

PROPOSAL SOLICITATION PACKAGE (PSP)

SUBSIDENCE MITIGATION THROUGH RICE CULTIVATION



**Prepared by
The Department of Water Resources
Delta Suisun Marsh Office**

March 24, 2008

Introduction

For over 100 years, as the West Delta islands have been reclaimed and farmed, the land (which is primarily made up of peat) has been subsiding. In several places within the West Delta, land has subsided over 25 feet and is continuing to subside at rates of approximately 0.5 to 1 inch per year. As the land subsides, more and more hydraulic pressure is exerted on the levees increasing the risk for levee failure. Millions of dollars are spent every year on maintaining these levee systems to insure the islands are not lost by flooding waters. Nowhere is this protection more important than in the West Delta where islands are used to hold back salty water from the San Francisco Bay, San Pablo Bay, and Suisun Marsh from the relatively clean waters of the San Joaquin and Sacramento Rivers. This “Cork in the Bottle” ensures the quality of water that is paramount for not only human consumption, irrigation, and industrial uses but also the sustainability of many wildlife species within the Delta.

The Department of Water Resources (Department) has participated in studies that show decaying plant matter under certain conditions may not only eliminate the continued subsidence that is occurring, but also accrete plant mass and add land volume.

As part of the photosynthetic process, plants convert atmospheric carbon (CO₂) into plant mass, thus fixing carbon and reducing greenhouse gasses. The Department would like to develop project(s) to demonstrate the potential for subsidence reversal and its subsequent benefits.



Rice farming has the potential to provide the Delta ecosystem with the ability to stop and possibly reverse subsidence as well as store carbon as organic matter, while providing local human populations with a potential economic benefit through commercial aspects of farming and carbon credit trading. Generating quantifiable research results that connect rice cultivation with subsidence reversal is a central part of this effort.

However, as a result of the decay of plant matter and other land management activities associated with rice farming, there is a need to develop management practices that eliminate adverse water and air quality impacts. As a result, these land management activities must be analyzed to ensure water and air quality are not adversely impacted and overall potential risk must be considered before these practices are encouraged Delta-wide. An important part of this project will seek to quantify water quality, sediment, nutrient, pollutant loads and fluxes, with a special focus on methyl mercury. Best management practices that foster subsidence reduction and minimize adverse environmental impacts such as increased nutrient and pollutant exports from rice growing areas will be implemented and assessed.

1-Who May Apply

Local public agencies meeting the criteria as defined in California Water Code Section 12311(a) may apply for funds. Applications for funding will be accepted from reclamation districts meeting the aforementioned criteria. These reclamation districts are encouraged to associate with research entities that may include but are not limited to: academic institutions; federal, state, and local agencies; private consulting firms and entities that are qualified to complete the activities associated with this project. There is also a farming component to this project, which may require partnership with a grower that has rice farming experience.

The minimum size of the rice growing farm plot is 300 acres and the required average depth of peat underlying the study site is 7 feet. Please provide location details in the proposal that ensures these minimum criteria are met. Project proposals that do not meet the criteria identified in this section will not be considered for funding.

2- Potential Funding

There is no maximum funding amount stated for the proposals as the Department will consider all proposals and costs to complete the subject proposals and award funding to the successful applicant. However, the Department may have a limited funding amount available to provide for this research and thus will be funding only one proposal. While specific funding levels have not yet been set, project funding may be as much as \$8 million for this multi year effort.

It is the Department's intent to have one funding recipient for a multi-year project (up to 8 years). All reasonable and appropriate costs associated with research activities will be reimbursed, including but not limited to: on-island land improvements necessary for implementing the study, equipment purchase and rental necessary to perform both the research and test plot set-up as well as, test plot operations and maintenance (planting and growing activities), all time and materials needed for research, test plot set-up, and test plot operations and maintenance, all reasonable project management and project administration necessary to conduct the proposed study.

The Department reserves the right to review and approve all expenses and invoices associated with the proposed study to ensure costs and expenditures are reasonable and applicable to the research conducted. All work will be performed on a time and materials basis with a not to exceed amount provided in a Project Funding Agreement. Additionally, the Department reserves the right to limit or expand the scope of work and/or timeframes to ensure research elements are conducted in areas of interest consistent with the Department's needs. To that end, the Department will participate in the ongoing development of rice cultivation research. Ten percent of the research costs will be withheld until the submittal of a Final Report. A consideration of interim release of funds will be considered on an annual basis and are at the sole discretion of the Department depending upon progress shown during that fiscal year.

3-Proposals: Main Inclusion Points

The project design should evaluate the viability of growing rice as a source of income (cash crop) and as a way of reversing subsidence and sequestering carbon within the West Delta region. Assessing the environmental and economic benefits and costs for farm-scale rice cultivation in the West Delta region in order to meet subsidence reversal is the central goal of this project. Proposed work should be described under five main topics with clearly defined research questions and testable hypotheses:

1. rice cultivation/agroecology
2. subsidence reversal and soil carbon dynamics
3. water and air quality impacts/biogeochemistry
4. economy/socio-economic implications
5. management/research recommendations

Rice Cultivation/Agroecology: Existing and ecologically/economically appropriate cultivars, with the potential for native wetland rice and/or rice surrogates, will be tested for survivability, yield, organic matter production, and organic carbon retention. In assessing rice cultivation, considerations and scales of inputs (e.g. organic or synthetic pesticides/fertilizers) should be considered within the scope of work. During the study, best management practices will be developed and documented for inclusion in a manual or some other media for distribution purposes as part of the final report. Assess the existing and potential habitat for and populations of native and invasive species, including vertebrate animal species and emergent wetland and/or other vegetation.

Subsidence reversal: This section involves developing quantifiable analyses of rice cultivation and the rates of subsidence reversal/elevation gain it affords in comparison with the status quo of management and other possible approaches that are in effect to reverse subsidence in the Delta. Remote sensing and field topographic surveys may be part of this approach. This section will include an assessment of the spatial extent of historical factors and current land management practices that have contributed to Delta island subsidence. In addition, this section of the work seeks to assess and quantify the amount of carbon fixed (e.g. Carbon Sequestration) into soil organic matter for different types of cultivars and cultivation techniques. All testing protocols should be developed and performed in coordination with any existing

research activities concerned with subsidence reversal and Carbon Sequestration as well as any approval entity that has jurisdiction over the carbon trading market in California, United States, and/or internationally (as appropriate). This coordination will ensure that the methods used are consistent with carbon trading market requirements.

Air and water quality/biogeochemistry: A full comprehension of air and water quality parameters that are affected by rice cultivation will be necessary in order to assess its environmental viability. Air quality measurements will include but not be limited to carbon, nitrogen and sulfur constituent rates and loads. Groundwater as well as surface water import and export pollutant (including pesticides and fertilizers) and nutrient loads will be assessed. Understanding the effects of rice cultivation on methyl mercury is an important part of this section. Quantifying water flow and constituent loads into and out of experimental sites will be important in scaling the concentrations of constituents measured to understand flux characteristics and assess air and water quality effects relative to current land uses. As part of this component, the applicant should state how it will compare per area constituent loads for water quality constituents of concern and air quality effects with the predominant current Delta land uses.

Economy/socio-economic implications: This section will explore the per acre costs/benefits to farmers of employing different methods of rice cultivation as a source of income and as a subsidence reversal and carbon sequestration technique. In addition, this project will investigate the willingness of farmers to invest in this method of rice cultivation as an option other than the status quo. Investigation of the carbon credit market will be an important part of this section.

Management/research recommendations: In order to integrate results from the various aspects of this project, the work to be conducted under the auspices of this section shall develop recommendations for management practices and future research. Within this section, a projected and recommended approach for rice cultivation as well as improvement will be outlined in the form of BMPs (best management practices). Future research and management will also be suggested. Considerations for climatic and hydrologic variability especially in the face of a rapidly changing climate should be considered within these recommendations.

Deliverables:

Products that will be delivered as part of the study, as well as during the study will include:

1. Experimental design plans that include discrete research questions and testable hypotheses, testing protocols, QA/QC procedures, and QAPPs (Quality Assurance Program Plans) for all sections and research elements.
2. Itemized report for profits/losses (annual) used for economic analyses.
3. Quarterly updates and progress reports (written updates, meetings, and meeting notes).
4. Semi-annual interim summary reports of major work and results to date (these will replace the scheduled quarterly report for that quarter).
5. Documentation of all research changes as a result of semi-annual report.
6. Raw data and data analyses from all research elements contained in a Draft Final Report.
7. Detailed map(s) of study site(s) with topography, landscape and experimental features, treatment and control plots.
8. Management and research implications/recommendations contained in a Draft Final Report.
9. Development and distribution of a Final Report.
10. Monthly invoices showing all costs associated with the project.
11. Presentations at CalFed Science and/or State of the Estuary Conferences (minimum of one per year of project).

4-How to Submit an Application

Three complete paper copies of the application marked as "ORIGINAL;" and one electronic copy in MS WORD (or pdf) on CD must be submitted to the Department by 4:00 p.m. on April 25, 2008. The proposal must sufficiently address each of the six main topics referenced above. Appendices B-C (detailed points and proposal scorecard) provide a reference for the exact points to be addressed within the proposal.

A complete application includes the following:

- a. Applicant information by completing Appendix A;
- b. Detailed Description of the Proposal including a narrative description of proposal, budget, timetable, products/ deliverables; and map(s) of study site(s). Refer to Appendices B-C.
- c. Supporting Documents (e.g. list of past projects completed, team member qualifications-resumes).
- d. Submit completed application and supporting documentation to:

By Mail:
Department of Water Resources
Delta-Suisun Marsh Office
P.O. Box 942836
Sacramento, CA 94236
Attention: Bryan Brock

Hand Delivery:
Department of Water Resources
Delta-Suisun Marsh Office
1416 9th Street, Room 1601
Sacramento, CA 95814
Attention: Bryan Brock

Furthermore, a public meeting to discuss this PSP will take place at the Walnut Grove Library, 14177 Market Street, Walnut Grove, California. The meeting is scheduled for 10:00 am on Thursday April 10, 2008. If you have additional questions regarding this PSP or need further clarifications prior to the meeting, please contact Mr. Bryan Brock at bbrock@water.ca.gov or (916) 651-0836.

5-Schedule

April 10, 2008 (10 am-12 noon)- Public Meeting at Walnut Grove Library, 14177 Market Street, Walnut Grove, CA 95690 [Walnut Grove Branch Library](#)
April 25, 2008 - Application Deadline
May 9, 2008 - Notification of Award
May 30, 2008 - DWR Submittal of Contract to Local District
June 20, 2008 - Notice to Proceed
April & October - Quarterly Reports
January & July - Semi-Annual Reports
Proposed Completion Date - Completion of Project and Final Report

6-Application Evaluation Process

Applications will be reviewed for completeness and for technical and financial feasibility through a multi-disciplinary Project Evaluation Team of engineers, environmental scientists, and specialists within the Delta-Suisun Marsh Office, the Department of Water Resources, and other State agencies. The scoring criteria and points to be awarded are shown in Appendices C-D.

7-Funding Requirements

The Department reserves the right to issue addenda and inquiries to all applicants for clarification during the application process. All participants, including applicants and reviewers, are subject to State conflict of interest laws. The funding recipient must sign a Project Funding Agreement with DWR before the State can disburse funding. Recipients shall comply with applicable Labor Code requirements. State monitoring and environmental laws shall be addressed and adhered to in the pursuit of project completion. Once the proposal has been submitted to DWR, any privacy rights afforded by law with respect to the proposal will be waived by the applicant. Applicants who are awarded funding will be required to provide free public access to any copyright, intellectual or proprietary rights for deliverables, designs, and patents resulting from the contracted work.

APPENDICES
APPENDIX A
APPLICANT INFORMATION

A.1. Project Information

Application Information	
Proposal Title <Insert project title>	
Amount of Funding Requested <Insert amount of funding requested>	
Total Project Cost <Insert total project cost>	Total Cost Share (if any) <Insert total cost share, if any>
Name of Agency <Insert agency name>	
Tax ID Number <Insert tax ID number>	
Day-to-Day Contact <Insert day-to-day contact>	
Address <Insert address>	
Telephone Number <Insert telephone number>	Fax Number <insert fax number>
E-mail address <Insert e-mail address>	
Duration of Project <Insert duration of project>	
Counties of Proposed Project Location <Insert counties of proposed project location; if more than one county, delimit by semicolon>	
Specific Project Location	
Representative Project Coordinates: Latitude (North) <decimal format>	Representative Project Coordinates: Longitude (West) <insert longitude in decimal format>
GIS shape file of the proposed project(s) <name of the GIS shapes files of the projects(s) and attach the shape files (preferably in NAD 27 datum and UTM 10 or 11 projection)>	
Map Projection of GIS Shape File of the Proposed Project	Datum of GIS Shape File of the Proposed Project <Insert datum (NAVD 88 etc.)>
Data Source of GIS Shape File of Project Area <Insert GIS shape files>	Units of GIS Shape File of Project Area <Insert units (ft., m. etc.)>
Bulletin 118-03 Hydrologic Region of Project (HR)* <Insert HR number>	Project Groundwater Budget Type (see page 110 in Bulletin 118-03 for explanation)*
Bulletin 118-03 Basin/Subbasin Number of Project*	Bulletin 118-03 Basin/Subbasin Name of Project* <Insert Basin/Subbasin name>

* Bulletin 118-03 refers to the DWR publication Bulletin 118 - Update 2003 *California's Groundwater*. Bulletin 118-03 can be found at the website: <http://www.groundwater.water.ca.gov/bulletin118/update2003/index.cfm>

A.2. Application Tracking Information

1. Name, title, address, telephone number, fax number, and e-mail address of the person of the applicant's governing body (such as mayor, supervisor, board president, or chairman) authorized by the Agency's resolution to file the application and enter into an agreement with DWR:

Name <Insert Name>	Phone <Insert Phone>	Fax <Insert Fax>
Title <Insert Title>	E-mail <Insert E-mail Address>	
Address <Insert Mailing Address>		
City <Insert City>		Zip <Insert Zip Code>

2. Name, title, address, telephone number, fax number, and e-mail address of the person to be designated as the Applicant's Manager:

Name <Insert Name>	Phone <Insert Phone>	Fax <Insert Fax>
Title <Insert Title>	E-mail <Insert E-mail Address>	
Address <Insert Mailing Address>		
City <Insert city>		Zip <Insert Zip Code>

3. Name, title, address, telephone number, fax number, and e-mail address of the person to be designated as the Applicant's Day-to-Day Project Contact:

Name <Insert Name>	Phone <Insert Phone #>	Fax <Insert Fax #>
Title <Insert Title>	E-mail <Insert E-mail Address> <Insert E-mail Address>	
Address <Insert Mailing Address>		
City <Insert City>		Zip <Insert Zip Code>

4. State Senate and Assembly District numbers for project area:

State Senate District Number <Insert Number, if more than one, delimit by semicolon>
State Assembly District Number <Insert Number; if more than one delimit by semicolon>

1. Rice Cultivation

- Appropriate cultivars to be tested.
- Temporal parameters to be addressed, BMPs accounted for.
- Spatial parameters addressed including total acreage within the study area, BMPs accounted for.
- Pesticides/fertilizers accounted for.
- Water regime addressed.
- Opportunistic (invasive/native) species accounted for.
- Measurements of success: e.g. total yield, survival percentage.
- Installation, operations and maintenance details.

2. Subsidence Reversal

- Appropriate parameters to be assessed.
- Elevation loss/gain accounting.
- Address possibility of using remote sensing methods.
- Field methods: GPS, laser surveying, survey pins.
- Elevation changes for treatment and control plots.
- Assessment of soil carbon dynamics and carbon budget.

3. Air and Water Quality Impacts/Biogeochemistry

- Appropriate parameters to be assessed: N and S species; pollutants, nutrients, pesticides/ organic compounds. C and CH₄ accounted for in section 2.
- Air: NO_x and SO_x export; rates and loads.
- Water: Groundwater measurements and parameter flux (rates and loads).
- C species accounting: DOC, POC, SOC, CO₂, CH₄, CH₂O (npp).
- Water: Surface water measurements and parameter flux (rates and loads).
- Methyl mercury accounting/flux.

4. Economy/Socio-economic implications

- Appropriate analyses of expected costs/benefits and crop prices for farmers.
- Carbon credit market investigation.
- Assessment of conditions for and willingness of rice cultivation by farmers.

5. Management and Research Recommendations

- Overall summary of findings with recommendations and implications for BMPs, future management and research directions; expected results.

6. Total Budget

- Appropriate costs/budget for total project and for each sub-section of project.

7. Past Experience

- Experience with rice and research related projects; provide supporting documents of past projects.

8. Team Member Qualifications

- Breadth and depth of experience in multiple relevant disciplines; names, disciplines, and resumes of team members.

APPENDIX C
SCORING TABLE

Topic	Inclusion Points	Yes/No	Explanation, qual.
Acreage of Study Area	a. Farm plot \geq 300 acres.		"No" means that the proposal will not be evaluated further or considered for funding.
Peat Depth within Study Area	a. Average peat depth \geq 7 feet.		"No" means that the proposal will not be evaluated further or considered for funding.
Topic	Inclusion Points	Rating, 0-5, quant.	Explanation, qual.
1. Rice Cultivation	a. Appropriate cultivars tested.		
	b. Temporal parameters addressed, BMPS accounted for.		
	c. Spatial parameters addressed, BMPs accounted for.		
	d. Pesticides/fertilizers accounted for.		
	e. Water regime addressed.		
	f. Opportunistic (invasive/native) species accounted for.		
	g. Measurements of success: e.g. total yield, survival percentage.		
	h. Installation, operations and maintenance details.		
2. Subsidence Reversal	a. Appropriate parameters assessed.		
	b. Elevation gain or loss assessment.		
	c. Evaluation of remote sensing methods.		
	d. Field methods: GPS, laser surveying, pins.		
	e. Elevation changes for treatment and control plots.		
	f. Assessment of soil carbon dynamics and carbon budget.		

Topic	Inclusion Points	Rating, 0-5, quant.	Explanation, qual.
3. Air and Water Quality Impacts; Biogeochemistry	a. Appropriate parameters assessed: N species; pollutants, nutrients, pesticides/org. compounds. C and CH ₄ accounted for in section 2.		
	b. Air: NO _x and SO _x export; rates and loads.		
	c. Water: Groundwater measurements and parameter flux (rates and loads).		
	d. Water: Surface water measurements and parameter flux (rates and loads).		
	e. Methyl mercury accounting and flux.		
	f. C species accounting: DOC, POC, SOC, CO ₂ , CH ₄ , CH ₂ O (npp).		
4. Economy	a. Appropriate analyses of costs/benefits to farmers.		
	b. Carbon credit market investigation.		
	c. Assessment of conditions for and willingness of rice cultivation adoption by farmers.		
		Rating, 0-10, quant.	Explanation, qual.
5. Management and Research Recommendations	a. Overall summary of findings with recommendations and implications for BMPs, future management and research directions.		
		Rating, 0-25, quant.	Explanation, qual.
6. Total Budget	a. Appropriate costs/budget for total project and for each sub-section of the project.		
7. Past Experience	a. Experience with rice and research related projects; provides supporting documents of past projects.		
8. Team Member Qualifications	a. Breadth and depth of experience in multiple relevant disciplines; names, disciplines, resumes.		

SUMMARY SCORE

Topic	Total Possible	Score
1. Rice Cultivation	40	
2. Subsidence Reversal	30	
3. Air and Water Quality; Biogeochemistry	30	
4. Economy	15	
5. Management & Research Recommendations	10	
6. Total Budget	25	
7. Past Experience	25	
8. Team Member Qualifications	25	
TOTAL	200	

APPENDIX D
SCORING CRITERIA

Applications determined to be complete and eligible will be evaluated by the Department according to the criteria in Appendix C. Points will be assigned on how well the applicant addresses each criterion as described below:

- A score of up to 100% of the maximum points will be awarded where the criterion is fully addressed with thorough and well presented documentation.
- A score of up to 80% of the maximum points will be awarded where the criterion is addressed but is not thoroughly documented.
- A score of up to 60% of the maximum points will be awarded where the criterion is not fully addressed and for which documentation is incomplete or insufficient.
- A score of up to 40% of the maximum points will be awarded where the criterion is marginally addressed and documentation is incomplete and insufficient.
- A score of up to 20% of the maximum points will be awarded where the criterion is minimally addressed and not documented.
- 0% of the maximum points will be awarded where the criterion is not addressed.

Exhibit 1

Example Format for Cost Estimate

	Key Personnel Hours				Total Cost (\$)	
	Project Manager Name (\$/hr)	Economist Name (\$/hr)	Technicians Name (\$/hr)	Office Tech (\$/hr)	Incidental Costs and Mileage	
Task						
Task 1 - rice cultivation/agroecology						
Task 2 - subsidence reversal						
Task 3 - water and air quality impacts/biogeochemistry						
Task 4 - economy/socio-economic implications						
Task 5 - management/research recommendations						
Total						