

PROGRAM DESCRIPTION

1. Briefly describe the proposed new program. Please indicate if it is an expansion of an existing program; a new program; a cooperative effort with another institution, business, or industry; or an on-campus or off campus program. Attach any formal agreements established for cooperative efforts.

The University of Montana is in the process of establishing a national prominence for its research and training programs in the field of Riverine Science. The purpose of establishing a new Center for Riverine Science and Stream Re-naturalization (*CRSSR*) is to create an organized structure that links faculty and researchers within the University of Montana System and enhances their efforts to develop nationally competitive research and training programs. The Center will focus faculty efforts from the Missoula campus, the Butte campus and the Montana Bureau of Mines and Geology. *CRSSR* participants will also include cooperative affiliates including faculty and researchers from outside universities, federal agencies and private industries. By sharing a common interest and effort, resources can be more effectively combined to enhance project development, collaborative efforts, extramural funding, and research training, as well as faculty and graduate student recruitment. This is particularly true of a field like riverine science, where research and education are multidisciplinary by nature and typically cross the boundaries of traditional science departments. Further, riverine science is also a field in which campus-based applied and basic research can foster the collaborative development of research in conjunction with state agencies, the private environmental industry, and federal agencies and laboratories.

The mission of the *CRSSR* is to act as a nucleus to focus interdisciplinary teaching and research on natural and impacted stream systems and to connect The University of Montana with national research labs (federal and private). It will also:

- a. Develop funding to add research and assessment components to on-going or proposed cooperating stream modification projects including cost effectiveness of best-management-practices (BMP);
- b. Bring to bear the most innovative science, research and creativity to address issues related to maintenance of river function, multiple use, and environmental soundness within the landscape;
- c. Develop creative methodologies and economically sound innovative solutions to re-naturalize (rehabilitate) physically, geochemically and biologically impacted river systems. Research will be designed to provide the foundation needed to mitigate impacts at sites throughout the country.

2. Summarize a needs assessment conducted to justify the proposal. Please include how the assessment plan was developed or executed and the data derived from this effort.

Montana has 176,750 miles of rivers including the headwaters of the Columbia, Mississippi, and Saskatchewan river systems. It is estimated that 8,900 miles of Montana streams are in poor condition; over 1,300 miles are directly impacted by mining. In 2001, the 2,500 mile long Missouri River was ranked the most endangered river in the United States. Nationally, more than 235,000 river miles have been channelized, 25,000 miles dredged, and more than 600,000 miles are impounded behind dams. In Montana, over \$80 million is committed to re-naturalization of mining impacted streams in western Montana, and state and federal land management and fishery projects are spending over \$2 million on stream improvement annually. Similar numbers nationally are not available, however, it is anticipated that over the next century the United States alone will expend from state, private, and federal sources in excess of one billion dollars annually. For example, the CALFED project addressing river deterioration in the Sacramento Delta region of California spent \$195 million of joint state-federal dollars in 2001. CALFED plans to continue this effort for several decades. Current river restoration projects, though traditionally engineered, often lack a holistic systems approach. The *CRSSR* is designed to commit resources towards assessing outcomes of past, on-going, and future projects, and developing innovative and sound methodologies that will improve re-naturalization outcomes, maintain healthy streams, and improve cost benefit ratios.

Increasing the strength and competitiveness of interdisciplinary research programs has been shown to be an effective mechanism through which to enhance undergraduate and graduate education in the sciences, faculty numbers, university infrastructure, and economic development. The need for the proposed Center is based on the following conditions:

- A. Over the last century in Montana (three centuries in most of the United States and thousands of years in many areas of the world) streams have been manipulated to serve the growing population. Only

recently, the importance of streams as drivers of the biodiversity of landscapes has been acknowledged. As a result, efforts are being undertaken to restore streams, their fishery and floodplains. Work to date, however, has focused solely on stream channel design and mechanics. A holistic approach to stream re-naturalization including groundwater exchange, geochemical cycling, and establishment of appropriate ecological processes and systems is missing. In Montana alone, millions of dollars are being spent annually to rehabilitate rivers, yet long term consequences of rehabilitation efforts remain un-assessed.

- B. Nationally, over 900,000 miles of streams are impacted.
- C. The desire to re-naturalize impacted stream systems and maintain intact river systems from a state and national perspective provides The University of Montana with an opportunity to focus its wide and deep expertise to address these issues.
- D. It builds upon existing faculty strengths within The University of Montana System.
- E. It is a significant area of need within Montana with respect to graduate and undergraduate training in a nationally targeted, high-priority field of research and education.
- F. It recognizes that new technology needs to be developed to make river re-naturalization more affordable.

3. Explain how the program relates to the Role and Scope of the institution as established by the Board of Regents.

The Mission Statement of The University of Montana (2002) is:

The mission of The University of Montana-Missoula is the pursuit of academic excellence as indicated by the quality of curriculum and instruction, student performance, and faculty professional accomplishments. The University accomplishes this mission, in part, by providing unique educational experiences through the integration of the liberal arts, graduate study, and professional training with international and interdisciplinary emphases. Through its graduates, the University also seeks to educate competent and humane professionals and informed, ethical, and engaged citizens of local and global communities. Through its programs and the activities of faculty, staff, and students, The University of Montana-Missoula provides basic and applied research, technology transfer, cultural outreach, and service benefiting the local community, region, state, nation and the world.

The CRSSR objectives in research, teaching, and public outreach mesh with the mission of The University of Montana, especially in regard to its activities being recognized for excellence at the state, national, and international levels. The goal of the CRSSR is to provide the structure, network and resources that will enhance the research and educational activities of the University. The faculty associated with the CRSSR will hold positions in established units, such as Geology, Chemistry, Geography, Computer Science, the Division of Biological Sciences, the School of Forestry, the Montana Forest and Conservation Experiment Station, Geological Engineering, and the Montana Bureau of Mines and Geology, and will be linked to the Center by virtue of their shared research projects in riverine science. In this respect, the Center will also serve to advance the scholarly missions of the participating academic units. Strategically, the Center will be able to offer collaborative opportunities, access to instrumentation, mentoring, and programmatic funding that are critical to both attracting and supporting nationally competitive science faculty. Advantageously, these same factors that enhance research efforts, namely increased critical mass and expertise, will have an equally positive impact on graduate and undergraduate education. Center activities will result in "hands-on" training in field and laboratory techniques. It is hoped that the Center's success will result in additional support for undergraduate and graduate research, thus strengthening existing programs. Beyond the campus, the CRSSR will represent an important point of contact for local, state, and federal agencies, and state and national private industries.

4. Please state what effect, if any, the proposed program will have on the administrative structure of the institution. Also indicate the potential involvement of other departments, divisions, colleges, or schools.

The CRSSR will have little or no effect on the administrative structure of the institution. The CRSSR will be housed in and administered by the Department of Geology within the College of Arts and Sciences at The University of Montana. The interdisciplinary and multi-campus nature of the CRSSR requires the Director to report to the Vice-President for Research at the Missoula campus. Members of the Center will include researchers holding faculty appointments in the Department of Geology, Computer Science, Geography, Chemistry, Division of Biological Sciences, School of Forestry and the Montana Forest and Conservation Experiment Station at the Missoula campus, and the Department of Geological Engineering and the Bureau of

Mines and Geology at the Butte campus. In addition, cooperative affiliate partners will be sought from state and federal agencies, tribes and the private sector. The number and length of the associations will vary depending on the structure of collaborative projects. Figure 1 presents the Center structure within the institution.

5. Describe the extent to which similar programs are offered in Montana, the Pacific Northwest, and states bordering Montana. How similar are these programs to the one herein proposed?

Montana: *Montana State University* has a limited number of faculty pursuing teaching or research areas directly interfacing with this center proposal. It does not have a specific department, center, or institute dedicated toward research in riverine science. *Montana Tech of the University of Montana* and the *Montana Bureau of Mines and Geology* have faculty conducting research in areas related to riverine science. Appropriate faculty and departments are included as participants in the Center.

Idaho: *Idaho State University, University of Idaho and Boise State* do not have a specific department, center, or institute dedicated toward research in riverine science.

North Dakota: *North Dakota State University* does not have a specific department, center, or institute dedicated toward research in riverine science.

University of North Dakota does not have a specific department, center, or institute dedicated towards research in riverine science.

South Dakota: *South Dakota State University and the South Dakota School of Mines* does not have a specific department, center, or institute dedicated toward research in riverine science. *University of South Dakota* does not have a specific department, center, or institute on its main campus dedicated toward research in riverine science.

Utah: *Utah State University* does have a group that focuses on some aspects of riverine science. Dr. Jack Schmitt the program leader for the Watershed Science Unit has expressed interest in cooperating with *CRSSR*. *University of Utah* does not have a specific department, center, or institute on its main campus dedicated toward research in riverine science.

Washington: *Washington State University* does not have a specific department, center, or institute dedicated toward research in riverine science. *University of Washington* does not have a specific department, center, or institute dedicated toward research in riverine science. They do have the Quaternary Research Center that does address some aspects of riverine science.

6. Please name any accrediting agency(ies) or learned society(ies) that would be concerned with the particular program herein proposed. How has this program been developed in accordance with the criteria developed by said accrediting body(ies) or learned society(ies)?

The Center is being established with funding provided primarily by federal appropriations, research grants and contracts. The short and long-term research agenda will be recommended by the Science Oversight Committee that will be composed of five eminent scientists representing the multidisciplinary nature of the *CRSSR*. There will not be any agency or society accrediting the Center.

7. Prepare an outline of the proposed curriculum showing course titles and credits. Please include any plans for expansion of the program during its first three years.

The *CRSSR* does not include a curricular component. It should be noted, however, that it is very likely that faculty associated with the *CRSSR* will take an active role in introducing additional riverine science topics into the existing undergraduate and graduate curriculum. Center success will result in additional support for undergraduate and graduate research, thus strengthening existing programs. Graduate research opportunities associated with active Center faculty areas of interest are anticipated to be enhanced as external funding is obtained.

FACULTY AND STAFF REQUIREMENTS

1. Please indicate, by name and rank, current faculty who will be involved with the program proposed herein.

Departments/Schools participating in the Center from **Missoula and Butte Campuses**, and related expertise include:

Missoula Campus

College of Arts and Sciences

Geology (home of the Center),

- Geochemistry
- Hydrogeology
- Sedimentology
- Geophysics
- Fluvial Geomorphology

Division of Biological Sciences:

- Microbiology
- Ecology and Ecosystems
- Conservation Biology
- Stream Ecology-Biological Station
- Fluvial Geomorphology-Biological Station

Chemistry:

- Remediation Technology
- Biogeochemistry

Computer Science

- Modeling
- Visualization

Geography

- Paleoclimates
- Paleoecology

School of Forestry/ the Montana Forest and Conservation Experiment Station:

- Soil Chemistry
- Hydrology/Watershed Management
- Water, Riparian and Wetland Resources
- Remote Sensing and Management of Information Systems
- Ecology and Ecosystems

Butte Campus

Geological Engineering

- Geotechnical Engineering
- Hydrogeology
- Geochemistry

Bureau of Mines and Geology

- GIS
- Hydrology
- Hydrogeology
- Geochemistry
- Data Management

Current faculty committed to participate in the CRSSR:

Johnnie N. Moore (Professor, Department of Geology, CAS Missoula)
William W. Woessner (Professor, Department of Geology, CAS Missoula)
Mac Hendrix (Associate Professor, Department of Geology, CAS Missoula)
Steven Sheriff (Professor, Department of Geology, CAS Missoula)
Nancy Hinman (Associate Professor, Department of Geology, CAS Missoula)
Christine Brick (Adjunct Assistant Professor, Department of Geology, CAS Missoula)
Vicki Watson (Professor, Environmental Studies, CAS Missoula)
William Holben (Associate Professor, Division of Biological Sciences, CAS Missoula)
Frank Rosenzweig (Professor, Division of Biological Sciences, CAS Missoula)
James Gannon (Professor, Division of Biological Sciences, CAS Missoula)
Matthias Rillig (Assistant Professor, Division of Biological Sciences, CAS, Missoula)
Mike DeGrandpre (Associate Professor, Department of Chemistry, CAS Missoula)
Ed Rosenberg (Professor, Department of Chemistry, CAS Missoula)
Jack Stanford (Professor, Division of Biological Sciences-Biological Station CAS Missoula)

Rich Hauer (Professor, Division of Biological Sciences-Biological Station, CAS Missoula)
John Kimball, (Research Assistant Professor , Division of Biological Sciences- Biological Station, CAS Missoula)
Mark Lorang (Research Assistant Professor, Division of Biological Sciences-Biological Station, CAS Missoula)
Bonnie Ellis (Research Specialist- Division of Biological Sciences-Biological Station, CAS Missoula)
Don Morton (Associate Professor, Department of Computer Science, CAS, Missoula)
Ray Ford (Professor, Department of Computer Science, CAS, Missoula)
Eric Edlund, Assistant Professor, Geography, CAS, Missoula
Don Potts (Professor, School of Forestry and MFCES, Missoula)
Scott Woods (Assistant Professor, School of Forestry and MFCES, Missoula)
Michael Merigliane (Research Scientist, MFCES, Missoula)
Donald Bedunah (Professor, School of Forestry and MFCES, Missoula)
Tom DeLuca (Associate Professor, School of Forestry and MFCES, Missoula)
Willis Weight (Professor, Geological Engineering, Butte)
Chris Gammons (Associate Professor, Geological Engineering, Butte)
Marvin Miller (Assistant Director of Programs and Research Professor, Montana Bureau of Mines and Geology, Butte)
Ted Duane (Senior Hydrogeologist, Montana Bureau of Mines and Geology, Butte)
John Metesh (Senior Hydrogeologist, Montana Bureau of Mines and Geology, Butte)

Administratively:

The Vice President for Research will appoint a Center director in consultation with the active faculty within the Center, the Center Scientific Oversight Committee and the Chair of Geology. The Director position will begin as half time and may expand to full time if success of the Center outside funding requires full-time attention for operation of the Center. An Associate Director position funded with outside dollars will be created if sufficient research is ongoing. In addition, the Center will have a 0.5 FTE administrative assistant to attend to the daily operation and needs of the center. Administrative staff time will increase if funding warrants.

The Center Scientific Oversight Committee will be composed of five distinguished researchers representing the geological, hydrological, biological, chemical and engineering aspects of riverine sciences. This group will review Center objectives and assists in focusing research on key aspects of riverine science. Their terms will be for three years.

Cooperating Affiliates invited to participate.

Researchers and Associated Institutions:

Seith Makepeace, The Confederated Salish Kootenai Tribes
Chris Hunter, Fisheries Division Administrator, MTFWP
Inland Northwest Research Alliance, Inc. (INRA), Idaho Falls, ID in conjunction with Intermountain National Environmental Engineering Laboratory (INEEL), Idaho Falls, ID
(Support via. President Denison-Board of Directors)
Kate White, US Army Cold Regions Research and Engineering Laboratory, Hanover, NH
Samuel Luoma, US Geological Survey National Research Program, Menlo Park, CA (Riverine Ecology and Bio Geochemistry)
Mavrik Zavarin, Lawrence Livermore National Laboratory, Livermore, CA (Geochemical modeling)
Jack Schmitt, Watershed Science Unit, Utah State University (Fluvial Geomorphology, River Mechanics)
Skip Roquist, Lolo National Forest, Missoula
Bob Davis, Chief, Water Resources Division, U.S. Geological Survey, Helena

Private Companies and Organizations:

Thomas Osborne, Hydrosolutions, Environmental Consulting, Billings.
Ross Miller, Land and Water Consulting, Environmental Consulting, Missoula, Kalispell, Helena
Eric Smart, MCS Environmental, Environmental Consulting, Missoula
Bill Clark, Maxim Technologies, Inc., Environmental Consulting, Missoula, MT
David Donohue, Tetra Tech, Inc., Environmental Consulting Helena
Mark Rotar, Interfluve, River Restoration, Bozeman

2. Please project the need for new faculty over the first five-years of the program. Include special qualifications or training. If present faculty are to conduct the new program, please explain how they will be relieved from present duties.

The *CRSSR* is not designed with the intention of having its own faculty, but rather to link faculty from a variety of departments, research stations and bureaus that share research interests in riverine science. All of the participating researchers from The University of Montana System will hold faculty or research positions in established university research stations or bureau units. Decisions regarding the division of effort between instruction/research, scholarly activity, and service will be a function of that unit. Professional time devoted to *CRSSR* activities would, for the most part, fall under the category of scholarly activity. Indeed, the resources and collaborative opportunities afforded through the *CRSSR* are there for the express purpose of enhancing faculty research.

The Director position is assumed to initially be a current faculty member who will be released from his/her academic duties and partially supported over the summer semester. The University will provide support to the department corresponding to 0.5 FTE release time.

3. Please explain the need and cost for support personnel or other required personnel expenditures.

As stated in the previous section, the Director position is assumed to initially be a current faculty member who will be released from his/her academic duties and partially supported over the summer semester. The University will provide support to the department corresponding to 0.5 FTE release time. The 0.05 FTE Administrative Assistant will handle daily operations including routine record keeping and correspondence for the *CRSSR*. That person will also assist with Center-specific projects, such as invited speakers, conferences, web pages, and public outreach information.

A modest budget for support personnel, the director (0.5 FTE) and administrative assistant (0.5 FTE), is supplied by the Office of the Vice President for Research and Development in Year 1 and by grants and contracts for the following years. Year one commitment is \$75,072. Following years are budgeted at \$110,409 and \$114,435, respectively; these funds derived from grants and contracts.

CAPITAL OUTLAY, OPERATING EXPENDITURES, AND PHYSICAL FACILITIES

1. Please summarize operating expenditure needs.

	<u>Year 1</u>	<u>Year2</u>	<u>Year 3</u>
Capital Outlay:	\$10,000	\$10,000	\$10,000
Personnel	\$49,072	\$80,409	\$84,435
Operating Expenses	\$16,000	\$20,000	\$20,000

2. Please evaluate library resources. Are they adequate for operation of the proposed program? If not, how will the library need to be strengthened during the next three years?

Research within the *CRSSR* is multidisciplinary with literature needs that overlaps with those routinely required for general programs in geology, geography, chemistry, biology, ecology and certain areas of engineering. As such, the scientific journals relevant to its research mission are those that address current topics in these fields.

CRSSR researchers will work with University library staff to advocate for and to acquire funding for the expansion of electronic subscriptions that support research within the riverine sciences at UM. Center resources will be allocated to aid the library in acquisition journals and monographs supportive of Center research.

3. Please indicate special clinical, laboratory, and/or computer equipment that will be needed. List those pieces of equipment or computer hardware presently available in the department.

The University of Montana Missoula and Butte campuses are well outfitted to support the goals of the *CRSSR*. It has a strong laboratory system, data processing capability and experience assessing river systems. Current analytical facilities include: Murdock Environmental Biogeochemistry Laboratory and the Bureau of Mines Analytical Laboratory that are to designed to run high volumes of water and sediment geochemical samples.

The MBMG Analytical Laboratory is certified to analyze water samples from public water supplies by the Montana Department of Public Health and Human Services, which is the agency that performs such certifications for the USEPA in Montana. There is also a joint Geology-DBS Field Research Center at Fort Missoula housing temperature control chambers and facilities to build and maintain sophisticated field instruments. A 5400 GEOPROBE and a Mobil Auger Rig are also owned and operated by the University. Standard modern geophysical equipment, survey and GPS tools are available in the Department of Geology. GIS, remote sensing, and data interpretation tools are accessible through individual departments, the Biological Station and Numerical Terradynamic Simulation Group, School of Forestry and the Montana Forest and Conservation Experiment Station, and through the Bureau of Mines and Geology. The Bureau of Mines and Geology is experienced in operating and maintaining large environmental data sets and will most likely provide such services to the Center.

Though no new research or computational equipment is being requested, *CRSSR* will work closely with other participating departments to fund the acquisition of resources that will enhance both research and instruction in the field of riverine science. The Center, in cooperation with its participating faculty, will access the Scientific Computing Laboratory and the Access Grid Node (AGN) operated by the Department of Computer Science at the UM campus. With the Access Grid Node, it is now possible to interact with experts in various fields remotely.

4. Please describe facilities and space required for the proposed program. Are current facilities adequate for the program? If not, how does the institution propose to provide new facilities?

Other than a shared office space for the Director and administrative assistant (provided by the Department of Geology), no specific additional office or laboratory space has been directly assigned to the *CRSSR*. All of the participating faculty have research and office space as assigned by their respective academic units. There is already a significant need for additional research space on campus and it is anticipated that even more space will be needed as the research productivity of the *CRSSR* investigators grows. The *CRSSR* will proactively help and contribute its scientific critical mass to campus efforts aimed at securing external funding for the construction of research facilities. It would be ideal if a core of riverine researchers could be housed in adjacent offices, as this would enhance the exchange of ideas and the Center's productivity. The Center director will promote this vision as new construction and building renovations are being considered on the Missoula Campus.

EVALUATION OF PROPOSED BUDGET

1. Please name faculty committees or councils that have reviewed and approved the program herein proposed

This proposal has been reviewed and approved by the Dean of the College of Arts and Sciences, Dean of the School of Forestry, Associate Dean of Biological Sciences, Vice President for Research and Development, Vice President of Information Technology, Provost and Vice President for Academic Affairs, the Faculty Senate, and the President of the University.

2. If outside consultants have been employed, please list the names of these consultants, their current positions, and titles. Append copies of their written reports (this is required of new doctoral programs).

Outside consultants have not been employed. The Center has been supported by outside private industry, state and federal agencies (see list of affiliated parties in section 1)

**Budget Narrative:
Expenditures**

Year 1 Expenditures have been committed by the Vice President for Research and Development from non – state dollars.

Year 2 and Year 3 expenditures will be derived from appropriation, grant and contract revenues.

Personnel and Fringe Benefits: 0.5 FTE director.

Costs are based on 0.5 FTE Full Professor buy out of teaching one course each semester and ½ time summer support for Year 1. Years 2 and 3 will be supported by external funding with review of support levels by the Office of the Vice President for Research. Years 2 and 3 are calculated as a ½ buy out of teaching, research and mentoring responsibilities (9 month academic year yields \$35,500, Fringe for 9 months at 22.5%, \$7988

and 50% of insurance costs, \$1652); then one-half time summer support (at \$11, 850, with a fringe of 22.5%, \$2,666).

0.5 FTE administrative assistant position based on UM Grades Scales (fringe covers benefits and insurance).
Years 2 and 3 will be supported by external funding with review of support levels by the Office of the Vice President for Research.

Operating Expenses:

Travel of Director to Washington, D. C. and appropriate meetings with local, state, federal and private funding agencies; Travel to Missoula for Scientific Oversight Committee once a year.

Communication: Phone, Mail, Internet Connects. Reproduction of Center Proposals

Materials and Supplies: Office supplies.

Capital Outlay:

Library \$10,000 to assist with electronic subscriptions that supports the Center

Revenues

Year 1 University of Montana Direct Support-Office of the Vice President for Research and Development

Years 2 and 3 Direct Federal Appropriation and other new grant and contract support (3 to 5 year reoccurring).