Proposal Reviews

#155: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Stanford University, Center for Conservation Biology

Research and Restoration Technical Panel Review	
Bay Regional Review	
Delta Regional Review	
San Joaquin Regional Review	
Sacramento Regional Review	
External Scientific Review	#1 #2 #3
Environmental Compliance	
Budget	

Research and Restoration Technical Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Research and Restoration Technical Panel Review Form

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;
Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;
Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;
Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Superior	**External and regional reviews and panel discussions raised substantial concerns regarding sampling issues and experimental design, and extremely serious concerns were raised regarding the proposals baffling restriction of biological measurements to invertebrates and excluding fish, the presumptive recipient of invertebrate production. (Are there no fish remaining in these creeks?) The concept of before and after assessment of the effects of restoration activities and treating restoration activities as a disturbance is to be commended, but we cannot recommend the research strategies developed in this proposal.**
-Above average	
-Adequate	
XNot recommended	

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

   The goals of this project to monitor physical and biological characteristics of a small stream before and after restoration was met with general approval by external referees. Too few restoration projects have had such before and after studies. Biological characteristics focus almost exclusively on invertebrates as a food supply for salmonid fishes, but there is little mention of historic or current abundance and no proposed sampling of salmonid fishes in the study streams.

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

External referees expressed skepticism that the proposal could deliver meaningful conclusions regarding the effects of restoration activities on invertebrate production and fish for numerous reasons. These reasons included substantial deficiencies in basic sampling principles including (among other things) inadequate sample sizes, inadequate attention to randomized location of samples, inadequate comprehension of spatial and temporal variability in invertebrate community composition and abundance, inadequate measurements of invertebrate presence for estimation of production, and complete absence of measurements taken on fish consumption of invertebrate prey items. Also, it was questioned that any long-term assessments of response to restoration could be drawn over the short (3 year) timeframe of the proposal. (Some important invertebrate species have multi-year life histories.)

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

   Final technical report, presentations at meetings, scientific publications.

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The cost of the project (about $392k/3 yr) was judged excessive when compared to the very small scale of the proposed work and it seemed that the project costs could be reduced if greater advantage were taken of undergraduate and graduate student labor. One reviewer noted that there are 483 total hours in the budget for the consultant to do fieldwork, at $94/hour. This kind of work can be done for a fraction of the price when there is not a PhD doing the fieldwork.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

   Bay Region review rating was medium, but San Joaquin, Delta and Sacramento region reviews were all low. Low ratings were in part due to questioned transferability of results from Marin County to other regions, but a more pertinent observation noted that the study (restoration) stream (Redwood Creek) drains directly into the Pacific Ocean and has no physical connection to the Sacramento River/Delta/SF Bay system, whereas the reference stream appears to drain into SF Bay. Appropriateness of CALFED funding therefore seems unclear.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

   No administrative concerns were raised.

Miscellaneous comments:

The principal investigator on this project is ostensibly Paul Ehrlich, a world-famous ecologist. The project allocates no funds for Dr. Ehrlichs participation in the project, however, and one of his post-docs appears to have full management responsibility for the project. Dr. Ehrlichs role is therefore unclear.

Bay Regional Review:

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Overall Ranking: **-**Low **X**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

Good study proposal for understanding the effects and evaluating the benefits of stream restoration for salmonids. The study is focused on small coastal stream systems and would have limited applicability in the larger CalFed solution area.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   good study design, applies appropriate sampling techniques appropriate statistical design to collection of physical and ecological data to evaluate the effects of restoration on invertebrates as a food resource for salmonids. project is being coordinated with restoration work and with local stakeholders

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   MR 6 Recovery of at risk species by dev. of conceptual understanding of models and processes.

   ERP Strat. Goals 1 & 2: recovery of at risk species, understanding what is being restored as part of restoration, and Recovery of functional systems Concept Model, Concept model developed as part of project would have applicability CalFed wide.

   CalFed Science Program, advance process of understanding and compare relative effectiveness of different restoration strategies.

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

How?

Proposed research is not closely tied to ongoing CalFed projects or regional planning. applicability greatest for smaller coastal streams. will provide information to evaluate effectiveness of salmonid restoration.

4. Does the project adequately involve local people and institutions?

XYes **-**No

How?

project coordinated with NPS, Marin County Stormwater Prevention Program, Mill Valley Stream Keepers.

meetings will be held to present the project, receive input and update on results of research and final report.

Project involves local consultants.

Other Comments:

none

Delta Regional Review:

Proposal Number: 155

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

Salmonid spawning habitat is not located in the Delta. Therefore, studies of adequacy of those restoration efforts is not a high priority in the Delta. Some of this information may be useful to the East Side tribs.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   There dont seem to be local constraints. They are really only sampling for drift and benthic quantity and quality.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   -Yes **X**No

   How?

   Most of the restoration principles (goals and priorities) in other regions. This one is set in the Bay region and in the outer Bay region. The restoration activities that they want to affect might exist in the Eastern Tribs and other tribs, but there are no applicable features in the delta.

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   -Yes **X**No

   How?

   This study is linked with restoration activities in the Bay region. (Redwood Creek, Marin)

4. Does the project adequately involve local people and institutions?

   -Yes **X**No

How?

It involves local people in them Marin area.

Other Comments:

While there are some questions that are good, the questions that dont make sense are the ones of whether the benthic community will change in a restoration area. Benethics will change if not in diversity, abundance. The questions should revolve around whether there is sufficient food production in the creek to provide adequate spawning, nursery, and rearing habitat. This question may be better answered on a whole river basis rather than on a reach of river basis.

San Joaquin Regional Review:

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

The committee ranked this project as a low priority for the San Joaquin region. We were reluctant to give the project this low ranking, but it had little connection to the stated goals of the region in the PSP. The committee would recommend that this project be reviewed by a more appropriate region.

1. Is the project feasible based on local constraints?

   -Yes **X**No

   How?

   Proposed project is totally outside the geographical range of the San Joaquin region and is subject to different hydrologic and climatic conditions than watersheds in the San Joaquin region. Overall hypotheses that will be tested are applicable to the restoration projects throughout all the ERP regions, but must be adjusted to local constraints and conditions.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   Project addresses the strategic goals #1 (at risk species) and #2 (ecological processes), Multiple region #6 (recovery of at risk species with principles that cross regional boundaries) and Science Program Goals (compare relative effectiveness of restoration goals).

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   -Yes **X**No

   How?

   The appropriate local region for this project would be the Bay or Delta region rather than the San Joaquin. Therefore, there are not any local projects that would be linked closely with this project at this time. However, the information that would be derived from this project would be of use to the general conceptual planning of restoration projects in this

region.

4. Does the project adequately involve local people and institutions?

   -Yes **X**No

   How?

   The proposed project is located in Marin County and will involve local groups and agencies in that area, as well as the institution from the bay area that is proposing the project. There is no apparent connection to the San Joaquin region's people or institutions for the implementation of this project.

Other Comments:

This project is well thought out and has the potential to generate very useful information when it is completed, but unfortunately was not appropriate for the San Joaquin region and its needs according to the PSP guidelines. The comittee hopes that this project will receive a higher rating when reviewed in a more appropriate region (Bay, Delta, or Multiregional) and recommends that it be redirected to those regions.

Sacramento Regional Review:

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

This looks like an interesting ecological study, but the scope is largely outside of the geographical area of the current PSP. The study is not a PSP topic and the results are unlikely to be of major use to restoration projects in the Sacramento Region.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   It appears that the Redwood Creek restoration project will proceed as planned, allowing the proponents to do sampling.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   -Yes **X**No

   How?

   The proposal indirectly addresses some of the topics listed in the CALFED ERP, but the study does not pursue restoration priorities in the current PSP.

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

   How?

   This study is closely linked with a restoration project in Redwood Creek. However, Redwood Creek is not a tributary to SF Bay, so the relevance to Bay-Delta activities is dubious. A SF Bay tributary would be used as one of the reference sites, but this isnt where the restoration activity and evaluation would occur.

4. Does the project adequately involve local people and institutions?

XYes **-**No

How?

There appears to be adequate involvement of local groups through the National Park Service.

Other Comments:

The biggest limitation of this study is that the study area is not a tributary of SF Bay. The Review Panel questioned whether the results are relevant to the lower gradient streams of SF Bay. The proposal addresses some very interesting ecological research topics; however, from the standpoint of Bay-Delta restoration it is largely an expensive monitoring study focusing on invertebrates, a single one (large) taxonomic group. It would not evaluate how the two target species (coho and steelhead) respond to restoration. We may learn something about how invertebrate communities respond to habitat changes, but the study would not tell us anything about whether or not food was limiting, or whether salmonid feeding success was affected. This study would have been much more effective if it included sampling at multiple trophic levels.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **155**

Applicant Organization: **Stanford University, Center for Conservation Biology**

Proposal Title: **Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**The general ideas of the study seem worthwhile and it was hard for me not to be hugely impressed that Ehrlich is involved in the proposal. But I was not impressed by the proposals grasp of the importance of sampling theory issues wrt collection of invertebrates (notorious for small scale spatial variability in abundance and species composition) and I was disappointed not to see any "fish work". If the proposal is really about invertebrates as a food supply for fish, it would be nice to have some direct measurements from fish, perhaps using modern lavage techniques to take non-destructive gut samples from fish. My original rates was "fair", somewere between good and poor, but this online form does not allow such an entry. "Poor" would be too harsh; "good" is too generous.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   Goals (examination of how restoration activities in small streams may impact invertebrate composition and abundance) seem worthy of attention.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   I don't see any major problems with their "conceptual model" diagram at p. 5.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The proposal is deficient with respect to description of various important details of sampling. For example, no explicit mention is made of methods used to select locations where bed materials will be characterized. It seems to me that there should be some kind of stratified (habitat type)- random (randomized quadrat locations) design for bed material. Deatils of just how macroinvertebrates will be identifed are not included. Will there be any biomass measuremnents or will they just be sorted and counted? Will any sizes of individuals be recorded? Without such data, it would seem hard to get at PRODUCTION of invertebrates. What will generally be the "lowest taxonomic level possible"? Could this be standardized? Will the timeframe (3 years) of the proposed work be sufficient to really say anything definitive about the response of the studied invertebrate communities to disturbance due to restoration activities?

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   I see no reason why the measurements and data collections proposed could not be accomplished, but I believe that it would be good to reconsider and/or refine some of these proposed methods (see above). The scale of the project is refreshingly "small", therefore allowing the researchers to do a good job at a small local scale.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   evaluation of field collections via number and types of samples that are collected.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   technical report, presentations at meeting, etc.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   Who in my generation did not read Ehrlich's population bomb? However, none of Ehrlich's time is budgeted on this proposal and it's tough to determine if he will be actively involved in this work. Bailey, a post-doc with Ehrlich, seems the real PI and she appears to have appropriate training for this work.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget ($391k/3 yr) seems reasonable for the work proposed and Bailey's salary rate seems exceptionally modest compared to other CALFED requests for PIs.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **155**

Applicant Organization: **Stanford University, Center for Conservation Biology**

Proposal Title: **Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

None

Review:

Please provide an overall evaluation summary rating:

<u>Excellent:</u> outstanding in all respects;
<u>Good:</u> quality but some deficiencies;
<u>Poor:</u> serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**Conceptually, the study questions are extremely important; technically, the approach has a few problems and could use some serious replication within basins.**
XGood	
-Poor	

1. **<u>Goals.</u>** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The stated goal is to develop a better understanding of linkages between physical and ecological processes that support salmon in Bay-Delta streams, with a focus on stream habitat provision of invertebrate prey resources. The novel construct of this proposal is that it examines stream restoration for salmon habitat as a potential disturbance deleterious to salmon ecology. No objectives are stated but the underlying hypothesis is precisely stated, with an accompaniment of five specific research questions. This concept is both timely and important for CALFEDs planning and implementing watershed restoration that targets salmon (rearing) habitat.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   A relatively detailed conceptual model is included.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The proposed study has the perpetual replication problem of restoration, n=1 for each treatment. Although it will not alleviate this pseudoreplication conundrum, the applicants are making an effort to replicate pairs of stream reaches to at least evaluate variation through the pair-wise comparison. Another concern is the fundamental assumption in selection of the reference and restoration treatment stream reaches that are in two separate basins, one (restoration reach) on the coastal margin and the other (reference) on the Bay margin of Marin County; although the underlying geology may be parallel, it is a bit difficult to imagine that they are climatically and hydrologically that similar? Questions 2, 3 and 5 are designed to assess the response time of stream invertebrate communities after the restoration disturbance, but this study is only planned and funded for three years; it is very reasonable to assume that return to equivalence to the reference site may well take longer than three years but not necessarily be on the road to failure.

   Sampling methodology is adequately described. One recommended modification is to include sampling (scrapes?) of epiphytes on stream substrate, for both biomass and fauna. The epiphyte community may be one of the more responsive to stream substrate disturbance and may provide early habitat value after a restoration disturbance. The dietary requirements of coho and steelhead may also be of concern, due to the imprecision of the literature compared to the invertebrate prey data gathered from the study sites; the applicants may consider using the Wisconsin bioenergetic model to standardize prey consumption?

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   Schedule for restoration appears to be somewhat indefinite, and funding requirements potentially tenuous.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   Performance measures are relatively trivial and unspecific.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   Anticipated products run the full gamut, from technical reports and conceptual model to scientific technical publications.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   CBB and PWA is a strong team. Famous principal investigator does not appear at all in the budget; co P-I post-doc fellow is the one actually leading the study in conjunction with PWA.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The cost ($391,448) is relatively reasonable given the amount of field and laboratory time required.

Miscellaneous comments:

This proposal exemplifies the dilemma associated with scientific study of restoration, which is a long-term process, with short-term funding: you can take a comparative approach and suffer the consequences of limited replication or have increased replication over short term and hope you can detect an interpretable response in 2-3 years (you can also use space-for-time substitution approach but it has same problems with replication). You seldom achieve both.

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **155**

Applicant Organization: **Stanford University, Center for Conservation Biology**

Proposal Title: **Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**Although this is a valuable research project, and management needs to be aware of the combined physical and biological factors that govern the success of restoration projects, there are several voids in their study approach, location, sampling methodology, and data analysis that would need to be addressed before I think they could efficiently and effectively answer the research questions.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goals of this project are clearly stated, and coincide with an important topic in restoration ecology. Monitoring both physical and biological habitat characteristics throughout a pre- and post-restoration temporal scale is often lacking in restoration projects. This appears to be the case for this specific project, as the current evaluation procedure for the success of the project is physically based. The authors are correct in stating that adding a biological component will significantly add to the knowledge on whether or not the restoration is successful in restoring coho and steelhead habitat. By looking at the whole invertebrate community, they will also branch out the results to include a whole ecological community, not just two species of salmonids. The objectives coincide well

with their specific goals, and seem to fit in well with the timeline for the restoration project. They have included a well-rounded approach, including physical, biological, and GIS-developed land use characteristics. It appears that specific experimental hypotheses will not be tested, rather, general research questions will be answered.

The concept is timely and important, as there is definitely a lack of data on this subject. Monitoring plans should ALL include both physical and biological monitoring in order to determine if a restoration project has met its designed goals.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   The study is fairly-well justified relative to existing knowledge. Their general experimental design agrees with acceptable monitoring schemes (pre- and post-restoration, up- and downstream sites, and reference sites). The factors they have decided to focus on are applicable to answering their research questions, and combine a wide-variety of techniques (biological and physical attributes, technologically based GIS classifications of land use).

   It would be nice if they included more of a discussion of what coho and steelhead populations were like historically, and how characteristic the study streams are of ancient streams in the area. One critique is that the study reach (Redwood Creek) drains into Muir Beach, which seems slightly displaced from the San Francisco Bay and Estuary, and the reference stream drains into Mill valley in the Central Bay. This study might be more appropriate and useful to CALFED if it was done in streams in the lower Sierra Nevadas, upstream of the Bay and Delta. They also dont give specific information on how the site will be restored (placement of woody debris? Channel modification?).

   They have a very clear conceptual model (fig. 2), in which the processes of the proposed research are linked to each other, which in turn are linked to the overall restoration project. They have definitely uncovered a gap in the monitoring plan of a restoration project, and their research questions are constructed to fill this void.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   I think the information will be quite useful to decision makers, if generated in a meaningful way. Having stated that, my biggest critiques have to do with their approach, as follows: (1)Biological/physical sampling design: n=2 for all of their invertebrate sampling (benthos, drift, terrestrial insects). This seems not enough to statistically test their results, n=3 is usually the bare minimum for such sampling, as in the Benthic Index of Biological Integrity sampling protocols (BIBI), with n=5 more appropriate. I am not as familiar with the physical measurements, and the techniques were not described in enough detail for me to fully evaluate them. In general, they seem like appropriate measurements to obtain their objectives. The water quality measurements would be most beneficial if they were conducted on a 24-hour basis, instead of spot measurements, but they do not say which they plan to do. (2)The restoration stream and the reference stream are in different watersheds (the restored reach drains into the Pacific Ocean, the reference reach drains into the Central Bay). This may add too much natural variation for them to be viable comparisons. (3)One of the main research questions asks how long it will take for the invertebrate community to stabilize post-restoration. I dont think the study is long enough

to determine this, as it often takes invertebrate communities many years to stabilize; they state this in the proposal, saying they could seek out additional funds to continue monitoring in later years. This question might be better answered by comparing the invertebrate communities at a different site that has already been restored for a number of years, if such a site exists. (4)There is no fish sampling. It seems like if your goal is to relate your results to fish use and feeding, you should at least do some baseline sampling. I acknowledge that this can be really hard to accomplish with native species of concern, but I think it would be possible to do some snorkel surveys or underwater video to determine location and rough abundance of coho and steelhead, both at and around the restoration site, and at the reference sites. If some fish could actually be sampled with electrofishing or fly-fishing, their stomach contents could be sampled via non-invasive gastric lavage, so that they could say exactly what the fish are feeding on. They could then utilize selectivity and similarity indices to determine how/if salmonids are feeding differently at their different sites. They say they will obtain such fish diet information from the literature I looked up the 2 references they give for this, Spence 1996 is a large review of Pacific Coast salmonids, and I couldnt find any specific data that they could use, and Rader 1997 was a study in the Rocky Mountains. IF they have good data from references in the Bay area or at their specific sites, that would be acceptable, but it would be better if they actually obtained some new data as that appears to be one of the goals of their research proposal.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   The techniques that they propose seem clearly stated, with the exception of the physical measurements, but that could be just that I am not as familiar with those techniques of measuring reach topography, morphology, bed material composition, velocity distributions, water quality and discharge. Given the expertise that PWA has on the subject, I have no doubt that they have the means to accomplish these tasks. The scale of the project is appropriate, as they are testing a specific restoration project.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   As stated above, I think they need greater replication in their sampling design in order to quantify the results. They plan to only compare proportional abundance and percent similarity index between invertebrate communities. In order to truly quantify the results, they would need to have greater replication so that they could utilize parametric statistics (ANOVA). For analysis of the physical habitat measurements, they only use such phrases as will be correlated or will be compared, without specifically saying how they will do this. This seems like a gap in their study design, since the whole goal of their proposal is to better detail how/if a restoration project meets its goals.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   Products of value will definitely be generated if their study design proves adequate to assess their objectives. This is a very appropriate research question, and we are in need of such data, but it may be hard to interpret their outcomes based on their approach, combined with underlying natural variability that is inherent in sampling ecological communities. Since the restoration project is already planned to happen, it would be a shame if sufficient monitoring was

not performed in order to assess the post-restoration success.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   Paul Ehrlich is one of the foremost ecologists of our time, and it would be hard to doubt his abilities to successfully lead a project. I see they have budgeted a lab tech and grad student, which I assume will be who is actually analyzing the invertebrate samples, and that they have the expertise to guide the taxonomy work. PWA has significant experience in measuring aspects of physical habitats. They seem to have sufficient expertise to perform their stated research goals, between the facilities at Stanford and PWA, I cant think of any lack of support.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   $391,447.64 seems like a lot of money; I think the project could be accomplished for less. Most of their budget is directed towards the high salaries, especially for the consultants (PWA) at $94 an hour. Dr. Ehrlich hasnt budgeted in any salary, so it seems like the post-doc Dr. Sallie-Anne Bailey will actually be leading most aspects of the project. Monitoring projects can often be accomplished at lower prices when graduate students/lab techs do most of the field/labwork, with the experts providing guidance and facilities. For example, there are 483 total hours in the budget for the consultant to do fieldwork, at $94/hour. This kind of work can be done for a fraction of the price when there is not a PhD doing the fieldwork.

Miscellaneous comments:

I like that they are taking a community approach to their sampling; too many studies focus just on maintaining habitat for one endangered species. I agree with their argument that maintaining habitat necessary for a healthy total ecological community is the way to go.

Environmental Compliance:

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

   XYes **-**No

   If no, please explain:

   Will be obtaining National Park Service Research and Collection Permit for work in Redwood Creek.

   ***For the above permit, list "required" next to "Other" for Federal Permits and Approvals.**

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

   XYes **-**No

   If no, please explain:

   No budget or timeline is specified.

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

   -Yes **X**No

   If yes, please explain:

   All necessary permits will be obtained and no environmental documentation is needed.

Other Comments:

Budget:

Proposal Number: 155

Applicant Organization: Stanford University, Center for Conservation Biology

Proposal Title: Ecological Impacts of Physical Habitat Restoration on Resources Available to Salmonids

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

   XYes **-**No

   If no, please explain:

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

   XYes **-**No

   If no, please explain:

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

   XYes **-**No

   If no, please explain:

4. Are appropriate project management costs clearly identified?

   -Yes **X**No

   If no, please explain:

   No separate task for PM. Costs dispursed in other tasks and salaries.

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

   XYes **-**No

   If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

6. Does the budget justification adequately explain major expenses?

   XYes **-**No

If no, please explain:

7. Are there other budget issues that warrant consideration?

   -Yes **X**No

   If yes, please explain:

Other Comments: