CALFED Progress Report
California Sea Grant College Program

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ProjectYear_2A 3rd Year **ProjectNo_2C** R/SF-8

TypeQuestionnaire_2B Interim Questionnaire

Preparer Information

PrepName_1A John Harrison
PrepEmail_1B harrisoj@vancouver.wsu.edu
PrepPhone_1C 360-546-9210

Project Information

ProjectNo_2C R/SF-8 **StartDate_3a** June 15, 2006 **EndDate_3b** June 15, 2008
ProjectTitle_4 Modeling Nutrient and Organic Carbon Loads and Sources in Central Valley Watersheds: Taking Existing Monitoring Data to the Next Stage

CALFed Fellow contact information

FelTitle_5A Dr **FelLast_5B** Harrison **FelFirst_5C** John **FelInit_5D** A
FelInstitution_5E Washington State University
FelDepartment_5F School of Earth and Environmental Sciences
FelStreetAddr_5G 14204 NE Salmon Creek Avenue
FelCity_5H Vancouver **FelState_5I** WA **FelZip_5J** 97210
FelPhone_5K 360-546-9210 **FelFax_5L**
FelEmail_5M harrisoj@vancouver.wsu.edu
FelPositionTitle_5N Assistant Professor

Research Mentor (for additional please see #8)

RMTitle_6A **RMLastName_6B** **RMFirstName_6C** **RMInit_6D**
RMInstitution_6E
RMDepartment_6F
RMStreetAddr_6G
RMCity_6H **RMState_6I** **RMZip_6J**
RMPhone_6K **RMFax_6L**
RMEmail_6M
RMPositionTitle_6N

Community Mentor (for additional please see #9)

CMTitle_7A **CMLastName_7B** **CMFirstName_7C** **CMInit_7D**
CMInstitution_7E
CMDepartment_7F
CMStreetAddr_7G
CMCity_7H **CMState_7I** **CMZip_7J**
CMPhone_7K **CMFax_7L**
CMEmail_7M
CMPositionTitle_7N

Additional Research Mentors and Community Mentors

Additional Research Mentors_8

Additional Community Mentors_9

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Project Objectives: Please type your responses, and answer the questions in a style appropriate for laymen.

ProjectObjectives_10

The objective of this research is to use existing data, in combination with models, to gain a quantitative understanding of current and likely future fluxes, sources and controls of DOC, DIN, and DIP transported through the SSJ system. Specifically, we are addressing the following research questions:

1. What are the relative contributions of various land-based sources of DIN and DOC to the Sacramento and San Joaquin River systems?
2. How can we improve our ability to predict river DOC and DIN concentrations, export, and sources?
3. How are river DOC and DIN concentrations, loads, and sources likely to change as a function of climate, population growth, water demand, and land-use change in the next few decades?

Summary of progress in meeting each of these goals and objectives

ProgressSummary_11

In the first two years of this project we have achieved many of our initial goals. We have collated the data necessary to calibrate, validate, and apply our nutrient transport models, including C, N, and P loads, yields, and concentrations, basin delineations, and C, N, and P input data for most of the sub-basins of the Sacramento and San Joaquin Rivers. We have also written and published at least 10 peer-reviewed papers, including a paper containing the first-ever N budget for CV basins. We have also developed and applied a successful (r2= 0.80 between measured and modeled DOC yield (kg km-2 yr-1) DOC export model and carried out an analysis of land-based controls on DOC export and disinfection byproduct formation. We have also contributed substantively to an analysis of patterns and controls of primary production in the San Joaquin River (Dahlgren et al, Submitted, Henson et al., In Preparation).

PROJECT MODIFICATIONS: Please explain any substantial modifications in research plans, including new directions pursued. Describe major problems encountered, especially problems with experimental protocols and how they were resolved. Describe any ancillary research topics developed.

Modifications_12

In 2006 I started a tenure-track faculty appointment at Washington State University's Vancouver Campus. While this has been a wonderful professional opportunity, it has required that I adjust the timetable of research that I initially proposed to follow out as a CALFED Science Fellow. In 2006 I therefore submitted a revised scope and budget to CALFED. I proposed to de-emphasize the DIP modeling in the original proposal in order to focus on the DOC and DIN modeling. I also proposed to hire a postdoc to continue the model development and application work as well as supporting some summer salary for myself. I have successfully made these modifications, and the project is proceeding according to this revised plan.

BENEFITS AND APPLICATIONS: Suggest the relevance of these new findings to management. Describe any accomplishment, that is significant effects your project has had on resource management or user group behavior. CALFED is looking for "management cue" (see http://science.calwater.ca.gov/pdf/soemgmtcues.pdf).

BenefitsApplic_13

To my knowledge, none of the products resulting from this project have been applied commercially.

We are not presently aware of any direct economic benefits resulting from this project. However, this research could directly enhance economic development in several ways, including by guiding effective management of the DO TMDL in the lower San Joaquin River, by guiding effective implementation of best management practices so as to minimize the environmental impacts of poor fertilizer use practices, and by indicating where potential trouble-spots are likely to occur in coming decades with respect to nutrient loading and consequent eutrophication.

PUBLICATIONS: List any publications, presentations, or posters that have resulted from this funded research. Give as many details as possible, including status of paper (e.g., in review; in press), journal name, conference location and date of presentation. Please note (as outlined in the conditions of the award) that each fellow is required to submit an abstract for an oral or poster presentation at each State of the Estuary conference and CALFED Science Conference during the duration of the fellowship.

Publications_14

Published

Glibert, P. M., J. A. Harrison, C. Heil and S. P. Seitzinger (2006) Escalating worldwide use of urea: a global change contributing to coastal eutrophication, Biogeochemistry, doi:10.1007/S10533-3070-0, 1-23.

Chow, A.T., R.A. Dahlgren, and J.A. Harrison (In Preparation) Patterns and sources of DOC and DBP formation potential in California's Central Valley River systems, For Environmental Science and Technology.

Seitzinger, S.P., J.A. Harrison, J.K. Bohlke, A.F. Bouwman, R. Lowrance, B.J. Peterson, C. Tobias, and G. Van Drecht (2006) Denitrification across landscapes and waterscapes: a synthesis, Ecological Applications.

Glibert, P., et al. (J.A. Harrison 30th of 55 authors) (2008) Fertilizing the tropical or subtropical oceans with urea will not reduce greenhouse gases and should not be conducted to gain carbon offsets. Marine Pollution Bulletin.

In Press

Harrison, J.A., R. Maranger, R.B. Alexander, J. Cornwell, A. Giblin, P.-A. Jacinthe, E. Mayorga, S.P. Seitzinger, and W. Wollheim (In Revision) Controls and significance of N retention in lakes and reservoirs. Biogeochemistry.

Seitzinger, S. P. and J. A. Harrison (In Press) Sources and Delivery of Nitrogen to Coastal Systems, Chapter 8 in Nitrogen in the Marine Environment, 2nd edition. D. Capone, D.A. Bronk, M. R. Mullholland, E. Carpenter Eds., Academic Press, New York.

Ahrens T., M.Beman, J. A.Harrison, P.Jewett, P.Matson (In Press) Nitrogen transformations and transfers from land to the sea in the Yaqui Valley agricultural region. Water Resources Research.

Ahrens, T., J.A. Harrison, J.M. Beman, P.A. Matson, P. Jewett, and I. Ortiz-Monasterio (In Press) Nitrogen in the Yaqui Valley: Sources, Transfers, and Consequences, Chapter 6 in The Yaqui Valley as a Template for Interdisciplinary Research, P.A. Matson, R. Naylor, and W.P. Falcon, Eds., NRC Press, Washington D.C.

Liu, K.-K., S. Seitzinger, E. Mayorga, J. Harrison, and V. Ittekkot (In Press) Fluxes of nutrients and selected organic pollutants carried by rivers, Chapter 8 in: E. Urban & S. Greenwood (Eds.) PACKMEDS - Dynamics and vulnerability of semi-enclosed marine systems: the integrated effects of changes in sediment and nutrient input from land. Scientific Committee on Progress in the Environment (SCOPE), New York.

Wolheim, W.M., C.J. Vorosmarty, A.F. Bouwman, P. Green, J.A. Harrison, M. Meybeck, B.J. Peterson, S.P. Seitzinger, and J.P. Syvitski (In Press) A spatially distributed framework for aquatic modeling of the Earth system (FrAMES). Global Biogeochemical Cycles.

Submitted

Dahlgren, R.A., J.A. Harrison, S.S. Henson, A.T. O'Geen, E.E. Van Nieuwenhuyse, P.W. Lehman, and E. Gallo (In Preparation for Resubmission) Diel phytoplankton dynamics in a eutrophic river resulting from growth and transport.

In Preparation

Henson, S.S., Dahlgren, R.A., and J.A. Harrison. (In Preparation) Patterns, magnitudes and controls of phytoplankton growth and transport through the San Joaquin River, For J. Freshwater Biol.

Sobota, D.J., J.A. Harrison, and R. A. Dalhgren, Input and export of nitrogen in watersheds of western North America: Annual and seasonal patterns in the Central Valley, California, For Biogeochemistry.

Van Drecht, G., A.F. Bouwman, J.A. Harrison, and J. Knoop, Global nitrogen and phosphate in urban waste water for the period 1970-2050. For Global Biogeochemical Cycles.

COOPERATING ORGANIZATIONS: List those agencies and/or persons who provided financial, technical or

other assistance to your project since inception. Describe the nature of their collaboration.

CoopOrganiz_15

UC Davis

USGS

AWARDS: List any special awards or honors that you, or mentor or members of the research team, have received during the duration of this project.

Awards_16

Best student poster award (Elliott Whitling), WSU Research Showcase, Harrison invited to participate as an associate editor at Frontiers in Ecology and the Environment (declined)

KEYWORDS: List keywords that will be useful in indexing your project.

Keywords_17

Nitrogen, carbon, phosphorus, watershed, model, water quality, climate change, eutrophication, land use, rivers, San Joaquin, Sacramento

PATENTS: List any patents associated with your project.

Patents_18

none

Additions: Additional information can be added here. Please begin the text with the

number of the question you are adding to.

Additions_19