

Selection Panel (Primary) Review

X Fund (a proposal recommended for funding at the amount sought or funding in part of selected project tasks or subtasks)

– *Reconsider if Revised* (a proposal that is a high priority but that requires some revision followed by additional review prior to being recommended for funding)

– *Not Recommended*

Amount Sought: \$1,651,396

Fund This Amount: \$1,234,396

Conditions recommended (Conditions that applicants would need to meet to obtain funds may be recommended for proposals suggested for either full or partial funding. For proposals recommended for partial funding, conditions that identify the funded tasks or subtasks must be recommended.)

The Selection Panel agrees with the Technical Panel that the genetic marking work is not essential. Eliminate the QTL development task and continue to use the RAPD method for a cost savings of \$139,000 per year for 3 years – total \$417,000.

A detailed explanation of the proposed administrative overhead rates and an evaluation of the proposed administrative fees for the primary and subcontractor agreements is required. The panel recommends that State reserves the right to negotiate a reasonable administrative overhead rate and additional fee rates other than stated in the grant proposal.

The proposed grantee shall provide a description of qualifications and a short justification for contracting services for pre-selected subcontractors. The proposed grantee shall submit a detailed budget identifying labor rates and indirect costs of the proposed subcontractors.

Please provide a brief explanation of your rating, including an explanation of the reasons for any conditions that the panel recommends. Revisions required of proposals recommended for reconsideration should be outlined, together with a justification for the suggested revisions:

The Selection Panel agrees with the Technical Panel and the Regional Panel that this is important work described well in the proposal. The Selection Panel agrees with the Technical Panel that the new genetics testing method (QTL) does not need to be funded. The Panel recommends funding without this task.

Technical Panel (Primary) Review

above average

Explanation Of Summary Rating

Overall, the external reviewers provided strong support for the monitoring efforts. The monitoring is very important work, and the project team is very well suited to do this work. The technical review panel felt that the clapper rail monitoring is necessary, but not responsive to this grant solicitation (i.e. does not investigate restoration outcomes). The QTL work is worth-while from a long-term point of view. It is not needed under the current goal of eradicating all hybrids, if the eradication is indeed achieved within the next five years. But in case it is not (and this may well be the case seeing the collective success in eradicating introduced species), it may provide an important tool down the road.

Review Form

Goals And Justification

The project's goals are clearly identified. The goal of eradicating the non-native *Spartina* and hybrids is a very important one. The monitoring of non-native *Spartina* is well justified and is a very important tool for guiding the control program and determining the success of the eradication program. The monitoring of the clapper rail at sites slated for treatment is important, though more of a pre-treatment necessity (i.e. part of the restoration itself) rather than being focused on monitoring restoration impacts and outcomes. This may be a consequence of lack of planning for the initial restoration efforts. It appears that monitoring the effects of the non-native *Spartina* eradication on clapper rail is not included in this proposal. The justification for the QTL work is a bit less obvious. The researchers currently successfully use different molecular genetic approaches (RAPDs – Random Amplified Polymorphic DNA markers and chloroplast DNA sequences) to identify hybrid plants (while some hybrids can be identified on the basis of their physical appearance alone). RAPDs have their limitations, but are well suited for this task. Since the goal of the control program is to eradicate all non-native species and hybrids by 2008, there is less of a need to identify the most invasive genotypes among the hybrids (assuming it can be done and the method worked out before 2008). Also, getting rid of the worst genotypes would not help as long as the source populations (the native and exotic *Spartina*) are still present in the Bay. However, there is some justification for developing a new genetic tool within this grant program. If the planned eradication within the next five years is not successful, than being able to distinguish between hybrids that are (genetically) very invasive and less-invasive genotypes would be

beneficial. The methodology developed may also transfer to other systems/invasive species.

Approach

The approach for monitoring *Spartina* in the new monitoring rounds is not well described in the proposal. Data from the 2001 monitoring effort are summarized, but results from 2003 and 2004 efforts are not yet available. And no evaluation of sampling errors / precision of estimates etc. were included. The authors do list (in the data handling section) their program design for the 2003 monitoring program, which seems appropriate. The authors indicate that they will be making improvements on the basis of the earlier monitoring experiences: “implementing some additional procedures to validate data and to measure the repeatability of, and hence the confidence in, field observations of non–native cordgrass” (and they expand on these modifications). Thus their accumulated expertise and experiences can be expected to result in an approach that meets their objectives. The approach for monitoring clapper rail is described and seems appropriate. The approach for the QTL work is described in detail. However, developing the QTLs is not yet a routine procedure; it is going to be a big effort and may not work out. Although this is a lofty goal, it may not pay off in the course of a 3–year study and the authors can (at this stage) only hypothesize that invasive hybrid individuals are characterized by a detectable, diagnostic marker profile. It is difficult to identify the characteristics that make an individual an effective invader. It may be a combination of characteristics (making it very difficult to tie it to particular genetic markers) and these characteristics may differ for different parts of the estuary. Also, markers identified in experimental field plots may not be those that predict invasiveness in the wild. And if QTL markers are identified after a long effort, there may be new invasive genotypes in the field by then. That said, while the pay–off is not guaranteed, there are long–term benefits if it works out.

Feasibility And Likelihood Of Success

The monitoring of non–native *Spartina* and hybrids and the monitoring of clapper rails are technically feasible and conducted at a scale consistent with the objectives. The development of QTLs for invasiveness in *Spartina* is feasible (the researchers have already done part of the preliminary work and are very qualified to do this) but it is not straightforward and requires an element of luck. The regional panel review and the environmental compliance review did not identify any local circumstances or issues that would impede the project.

Performance Measures

The *Spartina* monitoring is aimed at both documenting the extent of the non–native *Spartina* problem and to evaluate success of *Spartina* eradication projects. The clapper rail monitoring may be tied to restoration projects (other than being conducted to guide timing of treatments),

but that remains unclear. Both should be tied easily to assessing the performance of restoration actions. The project could (and should) have a more explicit evaluation of the effectiveness of aerial surveys (versus ground-surveys) and of visual identification of hybrids versus genetic identification of hybrids.

Products

The products of monitoring (Spartina and clapper rail data) will be of great value to resource managers and other decision makers. The researchers do an excellent job describing the products that have been made available in the past and those to be made available from this project. Emphasis should be placed on making sure that data and results get out to the public. Data handling, storage and dissemination methods seem to be very well thought out and seem more than adequate to allow others access to the results. The products of the QTL analyses will be of great interest to scientists, and potentially of use to resource managers and decision makers.

Capabilities

The project team is a definitely up to the task. As one reviewer stated: “they are the best qualified team to conduct the proposed research and monitoring”.

Budget

The budget seems reasonable and adequate, though somewhat hard to evaluate relative to lack of details on monitoring issues (# sampling sites etc.). There should not be a need for “fee remission” funds for the doctoral student who will be a postdoc by the start of the project. Though these funds may be necessary for the graduate research assistant to be hired.

Regional Review

The proposal received a very positive regional review. The regional review felt that this project will be particularly useful for new restoration projects. They felt that this program is extremely important for the long-term health of the Bay and would provide critical information for other restoration projects. The program has been a model for local involvement and working with the public. The data collected are expected to become an integral part of all intertidal restoration projects in San Francisco Bay, and to influence how such restoration efforts are carried out. The regional review panel gave it an overall ranking of “very high”.

Administrative Review

Prior-phase funding review did not indicate any problems and mentioned that the project's management is impeccable. Environmental compliance review only mentioned the need to provide copies of the letters of authorization from all public and private landowners for access to survey sites.

Additional Comments

The proposal had many typographical errors in it and was not well organized.

Technical Review Panel's Overall Evaluation Rating:
above average

Bay Regional Review

Very High

Review:

1. Applicability to ERP goals and regional priorities.

The project meets the PSP priorities as it seeks to eradicate all non-native invasive species of *Spartina* species and hybrids from the San Francisco Bay ecosystem and prevent their spreading to the outer coast, into the Delta, and into newly restored marshes. The most invasive species, *S. alterniflora*, invades mudflats, modifies the hydrology of a tidal marsh, and threatens the native biota. Because of the great potential for altering the bay ecosystem, in 2000 the California Coastal Conservancy established a San Francisco Estuary Invasive *Spartina* Eradication program, a strong program with multiple partnerships with land owners and other state and federal agencies. Funding from this proposal will continue the monitoring of non-native populations of *Spartina* including their rate of spread, the area covered, the effectiveness of treatment (400 acres were treated in 2004), and the recruitment of seedlings. In addition, there will be an important development of Invasive marker profiles for invasive hybrid genotypes carried out by scientist at U.C. Davis. and ongoing clapper rail monitoring to determine the presence of rails at sites scheduled for treatment. This monitoring program extends throughout the Bay and will be particularly useful for new restoration projects. Because of the concern about the invasiveness of *S. alterniflora*, the program manager is in contact with most if not all restoration projects in the Bay.

2. Links with other restoration actions.

Because many of the tidal marshes in the Central Bay have been invaded by *S. alterniflora*, this eradication and restoration project affects many projects around the Bay and is of concern to restorationists and scientists alike. Although the plant has not penetrated far into San Pablo Bay it does well in brackish water and could well extend its range up to the Suisun and Delta marshes. The native *Spartina* could very well become extinct through extensive hybridization with *S. alterniflora* and the Bay ecosystem including the biota seriously altered. All data for the project is stored at the Coastal Conservancy, is available to the public, and the program creates an annual report along with maps. The Quality Assurance and Quality Control practices for data collection follow guidelines provided by the U.S. EPA. The program has made excellent strides at mapping the extent of non-native *Spartina* and has begun its eradication program on 350 acres in 2004. Work on identifying the most invasive hybrids has also been underway. This program is extremely important for the long-term health of the Bay. Peggy Olafson, the project director is estimating that all invasive *Spartina* will be eliminated within 4 or 5 years and a maintenance program will be developed at that

point. The information will be critical for restoration projects in the bay and strategies are being developed to disallow seedling establishment in new project areas.

3. Local Circumstances.

This project is important to the SF Bay Estuary's health. In 2001 there were 470 acres of *S. alterniflora* and by 2003 the acreage had quadrupled. This program has a three year cordgrass inventory and one year treatment for 350 acres. All permits are now complete and the most successful treatment method is now permitted for the SF Bay marshes. The program has been careful about permits and permissions and I believe they are all up to date. Corte Madera Creek where *S. densiflora* grows has many private land owners and presents more challenge for landowner cooperation but the project is moving forward.

4. Local involvement.

this project is a model for local involvement and working with the public. Several "Friends of .." groups are involved, public agencies are involved, restoration consultants are involved. It is a Bay wide project; however the data is kept in the Conservancy office and is available to the public. . This year the group hosted the first International Invasive *Spartina* conference which was very well attended and attracted several foreign investigators. Because the project was formed by the Coastal Conservancy, it will persist until it is known how successful the control efforts will be. At this point a maintenance program will be developed. Because of the importance of the success of this project, I think it will be funded into the foreseeable future by state and private funds.

5. Local Value.

The data collected (mapping of the spread of non-native invasive cordgrass), the monitoring of clapper rail populations, and the scientific work that will identify the most invasive forms of hybrids will be an integral part of all restoration projects in San Francisco Bay. This information will influence how all restoration efforts are carried out. It will affect small local projects as well as help develop policies for the management of regional tidal wetlands.

6. Other comments:

Eradication efforts are being carried out in the state of Washington with some degree of success. It is more complicated here in SF Bay because of the presence of a native species of cordgrass and the endangered clapper rail. This effort is an all out effort with an unknown outcome however the stakes are so high (the loss of a native species and a major alteration of the Bay's wetlands and ecosystem) that everyone is optimistic it will be successful. The team is a very competent team.

Overall Ranking:
Very High

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

External Technical Review

Goals And Justification

This was a very difficult proposal to review. On the one hand, getting rid of invasive spartina in the SF Bay is extremely important for a wide variety of environmental reasons – they have done a good job of justifying this. Consequently, we don't want to do anything to stymie the flow of money to meet this environmental challenge. On the other hand, much of the specific work they suggest doing is either one, poorly justified, or two, seems unnecessary for the purposes of controlling spartina, in spite of the proposed work's intellectual merits, which are considerable. Consequently, I was left wondering whether the proposed work was the best way to meet the challenge of spartina invasions in the SF Bay.

There are 3 principal components of the proposed work: 1) spartina monitoring, 2) genetic work on spartina, and 3) clapper rail surveys. The justification for the last of these efforts, i.e. for clapper rail surveys, seems well justified, but represents a tiny fraction of the total cost of this proposal. The justification for the first part of the proposal, i.e. for spartina monitoring, seems justified, but the approach is not adequately discussed (which I address in the next section on "Approaches"). The second component of the work, the genetic work, is the area of the grant that is most poorly justified. I detail the reasons for this below.

The proposed genetic work on invasive genotypes of spartina hybrids is really intellectually interesting. How fast can evolution operate? How quickly do particular genotypes or genetic traits spread through a population? How many distinct traits are needed for evolutionary hegemony? This is really great stuff. Further, understanding these sorts of processes as general phenomenon would undoubtedly be extremely useful in battling other invading species. All of this is clearly relevant to NSF or USDA funding. However, none of the proposed work really seems necessary or adequately justified for the specific purposes of eradicating spartina and spartina hybrids from SF Bay. There are several reasons for this.

First, as they have already stated, the existing genetic techniques that they have already developed are adequate for determining whether a species is a hybrid or not. These techniques, together with other methods of detection, should be adequate for identifying hybrid individuals. For example, some percentage of hybrids can be detected by their physical appearance alone – these individuals should be removed. Some percentage of hybrids can be detected by where they are growing, for instance any plant growing in areas that were previously mudflats are clearly the invading species or one of its hybrids – these species should be removed. That still leaves some percentage of hybrids with cryptic phenotypes growing in amongst the native species that are difficult to identify. For those individuals they have the existing genetic techniques. Since the plan is to eradicate all alien individuals and all hybrid individuals, and since they envision doing this by 2008, I'm not

sure what advantage knowing specific things about all the individuals that you plan to kill anyway could conceivably provide to the eradication process per se – despite the intellectual merits of knowing the questions and others outlined above.

Second, identifying the specific characteristics that make an individual (or population or species) an effective invader are notoriously difficult to do. It is not at all clear that they will be able to match particular gene markers with the full range of characteristics (and worse the combination of characteristics) that may make an individual successful. This is true for several reasons. A), what makes a particular individual successful may often be a complex set of characteristics and not any one characteristic, or even any two or three. Therefore, it could be a complex set of genetic characteristics that allow for success, which if true would be very difficult to detect by matching particular characteristics to particular markers. B), even if this could be done for a given genotype, this may very well only hold true for one set of conditions present in the marsh, i.e. the characteristics or combination of characteristics that allow for success in one place in the estuary may be very different than those that allow success in another part of the estuary; for example, individuals invading the high and low marsh may have very different genotypes.

Third, part of the premise for this work is that these highly invasive genotypes are demonstrating exponential population growth rates, which they suggest could be changed if we could get rid of the worst invading hybrid genotypes. This sort of logic is inherently flawed and I was a bit surprised to see it listed as a justification. In reality any genotype that can invade a previously unoccupied habitat (such as the previously unoccupied mudflats) will show exponential growth rates! It doesn't matter if the individuals in question produce 10 or 1000 seeds per generation, or whether they grow vegetatively at 1 inch or 1 meter per generation – in either case populations would grow exponentially. This is just the way populations grow when taking advantage of previously unoccupied resources. This doesn't mean that the rates would not be different, but just instead that either way the rates would be very fast and available habitats should be colonized and occupied within just a few years once the period of rapid population expansion had begun.

Fourth, there seems to be a fundamental flaw to their reasoning. They suggest that getting rid of the worst genotypes would be helpful. However, the bottom line is that as long as both parent populations to these hybrid species are present, i.e. as long as both the native and exotic spartina are present in the bay, then the genetic material or variation needed to generate these “worst” invader genotypes will still exist and we can expect these genotypes to arise again and again. The only long-term solution is to completely eradicate the alien species and its hybrids.

Approach

I restrict my comments here to discussing the approach to the monitoring per se, and not to the genetic work or the clapper rail surveys.

I had the distinct impression reading this proposal that the authors knew exactly what they wanted to do for the monitoring, including how many sites they would survey, how many acres that would involve, how long it would take to do a given number of sites, etc. Unfortunately, they never communicated any of these things in the proposal. Instead they focused on how surveys at particular sites would be surveyed, which they described adequately. As a consequence, I found it very difficult to know if their approach was adequate. This is complicated by the lack of analysis (at the time of submission) of the surveys conducted in 2004. The survey conducted in 2001 sounds like it was exhaustive, looking for all invading populations. Whereas, the survey conducted in 2003 and presumably in 2004 subsampled the bay to try and get an estimate of rates of change in invaded areas. This is certainly a reasonable thing to do. It is unclear, however, whether their subsampling approach was sufficient. They provide no documentation to suggest that it was or wasn't. Certainly, some sort of analyses were conducted to evaluate the margin of errors in their estimates. This wasn't discussed. This really left me wondering whether their monitoring approach was working, a situation that was only complicated by the lack of analysis for 2004. Worse, they don't tell the reader what the plan is for 2005. Are they planning another exhaustive survey of the bay or just another subsampling approach? They don't say.

All of this is complicated by the conflicting information they provide in the proposal. On the one hand, they suggest that based on changes in population size between 2001 and 2003 that the population had quadrupled in size. If this rate of population growth were to continue to the present time, then the 2000 acres estimated to exist in 2003 would now be 16,000 acres and by summer of 2005 occupy a truly large portion of the bay. On the other hand, they suggest that they expect to have near-eradication of the populations by 2008. How can this be given a consistent level of financial support to pay for control efforts. Either the population growth rate of the invasive spartina population has now dramatically slowed in which case there may be some hope of containing it, or the population is so large that it is now already beyond our control. Which of these two scenarios is most likely depends on the population growth rate in 2004 and the validity of their estimates from 2003. Given the information in the proposal it's just not clear which is most likely. As such, it is very difficult to assess with the given information whether the amount of money and time planned for this project is sufficient or not.

Technical Feasibility

Other than the concerns outlined above, which I believe are significant, I believe that the proposal is technically sound and consistent with the objectives.

Performance Measures

They plan to do a variety of analyses, for instance examining both aerial photos and ground truthing techniques. This should allow the inadequacies of any particular method to be detected. However, there doesn't seem to be adequate documentation of how the sum of their methods will be evaluated for success. However, given the great number of agencies, concerned citizens and academic researchers investigating this process, I believe that the relative success or failings of their work will quickly be communicated to the larger scientific community and to the public. As such, I think that this is not a concern for this proposal.

Products

The information they provide will be inherently useful, as all the information is designed to guide the procedures and efforts to eradicate the invasive and its hybrids. They do a wonderful job of describing the publicly assessable products they have previously created, as well as the ones they will create. I have no concerns at all about the products they will produce, with respect to their ability to handle and store the data, to produce useful products, or to disseminate them. Further, the scientific merits of the questions proposed (and the high quality results they are likely to produce) for the genetic research really are intriguing and would be useful in propelling the fields of evolution and invasion biology along in a very positive direction; they would definitely stand up to the peer-review process.

Capabilities

This is a top-notch team! The individuals involved are widely known and respected. They are more than up to the challenges proposed in the proposal. They have a great track record and I'm sure will complete the projects they have proposed to do.

Budget

Once again, this is a tough question. I don't know if the monitoring funds are adequate for two reasons, I don't know how many sites they plan to survey, nor if the number they plan to survey are sufficient. It could be that they need much more or much less money for the survey. With respect to the genetic work, the budget looks reasonable and adequate. The same can be said of the bird surveys.

Additional Comments

I think this proposal should be funded if the reviewers can meet the principal concerns I've outlined. I suppose some sort of rapid resubmission process would be appropriate if possible. We certainly don't want to cut-off funding to this critical project. I feel particularly strongly about this with regards to the monitoring. With regards to the genetic work, however, I'm really not sure if this is the type of work that is critical to the proximate goal of controlling spartina, although I am convinced that it will be extremely valuable work in understanding invasions and evolution more generally.

External Technical Review

Goals And Justification

The goal of the proposed research, to 'preserve and restore native habitat' to the San Francisco Bay and surrounding areas by eradicating non-native *Spartina* and hybrids is of utmost importance and was well justified by the authors. The conceptual model (figure 2) was difficult to follow, as this proposal represents only a piece of a larger effort. For example, on p.4, authors state that the ISP proposes to remove 100% of *Spartina* at known hybrid-invasion sites, and it is not clear how this activity fits in to the proposal. Three other goals are clear: monitor non-native and hybrid *Spartina* invasion/expansion, develop invasive marker profiles, and monitor Clapper rail populations.

Approach

Tasks 1 &3 (or 2 &4?), that is, monitoring *Spartina* invasion/expansion and Clapper rail monitoring are in my view justified uses of conservation dollars. "Task 3", the development of an invasive marker profile (IMP) is not as well justified. Authors intend to remove 100% of *Spartina* at known invasion sites (p. 4). Authors should therefore explicitly quantify the cost of (1) further monitoring post-eradication, (2) using RAPDs to identify hybrids—both new invaders (post-eradication) and those outside the eradication zone, and (3) removal of genetically identified (RAPD) hybrids, and compare this cost to the cost and risks of developing IMPs. The development of quantitative trait marker technology is still in its early stages, so its application to a conservation problem is exciting, but it is also risky. At this stage authors are only capable of hypothesizing, rather than demonstrating, that invasive hybrid individuals are characterized by a detectable, diagnostic marker profile. The probability that they will NOT is in my view too high to risk conservation money, unless it can be demonstrated (1) that the alternative (post-eradication monitoring and removal using RAPDs) exceeds the costs of developing IMPs, and (2) a reasonably high probability of success using IMPs, i.e. some level of validation of the technique. How many loci are expected? What is a "majority" (p. 14)? What is the relative importance of each phenotype with respect to fitness? Do markers identified in experimental analyses prove true in the field? QTL studies are statistical by nature—there is always a probability that invasive hybrids in the wild will exhibit less than a majority of identified markers, and at this point researchers are not in a position to estimate this probability and the effect this may have on further invasion. Lastly, the project may be a Red Queen: by the time markers are identified (and this takes a significant amount of time and effort!), even if they are reliable (still unvalidated), new invasive genotypes may have arisen in the field.

Technical Feasibility

Monitoring, identification by RAPDs, and Clapper rail monitoring all seem feasible and well within the scope of the ISP. Researchers at UC Davis appear well equipped to develop QTL markers; however, as stated above, the utility of these markers for identifying invasive individuals in the wild is still unclear and the money may be better spent on more predictable efforts.

Performance Measures

Performance measures appear detailed and strong.

Products

The products of monitoring, genetic identification, and Clapper rail monitoring are critical to the conservation effort and will provide vital information for resource managers, other decision makers, and scientists. The products of the QTL analysis will be of great interest to scientists, but its importance to resource managers and other decision makers is as yet unknown.

Capabilities

The project team seems well qualified.

Budget

The budget appears reasonable and adequate.

Additional Comments

The proposal was filled with typographical and grammatical errors, and was poorly organized. A reviewer should not have to rely on an unknown companion proposal to make sense of the overall framework.

External Technical Review

Goals And Justification

Among other things, the proposal will monitor the success of previous efforts to remove hybrid and non-native *Spartina* plants from 400+ acres of marsh and upcoming efforts to remove these invasive forms from over 2000 acres of marsh. The importance of the restoration activity and subsequent monitoring is abundantly clear. Invasive *Spartina* species and their hybrids with the native *Spartina* threaten to 1) replace the native *Spartina* species, 2) alter the hydrological, carbon, and nutrient cycling of *Spartina* marshes, and 3) invade other habitats, changing the ecological functioning of the invaded habitats. Project applicants correctly argue that halting the spread of non-native and hybrid *Spartina* requires 1) accurate identification of hybrids in the wild and 2) effective monitoring of previously treated sites to determine whether *Spartina* eradication efforts were successful.

The applicants also request funding to survey for Clapper Rails. This monitoring is necessary to determine whether Clapper Rails are present prior to hybrid-*Spartina* survey and eradication efforts. It will probably also provide information about degree to which invaded marshes support Clapper Rail reproduction; but this benefit is not specifically discussed. However, this is pre-treatment monitoring to determine whether treatment is permissible (timing of treatment is adjusted if Clapper Rails are present) or necessary (if non-native *Spartina* genotypes are not detected, treatment will not occur). The Clapper Rail monitoring is part of the effort to determine the extent and rate of spread of hybrid *Spartina*. Thus, this kind of monitoring is actually part of the restoration (it occurs prior to treatment) not monitoring of the effect of restoration (which would occur after treatment). It is not directly responsive to the grant solicitation's effort to document the impacts of restoration activities conducted previously.

The applicants also request funding to develop new tools for identifying and studying the spread of invasive *Spartina*. The new tools (microsatellite DNA markers) and the new studies (Quantitative Trait Loci-QTL) will likely advance our ability to understand, monitor, and eradicate invasive *Spartina* in the future. But, these items are only tangentially related to the focus of the PSP as their products (like those of any primary research effort) are of uncertain value. Also, the project applicants claim that the molecular tools they currently have (RAPD's) are suitable for the task of identifying hybrids; so the justification for developing new tools, within the context of this PSP (targeted at monitoring and evaluation), is limited.

Approach

The activities described in this proposal are all quite important. While the applicants already

have the tools to identify hybrids (RAPDs), the new suite of microsat markers they plan to develop will allow analyses that cannot be performed using the RAPD markers. The Quantitative Trait Loci analyses may vastly enhance our understanding of the forces that promote the spread of the hybrid swarm. This could allow researchers and managers to identify and target at-risk marshes and to modify marsh restoration efforts so as to limit the success of hybrid *Spartina*. Also, the QTL analyses may highlight additional field markers that will increase the efficacy of identification and eradication techniques.

The QTL analysis holds the promise of bridging the gap between hybrid identification and the ecological processes that promote hybrid evolution and spread. But, it is essentially primary research. Whereas it could produce advances in monitoring and control of hybrids, this task is not directly relevant to the goals of this grant solicitation — to monitor the impact of previous restoration efforts.

Importantly, there are tasks identified in this proposal's "adaptive management model" (Figure 2 page 5) that ARE directly responsive to this PSP but that are not included in this proposal (i.e. they are not highlighted in yellow in this figure). These are: "evaluate treatment efficacy, "evaluate positive and negative effects on Clapper Rail populations".

Technical Feasibility

There are three parts to this proposal:

- 1) post-restoration monitoring. The applicants are clearly capable of performing this task.
- 2) pre-treatment monitoring. This includes field identification of hybrids, molecular id of hybrids (using RAPDs), and pre-treatment surveys for Clapper Rail. The applicants are obviously capable of performing these tasks.
- 3) Development of new tools for monitoring and analyzing the evolution and spread of hybrids. The project applicants are highly skilled researchers. They have documented their approach well. They are well-positioned to begin their QTL analysis (they already have >120 microsat markers). But, QTL analyses are inherently risky. They require a great deal of skill (which the applicants have) and certain amount of luck. It is therefore unclear what kind of results will actually be produced.

Performance Measures

The applicants currently rely on a mix of techniques to identify hybrid/invasive *Spartina* genotypes. These are: 1) field id using morphological cues, 2) aerial surveys, 3) molecular analyses using RAPD markers. Of these, the last has the greatest diagnostic ability but it is

also the most expensive and tedious. Also, the authors are clearly aware of this methods' limitations for anything other than hybrid identification (hence, their request for funding to develop the more useful microsatellite markers).

The authors mention the idea of evaluating the accuracy of field marks and aerial identification. But, I would like to see more explicit tests. The authors seem convinced that they can successfully id certain hybrid phenotypes and that they need the molecular tools only for identification of cryptic hybrids. I think the authors should genotype all the *Spartina* that they sample to determine the accuracy of the morphological marks. Very often, studies of hybrid swarms discover heretofore unnoticed morphological variants and identify them as hybrids. This results in 1) wasted effort eradicating "wierd looking" natives and 2) artificial selection against "deviant" native genotypes. Given that we are dealing with novel genotypes (the hybrids) and potential ecophenotypic responses to novel environments (non-natives in novel habitats), it is important to clearly identify the full range of native phenotypes. Similarly, I would like to see an explicit evaluation of the effectiveness of aerial surveys, as compared to ground-truthing (field marks), as compared to molecular markers. Again, these comparisons should be done for plants/patches identified as non-native genotypes AND plants/patches identified as natives.

The researchers seem to subsample their field collections from transect surveys (page 11 paragraph 3) for molecular identification. It is not clear why they do this. I suspect that it is because the molecular techniques are expensive and time-consuming. The subsampling may also be seen as a nod to statistical conventions; but, complete eradication of hybrid genotypes is not a question for statistical orthodoxy -- either the hybrids have been completely identified and eliminated or they have not. The authors argue that the hybrid genotypes may be ecologically superior to natives. If this is the case, nothing will substitute for complete eradication. Thus, I recommend molecular screening of all samples from their field transects.

Products

This team will almost certainly produce valuable monitoring and research products from all parts of this proposal. The QTL effort is speculative but will probably produce at least some useful results and may produce really critical insights into hybrid swarm formation, spread, and evolution. It is just not clear whether developmenet of new tools for future monitoring is relevant to a PSP that seeks to fund monitoring and evaluation of previous restoration efforts. Similarly, the Clapper Rail monitoring will produce valuable results but, as it is "monitoring" that occurs prior to restoration treatments, it is not clearly responsive to the goals of this PSP. The small part of the budget dedicated to evaluating the effectiveness of *Spartina* treatments is clearly necessary and will produce valuable results.

Capabilities

This team is not only highly qualified, they are the best qualified team to conduct the proposed research and monitoring.

Budget

The budget is reasonable. The QTL analysis seems very inexpensive given the typical costs of such projects. This may be because the authors have already identified so many microsat markers.

The only question I have about this part of the budget is the \$9270/year for fee remission to UC Davis for Christina Sloop. If “Ms. Sloop” will be “Dr. Sloop” by the time this project is funded (as applicants contend), and she will be employed as a post–doctoral researcher, are there fees to be remitted? This sounds like an expense for a graduate student who must still register for courses etc.

Additional Comments

External Technical Review

Goals And Justification

The goals are straight forward and clear. These are to monitor for non–native *Spartina* grass in SF Bay and outer marshes, including sites where there have been control efforts. The monitoring will include measuring the rate of spread, area covered, seedling recruitment, hybrid genotype identification, and monitoring of clapper rails (presence or absence). Project scientists will test the hypothesis that removal of plants with invasive marker profiles will reduce the invasion rate. This has practical value and is scientifically interesting.

Approach

Regional surveys will be conducted annually. Genetic markers will be developed to screen for non–native species. The goal of developing markers of plants with ‘invasive profiles’ is particularly intriguing. This is a lofty goal and may not be possible in the course of a 3–yr study, but the effort should be encouraged.

Technical Feasibility

Previous work by this group, which has been highly successful, supports the technical feasibility of this project. The team appears to be well on the way toward developing genetic markers for aggressive invaders, having identified a number of competitive traits that are under genetic control (self–compatibility, height, high salt tolerance, etc.). Genetic screening is probably the only way to identify cryptic hybrids. A monitoring effort for *Spartina* populations would be accomplished on the ground (by foot survey, high tide boat surveys), and from the air. Data would be mapped into a GIS.

Performance Measures

Monitoring efforts will be evaluated by internal and external peer review. Results will be made available on a public web site.

Products

The project will include data on the rate of spread and extent of non–native *Spartina* populations, effectiveness of control strategies, clapper rail presence at control sites, and genetic markers for identification. There are products that will be of great value to resource managers. The QAQC protocols and data archival methods are impressive. The team will produce annual reports that are distributed in hardcopy and electronically.

Capabilities

The project team is very capable of this work.

Budget

The budget fits the scope of work.

Additional Comments

I would expect products of the highest quality from this capable team.

Budget Review

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

No.

If no, please explain:

There are very broad categories identified in the table. It's hard to evaluate such broad categories.

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

No.

If no, please explain:

Task and Deliverables – Grantee must provide detailed information for all work including subcontractor work for each specific task, services, and work to be performed with the appropriate and corresponding deliverable or end product for each task(s) and/or sub-task(s). Costs associated with each task and deliverable should be evaluated based on what is considered to be reasonable costs for performing similar services.

3. Are project management expenses appropriately budgeted?

No.

If no, please explain:

20 hrs/month doesn't seem like an adequate amount of time per month.

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

No.

If no, please explain:

No explanation of what is included in the indirect and overhead rates.

Budget Detail/Administrative Overhead Fees – Budget detail combines the labor rates with the direct overhead rate. The labor rate, benefits and indirect rate should be itemized in the format provided by the PSP to enable reviewers to better evaluate and ensure that proposed labor rates are comparable to state rates.

If proposal is funded, a detailed list of items included in the indirect cost rate should be provided by the grantee. Grantee must provide itemized and detailed information included and charged as part of Indirect Rates (IDC) charges.

Note: No overhead or indirect rate charges on the equipment purchases should be allowed as part of the budget that shall be funded as a result of this PSP.

Subcontracting – Proposals for work to be performed by subcontractors or other entities in excess of the 25% of the total project dollars the grantee is required to provide a justification for subcontracting services. If subcontractors are pre-selected and identified in the proposals as part of the project team, the grantee should provide a justification on how each subcontractor was selected. Grantee shall identify labor rates and indirect costs rates paid to each identified subcontractor to ensure that labor rates are comparable to State rates.

The Subcontracted work should be identified with a rate and hours and attributed to each task and deliverable for each year. A performance evaluation is also recommended for subcontractors that receive more than 50% of the grant funds. If the subcontractor has not been identified, a position description complete with education level, experience, and abilities be submitted and the rate and hour associated with that position will be attributed to a task, and deliverable. The grantee must also comply with the State competitive bidding process as stated in the PSP.

The Grantee should charge a reduced indirect cost rate to the state for services that will be subcontracted by the grantee. (Researching SCM Section 3.06 B).

5. Does the budget justification adequately explain major expenses? Are the labor rates and other charges proposed reasonable in relation to current state rates?

No.

If no, please explain:

Is a Program Director with a salary of \$108,000/yr necessary to the goals of the project and the work being performed?

Major Expenses – If the grantee is awarded a detailed list of equipment purchases should be

provided by the grantee so reviewers can better evaluate whether it is more cost effective for the state to purchase large dollar equipment items through the state procurement process. If the equipment list is available within the State inventory or stock, then purchase of some or all of the listed items may be provided, loaned, or leased by the state to the grantee. In the event, that the equipment is purchased by the grantee, the grantee shall maintain an inventory of major equipment for auditing purposes and potential use for future projects. Grantee shall follow State Contracting Manual [SCM] Section 7.61 thru 7.62 rules pertinent to equipment purchase, lease, etc.

6. Are other agencies contributing or likely to contribute a share of the projects costs?
Yes.

If yes, when sufficient information is available, please sum the amount of matching funds likely to be provided:

Wildlife Conservation Board \$3 million over three years.

Cost Sharing – Grantee shall provide information regarding its financial capability and stability as well as it’s level of commitment for any proposed cost share funds. A detailed budget of the project’s proposed cost share funds should be provided prior to grant funds being awarded. A financial evaluation is recommended for grant agreements that state/claim over 30 % or \$250,000 (which ever is less) of matching funds. The evaluation will avoid likelihood of the grantee requesting an amendment to increase project funding due to lack of or miscalculation of matching funds to complete the project.

7. Does the applicant take exception to the standard grant agreement's terms and conditions? If yes, are the approaches the applicant proposes to address these issues a reasonable starting point for negotiating a grant agreement?
Yes.

If no, please explain:

Stated acceptance of standard T's &C's.

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

If yes, please explain:

no

Other comments:

Environmental Compliance Review

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

YES– NO~~X~~

2. Is compliance with National Environmental Policy Act (NEPA) required for this project?

YES– NO~~X~~

3. Does this project qualify for an Exemption or Exclusion under CEQA and NEPA, respectively?

YES– NO– N/~~AX~~

Comments:

4. Did the applicant correctly identify if CEQA/NEPA compliance was required?

YES~~X~~ NO–

Comments:

5. Did the applicant correctly identify the correct CEQA/NEPA document required for the project?

YES– NO– N/~~AX~~

Comments:

6. Has the CEQA/NEPA document been completed?

YES– NO– N/~~AX~~

7. If the document has not been completed, did the applicant allot enough time to complete the document before the project start date?

YES– NO– N/~~AX~~

8. If the document has not been completed, did the applicant allot enough funds to complete it?

YES– NO– N/~~AX~~

Comments:

9. Did the applicant adequately identify other legal or regulatory compliance issues (Incidental Take permits, Scientific Collecting permits, etc.) that may affect the project?

YES– NO~~X~~ N/A–

Comments:

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

The California clapper rail surveys will need a Scientific Collecting Permit and an MOU from CDFG under Section 2081(a) of CESA.

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

YESX NO– Project is on public land/water or question is otherwise N/A–

Comments:

There are multiple landowners. Letters of written permission are not attached, but the applicant states: ". . . has obtained letters of authorization from all public and private landowners for access to survey sites. These letters are reviewed and updated annually." The applicant must provide copies of the letters of permission.

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

YES– NOX

Comments:

Prior-Phase Funding Review

Project Title	Introduced Spartina Eradication Project
CALFED Contract Management Agency	U.S. Fish and Wildlife Service
Amount Funded	\$250,000 + \$25,000
Date Awarded	2000/01/01
Project Number	ERP-99-F09

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

Yes.

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

Yes.

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

Yes.

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

Yes.

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

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

Other comments:

Prior-Phase Funding Review

Project Title	Invasive Spartina Project
CALFED Contract Management Agency	Department of Water Resources
Amount Funded	\$1,793,661
Date Awarded	2002/01/01
Lead Institution	California Coastal Conservancy
Project Number	4600001875

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

Yes.

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

Yes.

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

Yes.

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

Yes.

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

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

Other comments:

This project's management is impeccable. The only administrative issues arise from the complexity of these weed abatement actions' regulatory burden, which sometimes slows work schedules and led to an amendment for extension of time for the project. The Conservancy is working hard to address these impediments, which are due to others' regulatory knots, rather than any administrative ineptitude by the Conservancy.

