

MSU INVESTMENT PROPOSAL FOR INSTITUTIONAL PRIORITIES

PROPOSAL OVERVIEW

Title	'Mountains and Minds' First Year Engagement Initiative: Building a Sense of Place Through Discovery in the Greater Yellowstone GeoEcosystem	Request Date	December 16 th , 2011
Department	Earth Sciences	Email	scuster@montana.edu
Requestor	Dr. Stephan Custer	Phone	406 994-6906

STRATEGIC ALIGNMENT

<p>Core Themes and Objectives (check all that apply)</p>	<p>Educate Students</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Our graduates will have achieved mastery in their major disciplines <input checked="" type="checkbox"/> Our graduates will become active citizens and leaders <input type="checkbox"/> Our graduates will have a multicultural and global perspective <input checked="" type="checkbox"/> Our graduates will understand the ways that knowledge & art are created and applied in a variety of disciplines <input checked="" type="checkbox"/> Our graduates are prepared for careers in their field <input checked="" type="checkbox"/> We will provide increased access to our educational programs <input checked="" type="checkbox"/> Communities and external stake holders benefit from broadly defined education partnerships with MSU <p>Create Knowledge and Art</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Students, faculty, and staff will create knowledge and art that is communicated widely <p>Serve Communities</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> We help meet a fundamental need of the citizens of Montana by providing degree programs for our students <input checked="" type="checkbox"/> We help meet the educational needs of the citizens of Montana by providing a wide range of educational opportunities to a variety of students <input checked="" type="checkbox"/> Our students, faculty, staff, and administrators reach out to engage and serve communities <input checked="" type="checkbox"/> Our students, faculty, staff, and administrator reach in to build the university community <p>Integrate Learning, Discovery, and Engagement</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Each graduate will have had experiences that integrate learning, discovery and engagement <input checked="" type="checkbox"/> Outreach activities will educate students and address the needs of the communities we serve <input checked="" type="checkbox"/> Students, faculty, and staff will create knowledge and art that addresses societal needs <input checked="" type="checkbox"/> MSU is a community that will be characterized by synergy within and across disciplines, roles and functions. <p>Stewardship</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> The public trusts the institution to operate openly and use resources wisely <input checked="" type="checkbox"/> The faculty and staff are well-qualified and supported <input checked="" type="checkbox"/> MSU will support Native American students, programs, and communities <input checked="" type="checkbox"/> MSU will be an inclusive community, supporting and encouraging diversity <input checked="" type="checkbox"/> Our publicly provided resources are used efficiently and effectively <input checked="" type="checkbox"/> Natural resources are used efficiently and sustainably <input checked="" type="checkbox"/> MSU nurtures a culture of resource conservation and ecological literacy among students, faculty and staff <input type="checkbox"/> Our physical infrastructure (e.g., building, equipment, open spaces) will be well-maintained and useful
---	--

INSITUTIONAL BENEFIT						
Campuses	<input checked="" type="checkbox"/> Bozeman <input type="checkbox"/> Billings <input type="checkbox"/> Havre <input type="checkbox"/> Great Falls <input type="checkbox"/> FSTS <input type="checkbox"/> Extension <input type="checkbox"/> MAES					
Cross Depts	Please List: ___Earth Sciences, Ecology, LRES, Political Science, Chemistry, and Institute on Ecosystems and Thermal Biology Institute.					
TIMEFRAME						
Proposed Dates	Start:		End:			
COST AND REQUIREMENTS						
Funding Type	One-Time (\$)	Multi-Year (\$)			Base (\$)	FTE
		Year 1	Year 2	Year 3		
Personnel (w/benefits)		31,277	31,277	31277		0.2667(adju nct only)
Materials & Supplies	20,000					
Travel		35,000	35,000	35,000		
Contracted Services	Faculty Stipends	20000	20000	20000		
Capital						
Other Operations	27,125 (assess.)	7285	7285	7285		
TOTAL	47,125	93,562	93,562	93,562		
Please comment, if necessary, regarding cost and requirements.	<p>One Time Only Expenses. Includes field instrumentation and equipment (e.g. infrared thermometers, compasses, hand lenses, portable microscope, rock hammers, portable mass spec., etc.). Initial budget of ~\$10,000 to acquire equipment, replacement/enhancement budget of ~\$5000 for years two and three.</p> <p>Assessment expenses (\$27,125) are estimated at 10% of total budget (NSF standard rate). No Base funding is requested in the proposal although we anticipate a transition to a permanent base funding model if assessed objectives are met at completion of the three year pilot.</p> <p>Annual Expenses. Includes faculty stipends for field experience mentoring and instruction (ten interdisciplinary faculty, one week at \$2000 each), Field experience coordinator (\$7000 + 25% benefits), temporary administrative support (\$5000), extra section of Yellowstone EARTH 212R course (\$8000 + 25% benefits) to accommodate 50 additional students (100 total), and \$7527.15 for a teaching assistant for the additional three laboratories required (includes tuition waiver).</p> <p>Travel expenses for 100 students include two charter busses for three days each (\$6000), Three motor pool vehicles for faculty exchange, logistical support and emergency transport at about \$500 each. Lodging for two nights at \$100/student (\$10,000 total) and meals for three days at ~\$25/day (~\$7500 total).</p> <p>Speaker/Guest researcher travel support for approximately five visiting scientists, scholars, or artists totals ~\$10,000. Development and maintenance of the student research results and service web site is estimated at ~\$5000/year.</p>					

PROPOSAL SCOPE

Describe the Proposal

We propose to develop an innovative first-year experience to engage incoming students in the excitement of discovery through an interdisciplinary exploration of the unparalleled natural laboratory surrounding Montana State University. The academic and scientific identity of our campus is defined by the Greater Yellowstone Ecosystem that surrounds us and the culture of curiosity it engenders. This twin ideal of place and intellectual engagement is embodied by the MSU motto, *Mountains and Minds – we are a mountain university!* The motivation for this project is to foster this identity in first-year students starting with an interdisciplinary, inquiry-based field experience *before* their first classes and continuing through an integrative first-year Core 2.0 research course (RN) with service-learning modules that would build on the field experience. The central goals of this initiative are to increase student engagement, motivation and retention through field-based discovery. The efficacy of this approach is directly supported by solid evidence that place-based learning plays a key role in recruitment and retention of students, and particularly students from under-represented groups (Semken 2005, Williams and Semken 2011). We will broaden the reach of the initiative by developing web-based exploration modules that will bring Yellowstone discovery to students throughout Montana and the nation.

The Mountains and Minds initiative is fundamentally interdisciplinary and is supported by several of the most active field-based departments and institutes at MSU. The student experience will span the sciences, social sciences, the arts and humanities so that students develop a holistic appreciation for the interaction between the landscape and people in our region. Teams of experts from Earth Sciences, LRES, Ecology, Political Science, the Montana Institute on Ecosystems, and the Thermal Biology Institute, among others, will lead the initial field trip and follow-up course "Yellowstone: A Scientific Laboratory".

This initiative addresses University Priorities outlined in the mission statement and the evolving strategic plan: 1) increasing retention through early engagement in our place-based culture of discovery, (2) integrating learning, discovery and engagement to connect students to their University and community, and (3) enhancing interdisciplinary education and cooperation in research. Evidence shows that students who participate in exciting, cutting-edge field and laboratory experiences led by leading scholars connect more strongly with their institutions, succeed in school and are more likely to graduate and find success in careers (e.g. Astin 1997, Kenny et al. 2001, Kuh 2008). *Early engagement is critical.* The Mountains and Minds initiative begins with an interdisciplinary field experience to connect students to the MSU academic identity; for incoming students this will be an exploration of Greater Yellowstone through hands-on field discovery. The primary purpose of the field experience is to engage students early in their college experience, help them gain ownership over their education, and be inspired to pursue studies in the natural sciences and related fields. Enhanced retention is a measurable outcome that we will assess.

Why an introductory field experience? The joy of discovery in the field is commonly a transformative experience. One of the most important roles of field trips in the learning process is in the "direct experience with concrete phenomena and materials" (Orion 1993). Boyle et al (2007) report that most students enjoy the social aspects of doing field work. Students generally report that they have a positive view towards field work, and concerns about learning methods in the field (especially group work) can be mitigated by a positive field learning experience (Kempa and Orion 1996, Boyle et al. 2007). Additionally, many field scientists assert that well-designed field experiences are an effective means to recruit students to the Earth science majors (Kern and Carpenter 1984, 1986, Karabinos et al. 1992, McKenzie et al. 1986).

Description

We propose to develop a 3 year program with a built-in assessment component and a plan for sustainability if the program proves successful in meeting its objectives. The main components of the program are outlined below:

- 1) A multi-department Yellowstone field experience for incoming students;
- 2) Expansion of a popular interdisciplinary Core 2.0 four-credit research course (RN) "Yellowstone: A Scientific Laboratory"
- 3) A student-led service program focused on stewardship and service in communities surrounding Yellowstone, and;
- 4) A continually updated web-based curricula documenting the discovery and learning experience.

Field Experience: Place-Based Exploration of Science, Policy and People in the Greater Yellowstone GeoEcosystem

The field experience would bring together top scientists from departments that span a wide spectrum of disciplines at MSU: Earth Sciences, Ecology, Land Resources and Environmental Sciences, Chemistry, Political Science, History and Philosophy, to lead a field course that highlights key science, policy and cultural features of the Yellowstone landscape and surrounding communities. This course would capitalize on five core strengths of Montana State University: 1) Greater Yellowstone's unparalleled natural and cultural laboratory and the wealth of research aimed at understanding the rich natural history, politics and unique mountain culture of this area; 2) establishment of the Montana Institute on Ecosystems and the attendant momentum to increase interdisciplinary research; 3) the high degree of undergraduate involvement in field-based scientific research with faculty who are leaders in their fields; and 4) broad campus-wide interest in developing a coherent undergraduate curriculum focused on sustainability; 5) EPSCoR-funding to the IoE to develop in-service internships focused on the environment and sustainability.

The field experience would consist of a three day trip in and around Yellowstone to some of the most renowned natural features linked to current research at MSU. Examples of these sites and associated research topics include: the Yellowstone caldera and features associated with past supervolcanic eruptions as well as surrounding Laramide Mountains, providing the bedrock template for life in Yellowstone; mountain landforms and environments shaped by previous glaciations; thermal pools where extensive research is underway to develop alternative energies, medicinal products and investigating the diversity of life and the possibility of life in other extreme environments in our solar system; Yellowstone's Northern Range where the recent reintroduction of wolves is providing new insights into the role of top predators in large protected areas;; fire threats at the wildland-urban interface; and debates about conservation of keystone species in and outside of Yellowstone among many others. The course would also explore the politics and culture of the communities surrounding Yellowstone and the resource management issues unique to mountain settings of the western US and elsewhere. In the first year of the program, peer mentors will be identified and trained to help incoming students successfully navigate the undergraduate experience. These peer mentors will play an active role in subsequent years of the field laboratory experience.

We propose that the first-year field experience would be open to incoming students interested in pursuing studies in the natural and political sciences and would target underserved populations who have historically experienced poor retention rates. The field trip would serve to promote a mentoring ladder between the incoming student cohort group, peer mentors, and professors. Following the field course, students would be invited to visit faculty laboratories to see laboratory research underway and explore possibilities of becoming involved in faculty research. Active field and laboratory discovery of leading scientific pursuits would encourage students to pursue further study in the natural sciences by participating in research at MSU and through their choice of major and associated curricula.

Expanding the scope and availability of popular fall class on Yellowstone: "Yellowstone: A Scientific Laboratory"

The new Montana Institute on Ecosystems provides great momentum for interdisciplinary research and education and one objective of our proposal is to further this momentum by institutionalizing interdisciplinary research and education through the proposed program. A key component of this effort would link the field experience with an expansion of a popular interdisciplinary course "Yellowstone: A Scientific Laboratory" a four-credit Core 2.0 research course centered on the unique science, policy, and human aspects of Yellowstone and its surrounding communities. We propose to open a second section of this course. As a mountain university (*Mountains and Minds*), we have an opportunity and a responsibility to educate students about the qualities that make our setting unique, the natural environment and the culture and politics of mountain communities. Increasing access to 'Yellowstone: A Scientific Laboratory' would allow students who participate in the field experience to expand and build upon topics introduced by faculty, allowing for a rigorous and more in-depth exploration of key topics – coupling the field experience with rigorous intellectual inquiry and self-directed research – 'Mountains and **Minds**'. Additionally, this would further link students with faculty conducting research related to sustainability and cutting-edge science in the Greater Yellowstone Area, an important objective of this initiative.

Student-led service program focused on stewardship and service in Montana communities

A third component of this program would be to couple with the IoE initiative to increase student involvement in service learning through internships focused on sustainability, stewardship and service in the region. Students completing the field program would be offered the opportunity to participate in the IoE led internship program on projects that directly benefit the needs of mountain communities surrounding Yellowstone and Montana State University. The theme of the program would be centered on a broader idea of stewardship and sustainable communities. An example of a project that is already underway is the development of web-based Virtual Trail Guides that distill multi-disciplinary research on different areas of Yellowstone in a format that is easily accessible for students, parents, and the general public to discover science and more deeply engage in learning about the science of Yellowstone (see an example: <http://serc.carleton.edu/37967>).

Creation of web-based curricula, learning modules and documentation of the discovery and learning experience

Education and learning is experiencing a paradigm shift that is helping to create broader communities of learning through distance and online curricula. The development of distance and online learning benefit rural, underserved and adult populations by creating new opportunities to engage in learning, acquire new skills and advance professional goals. Likewise, access to education and learning is limited for many Montana communities and populations. A fundamental component of the Mountains and Minds program is to provide access to learning through the development of online learning modules that focus on science, policy and management, and human-dimension topics discussed in the field experience and first-year seminar. This approach is critical for providing opportunities for distance learning and access to ongoing research for students from all over Montana, and is increasingly becoming a cornerstone in science and laboratory learning in science, technology, engineering, and mathematics, (STEM) sciences. Examples include the Earthlabs and InTegrate, two web-based efforts to increase geoscience literacy and the number of students pursuing science majors and to training and preparation students to become future scientists capable of addressing important societal issues (<http://serc.carleton.edu/index.html>).

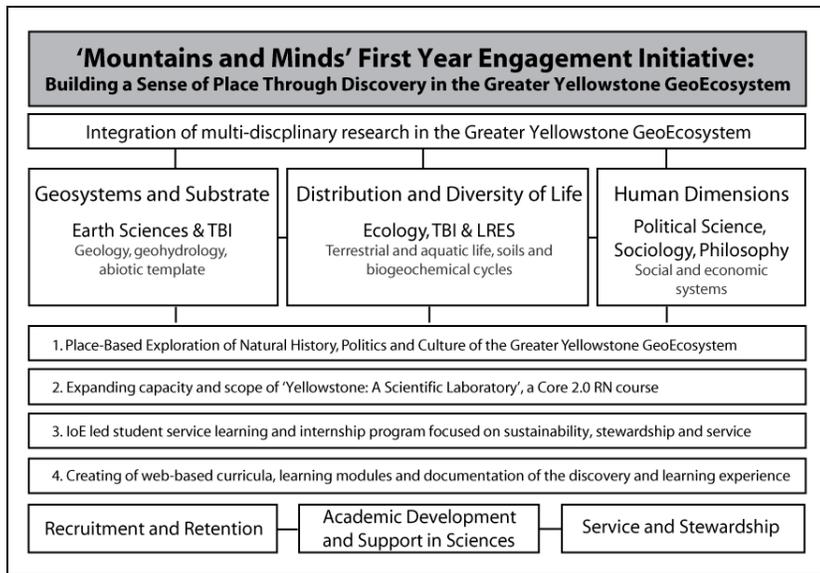


Figure 1. Overview of proposed 'Mountains and Minds' First-Year Engagement Initiative.

PROPOSAL SCOPE

Describe the broader impacts and benefits of this proposal

Broader Implications, Benefits and Outcomes

Field experiences linked to cutting-edge science have been shown to engage and connect students who might otherwise chose to prematurely end their program of study. An increasing body of research demonstrates a strong link between student involvement in field based laboratory curricula and student success, retention and professional achievement (Orion 1993, Kempa and Orion 1996, Boyle et al. 2007). We believe a three-day field experience will increase retention, especially for underserved populations (Semken 2005, Williams and Semken 2011). By coupling the field experience with opportunities to pursue more in-depth investigations of research topics in the 'Yellowstone: A Scientific Laboratory' research course, this program both engages students in place-based learning and promotes academic inquiry. It would showcase the excellent science being conducted at MSU in a setting that is recognized globally as a scientific laboratory. In doing so, the course would help students gain an appreciation and ownership of their educational experience *through a strong identity with MSU's natural environment*.

MSU has been involved in cutting-edge research that is directly related to the natural environment of Yellowstone and many faculty members have increasingly involved undergraduate students in this research. Despite this, retention rates are still low and underserved populations are often poorly connected to the University, fellow students and the unique setting that surrounds them. Faculty across departments testify to field experiences as *foundational experiences* that captured their interest and inspired them to pursue careers in the natural sciences. We believe this type of field experience would not only engage young students, grounding them at MSU, but would also serve to increase ownership of their educational experience and help motivate them towards careers in the sciences, while at the same time addressing chronically low retention rates. The multifaceted Mountains and Minds program will help address key institutional priorities and goals that center on: science education, stewardship and service. The express goal of this program is to increase recruitment and retention by creating strong links between students and their cohorts and faculty, educate students through integrative, learning discovery and engagement and provide a long-term and provide opportunities to contribute directly to the enhancement of surrounding communities through service and stewardship and peer to peer mentoring.

References Cited

- Astin, A. W. 1997. What Matters in College?: four Critical Years Revisited. New York: Jossey-Bass.
- Boyle, A., Maguire, S., Martin, A., Milson, C., Nash, R., Rawlinson, S., Turner, A., Wurthmann, Sl., and Conchie, S., 2007, Fieldwork is good: the student perception and the affective domain. Journal of Geography in Higher Education, v. 31, 299-317.
- Karabinos, P., Stoll, H. M., and Fox, W. T., 1992, Attracting students to science through field exercises in introductory geology courses, Jour. Geol. Education, v. 40, 302-305.
- Kenny, S. S., B. Alberts, W. C. Booth, M. Glaser, C. E. Glassick, S. O. Ikenberry, K. H. Jamieson, R. M. O'Niel, C. Reid-Wallace, C.-L. Tien & C. N. Yang. 2001. Reinventing Undergraduate Education: A Blueprint for America's Research Universities, Boyer Commission Report on Educating Undergraduates in the Research University., 46. Stony Brook.
- Kempa, R. F., and Orion, N., 1996 'Students' Perception of Co-operative Learning in Earth Science Fieldwork Research in Science and Technological Education. v. 14(1), 33-41.
- Kern, E. and Carpenter, J., 1984, enhancement of student values, interests and attitudes in earth science through a field - oriented approach, Jour. of Geol. Education, v 32, p. 299-305.
- Kern, E., and Carpenter, J., 1986, Effect of field activities on student learning, Jour. of Geol. Education, v. 34, p 180-183.
- Kuh, G. D. 2008. High-Impact Educational Practices. American Association of Colleges and Universities.
- McKenzie, G. D., Utgard, R. O., and Lisowski, M., 1986, The importance of field trips a geological example, Jour. College Science Teaching, Sept/Oct., p. 17-20.
- Orion, N., 1993, A model for the development and implementation of field trips as an integral part of the science curriculum, School Science and mathematics, v. 93, p. 325-331.
- Semken, S., 2005, Sense of place and place-based introductory geoscience teaching for American Indian and Alaska native undergraduates, Jour. of Geoscience Education, v. 53, p. 149-157.
- Seymour, E., 2000, Talking About Leaving, Why Undergraduates Leave the Sciences, Jossey-Bass/
- Williams, D., and Semken, S., 2011, Ethnographic methods in analysis of place-based geosciences curriculum and pedagogy. Geol. Soc. Amer., Special Paper 474, p 49-62.

ADDITIONAL INFORMATION**Implementation Plan** *(Please describe with timelines)*

Spring 2012: Hire Chief coordinator and hourly to begin organizing field experience. Invite faculty from all departments to participate in leading 3 day field course and to participate as student mentors, guest speakers for fall 2012 'Yellowstone: A Scientific Laboratory' course.

Summer 2012: Plan and organize field course syllabus, logistics, itinerary and communicate with Park personnel and relevant agencies.

August 2012: Conduct 3 day field experience.

Fall semester 2012: Expand offering for EARTH 212: 'Yellowstone: A Scientific Laboratory' by offering a second section of this course (currently fills at 42 students). Hire hourly to begin implementing assessment program. Identify student mentors for 2013 field course. Recruit students for IoE service learning internships.

Spring 2013: Analyze assessment survey data. Begin planning for 2013 field course. Expand on number of students participating and recruit from different departments and underserved student body.

Summer 2013: Plan and organize field course syllabus, logistics, itinerary and communicate with Park personnel and relevant agencies.

August 2013: Conduct 3 day field experience.

Fall semester 2013: Continue to offer second section of EARTH 212: 'Yellowstone: A Scientific Laboratory' if two sections enrolled during first year of program. Hire hourly to begin implementing assessment program. Identify student mentors for 2013 field course. Recruit students for IoE service learning internships.

Spring 2014: Continue to analyze assessment survey data. Begin planning for 2013 field course. Expand on number of students participating and recruit from different departments and underserved student body.

Summer 2014: Plan and organize field course syllabus, logistics, itinerary and communicate with Park personnel and relevant agencies.

August 2014: Conduct 3 day field experience. Assess the outcomes of 3-year program and discuss continuation and expansion of program.

Assessment Plan *(Please describe with indicators)*

A variety of formative, summative and longitudinal assessment instruments will be used to monitor impacts of the field program on students' professional development. These include: pre- and post-event surveys such as the VASS and Science Motivation Questionnaire to determine students' interests and motivations to learn science; embedded assessments during the field trip such as observational and interview protocols; and journaling and reflective writing activities during and immediately after the field trip to help students explore personal interests, attitudes and values that can then be aligned with follow-up mentoring activities. Summative assessments will be utilized at the end of the field trip, and for students enrolled in the associated course, to determine learning gains from the field experience (e.g. a modified Student Assessment of Learning Gains [SALG] instrument). Longitudinal assessments will be done for all students who participated in the field program to track their academic trajectories through their careers at MSU, with particular attention to factors that helped students to decide on a major or possibly leave college (e.g. Seymour 2000).

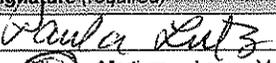
If assessed objectives are not met in the timeframe outlined, what is the plan to sunset this proposal?

The goals, objectives and implementation of this proposal are easily modified. If assessed objectives and goals are not met the field experience will no longer be offered and a second section of the popular course "Yellowstone: A Scientific Laboratory" can be closed. Additionally, participation in the service learning and internship component of the proposal can easily be reduced.

"Mountains & Minds": 1ST Year Engagement Initiative --
 Building a Sense of Place Through Discovery in the
 Greater Yellowstone Ecosystem

ESCI #1

Formatted: Font: (Default) Arial, 10 pt, Bold

SIGNATURES		
Department Head (please print)	Signature (required)	Date
Stephan G. Custer		23 December 2011
Dept Head Priority (please circle one):	Very High High Medium Low Very Low	
Dean/Director (please print)	Signature (required)	Date
Paula Lutz		1-3-12
Dean/Director Priority (please circle one):	Very High High Medium Low Very Low	
Executive/VP (please print)	Signatures (required)	Date
Executive/VP Priority (please circle one):	Very High High Medium Low Very Low	