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

Program Statement
A Graduate Certificate Program in Resilience and Adaptation is proposed to advance knowledge and to promote social-ecological research in sustainability and resilience. Courses offered by the program 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 program is offered by the Graduate School’s Interdisciplinary Program and will meet the needs of students and professionals.

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
      2. Credential level: Graduate Certificate
      3. Admission requirements and prerequisites
         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 of required core courses (9 credits) and approved elective courses (3 credits)

   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 electives 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/BIOL/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.

NRM 692  Methods in Interdisciplinary Research
1 credit       Offered Spring
This course provides a forum for students in graduate programs to explore research design issues related to interdisciplinary research. The seminar supports each student’s preparation and presentation of a mixed methods thesis or dissertation prospectus. Topics range from climate modeling, to conducting surveys, to community-based and action research, and include both traditional and emerging methods used in a range of social science and natural science disciplines.

LAS 601  Responsible Conduct of Research
2 credits       Offered Fall and Spring

URSA 493  Introduction to Bio-cultural Conservation
3 credits       Offered Fall
The course will provide students with an introduction to sub-Antarctic biological and cultural diversity, as well as to the approach of the Sub-Antarctic Bio-cultural Conservation Program at UNT. Students will gain an overview of the flora, fauna, geography, climate, and ethnography of southern South America. They will also gain a conceptual framework to integrate environmental philosophy and ecological sciences, and their integration into practical and theoretical aspects of bio-cultural conservation, including education and ecotourism. Additionally, and as a way of comparing and contrasting with the Sub-Antarctic contents, the course will have a section on Sub-Arctic contents.
Different skills and philosophies are introduced in this course and will work as a group to broaden and integrate our approaches to bio-cultural conservation. This semester-long seminar-style course will have an emphasis on ethno-ornithology and ecotourism, as a way to implement bio-cultural conservation. The course is part of a broader International Research Experience, and a study-abroad field course, entitled Tracing Darwin’s Path (TDP). Although this course is a recommended pre-requisite for the TDP field course, participation in the field components associated with the semester-long seminar course is not a requirement.

*Approved electives are allowed

5. Requirements for the certificate
   Complete 12 credits from core courses and approved electives

   a. Sample course of study *

<table>
<thead>
<tr>
<th>Courses (Credits)</th>
<th>Fall Y1</th>
<th>Spring Y2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol F616 (1)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Anth F616 (1)</td>
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<td></td>
</tr>
<tr>
<td>Econ F616 (1)</td>
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<td></td>
</tr>
<tr>
<td>NRM F647 (3)</td>
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<td></td>
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<tr>
<td>Biol F649 (3)</td>
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<tr>
<td>Electives**</td>
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<tr>
<td>NRM F667 (1)</td>
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<td></td>
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<tr>
<td>NRM F668 (1)</td>
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<td>X</td>
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<tr>
<td>NRM 613 (2)</td>
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<tr>
<td>NRM 692 (1)</td>
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<tr>
<td>LAS 601 (2)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>URSA 493 (3)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EPSCOR LAS 693 (2)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EPSCOR LAS 692 (1)</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*This schedule will be repeated annually
**Other approved courses can be used as electives

b. Catalog description and layout

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

Minimum requirements for certificate: 12 credits

As a post-baccalaureate program, the certificate in resilience studies is ideal for current graduate students in many disciplines. The graduate certificate
encourages a more in-depth study of resilience and adaptation and provides students a credential recognizing their expertise in this field of sustainability science.

**Graduate Certificate**

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
2. Complete the general university requirements
3. Complete the graduate certificate requirements
4. Complete the listed 9 credits from core courses
5. Complete 3 or more credits of the listed electives
6. Minimum credits required: 12
   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 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. RAP 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 exceeded 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
      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). RAP students are exposed to and challenged with the task of integrating resilience theory into their research.
   b. 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.
   c. 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: 15
   b. Current students: 43
   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. The anthropocene has created new problems that cannot be addressed with a disciplinary approach.

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 offers studies in sustainability science as society faces critical decisions about the future of humans and their relationship to the Earth System. Resilience and Adaptation serve as central concepts in exploring the challenges of sustainability. Student research is both “basic” and “applied”, transcending disciplinary
boundaries by focusing on urgent 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 students are 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. Respondents reported increasing employment opportunities (100%)
      “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 improved their ability to secure their current employment.

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  
a. Date of implementation: Fall 2014  
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: attached.
1a. Major Academic Unit (choose one) | UAF
---|---
1b. School or College | Graduate School
1c. Department or Program | Interdisciplinary Programs

2. Complete Program Title | Resilience and Adaptation Program

3. Type of Program
- [ ] Undergraduate Certificate
- [ ] AA/AAS
- [ ] Baccalaureate
- [ ] Post-Baccalaureate Certificate
- [x] Master’s
- [ ] Graduate Certificate
- [x] Doctorate

4. Type of Action
- [x] Add
- [ ] Change
- [ ] Delete

5. Implementation date (semester, year)
- [ ] Fall
- [x] Spring
- Year 2015

6. Projected Revenue and Expenditure Summary. Not Required if the requested action is deletion. (Provide information for the 5th year after program or program change approval if a baccalaureate or doctoral degree program; for the 3rd year after program approval if a master’s or associate degree program; and for the 2nd year after program approval if a graduate or undergraduate certificate. If information is provided for another year, specify (1st) and explain in the program summary attached). Note that Revenues and Expenditures are not always entirely new; some may be current (see 7d.)

<table>
<thead>
<tr>
<th>Projected Annual Revenues in FY 16</th>
<th>Projected Annual Expenditures in FY 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrestricted</td>
<td>Salaries &amp; benefits (faculty and staff)</td>
</tr>
<tr>
<td>General Fund</td>
<td>Other (commodities, services, etc.)</td>
</tr>
<tr>
<td>Student Tuition &amp; Fees</td>
<td>TOTAL EXPENDITURES</td>
</tr>
<tr>
<td>Indirect Cost Recovery</td>
<td>One-time Expenditures to Initiate Program (if &gt;$250,000)</td>
</tr>
<tr>
<td>TVEP or Other (specify):</td>
<td>(These are costs in addition to the annual costs, above.)</td>
</tr>
<tr>
<td>Restricted</td>
<td>Year 1</td>
</tr>
<tr>
<td>Federal Receipts</td>
<td>Year 2</td>
</tr>
<tr>
<td>TVEP or Other (specify):</td>
<td>Year 3</td>
</tr>
<tr>
<td>TOTAL REVENUES</td>
<td>Year 4</td>
</tr>
</tbody>
</table>

Page # of attached summary where the budget is discussed, including initial phase-in:

7. Budget Status. Items a., b., and c. indicate the source(s) of the General Fund revenue specified in item 6. If any grants or contracts will supply revenue needed by the program, indicate amount anticipated and expiration date, if applicable.

<table>
<thead>
<tr>
<th>Revenue source</th>
<th>Continuing</th>
<th>One-time</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. In current legislative budget request</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>b. Additional appropriation required</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>c. Funded through new internal MAU redistribution</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>d. Funds already committed to the program by the MAU</td>
<td>$300000</td>
<td>$</td>
</tr>
<tr>
<td>e. Funded all or in part by external funds, expiration date</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>f. Other funding source Specify Type:</td>
<td>$</td>
<td>$</td>
</tr>
</tbody>
</table>

8. Facilities: New or substantially (>25,000 cost) renovated facilities will be required. [ ] Yes [x] No

If yes, discuss the extent, probable cost, and anticipated funding source(s), in addition to those listed in sections 6 and 7 above.

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1 Sometimes the courses required by a new degree or certificate program are already being taught by an MAU, e.g., as a minor requirement. Similarly, other program needs like equipment may already be owned. 100% of the value is indicated even though the course or other resource may be shared.
9. Projected enrollments (headcount of majors). If this is a program deletion request, project the teach out enrollments.

| Year 1: 15 | Year 2: 15 | Year 3: 15 | Year 4: 15 |

Page number of attached summary where demand for this program is discussed: 9-10

10. Number* of new TA or faculty hires anticipated (or number of positions eliminated if a program deletion):

| Graduate TA | Adjunct | Term | Tenure track |

Former assignment of any reassigned faculty:
For more information see page of the attached summary.

12. Other programs affected by the proposed action, including those at other MAUs (please list):

| Program Affected | Anticipated Effect |

Page number of attached summary where effects on other programs are discussed:

13. Specialized accreditation or other external program certification needed or anticipated. List all that apply or ‘none’: None

14. Aligns with University or campus mission, goals, core themes, and objectives (list): complements and contributes to other degree programs and facilitates communication and collaboration across disciplines.

Page in attached summary where alignment is discussed: 7

15. State needs met by this program (list): the capacity of the community to manage resilience.
Page in the attached summary where the state needs to be met are discussed: 8

16. Program is initially planned to be: (check all that apply)

- Available to students attending classes at UAF campus(es).
- Available to students via e-learning.
- Partially available students via e-learning.

Page # in attached summary where e-learning is discussed:

Submitted by the University of Alaska Fairbanks with the concurrence of its Faculty Senate.

(choose one above)

Provost / Date

Chancellor / Date

☐ Recommend Approval / _____________________________ / _____________________________

☐ Recommend Disapproval / _____________________________ / _____________________________

UA Vice President for Academic Affairs on behalf of the Statewide Academic Council / Date

*Net FTE (full-time equivalents). For example, if a faculty member will be reassigned from another program, but his/her original program will hire a replacement, there is one net new faculty member. Use fractions if appropriate. Graduate TAs are normally 0.5 FTE. The numbers should be consistent with the revenue/expenditure information provided.

Attachments:  Summary of Degree or Certificate Program Proposal  Other (optional)

Revised:  10/10/2012
RAP is an interdisciplinary graduate program focusing on global-to-local sustainability in times of rapid change. RAP offers studies in sustainability science as society faces critical decisions about the future of humans and their relationship to the Earth System. Sustainability science serves to bridge scholarship and approaches from the natural and social sciences, engineering, and medicine to help society devise innovative strategies for adaptation and transformation. Resilience and adaptation serve as central concepts in exploring the challenges of sustainability. Student research is both "basic" and "applied," transcending disciplinary boundaries by focusing on urgent real-world problems.

RAP is funded by the Integrative Graduate Education and Research Traineeship (IGERT) Program of the US National Science Foundation. RAP prepares students for positions of leadership in academia, research institutes, government agencies, non-government organizations, and indigenous organizations. The core curriculum of RAP includes coursework in resilience theory and methods for integrated assessment, an international internship experience, thesis research, and participation in special seminars, workshops, and conferences.

Our focus is on questions of sustainability for Alaska, the Circumpolar North, and beyond. Research opportunities are available in:

- Climate-Disturbance-Human Interactions
- Food Security
- Water Resources
- Wildlife Ecology, Ecosystem Services, and Subsistence
- Adaptive Resource Co-Management
- Land-use Change and Sustainable Development
- Sustainable Resource Economics
- Wildlands Management
- Integrating Indigenous Knowledge with Western Science
- Alternative Energy
- Rural-Urban Interdependencies and Conflicts
- Other topics

Program elements

- Interdisciplinary graduate training is available at the PhD or Masters levels;
- RAP is open to students at the University of Alaska Fairbanks and to visiting students enrolled in PhD studies at other universities;
- Alaska Natives and members of other minorities are encouraged to apply.

RAP builds on existing graduate programs at the University of Alaska Fairbanks in ecology, biology and wildlife, natural resources management, indigenous studies, anthropology, economics, political science, geology, geophysics, engineering, interdisciplinary studies, and other relevant disciplines to address sustainability in a systems framework.

www.uaf.edu/rap
Special resources for RAP students

- IGERT Fellowships of $30,000 per year for U.S. PhD students, plus tuition waiver and health insurance;
- Other fellowships through various UAF programs;
- Teaching and research assistantships;
- Funding for an international internship experience to broaden disciplinary perspectives;
- Laptop computer and offices with other RAP students;
- Interaction and learning in a community of students and faculty from different disciplines interested in sustainability and change.

Application process

- Applications are evaluated on the basis of students' commitment to interdisciplinary studies in sustainability;
- IGERT PhD Fellowships available only to US citizens;
- Application target date is February 1st;
- More information is found at www.uaf.edu/rap.

For more information, contact

RAP
Institute of Arctic Biology
University of Alaska Fairbanks
PO Box 757000
Fairbanks, AK 99775-7000
Phone: 907-474-7987
rap.uaf@alaska.edu

www.uaf.edu/rap