Proposal Reviews

#183: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

University of Arkansas

Initial Selection Panel Review	
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 #4
Environmental Compliance	
Budget	

Initial Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Initial Selection Panel Review

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

Please provide an overall evaluation rating.

Explanation of Recommendation Categories: Fund

- **As Is** (a proposal recommended for funding as proposed)
- **In Part** (a proposal for which partial funding is recommended for selected project phases or components)
- **With Conditions** (a proposal for which funds are recommended if the applicant contractually agrees to meet the specified conditions)

Consider as Directed Action in Annual Workplan (a proposal addressing a high priority action that requires some revision followed by additional review prior to being recommended for funding)
Not Recommended (a proposal not currently recommended for funding-after revision may be considered in the future)

Note on "Amount":

For proposals recommended as Fund As Is, Fund In Part or Fund With Conditions, the dollar amount is the amount recommended by the Selection Panel.

For proposals recommended as Consider as Directed Action in Annual Workplan, the dollar amount is the amount requested by the applicant(s).

Fund	
As Is	**X**
In Part	**-**
With Conditions	**-**
Consider as Directed Action	**-**
Not Recommended	**-**

Amount: **$747,741**

Conditions, if any, of approval (if there are no conditions, please put "None"):

none

Provide a brief explanation of your rating:

This is a basic research project that will develop 500 year hydroclimatic models based upon ancient blue oak tree-ring chronologies as well as identifying the present distribution of blue oak. This addresses the PSP's multi-region priority #4, of ensuring that restoration and water management are sustainable under future climate change. Understanding effects of future climate change is dependent upon understanding effects of past climate change. This is an excellent research team. The results should be used by many future water, channel, and floodplain restoration programs as foundation data.

Research and Restoration Technical Panel Review:

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

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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**
XSuperior	**This proposal (by a very capable team) will result in significant advances in our understanding of the spatial variations in precipitation and streamflow over the past 500 years. It is clearly related to CALFED goals, and full-scale implementation is justified.**
-Above average	
-Adequate	
-Not 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 are clear, and funding for the proposal is justified based on (1) questions of how representative the 20th century was in terms of flood and drought occurrence, (2) lack of knowledge of the spatial variability of precipitation and streamflow in other reconstructions from tree-rings and other proxy sources, (3) lack of knowledge of the existing distribution of ANCIENT blue oak forests. The proposal is clearly related to CALFED goals.

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?

The external reviewers had only very minor comments on the proposed approach. All these seem fairly easy to resolve and will not limit the successful implementation of the PIs research plan. All external reviews gave the proposal a rating of "Excellent." The team has an excellent track record and is quite capable of effectively implementing their research plan.

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?

   The proposed research will provide important new information on the decadal-scale spatial variability of precipitation and streamflow in California, and linkages between drought and climate forcings such as ENSO and PDO. The proposal is clearly related to CALFED goals.

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

   The budget is reasonable. The benefits of this project far outweigh the costs.

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?

   The San Joaquin, Bay, and Delta panels all gave this proposal a rating of "High." Positive comments included "can evaluate regional differences" (San Joaquin), "...general consensus that this study would help restoration practitioners better plan restoration projects..." (Bay), "...may also provide useful information for developing fish population models" (Delta). The Sacramento panel gave this proposal a "Low" rating, and commented that these type of hydroclimate models already exist.

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?

   Budget - no work schedule, only not which campuses will do the work, no tasks defined in the proposal narrative.

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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

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

The high ranking is based on the proposal's research strengths (well written/highly feasible) and the high need for more explicit information on climate variability in the bay region. There was a general consensus that this study would help restoration practitioners better plan restoration projects by increasing their understanding of specific climate patterns once the research was completed.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   The research appears very feasible. The only hitch, is that it is unclear how difficult it will be for the project proponents to gain access to properties for which they do not currently have permission. Proposal states, The proposed tree-ring sampling is non-destructive (5mm cores are extracted without harming the tree), but we will obtain written permission for fieldwork from all property owners.

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

   XYes **-**No

   How?

   The proposed research is multiregional and will provide accurate long-term data on the natural hydrodynamics of the Sacramento, San Joaquin, Delta/Eastside Tributaries, and Bay regions of CALFED. MR-4 - concerning climate and hydrologic interannual to decadal variability of precipitation and streamflow across the entire CALFED region. MR-6 More indirect results is to provide information on conceptual models of community dynamics for salmonids or other at-risk species BR-3, BR-5, BR-7: Very indirect result - The proposed Delta inflow, X2, and estuarine salinity reconstructions will provide a long term perspective on hydrologic regimes that may be related to the success of some at-risk species, and may be linked in part to the invasion of non-native species.

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?

No, not very applicable. There is not a lot of connection with ongoing regional planning efforts or implementation projects; however, the research results are likely to influence these processes (see above).

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

XYes **-**No

How?

This is a research project and connections with local people and institutions are not well developed to date. However, there is a plan to include local people, as the proposal states none yet developed, but many presentations are planned to help raise public awareness.

Other Comments:

This project has merit for understanding long term climate change scenarios that are likely to help predict future Bay Delta conditions. Also the mapping effort will benefit entities who are targeting terrestrial based restoration efforts that through watershed processes affect the aquatic system. At first glance, the proposal seemed a better fit for the CALFED Science Program than the ERP with a more implementation focus, but the value to understanding climate and precipitation scenarios as a whole warrants funding despite the more indirect connection to ERP goals.

Delta Regional Review:

Proposal Number: 183

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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

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

Will provide very valuable information

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Much is research-based; will need to get access permits for testing using non-destructive coring techniques; have obatined permits for sampling from DFG,DPR,Nat'lPS, USDA, Forest Service, and USBLM; asseet that tree-ring chronology technique has been sucessfully developed (to be verified with technical review).

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

   XYes **-**No

   How?

   Provide background info. to address Prior #8- interpretation of data in terms of establishing controlling factors and linkages in climate variability; may also provide useful information for developing fish population models

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?

   Well-rounded representation for this type of research effort; Forest Service involvement.

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

   XYes **-**No

   How?

Well- rounded effort-local regulatory Agencies have provided permits for sampling-DFG,DPR; may also want to engage local peer review

Other Comments:

Many germain scientific questions scattered throughout the proposal, but not sure how they will be addressed or reported- a little fuzzy on deliverables in this regard- will these be included in "publication" Task?

San Joaquin Regional Review:

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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

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

Blue Oak is a very good proxy for whole drainage basin because it is found throughout the basin unlike other proxies that are limited in distribution. Will develop climate reconstructions for individual San Joaquin basins. Can evaluate regional differences which is very important.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Qualifed Yes. Some concern that local access to private land could bias sampling

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

   XYes **-**No

   How?

   This kind of work and the specific project proposed is very valuable because the climatic context is very important for designing restoration projects and evaluating their success. They could have made somewhat stronger case for the relevance of the work. Their applicability section B could have been stronger- used the term may be to much.

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?

   Partial yes. Part of this project should consider how their work should be incorporated into restoration planning. Do not just leave this step up to CalFed or restoration practioners since they may not fully understand the results or the implications of the results

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

-Yes **X**No

How?

Not relevant

Other Comments:

Extremely valuable research by a well qualified group. Blue Oak is a very good proxy for whole drainage basin because it is found throughout basin unlike other proxies that are limited in distribution. Can evaluate regional differences which is very important

Very relevant research that should be cost-shared by other interested parties. CalFed should not be only contributor. Other interested agencies should be MWD, State Water Project Contractors, DWR, USBR (separate from their CalFed interest) and other water supply and management agencies.

Wondering whether climate research should wait for guidance from CalFed commissioned white paper on the climate change and climate context for CalFed?

Three separate research Qs linked by the species but not the issues

No discussion of how access to groundwater might influence growth patterns and relationship to climate signal

Sacramento Regional Review:

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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

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

Although several panel members felt this project was of medium priority, in general the panel felt these types of hydroclimatic models already exist.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   The researchers are well qualified and the methods have been well established, suggesting this project is feasible. The study would create a climate history of the Bay Delta watershed based on blue oak tree ring data. Although there is some variability in the predictiveness of this information in wet years, but with a sample size of 50 and by including samples from trees at a range of ages and from a variety of climates, the researchers should be able to produce a fairly accurate model.

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

   XYes **-**No

   How?

   Our yes is qualified. The project indirectly addresses PSP regional priority 7, to develop conceptual models to support restoration of river, stream, and riparian habitat.

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 project is not linked with any specific restoration project in the region. It is a research project evaluating tree cores that would be sampled at 50 sites, and then used to develop climate histories for the Bay Delta region.

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

   -Yes **X**No

   How?

   There would be sampling of oaks on local lands, and it is possible that landowner involvement would occur. However, it does not appear that local people and institutions are a component of this project. Some panel members suggested this factor is not applicable to research projects.

Other Comments:

The panel thought this proposal was interesting, but was not sure how the data will contribute to restoration efforts.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **183**

Applicant Organization: **University of Arkansas**

Proposal Title: **HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY**

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**
XExcellent	**This is a well thought out proposal, with a well qualified team of researchers, investigating key climatological long term patterns which are vital to predict water resources into the future, and at a reasonable cost. This should be funded.**
-Good	
-Poor	

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

   This proposed research has 2 main goals; 1, to reconstruct the climate over the past 500 years using tree ring data, and 2, to map the distribution of ancient blue oak forests. The first goal is very important and timely for the long term management of water in the system, while the relevance of the second goal is not clear.

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?

Most of the study is justified - this type of information - long range climate patterns - is not known and vitally important to manage the water resources of the Central Valey-Delta. An overarching conceptual model is not presented and would have been helpful to see how the tasks relate to each other (perhaps is was on page 1? - the pdf file was missing that page). This is appropriately a research project.

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 purpose of the various tasks of the proposal are summarized: Task 1 - develop tree ring chronology; Task 2 - single-station precipitation reconstruction over the past 300-500 years; Task 3 - regional precipitation reconstruction (Tasks 2 and 3 will be used to document interannual to decadal variability over the entire drainage basin); Task 4 - reconstruct full natural flow for selected rivers from tree rings to complement precipitation reconstructions; Task 5 - explore connection between observed and reconstructed ppt and streamflow variability and large scale climate patterns; Task 6 - examine fine scale spatial anomalies in reconstructed ppt, and map extant ancient blue oak woodlands. All tasks are fully documented and have excellent inter-task linkage EXCEPT task 6. Fine scale spatial anomalies in ppt are not likely to be a strong signal over the time scales involved, and mapping of ancient blue oak stands, while interesting, has little connection to the rest of the project or to CalFed goals.

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 project seems highly feasible.

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?

   Yes, Table 2 (P 21) lists specific activities, outcomes and expected completion dates,

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?

   The product will be a better understanding of long term climate variation/patterns - critical information, in my opinion.

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?

   The research team seems highly qualified with adequate institutional support.

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

The budget is not arranged according to tasks, but according to the researchers, making it difficult to fund parts of the proposal, or to see how much each task costs. Also, there are indirect costs associated with each institution that don't appear in the tables, making if difficult to get at the total indirect costs. The University of Arkansas is asking for indirect costs on each subcontract, but only on the first $25K. That said, the benefits of this research outweigh the costs.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **183**

Applicant Organization: **University of Arkansas**

Proposal Title: **HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY**

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**
XExcellent	**This is a truly excellent proposal. We do not have adequate information on the spatial extent and spatial coherence of drought in the paleo record. This is an amazing group of people who have been brought together to do this research (some of the most productive scientists that I know of), and they will have no problem effectively implementing their research plan. The strong links between some of the PIs (Dan Cayan, Mike Dettinger, Kelly Redmond) and decision makers in the region provides confidence that the research will be used in CALFED restoration efforts. I'm looking forward to seeing some of the results!**
-Good	
-Poor	

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

   The goals in this proposal are extremely clear - the PIs plan to develop over 50 tree-ring chronologies over the Sacramento and San Joaquin drainages, and use these chronologies to reconstruct the spatial variability of precipitation, streamflow, and at larger spatial scales, reconstruct Sacramento and San Joaquin River runoff and San Fransisco Bay salinity. The PIs further plan to develop a predictive model to map the location of ancient blue oak woodlands.

The concept of this proposal is important - while we do have information on the probability of drought for specific locations in California, we do not have adequate information on the spatial extent and spatial coherence of drought, and links with climate variability. Questions that need answering are: is drought on the Coast Range correlated with drought in the Sierra Nevada?; is dought in the Sacramento River correltated with drought in the San Joaquin?; what are the relationships between drought and decadal-scale variability in ENSO and PDO? This proposal will take important steps toward answering these questions.

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?

   This proposal is builds upon existing knowledge, much of which has been gained through the efforts of the extremely capable group of investigators in this project. The major contributions to the CALFED effort are 1) substantially improve our understanding of the system-wide natural hydro-climate regimes which CALFED is designed to re-establish and maintain, and 2) to inventory, map, and thereby help conserve a major native biotic community in the Bay-Delta watershed. Full-scale implementation of this project is clearly justified.

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 approach is very well designed. It goes beyond the simplistic concept of many paleo-climate studies (some of which do little more than tell us that drought happens and is much more scary than in the instrumental record) to provide a detailed understanding of the spatial variability of precipitation and streamflow over the last 500 years, and establish links with climate forcings.

   One very minor comment: For the single station precipitation reconstructions, it was not clear to me why the PIs were interpolating the station data to the site of the tree-ring chronology, and then computing the reconstruction. In this approach, there is uncertainty in both the interpolation and in the tree-ring reconstruction. It would make more sense to me if the PIs used multiple tree-ring chronolgies, perhaps split into predictor subsets, to reconstruct the precipitation time series at each station. Statistical methods described elsewhere in this paper (e.g., neural nets, multiple linear regression with principal components transformation of the predictors) are perfect for this task. The PIs would obviously have to ignore those stations with poor reconstructions, but this would provide many more precipitation reconstructions than (perhaps >200) than the 50 tree-ring chronologies they are proposing to use.

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 approach is well documented, and previous research indicates that the probability for success is certain.

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 expressed in terms of successfully completing the tasks in the proposal.

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?

   The strong links between some of the PIs (Dan Cayan, Mike Dettinger, Kelly Redmond) and decision makers in the region provides confidence that the research will be used in CALFED restoration efforts. The high level of information output of all PIs suggests that we will see numerous peer-reviewed 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?

   The team is extremely capable and has produced some excellent research in the region.

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

   The budget is reasonable and necessary to complete the proposed work.

Miscellaneous comments:

None.

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **183**

Applicant Organization: **University of Arkansas**

Proposal Title: **HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY**

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**
XExcellent	**This is an excellent proposal. The objectives match Program Goals -- questions to be addressed are interesting and relevant. Project tasks and methods match objectives and are appropriate -- specific review comments can be easily addressed. Investigators have strong backgrounds, each brings needed expertise to the effort -- tasks are clearly laid out and well integrated.** **The project has a high probability of success and of providing important findings to the Bay-Delta Program and broader ecological and climate communities. The proposed investigation should be granted full funding, with minor adjustments as needed in response to comments.**
-Good	
-Poor	

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

   Project Goals ---------- Major objectives are clearly stated and well developed (Section A.2, p. 2ff.). The objectives are:

(1) Understand interannual and decadal variability in SF Bay watershed precipitation, runoff, and bay salinity over the last 500 years based on blue oak tree-ring chronologies (p. 3). The purpose is to gain long-term perspective on variability in natural flow regimes affecting the Bay-Delta system and on local to hemispheric-scale climatic causes of this variability.

(2) Map the current distribution of old-growth blue oak through predictive landscape modeling (p. 4). The purpose is to contribute to efforts to preserve old-growth blue oak stands -- an important native plant community and an indicator of intact watersheds with critical salmon habitat.

Relevancy to Program Goals ---------- Both objectives are timely and relevant to CALFED ERP goals. The first objective is relevant to ERP goals to understand natural hydrodynamic regimes of the Bay-Delta system and watershed (p. 2, 16f.). The second objective -- blue oak mapping -- is relevant to ERP goals to help conserve major native biological communities, both with respect to preservation of old-growth oak woodlands and maintenance of high-quality salmon habitat (p. 2, 17). ---

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 project is justified based on existing understanding of the system and need to expand this knowledge. To develop 500-yr tree-ring chronologies of climatic, watershed, and estuary system variables, the project builds on existing knowledge, standard methodologies, and a proof-of-concept study. The project will also develop a GIS-based model to map the distribution of old-growth blue oak woodlands -- this effort builds on an existing satellite and aerial photography digital map of blue oak woodlands (without distinction of regrowth and old growth stands) and understanding of landscape processes. ---

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?

   Overall ---------- Tasks and methods are well laid out and appropriate for project objectives (Sections A.2 and A.3). The project will generate solid reconstructions of the past 500 years of precipitation and runoff regimes for the Bay-Delta watershed. This effort is designed to increase our understanding of hydrologic variability in this system and broad scale (e.g. Northern Hemispheric) climatic drivers of this variability -- this long-term perspective will assist in Bay-Delta management decisions, especially with respect to flow restoration. The project will also model landscape distribution of old growth blue oak. Results from this effort will help agencies responsible for management and preservation of native plant communities and salmon habitat.

   Specific Comments ---------- (1) Interpolation of station precipitation records (p. 7, parag. 2) -- In developing a historical precipitation record for each tree-ring sample site, the investigators propose to interpolate precipitation data from nearby weather station records using inverse-distance weighting interpolation. The proposal, however, does not address two critical issues associate with such an approach: (i) station data quality and (ii) appropriate interpolation schemes in heterogeneous terrain.

(i) Precipitation data are to be obtained from California DWR and NOAA Western Regional Climate Center (WRCC), but there is no discussion of what kind of data quality tests have been or will be applied to station records and how this will influence station selection and data use. Precipitation data are very sensitive to station moves, changing conditions around stations (vegetation, buildings), and other sources of record inhomogeneities. Testing and adjusting datasets are arduous processes that are prone to error. The investigators need to address how they will address this issue and how errors in the dataset will be accounted for in developing climatic reconstructions.

(ii) Spatial patterns of monthly and seasonal precipitation are highly dependent on topography -- not just in the mean but also with respect to interannual anomalies (as the investigators note, p. 3). Simple methods (such as inverse-distance weighting) tend to mix signals from stations that even though are nearby have different aspects (windward vs. leeward) and elevations. Schemes that account for such factors may be more appropriate, especially given that the objective is to discern anomaly patterns that are dependent on topography. Daly et al.'s (1984, J. Appl. Meteorol. 33:140-158; http://www.ocs.orst.edu/prism/) PRISM model is an example of a "topographically-smart" interpolation system. Chris Daly (Oregon State University) is creating a high-resolution monthly precipitation chronology for the 20th century covering the conterminous US. I recommend that the project make use of this dataset, or that project scope (and funding) be increased enough to implement this type of interpolation in order to generate more sophisticated estimates of site precipitation records.

(2) Use of reconstructed records (p. 7ff., 11) -- (i) Tree-ring chronologies will be used to reconstruct site and regional precipitation and full natural flow (FNF) timeseries (p. 7-9), each of which is a statistical estimate rather than actual data. The use of estimated variables to develop regressions models (for the reconstructions) can lead to overestimating the statistical significance of the regressions. This is because errors in the estimation of independent and dependent variables (e.g., FNF) are not considered in traditional statistical techniques -- these errors are expected to be larger than observation error. Without consideration of propagation of errors, the regressions that form the basis of hydroclimatic reconstructions will be reported with larger significance than is due.

(ii) The same caution is needed in the comparison of reconstructed hydroclimatic series with proxy reconstructions of ENSO and other global and hemispheric climate indices (p. 11). Correlation analysis, for example, of two estimated series will also lead to over-reporting of significance level -- errors in the estimation of the two series are ignored.

The investigators need to propose methods that will account for the propagation of errors in their analyses.

(3) Mapping of 'ancient' blue oak woodlands (p. 5, 12ff.) -- It is not initially clear how well a predictive model will be able to distinguish old-growth from regrowth woodlands if this is largely a function of human disturbance as opposed to environmental controls. However, the investigators state that studies have found that environmental conditions such as steep slopes, exposure, infertile soils, rock outcrops, and remoteness are associated with old growth stands in highly disturbed areas (p. 14). Prediction of old growth stands might be, nonetheless, very complex with strong dependence on intensity and type of disturbance and non-linear interaction among variables. The investigators need to provide more information as to (1) how the model will be structured and (2) availability of needed input data layers at a spatial resolution sufficient to capture key landscape features. I recommend that this component be given enough funding to do a proof-of-concept study. ---

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?

   Overall ---------- Approaches addressing the first project objective -- hydroclimatic reconstruction -- are technically feasible (Sections A.3 and A.4). This is supported by a proof-of-concept study -- preliminary findings showed strong relationships between a limited number of tree-ring chronologies and station precipitation and SF Bay salinity (Figs. 4-8). Their proposed methods have a high likelihood of success. Scale of project in terms of tasks and sampling regime are consistent with objectives.

   Specific Comments ---------- The project will also develop a GIS-based model to map the distribution of old-growth blue oak woodlands -- this effort will need testing to show its feasibility (see Specific Comment 3 under Approach, above). ---

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?

   The project will generate a series of products (see Products, below) during the three-year funding period that will be a measure of its progress and final results (Table 2). Each of these products are quantifiable performance measures. ---

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?

   Overall ---------- Project products (Sections A.6-A.7, p. 16) will be of value to users of Bay-Delta watershed research and to broader ecological and climate research communities. The products will be available to these groups and include:

   (1) Tree core collections (archived at the U Arkansas Tree Ring Laboratory repository). (2) Digital tree ring data, climate data, and reconstructed chronologies -- including 500-yr timeseries of precipitation, watershed runoff, and Bay-Delta hydrodynamic variables (distributed on CD and archived at the NOAA Geophysical Data Center and the WRCC). (3) High-resolution digital maps of GIS-modeled old growth blue oak stand distribution. (4) Dissemination of results via refereed journal articles, the web, and other publications.

   Specific Comments ---------- With respect to item 3, field-observed stand distribution and ancillary data, as well as datasets used to drive the predictive model, should also be included as GIS layers. This product (all GIS layers, including model results) should be publicly available and released in commonly-available GIS formats. ---

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?

   Project personnel (p. 17f.) are highly qualified with strong track records. Research team is well selected. Each investigator is responsible for clearly defined tasks (Table 3; Budget Justification section) that are integral to the project and each brings needed expertise to the effort. Facilities available to the project at the 5 institutions provide needed infrastructure. ---

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

   Roughly $750K is for 3 years and is distributed among 5 institutions, with the largest portion going to the lead group (U. Arkansas). Budget is feasible and appropriate for proposed tasks. ---

Miscellaneous comments:

-none-

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **183**

Applicant Organization: **University of Arkansas**

Proposal Title: **HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY**

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**
XExcellent	**This group is about the best team of reconstruction and hydroclimatic researchers I've see on one project in a long time. There should be some excellent material forthcoming if it is funded. I strongly recommend it.**
-Good	
-Poor	

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

   The twin oals of mapping locations of ancient blue oak occurrence and the climate and hydrology reconstruction are expressed and described very well. The work is timely inview of questions about 20th century weather and hydrology patterns. We don't know how representative the 20th century was, particularly in drought and flood occurence. This comprehensive project should shed much light on that question.

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?

As noted, some work on blue oak reconstructions of runoff has abeen done previously which tells us the methods do work and can provide better past water year reconstruction than previous studies which have used mostly pines and junipers. The development of new water storage in the CalFed program is tied to multiyear droughts. The firm yield and probabilities of a given supply rest now on a rather short hydrological record of less than 100 years. This proposal, if funded, would be expected to provide useful new guidance on the amounts of new storage needed and their reliability in the long run.

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 general approach builds upon previous mapping and reconstruction work. The authors know that careful analyses of data and judicious selection of suitable trees are the keys to the best reconstruction. The proposal is an ambitious but achievable plan which should yield massive amounts of new data and that on a regional scale in the Bay Delta drainage basin.

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 methodology is described thoroughly and in much detail in the proposal. These researchers have much experience in their respective fields and the results are expected to be about the best that can be developed. Mapping of ancient blue oak tree sites should help preserve many of these trees for a future generation of scientists who may have even better measurement and reconstruction tools at their disposal.

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?

   The tree sampling and chronology development and the reconstruction of precipitation, runoff, climate variability, and San Francisco Bay system salinity are described in much detail (good enough to be part of a textbook). Since there are 5 regions for which hydroclimatic data are to be developed, we are certain to have partial success even if all the research effort doesn't succeed. The mapping portion is quite straightforward and should be achieved without major problems.

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?

   The major product, aside from the mapping of blue oak tree locations, is the addition of 400 years of hydroclimatic history to the rather short instrumenal record which we now have. The potential discovery of useful predictive patterns (say for multiyear drought) requires centuries of data for longer cyclic variations. The information expected from successful conclusion of this project offers exciting prospects for further climate research on driving mechanisms.

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?

I know 4 of the 5 researchers. They are some of the top people in their field, with excellent reputations and are noted for producing the kind of results water managers and planners can use. CalFed will get its money's worth from this group.

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

   The total cost, while considerable at nearly $ 748,000, is small in comparison to potential better design of water facilities costing in the billions of dollars and the possibility of improved long range forecasts to help in water operations.

Miscellaneous comments:

We have had some experience in reconstruction of runoff on the Sacramento River system in a project completed in 2001 by Dr. David Meko. That 1000 year reconstruction of annual runoff was the best so far in the western USA to my knowledge. This project will be much more comprehensive and should provide better results, and results for the whold Bay-Delta drainage area.

Environmental Compliance:

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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

   XYes **-**No

   If no, please explain:

   All required permits will be obtained.

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 specific budget or timeline for permits is listed.

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

   -Yes **X**No

   If yes, please explain:

Other Comments:

Budget:

Proposal Number: 183

Applicant Organization: University of Arkansas

Proposal Title: HYDROCLIMATIC RECONSTRUCTION AND ANCIENT BLUE OAK MAPPING OVER THE DRAINAGE BASIN OF SAN FRANCISCO BAY

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?

   -Yes **X**No

   If no, please explain:

   No Work Schedule, only note as to which campus will do the work, no tasks defined in Proposal narrative.

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?

   XYes **-**No

   If no, please explain:

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: