Coastal Science Assistantship Program Application

(Enter requested information in the gray boxes; they will expand as is necessary)

Name: Y. Jun Xu

Address: 227 RNR Bldg, School of Renewable Natural Resources, Baton Rouge, LA 70803

Institution: Louisiana State University

E-mail address: yjxu@lsu.edu

Student's graduate degree major (please attach degree requirements): RNR (area of concentration in Watershed Science)

Anticipated date of acceptance of student: Summer 2015

Anticipated date of graduation: Spring 2018

****Note* – Louisiana Sea Grant requires that overhead (F and A) charges be waived for this funding.**

Proposal narrative

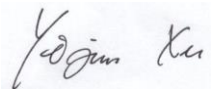
- Provide a brief (two page maximum) description of the research that would be conducted as part of the recruit's Master's degree at your institution. This does not have to be exact as we anticipate the student will play a role in developing specific research objectives as part of this learning experience. Explain how this research is of interest to the Coastal Protection and Restoration Authority (CPRA) and how it fits within the 2012 CPRA Master Plan (see: THE MASTER PLAN - Coastal Protection and Restoration Authority of Louisiana).

- Outline the anticipated curriculum for the student including the classes that the student might take.

- Provide a description of current or anticipated funding sources that will be applied to support the research activities proposed for your student. This must include full disclosure of any employment, agency or other contractual and/or funding agreements to which the applicant, or anyone else participating in their research, are bound or intend to become bound involving any party to the litigation pending before the United States District Court for the Eastern District of Louisiana captioned "In re: Oil Spill by the Oil Rig 'Deepwater Horizon' in the Gulf of Mexico on April 20, 2010", MDL No. 2179 ("Oil Spill Litigation"). Applicants must establish that no conflict of interest exists regarding any existing or anticipated contractual and/or funding agreements and the receipt of research funding from CPRA under the CSAP program. The applicants selected for funding also agree to make CPRA aware of, and obtain CPRA's prior written approval, before (i) accepting any funds from any party to the Oil Spill Litigation, (ii) providing any services or conducting any research that is in any way oil spill related, or (iii) becoming involved in any other work, research and/or projects that could potentially affect the State of Louisiana's claim for natural resource damages in the Oil Spill Litigation[1].

[1] The following is a list of the parties to the Oil Spill Litigation to which conflicts may apply for purposes of a student's receipt of CSAP funding: (i) the Defendants include: BP Exploration &

Note: A condition of this award is completion of an internship of 240 hours at a CPRA office during the period of the CSAP funding.



Signature of applicant

Submit Applications to:
CPRA Coastal Science Assistantship Program
C/O Louisiana Sea Grant College Program
232 Sea Grant Building
Louisiana State University
Baton Rouge, La 70803-7507
Or via email to Katie Lea at klea@lsu.edu

Production, Inc., BP Corporation North America, Inc., BP America, Inc., BP America Production Company, BP p.l.c., Anadarko Exploration & Production LP, Anadarko Petroleum Corporation, Transocean Holdings LLC, Triton Asset Leasing GmbH, Transocean Deepwater, Inc., Transocean Offshore Deepwater Drilling, Inc., Transocean Ltd., Halliburton Energy Services, Inc., and (ii) the non-Louisiana plaintiffs include: the United States of America (including the following federal agencies: the Department of Justice; the Department of Commerce National Oceanic and Atmospheric Administration; the Department of Interior Fish and Wildlife Service, National Park Service, Bureau of Land Management; the Environmental and Protection Agency; the Department of Agriculture; and the Department of Defense), the Alabama Department of Conservation and Natural Resources, the Geological Survey of Alabama, the Mississippi Department of Environmental Quality, the Florida Department of Environmental Protection, the Florida Fish and Wildlife Conservation Commission, the Texas Parks and Wildlife Department, the Texas General Land Office, the Texas Commission on Environmental Quality.

Project Title: Determining sediment accretion and availability in the lowermost Mississippi River

Background

Riverine sediment is a precious resource for Louisiana's coast which is built on thousands of years of sediment deposits. In the past century, sediment delivery from the Mississippi River to Louisiana's coast has declined from about 400 million tons each year to the current 180-200 million tons each year. Concurrently, the region has lost about 5000 km^2 land and its current land loss rate remains at 40-60 km^2. In addition to the declining trend of riverine sediment, some recent studies found that more than half of the 180-200 million tons of sediment actually did not reach the river mouth, but was trapped in the riverbed and bank. While sediment diversions from the lowermost Mississippi River have been proposed (see the CPRA 2012 Master Plan), uncertainty exists about how much and when most sediments are actually available since the river flow fluctuates largely. In general, despite our knowledge of long-term annual sediment yields from the Mississippi River, there is a knowledge gap concerning the variability of riverine sediment and actual divertible quantity in its lowermost reach in Louisiana.

Objectives

I propose to recruit an outstanding graduate student to conduct a detailed riverine sediment availability assessment for the lowermost Mississippi River. Specifically, the proposed study will 1) quantify long-term sediment accretion in the riverbed and riverbank below the Old River Control Structure; 2) determine the relationship between sediment accretion rates and river hydrological conditions; 3) develop a hydrograph-based sediment availability routing model for the lower Mississippi River, and 4) assess optimal river diversion locations with respect to maximizing riverine sediment capture.

Research Approach

The proposed study will be accomplished through the following four tasks:

1. *Assessment of long-term (1980-2015) sediment accretion in the lowermost Mississippi River* Records on river sediment, discharge, and stage height below the Old River Control Structure (i.e., Tarbert Landing, St. Francisville, Baton Rouge, and Belle Chasse) will be gathered from USACE and USGS gauge stations. Sediment budgets for silt and sand fractions will be established for each of the stations. The long-term budgeting analysis will allow quantification of sediment accretion rates in riverbed and riverbank in the river reaches.
2. *Determination of relationship between sediment accretion rates and river hydrological conditions* Monthly and annual sediment accretion rates will be analyzed in connection with fluctuations in river discharge and hydraulic gradient calculated using the river stage data. The relationship assessment will help identify sediment transport characteristics in the lower Mississippi River.
3. *Development of a hydrograph-based sediment availability routing model* Using a sediment-hydrograph approach (Rosen & Xu, 2014), actual availability of silt and sand sediment fractions will be quantified for each of the river monitoring stations under different hydrologic conditions. The results will be utilized to develop a river sediment routing model that can predict sediment delivery rates along the lower Mississippi River at various river stage heights.
4. *Assessment of optimal river diversion locations* This assessment will be done in two steps. First, we will use the results gained from the above assessments to identify river locations for optimal sediment capturing. Second, we will take river navigation safety and flood into account and will consider the variables as two controllable factors in a deterministic decision making model.

Expected Outcomes and Significance

The primary deliverable of this proposed study will be an assessment of sediment accretion and availability in the lower Mississippi River. The assessment will provide detailed information in tabulated, graphical, and map data on sediment sources and their long-term relations with river hydrologic conditions at Tarbert Landing, St. Francisville, Baton Rouge, and Belle Chasse.

The Mississippi River Delta region contributes an estimated $45 billion in revenue annually and has a natural capital asset value estimated between $330 billion and $1.3 trillion. The existence of the economy and associated jobs are being seriously threatened by the rapid coastal land loss. The CPRA 2012 Master Plan has

accommodated future restoration projects along Louisiana's coast, many of which rely on sediment diversions from the Mississippi River. Sediment availability is a key to success of future coastal restoration in Louisiana. The information gained from this proposed study can be very useful for developing effective sediment diversion strategies and plans, helping protect coastal assets and economy in the State.

Expertise of PI and Funding Sources for the Proposed Study

I am a hydrologist with 20+ years of research experience in the field of water resources. My expertise pertinent to this proposed study may be best reflected by some of the recent publications from my research group:

Rosen, T., and Y.J. Xu. 2011. Riverine sediment inflow to Louisiana Chenier Plain in the Northern Gulf of Mexico. *Estuarine, Coastal and Shelf Science* doi:10.1016/j.ecss.2011.09.013.

Rosen, T., and Y.J. Xu. 2013. Recent decadal growth of the Atchafalaya River Delta complex: effects of variable riverine sediment input and vegetation succession. *Geomorphology*, 10.1016/j.geomorph.2013.04.020.

Rosen, T. and Y.J. Xu. 2014. Estimation of sedimentation rates in the distributary basin of the Mississippi River, the Atchafalaya River Basin, USA. *Hydrology Research*, doi:10.2166/nh.2013.181.

Rosen, T. and Y.J. Xu. 2014. A hydrograph-based sediment availability assessment: Implications for Mississippi River sediment diversion. *Water* 6: 564-583.

Xu, Y.J. 2010. Long-term sediment transport and delivery of the largest distributary of the Mississippi River, the Atchafalaya, USA. In: Sediment Dynamics for a Changing Future, p282-290, IAHS Publication 337, Wallingford, UK.

Xu, Y.J. and T. Rosen. 2012. Are riverine sediment discharges sufficient to offset the sinking coast of Louisiana? In: Erosion and Sediment Yields in the Changing Environment, p104-113, IAHS Publication 356, Wallingford, UK.

Xu, Y.J. 2014. Rethinking the Mississippi River diversion for effective capture of riverine sediments. In: Sediment Dynamics from the Summit to the Sea, p463-470, IAHS Publication 367, Wallingford, UK.

Zhong, B. and Y.J. Xu. 2011. Risk of inundation to coastal wetlands and soil organic carbon and organic nitrogen accounting in Louisiana, USA. *Environmental Science & Technology* 45: 8241-8246.

I am Co-PI of an ongoing NSF-funded project on resilience and stability of coastal Louisiana (NSF Grant# 1212112; $1.5 million; Nov 2011 – Oct 2016), and my group is studying sediment transport and budgeting in the Mississippi-Atchafalaya River system. I am also conducting a NFWF-funded project (Grant# 8004.12.036402, $400,000, Dec 2012 – Nov 2016) on coastal river water quality. Funding from these projects can be used for field work necessary in the proposed study.

Anticipated Curriculum for the CSA recruit

Course #	Course Title	Credits
OSC 4024	Coastal Morphodynamics	3
GEOG 4045	Environmental Remote Sensing	3
RNR 4061	Potamology	3
RNR 4900	Watershed Hydrology	3
EXST 7005	Statistical Techniques I	4
RNR 7001	Research Methodology	3
RNR 7073	Graduate Seminar in Water Resources	2
RNR 7151	Watershed Hydrology & Floodplain Analysis	3
CE 7255	Environmental Hydraulics	3
GEOL 7900	Deltaic Morphodynamics	3
GEOG 7917	Extreme Events	3
RNR 8000	Thesis Research	40
	Total (excluding RNR 8000 Thesis Research)	***33***

CSA Student's graduate degree major – M.S. in Renewable Natural Resources

General M.S. Degree Requirements at the School of Renewable Natural Resources, LSU

The minimum requirement for the Master's degree is 30 semester hours of graduate credit, although many students will accumulate significantly more credit hours before completing degree requirements. The 30-hour requirement includes 6 semester hours of thesis research and 24 hours in coursework, chosen by student with approval of graduate committee, 9 hours of which must be at or above the 7000 level. Graduate credit is not allowed for courses numbered below 4000 or for correspondence courses. The minimum standard for grades in courses completed for the degree is a 3.0 average with no grade below "C."

Up to 9 hours of coursework completed at another institution, or during post-baccalaureate work at LSU, can be transferred and applied to the coursework requirement. Transfer credit cannot be used for the 7000-level course requirement.

Programs for the Master's degree must be completed within five years of entrance into the program.

Masters students pursuing an RNR degree with the area of concentration in Watershed Science should develop a program of study listing the courses to be taken for the degree in consultation with the major advisor. The minimum requirement for the degree is 30 semester hours of graduate credit that includes 6 semester hours of thesis research (RNR 8000) and 24 hours of coursework, 12 hours of which must be at or above the 7000 level. The following courses must be completed:

RNR 7001 - Research Methodology (3 hrs)
RNR 7073* – Seminar: Current Issues in Hydrology and Water Resources (1 hr; two semesters)
EXST 7004 or 7005 - Statistical Techniques 1 (4 hrs)
** This is a pending course*

The program of study form must be approved by all members of the graduate advisory committee and must be submitted to the Graduate Coordinator of the School of Renewable Natural Resources.

While developing the list of coursework, students should discuss their research plans with the advisory committee.

For more detailed information checkout the Graduate Handbook or to request an application package, contact:
Dr. Allen Rutherford, Director
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(225) 578-4187
druther@lsu.edu