

Selection Panel Review Summary

Proposal No.: 031

Proposal Title: Quantitative Assessment of Delta Habitat and Food Web Parameters Using Isotopes and Numerical Models

Principal Investigator: Carol Kendall

Amount Requested: \$287,900

Recommended Amount: \$ 0

Summary: The main objectives of this proposal are the refinement and use of numerical modeling and visualization tool to aid in the interpretation and synthesis of this water quality and isotope data, and the use of model scenarios to better understand the impact of management actions on the ecosystem in the study area. Generally, the project aims to address how hydrodynamic conditions, water quality, water temperature, and primary and secondary production are linked within aquatic ecosystems of the Delta and its tributaries and floodplains, and how habitat variables for aquatic organisms are distributed spatially under different river inflow and water temperature scenarios.

Assessment: The Selection Panel acknowledges that this project is run by a very good team that is able to do good work and that the objectives are good if the Project Team is able to attain them. There is value to using the isotope data in the development of a model. It is questionable as to whether they would be able to reach these objectives as the project is written. The proposal does not provide information about how the data will be used and whether they have enough data for the analysis. This proposal was reviewed in the recent PSP of the Delta Science Program. The Selection Panel felt that the applicants did not address the many concerns expressed in the earlier technical review.

2010 Final Review Panel – Summary of Review

Proposal # 151

Proposal Title: Quantitative Assessment of Delta Habitat and Food Web Parameters Using Isotopes and Numerical Models

Lead Primary Investigator: Carol Kendall

Applicant Organization: U. S. Geological Survey

Amount Requested: \$280,150

Panel Findings:

Relevance to Topic Areas: This project has great potential to develop better understanding of nutrients in the Delta and to address problems specifically related to total ammonia contamination concerns in the Delta, although the authors did not specifically mention or reference current point source concerns such as ammonia contamination within the City of Sacramento. This area supports the PSP objective of Coupled Hydrologic and Ecological Models and, to a lesser extent, Food Webs of Key Delta Species and Their Relationship to Water Quality and other Drivers.

Quality of the Proposed Research: The main body of work is to be leveraged off previous data collection to fill a “funding gap” in existing analysis of water quality data. The authors acknowledge significant scatter in nitrogen data and expect modeling efforts will help to explain the scatter. Data were collected in 2009 and 2010 and have been stored since that time. There was concern by the Panel and some reviewers about the stability and reliability of those stored samples.

Main Summary Comments of Reviewers: External reviewers were concerned about the importance of denitrification in the study. Although it may not have an important role, the Panel felt that denitrification should have been included or the rationale for not considering this process. The Panel was also concerned that, as the authors mentioned, nitrogen isotopes are notoriously variable and is difficult to reliably interpret in time and space. There is a certain

vagueness in the quality of the archived samples and what percentage of those samples is anticipated to be used to fill in the “data gaps” for the modeling efforts. External reviewers noted that the proposal was difficult to follow in places, always making evaluation difficult. The Panel also noted that the feasibility of the project is dependent upon the IEP funding to process the samples. It is assumed that this funding has been awarded.

Funding Category: Sufficient

Proposal Number: 0151
Proposal Title: Quantitative Assessment of Delta Habitat and Food Web Parameters Using Isotopes and Numerical Models
Proposal Applicant: United States Geological Survey
Amount Requested: \$280,150
Primary Investigator: Carol Kendall, USGS

FRP primary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose
This project fills a gap in other funded projects. The purpose is to synthesize existing data to assess habitat quality, food web dynamics and the survival of species. The basic hypothesis is:
Key habitat parameters in the study area can be adaptively managed by manipulating flows and nutrient species/concentrations in the Sacramento River and in effluent inflows.

Background/Conceptual Models
The study area follows the Sacramento River down to Suisun Bay. Sources and sinks of nutrients are being identified and traced using stable isotopes.
The study is based on the DRERIP conceptual models. This is a collaborative interdisciplinary team from federal agencies, academia and the private sector.

Approach
DSM2-QUAL and RMA models are used to evaluate key hydrodynamic indicators such as residence time and nutrient dynamics.
The study does depend on an IEP project (awaiting contract). The modeling will provide information that will contribute to the refinement and quantification of the DRERIP conceptual model. It is unclear whether the variability of data collected since 2009 can be explained sufficiently using the proposed models, but the project will certainly contribute to a practical research question. Can the sources and possibly the age of water be identified in the Delta?

Feasibility

Relevance
This proposal fits within the PSP priority themes of 'Food Webs of Key Delta Species and their Relationship to Water Quality and other Drivers', Coupled Hydrologic and Ecosystem Models; and Water and Ecosystem Management Decision Support System Development.

Qualifications

This project will also provide important information on the Delta food web that will benefit several programs in the Delta.

The researchers are qualified to conduct the work. They are currently heavily engaged in Delta issues and bring strong track records. It is unclear to the reviewer whether the PSP allows researchers within private for profit organizations to be a co-PI or whether they should be listed as Subcontractors.

Summary Comments

This is a proposal that leverages several ongoing studies and provides 'value-added' research. The results of the study will investigate and quantify some of the relationships in the DRERIP models.

Please identify your overall ranking for this proposal:

- 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
- Fair
- Poor

Comments:

There are two reviews. These reviews are thorough and highlight gaps in teh proposal where the scientific method is unclear.

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

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Amount Requested: \$280,150
Primary Investigator: Carol Kendall, USGS

FRP secondary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose	<p>The stated objective of linking "key habitat parameters" (loosely defined within the proposal) and nutrient concentrations (in fact, Nitrogen specise) and flow dynamics is a fascinating objective and would certainly be a beneficial tool to developing some restoration goals and management strategies.</p>
Background/Conceptual Models	<p>Background information is primarily focused upon existing data acquisition by this team from other concurrent projects and does an adequate job of identifying key research that underpins the conceptual model and the models that are proposed to be linked together. The concenptual model is difficult to follow and does not identify what data are available nor the precision and accuracy of input data required to get effective output. As a result, it becomes a bit of a guess as to whether or not this project is feasible.</p>
Approach	<p>The approach is to use data from current research projects as input to the DSM2 and RMA models to get predictons of nutrient concentrations under various scenarios. However, the proposers do not indicate the scope and range of existing data and how much data will have to be acquired (and subcontracted) from archived samples. This brings into question the integrity of archived samples as well as quality control of the analysis. The model output could be compromised by poor quality of some input data. The proposers admit that there is little N or P data from some transects that they propose to use for calibration data. What is the historical record of the archived data? That is, is it appropriate to use data from 2, 5 or 10 years ago with currently collected data? These questions are not considered in the proposal.</p> <p>Another concern is the appropriateness of some of the data for the calibration. For example, the proposers indicate that the hydrdynamic model will be calibrated</p>

using Mar 2009 to Apr 2010 flow data for travel time [and other hydrological input?]. A couple of questions come to mind: (1) aren't these data for calibration coming from a recent time when the system has flow records that are already compromised or degraded; if not, (2) what are the assurances that this short hydrologic record is typical of the Delta region. Wouldn't a time-series analysis of the historical record provide more accurate calibration data?

Feasibility

The laboratory and field capabilities are certainly sufficient to conduct the analysis.

Relevance

Since changes in ammonia concentrations have been linked to decreases in phytoplankton blooms and changes in Delta smelt populations, the proposed research is an essential project to identifying some of the problems that must be managed for an effective restoration program in the future. It fits well into the Food Web/Water Quality/ Drivers topic area.

Qualifications

Both of the principal scientists in the study are well qualified to conduct the work. They have a good record of scholarship and funding support for similar projects.

Summary Comments

This is an interesting coupling of some fairly interesting models in order to get at the impacts of nutrient changes on ecosystem dynamics. My greatest concern is not whether or not the models can be utilized [they have been sufficiently developed, I assume] but whether or not the input data are sufficient to get good calibration and appropriate output. The proposers need to pay special attention to quality control of input data. It is difficult to determine if the computational model can mimic the conceptual models as the conceptual models were difficult to follow.

Since the amount of existing input data versus the amount of archived data that must be analyzed is not indicated, it is unclear if the proposed budget is appropriate to the amount of work required in the subcontractor's lab while still assuring support for the rest of the work.

Please identify your overall ranking for this proposal:

- 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
- Fair
- Poor

Comments:

Both technical reviews provided a good analysis of the benefits and shortcomings of the research. While one technical review was unsure of the conceptual model, the other was more positive, but both indicated that it was difficult to assess the ability of proposed models to use available data to create usefull output.

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

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Proposal Applicant: United States Geological Survey
Amount Requested: \$280,150
Primary Investigator: Carol Kendall, USGS

FRP secondary Reviewer's Evaluation Summary and Rating

Provide a brief explanation of your summary and rating.

Comments:

Purpose	<p>The PIs propose to use numerical modeling to synthesize existing data sets in order to characterize physical and chemical properties of the system, fill in some data gaps, and use the model to advance understanding of the Delta ecosystem and also as a quantitative assessment tool of the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP). The PIs make a compelling case for the use of numerical modeling to combine various concepts. Incorporating stable isotope analyses is particularly attractive. The proposal includes one hypothesis that will be addressed by scenarios using the proposed modeling tools: Key habitat parameters in the study area can be adaptively managed by manipulating flows and nutrient species/concentrations in the Sacramento River and in effluent inflows.</p>
Background/Conceptual Models	<p>The proposal includes no single conceptual model, but frames the research among multiple ones that appear to have been configured to address various areas of inquiry en route to resolving environmental problems within the study area. Some of the figures are clearer than others. With regard to the ones addressing nutrient scenarios, I agree with external reviewer #2 that it is odd that denitrification does not seem to be factored in to the figures and descriptive text. This part of the proposal was difficult to follow and was not well organized for clear communication.</p>
Approach	<p>The study plan included a list of specific steps to be completed to meet the study goals as well as a description of each of 5 tasks, including the investigator responsible, work scope, and some explanation of techniques, which were not very detailed. The overall schedule of research appears adequate. With regard to water quality analyses (Task 2), I would have liked to have seen how archived water samples previously assayed for inorganic nutrients, and</p>

	<p>now to be un-archived and analyzed for DON and DOP, have been stored and for how long. Could the quality of the samples and, therefore, value of these new measurements been jeopardized by the storage length of time and/or conditions of storage?</p>
Feasibility	<p>From what is available as the explanation of the research plan and its timeline in the proposal, the work seems feasible.</p>
Relevance	<p>The research is related to Topic areas 2 (Food Webs of Key Delta Species and Their Relationships to Water Quality and Other Drivers) and Topic area 3 (Coupled Hydrologic and ecosystem Models).</p>
Qualifications	<p>The research team appears well qualified to complete the study tasks.</p>
Summary Comments	<p>Overall, the study goals offer new perspectives through numerical modeling that will synthesize data from different sources and incorporate stable isotope analyses - all of which is very attractive. Clarity of the proposal suffered in places, the model figures were not always complete in capturing all relevant processes, and description of some procedures would have benefited from more detail.</p>

Please identify your overall ranking for this proposal:

- 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
- Fair
- Poor

Comments:

The external reviewers provided valuable comments.

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

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Proposal Applicant: United States Geological Survey

Project

comments	Proposed work is to model nutrient and water flows in the Sacramento/San Joaquin Delta. It will use isotope data from archived water samples (funded by another grant) to estimate transformation rates of nitrogen species based on fractionations of the isotopes. This method is novel and have been used in other ecosystems to identify rates of processing. The authors will incorporate these rates in off-the shelf water quality models to predict outcomes of varying management scenarios.
rating	Above Average

Background

comments	<p>The conceptual model is extremely difficult to follow because there were 4 different box and arrow diagrams each with the descriptor of conceptual model. I had a very hard time linking what was known vs unknown; much had to do with recondite writing. It appears that the authors wrote this proposal for an audience extremely familiar with the Delta and the modeling methods they propose. Dozens of long acronyms and complex, backward sentences, prevent my easily interpreting the significance of the proposed work. Sentences such as: "A primary outcome of this project is the development of a portfolio of quantitative results visualizing key findings and analyses that can be utilized in adaptive management of current and potential future Delta conditions and to aid key species" confuse rather than communicate. Paragraphs do not follow from one to the other.</p> <p>Denitrification seems to be missing as a N transformation. It is mentioned only twice in the proposal. It is possible that this process is quantitatively unimportant, but because it so strongly fractionates NO3 a little may alter the del15NO3. If denitrification is unimportant, the authors need to say so.</p>
rating	Inadequate

Approach

comments	The modeling approaches the authors describe seem appropriate. Modeling various scenarios will likely assist future management of the Delta
rating	

	Above Average
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Feasibility

comments	Assuming the isotope data work out well (the analysis of them is not part of this proposal), the modeling goals in this proposal seem quite feasible.
rating	Superior

Relevance To The Delta Science Program

comments	The question the authors propose is important and the results of their modeling will likely assist managing the Delta. It meets the priorities in the proposal submission package quite well, especially topic 3 (Combined hydrologic and ecosystem models) It combines hydrology, water quality modeling and cutting edge biogeochemistry, which is a strong point. It synthesizes existing information and is collaborative.
rating	Superior

Qualifications

comments	The authors are well qualified for this research.
rating	Superior

Overall Evaluation Summary Rating

comments	<p>I think this work will be quite novel and will assist in managing the Delta and is right down the middle of the research priorities. The abstruse writing and complicated conceptual model made it very difficult for me to link the conceptual basis of this work with what the authors plan to do.</p> <p>Based on that I think this proposal was very difficult to interpret, the authors will need to work hard to make the results of this project interpretable to non experts.</p>
rating	Above Average

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Proposal Applicant: United States Geological Survey

Project

<p>comments</p>	<p>The hypothesis is very clearly stated. There is an expected relationship between water flow, sources, and retention to nutrient dynamics. Dissolved inorganic nitrogen (DIN) is the focus of this proposal and there is a nice conceptual link between delta15N and different DIN species. What is lacking is a clear description of the data available (in terms of distinct samples in time and space) and a demonstration that end-points of isotopic mixing models can be clearly determined from field data. Finally, there is a suggestion that different sources of water in the Bay Delta area have distinct isotopic signatures, but no data are presented to support this important conjecture.</p>
<p>rating</p>	<p>Sufficient</p>

Background

<p>comments</p>	<p>Conceptually, this is an exciting proposal. It seeks to link water flow dynamics in the Delta to ecosystem processes related to the fate of nitrogen in this system. This is a timely topic because ammonia is thought to have negative effects on fish recruitment, etc. It could suggest ways to alter water operations to minimize threats of high ammonia concentration.</p>
<p>rating</p>	<p>Above Average</p>

Approach

<p>comments</p>	<p>The approach is well designed, in the sense that isotopic data give some insight into nutrient dynamics and that large-scale, regulated water systems are regularly modelled. Apart from my reservations about supporting data, it appears the management tasks are well defined (with Kendall as primary manager). I like the emphasis of visual presentation of model results and 'movies' of different water management scenarios -- this is likely to be a highly effective presentation tool. There are plans to present this information to water managers in the system, and publish peer-reviewed scientific papers from the modelling effort.</p>
<p>rating</p>	<p>Above Average</p>

Feasibility

comments	<p>I felt the proposal was seriously lacking in some key supporting data and analyses. The proposal needs an explicit statement of the water quality and isotopic variables in the long term data set and the number of distinct sampling times and places is required. An analysis of how much data are needed for model validation would be very helpful for evaluation of feasibility. While mixing models in principle are widely accepted, their implementation depends on how well endpoints can be discriminated with field data. Nitrogen isotopes are notoriously variable in time and space. Discrimination of endpoints needs to be clearly demonstrated before I will be convinced that mixing models will offer any insight into nutrient dynamics in this system.</p>
rating	Inadequate

Relevance To The Delta Science Program

comments	<p>This is a highly integrative effort that attempts to gather available WQ, isotopic and water flow data and synthesize them to make explicit recommendations about management of water flows in the system. The attempt to understand the dynamics of nutrient flow in the system based on isotopic geochemistry and time series is novel.</p>
rating	Superior

Qualifications

comments	<p>These authors have an impressive track record, and appear to have familiarity with all methods discussed in the proposal. The laboratory that did the original WQ data collection will be subcontracted to obtain 'missing' data to fill in gaps to minimize among-instrument measurement variance. What was not clear is how much data will be gathered? It is also not clear to me what the roles of Young and Kraus are, nor are their qualifications discussed in the proposal apart from including CVs.</p>
rating	Sufficient

Overall Evaluation Summary Rating

comments	<p>Although conceptually very interesting and highly relevant to water management in the Bay Delta, I had serious reservations about technical details of this proposal. I have identified a few things below that need to be addressed before this proposal realizes it's full strength.</p> <p>1) The proposal needs an explicit statement of the water quality and isotopic variables that exist in the long term data set, what</p>
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	<p>new data are to be gathered, and how it will be analyzed and combined with water flow models. Some of the key variables, like chlorA, just seem to appear in the proposal out of thin air.</p> <p>2) An explicit statement of the number of distinct sampling times and places is required, and the variance in key parameters in time and space. Are there sufficient data for model validation?</p> <p>3) While mixing models in principle are widely accepted, their implementation depends on how well endpoints can be discriminated with field data. Nitrogen isotopes are notoriously variable in time and space. Discrimination of endpoints needs to be clearly demonstrated before I will be convinced that mixing models will offer any insight into nutrient dynamics in this system.</p> <p>4) What are the effects of 'archiving' of samples on isotope ratios? How are they archived? Could preservation procedures influence data obtained to 'fill in the gaps' in the long-term WQ dataset?</p> <p>5) The proposal could benefit from more careful writing. It is disjunct and telegraphic in places. Acronyms are widely used and not spelled out.</p> <p>6) The proposal refers to 'isotopic fingerprints' and implies that each tributary has a distinct isotopic signature. Is this actually true? Where are the data that demonstrates this?</p> <p>7) I felt the budget was a bit excessive for the work proposed. It was not exactly clear what the role of some personnel were. Also, the phrase 'portfolio of results' is used widely in this proposal. What does that mean exactly?</p>
<p>rating</p>	<p>Sufficient</p>