficient quality for peer−reviewed publications. But insight into SP reintroduction success will be limited in the absence of proper integration of the three project components and scale limitations. Access of others to these data seems appropriate.

Capabilities

Cech, May and Moyle (PIs) are all very highly qualified and their strong publication records indicate that they have the ability to complete the project. Their mix of disciplines is a clear strength of this proposal. The qualifications of the

lead PI (Kim Lamar) are not listed (and this person's role is unclear; administrator?).

Budget

The budget appears generally reasonable and adequate. One external reviewer felt it to be too high, considering the limited field sampling, the use of a bioenergetics model that is already pretty far developed, and the fact that the project does not contain an excessive amount of genetics work.

Regional Review

The proposal underwent 3 regional reviews. One regional review felt that the focus on a single species that was not federally- or state-listed and that would need to be stocked at restoration sites, gives it poor utility as an indicator of success at restoration sites. The second regional review felt that the project's value to increase understanding of restoration outcomes is unclear, that it does not look at factors that may have caused the extirpation of the species from its native range, and that it does not provide important long-term data on progress of restoration activities in the region. The third review mentioned the lack of a link to other restoration efforts and that reintroductions may in most cases not be successful due to the presence of non-native species, and that the research was too focussed on a single species – but that it does address milestones for the Sacramento perch and meets most regional criteria. Overall rankings were respectively: "medium", "low", and "high".

Administrative Review

Various problems were identified in the budget review (items as "supplies" rather than "equipment" due to use of different $ cut-off amount) and some major changes to the standard grant agreement's terms and conditions. Environmental compliance review stated that, in contrast to what is stated in the proposal, CEQA/NEPA compliance is required, and permits are needed for incidental take of listed fish species. The eradication of non-native centrarchids (proposed for some

sites) may be in conflict with CDFG sportfish policies, and this could be a serious impediment to this task. Prior−phase funding review noted some problems with final report being late, rights−in−data issues and with invoicing.

Additional Comments

The proposal is exceptional in goals, but vague in implementation. The proposal appears to have been put together hastily. The proposal would be much stronger if it had a proper conceptual model with linkages between the components.

Bay Regional Review

Bay Regional Panel's Overall Ranking:
Medium

Summary:

The project focuses on a single species that is not federally or State listed. The species currently is reared and released to specific locations, rather than naturally dispersing to these sites. There the utility of the Sacramento perch as an indicator species of the success of restoration of uninhabited sites is poor (e.g. it is unlikely to disperse to newly created suitable habitats). The Sacramento persch was not known to be a target species for the restoration of Black Loch Tidal Marsh.

1. Applicability To ERP Goals And Regional Priorities.

The Sacramento perch is a species in the MSCS. The project would provide information on the biology and genetics of the fish, and als the environmental factors (water quality) at the sites inhabited by the animal.

2. Links With Other Restoration Actions.

The proposed project would monitor the Sacramento perch at a number of restoration sites in northern California. The objectives of the project is to examine the potential for this species to serve as an indicator of the success of restoration activities.

3. Local Circumstances.

There do not appear to any local cicumstances that would constraint the project.

4. Local Involvement.

The results of the proposed project will be made available to stakeholders including conservation banks, vector control agencies, and State and Fedeal agencies.

5. Local Value.

The Proposed Project Will Provide Insight Into The Success Of Restoration Projects. However, The Overall Applicability Of These Results Maybe Constrainted By The Limited Dispersal Abilities Of This Species.

6. Other Comments:

Delta Regional Review

Delta Regional Panel's Overall Ranking:
Low

Summary:

This proposal doesn't articulate how monitoring the reintroduction of Sacramento perch at these sites will evaluate CALFED actions in the region. The proposal did not identify the habitat processes or stressors that may have extirpitated Sacramento perch from their native range (the Delta and Suisun Bay). The applicants state that this is a logical follow-up to their present CALFED project (ERP-02-P34) which studies the basic biology of Sacramento perch. But studying the biology of Sacramento perch does not seem like a restoration action and monitoring the reintroduction also does not seem like monitoring a restoration action. The project appears to propose a new restoration action (reintroduction) and determinig if it is successful. We do not believe this proposal continues previously funded monitoring in ways that provide important long-term data about ecosystem status and trends and the progress of restoration activities in the region. There would be value of reintroducing Sacramento perch and monitoring their success. There would also be value in determining the status of Sacramento perch in existing locations, but these objectives are not the focus of this proposal solicitation. The potential value of the project's products to increase understanding of restoration actions' outcomes is unclear.

1. Applicability To ERP Goals And Regional Priorities.

The project proposes to monitor the reintroduction of Sacramento perch at a minimum of 10 locations over the three year period. Four populations are established, but not listed, three populations are to be established in 2005 and are listed in the text, with at least three others to be established later in 2006. Of the three sites listed in the text, two of

them are from ERP land aquisition. At the third site it is not clear how much restoration has occurred. So it isn't clear how monitoring the reintroduction of Sacramento perch at these sites will evaluate CALFED actions in the region. The proposal says future reintroduction sites will be selected based on results of a bioenegetics model. The project may provide information about how reintroductions at these sites can contribute towards the reintroduction of Sacramento perch into the Delta and Suisun Bay. Sacramento perch is a California Species of Special Concern (a MSCS "r" species). The proposal did not identify the habitat processes or stessors that may have extripitated them from their native range (the Delta and Suisun Bay). The applicants propose to monitor reintroductions in an area near the Consumnes River. The project may be able to compare reintroduction success among the 10 selected locations, but it is not clear how many sites will represent particularly important types of habitat.

2. Links With Other Restoration Actions.

Monitoring of the 10 sites where reintroductions are made will include twice− yearly monitoring of other species in that area. The applicant states that this is a logical follow−up to their present CALFED project (ERP−02−P34), studying the basic biology of Sacramento perch, but studying the biology of Sacramento perch does not seem like a restoration action and monitoring the reintroduction also does not seem like monitoring a restoration action. Rather, this project would be doing a restoration action (reintroduction) and seeing if it is successful. It has been identified that the data would be available through the IEP database and readily accessible to others after the report is completed. This project does not continue previously−funded monitoring in ways that provide important long−term data about ecosystem status and trends and the progress of restoration activities in the region. It may provide information that could help inform planning or design of imminent restoration actions proposed for nearby ecosystems. If reintroduction is successful in certain habitats, then more habitat like that would be sought for land retirement or restoration. It isn't clear how this project could be used to assess other restoration actions in the

region until a large scale propogation program of Sacramento perch is implemented. It is not clear that CALFED or CDFG supports or will support a large scale Sacramento perch propagation program.

3. Local Circumstances.

The project is dependent upon sucessfully propogating Sacramento perch and reintroducing them, to potentially repopulate surrounding areas. The success of the program would be contingent upon continued success of propagating several groups of Sacramento perch which seems somewhat experimental and tenuous. The project will need a stocking permit from CDFG and there are a number of issues that will need to be addressed in this permit. The applicants have a scientific collecting permit from CDFG. The project is on private property (The Nature Conservancy) where they have a permit for access. The application does not include written permission from the property owner.

4. Local Involvement.

Public involvement is minimal and includes "cooperation" with groups like Wildlands, Inc., Contra Costa Vector Control, Solano Land Trust, DWR, CDFG, and UC Davis Cooperative Extension fisheries specialist to find sites on private land for introduction of Sacramento perch. It will also provide reports to stakeholders and oral presentations or posters at AFS or CALFED Science Conferences.

5. Local Value.

There would be value of reintroducing Sacramento perch and monitoring their success. There would also be value in determining the status of Sacramento perch in existing locations, but these objectives are not the focus of this proposal solicitation. It isn't clear why Sacramento perch have been extirpated in their native range and it isn't clear what CALFED actions have been taken to remedy the problem. The CALFED funded restoration sites that are discussed appear to be a result of land retirement and what type of restoration

that has occured, if any, is not clear. Thus, the value of the project's products to increase understanding of restoration actions' outcomes is unclear. There are no control sites, so it is unclear how the CALFED restoration sites would be compared to other, non-restored areas to determine if the success of the reintrodution is due to actions taken by CALFED or due to other reasons. The project possibly could help in determining the types of habitat that are best suited for Sacramento perch reintroductions.

6. Other Comments:

The project seems valuable, but its connection to CALFED's goals isn't clear. This project does not appear to monitor past CALFED actions, but monitors reintroductions that appear to be part of a different action (it is not clear who funded this action) and the monitoring proposed appears to be focused on that.

Sacramento Regional Review

Sacramento Regional Panel's Overall Ranking:
High

Summary:

This project meets most of the regional criteria and is ranked as a high priority. A very high ranking was not given because the panel feels that re-introductions may not be successful in most cases due to the presence of introduced species. Other factors limiting this species may be minor compared to competition from non-natives. Therefore, reintroduction success may be limited to only a few locations. The panel also feels that the project is too focussed on a single species, although it directly addresses the milestone for Sacramento Perch.

1. Applicability To ERP Goals And Regional Priorities.

The proposal will monitor populations of Sacramento perch established and studied under previous ERP funded project. It will monitor success of Sacramento perch introductions and determine key factors that make them a success. The researchers will study how habitat processes and stressors affect Sacramento perch, a species of concern. The project has links to the Cosumnes River, Sacramento River, and Delta, areas where CBDA has made large investments in restoration. This project will assess species' ability to sustain themselves in a floodplain and tidal environments and where ERP acquired land.

2. Links With Other Restoration Actions.

This project is linked to restoration of floodplain and in-channel habitat in the Delta. From what we can glean, the project is coordinated with other restoration and monitoring activities, though this is not specifically addressed.

The project continues previously funded monitoring such that it provides long−term data about status and trends. These data will fill an important knowledge−gap as no studies of this type are being done. Results will be readily accessible through the IEP database and publications and will inform planning and design of imminent restoration actions, particulary in the Cosumnes River floodplain.

This project is not directly coordinated with other restoration efforts, but proponents are involved in numerous other linked efforts. The results of this proposal will provide tools and information for restorationists to assess the probable benefits to Sacramento perch from the design or approach to a project.

3. Local Circumstances.

We do not foresee local circumstances that may impact the project's feasibility except that they will be sampling in areas that harbor listed species and a take permit will be required. Written permission for access to private lands was not included with the proposal; however, it does not appear that trespass on private land other than TNC land is required, although such access may be required in the future.

4. Local Involvement.

The project will coordinate with Wildlands Inc., Contra Costa Vector Control, Solano Land Trust, DWR, and DFG. Proponents will be looking for sites on private land for introductions of Sacramento perch. They could extend their audience by presenting their work to local watershed and conservation groups within the study area. b. Will project create a local partnership that is likely to endure beyond the term of an ERP grant? Not sure the level of study could be sustained by other sources. Agency sources have not focused on Sacramento perch in the past

5. Local Value.

This project will increase our ability to make resource decisions. The scale of the energetic model may be too fine to apply in areas where restoration choices are few. Sacramento perch are not likely to be the focus of large scale restoration projects, but components of these projects could be adjusted to better suit this species. The panel believes this project will help restorationists understand if/how their actions are obtaining restoration objectives. This project has both regional and site specific applications.

External Technical Review #1

Goals And Justification

This proposal aims to reintroduce extirpated populations of Archoplites interruptus to habitat once occupied by this species. At least ten reintroduction sites will be monitored for census size, water quality and ecological parameters, and genetic diversity. The author clearly states the importance of reintroducing and monitoring populations of A interruptus in their once native range. These populations are being reintroduced into suitable habitat for the continuance of A. interruptus populations and an added benefit is that these reintroductions are in association with larger CALFED restoration projects, which provides for a greater understanding among restoration ecology, demography, and population genetics. The goals and objectives are clearly described in the proposal; yet achieving these goals remains unclear (see below). Assuming that the restoration action is 1) to reintroduce A. interruptus populations and 2) to monitor the census size and genetic diversity over time, then the conceptual model presented does not clearly or adequately explain the underlying basis for the restoration actions. This proposal is seeking to accomplish the "Demo Project" phase without adequately describing the link between "Present Project Data Collection", "Developing Restoration Strategies" and "Initiating Restoration Strategies"; therefore it is unclear how these categories will be connected given the data from this project. I am sure authors understand this link, but the link is unclear to reader and is not conveyed in the conceptual model.

There are four main monitoring objectives each with several clearly stated research hypothesis. All hypothesis are justified given the existing knowledge and knowledge gaps.

Approach

The approach is perhaps the weakest part of the proposal. Although objectives and hypotheses are clearly stated, the

methodology used to test each hypothesis is extremely vague and unclear. For example:

Hypothesis 1 suggests a "successful" A. interruptus introduction is characterized by biological characters indicative of a healthy population. What are the author's baseline comparisons? Are they comparing A. interruptus introductions to healthy populations of A. interruptus or do all healthy fish populations have indicative characters – – I can think of numerous threatened or endangered fish populations that have multiple age classes and age/length structure. Also how is rapid growth being evaluated – this is unclear. Next, the sampling design is vague and inadequate. To truly understand the complexity of habitat utilization, sampling should be chosen to evenly sample across habitats, but selected haphazardly within habitat category. Lastly, it is unclear how population success will be based on total catch, CPUE, and age class structure.

Hypothesis 2 indicates that high levels of genetic diversity are indicative of persisting A. interruptus populations. As above, what constitutes high levels of genetic diversity? Populations must be compared to baseline populations, but this is never mentioned. Furthermore, it is unclear how the author will be monitoring genetic diversity. The sampling methodology indicates that ~30 naturally spawned individuals from each population will be fin clipped for genetic analyses. The author proposes to monitor genetic diversity by genotyping offspring and adults introduced into each site. First, tissue collection of adult fish in not mentioned in this proposal. Second, even if the adults are sample, I am reluctant that 30 individual offspring is sufficient to monitor the genetic diversity in each population, and there is no mention of what type of genetic diversity measure will be used. Given the experimental design of this project; there is the possibility that all 30 sampled individuals could have come from one paired mating, which will be an inadequate sample of the population as a whole. Lastly, I am reluctant to think that 30 individuals categorized to full sibs is an adequate estimation of the number of fish contributing to the next generation. In summary, the genetic monitoring section is vague and unclear,

leaving doubts about the feasibility of this portion of the project.

A larger flaw of this proposal is the lack of methodology pertaining to the actual introduction of A. interruptus into selected sites. The author mentions that 500 fish will be introduced into each monitoring site from differing source populations. Is the author controlling for unbiased sex ratios or the effects of inbreeding in these introductions? For example, what if 75% of the fish stocked are females or if 80% of the fish introduced from a population are from 5–7 paired matings? These types of introductions could have profound effects on the genetic diversity and long–term survival of each introduction. Before introductions occur these points need addressing.

The proposal is a follow–up to proposal ERP 02–P34, and the connection between them is vague; however, they adequately discuss how the bioenergetic model builds upon data gleaned from the earlier proposal. This model is an integral part of the project and will be utilized by managers and biologists.

Although there are reservations concerning the methodology of this proposal, the monitoring and evaluation activities, if implemented correctly, will contribute substantially to our knowledge–base. Perhaps the largest contribution of this proposal is the knowledge gleaned from ecological and genetic interactions between non–natives and A. interruptus. Ultimately these data will give a more complete view of how and why this endemic species was extirpated from its natural range. This, along with knowledge from the bioenergetics model, will provide valuable contributions to managers and biologists wanting concrete models for management decisions. Lastly, if implemented correctly, the genetics section complements the ecology portion of this proposal and provides an understanding of the demographic, life history, and genetic parameters influencing A. interruptus population dynamics (an aspect not often seen in population studies)

Technical Feasibility

As stated above, there are areas of this proposal that are vague and unclear; thus to judge the technical feasibility of this document is difficult. I have my reservations that the genetics section can appropriately address all objectives given the number low number of individuals sampled. The monitoring portion of the project is feasible; however, the sampling design may be inadequate to appropriately answer the objectives of this proposal (see above).

Performance Measures

A strong point of the proposal is the connection of A. interruptus monitoring and its link to CALFED restoration actions. This proposal works closely with multiple CALFED restoration sites; therefore, the efforts allow for the evaluation of CALFED's restoration actions. This link will benefit both CALFED restoration monitoring and the success of A. interruptus populations. Although the specific performance measures are outlined, as stated above, the rationale for many of these measures is unclear. Lastly, these data will allow for the evaluation of restoration strategies in the conceptual model; though it is unclear how success or failure will be defined given the vague nature of this proposal. The monitoring and evaluation plan is not explicit; rather it is unclear how the author is defining success. How is the author going to compare success – with known successful A. interruptus populations? There is a need for multiple baseline populations in order to adequately compare results with introduced populations. For example, I can think to numerous fish populations that exhibiting low genetic variability and are "successful". Given Appendix 2, there is a range of genetic variability in naturally occurring populations of A. interruptus. Will these data be compared to reintroduced populations?

Products

Data collected for this study will be a valuable asset to resource managers and other decision makers. The bioenergetics

model will be a valuable tool to managers wanting to reintroduce A. interruptus into its native range. Unfortunately, the only means of accessing the proposals data is through the IEP database. Will genetic data be deposited somewhere? Due to the vagueness of this proposal, it is difficult to judge how these results will stand up to peer−review. There are several gaps (mentioned above) that need clarification before these data stand up to the peer−review process.

Capabilities

Although all three lead PIs are highly qualified and highly regarded in their areas of expertise, the qualifications of the lead investigator for this project is not summarized in this proposal. The mix of disciplines is a clear strength of the proposal. Few restoration projects adequately utilize fields of aquaculture, ecology, and genetics. The mix of disciplines strengthens the links among restoration ecology, life history, demography, and population genetics. Lastly, the team's performance record is exceptional, indicating they have the ability to complete this project in a timely manor.

Budget

The budget appears in order and reasonable for the work proposed

Additional Comments

This proposal, although exceptional in its underlying goals, is vague in its implementation. Furthermore, numerous grammatical and typographical mistakes are present throughout −− making the proposal appear like it was done at the last minute and without adequate thought.

External Technical Review #2

Goals And Justification

The proposal is well structured and the collaborative research approach is to be applauded. Sacramento perch are an excellent focal species for this work and sufficient preliminary work has been conducted to provide assurance of likely success. The PIs propose to monitor the status of 10 experimental populations of Sacramento perch (4 extant populations, 3 to be established in 2005 and an additional 3 to be established in 2006). They also plan to evaluate the status of known populations of Sacramento perch. This work aims to identify factors associated with population success due to the combined effects of genetic variation and environmental effects on bioenergetics. The restoration activities are well documented. The hypotheses are clearly related to evaluating factors that influence the success/failure of Sacramento perch restoration activities. The interplay of bioenergetics, genetic diversity and local environmental conditions is well conceived and should provide new insights not available from considering these factors in isolation. The proposal provides a nice conceptual model that shows how research activities and restoration actions are related to each other.

Approach

The multi−pronged approach of this project is very attractive. The interplay between population genetics and population success should be useful for identifying appropriate source populations for future introduction efforts. The bioenergetics model is especially interesting and should provide a means by which to evaluate how different environmental stressors impact on individual energy budgets. This model could be expanded to consider the population level effects of such stressors by evaluating how environmental stress effects reproduction and recruitment.

The project builds on current work in terms of population monitoring, genetic and bioenergetic research. The genetic

markers are well suited for this project. The bioenergetic model is currently being developed and should provide guidance on how environmental factors influence bioenergetics of individuals which ultimately translates to population level effects (reproduction and recruitment). The population monitoring is acceptable but could be improved by considering other sampling approaches such as mark recapture. Given the breadth and scope of this project, it would seem somewhat useful to at least explore mark–recapture to provide a little better information on population size. Simple batch applied fin clips can be easily used with large numbers of fish to obtain reasonable population estimates. This approach would be most useful for the smaller habitats such as the ponds on the UC Davis campus.

The bio–energetics model is interesting and should provide a nice means to evaluate environmental stress. Stella has an option for conducting sensitivity analyses. I am sure the authors are aware of this function, but I think they could explicitly show how a sensitivity analysis could be used to explore thresholds of various stressors.

The genetic sampling seems adequate, but additional information would be useful. For instance, evidence that all extant populations have been bottlenecked is provided. From this, one might infer that populations differ in allele frequencies and perhaps have some private alleles. This is inferred as the populations are presumably "genetically distinct". This information would be helpful as the PIs aim to use microsatellites as markers to evaluate the relative success of the various donor populations.

More information could be provided on the evaluation of population success. For instance, techniques for measuring individual growth rates and estimating condition are not provided. If the populations are sufficiently large, then small samples of fish could be collected for more detailed analyses. For instance, fat content could be easily measured by measuring dry mass before and after fat extraction with anhydrous ether.

New sites will be stocked with 500 fish from multiple sources, but how many sources will be used is not clear. It appears that sources be selected based on genetic markers, but this is not entirely clear? How many fish from each source population will be used?

Technical Feasibility

The project is well documented and technically feasible. The authors have generated considerable preliminary data. For intance, microsatellite markers have already been developed and the bioenergetic model has been developed. The project is well suited to addressing the issues associated with the success/failure of restoration activities. The project is especially appealing because of its interdisciplinary nature. The three research areas appear to be technically sound. The bioenergetics model is currently under construction and the microsatellite primers have been developed.

Performance Measures

The population performance measures are adequate but could be augmented with more precise population estimates and perhaps additional estimates of individual condition (fat storage). Otherwise, the field sampling should reveal the general status of the populations and this information can further be evaluated in the context of the genetic variation of the population as well as assessing performance at the individual level in terms of bioenergetics.

Products

The project should help delineate factors associated with the success/failure of restoration efforts. This information can help guide management decisions on which areas to restore and which populations to use in restoration efforts. The results will be presented in peer reviewed manuscripts and at appropriate meetings. The information will be available in the form of a report as well as in the peer reviewed literature. The preliminary work is suggestive that this work will result in a manuscripts of sufficient quality to be published in the

peer reviewed literature.

Capabilities

Cech, Moyle and May are well qualified to conduct this work. The collaboration among these PIs provides a unique opportunity to evaluate restoration efforts at multiple scales (genetic, individual bioenergetics and population). The PIs all have strong publication records and thus the work is likely to result in peer reviewed publications as well as specific management recommendations for Sacramento perch.

Budget

The budget appears to be adequate for the proposed research. I assume funds for publications during years 1 and 2 refer to progress reports.

External Technical Review #3

Goals And Justification

The proposed research will include: sampling of existing Sacramento perch populations, re−introduction of the species in a number of refugia, and monitoring of existing and new refugia populations. A stated goal is to assess the use of Sacramento perch as an index of restoration success.

The proposed research, as stated within the proposal, is internally consistent. However, there is no justification presented for use of the Sacramento perch as a index of restoration success. This might be one programatic goal, but it is not evident that creating habitats that support Sacramento perch will satisfy all, or even a majority, of the program's goals.

The proposal does not include a clear conceptual model explaining the basis of the restoration actions. A "conceptual" model is presented within the main body of the proposal that appears to represent an adaptive management−type decision framework: there is a problem, Sacramento perch is disappearing; a goal should be to stem and reverse this trend; research is needed; restoration actions should be undertaken; and problem solved, or reiterate. This does not constitute a conceptual model for the proposed research. It really is not a good model for adaptive management.

The proposal sets forth a number of hypotheses, but, unfortunately the criteria by which the hypotheses will be evaluated are not stated. For example, hypothesis one states that introduced populations of Sacramento perch will have population characteristics indicative of a healthy population. How will this be assessed? What exactly are the expected characteristics, what are they based on, and what will constitute support, or lack thereof, of the hypothesis? Hypothesis two states that populations are most likely to persist if they maintain a high genetic variation. How exactly is this to be tested? Data presented in the proposal shows the species to be genetically depauperate. Is this hypothesis at

all meaningful? Will population size– a measure of success– drive observed genetic variation? In other words, is the level of genetic variation present even meaningful?

More problematic is that a failed introduction may be due to lack of appropriate population characteristics (H1), low genetic variation (H2), unfavorable environmental conditions (H3), presence of exotic species (H5), or other unstated causes. To which cause shall the failure be attributed?

Here is the fundamental problem with this proposal: there is no conceptual "model" binding the three approaches (population, genetic, bioenergetic). There is no cohesion. This is three separate approaches, which do not support one another, under one umbrella.

In an overall sense, the hypotheses are not justified relative to existing knowledge. They are fairly trivial in nature.

Approach

The individual sampling/ analysis protocols generally are appropriate. The project is based on previous work by the co–PIs. I purposefully say "based on," rather than "builds on," the PIs former work. With exception of the proposed use of a bioenegertics model, developed in a previous effort, this work merely carries on existing activity.

Population monitoring is to be conducted twice per year. This will allow ONLY an assessment of population trends, at best. This sampling periodicity will not allow examination of seasonal changes in fish condition associated with reproduction, or other seasonal stressors. Further, this periodicity is likely to fail to detect unsuccessful reproductive bouts, or catastrophic losses of eggs, larvae, fry, etc. It will only allow one to observe that, for example, there was no successful reproduction. Not whether it was due to poor condition coming into the spawning season, unusual whether events, short periods of inclement conditions, etc. This, then, affects any interpretation of results from the bioenergetics model.

Will this project make a significant contribution? I don't think so. The basic biology of the Sacramento perch is sufficiently understood that sampling a small number of introduced populations twice per year is not going to add much. Without stronger integration and cohesion among population, genetic, and bioenergetic components of this project, I don't think the bioenergetics approach will yield much.

Technical Feasibility

The project is feasible– there are no novel or extremely difficult analyses to be conducted. The PIs appear to be able to rear fish for introduction into refugia.

The scale– the small number of reintroductions– is limited. But this may be unavoidable given the small numbers of fish that can be reared for reintroduction. Perhaps the PIs could partner with a state fish hatchery. This would allow them to make more, and larger, reintroductions and actually test meaningful hypotheses, for example: success is directly related to initial population size.

The PIs should be encouraged to explore such a partership in the future.

Performance Measures

Will this study allow evaluation of the restoration actions? Yes– successful reintroductions should be documentable. No– based on the proposed research, the PIs are unlikely to be able to attribute success or failure to any of the three metrics proposed (population characteristics, genetic variation, bioenergetics). As stated before, population monitoring is insufficient.

Products

As products, the PIs indicate they will present and publish their results. I have no doubt they will. I have some doubts about the utility of their results. The results will be

published in high quality journals, I am sure. But does publication of such papers overide the study design limitations? The results of the population, genetic, and bioenergetic components will be published separately. They must be, because it is not possible to attribute a population event to any ONE of the three components. In my view, this is a fatal problem.

Capabilities

The PIs are very capable and have a record of publishing high quality papers in the scientific literature. There can be little doubt that the PIs will complete the proposed research, if funded.

Budget

The budget is very high for this study. There is limited field sampling , the bioenergetics model has already been constructed, and there is not an excessive amount of genetic analysis proposed.

The budget is not easy to interprete– I don't think this is the PIs fault, rather it appears to be a consequence of budget format for this program. As I read the budget, only one graduate student will be funded.

Additional Comments

I am unsure where to put this comment. The PIs have not adequately addressed the population genetics of Sacramento perch in this proposal. First, they present results showing several populations have low genetic variation. I do not dispute this observation. However, its interpretation is problematic. The PIs present no information on the general level of genetic variation in the species. Is this a species, such as walrus, with a naturally low level of variation? This would help me understand this result better.

Further, the PIs plan to "increase" the chances of successful reintroduction by mixing fish from different sources so as to

increase the genetic variation. Is this advisable? I would like to know whether there is a possibility of outbreeding depression. Certainly, this is not addressed in the proposal.

The PIs are an exceptional group. This is not an exceptional proposal. It appears to have been hastily assembled– as these kinds of things often are. There are minor blemishes such a "place holder" for affiliation of Tom Cannon on page 4, and some misspellings. I mention these not because I am offended, or based my review on them, but it is clear that the PIs did not give this all they could. I think a conceptual model for THIS research, which specifically indicates linkages between the three study components, would improve the presentation here and the overall project. In particular, such a model would prompt the PIs to consider how various hypotheses can be refuted by one and only one component at a time.

Budget Review

1. Does the proposal include a detailed budget for each year of the requested support?
Yes.

2. Does the proposal include a detailed budget for each task identified?
Yes.

If no, please explain:

High amount of supplies and expendables(i.e. $55K in the first year).

3. Are project management expenses appropriately budgeted?
Yes.

4. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs? Are indirect rates, if used, appropriately applied?
Yes.

5. Does the budget justification adequately explain major expenses? Are the labor rates and other charges proposed reasonable in relation to current state rates?
No.

If no, please explain:

The proposer claims that the threshold for determining whether a supply item is equipment is $5000, not $1000. Therefore, there's a lot of equipment in the supplies and expendables category that should be in the equipment category.

6. Are other agencies contributing or likely to contribute a share of the projects costs?
No.

7. Does the applicant take exception to the standard grant agreement's terms and conditions? If yes, are the approaches the applicant proposes to address these issues a reasonable starting point for negotiating a grant agreement?
No.

If no, please explain:

Essentially they want to substitue their T's &C's for the CBDA T's &C's and they want to delete the State Travel Policy. These are major changes.

Contract Language Exceptions – Proposals submitted by grantees which identify exceptions to State of California's standard contract language provisions as provided in the 2004 PSP; and/or submit alternative contract language in lieu of the State's standard contract language should be carefully reviewed prior to awarding grant funds. Review will initially be conducted by the funding agency's contract office and referred to the legal department as needed.

8. Are there other budget issues that warrant consideration?
No.

If yes, please explain:

no

Environmental Compliance Review

1. Is compliance with California Environmental Quality Act (CEQA) required for this project?
Yes.

2. Is compliance with National Environmental Policy Act (NEPA) required for this project?
No.

3. Does this project qualify for an Exemption or Exclusion under CEQA and NEPA, respectively?
No.

Comments

Most likely no. Eradicating species, especially sportfish, will need to be evaluated for impacts to the environment and impacts to the angling communities who may fish for recreation and sustenance.

4. Did the applicant correctly identify if CEQA/NEPA compliance was required?
No.

Comments

The applicant stated CEQA/NEPA compliance was not required.

5. Did the applicant correctly identify the correct CEQA/NEPA document required for the project?
No.

6. Has the CEQA/NEPA document been completed?
No.

7. If the document has not been completed, did the applicant allot enough time to complete the document before the project start date?
No.

8. If the document has not been completed, did the applicant allot enough funds to complete it?
No.

Comments:

No funding or time were allocated towards regulatory compliance. The applicant needs to address effects of eradicating the sport fish species.

9. Did the applicant adequately identify other legal or regulatory compliance issues (Incidental Take permits, Scientific Collecting permits, etc,) that may affect the project?
No.

Identify those additional permits that may be needed by this project:

The applicant may need take permits for incidental take for state and federal listed species. The applicant also needs a take permit for the Federal listed splittail and must consult with USFWS.

10. Does the proposal include written permission from the owners of any private property on which project activities are proposed or, if specific locations for project activities are not yet determined, is it likely that permission for access can be obtained?
Yes.

11. Do any of these issues affect the project's feasibility due to significant deficiencies in planning and/or budgeting for legal and regulatory compliance or access to property?
Yes.

Comments:

Eradication of centrarchids may conflict with CDFG sportfish policies. The applicant must consult with CDFG.

Prior−Phase Funding Review #1

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

Project Title	Linked Hydrogeomorphic−ecosystem Models to Support Adaptive Management: Cosumnes−Mokelumne Paired Basin Project
CALFED Contract Management Agency	NWEF
Amount Funded	$1,546,016
Date Awarded	2002/01/01
Project Number	ERP−99−N06

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?
No.

Previously funded projects required negotiation between UCD, NFWF and CALFED to resolve Rights In Data issues.

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?
Yes.

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor−quality deliverables?
Yes.

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?
No.

Invoices are good. Delays in fiscal quarterly report due to the project staff not having access to full financial data.

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next−phase funding to monitor and evaluate project

outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?
Yes.

Other comments:

The previous restoration project, 99−N06, is now complete. The prior phase of this proposal, the reintroduction of Sacramento Perch, is being managed by GCAP.

Prior−Phase Funding Review #2

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

Project Title	McCormack−Williamson Tract Restoration Planning, Design and
CALFED Contract Management Agency	USFWS
Amount Funded	$556,200
Date Awarded	1999/01/01
Project Number	ERP−99−B193

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?
Yes.

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?
Yes.

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor−quality deliverables?
No.

University of California, Davis (UCD) was the cooperating organization for the above referenced contract. The technical work conducted, as described in the scope, was excellent and much of the information produced by this contract has been disseminated through briefings, talks, and meetings. However, the final report was not received until 16 months after the expiration of the contract, due to re−analyzing of data and modifications of the final report.

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?
Yes.

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next−phase funding to monitor and evaluate project outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?
Yes.

Prior−Phase Funding Review #3

List the CALFED or CVPIA funded phases of this project for which your agency manages contracts:

Project Title	Restoration of the Sacramento Perch to the San Francisco Estuary
CALFED Contract Management Agency	GCAP
Amount Funded	$424,246
Date Awarded	2002/01/01
Lead Institution	UCD
Project Number	ERP−02−P34

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

Project Title	Distribution, and abundance of shrimp, plankton and benthos in Suisun
CALFED Contract Management Agency	GCAP
Amount Funded	$271,804
Date Awarded	2002/01/01
Project Number	ERP−02−P32

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?
Yes.

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?
Yes.

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor−quality deliverables?
Yes.

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?
Yes.

Yes−−However, UCD has had difficulties invoicing the projects with data being provided and worked through various departments. At this time it is believed most issues have been resolved and invoices will be coming.

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next−phase funding to monitor and evaluate project outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?
Yes.

ERP−02−P34 work has been progressing well. Project proponents have viewed internal financial documents and believe it is on budget. See comment on Item 6 above regarding invoicing.