

I. Cover Memorandum

To: Graduate Academic and Advisory Committee
From: Lawrence K. Duffy
Director, Resilience and Adaptation Program
Subject: Creation of a Graduate Certificate in Resilience and Adaptation

a. Program Statement

A Graduate Certificate in Resilience and Adaptation (RAP) is proposed to advance knowledge and to promote social-ecological research in sustainability and resilience. Courses offered by the RAP program certificate will provide practical knowledge, training and integrative skill development to students working on degrees in the sciences and social sciences by broadening their disciplinary perspective across other disciplines such as economics, ecology, sociology, and culture. It takes a holistic perspective that recognizes the importance of both the social and biological dimensions of environmental sustainability and resilience. This certificate is offered by the Graduate School's Resilience and Adaptation Program and will meet the needs of students and professionals.

b. Approval Signatures

Director	_____
Graduate Advisory and Assessment Committee (GAAC)	_____
Dean of Graduate School	_____
President, UAF Senate	_____
UAF Chancellor	_____
UA President	_____
Board of Regents, (Chair)	_____

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II. Identification of the Program

A. Description of the Program

1. Program title: Resilience and Adaptation Studies

A Graduate Certificate in Resilience and Adaptation (RAP) is proposed to advance knowledge and to promote social-ecological research in sustainability and resilience. Courses offered by the RAP program certificate will provide practical knowledge, training and integrative skill development to students working on degrees in the sciences and social sciences by broadening their disciplinary perspective across other disciplines such as economics, ecology, sociology, and culture. It takes a holistic perspective that recognizes the importance of both the social and biological dimensions of environmental sustainability and resilience. This certificate is offered by the Graduate School's Resilience and Adaptation Program and will meet the needs of students and professionals.

2. Credential level: Graduate Certificate

3. Admission requirements, prerequisites and program statement

As a post-baccalaureate program, the certificate in Resilience and Adaptation requires admission as a graduate student to an established masters or doctorate program at UAF.

4. Course descriptions from UAF's catalog of required core courses (9 credits) and approved elective courses (3 credits). Cross-listed courses will count toward the certificate.

BIOL F616 Natural Science Background for Resilience and Adaptation

1 credit Offered Fall

Provides the natural science background that is necessary for understanding the role of science in complex systems involving interactions among ecological, economic, and social processes. Designed for incoming students of the Resilience and Adaptation Program (RAP), who have not received training in the natural sciences. ***Prerequisites: Graduate student enrollment or permission of instructor.*** Cross listed with NRM F616 (1+0)

ANTH F616 Anthropology Background for Resilience and Adaptation

1 credit Offered Fall

Provides the humanities background that is necessary for understanding the role of human culture in complex systems involving interactions among ecological, economic, and social processes. Designed for incoming students of the Resilience and Adaptation Program (RAP), who have not received training in the humanities. ***Prerequisites: Graduate student enrollment or permission of instructor.*** (1+0)

ECON F616 Economics Background for Resilience and Adaptation

1 credit Offered Fall

Provides the economics background that is necessary for understanding the role of economics in complex systems involving interactions among ecological, economic, and social processes. Designed for incoming students of the Resilience and Adaptation Program (RAP), who have not received training in economics. ***Prerequisites: Graduate student enrollment or permission of instructor.*** (1+0)

NRM 647 Global to Local Sustainability

3 credits Offered Fall

Explores the basic principles that govern resilience and change of ecological and social systems. Principles are applied across a range of scales from local communities to the globe. Working within and across each of these scales, students address the processes that influence ecological, cultural and economic sustainability, with an emphasis on northern examples. **Prerequisites:** *Graduate standing in a natural science, social science, humanities or interdisciplinary program at UAF; and permission of instructor.* Cross listed with ANTH F647, BIOL 647, ECON 647. (3+0)

BIOL 649 Integrated Assessment and Adaptive Management

3 Credits Offered Spring

Interdisciplinary exploration of theoretical and practical considerations of integrated assessment and adaptive management. Concepts important in understanding societal and professional-level decision-making. Students work as individuals and as a team to undertake case studies with relevance to integrated assessment and adaptive management. Collectively, the class builds a portfolio of cases and conducts an integrated assessment. **Prerequisites:** *Graduate standing in a natural science, social science, humanities or interdisciplinary program at UAF; and permission of instructor. The course is designed to fit into the sequence of the Resilience and Adaptation program's core courses. It is open to other graduate students interested in and prepared to conduct interdisciplinary studies relating to sustainability. Recommended: ANTH/BIOL/ECON/NRM F647 and ANTH/BIOL/ECON/NRM F667 (previously or concurrently). In case of enrollment limits, priority will be given to graduate students in the Resilience and Adaptation program in order for them to be able to meet their core requirements.* Cross listed with ANTH F649, BIOL 649, ECON 649. (3+0).

RAP recommended elective credits: (Minimum of 3)

NRM F667 Resilience Seminar I

1 credit Offered Fall

Provides a forum for students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research that are relevant to sustainability. A considerable portion of the seminar is student-directed, with students assuming leadership in planning seminar activities with the instructor. Graded Pass/Fail. **Prerequisites:** *Must be enrolled in the Resilience and Adaptation graduate program; or permission of instructor. Recommended: ANTH/BIOL/ECON/NRM F647 (taken concurrently). Cross listed with ANTH F667, BIOL 667, ECON 667. (2+0).*

NRM 668 Resilience Seminar II

1 credit Offered Spring

Provides a forum for students of the Resilience and Adaptation graduate program to explore issues of interdisciplinary research that are relevant to sustainability. The seminar provides support to each student planning his/her summer internship and preparing and presenting a thesis research prospectus. Graded Pass/Fail. ***Prerequisites: ANTH/BIO/ECON/NRM F647; ANTH/BIO/ECON/NRM F667; or permission of the instructor. Cross listed with ANTH F668, BIOL 668, ECON 668. (2+0)***

NRM F613 Resilience Internship

2 credits Offered Fall

Students of the Resilience and Adaptation Program participate in internships to broaden their interdisciplinary training, develop new research tools and build expertise outside their home disciplines. Internships are for eight to 10 weeks of full time commitments. In autumn students meet to discuss their internship experiences and make public presentations.

NORS F601 Research Methods and Sources in the North

3 credits Offered Fall

Development of students' research skills so they can engage in their own research on northern issues. Includes techniques of interviewing, conducting surveys, and sampling; qualitative and quantitative methods of research design; and familiarity with library sources and archival records. Each student will develop a research project. Course is also available on-line. (3+0)

LAS 601 Responsible Conduct of Research

2 credits Offered Fall and Spring

Maintaining the trust and respect of fellow scientists requires a clear understanding of the basic principles under which research is conducted and reported. Introduces students to the basic principles and expectations that form the foundation of research integrity. Students will learn to recognize and address ethical dilemmas in research scenarios, thus preparing them for situations that will invariably arise during their career. This course fulfills national Science Foundation and National Institutes of Health requirements. Prerequisites: Senior undergraduate or graduate student standing. Interested post-doctoral fellows and others with terminal degrees are also invited to enroll with permission of the instructor.

NORS F600 Perspectives on the North

3 credits

Basic knowledge of the circumpolar North - the social, economic, political and scientific facets of northern life. Consideration of major cultural groups of the North and their histories, the environmental settings and patterns of settlement and development in northern regions and systems of governance in different northern countries. Broad overview of the major policy issues of the North in education, justice, healthcare, and environmental and wildlife protection. Course is also available on-line. Cross-listed with HIST F600. (3+0)

5. Requirements for the certificate

Complete 12 credits from core courses or approved electives

a. Sample course of study *

Courses (Credits)	Fall Y1	Spring Y2
Biol F616 (1)	X	
Anth F616 (1)	X	
Econ F616 (1)	X	
NRM F647 (3)***	X	
Biol F649 (3)***		X
Electives**		
NRM F667 (1)	X	
NRM F668 (1)		X
NRM 613 (2)	X	
NORS 601		
LAS 601 (2)	X	X
NORS 600		X

*This schedule will be repeated annually

**Other approved courses can be used as electives, i.e. EPSCoR courses

***Cross-listed courses count

b. Catalog description for RAP certificate and layout

Resilience and Adaptation Studies Graduate Certificate
Graduate School
907-474-7460
www.uaf.edu/RAP

Minimum requirements for certificate: 12 credits

As a post-baccalaureate program, the certificate in Resilience and Adaptation Studies is ideal for current graduate students in many disciplines. The graduate certificate encourages an exposure to the study of resilience and adaptation concepts and provides students a credential recognizing their expertise in this field of sustainability science.

Graduate Certificate Requirements

1. Complete the following admission requirements:
 - a. Hold a baccalaureate degree from an accredited institution
 - b. Gain acceptance from a departmental or interdisciplinary admission committee in an established Masters or doctoral program
2. Complete the General University requirements for a graduate certificate
 - a. Complete the listed 9 credits from core RAP certificate courses
 - b. Complete 3 or more credits of the listed RAP certificate electives
 - c. Minimum credits required: 12
 - d. Students must earn a B or Pass grade (or better) in each course.

B. Program Goals

1. Objectives and Evaluation
 - a. RAP brings together students and faculty from many different departments, institutes and programs. Many RAP IGERT participants have acknowledged the value of constant dialogue among RAP students with diverse academic and cultural backgrounds which contributes to their graduate education experience.
 - b. The RAP certificate encourages and fosters students to take a “systems” approach to research that explores the interactions of social, economic and ecological components through a holistic lens. Hence, RAP students are given the academic freedom to solve complex real world problems using the best tool available and without the limitations of commonly accepted tools within single disciplines.
 - c. Students conduct an interdisciplinary inquiry process to address issues of sustainability.
 - d. Evaluation is successful completion of courses and capstone experience.
 - e. Specific learning outcomes are described in course syllabi
2. Relationship of certificate program to purposes of the University of Alaska Fairbanks
 - a. RAP complements and contributes to all other departments, institutes and programs across the UA system
 - b. RAP has facilitated communication and collaboration across disciplines. RAP students have excelled at interacting with and expanding communications across disciplines and bringing faculty out of their disciplinary silos and comfort zones.
 - c. RAP students’ research is on the cutting edge of sustainability research—an important part of UAF’s strategic plan.
 - d. RAP students and participating faculty bring in financial support from federal, state, and non-profit funding sources.
 - e. RAP certificate can be a model for other interdisciplinary certificates at UAF.
3. Occupational competencies to be achieved: Not applicable
4. Relationship of certificate to program objectives

- a. Courses give context to complex systems. RAP students are exposed to and challenged with the task of integrating resilience thinking into their lives and activities. In simple terms, *resilience* is the ability of a person, place, system, or thing to “bounce back” after being affected by a disturbance. If the person, place, system or thing doesn’t recover from the disturbance, and the fundamental and defined characteristics have changed, a state transition has occurred. A well cited paper defines *resilience* as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (Walker et al., 2004 www.ecologyandsociety.org/vol9/iss2/art5/)

Although the concept was introduced by a visionary thinker named CS “Buzz” Holding in 1973, resilience thinking (Folke et al 2010, <http://www.ecologyandsociety.org/vol15/iss4/art20/>) has continued to evolve and address the complex and dynamic nature of social-ecological systems (people and nature as interdependent systems). Courses introduce interdisciplinary aspects of sustainability science and adaptation. In general, *adaptation* is the process of responding to change. In biological systems, species may adapt to stressors by changing either their biology or behavior. In human social systems, people may adapt by reorganizing institutions and networks.

- b. The capacity of the community to manage resilience is referred to as adaptability.

Systems with high adaptive capacity reconfigure themselves without losing crucial functions. Systems with low adaptive capacity often sacrifice future options during reconfiguration. RAP students also explore the theory and practice of Adaptive Management, the iterative process of managing systems by using experimentation to learn about system function and reduce uncertainty. Effective adaptive management requires consideration of the social and ecological components of a system.

How do these concepts fit with sustainability science? Sustainability science addresses actions that promote human well-being while conserving the life-support systems of our region and our planet. Research on sustainability focuses on the dynamic interactions between nature and society. Building a science of sustainability requires a truly interdisciplinary approach that integrates knowledge and practical experience from many different sources. RAP’s framework is designed to follow these guidelines.

III. Personnel Directly Involved with Program

- a. Faculty:
 - 1. Lawrence K. Duffy, Program Director
 - 2. Todd J. Brinkman, Associate Program Director
- b. Administrative personnel:
 - 1. Mary van Muelken
- c. Classified: Not applicable

IV. Enrollment Information

- a. Projected enrollment: 15
Current enrollment: NA
- b. Current students: NA
- c. Application process: On line application concurrent with established Master or PhD program application in a discipline, including interdisciplinary.
- d. Minimum enrollment to maintain program for years 1-5.
6 students
- e. Maximum enrollment that program can accommodate: 15 students
- f. Special restrictions on enrollments: registered graduate students

V. Need for the Program

- a. Required for other programs? In what way? How has this requirement been met to date?

The certificate is not required for other programs but allows students to demonstrate a breadth of knowledge outside their discipline and the ability to work in interdisciplinary teams. Knowledge of resilience and adaptation concepts may help find solutions to problems associated with the anthropocene.

The demand and need for the program has been demonstrated over the last 10 years by NSF funding, good enrollment and the production of MS and PhD degrees in various disciplines (See Appendix A). The Resilience and Adaptation Program (RAP) is an interdisciplinary graduate program, focusing on the role of social and ecological systems in sustainability. RAP introduces students to a perspective related to decisions about the future of humans and their relationship to the Earth System. Resilience and Adaptation serve as concepts in exploring the challenges of sustainability. Resilience and Adaptation Research is both “basic” and “applied”, transcending some disciplinary boundaries by focusing on some real-world problems. The RAP graduate program began with an NSF IGERT grant and was recently funded by the University of Alaska Fairbanks beginning FY13. RAP certificate students would be prepared for positions in academia, research institutes, governmental agencies, non-governmental organizations, and indigenous organizations. The activities proposed in this certificate application build on the work accomplished by RAP alumnae and faculty members.

- b. Employment market needs

1. Survey: completed December 2013
2. 100 % of respondents reported their opinion that there will be increasing employment opportunities for interdisciplinary trained individuals. *“The RAP allowed me to extend my strong natural science foundation into work as a social scientist with a profound understanding of the cultural and economic issues facing Alaskan individuals and communities.”*
3. Alumni (n=14) report that 50% are employed in Alaska and 50% are employed out of state (including international).

RAP Alumni are employed in the following areas

Academic setting k-12	7.69 %
College or university setting	53.85 %
State government office	15.38 %
Federal government office	15.38 %
Native corporation/governance office	0 %
Non-governmental organization	7.69%
Private company	0 %

4. 86 % of alumni agreed that participation in RAP studies improved their ability to secure their current employment.
*There are currently no defined occupational competencies at the graduate level.

VI. Additional Information

A \$300,000 continuing allocation was made available by the Alaska state legislature in 2013.

VII. Resource Impact

- a. Budget: no new funds are requested
- b. Facilities: Program office space
- c. Credit hour production: 270 distributed across disciplines
- d. Faculty: 6 instructional and over 15 mentors
- e. Library material: The program has been in existence for 10 years and only requires standard library services.

VIII. Relation of Program to other Programs within the System

- a. Effects on enrollments elsewhere: Enrollment in other programs is increased due to RAP's complementary nature and the interest it generates among prospective students.
- b. Duplication in the system: none
- c. Relationship to research and service
 1. Supports and improves research and service
 2. Benefits: increases publications and community partnerships

- IX. Implementation/Termination of certificate.
 - a. Date of implementation: Fallg 2015
 - b. Plans for recruiting students
 - 1. RAP Website <http://www.uaf.edu/rap/>
 - 2. Professional meetings
 - 3. Print publication
 - 4. Graduate school orientation
 - c. Termination: FY 2020, if enrollment drops below minimum number of 15 students
 - d. Plans for termination: courses will be offered for two years after last cohort is admitted
 - e. Assessment of program: standard program review as described on the Provost's website.
- X. Regent Guideline Action Request
 - 1. Signature Form
 - 2. Board of Regents Document
- XI. Draft Prospectus: is being redrafted.