

Proposal Reviews

#63: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Environmental Science Associates

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: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

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 | - |
| In Part | X |
| With Conditions | - |
| Consider as Directed Action | - |
| Not Recommended | - |

Amount: **\$223050**

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

Task 1 should be funded.

Provide a brief explanation of your rating:

Funding is recommended for only Task 1 of this proposal's three components: (1) mapping, (2) edaphic and environmental issues associated with invasion and (3) an assessment of herbicide fate. Of the four external reviews it received two excellent ratings and two poor ratings. There is great variation in the rating among tasks. The technical panel recommends funding Task 1 the GIS mapping, but not Tasks 2 and 3. There is overall agreement that Task 3 is poorly described in the proposal and addresses a very difficult problem. The combination of these factors indicates to the Selection Panel that Task 3 should not be funded. Task 2 has some problems with the experimental design, which are described in detail by one reviewer, and there is such a high degree of concern regarding the proposed approach that the Selection Panel feels this is not suitable for funding.

Research and Restoration Technical Panel Review:

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

Proposal Number: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;

Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;

Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;

Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating |
|-----------------------------------|--|
| -Superior | For Task 1 only. Not recommended for tasks 2 and 3. |
| XAbove average | Some aspects of the proposed study are likely to produce immediately useful and applicable information, but the usefulness of other aspects is less clear. The work outlined in task 1 is likely to produce very valuable information about the current status of the L. latifolium invasion. The mapping effort in 1997 was based on mailed surveys and the recollections of botanists at a workshop and thus was not based on survey data. The GIS model will fill an immediate need for basic information. This aspect of the proposal is above average and should be funded. |
| -Adequate | Tasks 2 and 3 have flaws and should not be funded. The design of task two is not likely to produce a clear model of how L. latifolium invades and comes to dominate a marsh; it will not produce a clear picture of what factors combine to promote the invasion of L. latifolium or how marsh traits dynamically change once L. latifolium arrives. Finally, herbicide hazard assessment is a complex and difficult task. Its thematic relationship to the other goals of the proposal is not clear. More importantly, the authors do not provide a clear agenda for what exactly they want to accomplish nor how they plan to do it. |
| -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 proposal has three distinct goals: 1) to document the spatial extent and pattern of *Lepidium latifolium* invasion in the Bay-Delta region. 2) to test how dense monocultures of *L. latifolium* form and exclude natives. 3) to describe the non-target effects of herbicides used for *L. latifolium* control. Task 1 of the proposal is strongly justified as previous mapping efforts were not based on field suveys. Task 2 of the proposal is also generally well supported, although there are some conceptual difficulties due to the difficulties in assessing the relative contribution of factors, or discriminating proximate from ultimate causes. The panel liked the greenhouse-field linkage. Task 3 is inadequately supported.

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?

Task 1 is well designed and the methods proposed are likely to produce useful and interpretable results. The correlation of *L. latifolium* presence with pertinent environmental variables is likely to produce insightful clues as to the key factors that regulate *L. latifolium* invasion dynamics in the Bay-Delta. Task 2, while technically feasible, has several design ambiguities that could cloud the interpretation of the results. The authors do not provide specific information about the design of task 3 to accurately assess the approach.

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 most useful product to emerge from the proposed study will be an up to date GIS system containing the current distribution and habitat associations of *L. latifolium*. This information will be immediately useful in designing management policies and focusing control efforts. It will also likely form a valuable framework with which to build a long-term system for monitoring the *L. latifolium* invasion.

There are problems with tasks 2 and 3 that make their value questionable.

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

The budget itemized for tasks 1-2 is reasonable and adequate for the proposed work. It is difficult to evaluate whether the \$64,800 requested for task three is appropriate given the lack of detail provided.

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 Bay Regional Review ranked this proposal Low. They thought that most of the distribution data was known, and favored NIS projects that are comprehensive rather than isolated.

The Delta panel ranked the proposal Medium. They thought it addressed Priority 5 issues well (mapping), as well as Priority 6 (restoring habitats). The project adequately involves local people.

The San Joaquin Panel ranked the proposal Low as this is primarily a Bay-Delta problem.

The Sacramento Regional Review also ranked this Low as the proposal will not provide new information about management of the species.

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

No concerns

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Overall Ranking: ☒Low ☐Medium ☐High

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

much of the distribution information is already known and the regional panel favors NIS controls that are part of comprehensive, coordinated programs targeted at key threats rather than isolated NIS projects

1. Is the project feasible based on local constraints?

☒Yes ☐No

How?

yes and no - proposal states complete inventory of distribution would not be accomplished, need more information on what areas will be mapped (using GPS and GIS) - has DFG/SF State coordination/support - field site for experiment not definite

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

☒Yes ☐No

How?

- addresses Bay region goal # 3 (Implement actions to control NIS)

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

☒Yes ☐No

How?

yes and no

- complements other research (spartina alterniflora) and fate of herbicide study will assist others - will share information with land owners, agencies through website

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

XYes -No

How?

yes and no

- states there will be outreach/education to agencies, local govt. conservation NGOs and citizens, doesn't say how - SF State and CDFG involved

Other Comments:

proposal not complete, not enough information

Delta Regional Review:

Proposal Number: 63

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Overall Ranking: -Low **XMedium** -High

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

Generally addresses Priority 5 issues well. Can improve on coordination with key Agencies.

1. Is the project feasible based on local constraints?

XYes -No

How?

It is generally research-based. Will require access to public or private property for field surveys. Plots for field experiments will be on DFG-owned lands.

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

XYes -No

How?

Addresses Priority 5 issues well. Contributes to knowledge of distribution of perennial pepperweed w/ GIS mapping; will research mechanisms of invasion and effectiveness of chemical treatment; includes education and outreach to the public, agencies, land managers on perennial pepperweed . Also will contribute to prior 6 (restoring habitats while minimizing potential adverse effects of contaminants) in evaluating fate of herbicides to control pepperweed and potential impact on aquatic biota.

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?

DFG involvement; applicant appears informed of related efforts such as other invasive species mapping and CALFED arundo project; needsto engage DFA who has an invasive species program and FWS; includes education and outreach to the public, agencies, land managers on perennial pepperweed issues.

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

XYes -No

How?

DFG involvement; contact with Grizzly Island reserve manager (potential site experiment location); Also includes education and outreach to the public, agencies, land managers on perennial pepperweed .

Other Comments:

DWR is planning Delta-wide infrared aerial surveys for spring/summer 02 that might aid this type of survey effort. Well-rounded proposal to address perennial pepperweed issues. Agree with statement in proposal that it will be important to find a public-sector repository for the resultant data, especially GIS layers

San Joaquin Regional Review:

Proposal Number: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Overall Ranking: ☒Low ☐Medium ☐High

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

This was viewed as primarily a Bay-Delta related project. Not a known problem in the SJ Valley at present.

1. Is the project feasible based on local constraints?

☒Yes ☐No

How?

Team of qualified researchers for each aspect. Still needs access permission for some sites.

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

☐Yes ☒No

How?

MR 1: mostly Bay-Delta Not a specific priority for SJ Valley

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

☐Yes ☒No

How?

Not really. As research this information will be valuable for many current and future projects.

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

☒Yes ☐No

How?

To the degree needed. Little public involvement needed for this research.

Other Comments:

Better viewed with the Bay-Delta package of proposals. May need ESA pesticide permitting.

Sacramento Regional Review:

Proposal Number: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

Overall Ranking: ☒Low ☐Medium ☐High

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

The study is research-oriented and is unlikely to provide significant new information of the management of this invasive species.

1. Is the project feasible based on local constraints?

☒Yes ☐No

How?

Tasks 2 and 3 appear feasible, but it is unclear whether the team has access to all of the Bay-Delta habitats they wish to survey for Task 1. Many of the wetlands such as Suisun Marsh are in private ownership, where permission would be needed to sample.

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

☒Yes ☐No

How?

PSP Priority 1 includes: Non-native invasive species surveys and studies. Conduct NIS research to provide mechanist understanding of NIS life histories, recruitment dynamics and responses to different restoration actions. Conduct NIS surveys to detect new populations and develop monitoring methodologies to monitor the spread of these species. As noted in the proposal, this project would address PSP priorities: MR-1, DR-5 and BR-3.

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

☒Yes ☐No

How?

Assuming that the team samples most of the Delta, they would undoubtedly cover many of the habitats of interest to ongoing and future restoration projects.

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

-Yes XNo

How?

The team includes SFSU and DFG, but links with local landowners (e.g. duck clubs) are unclear.

Other Comments:

Task 1 basically repeats the efforts of SFEI (1998). This update would be useful, but not necessarily novel.

Task 2 looks like exciting ecological research, but the Review Panel questioned whether it would be of much use for the control of this species. Several pieces of evidence in the proposal suggest that allelopathy is already presentthis will only confirm that finding in greater detail. The Team would be much more supportive of this task if the authors could provide evidence that previous studies of allelopathy on other plant species have led to effective control measures. Allelopathy has been well-studied in many systems, providing some basis for evaluation of the benefits of this research approach.

Task 3: The description of this task was very vague & inadequate, so it was difficult to evaluate the validity of the methods. The task is worthwhile, but the panel had no idea if the proponents have the skills or methods to successfully complete it.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **63**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS**

Conflict of Interest Statements:

I have no financial interest in this proposal.

XCorrect

-Incorrect

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

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating |
|-----------------------------------|---|
| -Excellent | The proposed research is sound, necessary, and targetted to Calfed research goals. I would strongly recommend the surveying and mapping be funded. |
| X Good | |
| -Poor | |

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

This proposal has 3 goals, to map the distribution and habitat associates of a noxious invading weed, *Lepidium latifolium*; to determine impediments to restoration after successful pepperweed removal; and to track the fate of herbicides used to kill the plant. Each of these goals is internally consistent, but doesn't have strong linkages to the other objectives. Mapping and restoration impediments of invading plants are both important and timely questions. Calfed has listed NIS mapping and post-control restoration as research goals.

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

A conceptual model is not presented, but four tasks are discussed to investigate how pepperweed modifies the soil environment, even after it has been killed, to the detriment of native species and restoration efforts. Unclear why Grindelia was chosen as the "native" species of interest. Also, the results from petri-plate experiments that attempt to demonstrate allelopathy are usually highly suspect eg. was the concentration of leachate similar to what would be experienced in the field at the time of year the seeds typically germinate? The surveying portion of the grant is justified as the previous mapping was based on the recollections of weed botanists gathered around a map of the Bay, and therefore shouldn't be considered to be a thorough estimate of Lepidium distribution.

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?

They propose to employ GIS mapping which will not only document current distribution, but can be used into the future to track the invasion. Their proposed research on pepperweed effects on germination and establishment of a native species combines petri-plate, greenhouse, and field manipulations to get at a mechanistic understanding of pepperweed effects which can be used in formulated a successful restoration strategy. There is not enough information on herbicide tracking methodology to judge whether the approach is sound.

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 first 2 goals are quite feasible, the third goal, an assessment of herbicide hazard, seems underbudgeted (\$65K) for the level of information (determine the environmental fate and potential non-target impacts) they hope to obtain

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?

A detailed table is provided that sets a realistic schedule for meeting key milestones.

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 products will be very valuable for future tracking and mitigation of the effects of this noxious plant.

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 credentials of the research team are excellent for the vegetation analysis and plant ecology portions of the research, but the background of Kelly Runyen and Eloise Anderson, GIS specialist and technician, respectively, are not provided, so I cannot judge the capabilities of the team to conduct the GIS portion of the research. SF State will supply lab and greenhouse space.

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

The budget is reasonable for tasks 1 and 2, but details are too sketchy for the herbicide work to substantiate the \$65K requested.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **63**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS**

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 |
|-----------------------------------|--|
| X Excellent | The applicants do a good job describing why pepperweed is a problem in the estuary and develop well-thought out experiments for improving the state of knowledge of pepperweed. |
| -Good | |
| -Poor | |

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

The goal of this study is to improve the state knowledge on pepperweed dynamics in the estuary. I think the applicants do an excellent job of outlining objectives and hypotheses for accomplishing this goal.

This concept is timely and important given CALFED's efforts to restore wetlands in the estuary.

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 study is justified because of the potential of pepperweed to become established throughout the estuary. Since pepperweed is an introduced species, it may hamper the ecology and affect mechanisms of native species in the estuary. In addition, because CALFED is spending a substantial amount of money on restoration effort, the need to understand the distribution and ecology of this plant may provide valuable insight into how ecosystems can be restored in the estuary.

The applicants do a good job of articulating the problem with pepperweed in the estuary and justifying the need to understand regulating factors so effective management and restoration actions can be implemented

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 study approach is straight-forward. The greenhouse and field experiments seemed to be well-thought out and a very good way of generating proposed data. This information will add to the existing base of regional knowledge, as well as, to other systems invaded by pepperweed. This information will substantially improve the basis for restoration actions.

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?

Since not a lot of information was provided on the details of the experiments, it is difficult to assess if this study is feasible. The experiments do seem to be basic, but

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 performance measures listed are simply to meet milestones of the project, which is good enough for the scope of the project (i.e., it is not a restoration evaluation study).

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?

Expected products will be very valuable from this project. The product timeline is very reasonable. The only things missing as products, is the potential for this study to yield important peer-review information, as well as, presentations at conferences to inform interested stakeholders.

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 track record of all the applicants are excellent. I think this team is well-qualified to implement this project.

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

The budget appears to be very reasonable and adequate for the work proposed. The team might encounter funding issues if problems or delays arise during field or greenhouse experiments. Hopefully, the applicants have contingency plans if this occurs.

Miscellaneous comments:

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **63**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS**

Conflict of Interest Statements:

I have no financial interest in this proposal.

XCorrect

-Incorrect

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

None

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating |
|-----------------------------------|---|
| -Excellent | <p>Some aspects of the proposed study are likely to produce immediately useful and applicable information, but the usefulness of other aspects is less clear. I will decompose my overall poor grade by the three tasks outlined by the authors:</p> <p>The work outlined in task 1 is likely to produce very valuable information about the current status of the <i>L. latifolium</i> invasion. The GIS model will fill an immediate need for basic information. I would rate this aspect of the proposal as excellent.</p> |
| -Good | <p>Task two is likely to produce a static picture of how infested and un-infested stands differ in salinity, mycorrhizal makeup, and soil nutrient composition. This information is potentially useful for designing attempts to ameliorate the impact of <i>L. latifolium</i> and in designing marsh recovery plans. However, the design of task two is not likely to produce a clear model of how <i>L. latifolium</i> invades and comes to dominate a marsh; it will not produce a clear picture of what factors combine to promote the invasion of <i>L. latifolium</i> or how marsh traits dynamically change once <i>L. latifolium</i> arrives. The dynamic nature of changes might be inferred from the results of the study (particularly with the results of the litter removal and clipping experiments), but important ambiguities will still remain. Because of this, despite the interesting descriptive information that will be generated, I would rate this aspect of the study as poor. However, with some relatively small, although important, changes in experimental design the value of the study could be greatly increased.</p> |
| XPoor | <p>Finally, herbicide hazard assessment is a complex and difficult task. Its thematic relationship to the other goals of the proposal is not clear. More importantly, the authors do not provide a clear agenda for what exactly they want to accomplish nor how they plan to do it. Because of this, I cannot fairly comment on its scientific merit. Consequently, in the context of the overall proposal I must rate it poor.</p> |

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

The proposal has three distinct goals: 1) to document the spatial extent and pattern of *Lepidium latifolium* invasion in the Bay-Delta region. 2) to test how dense monocultures of *L. latifolium* form and exclude natives. 3) to describe the non-target effects of herbicides used for *L. latifolium* control.

Each of these goals has value in informing an overall management plan for *L. latifolium*. In my opinion, the first two goals are the most clearly developed, and they have the most immediate relevance to *L. latifolium* management efforts. It is critically important to have baseline information concerning the current abundance, distribution and habitat associations of *L. latifolium* in the Bay-Delta region. Also, understanding the mechanisms by which *L. latifolium* excludes native species has immediate management applications. Although control of *L. latifolium* would probably be enhanced by the use of approved herbicides, describing the eco-toxicological impacts of herbicides is a large and complex

question. As I comment on in more detail below, the authors do not outline the specific hypotheses they plan to test regarding the non-target impact of herbicides. As a consequence their exact goal is vague, and the immediate relevance to current *L. latifolium* management decisions is not well supported.

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?

Task 1 of the proposal (distribution mapping of *L. latifolium* populations) is strongly justified. The authors point out that there is no up to date information on the extent and distribution of *L. latifolium* in the Bay-Delta region. This is a clear area where new information is immediately required. Not only is it important to know how the spatial extent and pattern of the invasion has changed since the 1998 SFEI report, but also more detailed information on how infestations relate to site conditions is needed. Which sites in the Bay-Delta region seem most at risk for *L. latifolium* invasion? How quickly is the invasion occurring? Do certain activities (e.g. restorations) seem to promote invasion? The mapping of *L. latifolium* populations and the correlation of infestation to environmental variables in a GIS system will likely provide first order answers to these immediate questions.

Task 2 of the proposal is also generally well supported, although there are some conceptual difficulties. The authors propose to explore the mechanisms that allow *L. latifolium* to exclude native vegetation and which prevent native vegetation from colonizing areas where *L. latifolium* has been recently controlled. The authors provide good background support for four potential mechanisms: 1) the thick thatch layer under established stands increases soil salinity or levels of allelopathic compounds. 2) reductions in soil mycorrhizal fungi densities under established *L. latifolium* inhibits colonization by natives. 3) the rapid vegetative growth of *L. latifolium* competitively shades natives. 4) *L. latifolium* alters patterns of soil nutrient cycling.

One conceptual problem with these hypotheses is that, as is the case in most of ecology, they are not mutually exclusive. For example, changes in soil salinity caused by rapid shoot growth and litter production may influence the levels of soil mycorrhizal fungi which in turn may influence the pattern of nutrient cycling under stands of *L. latifolium*. Disentangling the relative contribution of factors, or discriminating proximate from ultimate causes can be difficult. As I outline below the experimental design proposed by the authors is unlikely to allow such discrimination.

Task 3 is the least supported. The authors state that the most effective herbicides against *L. latifolium* are not registered for use in aquatic areas. The authors provide little background for why this ban is in place, for whether there is active consideration for lifting the ban, or for how their results will inform the decision. The authors fail to provide a conceptual model for how pesticide use might cause non-target effects. For example, will the authors test the acute toxicity of herbicide on aquatic fauna or longer term toxicological effects? From previous work, which is more likely to be a problem? What exactly do the authors mean by the "herbicide impacts to non-target plant species" or "environmental fate in surface water"?

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?

For clarity I will comment on the approach of each of the specific tasks outlined by the authors:

Task 1 This task is well designed and the methods proposed are likely to produce useful and interpretable results. The correlation of *L. latifolium* presence with pertinent environmental variables is likely to produce insightful clues as to the key factors that regulate *L. latifolium* invasion dynamics in the Bay-Delta. One concern, however, is that the proposed measured environmental variables might not include the most important factors. Interestingly, they do not include the factors that the authors propose to study in Task 2. For example, soil salinity or nutrient status could be major factors in determining resistance of a marsh to *L. latifolium* invasion, but these will not be measured by the authors. Nevertheless, the GIS framework which will be constructed should make it relatively easy to add or refine specific environmental measurements.

Task 2 This task has several design ambiguities that could cloud the interpretation of the results:

a) Although the authors propose to assess how *L. latifolium* alters marsh conditions, their experimental design does not directly test this. For example, in the field test of the effect of litter on soil salinity it is not clear that the *L. latifolium* and the control native plots originally had the same soil salinity before *L. latifolium* colonization. The authors do not indicate that the plots will be matched spatially or arranged along the same tidal height. Even if they were, any current differences in soil salinity could simply reflect the pre-existing conditions that favored *L. latifolium* invasion. Additional evidence provided by the litter leaching experiment (e.g. high concentrations of salt in the litter) could support a direct effect of *L. latifolium*, although these results would still need to be compared to the natural variation in soil salinity seen within the native marsh. Similarly, the authors do not explicitly test the effect of *L. latifolium* on soil mycorrhizal density. Any differences in soil mycorrhizae could have pre-existed the arrival of *L. latifolium*. The authors do not plan to categorize the range of mycorrhizal densities found in native areas so it will not be possible to assess whether any observed reductions under *L. latifolium* are unusual. The same criticism exists for the proposed comparison of soil nutrient status between infested and native plots. One possible way around this would be to monitor changes in soil salinity, mycorrhizal density, and soil nutrient status following the removal of *L. latifolium* or its litter, but the authors do not propose to do this.

Given this design it is likely to remain ambiguous whether any differences found between *L. latifolium* and native stands represent pre-existing conditions that favored *L. latifolium* invasion, the transforming properties of *L. latifolium*, or a combination of the two. Depending on the management question, the distinction may be trivial or critically important.

b) The authors propose to test the influence of *L. latifolium* vegetative growth and litter production on native plant growth in separate experiments. It seems likely that *L. latifolium* vegetative growth and litter production are closely related and have synergistic effects on native growth. The separate 1-factor and 2-factor designs will not allow a test of this potential interaction. Yet, it would be useful to know the relative effectiveness of control strategies. Is repeated mowing sufficient to favor natives, or must it be combined with removal of thatch?

c) In the influence of salinity on "germination and competition" experiment the use of a one-way ANOVA implies that *L. latifolium* and *Grindelia* will be grown either all in separate pots or all together. This is not a test of competitive interactions. In order to test for competitive interactions both species must be sown separately and together over the full range of tested salinities.

d) In the laboratory test of the influence of potential allelopathic compounds on seed germination the authors appropriately plan to use a solution that matches the salinity of litter leachate as a control for the leachate treatment. In the associated greenhouse experiment on "germination and competition", however, the authors simply state that distilled water will be used as a control. This confounds the effect of salinity with any effect of allelopathic compounds. Also, as in the salinity experiment, in order to test for competitive interactions both species have to be planted separately as well as together.

e) The design and underlying hypothesis for the greenhouse experiment testing the influence of soil nutrients on germination and growth of *L. latifolium* and *Grindelia* is unclear. The authors propose to use soil collected from natural stands. This soil presumably will differ in salinity and in mycorrhizal concentration between *L. latifolium* and native stands. These factors confound the interpretation of any responses observed in the different nutrient treatments. The growth responses of both species may reflect an interaction between salinity, mycorrhizae, and nutrients, but the experimental design will not be able to detect such interactions. Additionally, it is unclear what the authors mean by the "full nutrient treatment" and a "treatment with phosphorous or nitrogen as a limiting nutrient". Is this relative to the concentrations observed in *L. latifolium* soil, native soil, or some baseline? The authors propose a one-way ANOVA as a statistical test of responses. This implies that differences in the nutrient response of plants growing on the two soil types will not be tested. Is the principal hypothesis being tested that native plants perform worse on soil from *L. latifolium* dominated sites because of a difference in nutrient conditions compared to soil from native areas? To test this, the growth response of *Grindelia* to the nutrient treatment must be evaluated with respect to the soil it is growing on (soil treatment): a two factor ANOVA.

f) It is unclear why *Grindelia* was chosen as the native bioassay species over other native species such as *Scirpus*. This question is important in terms of the practical application of the results of the lab and greenhouse experiments to actual field conditions.

Task 3

The authors do not provide specific information about the design of this task to accurately assess the approach. As I discuss above in section two, the authors do not provide specific hypotheses, only vague topics to explore.

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?

For task 1 and task 2, the methodology outlined in the proposal is technically feasible given the schedule of the proposed work. The feasibility of task 3 is less clear. As I state above, not enough detailed information about actual methods or schedule is provided by the authors to accurately assess the feasibility of the proposed work. While certain specific questions such as the immediate toxicity of a herbicide can be accomplished within the year allotted for the work, many other questions that might fall under the broad outline provided by the authors would not.

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 authors outline specific performance measures and appropriate quantification for tasks 1-2, but not for task 3. For task 2, design limitations might make practical interpretation of the results difficult (see section 3).

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 most useful product to emerge from the proposed study will be an up to date GIS system containing the current distribution and habitat associations of *L. latifolium*. This information will be immediately useful in designing management policies and focusing control efforts. It will also likely form a valuable framework with which to build a long-term system for monitoring the *L. latifolium* invasion.

In addition, the authors propose to generate information on how *L. latifolium* alters site conditions and excludes natives once it is established. It is likely that some of the information that the study generates will be useful in understanding how currently infested sites differ from native dominated sites, and in restoring infested areas to native vegetation. However, as I outline in section 3, the methodology will not produce a clear understanding of how *L. latifolium* dynamically alters a site or how this contributes to the establishment and invasion of *L. latifolium*.

As I outline above, the authors do not provide enough information to evaluate what products are likely to be generated by the herbicide hazard assessment.

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 do not have direct knowledge of the track record of the authors with respect to previous projects. Tom Parker is a well known researcher in the field of plant ecology. He has a well established record of important peer-reviewed contributions in a number of areas pertinent to the current proposal.

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

The budget itemized for tasks 1-2 is reasonable and adequate for the proposed work. It is difficult to evaluate whether the \$64,800 requested for task three is appropriate given the lack of detail provided.

Miscellaneous comments:

The proposal contained many typographical errors, which in some cases made interpretation of statements difficult.

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **63**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS**

Conflict of Interest Statements:

I have no financial interest in this proposal.

XCorrect

-Incorrect

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

None

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

| Overall Evaluation Summary Rating | Provide a brief explanation of your summary rating |
|-----------------------------------|--|
| -Excellent | It was difficult to provide a summary rating because the three tasks are so different, and were described in different degrees of detail. There are some excellent portions, but overall the proposal needed more coherence and stronger justification. |
| -Good | |
| XPoor | |

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

The proposal lists three distinct goals: to document the distribution of pepperweed, to conduct experiments on pepperweed's ability to outcompete native marsh species, and to conduct ecotoxicological research on the fate of chemical herbicides. Each of these tasks could be done independently of one another. The goals are clearly stated and are of relevance to CalFed's priorities. Four hypotheses were described which focus on the specific mechanisms by which pepperweed modifies the soil in tidal habitats.

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?

Pepperweed is a common weed in the wetlands, and can outcompete native species. CalFed lists pepperweed as a priority for study and control. It rapidly colonizes bare or disturbed areas, so is of concern in recently restored areas.

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?

An inventory of introduced tidal marsh plants was completed in 1998. It is not clear how the proposed update of that mapping would be helpful. Would the proposed work be done at a different resolution, or would it inventory areas that were not included in previous work? For Task 2, the field and laboratory experiments are described clearly and the approach is reasonable. I would, however, defer to reviewers who have more specific experience in this field. Task 3 was difficult to evaluate, especially with terminology as "this may include topics such as This task is supposedly a continuation of ongoing efforts by CDFG, but no summary of previous work is given. Without specific direction or procedures on how this study would be conducted, I would not recommend funding this task.

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?

For tasks 1 and 2, the work is feasible within the proposed time frame. Task 1 assumes access will be granted to all sites. Task 3 was described too broadly to assess its feasibility.

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 would be assessed by meeting the proposed schedule. I find this an inadequate measure of success. At a minimum, some peer review of experimental protocol, statistical analysis and reports should be included.

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?

Information on how *L. Latifolium* alters site conditions would be useful to land managers. Because I don't know how inadequate the 1998 inventory was, I can't judge the usefulness of an updated inventory (Task 1). No scale of the GIS map was given, nor the resolution of the survey.

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?

It would have helped to judge capabilities by including a list of pertinent reports and publications. The qualification statements for the most part are too broad to be a basis for judgment.

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

There is considerable cost involved in Task 1, and without a clear need of why the inventory has to be updated, I don't think the cost is justified. Task 3 requests \$64,800 for a nebulous project, so again, based on the given information, this cost is not justified. The field and greenhouse experimentation costs seem reasonable to produce some useful information.

Miscellaneous comments:

Environmental Compliance:

Proposal Number: 63

Applicant Organization: Environmental Science Associates

Proposal Title: DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

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

-Yes **X**No

If no, please explain:

The methodology of pesticide use was unclear. The applicant may need approval from the County Agriculture Commission and consult with the RWQCB for the NPDES permit process. He should consult with CDFG, NMFS, and USFWS for any listed species that may be in the area where field work will be conducted.

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

-Yes **X**No

If no, please explain:

Money and time are not allocated for consultation or obtaining any permits that may be required.

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

XYes -No

If yes, please explain:

If the applicant obtains the proper permits,the project is feasible.

Other Comments:

Budget:**Proposal Number:** 63**Applicant Organization:** Environmental Science Associates**Proposal Title:** DISTRIBUTION AND ECOLOGY OF LEPIDIUM LATIFOLIUM IN BAY-DELTA WETLANDS

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

XYes -No

If no, please explain:

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

XYes -No

If no, please explain:

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

XYes -No

If no, please explain:

4. Are appropriate project management costs clearly identified?

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 ☒No

If yes, please explain:

Other Comments: