

MONTANA BOARD OF REGENTS

LEVEL I REQUEST FORM

Item No.:	135-1009+R0507	Date of Meeting:	May 30-June 1, 2007
Institution:	The University of Montana - Missoula		
Program Title:	Field Ecology Option In Biology		

Level I proposals are those that may be approved by the Commissioner of Higher Education or the Commissioner's designee. The approval of such proposals will be conveyed to the Board of Regents at the next regular meeting of the board. The institution must file the request with the Office of the Commissioner of Higher Education by means of a memo to the Deputy Commissioner.

A. Level I action requested (check all that apply): Level I proposals include campus initiatives typically characterized by (a) minimal costs; (b) clear adherence to approved campus mission; and (c) the absence of significant programmatic impact on other institutions within the Montana University System and Community Colleges.

- 1. Re-titling existing majors, minors, options and certificates; (e.g. from B.S. in Mechanized Agriculture to B.S. in Agricultural Operations Technology);
- 2. Eliminating existing majors, minors, options and certificates via a Program Termination Checklist;
- 3. Adding new minors or certificates where there is a major;
- 4. Adding new minors or certificates where there is an option in a major;
- 5. Departmental mergers and name changes;
- 6. Program revisions; and
- 7. Distance delivery of previously authorized degree programs.

B. Level I with Level II documentation: With Level II documentation circulated to all campus chief academic officers in advance, the Commissioner or designee may propose additional items for inclusion in the Level I process. For these items to move forward, the Commissioner or designee must reach consensus with the chief academic officers. When consensus is not achieved, the Commissioner or designee will move the item to the Level II review process.

- 1. Options within an existing major or degree;
- 2. Eliminating organizational units within larger institutions such as departments, divisions and colleges or schools *with the exception of the five Colleges of Technology where changes require Board action;*
- 3. Consolidating existing programs and/or degrees.

C. Temporary Certificate or A.A.S. degree programs: Certificate or Associate of Applied Science Degree Programs may be submitted as Level I proposals, with memo and backup documentation, when they are offered in cooperation with and/or at the request of private or public sector partners and the decision point to offer the program is not consistent with the regular Board of Regents program approval process. Level I approval for programs under this provision will be limited to two years. Continuation of a program beyond the two years will require the normal program approval process as Level II Proposals.

All other Certificate or Associate Degree programs may be placed on submission at any Board of Regents meeting. They will be placed on action agendas at subsequent meetings. All campuses agree to insure that all other campuses receive program information well in advance of submission.

Item No.: 135-1009+R0507	Institution: The University of Montana - Missoula
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Specify Request:

The University of Montana – Missoula requests permission to establish a “Field Ecology” option in Biology using lecture and laboratory courses on campus and field courses at Flathead Lake Biological Station. Whether on campus or at the biological station, all courses are already being taught on a regular basis.

MONTANA BOARD OF REGENTS

NEW ACADEMIC PROGRAM PROPOSAL SUMMARY

Item No.: 135-1009-R0507	Institution: The University of Montana - Missoula
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1. How does this program advance the campus' academic mission and fit priorities?

The overall mission of the Montana University system is to "prepare students for success by creating an environment of ideas and excellence that nurtures intellectual, social, economic, and cultural development." This mission is enhanced by the Field Ecology Option in Biology that directly involves the Flathead Lake Biological Station in a functioning degree Option at the university. It gives studnets at UM-M the unique opportunity to organize their curriculum around the excellence that has developed at the Station and obtain hands-on experience in the theory and practice of Field Ecology.

2. How does this program fit the Board of Regents' goals and objectives?

The availability of this Option is consistent with the Vision and Goals of the Montana University System especially with regard to fostering scientific development, while being responsible to market, employment, and economic development needs.

3. How does this program support or advance Montana's needs and interests?

The Option offers students educational opportunities and provides valuable applied research experience that can be used to respond to critical environmental changes occurring in the state and nation.

4. How will this program contribute to economic development in Montana? (Note projected annual economic impact both regionally and statewide.)

Graduates of the program will be competitive for positions in the growing area of Field Ecology and management of resources.

5. What is the program's planned capacity?

• Break-even point?	N/A FTE students
• Enrollments / year?	10; after 4 years, 20-25
• Graduates / year?	5
• MT jobs / year?	5

6. Resource Allocation:

• Total program budget?	\$ N/A
• Faculty FTE?	no new faculty (30+ faculty involved in the program)
• Staff FTE?	no new staff

7. Does this program require new resources? Yes No
If yes, what is the amount? \$ _____

8. How will the campus fund the program?

UM-M is using the resources available at the Flathead Lake Biological Station to augment the experience of students already majoring in the Division of Biological Sciences. The coursework is currently offered at the Station and/or The University of Montana--Missoula campus.

9. If internal reallocation is necessary, name the sources.

I. Objectives and Need

Description of Program: The University of Montana—Missoula proposes to introduce an undergraduate Option in Field Ecology in the Division of Biological Sciences. This will be a rigorous biology degree with selected coursework outside the Division of Biological Sciences. The focal point of the program is built around a series of field courses at Flathead Lake Biological Station (FLBS).

The Flathead Lake Biological Station, a fully functional part of The University of Montana - Missoula since 1899, has developed during the past 25 years into an internationally recognized center for interdisciplinary research and teaching in freshwater ecology and terrestrial ecology of watersheds. The Flathead Lake Biological Station provides a truly unique educational experience for undergraduate students where the field of ecology is experienced firsthand – in the field.

The Field Ecology option will provide students with the background necessary to be employable, productive field ecologists. The program will prepare graduates for positions in state and federal agencies dealing with environmental issues, as well as most entry-level positions in general field ecology. Graduates will also have the coursework and exposure to research and research experience opportunities required for acceptance into graduate programs in either aquatic or terrestrial ecology.

The Field Ecology option includes the core chemistry, physics, biology and mathematics courses required for all Biology degree options. Additional requirements for the Field Ecology option include either the aquatic ecology series of courses or the terrestrial ecology series of courses, both series only available at FLBS. These courses have been developed at FLBS and have been taught in their current form for over six years. (In several cases the courses have been taught at FLBS for several decades, with continual updating). This program utilizes existing resources for all courses, seminars and research experiences, and complements existing B.A. and M.A. degrees within the Division of Biological Sciences.

2. Documented Need for the Program:

The overall mission of the Montana University System is to “...prepare students for success by creating an environment of ideas and excellence that nurtures intellectual, social, economic, and cultural development.” This mission is enhanced by the Field Ecology option in Biology that directly involves FLBS in a functioning degree option at the university. FLBS has become one of the world-class leaders in freshwater science and ecology. This program will give a suite of biology students at The University of Montana - Missoula the unique opportunity to organize their curriculum around the excellence that has been developed at FLBS.

A significant portion of the critical issues facing Montana, the nation, and the globe during the 21st century will be related to environmental change. This program, at no cost to the institution, will take advantage of the existing expertise of the nationally and internationally recognized Flathead Lake Biological Station. Montana is one of the great “water towers” of the North American continent; three great river basins (Columbia, Missouri, Saskatchewan) flowing into the Pacific, Atlantic and Arctic Oceans, respectively, originate in Montana. There are few amenities in Montana that are more important than our clean environment. Furthermore, as stated in the Montana Constitution, the people have a right to a clean and healthy environment. This program will substantively support the academic need in our state for ecological literacy and will advance Montana as a national leader in the interdisciplinary science of Field Ecology.

The proposed program in Field Ecology, as an Option in Biology, gets additional benefits out of existing resources. Following an extensive search, we have found no other programs like it in the country, where a Biological Field Station is fully-integrated into a degree option. Thus, we expect few competitors in the region, and we expect to be able to draw extensively within and from out-of-state. Over the past 20 years, between 40-60% of the students attending the FLBS summer session have come from out-of-state. Thus, we believe that this record can be continued and clearly demonstrates a need across the country for a rigorous program in this field. Additionally, for the past four years FLBS has maintained a rigorous REU (research experience for undergraduates) program funded by the National Science Foundation. This program at FLBS, organized in conjunction with the Field Ecology option, will provide outstanding research opportunities for the top-tier University of Montana students in the option.

3. Course Requirements

Required Courses: 102 core credits in specified courses are required for the degree option. These credits are:

Course #	Name	Credits
<u>Biology/Microbiology Core Courses</u>		
BIOL 108N/109N	Diversity of Life & Lab	5
BIOL 110N	Principles of Biology	4
BIOL 221	Cell and Molecular Biology	4
BIOL 223	Genetics and Evolution	4
*BIOL 342	Field Ecology (or BIOL 340/341)	5
*‡BIOL 343	Field Ecology Methods and Analysis	5

* Course offered at FLBS

‡recommended course for those students taking BIOL 342

Other Major Courses required for Field Ecology option

Choose either A or B to be taken at Flathead Lake Biological Station, during one summer:

A) Aquatic Emphasis:

BIOL 451	Landscape Ecology	3
BIOL 453	Lake Ecology	3
BIOL 454	River Ecology	3
BIOL 452	Conservation Ecology	3
BIOL 492	Seminars in Ecology & Res. Man.	1

B) Terrestrial Emphasis:

BIOL 451	Landscape Ecology	3
BIOL 458	Ecology of Forests and Grasslands	3
BIOL 459	Alpine Ecology	3
BIOL 452	Conservation Ecology	3
BIOL 492	Seminars in Ecology & Res. Man.	1

Choose an additional 8 cr. of upper division BIOL or MICB—at least one from each category C & D; one must be a writing course (marked with *)

C) –Ology courses (focus on a group of organisms):

*BIOL 304	Ornithology	4
*BIOL 306	Mammalogy	4
*BIOL 308	Biology & Management of Fishes	4
*BIOL 316	Plant Form & Function	5
BIOL 350	Rocky Mountain Flora	3
BIOL 400/401	Parasitology & Lab	4
*BIOL 410	Insect Biology	4
*BIOL 418	Fungal Biology	3
MICB 300/301	Gen. Microbiology & Lab	5

D) Evolutionary Biology courses:

*BIOL 405	Animal Behavior	5
*BIOL 406	Evolution of Behavior	4
*BIOL 480	Conservation Genetics	3
BIOL 482	Evolution & Development	3
BIOL 484	Ecological & Evolutionary Genetics	3

Other Courses required for Field Ecology option

MATH 150	Applied Calculus	4
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Statistics: choose A or B (B is recommended for graduate school prep in ecology):

A) MATH 241	Statistics	4
B) MATH 444/447	Stat Meth/Comp Analy I	4
MATH 445/448	Stat Meth/Comp Analy II	4

Chemistry: choose sequence E or F:

E) CHEM 151N	General & Inorganic Chemistry	3
CHEM 152N/154N	Org. & Biol. Chemistry & Lab	5
F) CHEM 161N	College Chemistry I	5
CHEM 162N	College Chemistry II	5
CHEM 221/223	Organic Chemistry I and Lab	5
CHEM 222/224	Organic Chemistry II and Lab	5
PHYS 121N	Fundamentals of Physics I (or PHYS 221)	5
PHYS 122N	Fundamentals of Physics II (or PHYS 222)	5

Example: CURRICULUM

YEAR/Semester	COURSE # and name	CREDITS
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First Year:**Fall Semester**

BIOL 108N—Diversity of Life	3
BIOL 109N—Diversity of Life Lab	2
CHEM 151N—General and Inorganic Chemistry	3
MATH 150*—Applied Calculus	4
GER—General Education Requirements	3
	15

*Depends on placement exam

Spring Semester

BIOL 110N—Principles of Biology	4
CHEM 152N—Organic and Biological Chemistry	3
CHEM 154N—Organic and Biological Chemistry Lab	2
GER—General Education Requirements	6
	15

Second Year:**Fall Semester**

BIOL 221—Cell and Molecular Biology	4
PHYS 121N—Fundamentals of Physics I (or PHYS 221)	5
MATH 444/447—Statistical Methods/Computer Analysis	4
GER—General Education Requirement	2
	15

Spring Semester

BIOL 223—Genetics and Evolution	4
PHYS 122N—Fundamentals of Physics II (or PHYS 221)	5
MATH 445/448—Statistical Methods/Computer Analysis	4
GER—General Education Requirements	2
	15

13 Students may take Track A to the Field Ecology Option taking advantage of two summers at FLBS; all other students would take Track B (further below)

Track A**Third Year:****Summer Session at Biological Station**

BIOL 342—Field Ecology w/Lab	5
BIOL 343—Field Ecol Methods & Anal	5
BIOL 491—Seminars in Ecology and Resource Management	1
	11

Fall Semester

BIOL 403—Vertebrate Design and Evolution	5
BIOL 480—Conservation Genetics	3
GER—General Education Requirements	7
	15

Spring Semester

BIOL—Upper Div BIOL Elective	4
GER—General Education Requirements	7
UD—Upper Division Elective	4
	15

Fourth Year:**Summer Session at Biological Station**

Choose either the Aquatic Series or the Terrestrial Series (only available at FLBS):

Aquatic Series:

BIOL 451—Landscape Ecology	3
BIOL 453—Lake Ecology	3
BIOL 454—Stream Ecology	3
BIOL 452—Conservation Ecology	3
BIOL 492—Seminars in Ecology and Resource Management	1
	13

Terrestrial Series:

BIOL 451—Landscape Ecology	3
BIOL 458— Forest and Grassland Ecology	3
BIOL 459—Alpine Ecology	3
BIOL 452— Conservation Ecology	3
BIOL 492—Seminars in Ecology and Resource Management	1
	13

Autumn Semester

GER—General Education Requirements	6
	6

Track B**Third Year:****Fall Semester**

BIOL 340—Ecology	3
BIOL 341—Ecology Lab	2
BIOL 403—Vertebrate Design and Evolution	5
BIOL 480—Conservation Genetics	3
GER—General Education Requirements	3
	16

Spring Semester

BIOL—Upper Div BIOL Elective	4
GER—General Education Requirements	8
UD—Upper Division Elective	4
	16

Fourth Year:**Summer Session at Biological Station**

Choose either the Aquatic Series or the Terrestrial Series (only available at FLBS):

Aquatic Series:

BIOL 451—Landscape Ecology	3
BIOL 453—Lake Ecology	3
BIOL 454—Stream Ecology	3
BIOL 452—Conservation Ecology	3
BIOL 492—Seminars in Ecology and Resource Management	1
	13

Terrestrial Series:

BIOL 451—Landscape Ecology	3
BIOL 458— Forest and Grassland Ecology	3
BIOL 459—Alpine Ecology	3
BIOL 452— Conservation Ecology	3
BIOL 492—Seminars in Ecology and Resource Management	1
	13

Autumn Semester

BIOL—Upper Div BIOL Elective	4
GER—General Education Requirements	7
UD—Upper Division Elective	4
	15

The majority of core and elective courses are offered under the current curriculum structure. What makes this option fundamentally different is the core suite of field courses as either an Aquatic Series or as a Terrestrial Series offered only through the Flathead Lake Biological Station. These courses are extremely field-oriented with more than 70% of the total contact hours spent in highly focused field instruction where students learn “hands-on” both the theory and the practice of Field Ecology.

II. Adequacy, Accreditation, and Assessment Issues**1. Adequacy of Present Faculty, Facilities, Equipment, and Library Holdings:****Faculty and Staff**

The Faculty of the Flathead Lake Biological Station, the Faculty in the Division of Biological Sciences (note: FLBS faculty are faculty in DBS), and the affiliated faculty in the interdepartmental program of Wildlife Biology program (administered through the College of Forestry and Conservation) have the required expertise to teach all of the courses in the core biology degree (see faculty list below). As an interdisciplinary program, the Field Ecology Option will also draw on the expertise of faculty and staff in several other departments, including Chemistry, Wildlife Biology, and Mathematics and Physics (see curriculum above).

Professors/Academic Areas

Current DBS faculty in Evolutionary Biology and Ecology

Allendorf, Fred W., Regents Professor, evolution and conservation biology
 Breuner, Creagh, Assistant Professor, evolutionary biology
 Brewer, Carol A. , Professor, science education, plant ecology
 Bromenshenk, Jerry J. , Research Professor, ecotoxicology
 Callaway, Ragan M., Professor, plant ecology
 Dial, Kenneth P., Professor, animal design and functional morphology
 Emlen, Douglas J., Associate Professor, developmental biology
 Ezenwa, Vanessa O., Assistant Professor, wildlife diseases and parasitology
 Fishman, Lila, Assistant Professor, evolutionary plant biology
 Foresman, Kerry R., Professor, mammalogy
 Greene, Erick P., Professor, evolutionary biology and conservation
 Hauer, F. Richard, Professor of Limnology, stream and wetland ecology
 Hutto, Richard L., Professor, ornithology
 Kimball, John, Research Associate Professor, ecosystem process modeling
 Kukuk, Penelope F., Research Professor, evolution of sociality in social bees
 Lorang, Mark S., Research Assistant Professor, process physical limnology
 Lowe, Winsor H., Assistant Professor, stream biodiversity and ecology
 Maron, John L., Associate Professor, species interactions and invasion ecology
 Martin, Thomas E., Adjunct Professor, avian behavior and life histories
 Sala, Anna, Associate Professor, plant physiological ecology
 Stanford, Jack A. Bierman Professor of Ecology and Director of the Flathead Lake Biological Station,
 ecosystems ecology
 Woods, Art, Assistant Professor, ecology and evolution

Current collaborating DBS Microbial Ecology and Evolution faculty:

James E. Gannon, Professor, applied Environmental Microbiology
 William E. Holben, Professor, molecular microbial ecology
 Matthias C. Rillig, Associate Professor, biology and ecology of soil fungi
 R. Frank Rosenzweig, Associate Professor, microbial population ecology

Current collaborating Wildlife Biology faculty (not listed above):

Crone, Elizabeth, Associate Professor, quantitative ecology
 Eby, Lisa, Assistant Professor, aquatic vertebrate ecology
 Hebblewhite, Mark, Assistant Professor, ungulate habitat ecology
 Mills, L. Scott, Professor, wildlife population ecology
 Naugle, David, Associate Professor, large scale wildlife ecology
 Pletcher, Dan, Professor and Wildlife Biology Program Director, population biology

Library Resources: A review of the current breadth and depth of library holdings indicates that there exists a solid resource on biology, field ecology, chemistry, and experimental design. General monographs on limnology, stream ecology, plant and animal population biology, and general ecology are in the holdings of Mansfield Library and the FLBS Library. Many biology and ecology journals are available electronically, and the Mansfield Library maintains numerous subscriptions in the interdisciplinary sciences associated under field ecology.

Facilities and Equipment: The option places an emphasis on ecology and ecological methods experienced in the field for both aquatic and terrestrial ecology and requires that teaching laboratories be equipped with state-of-the-art analytical instrumentation. The proposed option does not increase these needs: both laboratory and field instrumentation is already an integral part of the FLBS research and teaching program and on campus for all other required courses that support other degrees and degree options in the biology program. All of the instrumentation is currently in place. FLBS regularly updates and upgrades instrumentation through various grant sources, particularly NSF. Having the program in place will assist both FLBS and the DBS in obtaining grants for instrumentation.

2. Accreditation Status:

The department also offers options in several disciplines in Biology. These options will be complimented by the Field Ecology option, which stresses applied ecology in the field setting.

The botanical sciences include the study of various aspects of plant life such as form, structure, development, physiology, ecology, and evolution. Plant science is important for many different fields such as forestry, wildlife biology, pharmacy, and agriculture. This option is designed for students who plan careers in government agencies, environmental consulting companies, as well as for those students planning to continue their education at the graduate level.

Cellular and molecular biology is the study of cellular and physiological aspects of biology. In the last several years there has been an explosion of knowledge and technology which has merged several fields of science such as microbiology, biochemistry, immunology, virology, and others into what is know as molecular biology. This option is designed for those students planning to work in research or private labs or continue their studies at the graduate level or in the medical sciences.

The study of ecology has course offerings in organismal, ecological, and conservation biology. This option is designed for students seeking employment with various state and federal government agencies, environmental consulting, or continuing their education at the graduate level.

The Human Biological Sciences option is for students planning careers in the health science field. The following is a partial list of careers: physical therapy, medicine, dentistry, physician assistant, alternative medicine, and public health offices. This option would also work well for students seeking entry-level health careers without additional schooling.

The natural history option is designed for students who seek an interdisciplinary science program. This option is designed for students seeking careers in environmental education, science journalism, communication and natural history museums.

The study of zoological sciences includes various aspects of animal life such as form, structure, development, physiology, evolution, and ecology. Students choosing this option prepare for technical laboratory jobs, positions in consulting firms, governmental agencies, or continuing their education at the graduate level or in the medical sciences.

Although there are no specific accreditation societies, all the options in the Biological Sciences are highly rigorous meeting the undergraduate curriculum commensurate with a PhD granting department.

Assessment Issues:

The department will use a variety of tools to measure the degree of program success. Recruitment and completion of the program, as well as success after graduation, are the critical points to measure program success. The department will track the number of students who declare their major in the option. Students also will be tracked using average course work GPA, competence on exams, and other criteria to monitor program quality. The department also recognizes that student retention rates are an indicator of program health and rigor. Accordingly, the department will keep records of the success rate of students in the program, and will conduct exit interviews of students who drop out or change majors part way through the program. Successful employment of graduates will also be tracked, and the department will track graduates for up to three years after graduation to determine their success in the field.

A program assessment committee composed of faculty from FLBS, campus-based faculty in DBS, and from the Wildlife Biology program will meet on annual basis for the first five years to discuss the assessment data and the strengths and weaknesses of the program. Assessment results will be reported to the faculty via faculty planning meetings. Based on these discussions and the assessment data, the assessment committee, FLBS and Biology faculty, and the program advisor will make suggestions for changes to the program.

III. Impact on Faculty, Costs, Students, and Other Departments and Campuses

1. Additional Faculty Requirements: Because the program takes advantage of courses already offered in Biology and other departments, no additional faculty will be required to implement and maintain the program.

2. Impact on Facilities: The program should have no significant impact on facilities.

3. Cost Analysis*Enrollment*

There is a documented need for appropriately trained scientists to work in the interdisciplinary sciences associated with Field Ecology and a significant interest among students is anticipated. We anticipate an annual enrollment for the first two years to be approximately ten per year, thereafter increasing to 20-25 per year after four or five years. We anticipate that the new option will assist with recruiting through retention of Montana students who currently are enrolled as Biology majors, but are looking for a rigorous field component to their education. We anticipate a strong recruitment from out-of-state students as the option becomes better known and is listed as a formally recognized program in the Biological Sciences at UM - Missoula. Based on our experience teaching UM and out-of-state students through the FLBS summer program, we anticipate numerous students will choose to move to this option from this campus. Because the first two years of coursework in the field Ecology Option is the same as or similar to that for many other science programs on campus, students should be able to do this seamlessly.

5. Relationship to Other Campus Programs

The Division of Biological Sciences collaborates closely with the College of Forestry and Conservation in the co-management and shared faculty of the Wildlife Biology program. Biological Sciences students have courses in Chemistry, Math and Physics as a core component to their program-of-study. This option in the Biological Sciences will only enhance those interdepartmental relationships.

6. Relationship to Other Institutions:

As noted above, no other university in Montana currently offers a rigorous field ecology degree or option. The closest institutions offering such degrees are the University of Washington and Oregon State University. This program will provide an opportunity for enhanced and continuing collaboration between the UM and the Department of Ecology at Montana State University, which has close collaborative ties with FLBS faculty at the graduate level. This collaboration will take the form of invited lectures, internet-based course offerings and collaborative research projects involving UM students and faculty.

IV. Process Leading to Submission of Proposal

This program and proposal have been developed in consultation with UM faculty at FLBS, DBS, and the Wildlife Biology program. Program content and the development of the basic program outline was approved in concept by DBS faculty in 2004. This outline was refined in discussion with the Wildlife Biology Director (Dan Pletcher), Associate Dean Christian, Acting Associate Dean Greene, and the entire Ecology and Evolutionary Biology faculty over the ensuing two years.

This proposal has been reviewed and approved by the Organismal Biology and Ecology graduate program faculty in DBS, the full DBS faculty, the Dean of the College of Arts and Sciences, the Graduate Council for the Senate, the Dean of the School of Graduate Studies, the Provost and Vice President for Academic Affairs, and the Faculty Senate of the University of Montana.

This proposal was reviewed and approved by the affected departments as follows:

Department Name: Educational Leadership and Counseling

Date: 2/2/07

In addition, the Deans of the following Schools/Colleges reviewed and approved the proposal:

Dean of: School of Education

Date: 2/6/07

This proposal was reviewed and approved by the Faculty Senate at The University of Montana on:

Date: 3/8/07

No outside consultants were employed for the development of this proposal