S.94-40

SIMON FRASER UNIVERSITY

Office of the Vice-President, Academic

MEMORANDUM

To: Senate

From: J.M. Munro, Chair, Senate Committee on Academic Planning

Subject: PhD in Resource and Environmental Management

Date: April 11, 1994

Action undertaken at the meeting of the Senate Graduate Studies Committee and the Senate Committee on Academic Planning gives rise to the following motion:

Motion: "That Senate approve and recommend approval to the Board of Governors as set forth in S.94 - 40 , the proposed PhD in Resource and Environmental Management."

J. M. Munro

SCAP 94 - 20

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Alison Watt, Secretary
Senate Committee on Academic Planning

From: B.P. Clayman
Dean of Graduate Studies

Subject: PHD in Resource and Environmental Management

Date: March 2, 1994

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The attached PHD Program in Resource and Environmental Management was approved by the Senate Graduate Studies Committee, at its Meeting on February 28, 1994, and is now being forwarded to the Senate Committee on Academic Planning for approval.

B.P. Clayman
Dean of Graduate Studies

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SIMON FRASER UNIVERSITY

DEAN OF GRADUATE STUDIES

Memorandum

TO:	B. P. Clayman, Chair Senate Graduate Studies Committee	**FROM:**	Phyllis Wrenn Associate Dean
SUBJECT:	PhD in Resource and Environmental Management	**DATE:**	February 11, 1994

The Assessment Committee for New Graduate Programs (ACNGP) has approved and recommends to the SGSC for approval a proposal for a **PhD in Resource and Environmental Management.** The first draft of the proposal was received on 8 April 1993.

Please place this proposal on the agenda of the next meeting of the SGSC. By copy of this memo, I am inviting R. Peterman to attend this meeting as a representative of the proposed program.

Phyllis M. Wrenn

c: R. Peterman
P. Bawa
M. McGinn

2.

Proposal for a Ph.D. Program in Resource and Environmental Management

School of Resource and Environmental Management
Faculty of Applied Sciences
Simon Fraser University
Burnaby, British Columbia
Canada V5A 1S6

Revised

14 February 1994

3.

Table of Contents

* Available in the Office of the Registrar

** Not included

I. General Information

1. Title of the program will be:

   Ph.D. in Resource and Environmental Management

2. Credential to be awarded to graduates will be:

   Doctor of Philosophy (Ph.D.)

3. Faculty or school to offer the program is:

   School of Resource and Environmental Management
   Faculty of Applied Sciences
   Simon Fraser University
   Burnaby, British Columbia
   Canada V5A 1S6

4. The statement of intent to offer this program was approved by the Simon Fraser University Senate 8 April 1992.

5. Schedule for implementation:

   Admit first students in the fall of 1994
   First graduates expected late in 1998

II. Description of the Ph.D. Program

Simon Fraser University's School of Resource and Environmental Management is an interdisciplinary graduate program established in 1979 with faculty who have interests covering the natural and social sciences. The School currently offers a Master's degree in resource management. To meet the growing demand for more extensive training in this important field, we propose to establish a new degree program, a **Ph.D. in Resource and Environmental Management**.

Objectives

There are three objectives for the proposed Ph.D. program: (1) to provide a program at the doctoral level for carrying out high-level research and training in the area of managing natural resources and the environment, (2) to provide an interdisciplinary setting for that work by training students in both natural science and social science aspects of problems in this field, and (3) to help meet the need for more highly qualified personnel to fill positions in government, industry, and universities. The second objective, interdisciplinary training in the natural resource management field, was identified in 1991 as such a priority by the Canadian government that a special 3-year fellowship has been established by the Tri-Council Secretariat for Ph.D. students in interdisciplinary fields related to environmental management. The third need for more highly trained graduates has been expressed by several agencies, as will be discussed in other sections of this document.

The School of Resource and Environmental Management

The School of Resource and Environmental Management (REM) was originally established in 1979 under the name of the Natural Resources Management Program. Since its inception, it has been an interdisciplinary graduate program, having faculty and students with backgrounds in either the natural sciences or social sciences. Students in the Master's program take an integrated sequence of courses in complementary fields, pursue additional courses to deepen their expertise in some specialty, and complete a research project on a topic that involves more than one traditional discipline. In order to not sacrifice depth for breadth, 63 credit hours (13 courses) plus a research project are required for the Master's degree; it is the heaviest Master's program at Simon Fraser University (SFU). Faculty are actively involved not only in basic and applied research but also in collaborative work with various environmental management agencies. Through REM's formal Cooperative Education program (the only graduate one at SFU), students can take up to two Co-op work terms in a resource management agency to gain professional experience in applied problem solving. Because of their unique training, graduates from REM's Master's program are in high demand by employers (see Appendix 1).

As a result of these features, REM currently attracts some of the best Canadian graduate students interested in resource and environmental management. Since 1988, the number of applicants to the program has increased from 80 to 245 applicants per year, and most of them are Canadians. However, the program has only been able to accept about 15% of them because of limited resources. REM's reputation is now widespread, as indicated by the origin of applications for graduate work. Over 50% of applicants over the last 5 years have come from Canada but outside of British Columbia. Many of the students admitted have won nationally competitive scholarships from the Natural Sciences and Engineering Research Council of Canada (NSERC) to carry out work in the natural sciences, Canadian Environmental Assessment Research Council (CEARC) for work in environmental assessment, or Central Mortgage and Housing Corporation (CMHC) for work in regional planning. For

example, in each of the last two years, REM graduate students received 2 of the 10 CEARC scholarships awarded annually in Canada. As well, of the 25 students admitted for the fall of 1992, 19 were in a discipline eligible for an NSERC scholarship--and over one-half of these were awarded NSERC scholarships. Because the Social Sciences and Humanities Research Council of Canada (SSHRC) does not award scholarships to Master's students, no comparable assessment is available for students in a social science discipline.

The enrolment in the School of Resource and Environmental Management was 81 full-time equivalent graduate students as of September 1993. About 13% of these were working professionals who take the program part-time. The backgrounds of this diverse student body included academic training in engineering, biology, geology, forestry, geography, planning, law, economics, and business administration. The variety of viewpoints that these students have, plus their strong academic abilities, create the dynamic student body and active learning environment that are conducive to a dynamic Ph.D. program.

The School of Resource and Environmental Management is also unusual because it has 9 full-time faculty plus 2 cross-appointments, unlike most similar programs elsewhere in Canada that have mostly cross-appointed faculty from other departments (e.g. Dalhousie University, University of Manitoba). REM's emphasis on full-time faculty leads to an integrated, complementary set of courses, continuity of graduate supervision, and a core of interacting students and faculty.

The research of faculty and graduate students in the School of Resource and Environmental Management has resulted in national and international recognition for them, a strong graduate program, and an increasing level of funding for research, all of which are essential elements for a good Ph.D. program. The research fields covered include the dynamics and management of forests, fisheries, wildlife, contaminants, water, energy, recreation and tourism resources, land use, planning, policy analysis, and environmental regulation. REM's research projects include, among others, benefit-cost analyses of alternative resource uses, market and non-market valuation of natural resources, analysis of energy-use policies, establishing appropriate regulations for pollutants, ecologically sensitive forest management practices, environmental impact assessments, evaluations of management strategies for fish populations, coastal zone management, methods of conflict resolution in environmental problems, tourism behaviour research methodologies, and solving disputes between recreational users and resource extractors.

These research programs in REM are well recognized by external funding agencies. For instance, the 3 REM faculty who have applied to NSERC for research funds, have received above-average grants in their disciplines. The total is $508,467 for the 1990-95 period. As well, REM leads a team research project on Pacific salmon that is part of the Ocean Production Enhancement Network (OPEN), one of the 15 Networks of Centres of Excellence funded by NSERC and industry in 1990 for a 4-year period. Only 15 of the 154 Networks proposals were funded. This OPEN Centres of Excellence project brings an additional $168,993 to REM. REM faculty have also been awarded $186,000 in grants from SSHRC. In addition, REM faculty received $161,000 from the B.C. Ministry of Environment through the B.C. Science Council to investigate the management of the aquatic ecosystem in the Fraser River. Details of faculty awards and past supervision are set out in the faculty curriculum vitaes attached to this proposal (Appendix 5).

The Ph.D. Program and the Mission of the University

Given the importance of natural resources and the environment in the economy of British Columbia and Canada, it is logical that there be a designated Ph.D. program in this

field at one of B.C.'s publicly funded universities. Effective management of natural resources and the environment requires interdisciplinary skills and an appreciation of the principles and research findings in related fields (e.g. biology, economics, and planning), as well as expertise in traditional disciplines. Yet no Ph.D. program exists in western Canada in resource and environmental management. Simon Fraser University is the logical location for this program as the university is already well-known for its innovative programs in several disciplines and the proposed program would extend that tradition by building on the existing program of the School of Resource and Environmental Management. As well, the university is moving to establish an undergraduate program in the environmental area.

The School of Resource and Environmental Management has already established a setting where Ph.D. students will be able to pursue in-depth research in the context of related disciplines. The comprehensive exams for Ph.D. students described below will ensure sufficient breadth and depth, and their theses will be a further demonstration of their ability to do original in-depth research in a specialty with an interdisciplinary component.

An important philosophy of the School of Resource and Environmental Management makes the proposed Ph.D. program distinctive from Ph.D.s offered in many standard disciplines. Researchers in REM do not simply identify and describe environmental problems or their causes, but actively seek management solutions that are acceptable and implementable. This often requires that components of the research incorporate other disciplines. For example, to implement some new fisheries management regulation, alternative management actions are evaluated in terms of their economic or social effects, in addition to the biological ones. Ph.D. students in REM will be encouraged to apply this philosophy, while at the same time doing "cutting edge" basic research.

The interdisciplinary environment necessary for Ph.D. students to carry out high quality, original research already exists in the School of Resource and Environmental Management, as demonstrated by several REM Master's students who have received recognition for their work. For example, Ian Guthrie, a 1988 REM graduate, received an Honorable Mention Award for the journal paper resulting from his MRM research project. This award was given in the American Fisheries Society's competition for best paper published in 1988 in the North American Journal of Fisheries Management and Transactions of the American Fisheries Society (out of 140 papers). Another REM student, Murdoch McAllister, received the 1990 Dean's Medal at Convocation as the top graduate student (of all Ph.D. and Master's students) in the Faculty of Applied Science, and Timo Makinen, another REM student, was ranked second in the 1991 competition for that medal. McAllister's Master's research led to three refereed journal publications, two in the top journal in his field; one of those papers received an award for the "Most significant paper published in 1992" by the American Fisheries Society. Thus, it is possible for students to do leading edge research in their interdisciplinary projects. So far 10 of the School's 140 graduates have gone on to Ph.D. programs.

Comparison with Other Programs

To make the interdisciplinary training element of the proposed Ph.D. in Resource and Environmental Management function best, faculty from different disciplines in both the natural and social sciences should be housed in the same administrative unit so that course materials are integrated and graduate students can be frequently exposed to different methods of analysis and viewpoints. Therefore, comparisons of this proposal are made below with Ph.D. programs in, 1) other *interdisciplinary* Canadian university departments or faculties related to the environment, 2) other Canadian departments in *standard* environmentally-related disciplines, and 3) non-Canadian departments.

Interdisciplinary Departments at Canadian Universities

Only one other interdisciplinary unit in Canada offers a Ph.D. degree that is analogous to the one proposed here, York University's Faculty of Environmental Studies (Appendix 2). Unlike REM's proposed program, however, York's program is very heavily weighted toward the social sciences and does not offer strong support for Ph.D. students who wish either to specialize in natural science fields or integrate the two. The York University calendar describes its two areas of specialization as follows.

- Nature, culture, and society: This field is concerned with the philosophical and ethical characteristics of the relationships between human society and the totality of nature, of which humans themselves are part.
- Environments, institutions, and interventions: This field focuses on the relationships between human institutional frameworks and the social and cultural construction of human environments.

While the York University program will draw those students who are mainly interested in social science aspects of environmental studies, applicants to our program will be interested in more exposure to natural science methods and knowledge. REM's program will complement the existing one at York as there would be little overlap in the job markets for their students and ours.

A degree program that is somewhat similar in spirit to the one we propose is the Ph.D. in Interdisciplinary Studies (Resource Management Science) at the University of British Columbia (UBC). UBC's program is, however, not housed in a particular department, does not have any faculty, and is administered by an interdepartmental committee under the Faculty of Interdisciplinary Studies (Table 2). Students enrolled in this degree program have their course requirements tailored to their individual needs. It is essentially what is called at SFU a Ph.D. "by Special Arrangements." In contrast to the School of Resource and Environmental Management, there is no home base for the students and no core student body. Graduates receive a Ph.D. in Interdisciplinary Studies.

Several other Canadian universities offer interdisciplinary programs related to natural resources and the environment but they are only at the Master's degree level, not Ph.D. The better known ones are:

- University of Calgary, Faculty of Environmental Design
- Dalhousie University, School of Resource and Environmental Studies
- University of Manitoba, Natural Resources Institute
- University of Toronto, Institute for Environmental Studies
- University of Waterloo, Department of Environmental and Resource Studies

Standard Disciplinary Departments at Canadian Universities

Several departments in standard disciplines in Canada offer Ph.D. degrees that can be related to natural resources and the environment. However, they all reflect an orientation specific to the discipline offering the degree. For example, the Universities of Waterloo and British Columbia have planning schools. However, the majority of subject areas in which they offer supervision of Ph.D.s are not related to natural resources (see Appendix 2) and, where they are, the emphasis is on planning. For instance, Waterloo lists water resource, parks and land use planning, conservation, and environmental impact assessment. While these topics are also part of the School of Resource and Environmental Management's fields of study, REM's courses and the expertise of its faculty go far beyond specific disciplines into dynamics of environmental systems (forestry, fisheries, energy systems, toxicology), resource economics,

and environmental law. Furthermore, the common theme among researchers in REM is natural resources. Thus, the planning schools offer only part of what we propose to cover in a Ph.D. program in Resource and Environmental Management.

The same argument holds for other standard disciplines such as geography, biological sciences, chemistry, zoology, forestry, or business administration. For instance, the UBC School of Forestry necessarily focuses on forestry-related topics and therefore misses others that REM would cover such as toxicology or energy. Biology and zoology departments typically offer Ph.D.s in ecological aspects of natural resources but, to our knowledge, none requires interdisciplinary training in relevant social science areas such as resource economics, law, planning and policy analysis. The School of Resource and Environmental Management already covers these areas and they will be part of its Ph.D. program. Geography departments are usually more interdisciplinary than forestry or zoology departments, often covering social science as well as scientific aspects of problems. This is true of the geography departments at SFU, UBC, and University of Victoria. However, as shown by Appendix 2, the topics covered in those departments are quite different from those in REM. In fact, the proposed Ph.D. in Resource and Environmental Management would nicely complement the offerings in the Geography department at SFU, both in terms of courses and faculty expertise.

Most importantly, no other Ph.D. program in environmental natural resources requires interdisciplinary training. This will be accomplished in REM's program through a combination of comprehensive exams, courses, and a thesis with some interdisciplinary component, as described below. Other related disciplines at SFU are environmental toxicology and environmental chemistry, but neither of these has a formal Ph.D. program; furthermore they do not attempt to be interdisciplinary across the range of fields to be covered by a Ph.D. in Resource and Environmental Management.

Finally, there is a Ph.D. program at the French-speaking Universite du Quebec a Montreal (doctorat en sciences de l'environnement). However, this program is only interdisciplinary within the natural sciences (biology, chemistry, mathematics, geology); there are no social science aspects to the program. Furthermore, courses are only given in French so REM will largely draw on a different student market.

To summarize, the proposed Ph.D. program in Resource and Environmental Management will complement existing Ph.D. programs in related disciplines at SFU and elsewhere in British Columbia and Canada because it will provide a unique interdisciplinary forum for research and training that focuses on both natural and social sciences. The faculty will be able to supervise in a wide range of natural resource areas. Numerous applicants are already inquiring about a Ph.D. in the School of Resource and Environmental Management; if created, it would provide a unique combination that will fill a major gap in Canadian university offerings at the Ph.D. level.

Non-Canadian Ph.D. Programs

REM does not anticipate competing directly with universities in the United States for potential Ph.D. students. Only about 5% of the applicants for our Master's degree program currently come from the United States. Several U.S. universities already offer Ph.D.s. in this field and REM views those successful programs as rough models on which to base REM's proposed program. Three of the better known programs are at the University of Michigan, Yale University, and Duke University (Appendix 2). All are interdisciplinary, with the Yale program emphasizing forestry-related topics.

Detailed Structure of the Proposed Ph.D. Program

REM will supervise Ph.D. research in a wide range of areas. Some areas include: resource community planning, regional development, water management, environmental impact assessment, tourism planning and development, environmental toxicology and management, ecological risk assessment, energy economics and management, forest ecosystem dynamics, population ecology, conservation biology and landscape ecology, environmental law and regulation, the political economy of environment management, institutional design, fisheries management, and parks and recreation planning. Graduate supervisory committees will be composed of faculty with full-time appointments in REM, as well as faculty from other departments at SFU and the University of B.C. This will continue the past, mutually beneficial tradition, where REM faculty have served on graduate supervisory committees in other departments and faculty in those departments have served on REM's graduate student committees. Departments involved include Engineering Sciences, Biological Sciences, Education, Business Administration, Geography, Economics and, at UBC, Planning and Forestry, and Geography at the University of Victoria.

Requirements for Admission

All applicants to the Ph.D. program in Resource and Environmental Management must submit at the time of application a 500- to 1000-word "Statement of Interest" to describe how this program fits into their career objectives and what they expect to get from the program.

To qualify for admission to the Ph.D. program in Resource and Environmental Management, an applicant must meet Simon Fraser University's Graduate General Regulations and must have,

(1) the ability to carry out innovative, independent, and original Ph.D.-level research in that field,
(2) high academic standing in previous university work, and
(3) a Master's degree in a related discipline.

An exception to the third requirement may be made for a student currently in one of REM's master's degree programs (MRM or joint MRM/MBA) who shows exceptional abilities. In such cases, the student may apply to transfer to the Ph.D. program but will qualify for admission to it only if

(1) the first two requirements above are met,
(2) the student has been in the MRM program for at least two semesters and not more than 4 semesters, and
(3) the applicable university regulations for such transfers are met.

Applications for a transfer must be approved by the student's supervisory committee, the REM Graduate Studies Committee, and the SFU Senate Graduate Studies Committee. MRM students who successfully transfer into the Ph.D. program will only be eligible to earn the Ph.D. degree. REM anticipates that only a very small proportion of its students will qualify to transfer into the Ph.D. program. The majority of applicants will come from elsewhere. Students must be accepted by an identified senior supervisor prior to acceptance into the program. It is strongly advised that Ph.D. applicants visit SFU for an interview prior to 15 February of the year of requested admission.

Degree Requirements

Courses. A minimum of 20 credit hours of graduate courses (excluding directed studies courses and MRM 601) will be required for the Ph.D. This will be composed of at least 4 courses, one in each of two disciplines in the student's research area and two others (see description below). Normally, students will take a total of 6 to 8 courses in order to prepare adequately for the comprehensive exams. The list of courses to be taken must be approved by a student's supervisory committee. Courses outside of the School of Resource and Environmental Management are subject to the approval of the REM Graduate Studies Committee.

Comprehensive examinations. Normally within 5 semesters of full-time registration after admission to the Ph.D. (or to the MRM degree program if the student transferred from the MRM degree), students will be required to take 3 written exams, one in each of 1) environmental science, 2) resource and environmental economics, and 3) resource and environmental policy. These comprehensive exams will be the primary way to ensure that REM Ph.D. students have a sufficient grounding in the range of courses now required at the Master's level, and thus have the depth of understanding in the essential foundations of resource and environmental management. The REM Graduate Studies Committee will be responsible for administering the comprehensive exams. All three exams must be passed for the student to remain registered in the Ph.D. program. The possible outcomes for each of the 3 qualifying exams are, 1) pass, 2) marginal (student may be required to take more courses and is permitted a second and final opportunity to take the deficient exam(s) within one year), or 3) fail. If, after the second try, any one of the 3 exams is graded fail, the student will be required to withdraw from the Ph.D. program.

Thesis proposal. In conjunction with their supervisory committee, a Ph.D. student will develop a detailed written research proposal that defines the area and methods of intended research. Normally within 6 semesters of full-time registration after admission to the Ph.D. program (or within 4 semesters if the student transferred from the MRM degree), a student must orally present his or her written thesis proposal at a departmental seminar in the School of Resource and Environmental Management. The candidate's supervisory committee shall attend the presentation along with other interested members of the faculty and student body. The oral examining committee will be composed of the supervisory committee plus the chair of the REM Graduate Studies Committee. This presentation of the thesis proposal is intended to determine whether the student's research abilities are adequate for Ph.D.-level research and whether the proposed research is feasible and has merit. This presentation must be passed successfully for the student to remain registered in the Ph.D. program. Students who do not make satisfactory progress on their research topic, or who fail to demonstrate adequate knowledge and understanding of recent publications in their area of research, or who fail to have their revised thesis proposal approved by the supervisory committee within the time limit given at the start of this section, will be required to withdraw from the Ph.D. program.

Thesis. A written thesis based on a student's original research is the final requirement for the Ph.D. The thesis must include aspects of at least two disciplines (usually a primary and secondary discipline, such as ecology and economics, or toxicology and law). The topic must be approved as noted above and the student's progress will be evaluated annually. That evaluation will be undertaken according to the SFU General Regulations. To graduate, the student must successfully complete a thesis defense, following the usual SFU format. All other general requirements for a Ph.D. will be followed as outlined in the SFU calendar.

Period of residence. A Ph.D. candidate must be registered and in-residence at SFU for the minimum number of semesters as described in the SFU Graduate Regulations.

Curriculum

All Ph.D. students in Resource and Environmental Management must complete at least four graduate courses. They will be in:

1) MRM 801 (5 units) Principles of Research Methods and Design in Resource and Environmental Management
2) MRM 802 (5 units) Institutional Design and Decision Making for Environmental Management
3) At least one course in the student's primary field
4) At least one course in the student's secondary field

Courses already offered in the School of Resource and Environmental Management will be available for credit towards a Ph.D. degree. The only exceptions for credit toward a Ph.D. degree will be MRM 601 and directed studies courses.

MRM 601-5 **Natural Resources Management I: Theory and Practice.** An overview of disciplinary and interdisciplinary theories and their practical application to natural resource analysis and environmental planning.

MRM 602-5 **Natural Resources Management II: Advanced Seminar.** A professional group workshop course focusing on specific resource and environmental problems. (Prereq.: 8 MRM courses or permission of instructor).

MRM 610-5 **Management of Contaminants in the Environment.** A study of environmental behaviour and toxic effects of chemical substances in the environment and the application of methodologies for their management.

MRM 611-5 **Applied Population and Community Ecology.** A review of population, community, and ecosystem ecology; implications of these areas for methods of resource management and environmental assessment.

MRM 612-5 **Simulation Modelling in Natural Resource Management.** Methods of constructing simulation models and analyzing them through sensitivity analysis. Application of simulation modelling to research and management of environmental and resource systems. Topics include management of wildlife, forests, insect pests, fisheries, pollution problems, energy resources, and recreational land use. (Prereq.: MRM 611 or permission of instructor).

MRM 613-5 **Current Topics in Fisheries Management.** Models of fish population dynamics, methods of data analysis, and management in the context of uncertainty. Case studies of management of various world fisheries. In depth exploration of selected current fisheries problems including extensive data analysis. Focus will be primarily on biological aspects of fisheries management while illustrating how these interface with economic, social and institutional concerns of managers. (Prereq.: MRM 611 and MRM 612 or permission of instructor). Offered every second fall semester.

MRM 615-3 **Management of Aquaculture Resources.** Environmental, political, and social issues related to siting and operation of aquaculture facilities. Topics drawn

from coastal zone management, regional planning, public policy analysis, environmental and social impact assessment, resource law and ecology.

MRM 621-5 **Economics of Natural Resources.** Application of economic theory to natural resources and environmental management problems with a view to assessing existing and alternative policies. Includes theoretical analysis of concepts such as resource pricing, market failure, taxation, and management strategies for specific resources such as forestry, fisheries, energy and environment.

MRM 631-5 **Applied Geomorphology and Hydrology.** A review of geomorphic and hydrologic principles; the morphology of drainage basins; selected case studies.

MRM 641-5 **Law and Resources.** A study of legal interventions related to resource planning and environmental control. The course examines several aspects of environmental and resource law including administrative and constitutional law, international law, land use law, and native rights.

MRM 642-5 **Regional Planning.** Theory and techniques of regional analysis; planning models and their application to key resource sectors and the environment.

MRM 644-5 **Public Policy Analysis and Administration.** An analysis of methods of policy making and problem solving applied to natural and environmental resource issues. Topics include goal setting, problem definition, program scheduling, policy evaluation, policy implementation and public administration. A practical analysis of the structure and process surrounding major contemporary issues.

MRM 646-5 **Environmental and Social Impact Assessment.** Evaluation and application of current methodologies for social, economic and biophysical impact assessment. (Prereq.: MRM 601, MRM 611, MRM 621, MRM 642, or permission of instructor).

MRM 647-5 **Parks and Outdoor Recreation Planning.** Resource assessment, planning, and management methods related to parks and outdoor recreation.

MRM 648-5 **The Tourism System.** Examination of social, environmental, and economic components of tourism. Discussion of tourism planning and management will focus on the development of tourism as a renewable resource.

MRM 649-5 **Tourism Planning and Policy.** The course provides frameworks and methodologies for understanding the policy and planning initiatives of public and private sector tourism organizations. Foundations for resource assessment, market analysis, product-market matching, and regional tourism strategy development.

MRM 650-5 **Energy Management and Policy.** Integration of energy supply and energy demand management to formulate cohesive and efficient energy policies. Topics include thermodynamics, modelling, conservation, energy pricing, oil markets, project assessment, the environment and energy planning in developing countries.

MRM 651-5 **Project Evaluation.** The course will examine the role, limitations, and methods of benefit-cost analysis. Different measurement techniques will be applied to the estimation of a range of benefits and costs. (Prereq.: Econ 200, MRM 621, or permission of instructor).

MRM 652-5 **Community Tourism Planning and Development.** The course critically examines approaches employed by communities incorporating tourism into their development strategies. Techniques for optimizing the resource potential of communities from economic, social, cultural and environmental perspectives are explored with a view toward developing policies for 'appropriate' community tourism.

MRM 655-5 **Water Planning and Management.** Evaluation of theoretical models and management experiences; federal, provincial, and international institutional arrangements and jurisdictional responsibilities; emerging problems and opportunities. Includes field trips to review water management practices in California, the Columbia River Basin, and British Columbia. (Prereq.: MRM 601, MRM 621, MRM 631, and MRM 646 or permission of instructor).

MRM 658-5 **Energy Systems Modelling.** Training and practical experience in the use of the range of techniques for modelling energy systems: linear-programming, econometrics, input-output, energy service models and integrated systems. (Prereq.: MRM 621 and MRM 650).

MRM 660-5 through MRM 664-5 Special Topics in Natural Resources Management. Selected topics in areas not currently offered within REM.

MRM 670-5 **Introduction to Forestry.** Examines the theory and practice of forest management, based on an understanding of the linkages between forest ecosytem dynamics, economics, policy and social concerns. Principles are illustrated with reference to contemporary forestry issues. (Prereq.: MRM 611 or permission of instructor).

MRM 671-5 **Forest Ecology.** Structure, function and development of forest ecosystems. Population, community, ecosystem and landscape approaches are used to enable students to understand the biology and management of forests in terms of the processes driving spatial and temporal dynamics.

MRM 690-0 **Practicum I.** First semester of work experience in the School of Resource and Environmental Management's Co-operative Education program. (Prereq.: Students must have completed at least one semester's courses and permission of REM's Co-op Coordinator).

MRM 691-0 **Practicum II.** Second semester of work experience in the School of Resource and Environmental Management's Co-operative Education program. (Prereq.: Completion of Practicum I and permission of REM's Co-op Coordinator).

MRM 698-3 **Field Resource Management Workshop.** An intensive field course introducing students to the diversity of issues and viewpoints concerning management of natural resources. Problem areas will include forestry, mining, fisheries and wildlife management; energy, recreation and land use planning.

MRM 699-10 **Research Project.** A research project dealing with a specific interdisciplinary problem in resource management, administration or allocation. The study must result in the preparation of a formal paper and the presentation of a seminar.

In addition to these listed courses, graduate courses are available in other departments at SFU such as Biological Sciences, Chemistry, Economics, Geography, and Statistics. Some of REM's Master's students and a REM Special Arrangements Ph.D. student have already benefited from taking courses in SFU's Departments of Biological Science, Business Administration, Economics, Mathematics and Statistics, and others. This across-department registration is expected to increase slightly with the establishment of the Ph.D. program in Resource and Environmental Management.

Through the Western Deans' Agreement, courses at the University of B.C. are open to credit for SFU students (and vice versa). Several relevant ones offered at UBC are in Forestry, Community and Regional Planning, Zoology, Economics, and Agricultural Sciences, among other departments. Thus, there is a large set of courses on which REM Ph.D. students can draw.

New courses

As noted above, two new courses are proposed in direct support of the Ph.D. program, a research design and methods course, and a course in institutional design and decision making (see the attached course proposals). Because of these new courses, and a constraint on increasing the number of faculty, some existing courses may be offered less frequently.

III. The Need for the Program

It is widely recognized that natural resource problems have numerous dimensions involving issues of economics, ecology, sociology, chemistry, and many other disciplines. Proper management of natural resources and the environment requires that their complexities be understood and adequately accounted for by researchers, technical advisors, managers, and decision makers. Too narrow a viewpoint has frequently created new problems. This is true not only for government regulatory agencies but also for industry and consulting firms. It is therefore no longer effective for people in such agencies to be trained in only one specialty; in addition, they must understand the viewpoints, methods of analysis, and problems of the various users of the resources. This is particularly so in this era of broad public consultation because such personnel often serve on multidisciplinary task forces or research teams that are set up to investigate or resolve complex environmental problems. Effective communication in such settings is only possible when there is an adequate understanding of the relevant disciplines. This applies, for example, where a biologist knows the basic assumptions and methods of benefit/cost analysis, or where a resource economist recognizes the limits to the rate of replacement of some harvested population of plants or animals.

The need for interdisciplinary training in resource and environmental management must not compromise the depth of that training. This principle was recognized when the forerunner of the School of Resource and Environmental Management was set up at SFU in 1979. The aim then, as now, is to give students familiarity and competence in understanding the dynamics of natural resources, the strategies and methods of environmental planning and management, and the biological, physical, social, economic, and institutional implications of resource decisions. Students must also become familiar with various quantitative methods of analysis and aids to decision making. That philosophy has worked well for the education and subsequent success of REM's Master's students.

There is now an increasing demand for Ph.D. students who are trained more broadly than is common in the traditional single-discipline university departments. In 1991, the Canadian Department of Environment established the Eco-Research Program in conjunction

with the three federal granting councils: NSERC, SSHRC, and Medical Research Council of Canada (MRC). The administration of this program is through the Tri-Council Secretariat. One of the principal reasons for creating the Eco-Research program was a recognition by the Canadian government of the need for researchers to be trained more broadly than in just one of the traditional disciplines. This idea is reiterated in a recent report produced by the Federal inter-departmental committee (Eco-Research Program Evaluation Steering Committee 1992) that is responsible for evaluating the effectiveness of the Eco-Research program. The report, which traces the development of the program and provides the results of interviews with 22 key stakeholders, states:

> "In particular, it was emphasized that in order to effectively tackle environmental problems there is a need for people who can work across traditional discipline boundaries. One dimensional technical people will not be sufficient..."

Particularly relevant to our proposed Ph.D. program is the creation of 3-year fellowships for Ph.D. students in environmental topics by the Tri-Council Secretariat on behalf of NSERC, SSHRC, and MRC. The terms of reference for those fellowships clearly state that "The peer review committee favours cross-disciplinary programs of study" (Tri-Council Sec. 1991, p. 11). Further expression of this philosophy is given in the Tri-Council's introduction to the Eco-Research Program:

> "Moreover, innovative cross-disciplinary approaches are critical to take proper account of the complex, interactive nature of the various processed involved. For example, a composite of research skills is needed from the social sciences and humanities, the health sciences and the natural sciences and engineering to shed light on the dynamics of ecosystems, the impacts of environmental change on human health, and the underlying human causes of environmental degradation." (Tri-Council Sec. 1991, p. 1).

Consultation with Non-university Agencies

Several letters from potential employers in both public and private agencies indicate that they perceive a need for the type of Ph.D. program that REM proposes (Appendix 3).

Enrolment

There already is demand by potential students for a Ph.D. in the School of Resource and Environmental Management. The School receives about 12 to 18 requests per year for admission to a Ph.D. program, most of them from Canadians, a number that will undoubtedly increase once a program is actually in place. Most applicants express interest in the School of Resource and Environmental Management because of the interdisciplinary theme and the research interests of REM faculty. Many have been so keen to obtain this type of training that they are willing to take REM's Master's program in lieu of a Ph.D. even though they already have a Master's degree, The School has had over a dozen students who already hold Master's degrees, and it had 35 such Master's degree holders apply for admission in 1992. As with most graduate students, these applicants already have a well-defined goal and are seeking a program that will meet their needs for interdisciplinary training in natural resources. Thus, it is unlikely they would apply to other departments at SFU; they would likely apply to other universities, particularly in the United States, where such interdisciplinary Ph.D.s are offered. Because of REM's unique theme, it is rare that an applicant applies to REM and also to another SFU graduate program. REM is attracting new, high quality students to SFU who would otherwise not come here. As a result, this new program will reduce the number of Canadians having to study abroad, some of whom never return to Canada.

REM expects to admit about 2 or 3 Ph.D. students per year, which would mean a student body of about 8 to 15 Ph.D. students at a given time when running at full capacity. As a result, the School plans to accept 2 or 3 fewer students into its Master's degree stream each year. As noted above, only a very small proportion of students in the master's program will qualify or be interested in transferring to a Ph.D. program. Thus, most admissions to the Ph.D. program will come from outside applicants.

Type of Jobs

Successful management of natural resources and the environment necessitates a broad perspective by individuals at all levels in government agencies, industry, consulting firms, crown corporations, universities, and non-governmental organizations. Graduates with Ph.D.s from REM will be able to fill positions in those organizations as research scientists, research managers, members of planning or assessment teams, environmental biologists, and other related jobs. Ph.D.-level people are increasingly required as expert witnesses by all parties in technical or legal hearings on environmental conflicts. Some of the key program stakeholders who were interviewed in the course of the Eco-Research evaluation framework study (Eco-Research Program Evaluation Steering Committee 1992) indicate (in the words of the consultants who conducted the study) that: "...many companies will be hiring experts in environmental management" and "scientists and engineers with training appropriate for environmental research will be sought by a variety of employers, as well as by those directly concerned with research in environmental science." The latter point is true because, for instance, industries are being required to do more monitoring to ensure compliance with government environmental regulations. Finally, some Ph.D.s from REM will be hired as faculty at universities. Copies of recent advertisements illustrate that there is a need for such graduates (Appendix 4).

Demand for Ph.D. Graduates

Demand by employers for graduates of a Ph.D. program in resource management is expected to be large. The Conference Board of Canada and the Canada Dept. of Employment and Immigration have pointed out the expected shortage of highly trained personnel in this field. It will arise partly from the large portion of highly qualified staff that will retire or otherwise leave during the next 10 to 15 years. As noted above, NSERC, SSHRC, and MRC have also recently recognized through the Tri-Council Eco-Research Program, the unique role needed for interdisciplinary training in environmental management, which is exactly what our Master's program has been doing since its inception in 1979. This current and projected future need is what stimulated Canadian federal agencies to establish the fellowship program for Ph.D. students in environmental research. Furthermore, issues in management of our natural resources are high on the list of priorities of governments and the public, and they are likely to remain there for a considerable period because of limited natural resources and increasing conflicts over their use. Public demand is also high for increasing government regulation and action to manage the environment. This will further stimulate the creation of positions in public and private agencies to deal with these problems. Thus, the hiring of Ph.D. graduates in the field of environmental management will be a growth industry in North America over the next decade or two.

A rough indication of the demand for future Ph.D. graduates from SFU's School of Resource and Environmental Management comes from the current strong interest in its graduates from the Master's program. Appendix 1 shows the responsible positions held by

REM graduates. In fact, demand is so great that in some areas students are often lured away to high-paying positions before they have finished writing up their research project.

Supply of Ph.D.s in Resource and Environmental Management

No institution in Canada produces Ph.D. graduates with the type and depth of interdisciplinary training in natural and social sciences that they would get in the School of Resource and Environmental Management at Simon Fraser University. As noted in the section on Comparison with Other Programs, existing Ph.D. programs related to environmental management are either strongly disciplinary or emphasize only the social sciences.

The Conference Board of Canada (1990, p. 7) reported that environmental specialists are among the professions expected to be in shortest supply over the next 5 years. However, the information is not broken down by Master's vs. Ph.D.s.

Based on current enrolments and annual admissions, the number of Ph.D.s graduating annually from other Canadian universities in interdisciplinary resource and environmental management will in the near future be approximately 8 per year from York (mostly social science oriented) and 1 or 2 from UBC. REM expects to graduate between 2 and 3 per year. Thus, the additional graduates from our program are not likely to saturate the market. On the contrary, demand for graduates will continue to exceed the supply, especially for students with strong scientific and interdisciplinary training.

IV. Present and Projected Resources

Very little, if any, additional resources are necessary to offer this Ph.D. program. The School of Resource and Environmental Management currently has an interdisciplinary team of 9 full-time faculty and 2 faculty cross-appointed with other SFU departments, as well as several associate faculty in other departments. These are sufficient to mount the proposed Ph.D. program (especially as our total enrolment will remain unchanged), although over the next few years REM hopes to add to the quality of the program by hiring other faculty members. REM already offer a wide variety of courses and it expects that Ph.D. students will also take graduate courses in other SFU departments. At this time, it anticipates offering only two additional courses to meet the needs of Ph.D. students.

Ph.D. students will be funded through normal channels. Based on the past success of our Master's students in national scholarship competitions, we anticipate that some of the Ph.D. students will hold NSERC Postgraduate Scholarships and others will hold Tri-Council Secretariat Doctoral Fellowships. They will also be competitive for SFU fellowships, teaching assistantships, and research assistantships. There are also a growing number of private environmental scholarships available. Finally, we expect faculty research grants and contracts to provide stipends and research funds for Ph.D. students who are not otherwise funded.

The School of Resource and Environmental Management has had faculty and graduate students since 1979, and the library holdings have been adequate for their needs. While doctoral students will undoubtedly undertake more detailed and specific research in their theses, we do not presently anticipate needing significant additional materials over those presently available. The attached correspondence between R. Peterman (REM) and R. Stanton (Library) establishes the modest budget requirements for adding to the library's collection: $892 one-time cost plus $91/year. There will be no need to replace the lost donated documents referred to in the library's memo of 3 Feb. 1993.

Budget

As REM intends to keep its overall graduate enrolment stable by directly substituting doctoral for Masters admissions, no additional financial impact on the School is anticipated. We expect any additional pressures on financial resources to be covered by the grants to faculty and scholarships of the doctoral students, with the exception of the added cost for library resources noted above. REM's operating budget will be increased to cover that cost.

Research Awards to Faculty in the School of Resource and Environmental Management

The attached faculty curriculum vitae (Appendix 5) indicate both the existing level of funding available to support the research projects of graduate students and the quality of current research in the School of Resource and Environmental Management. This information indicates that REM faculty are capable of supervising Ph.D. students.

Conclusion

This proposal for a **Ph.D. in Resource and Environmental Management** reflects the spirit for which Simon Fraser University is known: establishing high-quality innovative programs. REM hopes to implement this proposal rapidly.

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University of Waterloo 1990-91 Graduate Studies Calendar, pp. 68-78.

York University 1991-92 Graduate Studies Calendar, pp. 68-78.

Table 2: Ph. D. Programs Related to Natural Resource Management Last updated: 14 Aug. 1992

School	Faculty or Department	# Faculty	# Ph. D. Students	Subject Areas	Course Requirements	Comprehensive Exams	Degrees
Interdisciplinary Programs at Canadian Universities							
York University	Environmental Studies	54	25 to 30	-nature, culture, and society -environments, institutions, & interventions	1 required course	one	Ph. D. in Environmental Studies
U. of British Columbia	Interdisciplinary Studies (Resource Management Science)	none directly appointed	7	-those covered by standard disciplinary departments such as Agricultural Sciences, Botany, Commerce and Business Admin., Community & Regional Planning, Economics, Forestry, Geography, Oceanography, and Zoology	depends on student's needs	two	Ph.D in Interdisciplinary Studies
Standard Disciplinary Programs at Canadian Universities that have Some Interdisciplinary Component							
U. of British Columbia	School of Community and Regional Planning	14	23	-community and regional planning -urban physical planning -urban policy planning -real property development planning -international development planning -natural resources planning	depends on student's background	1 (composed of two research essays)	Ph.D. in Planning
U. of Waterloo	School of Urban and Regional Planning, Faculty of Environmental Studies	14+ 8 cross appointed	24 full-time 9 part-time	-social and political processes -environmental planning (water resource, park, and land use planning, conservation, and environmental impact assessment)	at least 2 required courses	1	Ph.D. in Urban and Regional Planning
SFU	Geography	21	14	-physical and cultural geography	no required courses	1 oral exam 1 written exam	Ph. D. Geography
U. of Waterloo	Geography	19 full 12 cross appointed	25 full-time 14 part-time	-natural resource analysis (economic, social & ecological aspects) -urban systems, recreation geography, physical geography, cartography	2 required courses	one	Ph. D. Geography

APPENDIX 2

School	Faculty or Department	# Faculty	# Ph. D. Students	Subject Areas	Course Requirements	Comprehensive Exams	Degrees
Disciplinary Programs at Canadian Universities (continued)							
U. of Victoria	Geography	14	9 full 11 part	-resources -urban geography -physical geography -cartography, GIS -economic and cultural geography -environmental aesthetics	5 to 11 required courses	1 written 1 oral	Ph.D. in Geography
Non-Canadian Interdisciplinary Programs							
Duke University	School of the Environment (formerly Forestry & Environmental Studies)	15	20 to 25	-natural resource economics & policy -natural resource systems science -natural resource science/ecology	10 required courses	one	Ph.D. in Environmental Studies
U. of Michigan	School of Natural Resources	38	43	-aquatic ecosystems & management -terrestrial ecosystems & management -landscape resource planning & design -natural resource & environmental policy -human impacts & change processes	3 required courses + normally 5 elective courses	1 oral exam 1 written exam in a) major and secondary areas of specialization and b) research and analytical skills	Ph.D. in Natural Resources
Yale University	School of Forestry & Environmental Studies	36	21 Dr. of Forestry 27 Dr. of Philos	-soil science; water resource mgmt; pathology & entomology; wildlife ecology ecosystem mgmt; museology; various forestry courses subjects; economic policy & mgmt; sociology leisure & recreation	8 elective no required 1 written	1 prelim. oral 1 prelim. written 1 oral	Ph.D. Forestry, Doctorate in Environmental Studies

23

SENATE COMMITTEE ON GRADUATE STUDIES
NEW COURSE PROPOSAL FORM

1. Calendar Information:

School: **Resource and Environmental Management** Course Number: **MRM 801**

Title of Course: **Principles of Research Methods and Design in Resource and Environmental Management**

Calendar Description of Course: **Develop skills and insight into the design and methods of interdisciplinary research in natural resource and environmental management.**

Credit Hours: 5 Vector: 2-2-1
Nature of Course: **Lecture, laboratory, and tutorial**

Prerequisites (if any): **NONE**

2. Enrolment and Scheduling:
Estimated enrollment: 10
When will the course first be offered? **FALL 1994**
How frequently will the course be offered? **Once per year**

3. Justification:
This course will consolidate into one place research methods currently being covered briefly in several MRM courses. Students will develop skills and insight into the design and methods of interdisciplinary research in natural resource and environmental management.

4. Resources:
Which faculty member will normally teach the course? **Drs. Randall Peterman Frank Gobas, Pam Wright**
What additional resources will be required in the following areas?
Faculty: **None**
Staff: **None**
Library (append details): **Minor; see attached memo from the library**
Audio Visual: **None**
Space: **None**
Equipment: **None**

5. Approved:

Departmental Graduate Studies Comm. Randall M. Peterman Date: 12 Jan. '94
Faculty Graduate Studies Comm. [signature] Date: Jan 20, 1994.
Faculty: [signature] Date: Mar 3/94
Senate Graduate Studies Comm. [signature] Date:
Senate Date:

MRM 801: **Principles of Research Methods and Design in Resource and Environmental Management**

Purpose: Students will develop skills and insight into the design and methods of interdisciplinary research in natural resource and environmental management. This will help prepare students to carry out their own research projects.

Scope: This course will meet the specific needs of graduate students in the School of Resource and Environmental Management in their first year as they are selecting and designing a research project. The objective of this course is to familiarize students with both quantitative and qualitative research methods in the field of interdisciplinary resource management. The core material will be expanded on each year to focus on problems relevant to the research being undertaken by that year's students.

The curriculum is designed to address a variety of methodologies and techniques that can be used in planning and conducting interdisciplinary and applied research in complex real-world environments. The integrative and applied nature of research in the area of resource and environmental management often requires the application of advanced quantitative research methodologies (e.g. stochastic simulation modelling), as well as applications of traditional research methods (e.g. experimental design of management actions). It also requires identification of resource management objectives to ensure that results are useable. Similarly, the interdisciplinary nature of research projects in natural resource management requires qualitative research in some cases (e.g. analysis of policies and institutional jurisdictions, or social and economic impacts of resource developments).

Format: MRM 801 will have a lecture, laboratory, and seminar format. To complement lectures, some class sessions will be occupied by the discussion and analysis of current, classic, or problem papers illustrating a particular issue.

Prerequisites: We will assume prior knowledge of basic principles in inferential statistics, data analysis, and data collection methods in some specific discipline and an ability to read critically the primary technical literature of a variety of disciplines.

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801mrm

RECEIVED
FEB 12 1994
SCHOOL OF REM

MEMORANDUM

W.A.C. Bennett Library, Simon Fraser University
Burnaby, British Columbia, Canada V5A 1S6

Date: 8 February, 1994

From: Ralph Stanton (Collections Librarian)

To: Professor Randall M. Peterman, Chair of the Graduate Studies Committee, School of Resource and Environmental Management

Re: Added cost attached to collection assessment. SREM Ph.D. proposal. (Original memo dated 1 February, 1993, updated 14 January, 1994).

To confirm your telephone call of this morning in which you pointed out the desirability of adding the backrun of *Ecological Applications*. This publication was in its third year in 1993. Therefore we will buy 1991 to 1993 as a backrun; 3 years at $91 a year or $273.

ADDED COST TO THIS ASSESSMENT IS $273 AS A ONE TIME COST.

RS

MEMORANDUM

W.A.C. Bennett Library, Simon Fraser University
Burnaby, British Columbia, Canada V5A 1S6

Date: 14 January, 1994

From: Ralph Stanton (Collections Librarian)

To: Professor Randall M. Peterman, Chair of the Graduate Studies Committee, School of Resource and Environmental Management

Re: Your memo of 10 December 1993 regarding the Library collection assessment and the SREM Ph.D. proposal. THIS MEMO REVISES COSTS ORIGINALLY SET OUT IN MY MEMO DATED FEBRUARY 3, 1993.

Thank-you for your memorandum of 10 December, 1993. We agree with the basic direction of your memo and summarize our agreement following your points:

1. - Agree to remove the request for a subscription to *Negotiation Journal*.
- We suggest the purchase of a second copy of **Qualitative Data Analysis: a Sourcebook of New Methods by Miles and Huberman** (on your new reading list) at a cost of $59 since our copy is both a 3 week loan item and is now out on loan.

2. - Agree that **Biosis** on CD-ROM is an option you may wish to pick up at some future time.

If this approach is acceptable the revised costs are as follows:

Required:
7 monographs $560 one time cost
1 added monograph $59 one time cost
1 serial (Ecological Applications) $91 recurring cost

Optional: **Biosis** CD-ROM if and when the School has the funds and wants to add this item.

The costs in this memo were agreed to in a phone conversation with you today.

Best Regards,

Ralph Stanton

Search Browse Format Action Options Databases Books In Print PLUS

Search Workspace

7. kw = reliability
8. kw = v
9. kw = q
10. cs = 7
11. cs = 1

Citation(s) Selected : 1
Viewing : 1

Books in Print Format

Miles, Matthew B. & Huberman, A. Michael. Qualitative Data Analysis: A Sourcebook of New Methods. 240p. 1984. Hardcover text edition. $44.00. (ISBN 0-8039-2274-4). Sage Publications, Incorporated.

F1 ->Help F2 ->Pub F4 ->Save File F5 ->Print ESC ->Prev. Window
F7 ->Order

CALENDAR INFORMATION:

Department: School of Resource and Environmental Mgmt. **Course Number:** MRM 802

Title: Institutional Design and Decision Making for Environmental Management

Description: To familiarize students with three aspects of the organizational context for resource and environmental management--legislative, institutional and decision analysis.

Credit Hours: 5 **Vector:** 5-0-0 **Prerequisite(s) if any:** 1994

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 4 **When will the course first be offered:** 1994

How often will the course be offered: Once per year

JUSTIFICATION:

Students will develop an understanding of the methods of legislative and institutional analysis and methods of decision-making in natural resource and environmental management.

RESOURCES:

Which Faculty member will normally teach the course: Dr. Chad Day, Dr. Michael M'Gonigle Dr. Randall Peterman

What are the budgetary implications of mounting the course:

Are there sufficient Library resources (append details):

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course.
c) Library resources

Approved: Departmental Graduate Studies Committee: [signature] **Date:** 12 May '93

Faculty Graduate Studies Committee: [signature] **Date:** May 13, 1993

Faculty: [signature] **Date:** May 3/9x

Senate Graduate Studies Committee: [signature] **Date:**

Senate: **Date:**

30.

MRM 802 **Institutional Design and Decision Making for Environmental Management**

Purpose: Students will develop a sophisticated understanding of the institutional structure and methods of decision-making in natural resource and environmental management. This course complements material covered in a variety of master's level courses.

Scope: This course will familiarize students with three aspects of the organizational context for resource and environmental management--legislative, institutional and decision analysis. (1) The nature and methods of the legislative and regulatory framework will be analyzed at a provincial and national level, with appropriate international comparisons. From this, students will gain an up-to-date understanding of both the legal context and strategies for effective governmental action. (2) The attributes of effective institutional design will be analyzed from a range of perpsectives such as policy analysis and planning, monitoring and evaluation of programs, negotiation and public participation techniques. (3) Finally, a range of techniques for rational decision-making will be addressed, including simulation modelling, cost and risk-benefit analyses and goals achievement matrices. This section will especially address the nature of decision-making under conditions of uncertainty.

Format: Run as a small seminar, the research and discussion will be oriented to providing a forum for in-depth application of these topics to current issues and debates in the field. Each student will be expected to apply these topics to their special research area.

Prerequisites: While there are no prerequisites for this course, students will benefit from participating in existing 600 level courses, including MRM 641, MRM 642, MRM 644, MRM 646 or MRM 655.

Implications for Library Resources: The range of journals and books held currently by the library is sufficient at present for the disciplines covered in this course.

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plus numerous articles in journals such as: AI Applications in Natural Resource Management, Canadian J. of Fisheries and Aquatic Sciences, J. Environmental Management, Ecological Applications, Ecological Economics, Ecology, J. Environmental Economics and Management, Risk Analysis, and Science.

SIMON FRASER UNIVERSITY

FACULTY OF APPLIED SCIENCES
SCHOOL OF RESOURCE AND ENVIRONMENTAL MANAGEMENT

MEMORANDUM

TO: Dr. Phyllis Wrenn
Dean of Graduate Studies

DATE: 18 Jan. 1994

FROM: Randall M. Peterman
Professor and Chair of the Graduate Studies Committee
School of Resource and Environmental Management

SUBJECT: Responses to External Reviews of Proposal for Ph.D. in Resource and Environmental Management

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I apologize for the lengthy delay in responding to the external reviews of our proposed Ph.D. program in Resource and Environmental Management. Last fall was extremely busy.

The external reviews were very useful and constructive, especially Dr. Bassett's. Revisions to our proposal have now been made taking into account the suggestions of these reviewers. Our responses are summarized below. The School of Resource and Environmental Management is abbreviated REM.

External Reviewer # 1: Dr. John Bassett, University of Michigan
Dr. Bassett's page 1:

1. We did not intend to imply that our doctoral students would each obtain a 3-year Tri-Council Secretariat fellowship. We only mentioned the existence of this interdisciplinary fellowship as further evidence of the growing recognition that Ph.D. training in the environmental field should be interdisciplinary. A new section on funding of Ph.D. students has been added on page 17.

2. A statement has been added under "Requirements for Admission" on page 9 to clarify that MRM students who successfully transfer into the REM Ph.D. program would only be eligible to earn the Ph.D. degree. They would not get both a MRM and Ph.D.

3. Also in this same section, wording has been changed to read that "Students must be accepted by an identified senior supervisor prior to acceptance into the program." We have also now included in the calendar entry a statement encouraging Ph.D. applicants to visit SFU for an interview prior to 15 February.

Dr. Bassett's page 2:

4. Dr. Bassett's question concerning the minimum GPA for a MRM student who transfers into the Ph.D. is taken care of by the combination of the SFU General Graduate Regulations 1.3.3 and our "Requirements for Admission" on page 9 that require a "high academic standing in previous university work." The SFU regulation for entry into a Ph.D. program is for a minimum GPA of 3.5 at the Bachelor's level if the student does not already have a Master's degree, or a GPA of at least 3.5 in 75% of the graduate

course work after having completed at least 2 semesters of a Master's program at SFU. We therefore see no problem; all contingencies for MRM students who request a transfer into the REM Ph.D. program are clearly covered.

5. We currently require a "Statement of Interest" as part of the application for our Master's program and this will be true of the Ph.D. program as well, as Dr. Bassett suggests. Wording to this effect has been added under "Requirements for Admission" on page 9.

6. We hesitate to require more than the 4 courses already noted in the proposal. While we expect that most students will need to take more in order to prepare adequately for the comprehensive exams, this larger number of courses should not be required of everyone because some students may already have adequate background in one of the main topic areas. Instead, each student will at a minimum be expected to be knowledgeable in the areas covered by the comprehensive exams.

7. One of the required courses for Ph.D. students (MRM 801) will be oriented exclusively to the "tools of analysis, research design, ..." that Dr. Bassett suggests. We expect that most students will gain further background on those topics in courses in their area of primary interest. We therefore do not see a need to require two methods courses explicitly.

Dr. Bassett's page 3:

8. We have now added wording on page 10 to clarify the purpose and potential outcomes of the comprehensive exams and the defense of the thesis proposal. Successful completion of all three comprehensive exams and successful defense of the proposal is required in order for the student to proceed to the next phase, the thesis research. Students who fail to complete either of these requirements within the required time will be asked to withdraw from the Ph.D. program.

9. Dr. Bassett's comment on the fees simply reflects his lack of familiarity with the SFU graduate tuition system. There is no problem with the proposed degree program; SFU's minimum required 8 full-time fee units will apply.

10. He was also not aware that all SFU graduate students must register as "enrolled" if they are using university resources, including asking faculty to read drafts of theses and giving research advice.

11. After reflecting on Dr. Bassett's comments, we have changed the time in which we expect students to complete their comprehensive exams to 18 months since admission (instead of 15) and within 22 months of admission to defend their thesis proposal (instead of our original 18).

Dr. Bassett's page 4:

12. REM faculty fully realize that Ph.D. students are a much larger commitment than Master's students both in terms of research advice and financial assistance. In fact, in response to comments of another reviewer, Dr. Nelson, we have scaled down slightly the number of Ph.D. students that we expect to admit from 3 or 4 per year to 2 or 3.

13. We expect that Ph.D. students will obtain teaching experience through TAships or sessional lecturing. However, note that we do not expect very many of our Ph.D. students to go into academic teaching positions. This is documented in the outside letters of support in which there are many positions in government and private agencies.

14. Under "Present and Projected Resources" we did not mention the library's recommendation for a BIOSIS (Biological Abstracts) CD-ROM

($4,100 per year) because that was noted as an "optional" item by the librarian (and still is in his memo of Jan. 1994). That is exactly how we see it as well; it is not absolutely required for the Ph.D. program to work. We have been able to efficiently search library holdings in the past without such a service and do not anticipate that we will have funds to directly support an annual purchase of a BIOSIS CD-ROM. Other departments on campus such as Biological Sciences and Geography use Biological Abstracts as well. Thus, at best a joint funding arrangement might be worked out, if funds are made available.

All other matters raised by Dr. Bassett's most useful comments are either minor or are dealt with by normal SFU procedures. In general, his comments were quite supportive of the proposal.

External Reviewer # 2: Dr. Gordon Nelson, University of Waterloo

Dr. Nelson's page 1:

1. We agree that a transfer of a Master's candidate to the Ph.D. program would be a "truly exceptional" situation. That was our intent all along and the wording on page 9 on this point has now been underlined to emphasize that "only a very small proportion of its students will qualify to transfer into the Ph.D. program."

Dr. Nelson's page 2:

2. Dr. Nelson's comments on the expected supervisory committee load for the anticipated Ph.D. enrolment has prompted us to reduce the expected admissions to 2 or 3 per year, rather than the 3 or 4 noted originally. As he suggested, we will review our experience with the Ph.D. program annually and will revise this admission level as necessary to maintain a high quality program.

Dr. Nelson's last page:

3. Dr. Nelson's point 3 on this page suggests that we involve outside partners in government and industry through an advisory committee. We already have this informally though our extensive group of adjunct professors, who are working professionals in government or private agencies related to resource management. These adjunct professors serve on student supervisory committees to complement the expertise of the SFU faculty, and they work with us jointly on applied research projects. Some adjunct professors have arranged funding for REM graduate research projects. We anticipate that this arrangement will continue to work successfully for Ph.D. students as well.

Dr. Nelson's comments were also mostly quite favorable toward the proposal.

External Reviewer # 3: Dr. Ted Spence, York University

Dr. Spence's page 3:

1. Dr. Spence raises the question of funding available to support students. We do not anticipate that this will be a problem because if anything, there will be increased opportunities to conduct research projects with the addition of Ph.D. students to REM. They will be able to carry out research that is longer term and in greater depth than is possible for our current Master's students (because of the heavy course load for the Master's degree). Furthermore, as noted by several of the external reviewers of the Ph.D. proposal, our relatively young faculty are generally successful at obtaining research grants and contracts.

Dr. Spence's experience with developing a Ph.D. program at York University in a similar field to ours puts him in a unique position to comment on our proposal. He strongly endorses our arguments both for the demand by applicants to enter the program and demand for graduates.

External Reviewer # 4: Dr. Paul West, University of Victoria

Dr. West's page 1:

1. Dr. West is correct in describing our proposed range of comprehensive exams as "rigorous" and "daunting." They were intended to be this way to create uniquely trained students. The 15 years of experience in REM with teaching and doing research in an interdisciplinary setting have enabled us to hone our program to enable students to understand topics in both natural and social sciences. This experience will provide a solid foundation for moving into an interdisciplinary Ph.D. program.

Dr. West's page 2:

2. Under "minor points" the question is raised again about how many of our Ph.D. graduates are expecting to fill university faculty positions, but this view of their future job opportunities is too narrow. As noted above, we anticipate that only a few of the Ph.D. graduates will seek such positions, both because of the limited university market and because of the large number of other opportunities that are and that will be available in private industry, consulting, and government agencies. The letters of support (Appendix 3) attest to this pending outside demand for Ph.D. graduates.

3. We do not foresee an extensive demand for transfer into the Ph.D. program from the existing Master's stream. As noted above, the calendar entry, as well as any discussions with REM faculty, will make it clear that this route into the REM Ph.D. program will be a very unusual circumstance. We will thus deal with this in the normal way that other university departments do. The level of expectations will be set in proportion to the observed rate of successful transfers.

Dr. West also generally encourages proceeding with the proposal.

Conclusions

The four external reviewers tended to support our proposal and they made numerous suggestions that have improved it. The reviewers noted that the proposed program is unique in Canada and that REM faculty will be able to offer the degree. As well, they confirmed our original research that not only is there likely to be a demand by students to get into the program, but there will also be good employment prospects for graduates. The REM faculty are therefore eager to move to the next steps in getting university approval of this program.

Randall M. Peterman

Randall M. Peterman

(phdrespo)

THE UNIVERSITY OF MICHIGAN
SCHOOL OF NATURAL RESOURCES
& ENVIRONMENT

JUL - 6 1993
DEAN OF GRADUATE STUDIES OFFICE

June 29, 1993

Dr. Bruce P. Clayman
Dean of Graduate Studies
Simon Fraser University
Burnaby, British Columbia
CANADA V5A 1S6

Dear Dr. Clayman:

You have asked me to review the proposed doctoral program in Resource and Environmental Management and comment on its academic merit and structural integrity, the adequacy of the faculty and other resources, the demand by prospective students for the program, and the demand for graduates of the program. My comments follow the outline of the proposal.

Objectives

The objectives of the program (para. 2, p. 4) are laudable. With your interdisciplinary master's program firmly in place, these objectives certainly can be achieved. Moreover, the program does not seem to duplicate other doctoral programs at Canadian universities (p. 6-8), and I agree that it will fill a major gap (para. 5, p. 8).

It is not clear that each admitted doctoral student will be awarded a 3-year Tri-Council Secretariat fellowship (para. 2, p. 4). Even if each new doctoral student does get one of these fellowships, will that student need additional financial aid? Some doctoral students may be enrolled for more than six semesters (three years) before completing the degree. Will you need to support them beyond three years? If so, how much financial aid (e.g., scholarships, research assistantships, etc.) will be reallocated from master's students to doctoral students?

The School of REM

The current 11 REM faculty (para. 3, p. 5) should be able to develop a doctoral program and accommodate up to 20 currently-enrolled doctoral students. Judging from their curriculum vitae, most of the faculty are very active in scholarship and research.

Requirements for Admission

Transfer students. The proposal states (para. 2, p. 9) that a student currently enrolled in the REM master's degree program for at least two semesters may be allowed to transfer to the doctoral program. The calendar entry (Appendix 9) and the proposal should make clear whether a transfer student will earn the MEM degree in addition to the Ph.D.

Senior supervisor. The proposal states (para. 3, p. 9) that doctoral students generally will have an identified senior supervisor prior to being admitted. I recommend that you consider assigning a senior supervisor at the time of admission without exception. Taking on a doctoral student is a major commitment for a faculty member. In my opinion, a faculty member should know who has been assigned to her or him before the student has been admitted. Admittedly, not all admitted students enroll, but pre-enrollment assignment of senior supervisors precludes one type of unwelcome surprise to faculty members. And, to be fair to the student, he or she should be sure that her or his senior supervisor is enthusiastic about the assignment before admission. To get to know doctoral applicants, you can require or strongly recommend that they visit your campus prior to the admission decision.

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37.

Grade point average. According to the 1992-93 Calendar (p. 266), admission to the REM doctoral program will follow the University's Graduate General Regulations (sect. 1.3.3., p. 241) that apply to all doctoral programs at SFU. One of those general regulations is that an applicant who does not have a master's degree must have earned a cumulative grade point average of at least 3.5 in the baccalaureate program. If this regulation is not strictly followed, I see no problem. If you are allowed no flexibility in this regulation, however, I believe that you will have to deny admission to some applicants you would like to admit. I believe that you will receive applications from people who earned baccalaureates with less than 3.5 grade point averages, but who are highly motivated and have several years of excellent experience. Admission to a master's program requires a cumulative grade point average of only 3.0 (sect. 1.3.2, p. 241), and someone with a master's degree can be admitted to a doctoral program. So, why require a cumulative grade point average above 3.0 for someone with only a baccalaureate but several years of experience? I am curious how you will handle the following situation: Assume that a student earns a baccalaureate with a 3.0 grade point average and is admitted to your REM master's program. One year later that student, who has performed well, wants to transfer to your doctoral program. Can you consider such a student who has no master's degree and a grade point average of only 3.0 in the baccalaureate program?

I recommend that you include language in REM's Admission statement (for the doctoral program) in the Calendar (p. 266) that provides you with the opportunity to be flexible with respect to cumulative grade point averages earned in baccalaureate and/or master's programs.

Statement of Intent. I recommend that you require prospective doctoral students to include a 500- to 1000- word Statement of Intent as part of their application. Applicants should be asked to submit this document to describe what they expect from your doctoral program and how your program fits their career objectives. This statement will help faculty select applicants who have a clear idea of what they want to research, which increases the likelihood that their research interests correspond to the interests and strengths of the faculty. The statement also reveals motivation, organization, and clarity of thought.

Degree Requirements

Courses. According to the proposal (para. 4, p. 9), doctoral students will be required to take at least 4 courses (20 semester hours), excluding directed studies and MRM 601-5. This requirement is close to the average requirement of other doctoral programs administered by the Faculty of Applied Sciences, which range from 0 to 6 courses (0 to 33 semester hours).

I realize that the doctoral program is focused on research, but I feel that doctoral students should be required to take more than 4 courses to prepare them for writing a thesis. The proposal states that doctoral students normally take a total of 6 to 8 courses in order to prepare adequately for the comprehensive examinations. That being the case, I suggest that you consider requiring a minimum of 6 courses (presumably 30 semester hours), including two in each of two disciplines in the student's research area.

The proposal says nothing about what minimum analytical skills a doctoral student must have (e.g., applied statistics, experimental design, econometrics, policy analysis, etc.). Yet, new course MRM 801 (Appendix 6) assumes that participants will have prior knowledge of basic principles in inferential statistics and experimental design, data analysis, and collection methods in some specific discipline. I recommend that you consider requiring, in addition to a minimum number of courses, completion of at least two graduate-level courses (they may have been taken in a master's program) that focus on tools of analysis, research design, research evaluation, and/or method of data collection.

Comprehensive examinations. The proposal states (bottom of p. 9) that doctoral students normally will be required to take three comprehensive examinations within 15 months of full-time registration after admission. Are these examinations used to judge whether a student is ready for candidacy? Who administers these examinations? These questions should be answered in this section of the proposal.

Period of residence (para. 4, p. 10). According to your 1992-93 Calendar (page 248), the minimum fee for the doctoral degree is 8 full-time fee units. It is not clear to me the minimum number of full-time fee units that will have to be paid by a doctoral student who is admitted having already earned a master's degree from a university other than SFU. If adding two courses (from a minimum of 4 to a minimum of 6) would have the effect of adding one more full-time fee unit to the cost of your doctoral degree, disregard the suggestion I made two paragraphs earlier.

Enrollment

The proposal states (para. 3, p. 15) that only a few students are expected to transfer from the master's program to the doctoral program. I think that a strong doctoral program will result in more applications from transfer students than you anticipate. In our School of Natural Resources and Environment at the University of Michigan, we normally do not admit students to our doctoral program until they have earned a master's degree; several of our master's students continue on for the Ph.D. Such students normally perform very well as doctoral students, and they are successful in getting financial aid in their doctoral programs because as master's students they established good records and learned how to compete strongly for teaching and/or research assistantships.

The proposal states (para. 3, p. 15) that you expect to admit 3 or 4 doctoral students per year, which would result in a mean student body of about 12 to 20 doctoral students at a given time once the program is running at full capacity. As I stated earlier, I believe that servicing 3 to 4 new doctoral students per year is feasible for your current faculty of 11 members. This assumes that (a) the research interests of applicants are similar to those of your faculty, and (b) that each faculty member will be willing to supervise her or his share of doctoral students.

It is not clear what the maximum number of doctoral students enrolled in a given term will be. Your proposal says that 12 to 20 doctoral students will comprise the student body when the program is running at full capacity. Will all 12 to 20 be enrolled, or will some of these be candidates who are working on their research but are not enrolled? Normally there are nonenrolled candidates on and off campus who do not count in current student enrollments, but who do expect faculty to consult on research questions and to read draft chapters of the thesis. It is important for the faculty to agree on how nonenrolled (but active) candidates and enrolled doctoral students (noncandidates and candidates) together make up a full load of doctoral students.

If, eventually, you expect 12-20 doctoral students to be enrolled in any given term, you must be expecting them to take at least 3 to 5 years to earn the Ph.D. degree. If this is true, it seems to me that you are too optimistic in expecting them to be ready to take comprehensive examinations within 15 months after admission to the doctoral program (last para., p. 9). Requiring a defense of a thesis proposal within three months of completion of the comprehensive examinations is reasonable (but not if the defense is required only 18 months after admission to the program). If you expect doctoral students to have completed all formal coursework, passed three comprehensive examinations, and successfully defended the thesis proposal by the end of 18 months after admission, why do you expect them to be still enrolled 3 to 5 years after admission? Obviously, I am confused about this point. It would clear matters (unless no one else is confused) if you would include in the proposal a flow chart that shows the progress of a

typical student each term from admission to receipt of the Ph.D. degree (course load, research commitment, teaching experience, time of comprehensive examinations, time of thesis defense, work on or off campus while a candidate, and time of graduation).

The proposal states (para. 3, p. 15) that the addition of 3 to 4 new doctoral students will be offset by admitting 3 to 4 fewer master's students each year. I believe that you will find that this is not an equal trade-off. One doctoral student requires more faculty time than one master's student working on a research project. Compared with the master's student, the doctoral student normally is enrolled longer, needs more advice, and needs more financial aid. In the case of doctoral students doing biological/ecological research, they often need more sophisticated equipment in the field or laboratory and more laboratory space than master's students doing biological/ecological research. In short, if you eventually have 20 doctoral students enrolled in any given semester and reduce your enrollment of master's students by only 20, I believe that the faculty will experience an increase in workload.

I agree that there is likely to be a good pool of applicants from which to enroll 3 to 4 new doctoral students per year. As I mentioned earlier, I believe that you will attract some of your best master's students -- more than you anticipate.

Demand for Ph.D. Graduates (p. 16)

I agree that there will be a market to absorb an average of 3 to 4 doctoral graduates annually. The materials in Appendices 3 and 4 are very encouraging.

Some of these graduates presumably will want to teach and do research in academia. Nowhere in the proposal is there any mention of how doctoral students will get teaching experience. Does your University use doctoral students as teaching assistants? If no, how will they get teaching experience? If yes, how long will gaining teaching experience extend the time to completion of all degree requirements? And if yes, will you need to reallocate financial aid from master's students to create teaching assistantships? This matter may be clear to everyone at SFU, but my School must allocate part of its funds for teaching assistantships, hence my questions.

Present and Projected Resources

The proposal states (para. 1, p. 17) that few, if any, additional resources will be required to offer the new doctoral program. I believe that a successful doctoral program will require some, if only modest, additional resources: financial aid, space, research equipment/facilities. For example, in the section entitled "New Courses" (p. 13) the proposal states that offering two new courses (MRM 801 and 802) may result in other courses being offered less frequently. (This will affect some master's students, too.)

Not mentioned in this section of the proposal is the Library's recommendation (Appendix 8, p. 2) to add "BIOSIS" to its collection at a cost of $4,100 per year, which the library does not have in its budget. As the doctoral program unfolds, I would expect increasing demands from students for more computer hardware and software. In the next section of the proposal ("Budget", p. 17), it is stated that additional pressures on laboratory and office facilities <u>should</u> be covered by grants and scholarships brought by the doctoral students themselves. If these materials cannot be acquired through research grants and scholarships, who will provide them? Is there not a research office for the entire University that can help meet these needs? I can assure you that faculty and/or students will expect help (= dollars).

The proposal recommends (para. 5, p. 6) that faculty from different disciplines be housed in the same administrative unit. If you intend to attract more faculty to your School, will you have adequate space for them and their graduate students? Will they need special equipment and/or facilities (e.g., wet labs, GIS equipment, computers, etc.)?

Summary

I view this new doctoral program as promising because the REM faculty has had 15 years of experience running a successful interdisciplinary master's program and, at the same time, most of its members are energetic researchers and scholars. Moreover, course offerings and faculty collaboration within and outside REM bode well for prospective doctoral students. A persuasive case has been made that excellent students will apply to the program and that they will be in demand once they complete their programs.

I wish you every success in this ambitious endeavor.

Sincerely,

John R. Bassett

John R. Bassett
Professor of Forestry

JRB/ss

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June 21, 1993

Bruce Clayman
Dean of Graduate Studies
Simon Fraser University
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Dear Bruce:

RE: Proposed Ph.D. in Resource and Environmental Management

My review of the proposal and supporting documentation is complete and my response to the four evaluation criteria is set forth below:

- *The academic merit and structural integrity of the proposed programs.*

From an academic standpoint the proposal is strong, particularly in regard to requiring both breadth and depth and in requiring command of at least two disciplines in the research and dissertation. The proposal for 2 major seminars on interdisciplinary science methods and on socio-economic and institutional management is a good one although I have some concern as to how these will be tied together other than in the research itself. The requirement of different comprehensive exams in these key aspects of resource and environmental management is also a sound academic move in terms of the interdisciplinary goals of the program.

From a structural standpoint the proposed program seems well organized and planned. The goals are clear and the existing and new courses well aligned with these as also are the comprehensives and other requirements. The current list of courses developed for the M.A. represents a good basis for the Ph.D. program as do existing courses in other departments. I am a little concerned about the proposal that a Master's candidate could proceed to the Ph.D. without completing the first graduate degree. Such might seem desirable and possible under exceptional circumstances but they would in my view be truly exceptional.

In about thirty years of involvement in interdisciplinary or cross-disciplinary work where this requires a combination of natural sciences and the social sciences/humanities, I have known of only a few cases where this was done with the degrees being completed in a reasonable time period, say 5-6 years.

- *The adequacy of the faculty and other resources available to the proposed programs for achieving its intended goals.*

First, let me say that I know of the work of a number of faculty in the MRM program and have been impressed with their research and accomplishments in policy and practice. My study of the resumes in the proposal has impressed me further. All faculty are clearly strong academically in a variety of fields ranging across the natural and social sciences and the fields of policy, planning and management. A number of the senior faculty have had international reputations for many years. A number of the outstanding younger faculty are certainly headed in that direction. The faculty publications are numerous, frequently in good scholarly, professional and applied journals and presses. The grant and fund raising records are also generally of high caliber with numerous NSERC and SSHRC awards.

One difficulty I had in reviewing the files was in securing a good grasp of the graduate student advising experience of the faculty. In general this data for the Masters level is not provided in the proposal. I do have some knowledge of the quality of the grads which is often quite high based upon hearing presentation of papers at meetings, personal discussions or the reading of publications.

It also appears that the library and other resources available in support of the program are adequate to good, although the proposal does not make the laboratory/computer and other equipment clear to the reader.

I do have one significant concern as far as the adequacy of the faculty resources is concerned and that is whether the number of faculty and their advisory experience is sufficient to sustain the admission of four students annually or 15 - 20 in five years, assuming small numbers have graduated. It seems likely that each faculty member will serve as advisor/member on 6-7 student advisory committees assuming a student committee consists of an advisor and 3-4 faculty members. The use of faculty from other departments and faculties can help reduce this load but probably not significantly. In other words taking on a Ph.D. program even with a small number of highly qualified students is a large task and will significantly increase the overall and individual work load. I understand that the MRM group has no undergraduate degree program and no substantial undergraduate teaching requirement which is just as well under the circumstances. Please note that to do all these jobs, York has 54 faculty.

I do not want to be misunderstood. I am impressed by the proposal and by the faculty and other support. I also am impressed by the nature of and the plan for this new Ph.D. I feel it is very appropriate academically and in the applied sense. However, people, in my experience, constantly underestimate the amount of work required to conduct a strong Ph.D.

program. In this case I would not see it as wise to admit more than 3 candidates per year for the first four years whereupon an evaluation of the experience and future needs could be conducted. I also feel that the addition of some experienced faculty resources would be very helpful. Possibilities include a new faculty member, part-time work from experienced people in government, industry or more part time contributions from other units at SFU if that is feasible.

- *The demand for the proposed program among prospective students.*

Based on my knowledge of faculty and students at many Canadian and other universities and on work with government and private groups involved in the resource and environmental management field, I would anticipate that there would be a large number of applicants from an array of disciplines, for the 3 places to be filled each year. Given the nature of the program I would expect more applicants from the physical and natural sciences for the program than apply at existing programs. This proposed program is relatively rare in the seriousness of purpose with which the MRM faculty are attempting to provide *scientists* with the information, methods and skills needed to work effectively in the complex field of resource and environmental management today.

- *The demand for graduates of the proposed program.*

This is a harder question for me. Employment conditions are certainly not good in Ontario and some very good students are slow in getting jobs. However, the economic situation is brighter in the near and long term in B.C. The MRM faculty have also done considerable work on estimating employment prospects and have some convincing documentation in the proposal. I feel that there will be a good demand for well qualified Ph.D. grads yearly in the near future with prospects for many more if environmental and resource management becomes a strong part of the economic, corporate and government fabric in the longer term.

Further Thoughts

The criteria do not provide readily for discussion of some other points related to the proposal.

1. One of the great strengths of the faculty and the proposal is their deep involvement in practice through consultancies, memberships in NGOs, secondments to important positions and the like. The faculty are involved and this experience will lead to: useful research topics; funding and support of various kinds; avoidance of delays; and, inappropriate or inefficient activities and so forth.

2. To my knowledge the program is unique in its academic and professional character in Canada and soundly so. Such a program is needed in my view.

3. Nowhere in the proposal do I see attempts to reach out explicitly and include potential partners in government, industry and the citizenry. It might be useful to have an advisory or consultative committee of some kind.

Conclusion

I strongly support the approval and establishment of the proposed Ph.D. in Resource and Environmental Management and hope that the qualifying comments which I have made in regard to aspects of this proposal, will be helpful in its implementation.

Sincerely,

Gordon Nelson
Professor of Geography and
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September 7, 1993

Professor Bruce P. Clayman
Dean of Graduate Studies
Simon Fraser University
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Dear Dean Clayman:

I am writing with respect to your request that I review the documentation on the proposed new Ph.D Program in Resource and Environmental Management at Simon Fraser University. I apologize for the delay in my response to your request however as I explained to your assistant my summer schedule turned out to be much more hectic than I had previously anticipated.

I have now had an opportunity to review all of the documentation which you forwarded to me and I am pleased to be able to offer my strong endorsement for the proposed new Ph.D Program in Resource and Environmental Management.

It may be useful for you to know something of my background with respect to the development of a similar proposal here at York University. From 1982 until 1992 I served as Dean of York's Faculty of Environmental Studies and as the director of the Graduate Programs in Environmental Studies. Our Faculty of Environmental Studies was established in 1968 and from that time until 1991 offered only a Masters level program leading to the degree of Masters in Environmental Studies. In 1991 we introduced a new Ph.D Program in Environmental Studies. In my capacity as Dean and Graduate Program Director I played a significant role in the planning and proposal development phases of our Ph.D Program initiative. Specifically I worked with a small group of faculty in the development of our submission to the York University Senate in 1989, our submission to the Ontario Council of Graduate Studies (O.C.G.S.) in 1989, and finally on our submission to the Ontario Council on University Affairs (O.C.U.A.) in 1990. In the Ontario system O.C.G.S. is responsible for the academic approval of new graduate programs while O.C.U.A. is responsible for funding approval for new graduate programs. We admitted our first eight students to the Program in 1991 followed by seven additional students in 1992 and eight more students for 1993. We anticipate

our first graduates from the Program in the Spring of 1994 and we are aiming at a steady enrolment in the Program of about thirty.

Finally I should note that our new Ph.D program which is described in some detail in your proposal is interdisciplinary in nature and is based on the individual Plan of Study model which we have utilized in our MES Program over the last twenty-five years. As the authors of your proposal have correctly pointed out our program tends to place more emphasis on the social science and philosophical aspects of environmental studies with less emphasis on the natural science aspects.

I will organize my comments under the four subheadings which you have provided.

<u>The Academic Merit and Structural Integrity of the Proposed Program</u>.

I strongly endorse the case which is made in the SFU proposal with respect to the academic merits of an interdisciplinary program in resource and environmental management at the Ph.D level. There can be no doubt that studies confined by traditional disciplinary boundaries are no longer able to fully address the issues involved in the broad field of resource and environmental management.

The structural integrity and rigour of the proposed program is particularly impressive. The required course sequence along with the three comprehensive examinations will ensure both the breadth and depth of candidates' knowledge base. The two new courses being developed specifically for the Ph.D Program will provide doctoral students the important opportunity for advanced work in a class setting separate from the other graduate students. The identification of primary and secondary fields along with the three part comprehensive exam will ensure appropriate breadth. I believe that these are exceptionally ambitious course requirements that will ensure the academic merit of candidates in the new program. The required comprehensive exams in Environmental Science, Resource and Environmental Economics, and Resource and Environmental Policy, will be most demanding and again will ensure that all candidates for the degree will have developed expertise well beyond that which would be possible in any existing disciplinary program.

Finally the requirement that the Doctoral Thesis must include aspects of at least two disciplines again ensures that candidates will undertake research programs which are well suited to interdisciplinary programs and which could not be easily undertaken under the umbrella of existing disciplinary programs.

Overall I believe that the proposed degree requirements and curriculum indicate a great deal of careful planning which will ensure a very high level of academic merit and structural integrity within the program.

The Adequacy of the Faculty and Other Resources Available to the Proposed Program for Achieving Its Intended Goals.

Based on a review of the eleven faculty C.V.'s which are included in the proposal, and recognizing that a reduction in the Masters level enrolment to balance the new enrolments at the Ph.D level is planned, I have no hesitation in indicating that I believe that the faculty and other resources available are more than adequate to support the proposed program.

As a group, the faculty C.V.'s for the program members are most impressive particularly with respect to sustained research and publication and the demonstrated ability of faculty members to obtain research funding in the form of both grants and contracts.

Of the eleven faculty members at least four have very strong records over an extended period of time with respect to research, publications, and funding. These individuals would be the foundation of a Ph.D Program in any university. The fact that they have relatively little previous supervisory experience at the doctoral level simply indicates the nature of the programs to which they have been attached at SFU. I am confident that the members of this core group of faculty could each undertake more than one doctoral supervision as the program grows towards its steady state. I have identified a further group of five faculty members who although somewhat more junior in rank have compiled impressive records in recent years. These individuals could easily be expected to take on the supervision of a single doctoral student and to play important supporting roles with other students in the program. Of the eleven faculty members whose C.V.'s are presented only two appear to be at such an early stage of their career development so as to likely have their role in the Doctoral Program limited to committee membership in the early years.

I believe that the faculty resources in support of the proposed new program represent an enviable array of talent both in terms of the breadth of coverage of the field of resource and environmental management, and in terms of the demonstrated strengths of the individuals in terms of research and publication and their ability to obtain significant levels of research funding.

An important area of concern with any new program is with respect to the base funding available in support of the program and the research grants and contract funding that might be available to support students. The base funding question for the proposed program seems to have been addressed through the mechanism of reducing enrolments at the Masters level in order to accommodate additional students at the Doctoral level. In addition the proven ability of faculty members in the program to attract research and contract funding would seem to leave little doubt that it will be possible to obtain external funding in support of the research work

of doctoral candidates. In addition students in the School already have a good record with respect to attracting external scholarship funding and one would expect an even higher level of success among doctoral candidate.

The Demand for the Proposed Program Among Prospective Students.

Here I can provide you with some first hand recent experience. As I indicated above our interdisciplinary Doctoral Program has just completed its third cycle of admissions. Our experience has been that we are receiving between fifty and seventy five completed applications each year for the seven or eight positions that we have available in the Program. Most of the applicants meet our minimum admission standards and we have had a difficult time in turning away several well qualified students each year. The environmental science component of your proposed program will no doubt make it particularly attractive to a subset of students whom we have not been able to serve very well with our program which tends to be more focused on the social science and humanities side of the field. I am confident that you will find that there is a significant sustainable demand for places in your proposed new program. In fact I expect that a number of graduates of our MES Program will welcome the opportunity to apply to SFU for doctoral level work. Our past experience has been that MES graduates have had difficulty finding appropriate interdisciplinary Ph.D programs in Canada in which to pursue their environmental studies interests.

The Demand for Graduates of the Proposed Program.

The case that is made in the program proposal with respect to the potential demand for graduates is I believe a convincing one. In preparing our own program proposal in 1989 we canvassed senior executives in a large number of organizations in both the public and private sector. We received very similar responses to those represented in the letters contained in your proposal. There seems to be a very significant built up demand for true environmental specialists trained at the advanced graduate level. Experience in both the public and private sector has been that disciplinary specialists while having important roles to play in advanced environmental research often lack the breadth of perspective which is necessary to address the important interface between economics, policy, and environmental science. I strongly endorse the case that is made in the proposal with respect to the potential demand for graduates and I can assure you that the results of the SFU survey are very similar to those which we obtained in our recent survey addressing the same question.

Concluding Comments.

I hope that the above comments will be of assistance to you in your consideration of the proposed new Ph.D Program in Resource and Environmental Management. I believe that the proposal as presented is a very strong one which is supported by a significant group of well qualified and experienced faculty members. The Program as set out will be a rigorous challenge for candidates who are likely to enter from a wide range of backgrounds both in traditional disciplines and from the established interdisciplinary masters level programs in environmental studies. Finally I am confident that there will be a sustainable demand from highly qualified students for places in the program, and that the employment prospects for graduates will be very significant given the highly interdisciplinary nature of the environmental and resource management problems which are now being faced in all jurisdictions, from the local to the global scale.

Yours sincerely,

Edward S. Spence
Associate Professor

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UNIVERSITY OF VICTORIA
P.O. BOX 1700, VICTORIA, B.C., CANADA V8W 2Y2
TELEPHONE (604) 721-7353, FAX (604) 721-7212

ENVIRONMENTAL STUDIES PROGRAM

A.L. - 1993
GRADUATE STUDIES OFFICE

August 4, 1993

Dr. Bruce P. Clayman
Dean of Graduate Studies
Simon Fraser University
Burnaby, B.C. V5A 1S6

Dear Dean Clayman:

Please allow me to express my regret for the delay in the submission of a review on the PhD in Resource and Environmental Management, occasioned by some unforeseen commitments to out of province travel, and B.C. Round Table commitments.

My conclusion in summary, is that the proposed program serves to accommodate both a student interest and a societal demand that is well identified and likely to endure into the future. As well, the program, as conceived, does not come into conflict or overlap with other current offerings in the province. Individual thesis topics are likely to bear some resemblance to those in other programs, particularly the School for Community and Regional Planning at UBC. However, the interdisciplinary breadth, particularly into the natural sciences, clearly distinguishes the propose degree program in content.

In making comment on the academic merit and structural integrity of a PhD program, one is obliged to consider the faculty and other resources. In fact, the two areas are largely inseparable. For example, the core courses MRM 801 and MRM 802 are appropriate and well conceived as is the requirement for additional courses in the student's primary and secondary field. However, it is the range of background expertise of the faculty that is brought to bear in the design and execution of these new courses that is critical (and indeed in the remaining established courses). Examination of the current research and scholarly background of the faculty suggests a capability perhaps unique in Canada, at this time, to provide such a program at a high level of excellence.

Conceptually, the proposal of three written exams in the areas of, 1) environmental science, 2) resource and environmental economics, and 3) resource and environmental policy within fifteen months of registration is rigorous. The program suggests six to eight courses may be necessary to prepare for these comprehensive examinations (presumably also within the first fifteen months). Frankly, such a regime may prove daunting to many students who have already completed the Master's degree

often with extensive course work. Such will be the case particularly for students who have emphasized socio-economic aspects in their studies to date, and are attempting to revisit chemistry and biology (or even challenge these areas for the first time). Great care will be needed in building these bridges between the social and natural sciences in order to be able to truly certify interdisciplinarians over such a broad range. In this regard, several of the letters of comment on the program (Environment Canada, page 2) (EVS Consultants) still tend to think of Environmental Managers as technically trained "Environmental Scientists" with additional preparation rather than the opposite. While personally I might view this perspective as having a certain narrowness, it must needs be considered when determining the content of the "environmental science" comprehensive examination.

Some minor points:

1) In regard to the student program, especially if careers as university faculty are being considered, it will be important to identify undergraduate or other teaching assistantship opportunities either in Environmental Studies or related disciplines. Though not critical for a Masters Program, such experience is vital for the PhD candidate contemplating faculty positions.

2) The proposal could well have included a survey of existing Master's students to gauge eventual career goals if they were to pursue a doctorate. How many would choose University careers? Similarly, the proposal suggests few of the current eighty-three students would choose transfer to a PhD program. The extent of this demand could have been clarified by a student consultation. Extensive demand for transfer could swamp the intake (three to four students a year), or if not satisfied, create a degree of disaffection.

3) It is not clear whether the proposed undergraduate program would involve the existing faculty. If so, the combination of both a PhD and a large Masters program and the additional demands of an undergraduate program could severely tax the current faculty. As one suggestion, an additional practising physical/ natural scientist (Chemist, Geochemist, Toxicologist), could be required.

I have not dwelt to any great extent on the demand for graduates of the program, perhaps because my own activities in the province and nationally have so clearly confirmed the observations in the proposal and its supporting correspondence from industry, government and academic sources. Multi-faceted problems will require persons well versed in a number of different areas of study in order to fashion new approaches to solutions.

Critical constraints, environmental and social, will demand such resourcefulness of decision makers. I am persuaded that the proposed program has the potential to provide graduates that can meet that challenge.

Yours sincerely,

Paul R. West, Director
Environmental Studies Program

PRW:scn

MEMORANDUM

W.A.C. Bennett Library, Simon Fraser University
Burnaby, British Columbia, Canada V5A 1S6

Date: 8 February, 1994

From: Ralph Stanton (Collections Librarian)

To: Professor Randall M. Peterman, Chair of the Graduate Studies Committee, School of Resource and Environmental Management

Re: Added cost attached to collection assessment. SREM Ph.D. proposal. (Original memo dated 1 February, 1993, updated 14 January, 1994).

To confirm your telephone call of this morning in which you pointed out the desirability of adding the backrun of *Ecological Applications*. This publication was in its third year in 1993. Therefore we will buy 1991 to 1993 as a backrun; 3 years at $91 a year or $273.

ADDED COST TO THIS ASSESSMENT IS $273 AS A ONE TIME COST.

RS

MEMORANDUM

W.A.C. Bennett Library, Simon Fraser University
Burnaby, British Columbia, Canada V5A 1S6

Date: 14 January, 1994

From: Ralph Stanton (Collections Librarian)

To: Professor Randall M. Peterman, Chair of the Graduate Studies Committee, School of Resource and Environmental Management

Re: Your memo of 10 December 1993 regarding the Library collection assessment and the SREM Ph.D. proposal. THIS MEMO REVISES COSTS ORIGINALLY SET OUT IN MY MEMO DATED FEBRUARY 3, 1993.

Thank-you for your memorandum of 10 December, 1993. We agree with the basic direction of your memo and summarize our agreement following your points:

1. - Agree to remove the request for a subscription to *Negotiation Journal*.
   - We suggest the purchase of a second copy of **Qualitative Data Analysis: a Sourcebook of New Methods by Miles and Huberman** (on your new reading list) at a cost of $59 since our copy is both a 3 week loan item and is now out on loan.

2. - Agree that **Biosis** on CD-ROM is an option you may wish to pick up at some future time.

If this approach is acceptable the revised costs are as follows:

Required:
- 7 monographs $560 one time cost
- 1 added monograph $59 one time cost
- 1 serial (Ecological Applications) $91 recurring cost

Optional: **Biosis** CD-ROM if and when the School has the funds and wants to add this item.

The costs in this memo were agreed to in a phone conversation with you today.

Best Regards,

Ralph Stanton

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Search Browse Format Action Options Databases Books In Print PLUS

Search Workspace

7. kw = reliability 410
8. kw = v
9. kw = q
10. cs = 7
11. cs = 1

Citation(s) Selected : 1
Viewing : 1

Books in Print Format

Miles, Matthew B. & Huberman, A. Michael. Qualitative Data Analysis: A Sourcebook of New Methods. 240p. 1984. Hardcover text edition. $44.00. (ISBN 0-8039-2274-4). Sage Publications, Incorporated.

F1 ->Help F2 ->Pub F4 ->Save File F5 ->Print ESC ->Prev. Window
F7 ->Order

Proposed Calendar Entry for REM Ph.D. Program

Replace the first paragraph in the calendar with:

The School of Resource and Environmental Management offers graduate programs in the Faculty of Applied Sciences that lead to either a professional Masters level degree in resource management (MRM degree) or a Ph.D. degree. Post-doctoral positions are also available. The school is designed for individuals with experience in private organizations or public agencies dealing with natural resources and the environment, or for recent graduates in various disciplines related to natural resources. From time to time, courses are scheduled in the evening or week-long blocks to permit students to complete courses on a part-time basis.

Master's Program should be inserted after introduction.

The following should be inserted before reference to Co-operative Education

Ph.D.Program

Admission

All applicants to the Ph.D. program in Resource and Environmental Management must submit at the time of application a 500- to 1000-word "Statement of Interest" to describe how this program fits into their career objectives and what they expect to get from the program.

To qualify for admission to the Ph.D. program in Resource and Environmental Management, an applicant must meet Simon Fraser University's Graduate General Regulations and must have,

(1) the ability to carry out innovative, independent, and original Ph.D.-level research in that field,
(2) high academic standing in previous university work, and
(3) a Master's degree in a related discipline.

Students must be accepted by an identified senior supervisor prior to acceptance into the program. It is strongly advised that Ph.D. applicants visit SFU for an interview prior to 15 February of the year of requested admission.

See the *Graduate Regulations* for admission requirements for entry to the Ph.D. Program.

Transfer from the Master's Program to the Ph.D. Program

A student currently in the master's in resource management degree program (MRM) who shows exceptional abilities may apply to transfer to the Ph.D. program only if the first two requirements above are met, if the student has been in the MRM program for at least two semesters, and not more than 4 semesters, and if the applicable university regulations for such transfers are met. Applications for a transfer must have the approval of the student's supervisory committee, the REM Graduate Studies Committee, and the SFU Senate Graduate Studies Committee. MRM students who successfully transfer into the Ph.D. program will only be eligible to earn the Ph.D. degree.

Degree Requirements

Courses

A minimum of 20 credit hours of graduate courses (excluding directed studies courses and MRM 601) will be required for the Ph.D. This will be composed of at least 4 courses, one in each of two disciplines in the student's research area and two others (see curriculum below). Normally, students will take a total of 6 to 8 courses in order to prepare adequately for the comprehensive exams. The list of courses to be taken must be approved by a student's supervisory committee. Courses outside of the School of Resource and Environmental Management are subject to the approval of the REM Graduate Studies Committee.

Comprehensive examinations

Normally within 5 semesters of full time registration after admission to the Ph.D. (or to the MRM degree program if the student transferred from the MRM degree), students will be required to take 3 written exams, one in each of 1) environmental science, 2) resource and environmental economics, and 3) resource and environmental policy. These comprehensive exams will be the primary way to ensure that REM Ph.D. students have a sufficient grounding in the range of courses now required at the Master's level, and thus have the depth of understanding in the essential foundations of resource and environmental management. The REM Graduate Studies Committee will be responsible for administering the comprehensive exams. All three exams must be passed for the student to remain registered in the Ph.D. program. The possible outcomes for each of the 3 qualifying exams are, 1) pass, 2) marginal (student may be required to take more courses and is permitted a second and final opportunity to take the deficient exam(s) within one year), or 3) fail. If, after the second try, any one of the 3 exams is graded fail, the student will be required to withdraw from the Ph.D. program.

Thesis Proposal

In conjunction with their supervisory committee, a Ph.D. student will develop a detailed written research proposal that defines the area and methods of intended research. Normally within 6 semesters of full-time registration after admission to the Ph.D. program (or within 4 semesters if the student transferred from the MRM degree), a student must orally present his or her written thesis proposal at a departmental seminar in the School of Resource and Environmental Management. The candidate's supervisory committee shall attend the presentation along with other interested members of the faculty and student body. The oral examining committee will be composed of the supervisory committee plus the chair of the REM Graduate Studies Committee. This presentation of the thesis proposal is intended to determine whether the student's research abilities are adequate for Ph.D.-level research and whether the proposed research is feasible and has merit. This presentation must be passed successfully for the student to remain registered in the Ph.D. program. Students who do not make satisfactory progress on their research topic, or who fail to demonstrate adequate knowledge and understanding of recent publications in their area of research, or who fail to have their revised thesis proposal approved by the supervisory committee within the time limit given at the start of this section, will be required to withdraw from the Ph.D. program.

A written thesis based on a student's original research is the final requirement for the Ph.D. The thesis must include aspects of at least two disciplinary areas (such as ecology and economics, or toxicology and law). The topic must be approved as noted above, and the student's progress will be evaluated annually. That evaluation will be undertaken according to the SFU General Regulations. To graduate, the student must successfully complete a thesis defense, following the usual SFU format. All other general requirements for a Ph.D. will be followed as outlined in the SFU calendar.

Residence Requirement

A Ph.D. candidate must be registered and in-residence at SFU for the minimum number of semesters as described in the SFU Graduate Regulations.

Curriculum

All Ph.D. students in Resource and Environmental Management must complete at least four graduate courses. They will be in:

1) MRM 801 (5 units) Principles of Research Methods and Design in Resource and Environmental Management
2) MRM 802 (5 units) Institutional Design and Decision Making for Environmental Management
3) At least one course in the student's primary field
4) At least one course in the student's secondary field

Courses already offered in the School of Resource and Environmental Management will be available for credit towards a Ph.D. degree. The only exceptions for credit toward a Ph.D. degree will be MRM 601 and directed studies courses.

The following courses should be added to the end of the Graduate Course Listing:

MRM 801-5 **Principles of Research Methods and Design in Resource and Environmental Management.** Students will develop skills and insight into the design, implementation and analysis of interdisciplinary research in natural resource and environmental management. This will help prepare students to carry out their own research projects. (No prerequisites).

MRM 802-5 **Institutional Design and Decision Making for Environmental Management.** Students will develop a sophisticated understanding of the institutional structure and methods of decision-making in natural resource and environmental management. This course complements material covered in a variety of master's level courses. (No prerequisites)

MRM 899 **Ph.D. Thesis**

For the listing of MRM 601 under the Graduate Course listings, add to the end of the course description: "(Not for credit towards a Ph.D. in Resource and Environmental Management.)"