Selection Panel Review Summary

Proposal No.: 004
Proposal Title: Managing Natural Resources for Adaptive Capacity: the Central Valley Chinook Salmon Portfolio
Principal Investigator: S. Carlson
Amount Requested: $489,343
Recommended Amount: $489,343

Summary: This proposal will explore PE "portfolio effect" in Central Valley fall-run Chinook (CVC) wherein the variability of the population complex is less than that of individual populations, by examining tradeoffs between multiple anthropogenic activities, including flow modification, hatcheries, and fisheries, investigating 1) the role of phenotypic diversity in contributing to PE, 2) effects of anthropogenic activities on PE, and 3) incorporating PE into management. To explore drivers of PE in this system, the project would analyze stability and synchronization across time and space in existing time series data on population dynamics, environmental conditions, and anthropogenic activities. It will also model the relevant ecological, evolutionary, and economic drivers to explore how phenotypic diversity, environmental heterogeneity, and anthropogenic activities interact to determine overall system dynamics. The project proposes to focus on the protection and recovery of CVC by providing information on how various management actions are likely to affect PE in CVC and consequently resilience to environmental change. The project will develop quantitative tools (interactive spreadsheets, simulations) synthesizing dynamics relevant to a wide array of management domains (flow, hatcheries, fisheries) to support integrative management decision-making.

Assessment: This project has a reasonable cost using existing data, and would be conducted by a highly qualified team. The project was previously submitted to the Science Program PSP and received above average to superior marks from the reviewers. The Principal Investigator addressed the comments and concerns of the Science Program reviewers before submission to the ERP PSP. The tools they are proposing would be useful for Central Valley Chinook salmon management of hatchery and wild populations, supports goals for long term sustainability of species populations, and response to climate change. Life cycle modeling would be useful, but how these models will be used in current management was unclear when looking at the proposal.

2010 Final Review Panel – Summary of Review

Proposal # 112

Proposal Title: Managing Natural Resources for Adaptive Capacity: the Central Valley Chinook Salmon Portfolio

Lead Primary Investigator: Stephanie Carlson

Applicant Organization: University of California, Berkeley

Amount Requested: $489,343

Panel Findings:

Relevance to Topic Areas: The proposal is highly relevant to the Delta Science Program, and addresses key issues in Topic 1 Native fish biology and ecology, and Topic 4 Water and ecosystem management decision support systems. It is also highly collaborative and synthesizes existing information. It has the potential to examine the system from coupled hydrological, ecosystem, and human perspectives and of fostering management by integrating ecology, statistics and economics. Applying the portfolio approach to Chinook salmon in the Central Valley will provide useful information on the characteristics of the component stocks that lead to species risks.

Quality of the Proposed Research: The authors propose investigating the portfolio effect for the various runs of Central Valley fall-run Chinook salmon, the idea that differences in phenotypic traits that adapt populations to different rivers reduce the coefficient of variation in adult abundance in the rivers as a whole. The idea has been explored with Bristol Bay sockeye salmon, and found to be a key reason that the fish populations and fishery are stabilized through years and periods of strong fluctuations in any one population.

The external reviewers rated this proposal highly, and the Panel determined that it is an important approach to investigate, because salmon stocks in individual rivers are often managed somewhat in isolation, without understanding what harm there may be in

homogenization of life histories (e.g., via hatchery inputs), nor the benefits of fostering diverse life histories provided by some runs with low abundance.

Several aspects of the proposal could be strengthened, to address several concerns raised by the Panel:

1. The proposal considers only fall-run Central Valley Chinook salmon, whereas the true portfolio effect should be considered among all four runs.

2. One covariate proposed for use in modeling is water levels in the Delta, but it was unclear exactly what variable would be used here. This needs to be considered more carefully.

3. The genetic modeling for outmigration timing was not clearly described and its usefulness was questioned, especially since it considers only two stocks, as a stylized model, rather than the nine rivers originally discussed. The Panel was concerned that the model would be sensitive to this simplification, and was concerned how general the results could be from two stocks relative to the actual situation in the Central Valley. Likewise, the focus on outmigration timing as the sole determinant seems to fall short, since other aspects of the life history are also likely to be important.

4. The two subtasks about making the time series data available needs to be reconsidered because of issues about data security.

Main Summary Comments of Reviewers: The panel was intrigued by the prospects of applying analysis of the Portfolio Effect to Central Valley fall-run Chinook salmon, and addressing the interactions of managing the entire portfolio in the context of water and fisheries management. The investigators are well qualified to conduct the analysis, but the work could be improved by considering several caveats raised by the panel. This is a challenging project, but much could be learned from the effort.

Funding Category: Above Average

Proposal Number: 0112

Proposal Title: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Applicant: The Regents of the University of California

Amount Requested: $489,343

Primary Investigator: Stephanie Marie. Carlson, UC Berkeley

FRP primary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose	This is a proposal to examine the traits of individual runs of Central Valley Chinook salmon to assess genetic variability in the population complex. It has the aims of assessing overall variability, identifying anthropogenic effects on variability, and incorporating knowledge of variability into management.
Background/Conceptual Models	This is an outstanding proposal and clearly describes the problem and the benefits of addressing it. A clear conceptual model is presented that includes ecological and economic considerations for managing for a diversity of traits.
Approach	The approach will synthesize existing data and develop dynamical models. Each stock has traits that fit it to its natal stream conditions, breeding and rearing habitats. Collectively, the various stocks constitute the portfolio of the species' population and includes a greater pool of trait variation. The approach will demonstrate how management for diversity can dampen variance in the overall abundance of the CVC population.
Feasibility	The likelihood of success for each component of the project is high and the overall success is as well. Available data may be the primary constraint on overall success.
Relevance	The proposal is highly relevant and addresses many priority issues. For the PSP it addresses Topics 1 and 4 with regard to Central Valley Chinook salmon populations and relates to the biology and ecology of native fishes and water quality and ecosystem management. It has the potential to examine the system from coupled hydrological, ecosystem, and human perspectives and of fostering management by integrating ecology, statistics and economics.

Qualifications	The team is a mix of agency and academic collaborators and is well qualified to do the science and get it into the hands of resource managers. Agency people are well placed to know and obtain the data sets.
Summary Comments	This is an outstanding proposal from a highly qualified team with a modest budget and the likelihood of yielding great benefits. Teh research is likely to stand as a model for future research to enhance salmonid management and conservation.

Please identify your overall ranking for this proposal:

X Superior
– Above Average
– Sufficient
– Inadequate

FRP Member's Observations Of External Technical Reviewers' Performance On Review Of Proposal:

Along with your written observations, please **rate the collective performance** of the external reviewers of this proposal utilizing the criteria below. Please also provide a **brief summary** in the comment box below.

X Superior
– Good
– Fair
– Poor

Comments:
Two reviewers did an excellent job of critiquing the proposal and I rate them collectively as superior.

Select "Update" after you make changes you wish to save.

Proposal Number: 0112

Proposal Title: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Applicant: The Regents of the University of California

Amount Requested: $489,343

Primary Investigator: Stephanie Marie. Carlson, UC Berkeley

FRP secondary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose	Apply financial portfolio theory and population modeling with genetics to the fall run Chinook to examine how inter-river variability affects responses to environmental variation, fisheries management, and hatcheries.
Background/Conceptual Models	The background is well described. The idea is the variance of the portfolio is less than variance of the individual stocks due to asynchronous population dynamics. In the Central Valley, we have homogenized the portfolio.
Approach	The approach is well described. First, there will be a time series analysis of total adult returns (about 50 years) in the Central Valley for nine rivers, examining CV and cross-correlations. The PE strength and the relative strengths of river flow (local), pumping and water levels in the delta (affects some but not all), and PDO (all stocks) will be quantified statistically. The relation to environmental conditions is weak, as the authors do not discuss how they will collapse flows and Delta information into single annual indices; furthermore, what is meant by water levels in the Delta? Second, state-space models will be seeded with information from the first task and used to make stochastic projections and see how PE affects extinction risks. There are also two subtasks that involve providing a spreadsheet and R code for others to use the time series. These two subtasks (3.1.4.1 and 3.1.4.2) need to be re-evaluated. Is there a user's manual? How will the data integrity be maintained? Third, they will develop an evolutionary bioeconomics model for two rivers, so the modeling is somewhat hypothetical. Out-migration time is the sole genetic trait that is followed. The model is a population dynamics model with genes and hatchery fish included. One issue is whether the model can be specific to the

CV situation sufficiently to generate relevant results. Two selection events (outmigration and ocean arrival), determine the optimal timing of outmigration. I would like to see the evidence for using outmigration timing as the sole determinant of diversity. They will use the stylized model with different initial conditions of within and between river diversity in outmigration timing and examine the effects of different hatchery, water flow, and fisheries management. It was not clear to me how these factors actually fit into the population model; what processes are affected? Also, how general would the results with the two stocks be to the Central Valley situation? It would seem that the portfolio analysis would be highly dependent on the number and types of stocks. I would have liked to have seen a subtask that demonstrates (not for all conditions) that the model results are not sensitive to the number of stocks so that the two-stock results can be applied to the actual Central Valley situation of multiple stocks. Finally, they will use optimization to determine the best mix of fisheries management and hatcheries that maximizes net benefits or minimizes extinction risk. I would caution the authors to be careful about dollar values, as these will be readily quoted and they had be based on sound and extensive economics. Either drop the dollars stuff or be prepared to doing it rigorously.

Feasibility

While this is a challenging and difficult project, the authors are the right team to ensure a high probability of success. Even if complete success is not achieved, much will be learned from the effort and partial success.

Relevance

The proposed project is very relevant, as Chinook have been the center of controversy and are listed. It would have been better if the authors had specifically discussed recovery as a tuning knob. I did not see that in the proposal, although it was a dense proposal so it may be buried in there somewhere. The generality of the two-stock analysis and the specifics of how environmental variation, fisheries management, and hatchery effects (includes genetic effects?) will be represented needs to be specified in more detail, as this will greatly determine the relevancy of the results.

Qualifications

Qualifications

The team is well qualified to do the work. The budget is reasonable, as it builds upon previous modeling.

Summary Comments

This is strong proposal on a relevant topic. I discourage handing over the data in a spreadsheet to anyone (expect for stated research purposes) without

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proper documentation, data integrity, and training. I
also would like to see better justification that the
modeling approach can include sufficient detail and
that the two-stock analysis are representative of the
actual situation in the Central Valley and that
outmigration timing as the sole determinant of
variability among stocks.

Superior (provided the issues above can be addressed)
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Please identify your overall ranking for this proposal:

X Superior
– Above Average
– Sufficient
– Inadequate

FRP Member's Observations Of External Technical Reviewers' Performance On Review Of Proposal:

Along with your written observations, please **rate the collective performance** of the external reviewers of this proposal utilizing the criteria below. Please also provide a **brief summary** in the comment box below.

– Superior
– Good
X Fair
– Poor

Comments:
Reviews did provide any specifics.

Select "Update" after you make changes you wish to save.

Proposal Number: 0112

Proposal Title: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Applicant: The Regents of the University of California

Amount Requested: $489,343

Primary Investigator: Stephanie Marie. Carlson, UC Berkeley

FRP secondary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose	The goal of this project is to consider the portofolio effect for Central Valley Chinook salmon, how selection for various life history traits may reduce viability of this set of stocks, and how anthropogenic effects such as hatchery rearing and water management may alter such selection. This is a very complex goal that addresses many interacting factors that influence salmon in the Central Valley, and if accomplished, could generate novel and useful information that would aid in management.
Background/Conceptual Models	Although this is an important problem, and the role of the portfolio effect (PE) is timely and potentially an important and novel approach, I found the conceptual model to rather broad, vague, and generally a bit weak. The description encompassed only a few paragraphs. The authors did not develop it in enough specific detail to allow a salmonid ecologist to understand clearly the model they will test.
Approach	Likewise, I found the approach rather poorly presented and confusing. Determining the correlations among abundances of salmon in different rivers, considering distances among them (the spatial component), and the role of physical factors that may drive these correlations seems straightforward. However, the use of, for example, multivariate approches to assess drivers of abundance (Section 3.1.3.1) is not adequately described, and much of the proposal seems to hinge on the multivariate state-space models (Section 3.1.3.4) that are similarly not described. Overall, I came away with an uneasy feeling that reviewers were expected to take much of the approach on faith.
Feasibility	Given the uncertain nature of the approach, I wonder if a pilot project could be proposed as a "proof of concept" for this proposal, given that much hinges on parts that were not well explained or supported.

Relevance	The project is highly relevant to the Delta Science Program, and could address important parts of Topics 1 and 4 (Native fish biology and ecology, and Decision support for water management).
Qualifications	The investigators appear well qualified, judging from the publications listed in their vitae (which could have been more complete), and the team is highly collaborative and interdisciplinary. However, most are relatively early in their careers. I wonder whether help from a more experienced scientist might have improved the clarity and focus of the proposal.
Summary Comments	Overall, this proposal describes a highly ambitious modeling approach (perhaps too ambitious) aimed at integrating all the factors that affect multiple stocks of Central Valley Chinook salmon, and assessing how different management approaches may influence their viability, and the human economy that depends on them. Unfortunately, the conceptual model appeared to lack focus and clarity, and the approach outlined was not well described, leaving open the question as to whether the modeling and analysis described would achieve the desired goals.

Please identify your overall ranking for this proposal:

– Superior
– Above Average
X Sufficient
– Inadequate

FRP Member's Observations Of External Technical Reviewers' Performance On Review Of Proposal:

Along with your written observations, please **rate the collective performance** of the external reviewers of this proposal utilizing the criteria below. Please also provide a **brief summary** in the comment box below.

– Superior
– Good
X Fair
– Poor

Comments:
I felt that both reviews accepted the proposal rather uncritically, whereas I found the conceptual model a bit vague and the approach described only in rather general terms.

Select "Update" after you make changes you wish to save.

External Review, Form #40, of Proposal #0112: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Title: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Number: 0112

Proposal Applicant: The Regents of the University of California

The reviewer has made no 'accept comment' about whether or why (s)he will Review this Proposal.

Project

comments	This is an outstanding proposal in nearly all regards. It is widely recognized that Delta area salmon stocks are substantially depressed both in terms of productivity and in their stock complexity. Whether the declining reliability of the system is caused by eroding stock complexity remains poorly understood but is a very logical link in this system. This proposal focusses on this problem by combining ecologica, evolutionary and economic approaches. The results of this project are very likely to add substantially to the knowledge base of the Delta ecosystem, and to the ecology of salmon ecosystems under human stress in general.
rating	Superior

Background

comments	The proposal is very strong and convincing. It does an outstanding job reviewing the relevant literature to justify the project. The team has an excellent handle on both the data available and the expertise needed to accomplish the goals of the project. My only minor gripe with the proposal is that the proposal uses the term 'biocomplexity' incorrectly. As currently used in the proposal, I think the authors mean 'biodiversity' (i.e., the biological diversity, from genes to life histories to populations within the stock complex). Biocomplexity really refers to the combined system that includes the biodiversity mentioned above, and the physical system (i.e., the habitat) that produces and maintains this biodiversity. There is very little emphasis placed on understanding and modeling the physical components of biocomplexity in this system. This is a minor comment.
rating	Above Average

Approach

comments	The approach is first rate overall and is very likely to meet the objectives of the project. The proposal outlines a series of well developed strategies for analysis of existing data and simulation models for future development in this ecosystem. The products are not necessarily the strength of this project - beyond the scientific publications it will surely produce.
rating	Superior

Feasibility

comments	The approaches have been documented very carefully and appear to be highly appropriate for the goals of the project. The likelihood of success is very high. The scale of the project is excellent - in fact it is a major deal. Several of the senior contributors will be providing their efforts without charge to this project.
rating	Superior

Relevance To The Delta Science Program

comments	This project fits very well within the Delta Science Program. The proposal is collecting very little new data but is focussing mostly on analysis of data that have already been paid for. The proposal focusses on a problem that has been appreciated in this system for at least a decade but has not been adequately assessed to date.
rating	Superior

Qualifications

comments	The team is outstanding. It is a good mix of expertise and experience. All investigators have something substantial to bring to the project. All investigators have an excellent record of achievement both in publishing their results and for bringing their work to management (in the case of the agency people on the team).
rating	Superior

Overall Evaluation Summary Rating

comments	This is an excellent proposal in all regards. It asks interesting and important questions. The team is a perfect fit for the job. The budget is extremely modest considering what it should accomplish. The proposal is directly within the focus area of the DSP and will bring new perspectives to the research in this ecosystem. This proposal should be funded without hesitation!

| rating | Superior |

External Review, Form #40, of Proposal #0112: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Title: Managing natural resources for adaptive capacity: the Central Valley Chinook salmon portfolio

Proposal Number: 0112

Proposal Applicant: The Regents of the University of California

The reviewer has made no 'accept comment' about whether or why (s)he will Review this Proposal.

Project

comments	The proposed study is very important and timely. The goals, objectives and hypotheses are clearly stated and internally consistent. The study is justified relative to expanding existing knowledge. The scale of the project is well justified given the goals of the project. The proposed project provides potentially important novel information to practical natural resource management problems as well as to methodologies and approaches to analyzing them. The project examines and systematically integrates several sub-areas of work, and the project has the potential to contribute new information and methodologies in each of the sub-areas as well as through their integration into a consistent framework.
rating	Superior

Background

comments	The conceptual approach in this study comprises several sub-modules and their integration. The approach is clearly explained and well justified. The proposal portrays a solid understanding of the methodological approaches proposed and their application to the problem under examination. The proposal well documents the proposed approach and its empirical application.
rating	Above Average

Approach

comments	The proposed approach is very well designed and appropriate and required for meeting the objectives of the project. The management responsibilities are clear and there are resources set aside for management. The project has the potential to produce valuable products to academia and conservation practitioners, including government agencies and NGOs. The proposal describes a

	dissemination strategy.
rating	Above Average

Feasibility

comments	The proposed approach is fully documented and technically feasible, though it is my expectation that practical data limitations may become more constraining than it now appears. However, this does not reduce the value of proposal but merely highlights its additional value: systematic assessments such as the one proposed here are especially powerful to help identify important current information gaps. Moreover, the proposal already addresses critical data issues and the team has the capacity to address additional data limitations as the become concrete. The proposed project is ambitious but the team is very well qualified and constructed to achieve the objectives of the project.
rating	Above Average

Relevance To The Delta Science Program

comments	The proposal address not just one, but all of the priority research topics in the PSP. First, the proposal directly addresses native fish biology and ecology. Second, it examines the food webs of key delta species and their relationship to water quality and other drivers (anthropogenic factors). Third, the proposal has the potential to examine the system from a coupled hydrological, ecosystem, and human perspective. Fourth, the proposed approach and outputs will contribute to important decision system development in the area natural resource management in the Delta. The proposed approach is built on the integration of multiple disciplines, including ecology, statistics, and economics. The project clearly has a strong potential to produce valuable information to Delta resource managers and policy makers.
rating	Superior

Qualifications

comments	The team is very well qualified. The team is not heavy on established senior talent, which may have been been helpful to include. Nevertheless, the background of the team is strong and reflects already established and in part upcoming talent not just in California but also more generally (nationally, internationally). Undoubtedly, the team has access to the infrastructure and other support systems necessary for the project.
rating	Above Average

Overall Evaluation Summary Rating

comments	This is an ambitious proposal addressing an important current natural resource and environmental policy problem. The proposal presents a systematic quantitative assessment of the population dynamic and management options of the Central Valley salmon throughout its entire life-cycle. This is exactly the kind of approach needed for evaluating and possibly improving current natural resource management in California, in the United States, and globally.
rating	Superior