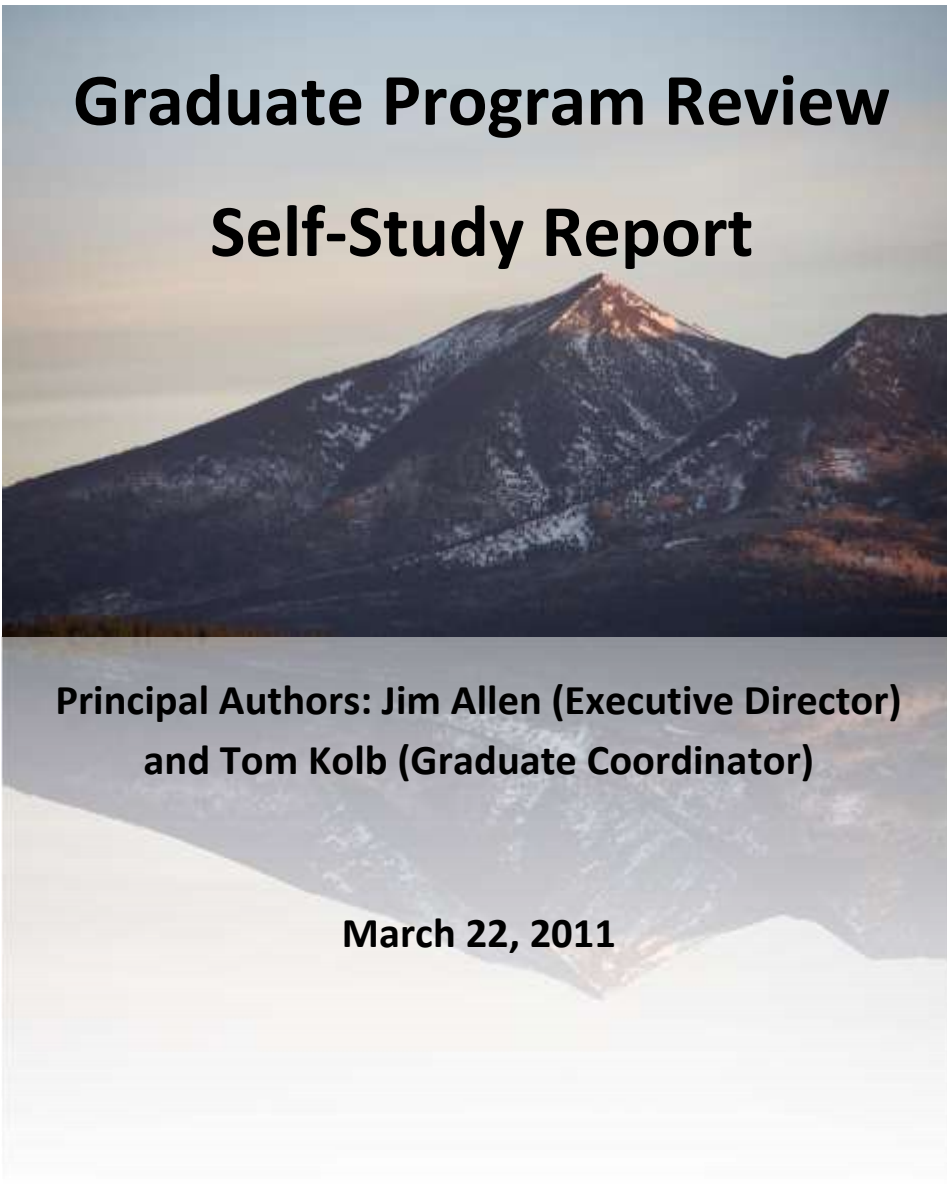




**NORTHERN ARIZONA
UNIVERSITY**

College of Engineering, Forestry & Natural Sciences

School of Forestry

A photograph of a mountain range with snow-capped peaks under a clear sky. The mountains are dark with patches of snow, and the sky is a pale blue.

Graduate Program Review Self-Study Report

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March 22, 2011

Table of Contents

EXECUTIVE SUMMARY	1
OVERVIEW OF NAU AND THE SCHOOL OF FORESTRY	2
The University.....	2
The School of Forestry	3
<i>History of the School of Forestry</i>	3
<i>School of Forestry Mission</i>	4
<i>School of Forestry Organization and Administration</i>	4
SUMMARY OF RECOMMENDATIONS OF LAST PROGRAM REVIEW AND ACTIONS TAKEN	6
GRADUATE PROGRAM.....	13
Graduate Degrees Offered.....	13
<i>Master of Forestry</i>	13
<i>Master of Science in Forestry</i>	14
<i>Doctor of Philosophy in Forestry</i>	15
Admission to the Graduate Program	16
Graduate Courses	17
<i>Overview of courses</i>	17
<i>Role of Service Courses for Non-Majors</i>	18
<i>Distance-Delivered Courses</i>	18
Program Changes During the Past Five Years	18
<i>Master of Forestry</i>	18
<i>Master of Science in Forestry</i>	18
<i>Doctor of Philosophy in Forestry</i>	18
Program Assessment	18
FACULTY	20
Faculty Numbers and Characteristics.....	20
Faculty Workloads	20
Faculty Sabbaticals.....	21
Nature and Breadth of Faculty Scholarly Contributions	21
Nature and Breadth of Professional Service	22
GRADUATE STUDENTS.....	24
Enrollment and Graduation Trends	24
Graduate Teaching Assistants	25
Graduate Research Assistants	25
Student Advising and Mentoring	26

Other Support Available to Graduate Students	26
The Forestry Graduate Student Association.....	26
RESOURCES	27
Budget	27
Staff Positions	28
Physical Plant and Equipment.....	29
Computing Resources and Other Information Technologies	30
Library Resources	31
Centennial Forest.....	31
PLANNING FOR THE FUTURE.....	32
Relationship of the School of Forestry's and the University's Strategic Plans	32
The <i>Foundation for Excellence</i> Plan.....	34
Challenges and Opportunities	34

APPENDICES

A1: Catalog descriptions of School of Forestry Graduate Degrees (M.F., M.S., Ph.D.)	
A2: List of 500- and 600-level courses offered by the School of Forestry	
A3: 2010 Annual Report on Degree Program Assessment of Student Learning from the School of Forestry to the University Assessment Committee and Office of Academic Assessment.	
A4: School of Forestry Faculty Background Summary	
A5: School of Forestry Adjunct Faculty	
A6: School of Forestry Peer-Reviewed Publications, 2004-2009	
A7: Incites™ Reports on NAU Forestry Publications	
A8: Cline Library Support of the Forestry Graduate Program, October 2010	
A9: School of Forestry Strategic Plan, 2005-2010	
A10: Proposal for Becoming a Top Ranked Forestry Program in the United States: A Foundation for Excellence	

EXECUTIVE SUMMARY

Northern Arizona University (NAU) is a comprehensive baccalaureate and focused graduate research university. It is classified by the Carnegie Foundation as a large, comprehensive, doctoral, high undergraduate, primarily residential university with a high level of research activity. The University is organized into six colleges, including the College of Engineering, Forestry and Natural Sciences, of which the School of Forestry (SOF) is a part.

The SOF offers a B.S. degree in Forestry, two Masters degrees and the Ph.D. The Master of Science (M.S.) degree was initiated in 1969, the Doctor of Philosophy (Ph.D.) in 1994, and the Master of Forestry (M.F.) in 2004. The M.S. degree has an emphasis on thesis research, while the M.F. emphasizes coursework and a capstone integrative professional paper. The Ph.D. emphasizes specialized and original research.

The number of SOF graduate students ranged between 63 and 84 over the last five years. While enrollment increased over much of this period, a decline over the past year is attributed in part to the loss of faculty who are available to serve as advisors. Currently, 43% of graduate students are female, and 13% are minority. Degree productivity (55 M.S., 19 M.F., and 15 Ph.D. over the last five years, 2005/2006-2009/2010) exceeds Arizona Board of Regents (ABOR) thresholds. Most M.S. and M.F. students graduate within three years, and most Ph.D. students graduate within five years.

The SOF has 20 full-time tenure-track faculty, one half-time tenured faculty member, three research faculty, about 25 graduate student Research or Service Assistants, and a small administrative and support staff. The faculty includes nine women, one Native American, and three faculty members who are originally from other countries (Ethiopia, South Korea, and Taiwan). Full-time faculty teach most undergraduate and graduate courses. Currently, 46 graduate-level courses in forestry are listed in the NAU Catalog, of which 34 are formal disciplinary courses. However, several of these courses have not been offered in three or more years. Most graduate-level courses are taught using a variety of modern teaching and learning approaches such as experiential learning, web enhancement, student-to-student mentoring, and student-led discussions, in addition to classroom lectures.

Faculty have research appointments that range from 10 to 50%, and currently have 52 external grants and contracts from a wide range of agencies and organizations. In the past five years, research in the SOF has produced an average of 55 refereed scientific articles, books or book chapters per year, and graduate students are authors on 51% of these publications. Much of the SOF's research is in collaboration with federal and state agencies that manage forests and wildlands. Faculty service includes engagement at the program, university, local community, state, national, and international levels. Numbers of research grants, graduate research assistants, and publications are largest in forest ecology.

The SOF's graduate teaching and research programs are housed in the Southwest Forest Science Complex which was opened in 1992 and includes modern classrooms, laboratories, and computer facilities. All graduate students on research assistantships are provided with offices. Library support for SOF programs is good.

A new strategic plan for the SOF has been developed based on the overall goal of becoming the top-ranked forestry programs in the U.S.

OVERVIEW OF NAU AND THE SCHOOL OF FORESTRY

The University

Northern Arizona University (NAU) is a comprehensive baccalaureate and focused graduate research university that has a commitment to professional programs, including those in education, the health professions, forestry, sustainable technologies, and selected areas of the biosciences. The University is classified by the Carnegie Foundation as a large, comprehensive, doctoral, high undergraduate, primarily residential university with a high level of research activity. With its main campus in Flagstaff, Arizona, NAU is the only public university located in northern Arizona. The University currently enrolls over 21,000 undergraduate and graduate students at its main campus in Flagstaff, through its 37 statewide locations (including the Yuma branch campus), and via online programs.

The University employs a comprehensive strategic planning process that includes the participation of a wide range of constituents. These important stakeholders help shape the institutional mission and goals, identify University priorities, and – through creative and intelligent discourse – provide solutions to formidable challenges and real-world problems. The current strategic plan identifies seven main goals for the University:

1. **Learning-Centered University:** To be a learning-centered university that promotes high levels of student success, engagement, and achievement.
2. **Student Access, Progress, and Affordability:** To provide responsive educational programs to Arizona citizens wherever they live and work.
3. **Vibrant Sustainable Community:** To elevate the environmental, economic, social, and cultural vitality of our communities.
4. **Global Engagement:** To advance the internationalization of the university to prepare students for global citizenship.
5. **Inclusion, Civility, and Respect:** To create a culture of inclusion that contributes to a rich learning experience and helps prepare students for engaged social responsiveness in a global environment.
6. **Commitment to Native Americans:** To become the nation's leading university serving Native Americans.
7. **Innovative, Effective, and Accountable Practices:** Exemplify an innovative, effective, and accountable learning community.

The strategic plan outlines a broad range of strategies to help achieve the seven goals. More information about the University and its strategic plan can be found on the websites of the Office of the President (<http://home.nau.edu/president/>) and the office of the Provost (<http://home.nau.edu/provost/>).

The School of Forestry

History of the School of Forestry

The Forestry degree program at Northern Arizona University (NAU) was initiated in 1958 as a Department of Forestry dedicated to the training of professional foresters at the Bachelor of Science level. Its existence as a department and later as a college-level professional school supported the recharter of Arizona State College to NAU in 1966. President J. Lawrence Walkup, in his memoir entitled *Pride, Promise, Progress: The Development of Northern Arizona University*, credited the creation of the School of Forestry (SOF) with being the first key step in the process of transitioning from a college focused on training teachers to the multi-purpose university that NAU is today.

The SOF grew in size and complexity between the late 1960s and mid 1990s. A Master of Science degree in Forestry was initiated in 1969 and a Doctor of Philosophy in Forestry was initiated in 1994; the latter brought additional faculty lines to the SOF. In 1999, the NAU Centennial Forest was established and the SOF assumed responsibility of its management.

The SOF has experienced numerous changes in administrative structure since 1992. The Parks and Recreation Management major joined the SOF in 1992. Also in 1992, the Department of Geography and Planning joined the SOF, which led to the creation of a College of Ecosystem Science and Management in 1996. In 2003, the College of Ecosystem Science and Management was dissolved and all faculty associated with the Department of Geography and Planning and the Parks and Recreation Management major moved into a newly named department, the Department of Geography, Planning, and Recreation, located in the College of Arts and Sciences (the current location of this department is the College of Social and Behavioral Sciences). In 2003 and 2004, the SOF was an autonomous college-level academic unit, and the Dean of the SOF reported directly to the university Provost. In 2005, the SOF was placed in a new, but short-lived college-level unit, the Consortium of Professional Schools, which included the SOF, School of Health Professions, School of Nursing, and School of Hotel and Restaurant Management. In 2008 the Consortium of Professional Schools was dissolved and, following one year during which it reported directly to the Office of the Provost, the SOF was moved to the College of Engineering and Natural Sciences, which then was renamed the College of Engineering, Forestry, and Natural Sciences.

The research productivity and reputation of the SOF continues to grow, particularly in the broad areas of forest ecology/health and ecological restoration. Two recent studies of research productivity both ranked the SOF in the top ten nationally among forestry schools, based on per capita productivity as judged by research publications, citations of those papers by other scientists, grants received, and other factors. Part of this increase in productivity has been driven by the creation of the Ph.D. program in Forestry in 1994. The construction of the Southwest Forest Science Complex in 1992, which expanded the amount of lab space available to faculty and students, has also been an important enhancement of the research program. Finally, the SOF has benefited from productive partnerships with the Forest Service's Rocky Mountain Research Station and the Ecological Restoration Institute, both of which have numerous personnel housed in the Southwest Forest Science Complex. The concentration of forestry researchers in the Southwest Forest Science Complex and the greater Flagstaff area helps create a level of activity

and synergy that is similar to some of the other centers of western forestry research, such as Corvallis, Oregon, Missoula, Montana, and Fort Collins, Colorado.

School of Forestry Mission¹

The fundamental educational mission of the SOF is to foster the intellectual and personal development of our students, at both the undergraduate and graduate levels. We intend that our students be, firstly, liberally educated, secondly, good citizens, and finally, skilled professionals and life-long learners with training in an integrated approach to forest ecosystem management.

The SOF educates students in forest ecosystem science and management by integrating instruction in biophysical and human systems. In Forestry, we cross traditional boundaries by applying transdisciplinary and multiobjective approaches to ecosystem studies.

Our scholarship mission features this integrative approach to advance knowledge in forest ecosystem science and management, to bring this new knowledge back to the classroom, and transfer it to citizens of Arizona, the Southwest, and elsewhere. *Our programs leading to the Master of Forestry, Master of Science in Forestry, and Doctor of Philosophy in Forestry play a special role in carrying out our scholarship objectives.*

Our mission includes educational and research activities which bring views from a variety of cultures to the classroom and to the management of forest ecosystems.

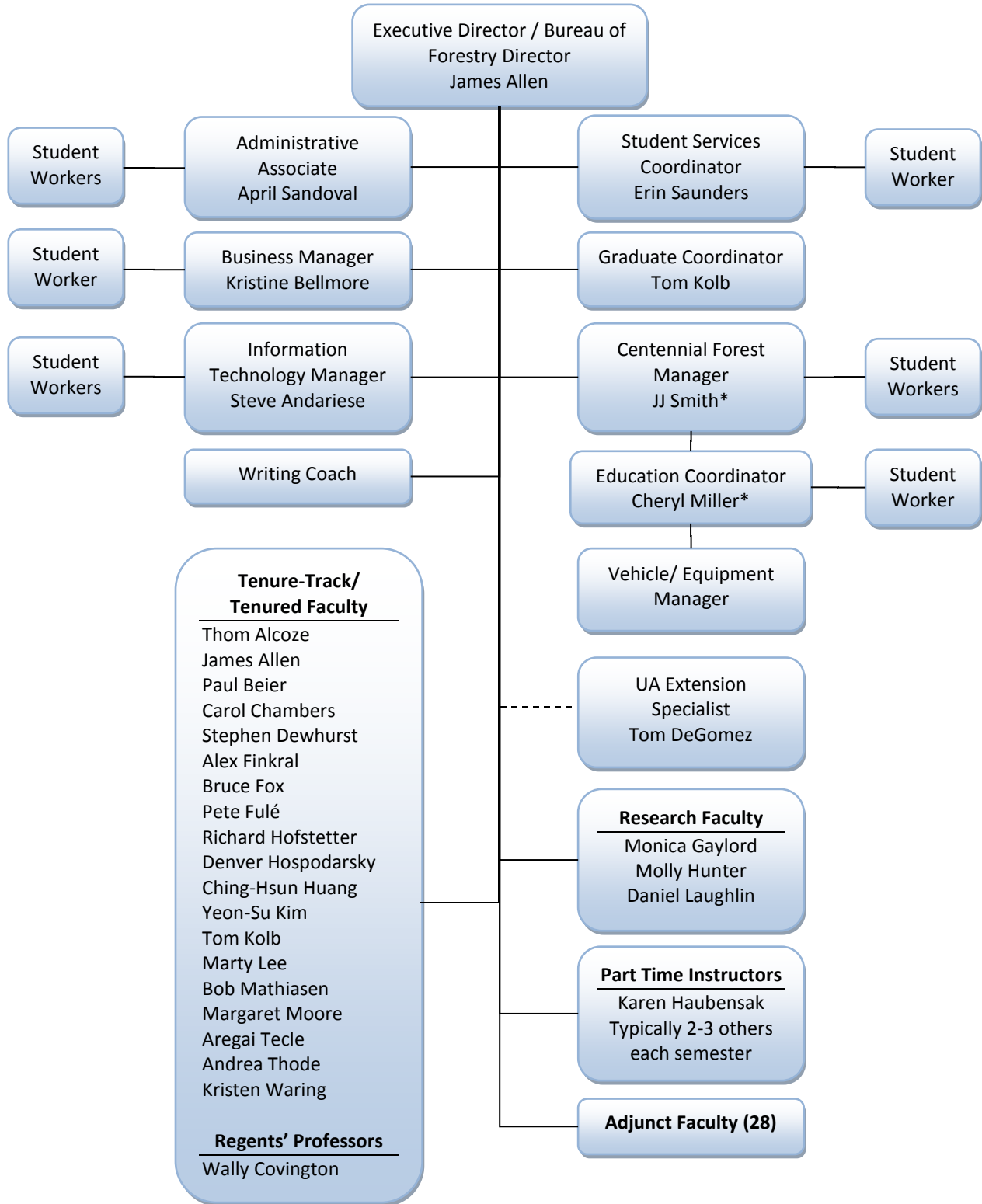
School of Forestry Organization and Administration

The current SOF organization is shown in Figure 1. The SOF currently includes 21 tenure-track/tenured faculty, three newly appointed research faculty, several part-time instructors, and 28 adjunct faculty. It also includes six full-time staff members, two part-time staff members and several student workers. Not listed in Figure 1 are a number of additional employees that are supported directly by research or extension-related grants.

The SOF is led by an Executive Director, who reports directly to the Dean of the College of Engineering, Forestry and Natural Sciences. The Executive Director directly supervises most of the staff (Administrative Associate, Centennial Forest Manager, Information Technology Specialist, Student Services Coordinator, and Writing Coach), as well as all tenure/tenure-track and part-time faculty. The Executive Director also supervises the research faculty, although all three of them are currently funded by grants managed by tenured faculty members and therefore in practice work much more closely with those faculty members. In cooperation with the other full-time faculty, the Executive Director also oversees the appointments of the adjunct faculty.

¹ Last updated in the Spring of 2006, sentence in italics is highlighted given the context of this review.

Figure 1. School of Forestry Organizational Chart



SUMMARY OF RECOMMENDATIONS OF LAST PROGRAM REVIEW AND ACTIONS TAKEN

The SOF graduate education and research programs were reviewed in 2004. The external team was provided by the CSREES (Cooperative State Research, Education and Extension Service) in response to a request from the SOF, and consisted of:

- Dr. Catalino A. Blanche, Team Leader, National Program Leader, Natural Resources and Environment, USDA CSREES
- Dr. Bill Block, Project Leader/Supervisory Research Wildlife Biologist, Rocky Mountain Station
- Dr. Robert L. Edmonds, Associate Dean and Professor, College of Forest Resources, University of Washington
- Dr. Joseph F. McNeel, Director Division of Forestry, College of Agriculture, Forestry, and Consumer Science; West Virginia University
- Dr. Doug Richards, Associate Director, Forestry and Wildlife Research Center, Mississippi State University

The external review team provided many constructive recommendations, which were divided into seven areas: faculty, graduate education, research, extension, administration, facilities/infrastructure, and Northern Arizona University. Below are the verbatim recommendations of the external team, followed *in italics* by how the SOF responded to each recommendation.

Faculty

- “The School should add faculty in strategic disciplines to address critical client needs, while generating significant research opportunities. “

The SOF has lost a net of 2.5 tenure-track/tenured faculty positions since this recommendation due to retirements and faculty leaving NAU for other opportunities. The net loss of 2.5 faculty resulted from the loss of 8.5 faculty (areas of forest genetics, forest management (2), soils, Native American forestry, biometrics, silviculture, wood products, and half of an entomology position) versus the hiring of five new Assistant Professors (areas of fire ecology, forest economics, forest entomology, forest management, silviculture) plus the current Executive Director (forest/wetland ecology). In addition, the SOF had a half-time position in the area of natural resource policy that began after the last review and ended in 2008. Thus, the SOF has failed to add tenure-track/tenured faculty and, in fact, has lost faculty in key strategic disciplines. A notable exception has been an increase in the number of faculty with expertise in fire ecology.

- “The School should explore opportunities to financially reward highly productive faculty.”

NAU has a process of merit-based salary increases, but the process is rarely implemented due to financial constraints. Incentives for financial rewards

to faculty are present via summer salary from grants and contracts and occasionally by supplemental salary during the academic year. A small number of faculty with administrative assignments or affiliations with the federally funded Ecological Restoration Institute have received substantially higher salaries and more financial support than other faculty. Other opportunities, such as endowed chair positions, are in the planning stage.

- “Post-tenure reviews of faculty members should be made on a regular basis, with specific assignments and recommendations.”

Consistent with NAU guidelines, performance of all SOF faculty is reviewed annually. Evaluation letters written by the Annual Review Committee and Executive Director address perceived deficiencies and contain recommendations when deemed necessary. An effort has been made to make these evaluations more substantive in recent years.

- “The School should evaluate courses, both graduate and undergraduate, to determine what courses are less necessary and perhaps should be eliminated from the curriculum.”

Undergraduate courses are currently being reviewed by the SOF Curriculum Committee. Several graduate courses have been eliminated since 2004, but mostly due to the departure of key faculty or low enrollment, rather than a strategic review of course value. Overall, the SOF needs a broad suite of graduate courses to support our three graduate degrees, but it has become more difficult to offer some courses due to a lack of faculty or minimum enrollment guidelines imposed in recent years in response to budget cuts.

- “The Dean should re-assign and focus teaching responsibilities to promote opportunities for productive faculty.”

Some progress has been made regarding this recommendation. The old policy that all Assistant Professors must have at least a 60% teaching load has been revised to allow a lower teaching load for research-productive faculty. Associate and Full Professors often negotiate a reduced teaching load to allow more time for research, while others have had their teaching assignments increased to as much as 80%.

- “The School should continue to hire well-qualified faculty that buy into the collaborative process.”

The SOF seeks to hire the most-qualified faculty in every search. The applicant pool, however, has been smaller than desired for several recent searches, possibly due to the salaries offered by the SOF, which are substantially lower than salaries offered for similar positions at most other

U.S. forestry programs. In general, our recently hired faculty support the SOF's system of collaborative research and education.

Graduate Education

- “An attempt should be made to raise graduate stipends to cover tuition.”

Some success has been achieved. Average assistantship stipends for M.S. and Ph.D. students have been raised approximately 15% since 2004, but they are still below average compared with stipends offered by other western U.S. forestry programs. Flexibility in the exact amount of assistantship stipends (depending on grant support), and specialized fellowships (e.g., IGERT, Science Foundation Arizona) provides higher stipends for select graduate students, and has increased the research capacity and student academic quality. Additional success has been made at the university level via an increase in the mandatory waiver of resident tuition for all half-time Graduate Assistants from 0% to 75%. Efforts to increase this waiver to 100% are underway at the university level.

- “Teaching opportunities should be provided at least for Ph. D. students. Teaching Assistant support should be sought from the Graduate College.”

A little progress has been made. In 2010, the Dean of the College of Engineering, Forestry, and Natural Sciences offered the SOF additional funding to improve its national stature, including funding for support a new teaching assistantship for graduate (primarily Ph.D.) students. The assistantship would provide an opportunity for Ph.D. students to move off a research assistantship for one semester to more strongly focus on teaching. The SOF has asked for more teaching assistant funding from the Graduate College, but only temporary and usually half-time assistantships have been offered. The issue of how funding is allocated to NAU programs has been recently reviewed by the Graduate College. Much of the allocation was negotiated in past agreements that often are not currently relevant. The Graduate College is working to improve the allocation process, but recent university-level financial crises have slowed progress.

- “Because of the large number of courses with low enrollment, and the need for graduate courses that are currently not offered, graduate course offerings should be reassessed.”

As a result of university-level policy, low enrollment courses (<8 for graduate courses) cannot be offered. Overall, the SOF has lost several important graduate-level courses due to departing faculty, such as forest policy and forest genetics, and thus seeks to re-establish key courses.

- “Faculty are encouraged to make sure that high quality mentoring is available on a continuing basis to all students.”

High-quality mentoring is expected for all faculty who advise graduate students, but the quality of mentoring is known to vary somewhat among the faculty. In response to

concerns raised by some assistant professors, an informal mentoring program has been developed within the SOF, as an alternative (not necessarily a mutually exclusive one) to the long-standing program available through the University.

- “Faculty and students are encouraged to consider conducting more research, particularly at the Ph.D. level, outside the Colorado Plateau area. This will increase the national and international reputation of the school.”

Overall, the number of faculty and Ph.D. students who conduct research outside the local region has increased since 2004. For example, several recent Masters and Ph.D. students have conducted research in Africa, Mexico, and Central America as a result of an international research focus by several faculty. Moreover, since 2004 the SOF has added courses in tropical forestry and special topics in tropical research, such as entomology. While the SOF has increased international research since 2004, more improvements can be made.

- “The faculty and dean should make an effort to regularly attend school seminars.”

The current Executive Director is much more active than past Deans and Directors in attending seminars. The current Executive Director attends most SOF seminars, and regularly directs questions to the speaker. Attendance by faculty has improved, but several faculty consistently do not attend. Students and the Executive Director regularly remind faculty about the seminars, and the seminars are well advertised.

Research

- “Undertake a comprehensive strategic planning effort that includes development of a structured research program that will guide research and faculty decisions now and into the future.”

The SOF considers this to be a controversial recommendation. While strategic, institutional planning about research can successfully focus efforts and efficiency, it can also squelch creativity and limit support for individual faculty members whose research focus differs from the strategic plan. The SOF already allocates McIntire Stennis funds for graduate student research assistantships via the Mission Research Program based on the following guidelines that have a regional focus: “The research mission of the SOF is to improve the science and management of wildland ecosystems and their components. The Mission Research Program has a more narrow focus than the School’s research mission: to improve the science and management of wildland ecosystems and their components in the American Southwest.” Moreover, the SOF-affiliated Ecological Restoration Institute has a narrower research focus on restoration of frequent-fire dependant forest ecosystems. Overall, we believe that the balance of structured/strategically-planned research compared with less-structured research is currently about right for the SOF.

- “Continued alignment with ERI and RMRS is critical to research success.”

The SOF has no direct influence on relationships between ERI and RMRS, which have ranged from cooperative to competitive. While the ERI Director is a member of the SOF faculty, the SOF has little influence over his activities; he is currently supervised by the President of NAU. The partnership between the SOF and the RMRS is generally strong and productive in some areas, especially forest health and wildlife, but could be stronger in other areas. The director of the RMRS is a member of the SOF’s Advisory Council and has attended both of its meetings to date, which is a good sign of the importance of the partnership to the RMRS.

- “More structured long-term relationship with ERI and RMRS to ensure continued flows of resources. This can take various forms, but written agreements (e.g., MOUs) might be useful in documenting present and future directions and expectations.”

See last response.

Extension

- “The SOF at Northern Arizona University has no established extension program. At one point, the School shared an extension specialist focused on Native American issues, but the Review Team was informed that the position was being eliminated and the individual had been reassigned. There is a strong need for extension based programming in the region, focused on topics like fire safety, forest management, water issues, etc. The lack of any extension programming also limits the potential for professional development programs focused on federal and state agencies working in the area. This is an opportunity that the School of Forestry should consider a high priority. The Review Team strongly recommends that the School initiate an extension program focused on forest management and professional development. The benefits accrued from such an effort would be substantial.”

NAU is not a land grant institution and does not have a mandate or state-allocated funding to conduct traditional forestry-related extension activities. However, it does play a substantial and increasing role in extension, through a combination of its own activities, and through cooperation with the ERI, RMRS, and the University of Arizona.

The most substantial effort that the SOF has undertaken on its own since the last program review is the development of a series of credit-bearing courses offered to federal government employees in the GS-401 series. Employees in this series who deal with wildland fire management are mandated to obtain further training if they do not have an appropriate degree, and the SOF, with support from the University’s Extended Campuses Program, has helped meet this demand through a suite of courses and the option to obtain a certificate in Wildland Fire Ecology and Management. Since the first courses were offered during the Spring 2007 semester, 100 federal government employees have taken these courses; many have taken two or more of these courses and at least 20 are planning on obtaining a certificate.

Since the last review, the Ecological Restoration Institute has further developed its considerable extension and outreach program focused on restoration of frequent-fire dependant forests. While the SOF has no direct control over this program, the program frequently features SOF research in excellently produced synthesis papers, videos, and press releases.

Also since the last program review, a Forest Health Extension Specialist has joined the SOF as an affiliate. The position is funded by the University of Arizona. The Extension Specialist works closely with SOF faculty to communicate our research findings to the state's citizens. The physical location of the University of Arizona's Forest Extension Specialist in the SOF is probably the best situation we can expect in the absence of a major rearrangement of missions, and the subsequent reallocation of federal extension funds, within the state's university system.

Administration

- “Complete a comprehensive strategic plan as soon as is reasonably possible. The plan should seek to include the support of the university administration, the external constituents of the program, and state legislators with a vested interest in the management of forest resources in Arizona.”

The SOF has been guided by a strategic plan completed in 2005 and effective through 2010. While some progress was made in achieving the goals in this plan, progress was limited by changes in administration, reorganizations, and budget cuts since 2005, which limited both resources available and made it difficult to stay focused on all of the plan's goals. A new strategic planning process was begun last year, with an emphasis on how the SOF could become a more nationally prominent program. Support for these plans was, and will be, sought from university administration, external constituents, legislators, and others. The most recent planning process benefited greatly from the establishment of the SOF Advisory Council in 2009.

Facilities/Infrastructure

- “Assess space needs for collaborating programs to allow equitable allocation.”

The SOF currently has adequate space for our programs plus the programs of the Ecological Restoration Institute that shares the NAU half of the Southwest Forest Science Complex. The departure of the Geography, Recreation and Planning Department from the Southwest Science Complex in 2005 helped alleviate what was becoming a fairly serious space problem.

- “Implement the existing plans for the Centennial Forest by securing state and private support.”

Many of the plans that existed for the Centennial Forest in 2004 have been implemented. Specifically, the field campus has been developed and is heavily used for environmental education programs in the summer, and use of the Centennial Forest for research has increased. While little private financial support for the Centennial Forest has been

obtained, considerable state support, in the form of state fire assistance grants, has been obtained.

- “Solve the mold problem immediately before it becomes a huge financial and legal issue.”

To our knowledge, the mold problem has been corrected. Since 2004 the roof of the Southwest Forest Science Complex was replaced. The roof occasionally leaks into the upper floor during extreme precipitation events, but there have been no observations or reports of mold recently. Periodic air sampling has not found mold levels that are high enough to be considered unusual or a potential health concern.

- “Because Geography and Recreation & Parks are no longer part of the School, a plan for their relocation needs to be developed to free space for the growing needs of forestry.”

The Geography and Recreation & Parks programs were relocated to another campus building. This is no longer an issue.

Northern Arizona University

Note: The 2004 external review team also offered recommendations to the university that extend well beyond the SOF. These recommendations are provided below, but the SOF does not respond to them here.

- “Develop and implement a well-defined and transparent process for allocating resources based upon program stature, priority, productivity and performance.”
- “The University (senior officials) needs to recognize in its organizational re-structuring that the productivity, stature and future prospects of the School of Forestry are a function of its autonomy in managing the University’s science and education programs in forest resources.”
- “Improve the effectiveness of senior officials responsible for forest-based research at NAU by implementing a better system of coordination among these officials. One apparent outcome could be to assign this responsibility to the Vice Provost for Research and Graduate Studies.”

GRADUATE PROGRAM

Graduate Degrees Offered

The SOF offers three graduate degrees: Master of Forestry, Master of Science in Forestry, and Doctor of Philosophy in Forestry. Detailed descriptions of these degree programs are available in the NAU Catalog and in the SOF's Graduate Handbook (<http://www.for.nau.edu/cms/content/view/905/1419/>). Brief overviews of each degree program are provided below. The NAU catalog descriptions are reproduced in Appendix A1.

Master of Forestry

The Master of Forestry (M.F.) degree is the newest of the three SOF graduate degrees, having first been offered in 2004. It is designed for students who desire advanced training in forestry, but do not anticipate a career in research. A minimum of 30 semester hours of coursework plus 3 hours of credit for the professional paper are required. Additional remedial coursework is required for students who do not have an undergraduate degree in forestry. The program of study is designed by the student in consultation with the student's major professor, whose interests complement those of the student.

The M.F. course curriculum features a balance between required and elective courses. The 17-18 hours of required courses include:

- one 3-unit graduate course with significant content in statistics
- a minimum of one hour of enrollment in the Forestry Seminar (FOR 505) course that is based on the forestry seminar series
- Proseminar (FOR 692, 2 units)
- Professional paper (FOR 689, 3 units)
- 8-9 units of core courses, with one course from each of the following concentrations: ecosystem science, forest management science, forest social science; suggested courses for each emphasis are available in the Graduate Handbook (<http://www.for.nau.edu/cms/content/view/905/1419/>).

The remaining 15-16 hours of required courses are graduate-level electives that allow students to take courses in their specific areas of interest. Of the 33 hours required for the degree, at least 17 hours must be courses taught by the SOF. Thus, students have the option of using courses taught by other departments to meet a considerable portion of degree requirements (up to 16 of 33 hours).

The required courses are designed to meet specific educational goals. The requirement of one graduate-level statistics course provides students with training and competence in entry-level statistical analysis (e.g., regression, ANOVA) and more importantly, awareness of the need for inferential statistical analysis of many types of quantitative data. The forest seminar course exposes students to current research topics in forestry via attending the weekly forestry seminar speaker series, and helps develop student skill and confidence in professional-level discussions with expert forestry scientists via the post-seminar class meeting with the speaker. The Proseminar course provides students with training in development of effective oral and poster presentations.

The professional paper course serves as a capstone exercise that requires students to integrate knowledge and information from courses and other information to produce new insights on forest management. Moreover, the professional paper serves as the written comprehensive exam required under the “Comprehensive Examination Plan” for Master’s degrees at NAU. The professional paper must be a manuscript of length appropriate for submission to a professional journal, and judged by the Major Professor and the graders of the paper to represent "publishable quality" with respect to a relevant refereed journal. Actual publication, with the Major Professor as co-author as appropriate, is encouraged but not required.

The M.F. degree also is offered with a Peace Corps Master International option (PCMI), which combines the academic degree with two years of service as a Peace Corps Volunteer. PCMI offers a unique opportunity to combine Peace Corps service with the M.F. degree. A typical PCMI program at NAU begins in fall semester when a cohort of students enters the first academic part of the program. Students take two semesters (9-16 credits) of graduate forestry courses. Following two semesters of preparatory classes, students enter Peace Corps and begin three months of language, culture and technical training. After the Peace Corps in-country two year experience students return to NAU for one semester to complete their professional paper and additional course requirements. Students receive three credits for preparation of a Professional Paper (FOR 689) based on their Peace Corp experience. An additional three credits can be earned for completing FOR 695 (advanced studies) on a technical aspect of their in-country assignment.

Master of Science in Forestry

The Master of Science (M.S.) degree requires coursework and a traditional research-based thesis. Additional remedial coursework is required for students who do not have an undergraduate degree in forestry. The M.S. degree is designed for students seeking a research-intensive Master’s degree, and career goals that include research.

The M.S. in Forestry requires 32 semester credit hours divided into a minimum of 24 hours of coursework and at least 8 hours of thesis. Of the 24 hours of coursework, 12 are required courses:

- FOR 505 Forestry Seminar (1)
- FOR 690 Research Methods (3)
- FOR 692 Proseminar (2)
- STA 570 Statistical Methods I (3) plus 3 hours of another graduate-level course with significant content in statistics.

The remaining 12 hours of coursework are electives chosen in consultation with the major professor and thesis committee. Finally, a minimum of 8 hours of thesis (FOR 699) is required.

The M.S. curriculum is designed to meet specific educational goals. The research methods course trains students in research planning, design, review, and research ethics at the onset of each student’s thesis research. The Forestry Seminar course requirement exposes students to current research topics in forestry via attending the weekly forestry seminar speaker series, and helps develop student skill and confidence in professional-level discussions with expert forestry

scientists via the post-seminar class meeting with the speaker. The requirement of 6 hours of graduate-level statistics courses trains students in the most commonly used statistical approaches and tools in forestry research. The Proseminar course provides students with training in the development of effective oral and poster presentations based on research results, and helps prepare students for their final thesis presentation and defense.

Doctor of Philosophy in Forestry

The Doctor of Philosophy (Ph.D.) is the terminal degree in forestry and is designed for students interested in a career in academic teaching and/or research. A total of 63 credit hours are required for this program, including a minimum of 15 credit hours of dissertation research. Additional remedial coursework is required for students who do not have an undergraduate or Masters degree in forestry. The SOF offers three Ph.D. emphasis areas: ecosystem science, forest management sciences/economics, and forest social science.

Of the total of 63 credits required for the Ph.D. degree, 48 hours of coursework beyond the Bachelor's degree are required. Fourteen of these hours are specific courses:

- FOR 505 Forestry Seminar Series (1 hour)
- FOR 690 Research Methods (3 hours)
- FOR 692 Proseminar (2 hours)
- FOR 693 Teaching Practicum (2 hours)
- STA 570 Statistical Methods I (3 hours) plus three hours of additional graduate-level statistics.

Fifteen hours of emphasis courses are another component of the 48-hour coursework requirement; a list of suggested courses for each emphasis is available in the Graduate Handbook (<http://www.for.nau.edu/cms/content/view/905/1419/>). Nineteen hours of graduate-level electives are the final component of the coursework requirement; these electives may be taken in other departments.

The remaining 15 hours of the 63 credit hour requirement for the Ph.D. degree are dissertation credits. The dissertation requires students to generate novel research questions and/or hypotheses, answer the questions and/or test the hypotheses with data that they collect, and present the results as polished manuscripts aimed at publication in peer-reviewed journals. The dissertation culminates with an oral presentation of the dissertation followed by the student's defense of the dissertation with the dissertation committee.

The Ph.D. curriculum is designed to meet specific educational goals. The research methods course trains students in research planning, design, review, and research ethics at the onset of each student's dissertation research. The Forestry Seminar course requirement exposes students to current research topics in forestry via attending the weekly forestry seminar speaker series, and helps develop student skill and confidence in professional-level discussions with expert forestry scientists via the post-seminar class meeting with the speaker. The requirement of 6 hours of graduate-level statistics courses trains students in statistical approaches and tools needed to support their dissertation research. The Proseminar course trains students in the development of effective oral and poster presentations based on research results. The teaching practicum course trains students in learner-centered college-level teaching.

Other requirements of the doctoral curriculum focus on student demonstration of professional skills and knowledge. The teaching requirement requires student participation in the teaching of an established course in order to gain teaching experience. Such participation will include preparing a minimum of four lectures, delivering them in the presence of a faculty instructor, and developing test questions based on the material presented in class. All teaching by Ph.D. students must be formally evaluated by the student's Major Professor using a standardized form. The teaching requirement can be satisfied by completion of FOR 693 (Teaching Practicum). Each student's knowledge of forestry and their specific research discipline is evaluated by oral and written comprehensive exams taken after completion of required courses.

Admission to the Graduate Program

The requirements for admission to the SOF's graduate degree programs are:

- A GPA of 3.0 or greater (on a 4.0 scale) for all college and university coursework.
- GRE scores in the 40th percentile or above
- For applicants whose native language is not English, a score of at least 80 on the internet-based TOEFL, 550 on the paper-based TOEFL, or 213 on the computer-based TOEFL
- For M.S. and Ph.D. applicants, a faculty member must agree in advance to serve as the student's major professor

To apply, students must submit an application form, a statement of research interests and professional career goals, three letters of recommendation and a resume directly to the SOF. In addition, official transcripts, GRE scores, and TOEFL scores (if applicable) must be submitted to the university. Applications are accepted at any time, but for full consideration applications should be received by March 15 for fall semester admission and by October 15 for spring semester application.

Recruitment of Graduate Students

Recruitment of graduate students is primarily the responsibility of individual faculty members, who typically advertise any assistantships they have available and attempt to recruit the best possible students. However, support is provided by the School through its website, its various brochures and publications, and the services provided by the Graduate Coordinator and Administrative Associate, who often serve as early points of contact for prospective students. The Graduate College also maintains a website that is useful to prospective students.

In general, it appears that the size of the graduate program is not limited by the number of applicants. Instead it is limited by the availability of assistantships and other financial support, as well as by the capacity of many of our faculty to accept new students.

We don't have any solid data to indicate that the relatively modest financial support that we are able to offer most prospective students – in terms of stipends, tuition waivers and other benefits – has caused us to lose top quality students. However, we suspect that this has been the case.

Recent efforts to increase the amount of tuition remission associated with graduate assistantships have been helpful in this regard, we believe. Several years ago tuition remission was at 50%, then it was raised to 75% and, effective next year, it will be 100%. Stipends for assistantships funded by the McIntire-Stennis program have been flat for several years, at \$16,700 per year for M.S. students and \$19,000 for Ph.D. students. Several faculty are able to offer higher stipends through their own grants or through participation in specialized fellowship/traineeship programs, such as NAU's IGERT and Science Foundation Arizona programs.

Most M.F. students are self-funded, although they may be offered part-time employment by their advisors or to serve in a School-supported position (e.g., our Equipment and Vehicle Manager). One recent initiative that we hope will benefit our M.F. students is the approval we received recently to include our M.F. degree in the Western Regional Graduate Program; this will allow students from many western states to enroll at NAU and pay in-state tuition.

Graduate Courses

Overview of courses

The SOF curriculum currently includes 46 graduate-level courses, including 34 formal disciplinary courses. Of the 34 formal disciplinary courses, six have not been taught in the last several years due to loss of faculty or low enrollment (FOR 503, FOR 521, FOR 524, FOR 541, FOR 603, and FOR 605). Enrollment in SOF graduate-level courses ranged between 7 and 23 students per course in the last five years. A complete list of the current SOF graduate course curriculum is in Appendix A2. The undergraduate course curriculum includes an additional 50+ courses that can be taken by graduate students to meet remedial requirements.

Role of Service Courses for Non-Majors

Three non-SOF programs at NAU include SOF graduate-level courses in degree requirements. First, the following courses can be used to meet requirements of the Graduate Certificate in Conservation Ecology: FOR 503, FOR 504, FOR 580, FOR 625, and FOR 633. Second, the following courses can be used to meet requirements of the M.S. in Environmental Sciences and Policy: FOR 563, FOR 593, FOR 605, and FOR 633. Third, the M.S. in Climate Science and Solutions requires FOR 593 as a core course; FOR 500, FOR 580, FOR 605, and FOR 633 can be used to meet other requirements.

Distance-Delivered Courses

Only one SOF graduate-level course is delivered regularly via distance delivery modes. FOR 590 (Economic and Social Issues in Forest Recreation Management) is offered on the web every other year.

Program Changes During the Past Five Years

Master of Forestry

Four changes were made to the M.F. program in the last five years. First, FOR 505 (Forestry Seminar) was added as a required course. Second, a public presentation was added to the requirements for completion of the professional paper. Third, the Peace Corps Masters International Option was added. Fourth, the Tropical Field Study Option was deleted due to lack of student interest.

Master of Science in Forestry

The only change made to the M.S. degree was the addition of FOR 505 (Forestry Seminar) as a required course.

Doctor of Philosophy in Forestry

Two changes were made to the Ph.D. degree requirements in the last five years. First, the breadth requirement – taking one FOR course in an area other than the student’s emphasis - was deleted. Second, FOR 505 (Forestry Seminar) was added as a required course.

Program Assessment

Since 2004 the SOF has regularly participated in program assessments that are coordinated by the NAU Office of Academic Assessment. The SOF was awarded the “Seal of Academic Achievement” from the NAU Office of Academic Assessment in 2010. This award recognizes significant implementation of an outcomes assessment plan through the collection and sharing of various outcomes data. The SOF Assessment Report for 2010 is provided in Appendix A3.

In addition to university-level program assessment, the SOF continually assesses graduate programs and related issues two ways. First, feedback is obtained about programs, courses,

facilities, and policies via an on-line exit survey that is available to all graduating graduate students in the last month of each spring semester. Results of the survey are distributed to all faculty and are discussed by the SOF Curriculum Committee each year. One issue that came up in the last exit survey, and that we have discussed several times over the past semester in Curriculum Committee meetings, is co-convened courses, which some graduate students perceive as being less satisfactory than courses offered only at the graduate level. The faculty has been made aware of these concerns and has been urged to make appropriate adjustments but no courses have been split into solely undergraduate and solely graduate versions. Second, a graduate student representative, chosen by the Forestry Graduate Student Association, is invited to attend all faculty meetings and meetings of the Curriculum Committee to provide feedback about graduate programs and policies and to facilitate communication of curricular and other pertinent issues to graduate students.



FACULTY

Faculty Numbers and Characteristics

The SOF currently has 21 tenured or tenure-track faculty members. The percentage of total FTE staffed by tenure/tenure-track faculty is currently 84%, but has decreased from a high of 95% in 2004. One of the tenure-track faculty members (Wally Covington) has his primary appointment outside of the SOF and another (Michael Wagner) has a half-time appointment. There are also three research (non-tenure-track) faculty members. Information on these faculty members can be found in Appendix A and in an electronic file of faculty CVs that will be provided separately. There has been a significant amount of faculty turnover since the last program review in 2003/2004. Since that time, nine faculty have retired or taken jobs elsewhere (including one who came and went since the last program review), and six faculty have been hired.

The faculty is diverse in many ways, including their educational backgrounds, forestry sub-disciplines represented, gender and, to a lesser degree, ethnicity. Faculty members obtained their terminal degrees from a total of 15 different institutions, including institutions from widely varying parts of the U.S. Nine of the 24 faculty members are female which, at 38%, is believed to be one of the highest percentages of any forestry programs in the U.S. Three faculty members are originally from countries other than the United States and one is Native American.

In addition the regular faculty described above, there is one part-time instructor, two staff members who also serve as instructors, and 25 adjunct faculty members. The part-time instructor has been hired to teach one or two sections per year of FOR 213 (Ecology and Management of Forest Soils) since 2008 and may eventually teach a soils course at the graduate level. The two staff members who are involved in undergraduate teaching are JJ Smith and Cheryl Miller. The adjunct faculty members participate in the SOF's activities in different ways, such as by serving on committees, engaging in research with our faculty, providing guest lectures, and occasionally by co-teaching courses. A list of adjunct faculty, with a brief description of each, is provided in Appendix A5.

Faculty Workloads

All faculty are expected to engage in teaching, research and service, although the proportions can vary considerably. Current assignments range from 40% to 80% for teaching, 10% to 50% for research, and 10% to 20% for service. Individual assignments are subject to negotiation between the faculty member and the Executive Director. Once agreement is reached, the assignments are spelled out in a document called the Statement of Expectations (SOE), which is signed by both the faculty member and the Executive Director. This is normally completed by April or May for the academic year beginning in August.

The SOF has its own set of workload guidelines, which were approved in April, 2005 and revised slightly in September of the same year. However, beginning with the 2009/2010 academic year, an additional set of workload guidelines was developed by the College of Engineering, Forestry and Natural Sciences, in response to a directive from the Provost, which in turn was driven by a budget cut. The new college workload guidelines take precedence over the

SOF's, although latter are still used to the degree possible. They have primarily affected the more teaching-intensive faculty (those with 70% or 80% teaching assignments), who have been required to teach approximately 3-6 more credit hours per year.

Faculty Sabbaticals

NAU and the SOF recognize the importance of faculty sabbaticals for faculty development and renewal. All faculty are therefore eligible for sabbatical after six years of continuous service. Despite challenges such as university-wide budget cuts, no faculty members who have applied have been denied the opportunity to take a sabbatical. Faculty members who took sabbaticals since the previous program review are listed below. In addition, five faculty members have applied for sabbatical during all or part of the 2010/2011 academic year and all have received approval up to and including the level of the Provost.

Faculty who taken sabbaticals since August 2004 include:

- Carol Chambers: 2004/2005
- Robert Mathiasen: 2004/2005
- Pete Fulé: 2005/2006
- Paul Beier: 2006/2007
- Yeon-Su Kim: 2008/2009
- Margaret Moore: 2008/2009
- Thom Alcoze: 2009/2010 (Spring Semester only)
- Aregai Teclé: 2009/2010

The activities undertaken as part of the faculty sabbaticals have been diverse. Three faculty members spent their sabbatical years overseas with the support of Fulbright Fellowships, including Pete Fulé (Spain), Paul Beier (Ghana) and Aregai Teclé (Ethiopia). All faculty members are required to submit a report on their sabbatical activities and to present a seminar upon their return.

Five faculty have been approved for sabbaticals during the 2011/2012 academic year. These include a one-semester sabbatical (Tom Kolb) and four full-year sabbaticals (Carol Chambers, Alex Finkral, Robert Mathiasen, and Andrea Thode).

Nature and Breadth of Faculty Scholarly Contributions

SOF faculty published 328 refereed articles/book chapters from 2004 through 2009 (an average 55 publications/year; Appendix A6). Graduate students were authors or co-authors of 167 of these publications, including 120 publications for which they were the first author.

The SOF has been recognized for its research productivity and the impact of its publications in several ways in recent years. The Faculty Scholarly Productivity Index ranked NAU tenth nationwide for research productivity in forestry in 2007 (the last year for which we have access to the ranking). A study published in the *Journal of Forestry* in 2006 ranked NAU sixth among North American forestry programs for the number of citations of its publications per faculty

member². The research of some of our faculty members extends into the field of conservation biology, and was clearly one of the main reasons why NAU was ranked in the top 15% of 317 programs nationwide in terms of research productivity in this field³. An impressive number of faculty members have “citation classics,” – publications that have been cited 100 times or more. Faculty members with papers cited more than 100 times, according to an ISI Web of Science/Google Scholar search on 11/17/10, include Paul Beier (3 papers; 1,442 citations of all papers combined), Wally Covington (6 papers; 2,871 citations), Pete Fulé (4 papers; 1,791 citations), Tom Kolb (4 papers; 2,389 citations), Margaret Moore (5 papers; minimum of 1,300 citations⁴), and Michael Wagner (1 paper, minimum of 850 citations).

In addition to the various measures of faculty productivity described above, NAU’s Cline Library staff has helped us document our productivity in various other ways using InCites™ software, which uses the ISI Web of Science database to quantify publications by field and the impact of those publications. Three reports developed using this tool are presented in Appendix A7. The reports focus only on the forestry subject area, although we have faculty members who publish in other areas (e.g., wildlife and conservation biology). Even for the forestry subject area, the Web of Science does not include all publications produced by our faculty. However, the data in these reports nevertheless show healthy increasing trends in the number and impact of our publications. The third report also shows that NAU compares well in the forestry subject area with other Western forestry schools.

In addition to the impact that the SOF has among its scientist peers, the School takes pride in the applied nature of its research, its collaboration with management agencies, and the immediate impacts of our research on management actions. Much of our research is funded by government agencies in response to specific management needs. We collaborate with, or do research specifically to serve the US Forest Service, National Park Service, Bureau of Land Management, US Fish and Wildlife Service, Arizona State Lands Department, Arizona Game and Fish Department, federal and local Departments of Transportation, local governments, conservation NGO’s and tribal organizations.

Several faculty contribute substantially to the work of the Ecological Restoration Institute (ERI), which is NAU’s most visible and high-impact effort to join forest science, research, and management. The ERI is led by a SOF faculty member, Wally Covington, and is staffed with several SOF graduates. Although the focus of the SOF’s research has been in the Southwest, our research efforts extend further afield, including Mexico, Europe, and Africa.

Nature and Breadth of Professional Service

² Laband, D.N. and D. Zhang. 2006. Citations, publications and perceptions-based rankings of the research impact of North American forestry programs. *Journal of Forestry* 104(5): 254-261.

³ Grant, J.B., J.D. Olden, J.J. Lawler, C.R. Nelson, and B.R. Silliman. 2007. Academic Institutions in the United States and Canada Ranked According to Research Productivity in the Field of Conservation Biology *Conservation Biology* 21(5): 1139-1144.

⁴ It is difficult to sort out all the citations for common names like MM Moore and MR Wagner, so we stopped counting citations that definitely were for our faculty members at approximately the number listed.

Most faculty in the SOF belong to two or more professional societies and many serve these organizations by reviewing manuscripts for society-sponsored publications, serving on editorial boards for these journals, serving on local, national, and international governing boards of these societies, serving on committees, and chairing symposia at professional meetings. Some examples of significant roles of this type include Jim Allen's role as Chair-Elect of the Southwest Section of the Society of American Foresters, Paul Beier's status as President-Elect of the Society for Conservation Biology, Carol Chambers' role as a member of the Wildlife Society's governing board, and Rich Hofstetter's role as the Chair of the Western Forest Insect Working Conference.

Our faculty's professional service extends beyond professional societies to include serving on review panels for funding programs (e.g., National Science Foundation and the USDA) and advisory groups, and as board members or science advisors for various NGOs that focus on conservation and management of natural resources, including locally prominent organizations such as the Greater Flagstaff Forest Partnership and The Arboretum at Flagstaff. Our faculty also regularly participates in community events such as "Kids for Conservation" program at the Coconino County Fair and the Flagstaff Festival of Science. Several faculty members participate in local, state or regional organizations such as the Flagstaff Open Space Commission or the Friends of the Rio de Flag. Several faculty also serve as advisors for student clubs. Finally, on average, each of our faculty serve on at least one standing committee in the SOF, at least one NAU committee, and at least one ad-hoc committee per year.

GRADUATE STUDENTS

Enrollment and Graduation Trends

Total student enrollment in the three SOF graduate degrees has ranged over the last six academic years between 63 (2007-8) and 83 (2008-9) students. The M.F. program grew from zero to 23 students between 2004 and 2009 (Figure 2). Enrollment in the M.S. program declined from 54 to 31 students between 2003 and 2007, and then increased to 36 students in 2009. Enrollment in the Ph.D. program ranged between 18 and 24 with no clear temporal trend (Figure 2). The percentage of Ph.D. students relative to all SOF graduate students has been stable over the last six academic years (27 to 29%).

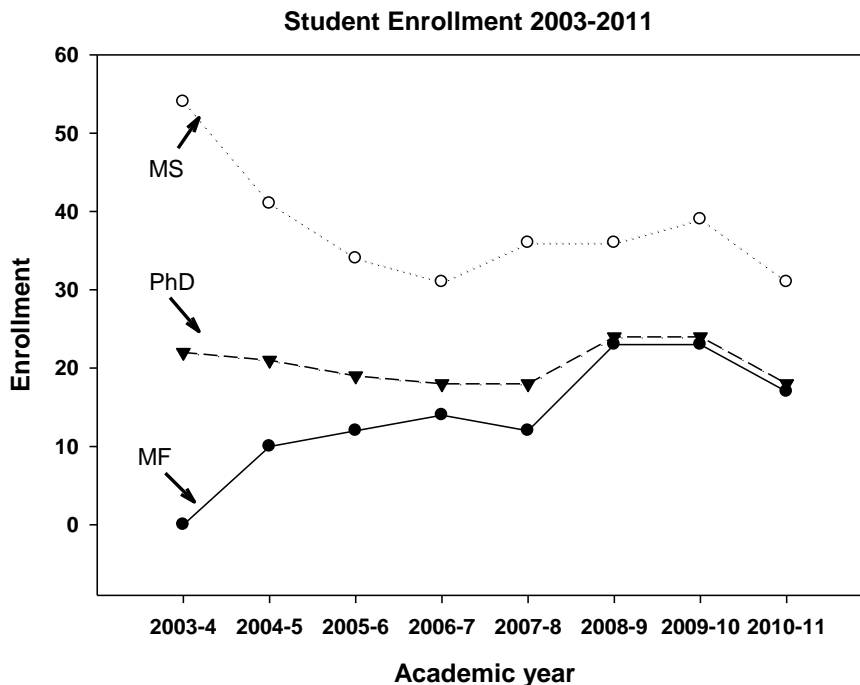


Figure 2. Annual student enrollment in the Master of Forestry (M.F.), Master of Science (M.S.), and Doctoral (Ph.D.) degrees in the SOF for eight academic years.

Consistent with higher enrollment in the M.S. degree, the annual number of graduates for the last six academic years has been higher for the M.S. degree than the M.F. and Ph.D. degrees (Figure 3). Annual number of M.S. graduates over this period has trended downward from between 10 and 18 graduates in 2003-2006 to 8 graduates in 2009 (Figure 3). Annual number of M.F. graduates increased from zero in 2004 to between three and five in most subsequent years. Annual number of Ph.D. graduates ranged between zero and five with no obvious temporal trend (Figure 3). Averaged over the last six academic years, the percentage of students graduating each year relative to student enrollment is 25% for the M.F. program, 30% for the M.S. program, and 14% for the Ph.D. degree.

The SOF graduate student population is diverse. Of the 68 graduate students enrolled in classes in Fall 2010 semester, 29 (43%) are female and nine (13%) are minority.

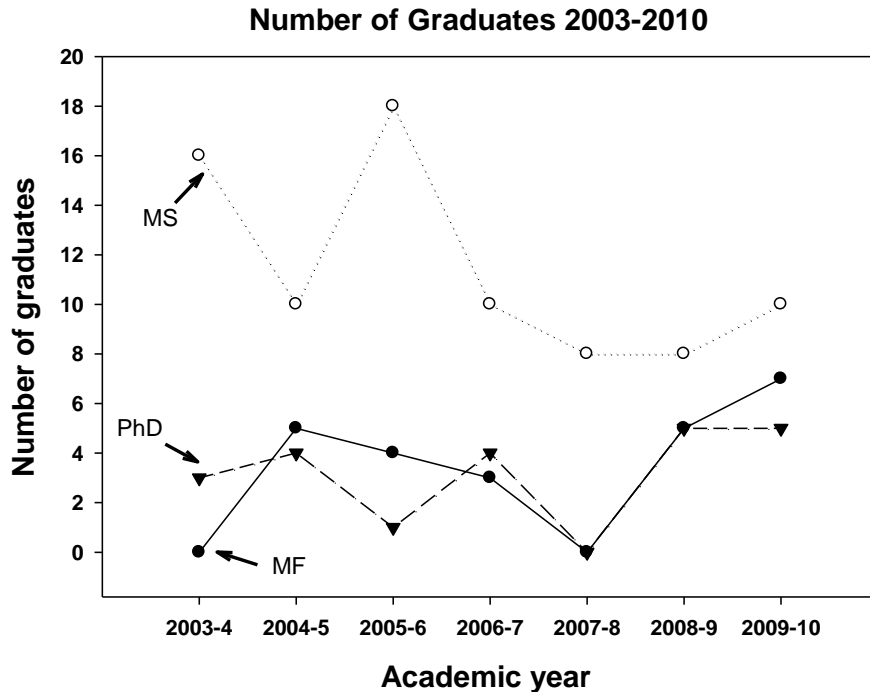


Figure 3. Annual number of graduates of the Master of Forestry (M.F.), Master of Science in Forestry (M.S.F.), and Doctoral (Ph.D.) degrees in the SOF for the last seven academic years.

Graduate Teaching Assistants

In contrast to some other academic units on campus, the SOF does not rely heavily on graduate teaching assistants. Until the current academic year, no graduate teaching assistant positions had been provided by the university. However, starting in the fall of 2010, the dean of CEFNS provided a graduate teaching assistant position, which he has agreed to support (budget permitting) for at least the next three years. In addition, the SOF has typically hired a graduate teaching assistant to teach FOR 215 (Writing in Forestry), as well as to serve as a writing tutor for undergraduate forestry students. Graduate students occasionally teach courses or parts of courses in our undergraduate program, most often as replacements when their major professors are on sabbatical. The graduate students who do this typically are supported financially by their research assistantships.

Graduate Research Assistants

Many graduate students pursuing M.S. or Ph.D. degrees are supported by graduate research assistantships. During the Fall 2010 semester, 12 M.S. students, 9 Ph.D. students, and 2 M.F. students had graduate assistantships, including 11 supported by McIntire-Stennis funding, with the rest being supported by other types of grants or contracts. The support offered to students

receiving McIntire-Stennis supported assistantships included an annual stipend (\$16,870 for M.S. students and \$19,000 for Ph.D. students), 75% tuition remission, and health insurance.

Student Advising and Mentoring

All students are assigned a Major Professor, in most cases before they enroll in one of the graduate degree programs. The responsibilities of the Major Professor are described in the SOF's Graduate Handbook

(<http://www.for.nau.edu/mosaddphp/admin/sofdocs/GradHandbook/pdfs/GradHandbook.pdf>).

In addition to the advising and mentoring that students receive from their Major Professor, they may also receive such support from their graduate committee members, the Graduate Coordinator, or other faculty members. Among their other responsibilities, the Major Professor is expected to complete a written evaluation at the end of every semester for graduate students that are supported by research assistantships. In cases where the advising and guidance provided by the Major Professor is not satisfactory to the student, adjustments have been made that include either having another faculty member serve as a co-advisor or allowing the student to switch to a different Major Professor.

Other Support Available to Graduate Students

Currently all graduate students who request a workspace are assigned a desk in one of the seven graduate student offices, each of which house approximately eight students, or in one of 12 research labs. Space typically consists of a desk and bookshelf.

Graduate students have access to the SOF's laboratories as needed, and some students also use the laboratories of the Forest Service Rocky Mountain Research Station or other labs/facilities on the NAU campus. The SOF maintains a fleet of field vehicles which may be rented at substantially-reduced rates. Graduate students also have access to a considerable amount of computer hardware, software, and IT support, which is described in the Resources section of this document.

The Forestry Graduate Student Association

The Forestry Graduate Student Association (FGSA) was established to represent the interests of the graduate students, to help unite students in the various forestry sub-disciplines, and to provide a forum for interaction both among students and between the students and faculty and staff of the SOF. The FGSA plays a variety of important roles in the SOF. For example, the FGSA is entitled to have a non-voting member attend all Faculty and Curriculum Committee meetings, helps implement the Forestry Seminar Series and the orientation of new graduate students, organizes several social events per year, and engages in service projects. They also can serve as a channel for feedback about the graduate program, including the elements of it that are outside of the SOF's direct control (e.g., we have received recent feedback about some of our students' frustration with some graduate courses in statistics). Some FGSA members are active at the university level, as well, including one student who recently served as the President of the NAU Graduate Student Association. FGSA members are frequent contributors to, or are profiled in, the Graduate School's newsletter.

RESOURCES

Budget

A summary of the SOF budget for the past four fiscal years (FY; July 1 - June 30) is shown below. The primary operating budget for the SOF (Account FOR 1119, the components of which are indicated in the table below by asterisks) has declined by approximately 20% over the past four years due to the loss of salaries associated with faculty and staff positions that were vacated and not replaced due to University budget cuts.

Table 1. School of Forestry budget from state sources for the past four fiscal years.

Category	FY 2008	FY 2009	FY 2010	FY 2011
Salaries*	\$1,958,792	\$1,810,743	\$1,634,022	\$1,555,964
Student Wage*	\$29,804	\$30,002	\$30,206	\$30,206
Operations*	\$60,930	\$60,930	\$60,930	\$60,930
Professional and Outside Services*	\$3,014	\$3,014	\$3,014	\$3,014
In State Travel*	\$14,154	\$14,154	\$14,154	\$14,154
Capital*	\$42,439	\$42,439	\$42,439	\$42,439
Bureau of Forest Research	\$203,703	\$203,719	\$203,837	\$204,173
Total	\$2,309,836	\$2,165,001	\$1,933,762	\$1,856,040

In addition to the state budget lines in the above table, the SOF maintains a total of 12 local accounts and a variable number of grant accounts. Local accounts are for special purposes and the funds come from a variety of sources. Examples of local accounts include Generated Overhead, Forestry Class Fees, and Forestry Vehicle Operations. Most local accounts have less than \$10,000 in them at any given time.

On March 22, 2011, there were 45 external grant accounts managed by the School of Forestry, totaling \$4,271,455 over the life of the grants. Grant expenditures in FY 2010 totaled \$2,848,917, but the average for FY08-FY10 was lower, at \$1,911,878 per year. Major sources of funding on that date included the USDA Forest Service (including the Joint Fire Science Program; \$1,678,488), the Arizona State Forestry Division (\$673,692), USDA-NIFA (\$871,400), the National park Service (\$210,663), NSF (\$174,183), and the USGS (\$173,740). In addition, another 17 external grants totaling \$3,215,531, and that list a School of Forestry faculty member as the PI or co-PI, are managed by the Ecological Restoration Institute.

The SOF also maintains 32 Foundation (endowment) accounts, all of which are for specific scholarships. The balance in these accounts at the end of August, 2010 was \$1,412,188. The total amount in these accounts has grown substantially in recent years; five years ago these accounts held only \$671,059. The amount we have been able to give out each year in scholarships has grown accordingly, from just over \$30,000 five years ago to about \$70,000 for the current year. While the majority of the scholarships funds go to undergraduates, an increasing amount is being awarded to graduate students.

Staff Positions

The SOF has a small but highly effective support staff consisting of five full-time positions that are entirely or almost entirely supported by state funds, including:

- Administrative Associate
- Business Manager
- Centennial Forest Manager (currently on leave until March 2012)
- Manager, Information Technology
- Student Services Coordinator

In addition, the School supports several other staff positions from a variety of primarily “soft money” funding sources, including:

- Education Coordinator
- Equipment and Vehicle Manager (part-time and converted to a graduate student position following budget cuts in 2008/2009)
- Research Associate

A cadre of student workers also supports the School. They provide standard office support, support to the Business Manager, and staff the IT Help Desk. Several positions have been lost in the past three years as a result of state budget cuts to the University. These include:

- Equipment and Vehicle Manager (used to be a full-time position supported with state funds)
- Office Specialist
- Systems Analyst, Senior

Some of the staff support that has been lost over the past five years has been made up for by greater support from other units on campus (e.g., ITS has centralized some types of support), by increasing the number and/or hours allocated for student workers, and by shifting some responsibilities to soft money-supported positions. The SOF, however, has continued to experience a gradual erosion of support that began prior to the previous program review and has affected some aspects of its operations. Managing shared spaces and equipment, for example, has become more difficult without a full-time and relatively permanent Equipment and Vehicle Manager.

Physical Plant and Equipment

The SOF is housed on the Northern Arizona University campus in the Southwest Forest Science Complex that was completed in 1992. It consists of two wings, joined together by a large central atrium. One wing houses the SOF, while the other is occupied by the Flagstaff Unit of the Forest Service Rocky Mountain Research Station.

Facilities include offices for faculty and graduate students, classrooms with multimedia capabilities, numerous state-of-the-art research laboratories, and four modern computer laboratories (two of which are specifically reserved for graduate students). Space within the NAU-owned wing of the Southwest Forest Science Complex assigned to the SOF is listed in Table 2.

Table 2. Space on the NAU side of the Southwest Forest Science Complex.

Type of Space	Number of Rooms	Square Feet	Total Square Feet
Auditorium	1	1,988	1,988
Lecture Hall	1	866	866
Seminar Room	1	446	446
Classrooms	4	3,200	3,200
Total Classroom Space			6,500
Computer Labs	3	2,674	2,674
Server/Storage	2	233	233
Information Technology	3	390	390
Student Space	2	677	677
Conference Room	2	536	536
Emeritus Faculty Office	1	144	144
Faculty Offices	19	152 (average)	2,900
Faculty Research Labs	12	720 (average)	8,644
Graduate Student Offices	5	351 (average)	1,758
Centennial Forest Offices	2	143	286

Research Offices	4	290 (average)	1,163
Administrative Offices	2	279 (average)	558

The SOF has 12 research labs that support faculty and graduate student research. The laboratories are allocated to specific forestry sub-disciplines and include: Wildlife, Fire/GIS/Remote Sensing, Human Dimensions, Forest Management, Entomology, Hydrology, Ecology, Silviculture, Ecophysiology, Forest Ecosystem, Dendroecology. Each laboratory is managed by one or more members of the faculty.

In addition to the 12 labs, there are a number of other facilities with the Southwest Forest Science Complex that support research, including a walk-in cold storage unit, a room containing several freezers and drying ovens, and a fenced storage area on the loading dock for storage of equipment.

Computing Resources and Other Information Technologies

The SOF maintains 130 desktop or laptop computers for faculty, staff, and specialized research labs; 70 desktop computers in several student PC Labs; and 6 desktop computers in multimedia classroom environments. The School also maintains a Microsoft® Windows® Server with four terabytes of disk space which is backed up nightly to tape. A four-year replacement plan for computers is in place for permanent fulltime faculty and staff as well as PC labs, classrooms, and server. The graduate student PC lab is open to forestry graduate students 24/7; the undergraduate PC lab is open to all forestry students Monday through Friday into the evening and six hours on Sunday evening.

Most faculty and staff members have a black and white laser or color inkjet printer in their office. Additionally the school supports six network accessible high volume printers (one color laser, two color inkjet, and three black and white laser printers) as well as a color plotter capable of handling 42 inch wide roll paper. Other peripheral devices supported in the School include several flatbed scanners, a photographic slide scanner, digital cameras, and a digital camcorder.

The above IT infrastructure is supported by the School’s IT Team which is comprised of an IT Manager and a student staffed IT Help Desk. The School’s IT Team is available to faculty, staff, and students for assistance and consulting services during normal business hours.

In addition to the IT environment within the School, faculty, staff, and students have access to PC/MAC computing labs and two terminal servers on campus. The terminal servers and several campus labs are available 24 /7 during the school year.

Assistance and consulting services are available through the campus Information Technology Services (ITS) department. The ITS Student Technology Center is available 24/7 and staffed by six full-time IT professionals and student workers (9 FTE). The Solution Center is available to

faculty and staff during normal business hours and is staffed by seven full-time IT professionals. Additionally, the campus provides in-class and on-line training for faculty and staff in a range of software applications.

The campus supports Microsoft® Windows® IIS web servers for individual faculty, staff, and student web sites. In support the School's web site (www.for.nau.edu) the campus provides a UNIX Apache web server, a Microsoft® Windows® IIS web server, and a MySQL database server.

Library Resources

A report entitled *Cline Library Support for the Forestry Graduate Program* is provided in Appendix A8. Despite ongoing financial limitations on library holdings, Cline Library has continued to provide good support in the area of information resources for the SOF's graduate and research programs. Moreover, Cline Library assigns staff specifically to serve as a liaison to the SOF. Some key aspects of Cline Library's support of graduate and research programs include:

- A demonstrated willingness of Cline Library staff to provide assistance to individual students and classes, such as their support each year of our FOR 690 (Research Methods) class.
- Access to dozens of electronic journals pertinent to forestry and related fields of study.
- Access to numerous important databases, including Agricola, BioOne, Forest Science Database, ISI Web of Science, JSTOR, and Science Direct.
- An effective course reserve system.
- An efficient document delivery system for articles not available on campus.
- Access to hard copies of dozens of scientific journals, books and government publications pertinent to forestry and related fields of study.
- Access to significant and rare historical collections about Forestry in the library's special collections and archives.

Centennial Forest

In April 2000, Governor Hull signed an intergovernmental agreement creating the Centennial Forest to serve as a nationally recognized forest and model for the entire United States. The 75-year agreement between the Arizona State Land Department and Northern Arizona University specifies education, forest health, maintenance of natural forest assets and values, reduction of the risk of wildfire, and long term ecological research as stewardship objectives for this diverse area of approximately 47,000 acres. The Centennial Forest is managed by the SOF on behalf of NAU as a whole. It serves as the primary outdoor laboratory for the SOF's professional forestry program. The Centennial Forest has also been used extensively for research conducted by SOF faculty and graduate students.

PLANNING FOR THE FUTURE

Relationship of the School of Forestry's and the University's Strategic Plans

The SOF has always sought to align its strategic goals with those of the University and, more recently, with those of the College of Engineering, Forestry and Natural Sciences. The School's official strategic plan (Appendix A9) covers the period of 2005-2010 and is aligned very closely with the University's 2004-2009 strategic plan. The broad goals outlined in the SOF's strategic plan are exactly the same as those in the University's plan, with specific strategies tailored to the SOF. Goal #2 of both plans addresses graduate education directly. Specifically, it sets out a goal to "strengthen graduate and professional education, economic development, and research."

Seven strategies were identified by the SOF faculty to help advance Goal #2. The strategies are listed below, along with a brief summary of progress that has been made to date.

- Be the leading academic research organization on forests in the southwestern U.S. and the leading forestry research program in North America in the areas of forest health, ecological restoration, and ecosystem science and management.

Our high rating in the Faculty Scholarly Productivity Index relative to other forestry programs suggests that we are making good progress. According to the 2007 ratings, which are the most recent we have available, only Colorado State University rates higher in research productivity in our general region. There is little doubt that our high rating is due primarily to our research in the disciplines listed above, as well as in the area of conservation biology. The recent development of our Foundation for Excellence (Appendix A10) plan outlines additional strategies for achieving this goal.

- Strengthen graduate and research programs in forest management, economics, social science, and forest products.

Since 2004 we have hired three new faculty with expertise in forest management and/or economics (Alex Finkral, Kristen Waring, Ching-Hsun Huang). These three faculty have made excellent progress in building research programs and have therefore helped us achieve part of this goal. Our program in social science has remained relatively stable over this time period, while our capacity in the area of forest products has declined following the retirement of Robert Larson in May 2010.

- Develop a master's degree with emphasis on international forestry and environmental studies in collaboration with the School for Field Studies.

This emphasis was developed and offered for several years, but was terminated due to lack of enrollment. However, we have since developed a Peace Corps Master International option to the M.F. degree that is growing and showing every sign of becoming quite successful. The first three students to enroll in the program spent their first year on campus and are currently serving in the Peace Corps. Several others are

currently enrolled in the program and are expected to join the Peace Corps within the next six to eight months.

- Increase funded teaching opportunities for graduate students.

We have had limited success with this. The Dean of CEFNS recently provided the School with a graduate teaching assistant position on a year to year basis, but there are no permanent state-supported teaching assistantships allocated to the school. Some students have filled in as sabbatical replacements or have been hired to assist with courses, but overall the number of teaching opportunities for our graduate students remains small.

- Remove constraints that currently limit recruitment of the most qualified graduate students; work with the University and ABOR to institutionalize the waiver of all tuition for graduate students with research and teaching assistantships.

The tuition waiver for graduate students recently increased from 50% to 75%, so progress is being made. This is largely outside of the SOF's control, but we do advocate for this along with our colleagues in other academic units.

- Increase the number of faculty with expertise in fire science, and develop new educational and research programs in fire science/ecology.

Since 2004 we have hired one full-time tenure-track fire ecologist (Andi Thode) and one non tenure-track fire ecologist (Molly Hunter). We have made good progress in increasing our research in this area, along with the number of graduate students and courses. Although not of direct benefit to the graduate program, we now offer an undergraduate certificate in Wildland Fire Ecology and Management and a series of courses designed for wildland fire professionals working for federal agencies in the GS-401 job series.

- Increase the number of offices, classrooms, and research labs available to our programs in the Southwest Forest Science Complex.

We have converted two spaces into graduate student offices, thereby increasing the number of desks available to our students by at least 16. We have also converted an unused space into a small seminar-style classroom that is used for a number of graduate courses and purchased some equipment to upgrade our existing lab facilities.

More recently, the University has published a new strategic plan, the goals of which were described earlier in this report. The SOF has also developed a new plan that is described below. Although the newest SOF and University plans are no longer as explicitly tied together as the plans described above, they nevertheless align well in a more general way.

The Foundation for Excellence Plan

In late 2009, the Dean of the College of Engineering, Forestry and Natural Sciences challenged the SOF to consider what it would take to become the top ranked forestry program in the U.S. and to develop a plan to move the school forward towards that goal. Our response was the “Proposal for Becoming the Top Ranked Forestry Program in the United States: A Foundation for Excellence” document that is reproduced as Appendix A10. While not an official replacement for the School’s 2005-2010 strategic plan, it is nevertheless an explicit outline of some major goals for both the short term and going forward approximately five years.

The *Foundation for Excellence* plan focuses on five main goals, two of which are most directly related to the graduate program. One of these goals calls for growing the overall size of the graduate program and, in particular, the number of Ph.D. students/graduates. The other goal is to increase the research productivity of our faculty, which in turn relies to a significant degree on having a strong graduate program. Key strategies that we will be pursuing in the near future to achieve these goals include encouraging our faculty to pursue greater amounts of external funding (particularly for grants that support graduate students), seeking to create fellowship programs to help attract top quality graduate students, shifting some of our faculty’s workloads more towards research and graduate student advising, and building the size and capacity of our faculty to conduct research in areas such as climate change, carbon management, and wood utilization.

Challenges and Opportunities

While the SOF’s faculty has been remarkably productive in research and in the classroom, there are some potential barriers to further progress that need to be considered and, ideally, addressed. A key consideration is that our faculty salaries are lower on average than for virtually all of the other western forestry schools⁵; this could conceivably be incompatible with the goal of becoming a top research and graduate program. Our relatively low salaries have been at least partially responsible for the loss of several highly productive faculty members in recent years and have also impacted our ability to recruit new faculty. Other significant challenges include (1) an increase in teaching-related responsibilities for some faculty as a result of budget pressures, (2) the recent decline in the number of tenured and tenure-track faculty and staff within the school, and (3) the recent decline in funding provided by the University. The SOF faculty and staff share a common desire to be among the highest ranked forestry programs nationwide and hope that these potential barriers, will not prevent this goal from being achieved.

The challenges we face are significant and may become more so if the University as a whole has to absorb further budget cuts in the next few years, as is almost certain to happen. At the same time there are opportunities to make substantial progress in building our graduate and research programs. It appears that the SOF’s increasing reputation for research, as well as the growing opportunities to pursue external funding through programs such as those offered by the NSF and USDA-AFRI, will allow us to attract more top quality students in the future. We also have a strong cohort of young faculty who has demonstrated their ability to secure external funds and to build promising research programs. Finally, we have what we believe are a well-conceived set

⁵ See the data presented at <http://faculty.washington.edu/bare/naufrpsurvey.html>.

of goals and strategies in our *Foundation for Excellence* plan that focus on our graduate and research programs, that we intend to pursue vigorously in the next few years and that have the support of the Dean of the College of Engineering, Forestry and Natural Sciences.

Appendix A1: Catalog descriptions of School of Forestry Graduate Degrees

MASTER OF FORESTRY

This nonthesis plan prepares you for a career in forest management, in contrast to a career in research. It is appropriate if you desire advanced training in forestry, but not a research focus.

For this plan, you take the following 33 units, as well as any required remedial coursework, chosen with guidance from your faculty adviser. Please note that of these 33 units, at least 17 must be in FOR courses.

- 8-9 units of core courses, with one course from each of the following concentrations:

Ecosystem Science:

FOR 500, 504, 515, 520, 521, 544, 550, 551, 552, 553, 554, 560, 563, 579, 580, 582, 604, 611, 620, and 625 and MAT 542 and 543

Forest Management Sciences:

FOR 500, 503, 524, 525, 530, 541, 542, 551, 565, 573, 590, 593, 603, and 633

Forest Social Science:

FOR 515, 573, and 605; GGR 576; and POS 555, 658, and 659

Additionally, you can use FOR 506 and 695 as well as special topics courses offered by the School of Forestry or other departments in any of these concentrations with approval by your faculty adviser.

- STA 570 or one 3-unit graduate course with significant content in statistics (3 units)
- FOR 505 (1 unit)
- FOR 692 (2 units)
- FOR 689 (3 units)

(Please note that this requirement involves preparing a professional paper on a subject related to management as a capstone integrating experience. This paper meets Northern Arizona University's requirement for a written comprehensive exam.)

- 15-16 units of electives

For more program information, click here www.nau.edu/forestry.

Click here for information about Forestry graduate [courses](#) and [faculty](#).

M.S. Forestry

Our traditional 32-unit thesis option is an individually tailored plan of study that gives you experience in carrying out the kind of research you can expect to do throughout your professional career. This academic plan normally requires two calendar years of academic work that you may begin in either fall or spring term.

In preparing your thesis, we expect you to demonstrate your ability to work independently on a problem, your wide familiarity with the literature in your field, your command of the techniques and principles of research, and your ability to form valid generalizations from the data you use. We require a final oral defense of your thesis.

For this plan, you take the following 32 units, as well as any required remedial coursework:

- FOR 505, 690 and 692 (6 units)
- STA 570 (3 units)
- 3 units from STA 571, 572, 574, and 676; BIO 682; SOC 655; or another graduate-level course with significant content in statistics
- 12 units of formal coursework chosen with your major professor and thesis committee
- 8 units of FOR 699, for the research, writing, and oral defense of an approved thesis

(Please note that you may end up taking more than the 8 units of thesis credit you can count toward your degree because you must enroll for FOR 699 each term while you are working on your thesis.)

For more program information, click here www.nau.edu/forestry.

Click here for information about Forestry graduate [courses](#) and [faculty](#).

Ph.D. Forest Science

This is the terminal degree in the profession of forestry, and it prepares you for a career in research and/or education. We offer three concentrations within this doctoral plan—ecosystem science, forest management sciences and economics, and forest social science.

For this 63-unit plan, which involves completing a dissertation, we expect you to demonstrate your skill in generating original ideas; your considerable command of the literature; your skill at designing, analyzing, and interpreting research; your skill in scientific writing, including publication of research results in major professional refereed journals; and your basic skills in teaching. We expect you to be self-motivated and to largely direct your own research program with advice and counsel from your major professor and dissertation committee. We evaluate your work on the basis of the originality and quality of the new knowledge you generate.

We explain the general, coursework, research, and other requirements for this doctoral plan in the following sections.

General Requirements

For this academic plan, you must:

- attend the seminar series in the School of Forestry and present two seminars
- complete some teaching experience, regardless of the type of financial support you have
- fulfill Northern Arizona University's residency requirements
- For more information about residency and other requirements that pertain to this plan, see [Doctoral Requirements](#).
- pass the oral exam on your dissertation (dissertation defense)

Coursework Requirements

You must complete the following 63 units, including 48 units of coursework beyond the bachelor's degree and 15 units of dissertation credit:

- FOR 505, 690, 692, and 693 (8 units)
- STA 570 (3 units)
- 3 units from STA 571, 572, 574, and 676; BIO 682; and SOC 655 or another graduate-level course with significant content in statistics

- 15 units in your area of concentration, chosen from the following:

ecosystem science:

FOR 500, 504, 515, 520, 521, 544, 550, 551, 552, 553, 554, 560, 563, 579, 580, 582, 604, 611, 625 and MAT 542 and 543

forest management sciences:

FOR 500, 503, 524, 525, 530, 541, 542, 551, 565, 573, 593, and 633

forest social science:

FOR 515, 573, 590, and 605; GGR 576 and 698 (when offered as Planning for Small Communities and Rural Areas); and POS 555, 658, and 659

Additionally, you can use FOR 506 and 695 as well as special topics courses offered by other departments in any of these concentrations with approval by your dissertation committee.

(Please note that you must take at least two of these courses at Northern Arizona University and get your dissertation committee's approval for any courses taken elsewhere.)

- 19 units of electives, with no more than 9 units of 400-level courses
- 15 units of FOR 799, for the research, writing, and oral defense of an approved dissertation

(Please note that you can only count 15 units of dissertation credit toward your degree; however, you may end up taking additional units because you must enroll for FOR 799 each term while you're working on your dissertation.)

In choosing courses, please be aware that:

- At least 39 units must be 500- and 600-level courses.
- No more than 24 units from a master's plan can be credited toward degree requirements.
- Your dissertation committee must approve all of your courses.

Research Requirements

In addition to completing 48 units of coursework, you must demonstrate your independence, research skill, and experience in a discipline within forestry by choosing a problem and research area in consultation with your dissertation committee and then satisfactorily completing a dissertation.

Your dissertation research meets our standards when it is soundly based in the theoretical context of the subject, proceeds with a sound design that gives due attention to statistical adequacy, and concludes with findings and inferences set forth within an appropriate theoretical context. Your dissertation must demonstrate that you have mastered your field of specialization, carried out independent scholarly work, and contributed significant new knowledge. You must successfully pass an oral defense of your dissertation.

Comprehensive Exams

We also require that you demonstrate written and oral communication skills in English at a level that will allow you to effectively communicate your ideas and knowledge to a wide range of audiences. Part of this demonstration involves comprehensive written and oral exams designed to establish your competence in a breadth and depth of subjects within the larger field of forestry.

Research Competency Requirement

Northern Arizona University policy for PhD programs includes a research competency requirement that must be satisfied before a student can be admitted to candidacy. In most departments, this is enforced as a requirement to demonstrate an ability to translate disciplinary literature from a foreign language into English. The School of Forestry has chosen to recognize FOR690 (Research Methods), STA570 (or equivalent), plus one graduate level course with significant content in statistics, as meeting this requirement.

For more program information, click here www.nau.edu/forestry.

Click here for information about Forestry graduate [courses](#) and [faculty](#).

Appendix A2:

List of 500- and 600-level courses offered by the School of Forestry

- FOR500 Ecosystem Science And Management Principles:** *General systems overview of biophysical, social, and political factors associated with forestry. Emphasizes wildlife, recreation, and other noncommodity resources. (Usually offered: Fall semesters only.)*
- FOR503 Management Science Modeling For Multi-resource Management:** *Linear and nonlinear mathematical programming models and their application to forestry in a multi-resource management context. (Usually offered: Varies.)*
- FOR504 Forest Wildlife Ecology And Management:** *After brief overview of theory and practice, course involves critically evaluating current literature on a specific management concern, such as migratory birds, predators, or endangered species. Prerequisite: one course in general biology or ecology. (Usually offered: Spring semesters of even years only.)*
- FOR505 Forestry Seminar Series:** *Weekly presentations by leading scientists in biological and social sciences describing current projects in forestry and wildland management, followed by an informal discussion period. Each student reads scientific papers by 2 of the speakers (selected by the student). Students collaborate to identify and invite speakers for the following semester. Every semester. May repeat for credit. (Usually offered: Both Fall and Spring semesters.)*
- FOR506 Special Studies In Forestry:** *Individual investigation of a specially assigned topic. (Usually offered: Both Fall and Spring semesters.)*
- FOR514 Field Identification Of Birds:** *This course will teach students how to identify common forest birds of northern Arizona by sight and sound and provide an overview of sampling techniques used for monitoring forest-dwelling birds. All 5 class meetings are in the field. Usual instructor: Chambers. (Usually offered: Spring semesters only.)*
- FOR515 Forestry In Developing Countries:** *Ecology, management, and policy issues of tropical and arid land forests in developing countries. Co-convenes with FOR 415. Letter grade only. (Usually offered: Spring semesters only.)*
- FOR520 Applied Forest Stand Dynamics:** *Theory and practice of regulating forest composition, structure, and growth rates to meet multiple land-management objectives. Letter grade only. (Usually offered: Spring semesters only.)*
- FOR521 Advanced Topics In Ecosystem Ecology And Wildland Soils:** *Advanced Topics in Ecosystem Ecology and Wildland Soils. Course utilizes directed readings and discussion of classical and current literature in ecosystem ecology and wildland soils, with an emphasis on land management impacts and global environmental change. Prerequisite: FOR 213 or 479 or BIO 479 or equivalent. (Usually offered: Spring semesters of odd years only.)*

- FOR524 Aerial Photo Interpretation:** *Basic photogrammetric principles; uses of aerial photographs to identify and map vegetation, physiography, and cultural features. Letter grade only. (Usually offered: Spring semesters of even years only.)*
- FOR525 Gis And Spatial Techniques In Forestry:** *Application of geographic and spatial techniques to research and management in forestry, wildland management, and conservation planning. Seminar format may include analysis of data provided by instructor or students. Usual instructor: Dewhurst. (Usually offered: Both Fall and Spring semesters.)*
- FOR530 Ecological Restoration Principles For Practitioners:** *This course is designed for land management practitioners who desire current information about applying ecological restoration principles to ponderosa pine ecosystems of the Southwestern U.S. Instructor's consent required. (Usually offered: Varies.)*
- FOR541 Wood Products:** *Technical aspects of marketing wood products. (Usually offered: Spring semesters of even years only.)*
- FOR542 Principles Of Wood Science And Technology:** *This course covers physical and mechanical properties of wood and how wood properties affect the use of and performance of these products in service. Co-convenes with FOR 442. Letter grade only. (Usually offered: Fall semesters only. Course may be used in partial fulfillment of requirements for Indigenous Forestry Focus Area.)*
- FOR544 Landscape Ecology:** *Theory and application of landscape ecology. Course examines scale-related issues and spatial patterns in natural and human-dominated landscapes; and their role in determining the structure and function of ecological systems. Crosslisted with ENV 544. Usual instructor: Moore. (Usually offered: Spring semesters of even years only.)*
- FOR550 Forest Tree Ecophysiology:** *Effects of environment on physiological processes in forest trees. Prerequisites: college chemistry (including organic) and general or forest ecology. Usual instructor: Kolb. Usually offered: Spring semesters of even years only.)*
- FOR551 Fire Ecology And Management:** *Ecological effects of wildland fires, fire regimes, fire management, prescribed fire, and the application of fire science to restoring and managing ecosystems. Letter grade or pass-fail. Usual instructor: Thode or Fule. (Usually offered: Spring semesters only.)*
- FOR551L Fire Ecology And Management Lab:** *Field and computer lab applications in wildland fire: fuel sampling, fire behavior prediction, modeling fire effects, and prescribed burning. 3 hrs. lab. Letter grade or pass-fail. (Usually offered: Spring semesters only.)*
- FOR552 Forest Tree Diseases:** *Important forest tree diseases: their identification, ecology, and management. Co-convenes with FOR 452. Letter grade or pass-fail. (Usually offered: Fall semesters only.)*
- FOR553 Forest Entomology:** *Important forest insects, their ecology and control. Co-*

convenes with FOR 453. Letter grade only. (Usually offered: Spring semesters of even years only.)

- FOR554 Integrated Forest Health:** *Agents and processes of forest decline; methods of managing and monitoring forest health. Coconvenes with FOR 454. Letter Grade Only (Usually offered: Spring semesters only.)*
- FOR560 Wetland Ecology And Management:** *This course covers the major environmental factors responsible for wetland structure and function, as well as current issues related to wetland management and policy. Letter grade only. Course fee required. Prerequisite: Undergraduate ecology course or permission of instructor. (Usually offered: Spring semesters only.)*
- FOR563 Watershed Hydrology:** *Hydrologic principles and practices related to the land-water system; emphasis on the effects of climate, soils, vegetation, and land-use factors on the quantity and quality of runoff. Usual instructor: Teclé. (Usually offered: Spring semesters of odd years only.)*
- FOR565 Watershed Restoration:** *Watershed Restoration. Students will explore the effects of natural and anthropogenic activities on watershed conditions, and learn various approaches of restoring or handling any adverse effects of such disturbances on watershed ecosystems. Usual instructor: Teclé. (Usually offered: Spring semesters of odd years only.)*
- FOR573 Human Dimensions Of Natural Resource Management:** *Social science concepts and theory related to how humans value and use natural resources with a focus on recreation and current natural resource management issues. Letter grade only. (Usually offered: Fall semesters of odd years only.)*
- FOR580 Ecological Restoration Principles:** *Course designed to explore central concepts and philosophical underpinnings of ecological restoration. (Usually offered: Spring semesters only.)*
- FOR582 Ecological Restoration Applications:** *Examples and applications of ecological science related to restoring natural structures and processes of ecosystems. Co-convenes with FOR 382. Letter grade or pass-fail. (Usually offered: Fall semesters only.)*
- FOR590 Economic And Social Issues In Forest Recreation Development:** *Economic and social issues in promoting rural economic development and a quality rural environment through forest recreation development in the West. (Usually offered: Varies.)*
- FOR593 Natural Resource Economics:** *Application of advanced methods in analyzing multi-resource forest economics problems. Co-convenes with FOR 493. Letter grade only. (Usually offered: Fall semesters only.)*
- FOR599 Contemporary Developments:** *Examines recent trends and investigations in a selected area of a particular field of study. May be offered no more than three times before being submitted for a permanent course number. May be repeated for credit.*

Letter grade only. (Usually offered: Varies.)

- FOR603 Forest Biometrics:** *Quantitative approach to the study and construction of forest growth and yield models. recommended: calculus. (Usually offered: Spring semesters of odd years only.)*
- FOR604 Wildlife Habitat Relationships:** *Systems approach to comprehending the associations with and uses of habitat by wildlife. Letter grade only. (Usually offered: Fall semesters of odd years only.)*
- FOR605 Natural Resources Policy Analysis:** *Natural Resources Policy Analysis. Students will investigate how to analyze the natural resource policy process including; substance, actors, institutions, interest groups, and the role of social values in policy content. The course will include a review of current multi-resource philosophy, law and regulations. (Usually offered: Fall semesters only.)*
- FOR625 Applied Conservation Biology:** *Applied Conservation Biology. Class focuses on practice, rather than theory, of conservation biology, and on conservation in managed, rather than strictly protected, landscapes. Topics include collaborative conservation efforts, adaptive management, assessment tools, and integrated conservation and development projects in developing countries. Usual instructor: Beier. (Usually offered: Fall semesters of odd years only.)*
- FOR633 Ecological Economics:** *Theory of ecological economics, which is the union of ecology and economics, and its application to natural resource management. Addresses both micro and macro aspects of ecological economics. (Usually offered: Spring semesters of odd years only.)*
- FOR685 Graduate Research:** *Graduate research that is not part of a thesis, dissertation, or professional paper. Letter grade or pass-fail. Department consent required. (Usually offered: Both Fall and Spring semesters.)*
- FOR689 Professional Paper:** *Preparation of a professional paper if you are in the nonthesis master's program. Department consent required. (Usually offered: Both Fall and Spring semesters.)*
- FOR690 Research Methods:** *Scientific method; investigative procedures; formulation of hypotheses; problem selection and analysis; preparation of a research working plan. (Usually offered: Fall semesters only.)*
- FOR692 Proseminar I:** *Design, preparation, and presentation of professional seminars. Department consent required. (Usually offered: Both Fall and Spring semesters.)*
- FOR693 Teaching Practicum:** *Examination and discussion of effective teaching methods. Teaching experience. (Usually offered: Spring semesters only.)*
- FOR694 Supervised Teaching In Forestry:** *Practical application of learner-centered, active teaching and assessment methods in undergraduate Forestry courses. Forestry faculty will mentor graduate students in the implementation of effective teaching. (Usually offered: Both Fall and Spring semesters.)*

- FOR695** **Advanced Studies In Forestry:** *Directed study in a forestry subject, with area to be specified at registration. (Usually offered: Varies.)*
- FOR697** **Independent Study:** *Individualized directed study on selected topics. Pass-fail or letter grade, depending on departmental policy. (See the section titled Independent Study in the Degree Requirements chapter of this catalog for more information.) Department consent required. (Usually offered: Both Fall and Spring semesters.)*
- FOR698** **Graduate Seminar:** *Reading and discussion on selected advanced topics. Pass-fail or letter grade, depending on departmental policy. (Usually offered: Both Fall and Spring semesters.)*
- FOR699** **Thesis:** *Individualized directed research, writing, and oral defense of selected thesis topic. May be repeated as needed. Prerequisite: Admission to master's program. Department consent required. (Usually offered: Both Fall and Spring semesters.)*
- FOR799** **Dissertation:** *Individualized directed research, writing, and oral defense of selected dissertation topic. Department consent required. (Usually offered: Both Fall and Spring semesters.)*

Appendix A3:
2010 Annual Report on Degree Program Assessment of Student Learning from the School of Forestry to the University Assessment Committee and Office of Academic Assessment

Purpose: The purpose of the Annual Report on Degree Program Assessment of Student Learning is to provide information about progress in assessment efforts for each degree program within your academic unit. Only one report is requested of each academic unit, as this report will accommodate multiple degree plans. (You can still submit separate reports if you prefer.) The report will be made available publicly at the Office of Academic Assessment website and will be available to appropriate accrediting agencies. It is recommended that your unit use your assessment report and results to celebrate achievements of student learning as well as to identify potential areas for future curriculum improvement. The University Assessment Committee will review your report to provide constructive feedback, as well as to identify particular academic units for potential assessment awards and/or mini-grants to support continuing assessment efforts.

Please email this completed form as an attachment to d-oaa@jan.ucc.nau.edu.

CONTACT INFO:

Academic Unit: School of Forestry

Date: February 18, 2010

Name: James A. Allen

Title: Executive Director

Email: James.Allen@nau.edu

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NAU Box: 15018

Degree Program(s) reported here: Forestry (B.S., M.F., M.S., and Ph.D.)

ASSESSMENT REPORT:

Instructions: Please answer the following five questions to the best of your ability for each degree program offered within your unit. You may use the table provided on the next page, or you may create your own report format.

1. Summarize your assessment activities during the past year for each degree program. (e.g. faculty discussions, new survey design, data collection, revised assessment plans or learning outcomes, etc.).

B.S. Program: We continue to operate under the general guidelines of our current assessment plan, which was submitted in October 2004.

The 155 competencies identified in the 2004 plan continue to be considered important, but are not addressed individually in our annual assessment. A key element of our assessment approach continues to be how students perform in their senior-level capstone course (FOR 423-424). This

provides an integrated opportunity to assess student learning, including their knowledge of technical forestry skills and their skills in critical areas such as written and oral communication. FOR 423-424, as well as our other forestry courses, continue to be revised based on formal and informal assessment results.

Another key element of our B.S. program assessment continues to be the facilitated discussions (course evaluations by our students) held at the end of the semester in some of our professional program courses (Semester A, B, C, and D). The most recent such facilitated discussion was held at the end of Semester A, in December of 2009. These discussions are facilitated by an individual from outside the School of Forestry. The results of these discussions are available to the instructors and are used to help plan the following year's course.

An assessment effort we worked on over the past two years was a "Sunset Review" of our focus areas. Focus areas were implemented as a new requirement for the B.S. degree program in 2001. Our School of Forestry's Strategic Plan calls for all focus areas to be reviewed after five years; although we missed this goal by one year, we began a review of the five original Focus Areas during the Fall 2007 semester. Our approach to this review was based on (1) a request to each Focus Area Coordinator to provide a summary report addressing issues such as current enrollment, delivery of the required courses, and amount of time required to serve as the coordinator and (2) a survey of recent graduates to solicit their opinions on how well the focus area requirement has contributed to their education and subsequent career development. Both of these were initiated in the fall of 2007. Discussions about the results of this work began in earnest during the 2008-2009 academic year; during that same year a number of new considerations related to the budget and the need to streamline programs became part of the discussion.

We also continued to implement our on-line exit survey for seniors. The survey asks undergraduates for a wide variety of feedback, including on the curriculum, the quality of various support services, extra-curricular activities, etc.

In addition to our ongoing assessment efforts, we are scheduled for our next accreditation visit by the Society of American Foresters (SAF) in 2013. We will need to start planning for the self-study at least two years before that. SAF accreditation is critical to the continuing success of our B.S. degree program and provides a reasonable level of assurance that our program meets national-level standards for undergraduate forestry education. The SAF accreditation process is gradually evolving towards a more "outcomes based" approach and therefore is very much in line with NAU's approach to assessment.

Graduate Programs (M.S., M.F., and Ph.D): The graduate programs continue to operate under the guidelines of their current assessment plans, which are specific to each degree program (although they also have much in common); all are dated October 2004. For each degree program, a table was produced which describes specific outcomes, how they are evaluated, and how each type of assessment information is "fed back" into the program. Each outcome is evaluated by an individual or individuals (e.g., the Graduate Coordinator, course instructors, the student's committee and the Executive Director). The types of outcomes listed do not call for an annual discussion on the part of the faculty. Since much of the feedback comes to the Graduate Coordinator, that individual is expected to play a key role in identifying any major concerns that

arise and sharing them with the faculty. Several discussions at Curriculum Committee or faculty meetings have been held as follow-ups to feedback received by the Graduate Coordinator.

In addition, a graduate student attends all faculty meetings and meetings of the school's curriculum committee to provide feedback about graduate programs and policies to the faculty, and to facilitate communication of curricular and other pertinent issues to graduate students.

We also continued to implement our on-line exit survey for graduate students, which is similar to the one described above for undergraduates.

A seven-year review of our graduate programs will need to be initiated in 2010-2011, so planning for this will need to begin soon.

2. Describe specific assessment findings related to the learning outcomes assessed for each degree program, including any pertinent context surrounding the findings. Please include the learning outcomes themselves. (e.g. 77% of seniors performed at the "proficient" level of competency in problem solving, which is where we aimed to be this year using a new scoring rubric...)

a. Please attach any tables, graphics, or charts to the end of this report.

B.S. Program:

The reports of the facilitated discussions after our professional program semesters continue to be a rich source of information. The information in those reports generally indicates that students are satisfied with the courses, support the team teaching approach used in these courses, and like the way the field and lecture elements of the courses build on each other. They also indicate some potential problem areas, which the faculty that form part of the team for a particular semester (e.g., "Semester A") work to address for the following year. Despite the cost of these facilitated reviews (~\$600 each), we continue to support them - especially for the first year (Semester A and B) - so that we can respond to the concerns and suggestions of each new cohort of students.

Graduate Programs: As mentioned above, the graduate level assessment plans do not call for annual data synthesis or review by the faculty. Given the type of feedback received recently by the Graduate Coordinator (e.g., quality of theses/dissertations and performance of students at their defenses) and through the regular teaching evaluations, it appears that quality of the program is still quite good. Some of the same broad concerns highlighted in the previous reports still remain as important concerns, however, including the need for more opportunities for students to gain teaching experience (especially for Ph.D. students), the lack of tuition waivers and low stipends. We have also identified some concerns about graduate student advising through our informal feedback mechanisms, which we are now working to address.

3. Describe how assessment feedback has been provided to students, faculty, and staff. (e.g. report for faculty, executive summary for the dean, web page for students, alumni newsletter, discussion with students in class or club event, etc.)

B.S. Program: Our on-line exit surveys are shared with key individuals such as the Executive Director, Graduate Coordinator, Student Services Coordinator, and IT Manager. We no longer

post the results to our website due to the personal nature of some comments. Other types of assessment information (e.g., the results of the facilitated discussions after Semesters A, B, C and D) are not disseminated widely, but are available to SOF administrators and to the faculty who are involved in the specific courses.

Graduate Programs: There has been no formal dissemination of assessment results for our graduate programs in the last year, other than through sending the on-line exit survey to appropriate individuals and through discussions at curriculum committee and/or faculty meetings about specific issues raised about the program, mainly by our Graduate Coordinator.

4. In what ways have you used assessment findings to celebrate student achievements and/or to improve the curriculum this past year? (e.g. prizes to students, hosting student parties, changes to curriculum, student projects, learning goals, assessment strategies, etc.)

B.S. Program: The results of the facilitated discussions with students after Semesters A, B, C, and D are made available to the group of faculty responsible for teaching the course (both in the current year and for the next year). The group that teaches the course in the following year generally discuss the results in their pre-semester meetings and occasionally make adjustments of various types (e.g., how much to emphasize particular topics and how to avoid excessive redundancy). Beginning in the fall of 2008, several changes were made to Semester C that made the course more structured and challenging, which is based to a large degree on comments received from students from the facilitated discussions and through other, more informal channels.

The most significant change in our curriculum since the last assessment report is the decision to eliminate almost all of our focus areas (8 out of 9) and replace them with a lower number of certificates (4 through the SOF and one that will be offered jointly with the Department of Biological Sciences). This was a direct result of the Sunset Review mentioned earlier and subsequent discussions of some of the information obtained through that review. These changes were submitted this academic year and recently approved by the UCC (the joint certificate is still pending), and will be implemented beginning in the fall of 2010.

Graduate Programs: Individual elements of the overall approach to assessment clearly are exercised on a regular basis. Perhaps the best example of this is the assessment of the learning outcomes as demonstrated by the quality of a student's thesis or dissertation. It is not uncommon that students are required to improve these documents following their assessment by their graduate committees. A number of minor changes to the graduate curriculum have been made since the last assessment report, in part based on feedback received from students. For example, in the last year we have made the following improvements to the graduate curriculum and related assessment efforts based in part on assessment feedback from students: 1) A new evaluation form for graduate assistants was developed and is being regularly implemented; 2) An out-dated and under-enrolled graduate degree option (Master of Forestry – Tropical Field Studies) was deleted; 3) A proposal to help graduate students by reducing the number of thesis/dissertation units in the semester of graduation from three to one was developed by the Graduate Coordinator and proposed to the University Graduate Council for approval (pending).

Bigger picture assessment (beyond that of the individual student's performance) of the graduate programs has been more limited recently, but with the next seven-year assessment due to begin by next spring, this will be changing soon.

5. Describe any changes to your assessment plans, or any challenges or educational experiences with the assessment process this past year that you would like to share.

a. Please submit any revised/updated assessment plans to the Office of Academic Assessment along with this report.

No changes have been made to the existing assessment plans since the last report. We expect that some changes will be proposed beginning next year, when we begin to make use of the new three-year cycle for assessment. Upcoming seven-year reviews and accreditation cycles are also likely to help drive a refinement of our existing plans, all of which date to 2004.

**Appendix A4:
School of Forestry Faculty Background Summary, Academic Year 2010/2011**

Faculty Member	Academic Rank	12mo./9mo.	Major Field	Highest Degree Held Degree/Yr./Inst.	Experience (years)		
					Present Inst. ¹	Other Inst.	Non-Academic
Alcoze, Thom	Professor	9 month	Restoration Ecology & Indigenous Knowledge	Ph.D./1981/ Michigan State University	22	13	0
Allen, James	Professor And Executive Director	12 month	Forest and Wetland Ecology	Ph.D./1994/ Louisiana State University	5	6	17
Beier, Paul	Professor	9 month	Wildlife Ecology and Conservation Biology	Ph.D./1988/ University of California, Berkeley	19	6.25	.3
Chambers, Carol	Professor	9 month	Wildlife Ecology	Ph.D./1996/ Oregon State University	15	8	0
Covington, Wally	Regents' Professor and Executive Director, ERI	9 month	Forest Ecology	Ph.D./1976/Yale University	36	0	0
Dewhurst, Steve	Associate Professor	9 month	Forest Management	Ph.D./1999/Northern Arizona University	13 ²	8	2

¹ Counts 2010/2011 as a full year.

² Includes 5 years as a Research Specialist.

Finkral, Alex	Assistant Professor	9 month	Forest Management	Ph.D./2005/Yale University	6	0	9
Faculty Member ¹	Academic Rank	12mo./9mo.	Major Field	Highest Degree Held Degree/Yr./Inst.	Experience (years)		
					Present	Other Inst.	Non-Academic
Fox, Bruce	Professor	9 month	Forest Management	Ph.D./1980/University of Michigan	25	6	8
Fulé, Pete	Professor	9 month	Ecological Restoration and Fire Ecology	Ph.D./1996/ Northern Arizona University	13	0	4
Gaylord, Monica	Assistant Research Professor	9 month	Forest Entomology and Forest Health	Ph.D./2009/Northern Arizona University	1.5	0	5
Hofstetter, Rich	Assistant Professor	9 month	Forest Entomology and Forest Health	Ph.D./2004/Dartmouth College	6	3	2
Hospodarsky, Denver	Associate Professor	9 month	Forest Sociology	Ph.D./1993/ Oregon State University	19	0	0
Huang, Ching-Hsun	Assistant Professor	9 month	Forest Economics and Management	Ph.D./1999/ Stephen F. Austin University	4	7	1
Hunter, Molly	Assistant Research Professor	9 month	Fire Ecology	Ph.D./2004/Colorado State University	4	4	2
Kim, Yeon-Su	Assistant Professor	9 month	Natural Resource Economics	Ph.D./1998/ Oregon State University	13	0	0
Kolb, Tom	Professor	9 month	Forest Ecology and Tree Physiology	Ph.D./1988/ Pennsylvania State University	18	5	0

Faculty Member ¹	Academic Rank	12mo./9mo.	Major Field	Highest Degree Held Degree/Yr./Inst.	Experience (years)		
					Present	Other Inst.	Non-Academic
Laughlin, Daniel	Assistant Research Professor	9 month	Forest Ecology and Ecological Restoration	Ph.D./2009/Northern Arizona University	7.5 ³	0	2
Lee, Martha	Associate Professor	9 month	Wildland Recreation	Ph.D./1991/ Oregon State University	20	0	0
Mathiasen, Robert	Associate Professor	9 month	Forest Health, Forest Pathology	Ph.D./1977/ University of Arizona	21	1	9
Moore, Margaret	Professor	9 month	Forest and Range Ecology, Landscape Ecology, GIS/Remote Sensing	Ph.D./1987/University of Minnesota	25	3	0
Tecele, Aregai	Professor	9 month	Hydrology and Decision Systems Analysis	Ph.D./1988/ University of Arizona	23	13.5	0
Thode, Andrea	Assistant Professor	9 month	Fire Ecology	Ph.D./2005/University of California, Davis	6	4	4
Wagner, Michael	Regents' Professor	9 month	Forest Entomology	Ph.D./1980/University of Wisconsin	31	0	2
Waring, Kristen	Assistant Professor	9 month	Silviculture, Forest Health	Ph.D./2006/University of California, Berkeley	5	2	0.5

³ Includes 7 years as a Research Technician or Research Specialist.

Appendix A5: School of Forestry Adjunct Faculty

- Scott Abella, [UNLV Public Lands Institute](#)
- Ernesto Alvarado, [University of Washington, College of Forest Resources](#)
- William M. Block, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- Paul Bosu, [Forestry Research Institute of Ghana](#)
- Peter Brown, [Rocky Mountain Tree-Ring Research, Ft. Collins, CO](#)
- Samuel Cushman, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- Dennis Dye,, [USGS Western Georgraphic Science Center](#)
- Paulette Ford,, [Rocky Mountain Research Station, Albuquerque, NM](#)
- Joseph L. Ganey, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- Gerald Gottfried,, [Rocky Mountain Research Station, Phoenix AZ](#)
- Teryl G. Grubb, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- Stephen C. Hart, [University of California, Merced, Merced, CA](#)
- Karen A. Haubensak, [NAU School of Forestry](#)
- David Huffman, [Ecological Restoration Institute, Flagstaff, AZ](#)
- Michael Ingraldi, [Arizona Game and Fish Department](#)
- Robert Keane, [USDA Forest Service, Intermountain Fire Sciences Lab](#)
- Joel McMillin, [Arizona Zone Forest Health Protection, Flagstaff, AZ](#)
- Mario Montes-Helu, [NAU School of Forestry](#)
- Daniel G. Neary, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- Robert Parmenter, [Valles Caldera National Preserve, Los Alamos, NM](#)
- Steve Rosenstock, [Arizona Game and Fish Department](#)
- Carolyn Sieg, [Rocky Mountain Research Station, Flagstaff, AZ](#)
- John Vankat, [Miami University](#)
- José Villanueva-Díaz, [Instituto Nacional de Investigaciones Forestales y Agropecuarias](#)
- Christina D. Vojta, [Rocky Mountain Research Station, Flagstaff, AZ](#)

Appendix A6:
School of Forestry Peer-Reviewed Publications, 2004-2009
(last updated January 14, 2010)

In Press

- Bridgeland, W.T., **P. Beier**, **T. Kolb**, and T.G. Whitham. In press. A conditional trophic cascade: birds benefit faster-growing trees with strong links between predators and plants. *Ecology*.
- Dore, S., **T.E. Kolb**, M. Montes-Helu, S.E. Eckert, B.W. Sullivan, B.A. Hungate, J.P. Kaye, S.C. Hart, G.W. Koch, and **A.J. Finkral**. In press. Carbon and water fluxes from ponderosa pine forests disturbed by wildfire and thinning. *Ecological Applications*.
- Fierke, M.K., D. Nowak, and **R.W. Hofstetter**. In press. Forest Health Monitoring. In Castello, J. and S. Teale (eds.), Using the Baseline Mortality Concept in Forest Health. SUNY College of Environmental Science and Forestry. Cambridge University Press.
- Fischer, M.J., **K.M. Waring**, **R.W. Hofstetter**, **T.E. Kolb**. In press. Ponderosa pine characteristics associated with attack by the roundheaded pine beetle. *Forest Science* (accepted pending minor revisions).
- Fulé, P.Z.** In Press. Wildfire Ecology and Management at Grand Canyon, USA: Tree-ring applications in forest fire history and modeling. Book chapter in Stoffel, M., M. Bollschweiler, D. R. Butler, B. H. Luckman (eds.), Tree-Ring Reconstructions in Natural Hazards Research, Springer Science + Business Media B.V., Dordrecht.
- Hofstetter, R.W.** In press. Chapter 11: Mutualists and Phoronts of the Southern Pine Beetle. In Klepzig, K.D. and R. Coulson (eds.), Southern Pine Beetle Encyclopedia Forest Encyclopedia Network (FEN), USDA Forest Service.
- Hofstetter, R.W.**, J.C. Moser, S. Bloomquist and M.P. Ayres. 2009. Phoretic mites associated with bark beetles and their fungi. In Wingfield and Eifert (eds.), The Ophiostomatoid Fungi: Expanding Frontiers.
- Kim, Y-S.** In press. Ecological Restoration as Economic Stimulus: Potential Regional Economic Impacts of the Southwestern Ponderosa Pine restoration. Working Papers in Southwestern Ponderosa Pine Restoration, Ecological Restoration Institute, Flagstaff, Arizona.
- Kim, Y-S.** In press. Contingent Valuation of Protected Areas in Developing Countries: Problems, Aims and Responsibilities (Commentary). *Journal of Protected Area Studies*.
- Klepzig, K.D. and **R.W. Hofstetter**. In press. Chapter 10: From attack to emergence: interactions between southern pine beetle, mites, microbes and trees. In Klepzig, K.D. and R. Coulson (eds.), Southern Pine Beetle Encyclopedia Forest Encyclopedia Network (FEN), USDA Forest Service.

- Klepzig, K.D. and **R.W. Hofstetter**. In press. From attack to emergence: interactions between southern pine beetle, mites, microbes and trees. In Wingfield and Eifert (eds.), *The Ophiostomatoid Fungi: Expanding Frontiers*.
- Koepke, D., **T.E. Kolb**, H.D. Adams. In press. Variation in woody plant mortality and dieback from severe drought among soils, plant functional groups, and species within a northern Arizona ecotone. *Oecologia*.
- Laughlin, D.C., J.J. Leppert, **M.M. Moore**, C.H. Sieg. In press. A multi-trait test of the Leaf-Height-Seed plant strategy scheme with 133 species from a pine forest flora. *Functional Ecology*.
- Laughlin, D.C., S.C. Hart, J.P. Kaye, and **M.M. Moore**. In press. Evidence for indirect effects of plant diversity and composition on net nitrification. *Plant and Soil*.
- O'Hara, K.L., A. Youngblood, and **K.M. Waring**. In press. Maturity selection vs. improvement selection: lessons from a Mid-20th Century controversy in the silviculture of ponderosa pine. *Journal of Forestry*.
- Painter, M.L., **C.L. Chambers**, M.S. Siders, R.R. Doucett, and J.O. Whittaker, Jr. In press. Diet of spotted owls (*Euderma maculatum*) in Arizona as indicated by fecal analysis and stable isotopes. *Canadian Journal of Zoology*.
- Peppin, D.P., **P.Z. Fulé**, J.C. Lynn, A.L. Mottek-Lucas, and C.H. Sieg. In press. Market perceptions and opportunities for native plant production on the southern Colorado Plateau. *Restoration Ecology*.
- Roccaforte, J.P., **P.Z. Fulé**, and **W.W. Covington**. In press. Monitoring landscape-scale ponderosa pine restoration treatment implementation and effectiveness. *Restoration Ecology*.
- Sánchez Meador, A.J., **P.F. Parysow**, and **M.M. Moore**. In press. A new method for delineating tree patches and assessing spatial reference conditions of ponderosa pine forests in northern Arizona. *Restoration Ecology*.
- Sisk, T.D., C. Albano, E. Aumack, E.J. Bernstein, T.E. Crews, B.G. Dickson, S. Fluck, M. McMaster, A.S. Rogers, S.S. Rosenstock, D. Schlosberg, R. Sieg, and **A. Thode**. In press. Integrating restoration and conservation objectives at the landscape scale: the Kane and Two Mile Ranch project. Proceedings of the Biennial Conference on Research on the Colorado Plateau.
- Spalding, D., **A.J. Finkral**, and A.M. Evans. In press. Carbon market opportunities from managed ponderosa pine forests in northern Arizona. *Journal of Forestry*.
- Sullivan, B.W., S. Dore, **T.E. Kolb**, S.C. Hart, M.C. Montes-Helu. In press. A methods comparison for soil carbon dioxide efflux measurements across a gradient of forest disturbance. *Global Change Biology*.
- Sullivan, B.W., **T.E. Kolb**, S.C. Hart, J.P. Kaye, B.A. Hungate, S. Dore, M. Montes-Helu. In press. Wildfire reduces carbon dioxide efflux and increases methane oxidation in ponderosa pine forest soils of the southwestern USA. *Biogeochemistry*.

Villanueva Díaz, J., J. Cerano P., D.W. Stahle, M.D. Therrell, B.H. Luckman, M.K. Cleaveland, **P.Z. Fulé**. In Press. La dendrocronología y reconstrucciones paleoclimáticas en el norte-centro de México. Book chapter.

Yocom, L.L., **Fulé, P.Z.**, Brown, P.M., Cerano, J., Villanueva-Díaz, J., Falk, D.A., Cornejo-Oviedo, E. In press. El Niño-Southern Oscillation effect on a fire regime in northeastern Mexico has changed over time. *Ecology*.

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Beier, P., and B. Brost. 2010. Use of land facets in planning for climate change: conserving the arenas not the actors. *Conservation Biology* 24: DOI: 10.1111/j.1523-1739.2009.01422.x.

Beier, P., S.P.D Riley, and R.M. Sauvajot. 2010. Mountain lions. Pages 177-189 in Gehrt, S.D., S.P.D. Riley, and B.L. Cypher, (eds.), *Urban Carnivores: Ecology, Conflict, and Conservation*. Johns Hopkins University Press, Baltimore, Maryland.

Krauss, K.W., D.R. Cahoon, **J.A. Allen**, J.C. Lynch, N.C. Cormier and K.C. Ewel. 2010. Surface elevation change and susceptibility of different mangrove zones to sea-level rise on Pacific high islands of Micronesia. *Ecosystems*. DOI 10.1007/s10021-009-9307-8.

Mathiasen, R.L., and C.M. Daugherty. 2010. First report of limber pine dwarf mistletoe (*Arceuthobium cyanocarpum*) on sugar pine (*Pinus lambertiana*) from California. *Plant Disease* 94: 134.

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Beier, P. 2009. Cougars and conservation planning. Pages 177-189 in Hornocker, M. and S. Negri, (eds.), *Cougar Ecology and Conservation*. University of Chicago Press.

Beier, P., D.R. Majka, and S.L. Newell. 2009. Uncertainty analysis of least-cost modeling for designing wildlife linkages. *Ecological Applications* 19: 2067-2077.

Bell, D.M., **P.F. Parysow**, and **M.M. Moore**. 2009. Assessing the representativeness of the oldest permanent inventory plots in northern Arizona ponderosa pine forests. *Restoration Ecology* 17:369-377.

Boerner, R.E.J., J. Huang, and **S.C. Hart**. 2009. Impacts of fire and fire surrogate treatments on ecosystem nitrogen storage patterns: similarities and differences between forests of eastern and western North America. *Canadian Journal of Forest Research* 38: 3056-3070.

Cerano Paredes, J., J. Villanueva Díaz, **P.Z. Fulé**, J.G. Arreola Ávila, I. Sánchez Cohen, and R. D. Valdez Cepeda. 2009. Reconstrucción de 350 años de precipitación para el suroeste de Chihuahua, México. *Madera y Bosques* 15: 27-44.

Collins, B., J. Miller, **A. Thode**, M. Kelly, J. van Wagendonk and S. Stephens. 2009. Interactions among wildland fires in a long-established Sierra Nevada natural fire area. *Ecosystems* 12: 114-128.

Currie, W.S., M.E. Harmon, I.C. Burke, **S.C. Hart**, and W.L Silver. 2009. Cross-biome transplants of plant litter show decomposition models extend to a broader climatic range but lose

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- Harmon, M.E., W.L. Silver, B. Fasth, H. Chen, I.C. Burke, W.J. Parton, **S.C. Hart**, W.S. Currie, and LIDET. 2009. Long-term patterns of mass loss during the decomposition of leaf and fine root litter: an intersite comparison. *Global Change Biology* 15: 1320-1338.
- Hayes, C.J., **R.W. Hofstetter**, T.E. DeGomez, and **M.R. Wagner**. 2009. Effect of sunlight exposure and log size on pine engraver (*Coleoptera: Curculionidae*) reproduction in ponderosa pine slash in northern Arizona. *Agriculture and Forest Entomology* 11: 341-350.
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- Pope, T.L., W.M. Block, and **P. Beier**. 2009. Prescribed fire effects on wintering, bark-foraging birds in northern Arizona. *Journal of Wildlife Management* 73: 695-700.
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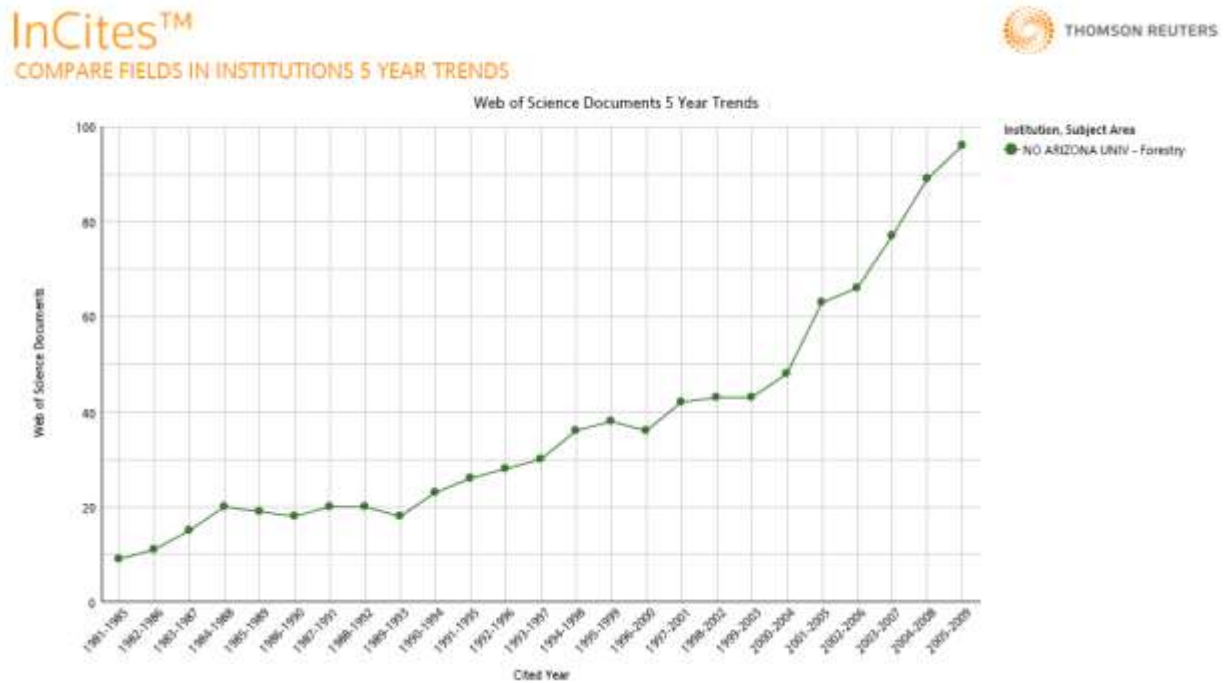
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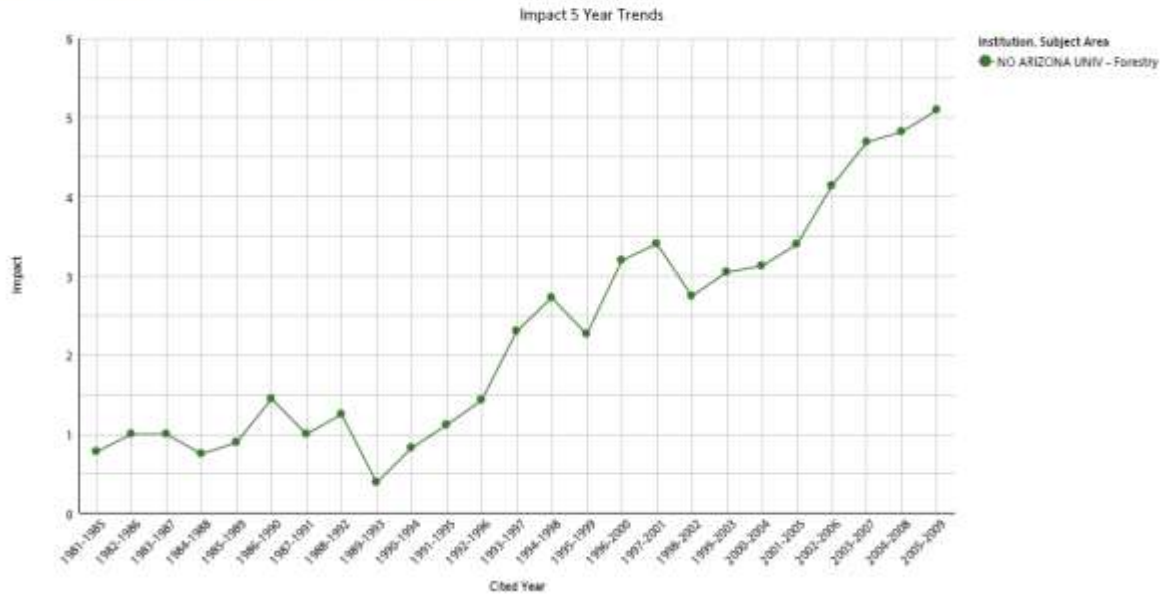
Appendix A7: Incites™ Reports on NAU Forestry Publications

Report 1: Trends in the number of NAU publications about forestry that appear in the ISI Web of Science database during overlapping five year periods from 1981 to 2009. This refers to the number of publications with publication dates that fall into each five year period. This report is based on a query of NAU's institutional data that is limited to items in the ISI Web of Science Forestry Subject Category, one of more than 250 specialized subject categories.



Report 2: Trends in the impact (cites per document) of NAU publications about forestry that appear in the ISI Web of Science database during overlapping five year periods from 1981 to 2009. This report is based on a query of NAU’s institutional data that is limited to items in the ISI Web of Science Forestry Subject Category, one of more than 250 specialized subject categories.

InCites™
COMPARE FIELDS IN INSTITUTIONS 5 YEAR TRENDS



Report 3: Comparison of ISI Web of Science publication and citation data among Western forestry schools over the past 10 years.

InCites™



COMPARE FIELDS IN INSTITUTIONS MOST RECENT 10 YEARS CUMULATIVE

Sort By:

Institution	Subject Area	Web of Science Documents View Graph	Times Cited View Graph	Cites per Document (Impact) View Graph	% Documents Cited View Graph	Impact Relative to Subject Area View Graph	Impact Relative to Institution View Graph	% Documents in Subject Area View Graph	% Documents in Institution View Graph	% Documents Cited Relative to Subject Area View Graph	% Documents Cited Relative to Institution View Graph
COLORADO STATE UNIV	Forestry	185	1,835	9.92	81.08	1.55	0.79	0.64	1.30	1.09	1.00
NO ARIZONA UNIV	Forestry	144	1,327	9.22	77.78	1.44	0.92	0.50	6.46	1.04	1.02
OREGON STATE UNIV	Forestry	877	8,312	9.48	76.85	1.48	0.80	3.02	6.68	1.03	0.95
UNIV ALASKA FAIRBANKS	Forestry	65	710	10.92	90.77	1.70	0.96	0.22	1.53	1.22	1.12
UNIV IDAHO	Forestry	187	1,246	6.66	78.61	1.04	0.73	0.64	4.03	1.05	1.02
UNIV MONTANA	Forestry	149	1,184	7.95	79.19	1.24	0.65	0.51	4.89	1.06	1.01
UNIV WASHINGTON	Forestry	234	2,354	10.06	78.63	1.57	0.49	0.81	0.43	1.05	0.93
UTAH STATE UNIV	Forestry	89	683	7.67	77.53	1.20	0.83	0.31	1.69	1.04	1.01

Appendix A8: Cline Library Support for the School of Forestry Graduate Program, October 2010

The mission of the Cline Library is to support the curricular, research and community service goals of Northern Arizona University and its constituents. A central learning resource, the Cline Library offers services, instruction and timely access to information resources and collections that strive to:

1. Prepare and develop students in our undergraduate, residential setting;
2. Meet the requirements of graduate programs that support the specialized interests of Arizona and the Colorado Plateau;
3. Reflect an educational environment that is culturally and socially diverse and global in perspective;
4. Support students and staff in thinking critically, acting cooperatively, and expressing creativity;
5. Serve individuals outside the residential setting who are seeking educational opportunities and enable distance learners to participate fully in the educational process;
6. Address the economic and social needs of the state through public service; and
7. Encourage continuous library staff development in pursuit of a highly-trained work force committed to the academic life of the University.

Facilities and Services

The Cline Library is a cornerstone of academic life at Northern Arizona University, committed to providing a physical environment for intellectual discovery, collaborative research projects, and computing. The library is dedicated to providing a 24/7 online learning environment that is equally rich, offering fully accessible e-books and e-journals, as well as services. The library's online resources and services support the University's undergraduate and graduate students, faculty and staff regardless of location. The library strives to respond effectively and creatively to institutional and college initiatives, and to the rapidly changing expectations of students and faculty.

To assist students, faculty, and staff in their academic endeavors, library holdings include more than 1,300,000 volumes, including over 623,000 books; 281,000 government documents; 41,000 maps; 379,000 microforms; 20,000 sound recordings; 16,000 videos, films and other non-print media; and 152,000 bound periodical volumes. Access is provided to over 62,000 e-books as well. These materials are represented in the library's online catalog.

The Cline Library licenses over 175 databases to support the study and research needs of the University community, which currently enjoys access to the articles found in over 53,000 e-journals and newspapers. Upon request, the library's document delivery service borrows and

delivers materials that are not available in the print or electronic collections; this service is free to University students, faculty and staff.

The library building is centrally located on the Northern Arizona University campus and has open stacks. For the Fall 2010 semester, the library building is open 108.5 hours per week, including a 2 a.m. closing five nights per week. Aside from students, faculty and staff, the library is also open to the public, and provides community users with access to guest computers.

Wireless access throughout the building allows all users to bring their own computers for research or study. The library is the largest computing lab on campus. It provides 180 networked computers; in addition, students can check out a PC or Macintosh computer from among the library's 60 lending laptops. The library also has a variety of group and individual study rooms available for student checkout, some equipped with computers, whiteboards or large wall panel displays.

In the Media Services area, two self-service multimedia production studios can be used for almost any kind of multimedia need, from podcasting to video and audio editing to 3D animation. The library also has two student multimedia production stations; each features a scanner and audio/video production and editing software. Media Services also houses the assistive technology equipment in the library, which serves the needs of University and community users.

Significant photographs, manuscripts, oral histories, and motion picture footage documenting the natural and cultural features of Northern Arizona and the Colorado Plateau are some of the sources that comprise the Cline Library's Colorado Plateau Archives of digital materials and are housed in the Cline Library's Special Collections and Archives. The physical archives are home to eight million unique items. The digital archives, which hosts over 75,000 items, has over two million site visits each year.

The Cline Library's website (nau.edu/library) is available both via a standard interface and also a web interface for mobile users, and we plan to expand our offerings for mobile learners. The website includes "Library 2 U" videos (nau.edu/library/videos), which were produced by student employees of the library and provide short introductions to the library building and key library resources and services.

The Cline Library's 400-seat Assembly Hall often serves as the location for programming of interest to Forestry students. For example, the library has partnered for many years with the Grand Canyon Association to provide the free "Canyon Country Community Lecture Series." The hall is a popular location for other free films and film series, lectures and events.

Support for Northern Arizona University Courses and Programs

As teaching and learning methods have evolved, so has the library's approach to proactively providing resources and services in support of courses and programs. Staff across the library

partner with faculty in all disciplines to design, deliver, assess and continuously improve an active, 24/7 learning environment that allows students to be self-directed and successfully achieve an instructor's stated student learning outcomes.

The library's resource specialists collaborate with faculty to:

- Identify relevant resources that support course or programmatic objectives
- Integrate library resources and services directly into courses, especially Blackboard Vista course shells and other Web 2.0 tools
- Design effective research assignments that match library resources, services and activities to specific learning outcomes in a course and make the research experience more productive and successful for students
- Provide content or instruction, either in-person or virtually, on the development of information-seeking skills that address specific course or program needs, and the effective and appropriate use of information across formats
- Design or redesign curriculum at the course or program level

As textbook costs continue to rise, the library is working with the growing number of faculty opting to provide electronic reserves materials instead of requiring their students to purchase expensive textbooks. The library delivers electronic reserves, which can include articles, e-books, and other resources, via Blackboard Vista course shells. Faculty members fill out an online course reserve form; from there the library makes the resources available quickly and takes care of copyright compliance. For the 2010 fiscal year, over 1,800 items were digitized for electronic reserves.

Faculty can also collaborate with Special Collections and Archives to identify primary materials to integrate into a course. If an item in the archives is not already in the Colorado Plateau Archives, the library will digitize it upon request.

The Cline Library is committed to helping students develop the research skills they need to become proficient scholars, and to supporting the diverse research needs of faculty. The library provides "Ask a Librarian" assistance in person, and via chat, e-mail or phone. Students and faculty can contact the library's resource specialists directly for focused, in-depth research help, including assistance with advanced search strategies and the use of highly specialized databases. Resource specialists also provide guidance in the use of RefWorks, an online bibliographic citation management tool available to all University-affiliated users; resource specialist Kristen Bullard has partnered with graduate students and faculty on advanced applications of RefWorks, including identifying import filters for Web of Science and Forest Science Database.

Course Support for the School of Forestry Graduate Program

Most of the library's interactions with students in the School of Forestry Graduate Program have been through the provision of assistance at the Library's front desk, through one-on-one research consultations, and through instruction sessions for FOR 690, *Research Methods*. Many students in FOR 590, *Forest Recreation Development*, request research consultations for assistance with literature searches for their masters and doctoral research. Research topics vary from evolutionary biology to public land use management to fire ecology. Resource specialists have a long history of course support for 690, which now includes library content in the course's Vista shell, instruction sessions on database searching, training on RefWorks, and student consultations.

Forestry was an early adopter of Web of Science, and resource specialists provided instruction on the database to Dr. Pete Fulé's Graduate Research Group and the Ecological Restoration Institute. Aside from assisting faculty with identifying resources and making them available to students, resource specialists also assist faculty in complex searching, including finding materials for which they may only have partial citations. The resource specialists would like to collaborate with Forestry faculty to explore opportunities to increase the integration of media or other library resources and services into classes.

Research Resources for the Forestry Program

The library's resource specialists work with Forestry faculty to ensure that core and emerging subjects and teaching or research methods are adequately covered in the virtual and physical library collections. Where possible, the library focuses on electronic content that is available to all users 24/7, including e-books, e-journals, streaming media, full-text databases and more. Due to the cross-disciplinary nature of forestry research, specific library materials for Forestry are supplemented by materials in biological sciences, physical sciences, geography, political science and many other subject areas. The depth and breadth in the collection of materials relating to Forestry, in combination with the Library's emphasis on collecting materials relating to the Colorado Plateau, has made the materials in the areas of the Library supporting Forestry a particularly strong segment of the Library's collection.

Because of the way information providers bundle content in databases, it is not possible to separate out the specific costs of databases or periodicals supporting Forestry research and curricula. Key databases include:

Forest Science Database	BioOne
Biological Sciences	Environmental Sciences & Pollution
Plant Science	Management
Web of Science	ScienceDirect
GeoRef	JSTOR

The library's subscription to Films on Demand, a source for streaming media, provides access to thousands of streaming media titles. At present Films on Demand provides 327 Environmental Sciences and 850 Biology titles. The library offers services for the digitization and delivery of

streaming media for class use. Streaming media is one of our fast-growing and well-received new services; last year the library made over 1,300 streaming films available for course support. In addition, the library's media collection includes an extensive collection of DVDs and videocassettes directly related to the Forestry program.

Forestry has been a consistent user of the library's electronic reserves services. The Reserves staff has worked with Forestry faculty to deliver readings and streaming media electronically, and has assisted them with integrating electronic reserves into their Vista courses.

Users may also find Special Collections and Archives materials relevant to Forestry work. For example, the archives include the Arizona Lumber & Timber Company Collection (manuscripts), the Coconino National Forest Collection (photographs) and the African American Pioneers Collection (oral histories). The online "Fire on the Plateau" exhibit has been integrated into a number of courses.

The Cline Library is a selective federal depository library with a selection rate of approximately 60% dating back to 1937, providing unique and primary source materials for research in topics pertinent to forestry research. The U.S. Documents collection has extensive holdings in materials from the Bureau of Land Management, the United States Department of Agriculture, the Rocky Mountain Forest and Range Experiment Station and other pertinent federal and state agencies. The Cline Library also collects Arizona State publications.

Cline Library has struggled to manage a cumulative \$1 million dollar reduction in its capital/acquisition budget since FY2001. Unfortunately, these budget challenges do not allow the library to allocate amounts to departments for monograph purchases. Instead, the library's limited monograph purchases are focused on items that address specified course needs, and a select number of purchases based on user-driven demand. These include *Conifers of the World: The Complete Reference* (2009) by James Eckenwalder, *Living Through the End of Nature* (2010) by Paul Wapner, and *Critical Transitions in Nature and Society* (2009) by Marten Scheffer.

The library has invested substantially in document delivery services staffing, tools and partnerships in order to effectively borrow or buy content on demand when the University's access to licensed and purchased content fails to meet expressed student and faculty user needs. For the 2010 fiscal year, the library filled 46,788 requests from university users for books and articles. The library is one of 200 participants in the RAPID ILL resource sharing consortium, whose members provide scanned materials directly to users in an average 24-hour turnaround time.

In recent years, the library has focused on increasing the University's investment in subscription e-content (and leveraged funds for licensed e-content through consortium arrangements) for a net gain in quantity and quality of information available to the University community. The library aggressively negotiates with vendor partners to limit cost increases while balancing user needs.

Faculty and others across the University community collaborate with the library to critically evaluate resources of all types, ensuring that funds are focused on resources that closely align with curricular and scholarly needs and honor University priorities. Many of our resource selection decisions are additionally informed by usage metrics, such as cost per use for e-journals and circulation records for print items. The library's acquisitions budget continues to be a high priority for the University and as funding allows, library staff will work with faculty and students to improve the collection areas where the library has fallen behind. The library welcomes opportunities to hear more from faculty and students about how we are meeting their needs.

For more information about the Cline Library's facilities, resources, and services, please see the library's website at nau.edu/library.

**Appendix A9:
School of Forestry Strategic Plan**

February 2006

NORTHERN ARIZONA UNIVERSITY

School of Forestry

Strategic Plan

A Working Document for 2005-2010

EXECUTIVE SUMMARY

The School of Forestry's strategic plan is designed to support the Northern Arizona University Strategic Plan for 2005-2010. Our goals are organized under the seven goals stated in that plan. Implementation of our plan will require an expansion of our budget to hire more faculty and staff, and to build and equip more classrooms, offices, and research facilities.

GOALS

1. Provide undergraduate educational excellence in a residential learning community.
 - Be the leading undergraduate forestry education school in North America.
 - Continue to provide excellent academic advising for undergraduate students by making our Student Service Coordinator a full-time permanent position funded via a state budget line.

2. Strengthen graduate and professional education, economic development, and research
 - Be the leading academic research organization on forests in the southwestern U.S. and the leading forestry research program in North America in the areas of forest health, ecological restoration, and ecosystem science and management.
 - Strengthen graduate and research programs in forest management, economics, social science, and forest products industry development.
 - Develop a masters degree with emphasis on international forestry and environmental studies in collaboration with the School for Field Studies.
 - Increase funded teaching opportunities for graduate students.
 - Remove constraints that currently limit recruitment of the most qualified graduate students; work with the University and ABOR to institutionalize the waiver of all tuition for graduate students with research and teaching assistantships.
 - Increase the number of faculty with expertise in Fire Science, and develop new educational and research programs in Fire Science/Ecology.
 - Increase the number of offices, classrooms, and research labs available to our programs in the Southwest Forest Science Complex.

3. Increase enrollment and retention
 - Increase the number of students applying for and graduating from our undergraduate and graduate degree programs, and increase the number of faculty and classrooms to accommodate more students.
 - Continue to provide excellent academic advising for undergraduate students by making our Student Service Coordinator a full-time permanent position funded via a state budget line.
 - Expand forestry educational opportunities for non-traditional students and forestry professionals through distance learning courses and workshops.
 - Develop a masters degree with emphasis on international forestry and environmental studies in collaboration with the School for Field Studies

4. Provide leadership in the development, use, and assessment of technologies in administrative systems and educational programs
 - Expand forestry educational opportunities for non-traditional students, forestry professionals, and tribal resource managers through distance learning courses and workshops.
 - Develop distance and continuing educational programs in Fire Science/Ecology.

5. Foster a culture of diversity, community, and citizenship
 - Develop programs in ethnic and cultural diversity in Forestry to include Native Americans, Hispanics, other US minorities, and international students.
 - Increase numbers of international students and faculty in our education and research programs.

6. Become the nation's leading university serving Native Americans
 - Develop consistent funding for the Native American Forestry Program.
 - Increase recruitment of Native American students by strengthening links to key two-year institutions that serve Native Americans.

7. Ensure financial stability and growth
 - Increase funding for education and research programs.
 - Fully staff the Centennial Forest, and develop funding to implement the Centennial Forest Master Plan.
 - Create an effective external advisory board and enhance ties to alumni.

ACKNOWLEDGMENT

The School of Forestry acknowledges both the many hours of effort spent and the careful thought of the Strategic Planning Committee in preparing the Plan. In 2003-4, members of the committee were:

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Table of Contents

EXECUTIVE SUMMARY	ii
ACKNOWLEDGMENT	iv
SETTING	7
National/Professional.....	7
State/Regional.....	7
The University	8
HISTORY OF THE SCHOOL	8
MISSION	9
SCHOOL GOALS AND STRENGTHS	9
Goals.....	9
Strengths.....	11
UNDERGRADUATE EDUCATION - PROFESSIONAL FORESTRY DEGREE	20
Current status.....	20
Connections	23
The Future.....	24
UNDERGRADUATE EDUCATION - ENVIRONMENTAL MGT PROGRAM	24
Current Status	24
Connections	25
The Future.....	25
GRADUATE EDUCATION	25
Current Status	25
Master of Forestry	26
Master of Science in Forestry	26
Doctor of Philosophy in Forestry.....	26
Connections	26
The Future/2004 Review	27
RESEARCH	30

Directions	30
Bureau of Forestry.....	31
Connections	32
The Future.....	32
SERVICE	33
NAU CENTENNIAL FOREST.....	34
Vision.....	34
Field Campus.....	34
Connections.....	38
PLAN IMPLEMENTATION AND MONITORING.....	39
Implementation.....	39
Monitoring	40
STAFFING NEEDS	40
INFRASTRUCTURE NEEDS.....	41

SCHOOL OF FORESTRY
2005-2010 STRATEGIC PLAN

SETTING

National/Professional

The School of Forestry at Northern Arizona University is one of 47 accredited professional forestry programs in the United States. The forestry profession, as is the case for all natural resources-related professions, is undergoing significant change. The previous focus on management for the production of wood products has been replaced by a management strategy that includes a broader range of goods and services and ecosystem health. Most recently, the concept of multiresource management has been replaced by the concept of ecosystem management, an ecological approach that blends the needs of people and environmental values to sustain our nation's forested ecosystems. Since 1971, NAU has been the national leader in interdisciplinary, systems-oriented, forestry education (Schultz and Thompson, 1971)⁴.

These changes are occurring at a time when the management of our nation's natural resources is a highly controversial and deeply polarizing subject. Issues such as the management and conservation of endangered species, the definition and conservation of old growth, and the role of professionals in defining and implementing the public interest are controversial, and oftentimes contradictory. In addition, large-scale wildfires and their connection to declining forest health and property losses in the wildland-urban interface have drawn attention to needs for fuels reduction and ecosystem restoration activities. All of these issues are becoming increasingly urgent, in a time of political and economic change. This is the setting for forestry education in the 21st century. Many other forestry schools and programs are also debating their future directions (Society of American Foresters 1992)².

State/Region

The School of Forestry is the only accredited forestry program in the Southwest (Arizona, New Mexico, and Nevada and the southern halves of California, Utah, and Colorado). Northern Arizona University is also geographically well suited for forestry education. The University is located in the midst of the world's largest continuous ponderosa pine ecosystem. In addition, nowhere else in the United States do forestry students have convenient access to a wider variety of climatic and vegetation zones than in northern Arizona.

Given the uniqueness of the teaching philosophy, the location of the mountain campus, and the importance that society places on the environment, Northern Arizona University is in an extraordinary position to be the leading forestry academic institution in the West, if not the entire nation.

¹Schultz, A.J. and Thompson, W.P. 1971. A new era in environmental education. American Forests.

²Anon. 1992. Forest Resource Management in the 21st Century: Will Forestry Education Meet the Challenge? Oct. 30-Nov. 2, 1991 Symposium. Denver, CO. Society of American Foresters.

The University

The School of Forestry is a free-standing unit in the Consortium of Professional Schools, a newly created college-level unit following campus-wide restructuring by the President in 2004.

HISTORY OF THE SCHOOL

The forestry degree program at Northern Arizona University was initiated in 1958 as a Department of Forestry dedicated to the training of professional foresters at the Bachelor of Science level. Its existence as a department and later as a professional School supported the re-charter of Arizona State College to Northern Arizona University in 1966. In 1972, under the leadership of Dean Charles O. Minor, an important and distinguishing change was made within the program. The faculty initiated resource integration in three intensive semesters; A, B, and C. In these three semesters, of the junior and senior year, students are taught the concepts of ecosystem management. A program in Native American Forestry was added in 1989, and the Park and Recreation Management major joined the School in 1992. A Master of Science degree was initiated in 1969 and the Doctor of Philosophy was added in 1994. A separate and distinct Department of Geography and Planning joined the School in 1992, which led to the creation of a College of Ecosystem Science and Management in 1996. A major effort in curriculum assessment began in February 1998 culminated with a final report describing substantive changes in our undergraduate curriculum approved by the faculty in October 2000. The major curriculum changes included a reduction in credit hours in the integrated professional program matched by the addition of a required focus area, and Semester C was split evenly into two semesters delivered during the fall (Semester C) and spring (Semester D) of the senior year.

The College of Ecosystem Science and Management was dissolved July 1, 2003. The School of Forestry was a stand alone unit within the University, and administered by a Dean and Associate Dean from July 2003 through June 2004 when it became a free standing unit in the Consortium of Professional Schools and Colleges (later to become the Consortium of Professional Schools) following University-wide restructuring efforts where it is now administered by the Executive Director of the School.

The non-thesis option in the Master of Science degree in Forestry was changed to a Master of Forestry in 2004. The Master of Forestry does not include original scholarly research using data collected by the student as a requirement, and is intended for growing numbers of post-Baccalaureate students who desire advanced training in forestry, but do not want, or may not qualify for, a research-based program such as the Master of Science in Forestry currently offered at NAU. Candidates for the Master of Forestry degree include agency professionals who desire advanced training, and students with backgrounds in general environmental science or environmental studies who are interested in focusing on forestry.

MISSION

The fundamental educational mission of the School of Forestry is to foster the intellectual and personal development of our students, at both the undergraduate and graduate levels. We intend that our students be, first of all, liberally educated, secondly, good citizens, and finally, skilled professionals, and life-long learners, with training in an integrated approach to forest ecosystem management.

The School of Forestry educates students in ecosystem science and management by integrating instruction in biophysical and human systems. In Forestry, we cross traditional boundaries by applying transdisciplinary and multiobjective approaches to ecosystem studies.

Our scholarship mission features this integrative approach to advance knowledge in ecosystem science and management, to bring this new knowledge back to the classroom, and transfer it to the citizens of Arizona, the Southwest, and elsewhere. Our programs leading to the Master of Forestry, Master of Science in Forestry and Doctor of Philosophy in Forestry play a special role in carrying out our scholarship objectives.

Our mission includes the development of educational and research activities which bring views from a variety of cultures to the classroom and to the management of forest ecosystems.

SCHOOL GOALS AND STRENGTHS

Goals

1. Provide undergraduate educational excellence in a residential learning community.
 - Be the leading undergraduate forestry education school in North America.
 - Continue to provide excellent academic advising for undergraduate students by making our Student Service Coordinator a full-time permanent position funded via a state budget line.

2. Strengthen graduate and professional education, economic development, and research
 - Be the leading academic research organization on forests in the southwestern U.S. and the leading forestry research program in North America in the areas of forest health, ecological restoration, and ecosystem science and management.
 - Strengthen graduate and research programs in forest management, economics, social science, and forest products industry development.

- Develop a masters degree with emphasis on international forestry and environmental studies in collaboration with the School for Field Studies.
 - Increase funded teaching opportunities for graduate students.
 - Remove constraints that currently limit recruitment of the most qualified graduate students; work with the University and ABOR to institutionalize the waiver of all tuition for graduate students with research and teaching assistantships.
 - Increase the number of faculty with expertise in Fire Science, and develop new educational and research programs in Fire Science.
 - Increase the number of offices, classrooms, and research labs available to our programs in the Southwest Forest Science Complex.
3. Increase enrollment and retention
- Increase the number of students applying for our undergraduate and graduate degree programs, and increase the number of faculty and classrooms to accommodate more students.
 - Continue to provide excellent academic advising for undergraduate students by making our Student Service Coordinator a full-time permanent position funded via a state budget line.
 - Provide strong mentoring and advising to minority students.
 - Expand forestry educational opportunities for non-traditional students and forestry professionals through distance learning courses and workshops.
 - Develop a masters degree with emphasis on international forestry and environmental studies in collaboration with the School for Field Studies
4. Provide leadership in the development, use, and assessment of technologies in administrative systems and educational programs
- Expand forestry educational opportunities for non-traditional students and forestry professionals through distance learning courses and workshops.
 - Develop distance and continuing educational programs in Fire Science.
5. Foster a culture of diversity, community, and citizenship
- Develop successful programs in ethnic and cultural diversity in Forestry to include Native Americans, Hispanics, other US minorities, and international students.
 - Increase numbers of international students and faculty in our education and research programs.
6. Help NAU become the nation's leading university serving Native Americans
- Develop consistent funding for the Native American Forestry Program.
 - Increase recruitment of Native American students by strengthening links to key two-year institutions that serve Native Americans.
 - Increase retention and graduation of Native American students.
7. Ensure financial stability and growth
- Increase funding for education and research programs

- Fully staff the Centennial Forest, and develop funding to implement the Centennial Forest Master Plan.
- Create an effective external advisory board and enhance ties to alumni.

Strengths

Through the years the School of Forestry has developed areas for which it has national recognition. These are generally areas that the School has deliberately chosen to focus its attention on and/or has concentrated resources and faculty expertise. We want, however, to emphasize that the School is a richly diverse academic unit with faculty working on a wide range of subjects and problem areas. While many of these are also unique and have strength in their own right, they simply are not large enough to be listed as a strength. Their lack of inclusion as a School strength should in no way diminish their importance to the School's overall program and reputation. We list and describe five areas of strength.

1. Ecological Restoration

Ecological restoration is an interdisciplinary conservation discipline, involving not only biology, but also sociology, economics, and policy. Ecological restoration is founded upon fundamental ecological and conservation principles and involves research and management actions designed to restore degraded wildlands. The School of Forestry is already recognized nationally as a leader in ecological restoration as evidenced by reviews in the Society for Ecological Restoration newsletter, and grant awards from National Science Foundation, the Department of Interior, and the USDA Forest Service. Graduate student applications in the general area of ecological restoration are steadily increasing, and undergraduates have expressed a great deal of interest in the field. An ecological restoration focus area was added to the BSF degree program in the 2000 curriculum revision.

An Ecological Restoration Institute (ERI) was formed by faculty of the School of Forestry in 2000. ERI is currently a free-standing Institute of the University that integrates practical, interdisciplinary research, service and education with full involvement of practitioners and the public to support ecological restoration. The ERI works cooperatively across colleges, with other universities, and with other organizations to assure that ecological restoration work is based on the best available knowledge and conducted in such a way that we continue to learn as we conduct restoration treatments.

Because ecological restoration deals not only with restoring degraded ecosystems but also with developing mutually beneficial human - wildland interactions, it is fundamental to ecosystem management and sustainable resource development. Ecological restoration will continue to grow in importance in the conservation professions.

2. Forest Ecosystem Health

Ecosystem health is currently a goal of forest ecosystem management on most public and some private lands. Defining forest ecosystem health is difficult and depends on human perspective and spatial scale. Common components of the definitions include ecosystem resilience, recurrence, persistence, and sustainability, and the production of forest conditions which directly satisfy human needs. The use of forest health as a management objective depends on defining healthy ecosystem conditions, the development of measurement indicators of those conditions, the implementation of monitoring programs, and the integration of forest ecosystem health criteria and monitoring data into forest management planning.

The NAU School of Forestry is a leader in national discussions on defining healthy ecosystem conditions. Forest health concepts are an increasingly important part of the School's curriculum at both the undergraduate and graduate levels. The School also has research and teaching expertise in many basic elements of forest ecosystem health including: wildlife behavior and habitat, soil productivity, nutrient cycling, hydrology and watershed management, tree physiology, abiotic environmental stress, vegetation dynamics, biodiversity, conservation biology, ecological restoration, and forest insects and diseases. Many faculty are currently involved in forest health-related research, including several major multi-disciplinary studies funded by external grants. Active research programs that are part of this focus include: insect plant interactions, plant genetic resistance to insects, biology and ecology of insects, insects as agents of ecosystem restoration, silvicultural management of tree resistance to insects, environmental remediation, quantification of pre-settlement forest structure and composition, and effects of ecological restoration treatments on forest ecosystems. Because of the comprehensive nature of forest health, this focus includes research activities which range from local to international in scope. Focus areas in conservation biology and forest health were added to the BSF degree program in the 2000 curriculum revision in response to student interest in the area of forest health.

3. Ecosystem Management Planning Systems

The development of ecosystem management planning systems entails creating tools and processes to help decision-makers incorporate data, knowledge, and information into the development and implementation of sustainable resource management plans. The tools can include research results, databases, surveys, guidebooks, working papers, field trials, demonstration projects, computer models, and software. The processes can include workshops, collaborative planning projects, conferences, seminars, and short courses. The objective of these tools and processes is to help decision makers integrate the available information and knowledge, and to apply it in a sophisticated and comprehensive fashion to the problems at hand. The hope is that these tools and processes will lead to better decisions, better management, and better understanding of wildland ecosystems.

A particular historical strength with the School has been in the development and application of computer models which identify alternate management paths aimed at achieving targeted ecosystem conditions, functions, and production goals. Alternatively the models may be employed to project the consequences of specified management regimes on future ecosystem characteristics and resource flows. These models are specifically designed to be used as decision-support tools which enable managers to investigate the limits and potentials of wildland ecosystems and to resolve tradeoffs among conflicting goals. Once decisions have been made, some models can identify optimal spatial and temporal schedules of management activities. The primary scientific approaches include operations research, GIS analyses, simulation models, and the design of software, user interfaces, and reporting procedures that facilitate use of the systems by managers.

The School has been a leader in planning system development for the past decade. TEAMS (our name for a family of planning systems developed by the School) was the first major advance in ecosystem management planning technology since FORPLAN. TEAMS was unique in being the only post-FORPLAN model to have been actually used in integrated multiresource forest planning. Different hierarchical versions of the system have been developed and employed in forest-wide planning efforts by the Navajo and Menominee Indian Nations. The Menominee ecological allocation model, which incorporates major advances in planning technology, is currently being employed by the Menominee in strategic and tactical planning. Their adoption of the model is particularly noteworthy because of the prestige enjoyed by the Menominee forestry organization both in Indian Country and the profession at large. TEAMS was used for a number of years as the primary instructional and analytical tool in the senior-level capstone experience and was central to the thesis and dissertation research of several graduate students. Our involvement in real planning efforts has enabled us not only to provide students with state-of-the-art models but also to make planning exercises more realistic. The School has remained on the forefront of planning system development and is now using LURCH (developed by a faculty member) as the ecosystem management and planning tool for the Senior capstone course. LURCH enables students to more easily incorporate the Montreal Process in the development of their capstone management plans.

4. Integrated Undergraduate Instruction

In the School of Forestry's professional program, undergraduate students take four sequential semesters (38 units total) of integrated, immersion, and team-taught instruction. Students learn to understand forest ecosystems in the fall semester of their junior year, the emphasis shifts to management practices and human values of wildlands in the spring semester. In the capstone course of the senior year, students collect resource data on a large forest area, use a computer-aided decision support system to develop a management plan for that land, and write a report that comprehensively describes and analyzes how various management alternatives can meet multiple and often conflicting goals. Throughout these 38 units, the instruction integrates across disciplines and across resources. In addition to these 38 units, a 12-credit interdisciplinary focus area is required of every student. The focus areas allow students to gain depth in a particular area of interdisciplinary interest. These focus areas are: conservation biology, restoration ecology, forest health, indigenous forestry, international forestry, forestry in the wildland-urban interface, and an individualized plan option.

Our integrated undergraduate teaching insures that our forestry professionals are trained as managers of wildlands, not as producers of narrowly defined commodities. NAU's Forestry Program not only pioneered this approach but is widely recognized as a leader in interdisciplinary teaching. In November 1995, the High Country News special issue on "Seeing the forest and the trees" praised NAU's Forestry program "not only because it has plotted the cleanest straightest path toward a new kind of forestry, but also because for years it has encouraged the interdisciplinary thinking needed for scientists to solve real problems." The faculty renewed their commitment to our teaching model in the curriculum revision of 2000 and the latest accreditation report by the SAF in 2004 recognizes the value, importance, and uniqueness of this approach.

5. Ethnic and Cultural Diversity Program (ECDP) in Forestry

Mission: The mission of the ECDP is to make the SOF the leading academic program for providing multicultural education, research and service in forestry and related disciplines in the United States. To promote and realize this mission, the SOF will extensively recruit, retain and graduate U.S. minority and international students, conduct relevant research and provide service to minority and underserved communities in which students actively participate and become key players. The research and service activities are designed to complement and strengthen the students' academic and professional skills and assist them to develop most appropriate forest resources management skills for use in their communities or anywhere else. The ECDP also strives to provide students of color with academic, social, cultural, emotional and personal support both at the individual and group levels to help them succeed in their study programs and career opportunities. Hence, the overall mission of the ECDP is to help make the SOF become as diverse as Arizona and the Southwest's population, and to increase its international student body and research activities significantly.

Structure: The ECDP consists of four specific programs: (1) Native American Forestry Program (NAFP), (2) International Forestry Program (IFP), (3) Hispanic Forestry Program (HFP) and (4) Other Minorities Forestry Program (OMFP) each with its own faculty coordinator. The ECDP director will serve as the coordinator for the OMFP and related research and service activities. The specific programs coordinators or individuals representing each Specific program, the ECDP director and two members selected at large from NAU faculty, administrators or staff will constitute as the ECDP Executive Committee (EEC) to guide the activities of the ECDP.

Up to a couple of years ago, the Native American Forestry Program, established in 1989, was the most prominent formal effort towards enhancing ethnic and cultural diversity in the School of Forestry. The ECDP is designed to expand the School of Forestry's efforts to serve the fast growing population of color in Arizona and the Southwest while continuing its original plan to serve Native Americans with more vigor. To help in the process, the School of Forestry has developed an articulation agreement in 2005 with Southwest Indian Polytechnic Institute (SIPI) in Albuquerque, New Mexico to allow SIPI students to transfer into the Forestry program at the sophomore or junior levels.

Goals: By approving the ECDP, the School of Forestry commits to support the ECDP and its activities to make forestry education and research accessible to the fast growing peoples of color in Arizona and the Southwest. This will be done, among others, by creating a better atmosphere for social and cultural understanding and growth through determined diversification of the curriculum, the student body, faculty, administration and support staff to provide students with mentors and role models that they can easily identify, connect, understand and communicate with.

The ECDP is organized to handle the SOF's commitments to diversify its academic, research and service programs. The ECDP will consist of the four specific programs: NAFF, IFP, HFP and OMFP each with its own specific objectives and goals, which are consistent with those of the ECDP. The specific objectives of the ECDP are to:

- A. Increase the number of all students of color and international students in the SOF. The goal is to make the number of students of color proportional to the total percentage of all minority groups in the State population while significantly raising the number of international students in the SOF. In particular, due to NAU's location in the middle of the largest concentration of Native American populations in the United States, the objective of the ECDP in as far as Native American students are concerned is to be the number one public school of forestry in the nation that provides specifically tailored educational and research services to Native Americans.
- B. Increase enrollment of students of color by focusing on recruitment of highly talented Native American, Hispanic, African American, Asian American, and other underserved and international students. This would help to diversify the SOF, NAU and the forestry profession as well as develop needed manpower to improve the quality of life of minority communities while also enabling them to have the control and decision-making ability and power over their resources.
- C. Further, develop the School's Indigenous Forestry Focus and International Forestry Focus areas. This will consist of expanding and further development of these two focus areas and other relevant curriculum in the SOF and collaborating with related programs like Ethnic Studies, Southwestern U.S. Studies and the Department of Applied Indigenous Study (AIS) around campus. This also involves recognition and increased awareness of differences in cultural values, traditions and view of traditional and contemporary issues that affect students of color and international students in the SOF and NAU.
- D. Develop new curricular and research programs that directly cater to the needs of forest-based Hispanic communities in the Southwest. This and the International Forestry Focus area will have special relevance to students from Mexico and other Latin American countries that have related background with those of Hispanic communities in the U.S.A. The ECDP will recruit Hispanic students directly from high schools and through 2+2 articulation with colleges and other institutions. It will also significantly increase the presence of international students in the SOF by sending recruitment materials and developing joint agreements with higher educational institutions in other countries.
- E. Recruit and retain a diverse faculty and avail training opportunities for non-minority faculty, staff and students to create a welcoming atmosphere at the SOF. Mentoring and advising services tailored to meet specific student needs will be developed in support of this goal.

- F. Establish an ECDP development fund to provide resources for increased accessibility of the forestry graduate program to minority and international graduate students. This development would be coupled with a well-designed recruitment, retention and graduation plan and other support mechanisms. The program will seek funding from various sources to help minority and other disadvantaged students pursue forestry and related graduate study programs.

Program functions and tasks: The functions of the ECDP are more than recruitment and retention of students of color. They also include engaging the students in relevant research projects and in services to minority communities and organizations to help promote personal and social progress, economic self-sufficiency and political self-determination. In addition, the ECDP will also collaborate with other School and University programs to make the campus climate more comfortable and fun for all students, faculty and staff. The ECDP will perform various tasks to achieve the above objectives. The most important tasks are described as follows:

- A. The ECDP is an academic support service that will provide advocacy and resource referral services to students of color and international forestry students and obtain funds through grant writing, and cooperative arrangements with Native American tribes, Hispanic and other minority communities and private and government sources of funding.
- B. Develop curricular and other educational programs such as teaching courses relevant to minority populations, and organizing specialized annual workshops summer short courses, small and large symposia and other meetings to bring together students, teachers, administrators and other scholars on minority issues. The meetings also would bring Native American, African American, and Asian American and Hispanic leaders to talk about and find solutions to timely problems affecting minority education and scholarship. Such activity would include a train-the-trainer program, and student and faculty exchanges with institutions serving peoples of color and other disadvantaged and underserved groups elsewhere. The ECDP will also develop a lectureship program to enhance university and local community awareness of minority issues and to inform faculty, staff and students how they can become involved to promote diversity in the SOF and at the University levels.
- C. Develop a collaborative mentorship program in which the SOF will collaborate with people of color and other related community members in mentoring SOF students. Such partnership is especially vital for successful recruitment and retention of students of color as well as for promoting related research and service programs in and for the communities. The ECDP will also develop a program in which college students mentor high school students to help build self-esteem among high students and motivate them to pursue post-secondary education.
- D. ECDP staff will serve as liaison between the SOF and minority communities and funding agencies, and will assist the students with financial aid planning, locating and applying for scholarships and providing information on internship and externships as well as academic advising and guidance on topics that may affect the students' educational success. To help in the process, the ECDP and its specific programs will make vigorous and extensive contacts and visits with outside interested parties such as Native American, Hispanic, African American, Asian American, other minority groups, government agencies and private interests to develop good working relationships to help students locate as interns for practical and hands-on experiences on their areas of training. The ECDP will take advantage of common cultural gatherings such as

powwow, Kwanzaa, and Cinco de Mayo to meet with parents and community leaders and recruit students.

- E. Develop a 2+2, or 2+2+2, or other mutually agreed upon articulation with other academic institutions to efficiently achieve ECDP objectives. The 2+2 partnership would be between NAU and other post-secondary two or four-year academic institutions (especially those serving Native American, African American, Asian American and Hispanic students) in which students would complete their first two-year academic program at the other institutions and then come to NAU to work on the rest of their forestry courses and earn their degrees. The 2+2+2 agreement entails working with students during their last two years in high school to prepare them for college education, and if they prefer to go to community colleges or non-forestry offering 4-year institutions, ECDP would work with those institutions to motivate the students to continue work for university degrees in forestry and related disciplines.
- F. Work with peoples of color and other underserved communities to create opportunities for the communities to become directly and indirectly important contributors to the academic and professional development of their youngsters by providing funds in the form of grants for their educational, research, knowledge transfer and other personal support. This would help the students develop special interest in their communities and become key players in the communities' resources management and development endeavors.
- G. Developing community-oriented, socially and culturally relevant research and knowledge transfer mechanisms in which students of color play a very active role.
- H. The ECDP will coordinate all SOF diversity-related activities such as the Indigenous Forestry Focus and the International Forestry Focus areas and create new ones as the need arises. To optimize use of available resources around campus, the ECDP will coordinate its activities very closely with diversity-related NAU programs such as the Multicultural Student Center (MSC), the Institute for Native Americans (INA), the Institute for Tribal Environmental Program (ITEP) and its affiliates, the Science and Mathematics Learning Center (MLC), the Department of Applied Indigenous Studies (AIS), the Multicultural Engineering Program, the Ethnic Studies Program, the International Office, and other programs and organizations serving minority groups in campus. It will also participate in various student service programs such as the STAR and the "Sisters" to help students adjust to campus life and do well in their academic programs, and the Retention Alert Program (RAP) to provide rapid response, support and resources to students at the earliest signs of trouble in their academic programs. The ECDP will also collaborate with Residence Life to create a Living and Learning Community as well as cohorts that live and take classes together to help ECDP students succeed.
- I. Generate external support equal to the institutional support through proposal submission for outside funding each year. The proposals may be written to get funding for research projects, faculty training on ethnic and cultural diversity, or to support the education of students of color and international students. Some proposals may be written specifically to support certain group of students of color such as Native Americans, and then strictly used for that purpose.
- J. Develop, support and expand international opportunities for faculty and students to gain international experiences through classroom and field course offerings and research activities. The ECDP in collaboration with its IFP will also attempt to facilitate international research efforts by faculty and students through programs that include faculty and student exchanges as well as collaborative agreements with international institutions and colleagues.

These tasks will help achieve the objectives and help the SOF become the leading forestry institution serving a culturally diverse student body in which Native American, Hispanics, African American, Asian American, Hawaiian and Pacific Islanders and international students are well represented.

Staffing and Functions: To be successful, the ECDP should be a highly visible program with serious commitments at the School and University levels. The visibility should be in the form of having a well-designed organizational structure with offices located in a well-recognizable and easily accessible area with adequate space for putting permanent as well as temporary displays. The Program should also receive commitment in the form of adequate staffing and good financial and material support. Most importantly, the ECDP should have a very good leadership with adequate backing from the School and the University to be successful. The functional structure and personnel involved during the initial stages of the ECDP are briefly described below.

- A. The ECDP will have a faculty director and a staff specialist on diversity. The director will participate in teaching, research and service activities in the SOF as well as coordinate the activities of the specific ECDP programs. Each specific program will have a coordinator who will be in charge of coordinating the specific curricular, teaching and research activities of one specific program. However, the ECDP director will be in charge of overseeing the different activities of the program designed to achieve the goals and objectives specified above in a timely, efficient and successful manner. The specialist on diversity will work as assistant to the director and specific program coordinators to handle day to day activities and be in charge of student recruitment and advising as well as help in grant writing and participate in some research activities. The specialist on diversity's responsibilities will also include high school visitations and at times representing the ECDP director and specific programs coordinators at community functions and other gatherings related to any 2+2 and 2+2+2 agreements with two year or four year colleges, and high schools, community colleges and NAU, respectively
- B. The ECDP will have an Executive Committee (EEC) consisting of all specific programs coordinators or other faculty with particular interest on each specific program, the ECDP director and two individuals selected at large from NAU faculty, administrators or staff members who have the interest and will to participate and help as associates in the program. The functions of the EEC are to review overall program functions, suggest improvements and actively participate in program activities such as proposal writing, student advising, mentoring and teaching.
- C. The ECDP will also recruit and form an External Advisory Committee (EAC) consisting of minority leaders, resources managers and others who are interested and willing to help the program achieve its objectives. The functions of the EAC are to advise on different issues related to the funding, development and growth of the program, student job placement and other program functions.

The personnel, committees and their functions are important to the success of

the ECDP. In addition, the ECDP should have a minimum budget of its own to operate smoothly, effectively, and continuously, even though most of funds to support students, research and service activities will come from grants, endowments and other external sources. Annual increases in recruitment, retention and graduation of students of color, the amounts of support in the form of financial, personnel and other materials received and very good regional and national recognition are the most important criteria for evaluating the achievement levels of

the Program. Programmatic evaluation with respect to such criteria will be made on an annual basis to determine the performances of the ECDP and its specific programs. Such a report will be submitted annually to the Executive Director of the SOF.

UNDERGRADUATE EDUCATION --THE PROFESSIONAL FORESTRY DEGREE

Current Status

Basic Philosophy

As noted earlier, the underlying educational philosophy is integrated instruction of students in ecosystem management. This includes a team-teaching immersion approach for each professional forestry semester taken by students in the junior and senior years. By immersion, we mean that our students will primarily take blocks of forestry courses in the four-semester professional forestry sequence.

The manner in which the curriculum is reviewed and changed is another important aspect of our teaching philosophy. The faculty have adopted an "adaptive curricular design" approach whereby the subject matter to be covered and the nature of integrative teaching is continuously under review. While Semesters A, B, C and D are each under the overall coordination of a single faculty member, the faculty involved each semester are expected to meet frequently to discuss and review both the curriculum and the students' progress and to make adjustments as warranted. In addition to assessment of individual faculty during the professional semesters, at the end of Semesters A, B and D, a detailed assessment is facilitated by a person outside of the School. This assessment asks detailed questions relevant to the organization, structure and flow for each of the professional semesters. This assessment is used each year in the ongoing revision of the organization and content of the professional semesters.

Major curriculum changes were approved in 2000. The revised program reflects a renewed commitment by the faculty to the team-teaching approach and the goal of integration and flow across the professional programs courses, which is recognized nationally as a significant and unique strength of our forestry program. The revised program also allows students to explore a focus area to expand their knowledge of ecosystem management in a particular area. This and other curricular changes were based on recommendations made by students, alumni, forestry professionals, literature, and comparisons with our peer forestry institutions.

A copy of the 2000 curriculum revision report is included in Appendix J of this strategic plan. The curriculum report includes a detailed description of the changes in the BSF curriculum, and the course content, goals and outcomes-based assessment plans for each course in our program. A review of the new 2000 curriculum was conducted by the coordinators of Semesters A, B, C, and D during 2003-2004 to determine if the revisions were being successfully

implemented. Minor changes were recommended to facilitate implementation of the revised curriculum and these were approved by the NAU curriculum committee in 2004. A general description of each semester follows.

Semester A: 13 Credits - FOR 313, 314 (Forest Ecology), 315, 316 (Silviculture). Semester A is the first semester in the four-semester sequence of professional instruction and is offered only in the fall semester, inasmuch as it is highly oriented toward field instruction until the middle of November. This semester covers basic forestry principles and techniques in ecology (7 credits) and silviculture (6 credits). A grade of C or better is required for progression to Semester B.

Semester B: 13 Credits - FOR 323, 324, 325, 326 (Forest Management).

Semester B is offered in the spring semester, and presents topics in multiresource management, economics, decision theory, and resource simulation, as well as management principles for timber, range, recreation, wildlife, and watershed resources. Again, a grade of C or better or approval of the forestry faculty is required for advancement to the next professional semester. Semester B is writing-intensive and fulfills the writing requirement for the NAU liberal studies requirements.

Semesters C and D: 6 Credits each - FOR 413, 414, 423, 424

Semesters C and D are "capstone" courses that fulfill NAU's liberal studies capstone requirement. This year-long sequence is designed to allow the students to integrate the technical aspects of forestry presented in Semester A with the ecosystem management principles, economics, and decision theory contained in Semester B, while also expanding on these areas of knowledge. This objective is accomplished through individual student investigation of a realistic ecosystem management situation.

Semester C is devoted to field inventory and analysis, and identifying problems on a field laboratory site in NAU's Centennial Forest which is managed by the School of Forestry. The class performs these tasks as small crews on a designated portion of the area. The students then compile and individually analyze these data, and in Semester D they prepare a professional report based on the parameters assigned to the project for that year. The report presents and justifies recommendations for managing the property for multiple goals utilizing ecosystem management principles and incorporates the Montreal Process. Intensive advice and guidance is given by Forestry faculty both in the classroom, addressing class assignments and standards, and to the individual student, as requested for clarification of specific problems. The reports are submitted for grading three weeks before the end of the semester and each report is graded by a minimum of two faculty; during this period the students investigate the policy and legal implications and procedures associated with implementing their recommendations on forest lands. The implementation component has been supplemented by a U.S. Forest Service land manager who leads a unit on the NEPA process as it relates to decision-making on public lands.

Focus Areas Students in the BSF program must complete one Focus Area (12 hours, with at least 6 hours 300- or 400-level) as part of the 120 hours required for the degree. The seven focus areas have been developed by the faculty to allow student specialization within Forestry. The theme of each focus area was deliberately developed to educate students in Forestry sub-disciplines that are cutting-edge in forest ecosystem management, under-represented in majors, minors, and programs offered by other forestry programs in North American, yet are firmly supported by faculty expertise in the School of Forestry.

- Conservation Biology
- Ecological Restoration
- Forest Health
- Indigenous Forestry
- International Forestry
- Forestry in the Wildland-Urban Interface
- Individual Focus Area

A new focus area in Water and Watershed Restoration was approved for the 2006-7 catalog. Moreover, the SOF plans to expand its current focus on fire science/ecology to create a center for fire education and research and to support agency fire and natural resource programs.

All focus areas will be subject to a sunset review every five years. The first review is scheduled for 2006 for those focus areas that started in 2001. The criteria below will be used to evaluate the future of each focus area:

1. Each focus area must have a designated faculty coordinator.
2. Each focus area must have at least two faculty who can teach the core courses.
3. The coordinator of each focus area will prepare sunset review report each five years, starting in 2006, that summarizes the number of students graduated in the focus area for the last five years. Each focus area should strive to have enrollment by at least 10% of the total number of BSF students.
4. The School of Forestry Curriculum Committee will review the focus area reports and make a recommendation for renewal or termination to the faculty. The reports are due Oct. 1 of the review year (starting 2006). Recommendations for renewal or termination will become effective the following fall.

Student Recruitment/Retention

A key to the success of recruitment and retention of undergraduate students into the BSF program is the Student Services Coordinator. The personal attention this individual can devote to prospective students and to advising freshman and sophomores has resulted in increased enrollment and retention at a time when University enrollment has been stable or declining. In addition, the quality of undergraduate students being recruited has increased. The faculty consider the Student Services Coordinator to be a very important position for maintaining and improving the quality and quantity of students in the BSF program. Making the Student Service Coordinator a full-time permanent position funded via a state budget line is essential. The ECDP will also help in the recruitment, retention, and graduation of students of color by providing special mentoring, advising, and funding opportunities.

Accreditation

The undergraduate major in Forestry is accredited by the Society of American Foresters. This 18,000 member professional organization is the only forestry accrediting body in the United States. The School of Forestry was initially accredited in 1968. The School underwent its last on-site review in 2003 following implementation of the revised curriculum and was again accredited for another 10-year period. The accreditation process requires that each school notify the Society of any substantive changes when curricula are altered.

Connections

The School of Forestry taken significant steps to offer forestry courses to meet NAU's Liberal Studies requirements. In 1995, FOR322 (now FOR222), Environmental Conservation, was the program's sole Liberal Studies offering. Currently, the School offers the following courses which non-forestry students can take to meet their Liberal Studies requirements: FOR254 (Introduction to Forest Health), FOR240 (Introduction to Conservation Biology), FOR250 (Arizona Forests and Wildlife), FOR255 (International Wildlife Issues), FOR230 (Multicultural Perspectives), FOR270 (Native American Ecology), FOR340 and 340L (Environmental Hydrology and lab), FOR370 (Indigenous Knowledge), and FOR282 and 382 (Ecological Restoration Principles and Applications, respectively). Moreover, FOR203 (Project Learning Tree), FOR204 (Project Wild), and FOR205 (Project Wild Aquatic) are one-credit courses frequently taken by students from a range of departments across campus, such as Parks and Recreation. Several Forestry courses have been recently approved to meet the new diversity requirements of all undergraduate degree programs at NAU (FOR255, FOR230, FOR415, FOR445).

The School of Forestry has been working with NAU's Honors program to cross-list some of our courses as Honors courses. Currently, FOR240, FOR250, FOR282, and FOR340 are available as honors courses. In addition, several forestry courses (FOR230, 240, 381, 430) meet requirements for the BS in Environmental Science – Management Emphasis in the College of Engineering and Natural Sciences. Finally, some faculty have begun to cross-list and jointly teach courses with Faculty in the Department of Biology.

The professional nature and unique mode of instruction for the Forestry major limits across-campus student access to Semesters A, B, C and D. However, other forestry courses such as FOR101 and FOR212 are frequently taken by non-forestry majors, and both have been offered as distance-learning courses on the web.

The SOF actively participates with the NAU International Office by providing faculty-led study abroad programs to Honduras, Mexico, and Ghana. These courses are available to all NAU students. Also, the SOF is an active participant in NAU institutional exchange with Southern Cross University in Lismore, New South Wales, Australia, and with several institutions in China.

The Future

The School of Forestry is currently working with Virginia Polytechnic Institute and State University (VPI), the University of Montana, and the University Idaho on a distance education consortium whereby web-based graduate and undergraduate courses and certificate programs will be offered to Federal Agency employees. In addition, the faculty are working towards offering some of the 100- and 200-level prerequisite courses required for admission to the professional program as web-based courses. We hope to offer these courses as classroom courses for students on the NAU campus and as web-based versions for potential transfer students. The web-based courses will allow a seamless transition for transfer students to move directly into Semester A.

More faculty and graduate student teaching assistants (TA) are needed in the future to accommodate increasing numbers of students in the BSF. For example, 48 undergraduate students entered the professional forestry curriculum in fall 2005 and this number may increase in the future based on the success of our student recruitment programs. We currently do not have the faculty, TA, or staff resources to accommodate increases in undergraduates.

UNDERGRADUATE EDUCATION - ENVIRONMENTAL MANAGEMENT PROGRAM

Current Status

The 1996 Strategic Plan called for a review of possible cooperation in an undergraduate major in environmental management between Environmental Sciences and the now dissolved College of Ecosystem Science and Management. A committee consisting of faculty from all units in the college created an Environmental Management Emphasis for the Environmental Science Degree in the College of Engineering and Natural Sciences. The School's philosophy for this major was to open the expertise of our faculty to other students and degree programs. Environmental Management was approved as an emphasis in the Environmental Science degree program.

Connections

All of the students in the Environmental Science - Management degree program are advised by a faculty member in the School of Forestry who is also responsible for recommending revisions to the curriculum. In addition, several forestry courses (FOR 230, 240, 381) are required courses in the Environmental Management emphasis.

The Future

In addition to Center for Environmental Sciences and Education (CESE) undergraduates continuing to enroll in FOR courses, the School of Forestry has strengthened its connections to CESE by:

- 1) Maintaining an advisor in the Environmental Management emphasis area.
- 2) Sharing a faculty position (51% Forestry 49% CESE) with a forest/land management policy person thus allowing forestry to fill a gap in policy education that may not have been filled for some years into the future.
- 3) Faculty serving as committee members/chairs in the Master of Science in Environmental Sciences and Policy degree.
- 4) Encouraging Forestry MA, MS, and PhD students to enroll in an Environmental Science policy analysis course.
- 5) Forestry will encourage CESE to participate in an international program/degree coordinated through the School of Field Studies in Kenya, Costa Rica and Australia.

GRADUATE EDUCATION

Current Status

The underlying philosophy of the School's graduate programs is to prepare students for public or private resource management or a related career in research and education. The emphasis is on the ecological, social, and economic problems and opportunities associated with integrated multiresource management of forest ecosystems.

The School's graduate programs are greatly enhanced by our excellent ecological and computer laboratories, and a small full-time staff of research professionals. Our teaching programs are further strengthened by the presence of the NAU Centennial Forest, a U.S. Forest Service Rocky Mountain Forest and Range Experiment Station research unit also located in the Southwest Forest Science Complex, and the USDI Colorado Plateau Research Station located on the Northern Arizona University Campus.

Master of Forestry

The MF is a terminal degree with the goal of preparing individuals for careers as land managers in contrast to careers in research or education. It was designed to accommodate both recent graduates and practicing professionals with career interests in ecosystem management and who wish to increase their effectiveness in dealing with ecosystem problems. This non-thesis degree incorporates multi-resource concepts, analytical tools, and communication skills. The program emphasizes rigorous analysis of forest ecosystem problems and opportunities. This degree normally requires two calendar years of academic work but a motivated student could finish it in one year. In addition to regular course work, students are required to prepare a professional paper on a subject related to forest ecosystem management.

Master of Science in Forestry

This traditional thesis option is an individually tailored program of study requiring two calendar years of academic work. It is designed to give students experience in carrying out the kind of research they desire to do in their professional careers. For the thesis, students are expected to demonstrate their ability to work independently on a problem, wide familiarity with the literature in their field, and their command of the techniques and principles of research. Another objective is to have students develop the ability to form valid generalizations from data. In addition to a written thesis, students must pass a final oral defense of their thesis and present the results of their thesis research as a seminar.

The Doctor of Philosophy in Forestry

This is the terminal degree in the profession of forestry. Its goal is to prepare individuals for a career in research and/or education. The Ph.D. program has three emphasis areas: ecosystem science, forest management sciences and economics, and forest social science. Students are expected to demonstrate their skill in generating original ideas, a considerable command of the scientific literature, and skill at designing, analyzing, and interpreting research. Students must also have skill in scientific writing, including publication of research results in major professional journals and to have basic skills in teaching. Candidates are expected to be self-motivated and to largely direct their own research program with the advice and counsel of the major professor and dissertation committee. The goal of the dissertation is the generation of new knowledge. The program includes both comprehensive written and oral examinations designed to establish an individual's breadth and depth of subjects within the larger field of forestry. Students must also demonstrate reading competency in a foreign language which can be fulfilled through additional statistics courses.

Connections

Our graduate programs have maintained cooperative working relations with institutions from the local to the international level. We will continue to strengthen existing relations and develop new ones as appropriate.

At the University level, our graduate courses provide support for other academic units. We have strong relationships with Biology, Environmental Science, Sociology, Political Science, Public Administration, Geography, and Mathematics. The School offers graduate level courses that are cross-listed with other departments (e.g., Landscape Ecology is cross-listed with Environmental Science), or taught in other departments (Wildlife Population Modeling through the Mathematics department). We support the Mathematics Statistical Consulting Services as a means of providing statistical consulting services for our graduate students. Most of our graduate courses in ecosystem science also serve the needs of graduate students in biology and environmental science. We will continue to strive to develop graduate courses that reach out to other academic units, while serving the needs of our students and non-degree seeking professionals. Our course development approach recognizes that in addition to serving other programs, attracting a disciplinary diverse group of students improves graduate courses for our students. In addition, forestry faculty serve on graduate student committees in a variety of disciplines across campus, and forestry faculty occasionally serve as graduate advisors to students in the interdisciplinary Conservation Ecology certificate program and in the Environmental Science and Policy Master of Science program.

At the national and regional levels, we have developed a cooperative relationship with the USDA Forest Service, the USDI National Park Service and Bureau of Land Management and the Colorado Plateau Center. Having the Rocky Mountain Forest and Range Experiment Station (RMRS) housed in the same building as the School has facilitated active participation of RMRS scientists in our graduate programs. These scientists have provided graduate support and have served on thesis committees. We will continue to work to expand the participation of these scientists in the support of our graduate programs.

At the international level, we have established partnerships with schools, universities, and research institutions in Africa, Honduras, Mexico, Korea, and Canada and are continuing to broaden our international relationships. We have maintained strong ties with the international community through graduate student recruitment.

The Future

Our graduate programs are reviewed on a regular basis to ensure that they are fulfilling the mission of the School. Continuing review occurs in the Graduate Studies Committee, and comprehensive review occurs through program reviews at the university level.

SOF faculty are actively engaged in conducting research in numerous foreign countries including research on restoration of native tropical forests, genetic resistance in tropical trees to insects, traditional ecological practices, tropical biodiversity, and restoration ecology. SOF faculty have trained international students from: Australia, Japan, Ghana, Mauritania, Mexico, Nepal, Thailand, China, Brunei, Germany, France, South Africa, and other countries.

2004 Review

School of Forestry graduate and research programs were subjected to a university program review, April 5-8, 2004. This review occurs every seven years and is mandated by ABOR. The review was conducted by the USDA Cooperative State Research, Education, and Extension Service (CSREES).

Overall, the review team was impressed with the quality of the School of Forestry's graduate education programs, and the quality and breadth of its research programs and productivity. However, the review team made specific recommendations for improvement, which are provided verbatim below.

Recommendations of the CSREES review team:

Faculty:

- The School should add faculty in strategic disciplines to address critical client needs, while generating significant research opportunities.
- The School should explore opportunities to financially reward highly productive faculty.
- Post-tenure reviews of faculty members should be made on a regular basis, with specific assignments and recommendations.
- The School should evaluate courses, both graduate and undergraduate, to determine what courses are less necessary and perhaps should be eliminated from the curriculum.
- The Dean should re-assign and focus teaching responsibilities to promote opportunities for productive faculty.
- The School should continue to hire well-qualified faculty that buy into the collaborative process.

Graduate Education:

- An attempt should be made to raise graduate stipends to cover tuition.
- Teaching opportunities should be provided at least for Ph. D. students. Teaching Assistant support should be sought from the Graduate College.

- Because of the large number of courses with low enrollment, and the need for graduate courses that are currently not offered, graduate course offerings should be reassessed.
- Faculty are encouraged to make sure that high quality mentoring is available on a continuing basis to all students.
- Faculty and students are encouraged to consider conducting more research, particularly at the Ph.D. level, outside the Colorado Plateau area. This will increase the national and international reputation of the school.
- The faculty and dean should make an effort to regularly attend school seminars.

Research:

- Undertake a comprehensive strategic planning effort that includes development of a structured research program that will guide research and faculty decisions now and into the future.
- Continued alignment with ERI and RMRS is critical to research success.
- More structured long-term relationship with ERI and RMRS to ensure continued flows of resources. This can take various forms, but written agreements (e.g., MOUs) might be useful in documenting present and future directions and expectations.

We will address as many of the recommendations of the external review team as possible within the constraints of our budget. Moreover, we will continue strengthening our Ph.D. program. We created new courses to expand the offerings in core and breadth requirements. In the biology area, courses were developed in Ecological Restoration, Conservation Biology, Ecosystem Science and Management, and Landscape Ecology. Additionally, courses in Ecological Economics, Wildlife Population Ecology, and International Forestry were developed. The School will continue cooperating with other academic units on the development of campus expertise in Operations Research and Economics. The strengthening of these areas on campus is essential to the success of the forest management sciences and economics emphasis areas of our Ph.D. program.

The School is developing a formal relationship with the School for Field Studies (SFS) whereby students will earn a Master of Forestry (MF) at NAU, with their professional paper based on field experience in Kenya, Costa Rica or Australia under the supervision of School for Field Studies faculty. Also, we are developing several graduate-level distance-learning courses that can be offered to both Master's and Ph.D. candidates. The School of Forestry is currently working with Virginia Polytechnic Institute and State University (VPI), University of Montana and the University Idaho on a distance education consortium whereby web-based graduate-level courses, graduate degree programs, and graduate certificate programs will be offered to Federal Agency employees. In addition, we are currently exploring ways to offer continuing education courses to federal employees (e.g., USDA Forest Service, Bureau of Land Management) that need such courses in order to meet new training standards and to facilitate career advancement. We know from several contacts with the Forest Service that interest among federal employees in such education courses offered as short courses or by distance delivery is high.

RESEARCH

Directions

The faculty research program of the School of Forestry strongly supports the mission in both undergraduate and graduate education, and in interdisciplinary, team-conducted research focused on ecosystem management. The research mission of the School is to improve understanding of natural ecosystems and the practice of forestry, broadly defined. Forest ecosystems include biological, physical, social, and political components. The focus of scholarly endeavor within the School of Forestry may be on one or more of these components or on the interaction between and among the components. Much of the research within the School produces results that can be quickly brought into the classroom. Also, in accordance with the overall mission of the University, forestry research at NAU generally emphasizes the Colorado Plateau region and rural Arizona including support of university-wide objectives that contribute to the education and development of Native Americans. This general focus is not intended to restrict faculty members from pursuing a wide range of research interests that will contribute to an improved understanding of forest ecosystems and the practice of forestry, either within or outside the Southwest. In the broadest terms, research activities within the School should emphasize the faculty role as a source of expertise for the citizens of Arizona and the world.

The School identified six mission research objectives for the period 2004-2009. These are:

1. Ecosystem processes
2. Resource function and linkages
3. Ecosystem linkages and interactions
4. Social-political-technological research
5. Incorporating economics and social information in decision analysis
6. Integrating values from different cultures with the current technology of ecosystem management

The School's research activities are guided by a faculty-elected committee called the "Mission Research Board." This committee is responsible for recommending to the Director of the School approval of proposals, allocation of Mission Research funds and research staff support according to policy, and for proposing Mission Research direction.

The School of Forestry research program is strengthened and enhanced by having a strong graduate program. Enrollment in the Masters and Ph.D. programs has been stable or has increased over the past 10 years. For example, in Fall Semester 1995, there were 41 students

pursuing Master of Science in Forestry degrees and 12 students pursuing the Doctor of Philosophy degree. In Fall Semester 2004, there were 43 students pursuing Masters degrees in Forestry (MF and MS) and 21 students pursuing the Doctor of Philosophy degree. The School of Forestry strives to recruit and retain a diverse student body, including International, Hispanic, Native American students, and other minority students.

Bureau of Forestry

In the late 1960's the president of Northern Arizona University created four research divisions on the campus. One of these divisions was the Bureau of Forestry Research. In keeping with the integrated approach to undergraduate education, the School in 1985 developed an integrated, interdisciplinary research and development program in ecosystem management. At that same time, major state funding increases were secured from the Arizona state legislature for implementation of the new ecosystem research and graduate academic efforts under the Bureau of Forestry Research. The level of funding has been relatively consistent during the past 10 years; in both FY 1995 and FY 2003 funds slightly exceeded \$180,000.

The Bureau of Forestry was last reviewed in 1991 and was reauthorized for continuation. The specific research objectives of the Bureau as summarized in the 1991 Sunset Review are:

1. Study ecosystem processes necessary to develop response functions for important forest biota and resources.
2. Establish linkages among resources and response functions to determine important resource interactions.
3. Develop multiresource interrelationships through systems analysis and simulation.
4. Investigate changing social attitudes and economic values regarding forestry and forest management, including economic tradeoffs inherent in multiresource forest management.
5. Develop decision support system models that assess long term trends in forest ecosystem structure as well as economic supply and demand for forest resource outputs.
6. Develop an understanding of the role and value of Native American philosophies and knowledge of natural resources for improved forest management science.

The allocation of funding under the Bureau of Forestry is decided by the Director of the School after considering recommendations from the Mission Research Board. Proposals may be submitted to the Mission Research Board on the initiative of individual faculty members or teams, or the Board may periodically circulate requests for proposals which identify specific

areas of research, and with concurrence of the Director, need to be addressed to maximize progress on ecosystem management.

In academic year 1995-1996, the Bureau of Forestry funded seven Master of Science students with stipends of \$10,500; each with an additional \$3,500 in research support funds. In academic year 2003-2004, the Bureau of Forestry funded six Master of Science and seven Ph.D. students. In 2005, each Master of Science student will receive a minimum stipend of \$14,708 with an additional \$3,500 in research support funds. Ph.D. students will receive a minimum stipend of \$16,708, each with an additional \$4,000 in research support funds. We plan on continuing to increase stipend amounts as our budget allows.

Connections

The School has strong research linkages with business administration, mathematics, chemistry, biology, environmental science, geology, engineering, computer sciences, and social sciences. Faculty from these other University departments serve as co-investigators on research projects and on graduate student committees. The presence of the USDA Forest Service Rocky Mountain Experiment Station research unit in the Southwest Forest Science Complex is also a strong asset and researchers collaborate on research projects and serve on graduate student committees.

The School's research program is funded by a wide variety of federal, state, and private land management and conservation agencies/organizations/companies. Funds are routinely obtained from organizations such as the U.S. Forest Service, National Park Service, Bureau of Land Management, Environmental Protection Agency, National Biological Survey, International Tropical Timber Organization Project, U.S. Fish and Wildlife Service, Arizona Game and Fish Department, Arizona Department of Water Resources, Arizona Prop 301 funding, and the National Science Foundation. Annual extramural funding normally exceeds \$2,000,000.

The Future

The research function of the School of Forestry will continue to grow and gain in national stature. The unique focus on ecosystems, excellent facilities in the Southwest Forest Science Complex and strong connections with state-private-federal land/resource management agencies and organizations form an extremely strong foundation to build upon. The School needs, however, to be alert to continued decreases in federal research monies and increased emphasis on targeted research program areas. Both potentially could seriously and negatively impact research in the long term. Keeping graduate student research stipends at a level where they are competitive with other programs around the nation is critical for maintaining the high quality of the School's program.

The relationships the School is building with the School for Field Studies and the distance-education consortium with Virginia Tech creates new opportunities for collaborative research around the nation and abroad.

SERVICE

By Service, the School of Forestry refers exclusively to work that draws upon one's professional expertise and is an outgrowth of one's academic discipline. We expect that service will do one or more of the following:

1. Aggregate and interpret knowledge so as to make it understandable and useful to society.
2. Disseminate the knowledge to the appropriate user or audience.
3. Support professional societies and organizations that benefit society.
4. Provide peer-review of research in order to facilitate the generation of knowledge

The School of Forestry does not have the formal extension or continuing education role that many land-grant institutions have. The School, however, does provide continuing education through workshops and short courses. For more than 15 years the School has sponsored an ecosystem management short course jointly with Utah State University and Colorado State University (formerly a silviculture short course) for practicing forestry professionals. Two weeks of the eight-week certification course are held at the School. The School now also sponsors a two week wildlife habitat and plant management short course biennially. Sponsorship of this course was transferred from Utah State University to Northern Arizona University in 2001; it has been taught twice to date. Students in this course are practicing wildlife and fisheries biologists, botanists, and foresters.

The SOF was recently awarded a contract from the US Forest Service International Programs Office to develop and deliver a seminar in International Forestry. The seminar will be offered to 20 forest managers from across the developing world for each of the next five years. Seminar themes will include: 1) maintaining the world forest resource base, 2) forest biological diversity, 3) forest productivity, 4) forest health, 5) socioeconomic benefits of forests, and 6) legal policy, trade, institutional framework, and international cooperation.

As part of our public service role, the management tools and techniques developed through our research are demonstrated and utilized in workshops and short courses. They are also made available to ecosystem managers, most often through cooperative research projects with

managing agencies where, for example, managers provide data and expertise to develop and refine management decision models, thereby learning to utilize analytical tools and procedures. The School's past projects with the Menominee Tribal Enterprises on an ecological allocation model is one example. The School also sponsors conferences such as the recent, highly successful conference on "Natural Resource Education for a Culturally Diverse Audience" held at Northern Arizona University March 14-17, 2004, and the Annual Symposium of the Arizona-Nevada Academy of Science.

The School's faculty provide another important professional service that is often not fully recognized. Faculty are frequently sought to assist federal land management agencies in assessing aspects of, or assisting in the preparation, of management plans for public lands. For example faculty were funded for studies assessing and deterring theft of petrified wood on National Park lands, developing and/or assessing effectiveness of web sites for Bureau of Land Management and National Park Service, determining public attitudes towards wildlife management for Arizona Game and Fish Department, and gathering information to assist in preparing General Management Plans for National Parks. This work is often instrumental in plotting the future for our region's and nation's public lands.

School faculty serve as associate editors for several ecological and forestry journals, and frequently are asked to provide peer-review of research articles.

NAU CENTENNIAL FOREST

The Northern Arizona University Centennial Forest covers more than 47,000 acres of forest and grassland which contain significant natural and cultural resources. These Arizona State Trust Lands are jointly managed by the NAU School of Forestry and Arizona State Land Department for the purposes of long-term ecological research and as a center of field-based environmental education. To achieve the education and research goals it is anticipated that a field campus consisting of several facilities will be blended within the natural resource and active research programs on the Centennial Forest. The facilities will also enhance the revenue generating capability of the Centennial Forest, which helps achieve our goal of economic and environmental sustainability for these lands.

Centennial Forest Vision

1. Ecologically and economically sustainable managed forest that demonstrates and maintains a diversity of forest conditions and management options.
2. Research/teaching focus for all environmental programs at NAU and proving ground of a world class Forestry School/Environmental University.
3. Field Campus (Forest Resource Enterprise Center (FREC), NAU Environmental Learning Center, Centennial Forest Retreat Center, Overnight Guest Lodging).

4. Forest that is linked to the greater community and contributes to open space, fire prevention and the overall quality of life and economic health of Flagstaff.

Centennial Forest Field Campus

To achieve long-term research and education goals and to provide a sustainable source of revenue, Northern Arizona University plans to construct a Centennial Forest Field Campus. The Field Campus will provide unique education and research facilities not duplicated elsewhere while managing several revenue generating enterprises that support this mission. It will also serve as a model for sustainable, environmentally friendly, and fire-wise design methods through its building materials, utilities, site layout, and interpretation. Part of the Field Campus atmosphere will be an opportunity for guests to participate and learn about active research and environmental education programs. We envision guests coming specifically to learn more about NAU's active research program, for example in Restoration Ecology, and perhaps participate with researchers and educators in Field Campus activities. Students are an integral part of the Centennial Forest and actively participate in planning, design, and implementation of projects on the Centennial Forest. Students will be employed in various internships to support Centennial Forest activities.

The Centennial Forest Field Campus is located in two 120 acre parcels of land west and south of the Arboretum at Flagstaff. The northern parcel is contiguous with the western Arboretum boundary in the southeastern portion of the 4,000 acre Historic School Forest Management Unit (T21N R6E S34 E2SE SENE). The southern lease parcel is approximately 0.25 miles south of the Arboretum (T20N R6E S2 N2NE NENW), and is bounded by U.S. Forest Service to the north and east, and the City of Flagstaff well field on the west side. The remainder of Section 2 to the south of the southern Field Campus parcel is also Centennial Forest land. Both parcels offer easy access to town, but are on the edge of large tracts of undeveloped forest land.

The fully developed Field Campus will include the following four elements:

Forest Resource Enterprise Center (FREC)

The Forest Resources Enterprise Center (FREC) would house programs designed to develop public/private partnerships in the novel use of forest products, as well as university research and education programs. A small business development program would provide research and development and technology transfer support for private business enterprises such as wood-based energy sources, composite materials, round wood construction techniques, and environmental engineering. Other programs would focus on wood engineering, wood products technology, marketing, and forest economics. The FREC facility would be a building large enough to house small-scale processing of traditional (poles, posts, latilla, vigas, round wood furniture stock, logs, sawn lumber, firewood, etc.) and non-traditional (mushrooms, resins, juniper berries, native grass seed, medicinal plants, basket weaving stock, etc.) forest materials. This facility would also house general maintenance equipment for the Field Campus.

The FREC will be a multipurpose facility with incubator, research, and education programs that focus on sustainable forest use, applied research, and development of scale-appropriate, forest-

based businesses. Education programs at FREC will include a Student Forest Projects Center which would be multifunctional space for University class projects related to the development of novel forest based products. Students from Anthropology, Biology, Business, Engineering, and Forestry would use the center to execute class projects. This space would also serve as a training center. Applied research programs may include marketing and regional economic studies, biomass energy, distillation of essential pine oils, and biomass gasification. The facility will include a small scale wood processing and fabricating shop for small diameter and non-traditional forest products, and will include a portable sawmill, peeler, solar kiln, chipper, band saw, and other equipment. Our best developed program concept is the Small Business Development Program.

The ultimate goal of the FREC Small Business Development Program is to promote long-term ecological sustainability of southwestern forests through a coordinated effort with several collaborators working toward sustainable forest utilization. The FREC program, combined with the Northern Arizona Technology and Business Incubator (NATBI), and the Greater Flagstaff Forests Partnership (GFFP), will create a 'triangle of support' for upstart businesses. The role of FREC in this effort will be to provide the physical space with access to equipment, nearby raw materials, and technical support needed to build small- and medium-sized forest-based businesses and facilitate public-private partnerships. These services will be provided through the creation of a forest business development program, aimed initially at small diameter wood utilization. The effort will be complemented by the inclusion of an existing indigenous products program focusing on the sustainable use, development, and marketing of typically non-wood 'wildcrafted' products (a cooperative effort with the Center for Sustainable Environments at NAU). Goals for the FREC Small Business Development Program are:

- 1) Strengthening rural economies by creating manufacturing opportunities with restoration by-products.
- 2) Partnering with private entrepreneurs to increase regional expertise on small diameter wood utilization.
- 3) Developing and expanding markets for small-diameter, and non-wood forest products.

The benefits of FREC and a small business development program will grow from minor local job creation linked to additional restoration treatment acres in the short term, into part of a much longer-term solution to the region's forest health dilemma.

Three aspects of the small business development program will benefit the local community. First, all of the raw materials used at FREC can be generated from fire prevention and restoration projects on the Centennial Forest that lie southwest of Flagstaff. These lands are upwind of Flagstaff during peak fire season weather patterns, and include the portion of the Flagstaff wildland-urban interface that is in most urgent need of fire prevention treatments. FREC will help produce markets that can use this small diameter wood which will in turn allow fire prevention dollars to cover larger areas of this critical zone. Second, a long-term solution to Flagstaff's fire risk problem is inextricably linked to the community's economy. FREC, by reconnecting scale-appropriate businesses to the forest, will help lead the Flagstaff community toward economically, as well as ecologically sustainable use of our forest resources. Third, as a regional focus for small business development, FREC clients could begin to participate in other on-going efforts to create sustainable forest business, such as LB International's business park initiative in Winslow, Arizona, the proposed APS biomass plant in Flagstaff or Bellemont, and other projects yet to be developed. In the long run, FREC will help introduce models of economically and ecologically sustainable forest use to the region that will help protect community values that are currently at great risk from catastrophic wildfires.

NAU Environmental Learning Center

This is a faculty and student designed educational facility that includes a campground, group camping area, and summer camp. The Camp will be designed around a theme of re-connecting people with the forest with target clientele such as NAU Alumni, elder hostel, Native American youth groups, Environmental Science Day Camp, public schools, 4-H, and others. Campground management would follow the Inn at NAU model of active involvement of students in teaching labs, and student employment. The facility would serve as an overnight site for the summer Centennial Forest volunteer program and internships in Parks and Recreation Management.

The campground would include a 30-person group campground facility with an adjacent amphitheater and ramada, which would support some activities of the environmental education camp. In addition, 30 individual camping sites would be divided into car, RV, and primitive camping sites. Five hogans would be used for summer programs, and a multi-purpose log building with kitchen facilities would serve as the central focus area. This facility could also be used for faculty retreats, university receptions, and potentially public rental during the off-season.

Centennial Forest Retreat Center

Eventually serving as the headquarters for the Centennial Forest, this facility would provide for field based environmental education activities, conferences, and retreats. Management would follow the "Inn at NAU Model" with technical assistance from the NAU Hotel and Restaurant Management Program. The retreat center will be a traditional malpais rock and ponderosa pine handcrafted log building that incorporates the environmentally appropriate use of ponderosa pine from ecological restoration thinnings. The building would include a covered entrance leading into an open foyer/reception area suitable for permanent museum quality displays or temporary poster displays such as those in most scientific meetings. Past the foyer would be the main multi-purpose meeting room, with a malpais rock fireplace, and room enough for 100 people. Adjacent to the multi-purpose room would be a partially covered patio suitable for outdoor dining and receptions. The facility would be fully handicap accessible and would include a full kitchen suitable to serve meals for 150, a Centennial Forest office, a small conference room for 20 that is adaptable for use by school children, a classroom with 12 computer stations, two guestrooms, and a small laundry facility for use by all overnight guests at the campus. A second conference room would offer magnificent views of the surrounding forest and afford an unparalleled meeting room for groups as large as the Arizona Board of Regents.

Overnight Guest Lodging

Guest cabins/hogans would serve as the major overnight accommodations for researchers, lecturers, conference attendees, and other Field Campus visitors. They would consist of a series of hand crafted, log cabins or traditional hogans located near the Environmental Learning Center. These guest lodges would be designed and managed so as to create an upscale premier facility that would be highly attractive to visiting scholars, potential donors, and the general public. A modular design would allow for Alumni, donors, or student groups to raise funds or participate in construction of named cabins. The cabins, designed with one, two or three bedrooms, would serve as a forest retreat free of disturbances such as phones and

television. Here visitors could enjoy a tranquil rural setting with extensive walking trails, easy access to primitive old growth ponderosa pine, magnificent views of the escarpment and San Francisco Peaks, and access to premier conference and research facilities. These cabins would be ideal for business meetings, retreats, weddings and small conferences. One cabin would house a resident campus manager/caretaker.

Connections

The Centennial Forest Field Campus will maintain strong relationships with the Arboretum at Flagstaff and the greater Flagstaff Community. The Arboretum at Flagstaff (AAF) is an adjacent property owner to the Centennial Forest Field Campus. A new Horticulture and Research Center is planned by AAF and is physically located very near to our proposed research/teaching facility. It is expected that staff at AAF will have joint use rights to the Field Campus including use of overnight facilities, environmental center, and overnight cabins by staff and visitors of the Arboretum. NAU students would be given access to horticultural plantings for educational purposes such as field trips. A broad memorandum of understanding will be developed to outline shared uses.

The Flagstaff community would also have functional connections to the Centennial Forest Field Campus. Community leaders currently serve on our Advisory Committee and would provide input on policy for Field Campus use. Adjacent forest areas will be treated to achieve fuels reduction and reduced wildfire risk to the city of Flagstaff. Several of the Centennial Forest facilities would be open for public use (with compensation) and special community events could be held on a cost reimbursement only basis. The reception/foyer area at the Environmental Learning Center could provide general information about Flagstaff attractions and could serve as a satellite for the Flagstaff Visitor Center. Partnerships could also be developed with Coconino County, Forest Service, Arizona State Land Department, and the State of Arizona.

Various entities within Northern Arizona University could also benefit through partnerships with the Centennial Forest Field Campus. These could include Hotel Restaurant Management, College of Business Administration, Communications, Environmental Sciences and Engineering, Civil Engineering, Construction Management, and Planning, School of Nursing, to name a few.

IMPLEMENTING, MONITORING, AND UPDATING THE STRATEGIC PLAN

Implementation

The School of Forestry Strategic Plan summarizes the current direction and plans for the future direction over the next five years. As the strategic plan is a living document, the current direction and much of the future direction is currently being implemented. To have successful implementation of any plan, three interrelated components must be in place: responsibility, authority, and accountability. Someone or some group must be assigned the responsibility of

implementing a course of action. They must be given the authority to obtain the resources to carry out the task. And they must be held accountable for the success of the implementation. The absence of any one of these components can lead to the failure of implementation.

To continue successful implementation of this strategic plan, this section will specify individuals and groups who have the responsibility and authority, and will be held accountable for current and future tasks in the plan. Many of these tasks are currently being accomplished by committees as detailed in the "University, School, and Department Standing and Ad Hoc Committees Policy, Membership, and Procedures Manual," August, 1994. These responsibilities will be briefly discussed. The focus of this section will be on those current and future tasks that require changes or additional effort.

Overall Responsibility

The School's Director has the overall responsibility for implementing, monitoring, and updating the strategic plan. The authority for these tasks is granted by the School's Faculty. The Director will ensure that responsibility for tasks is delegated, authority is granted, and accountability procedures are in place. The Director will monitor the plan's implementation and initiate revisions and updates as indicated by the monitoring results. The annual performance evaluation of the Director will provide for accountability. Specific questions regarding the Director's role in implementing, monitoring, and updating the strategic plan should be included in the evaluation form.

Undergraduate Education -- The professional forestry degree. The School's innovative teaching approach requires ongoing review and evaluation to ensure it continues to meet the goals of providing an integrated education while meeting professional standards. The overall responsibility for the undergraduate curriculum rests with the curriculum committee which consists of the coordinators of each professional semester plus the Coordinator of Academic Programs. This committee has the responsibility to review current curriculum and recommend changes to the faculty at large. To ensure integration in our team-taught professional courses (Semesters A, B, C and D), the faculty have adopted an adaptive curriculum design approach. The committee reviews and revises the curriculum as needed.

Graduate Education. The Graduate Studies Committee under the leadership of the Coordinator of Graduate Programs has the ongoing responsibility to review graduate programs and recommend changes to the faculty.

Research. The responsibility, authority and accountability for research rest with all faculty with a research appointment. Support for research must be continued to maintain the success of our program. The School's Director will ensure that there are accountability procedures in place to complement the evaluation of faculty's contribution to research such as changes in a faculty member's appointment teaching-research-service allocation based on performance criteria.

Monitoring

The School of Forestry Strategic Plan requires ongoing monitoring to ensure the School is moving toward its goals. Monitoring is also required to ensure successful implementation, to provide a basis for accountability, and to recognize changes that require plan revisions and updating. The School's Director has the overall responsibility for monitoring the strategic plan implementation and success. If monitoring is to provide information on how well the School is meeting its goals and implementing the Plan's future direction, goal and evaluation criteria are needed.

STAFFING NEEDS

Implementation of our goals will require additional faculty and staff in the School of Forestry. Below is a draft list of new positions needed to fully implement our strategic plan.

- 1 Associate Director of the School of Forestry (80% administration/20% teaching)
- 3 faculty to support instruction of more undergraduates and expansion of research
- 2 staff to support distance learning
- 1 director and 2 staff for the Centennial Forest
- 1 director and 2 staff for the Ethnic and Cultural Diversity Program
- 6 PhD Teaching Assistantships

Procedures for Selecting New Faculty and Staff Positions:

1. School Director informs faculty when any new position is available.
2. School Director asks faculty to identify any new "needs"
 - a. Needs should include a justification, a listing of the proposed teaching assignment, proposed teaching/research/service time appointment, and research area.
 - b. Needs may include those which were identified but not filled in a previous needs assessment.
 - c. All new position proposals are initially reviewed by the Committee on Faculty Status for completeness and to assure that all potentially valuable positions are included.
 - d. All new position proposals are distributed to the faculty.
3. Faculty rank the positions from highest to lowest.

4. School Director or his designee compiles responses and reports back to Faculty, regarding which position has the most support and the full ranking of the positions that were evaluated.
5. Faculty and Director review the results and select the position to be filled.
6. Unfilled needs are put un-prioritized into the current Strategic Plan.

INFRASTRUCTURE NEEDS

Our space in the Southwest Forest Science Complex is not adequate for our programs now or in the future. The anticipated move of the Departments of Geography and Public Planning, Applied Indigenous Studies, and the Grand Canyon Semester from the Southwest Forest Science Complex to other buildings on campus will provide some of the space we require. However, more space will be needed, and thus we seek to develop funding to build an addition to the Southwest Forest Science Complex to provide needed offices, classrooms, and research laboratories. We estimate approximately \$12 million in building costs, and another \$4.5 million to equip and supply the addition. We anticipate some combination of federal, state, and private funding for the addition. Moreover, completion of education and research facilities on the NAU Centennial Forest will require approximately \$7 million. Funds for the Centennial Forest facilities will be sought from a combination of a decision package to the Arizona State legislature, NAU facilities master plan, and private sources.

**Appendix A10:
Proposal for Becoming a Top-Ranked Forestry Program in the
United States: A Foundation for Excellence**



**NORTHERN ARIZONA
UNIVERSITY**

College of Engineering, Forestry & Natural Sciences

School of Forestry



**Proposal for Becoming a
Top-Ranked Forestry
Program in the United States:
A Foundation for Excellence**

December 7, 2010

Table of Contents

Introduction	2
The NAU School of Forestry	2
A Brief Overview of Other Forestry Programs	3
Ranking of Forestry Programs.....	4
A Proposed Approach to Becoming a Top Ranked Forestry Program.....	6
Strategies for Achieving each Criterion/Performance Indicator.	8
Strategies for Raising the Profile of the School of Forestry.....	13
What do we want to be known for?.....	14
Benefits to CEFNS and NAU.	15
Potential Barriers to Achieving the Goals in this Plan.	15
Literature Cited.	16
Appendix 1: Proposed New Faculty Positions	17

Introduction

The faculty and staff of the School of Forestry have spent considerable time thinking about the possibility of becoming one of the top ranked forestry programs in the United States. Included in our analysis was some thought about what it really means to be a top ranked program (i.e., the appropriate criteria for determining this) and what it would actually take for the School of Forestry to meet those criteria.

Paul Jagodzinski, Dean of the College of Engineering, Forestry and Natural Sciences (CEFNS) originally raised the idea of seeking to become one of the top ranked programs in the nation (and perhaps the top ranked program) for two primary reasons. First, he recognizes that our forestry program is quite strong and is already ranked highly. Second, he believes that, with fewer programs to compete against than say, Biology, there is a more realistic chance of the School of Forestry reaching the top national ranks than for any other program in CEFNS.

There is no doubt that our program is strong and thriving. Enrollment is trending upwards at both the undergraduate and graduate levels, research productivity (in dollars, number and diversity of grants, publications, presentations, citations, etc.) is high, student clubs are large and active, we've had two very good years for donations recently, and our national profile seems to be increasing. While the faculty and staff recognize that there are formidable challenges to achieving the goal of becoming a top ranked forestry program in the U.S., they agree that it is a very worthy goal.

The NAU School of Forestry

The forestry program at what was then called Arizona State College (ASC) was initiated in the fall of 1958. President J. Lawrence Walkup, in his memoir entitled *Pride, Promise, Progress: The Development of Northern Arizona University*, credited the creation of the School of Forestry with being the first key step in the process of transitioning from a college focused on training teachers to the multi-purpose university that NAU is today.

The School of Forestry is widely regarded as one of NAU's premier academic programs. It also enjoys a national reputation as a source of both well-prepared graduates and of high quality information on the ecology, restoration and management of forests.

The School of Forestry is nationally known for its unique approach to undergraduate forestry education, which is often referred to as the "Integrated Curriculum." This curriculum was initiated in 1972, and originally involved three, and now four, intensive semesters taught during the junior and senior years. Instead of single, discipline-specific courses, large blocks of time are devoted to team-taught and integrated instruction. In

addition to the academic benefits that the Integrated Curriculum provides, it also provides less tangible benefits, of which the greatest may be that it allows for particularly strong and long-lasting bonds to be formed between students. Our students work together intensively throughout the last two years of their program, including spending substantial amounts of time working together as crews both in the classroom and in the field.

While the Integrated Curriculum is the centerpiece of the undergraduate forestry program, pre-professional coursework and the various forestry-related extra-curricular activities offered are also vital parts of the students' educational experience. The Forestry Club, *Xi Sigma Pi*, the Student Association for Fire Ecology, and the Timber Sports Team are some of the options that are available to our students, and the activities of these organizations contribute significantly to the sense of community that we seek to cultivate within the school.

The undergraduate program remains one of the features of the School of Forestry for which it is best known, though the increasing research productivity of the school's faculty and graduate students is also beginning to gain substantial recognition. Two recent studies of research productivity both ranked the School of Forestry in the top ten nationally among forestry schools, based on its per capita productivity as judged by research publications, citations of those papers by other scientists, grants received and other factors. Part of this increase in productivity has been driven by the creation of the doctorate program in forestry, which began in 1994. The construction of the Southwest Forest Science Complex in 1992, which greatly expanded the amount of lab space available to faculty and students, and the creation of the 47,000+ acre Centennial Forest in 2000, have also been important developments in support of our research program. Finally, the school has benefited from productive partnerships with the Forest Service's Rocky Mountain Research Station and the Ecological Restoration Institute, both of which have numerous personnel housed in the Southwest Forest Science Complex. The concentration of forestry researchers in the Southwest Forest Science Complex and the greater Flagstaff area helps create an activity level and synergies that are comparable to some of the other centers of western forestry research, such as Corvallis, Missoula and Fort Collins.

A Brief Overview of Other Forestry Programs

There are 46 baccalaureate programs nationwide that are accredited by the Society of American Foresters (SAF), three that currently have candidate status for accreditation, and another three programs that are accredited only at the Master's degree level. A list of the SAF accredited programs is available at:

<http://safnet.org/education/handout2009Accr.pdf>. The National Association of University Forest Resource Programs (NAUFRP) has a more extensive list of members,

which currently includes 69 institutions (<http://www.naufrp.org/members.asp>). With the addition of some colleges and universities that are neither SAF-accredited nor members of NAUFRP, there may be roughly 75 forestry programs nationwide.

The majority of university forestry programs are offered at land grant institutions. For example, 33 of the 46 SAF accredited undergraduate programs are offered by land grant institutions. Most of the rest are offered at other major state universities. Of the three SAF-accredited programs at the Master's level only, one is at a major state university (University of Washington) and the other two are at major private universities (Yale and Duke).

As might be expected based on their locations at land grant institutions or other major universities, many forestry programs are considerably larger and better funded than ours. Oregon State University, for example, has an entire College of Forestry, which consists of three separate departments, more than 65 tenured/tenure-track faculty, more than 120 other people with non-tenure track faculty status, a large support staff, a large extension and outreach program, and a large (\$60+ million) endowment. A sense of the scale and operations of the OSU College of Forestry can be obtained by glancing through their most recent report to the provost (http://www.cof.orst.edu/news/Forestry_ProvRpt0809_final.pdf).

Ranking of Forestry Programs

Currently, there is no formal or widely accepted ranking system for forestry programs. The ranking that may come closest to this was a list of the top 25 forestry research programs in North America based on the perceptions of forestry deans, directors and chairs reported by Laband and Zhang (2006), which did not even include NAU among the top 25 (Table 1). While only 18 of the 53 deans, directors and chairs surveyed by Laband and Zhang actually responded, this still may indicate that the NAU School of Forestry has a ways to go, based on the perceptions of other forestry program heads.

Table 1. The top 25 forestry research programs in North America based on a "perceptions-based composite score" (Laband and Zhang 2006).

1. Oregon State University	14. University of Maine
2. Virginia Tech	15. University of Wisconsin -
Madison	
3. North Carolina State University	16. Clemson University
4. University of Georgia	17. Purdue University
5. University of Washington	18. Mississippi State University
6. University of Minnesota	19. Texas A&M University

- | | |
|-----------------------------------|---|
| 7. SUNY – ESF | 20. Duke University |
| 8. University of British Columbia | 21. Yale University |
| 9. University of Florida | 22. University of California - Berkeley |
| 10. Pennsylvania State University | 23. University of Montana |
| 11. Auburn University | 24. University of Idaho |
| 12. Colorado State University | 25. Louisiana State University |
| 13. Michigan State University | |
-

While the only perceptions-based ranking system we are aware of did not rank NAU among the top forestry research programs, the School of Forestry ranks much better in studies that take a more objective look at research productivity, especially in terms of per-capita research productivity and impact. Laband and Zhang (2006), for example, ranked NAU as 6th among 53 programs in terms of the number of citations of its faculty members' papers on a per-capita basis. In other words, an individual faculty member's research at NAU, on average, is having a higher impact than the faculty at most other institutions.

Perhaps the most comprehensive and objective rating system that includes forestry programs is the Faculty Scholarly Productivity Index. The Chronicle of Higher Education described the approach used for compiling this index thusly: "Take the number of professors in a given program, the number of books and journal articles they have written, the number of times other scholars have cited them, and the awards, honors, and grant dollars they have received, and plug all those into a neat algorithm." The most recent ranking available to us is for 2007, and it ranks NAU 10th among forestry programs in the U.S. that offer a graduate degree (Table 2).

Table 2. Top 10 U.S. forestry research programs in terms of per capita faculty productivity, according to the Faculty Scholarly Productivity Index (2007).

- | | |
|--------------------------------------|--|
| 1. Michigan Tech University | 6. Colorado State University |
| 2. Yale University | 7. University of Massachusetts |
| 3. Michigan State University | 8. University of Washington |
| 4. University of Wisconsin – Madison | 9. West Virginia University |
| 5. Oregon State University | 10. Northern Arizona University |
-

Unfortunately, the NAU forestry program was not included in the recent study of doctoral programs conducted by the National Research Council. This may be another opportunity for periodic evaluation of our research and graduate programs, if it is possible to be included in future versions of this study.

A Proposed Approach to Becoming a Top Ranked Forestry Program

The faculty and staff of the School of Forestry propose to become a top ranked program based on a selected set of objective and relatively easily determined criteria, which are described below. However, in addition to these criteria, it is unlikely that the School of Forestry will be widely regarded as a top program unless we also do more to raise our national profile, with special attention to how we are perceived by our peer/competitor institutions and by the employers of our students. A strategy for increasing our national profile is therefore also included.

Rating Criteria:

We propose to define a top ranked program based on a limited set of criteria that: (1) are objective and measurable, (2) reflect our core mission, (3) address key elements of NAU's strategic plan, and (4) include measures of performance at both the graduate and undergraduate levels. The criteria we propose to use include:

1. **Total undergraduate (B.S.F.) enrollment and number of graduates:** From what we have been able to determine the School of Forestry has a total enrollment at the undergraduate level in forestry or forest management (as opposed to related majors such as natural resources, wildlife management or forest engineering) that is already in the top ten and perhaps even in the top five nationwide. Total enrollment is an important measure, but our ultimate goal is to ensure that our students complete their B.S.F. degree program successfully and are well prepared for employment. While we can easily track our own graduation numbers, it is much more difficult to obtain this for other institutions than it is to obtain total enrollment information.

Performance Indicators:

- **Maintain total undergraduate enrollment above 175 students (Fall 21-day census)**
 - **Beginning with the 2011/2012 academic year, maintain a rolling three year average of at least 35 B.S.F. graduates per year**
2. **Total undergraduate (B.S.F.) enrollment of Native American students and number of graduates:** In general, we would like to become widely known as a welcoming school for minority students of all types and as the "go-to" institution for organizations interested in hiring very well educated, diverse students. More so than criteria based solely on Native American enrollment, this would be important

nationally. Given our location, however, we want to make a special effort to serve Native American students.

Reliable data on Native American enrollment is somewhat hard to find, but it seems clear that we already rank highly in this criterion⁵. At a NAUFRP meeting in 2006, it was reported that there were less than 25 Native American students enrolled in forestry programs nationwide. While we know the number is higher than that, it is likely to be less than 100 students, of which perhaps 25% may be at NAU. These goals also fit well with both our location and NAU's strategic plan.

Performance indicators:

- **Beginning with the 2011/2012 academic year, maintain total Native American undergraduate enrollment above 20 students (Fall 21-day census)**
- **Beginning with the 2012/2013 academic year, graduate at least 5 Native American students every year**

3. **Graduate program enrollment and number of graduate students:** Our graduate program has grown in recent years both in the number of degrees offered (M.F., M.S. and Ph.D.) and in the number of students (typically around 60-70). While this is already comparable to many forestry schools and we are nearing capacity for things like office space, we propose to continue to grow the program somewhat further over the next several years. While we will make efforts to increase both M.F. and M.S. enrollment, our focus for the purposes of this plan will be on the Ph.D. program.

Performance indicators:

- **Beginning with the 2012/2013 academic year, maintain a three-year rolling average of at least 10 Ph.D. graduates per year**

4. **Research productivity on a per-capita faculty basis:** As mentioned earlier, the School of Forestry has been found to be among the most productive forestry research programs in the nation when compared on a per capita basis. To the degree possible, we propose to rely on the Faculty Scholarly Productivity Index (FSPI) and possibly future National Research Council reports to measure this in comparison to other forestry programs. The FSPI is a commercial service that assesses universities with graduate programs in a wide variety of disciplines, including

⁵ Probably the Food and Agricultural Education Information System (FAEIS) will have the most information on this, but reporting by institutions to FAEIS does not seem complete.

forestry. It is a seemingly good instrument because it combines traditional measures of research productivity (number of publications and federal grants) with measures of research impact (number of times publications are cited and number of awards received by the faculty). Indirectly, it is also a reflection of the quality and productivity of our graduate program, since many of the publications, grants, etc. are tied to graduate student projects.

Performance indicators:

- **Beginning immediately, maintain a three-year rolling average of at least 50 peer-reviewed publications per year with T/TT faculty authorship (or around 2.5 publications/faculty member/year)**
 - **Beginning with the 2011/2012 academic year, produce at least three significant review papers per year that demonstrate faculty leadership and expertise in specific forestry-related areas (and that also tend to generate higher numbers of citations)**
 - **Beginning with the 2012/2013 academic year, maintain an external grant portfolio that includes at least 40 grants and a total amount of \$5 million (or around \$250,000 per T/TT faculty member)**
5. **School of Forestry Endowment:** The top forestry programs all are believed to have substantial endowments, which include scholarships, fellowships, endowed chair and professor positions, and endowments for purposes such as operating specific academic programs, school forests, etc.

Performance indicators:

-
- **By the end of 2015, increase the School of Forestry's endowment from approximately \$1.5 million to \$5 million**
- **By the end of 2015, establish at least two endowed chair or distinguished professor positions**
- **By the end of 2015, establish at least one endowed account for the Centennial Forest**

Strategies for Achieving each Criterion/Performance Indicator

For each of the three criterion described above, we have developed a number of proposed strategies. We have divided these into short-term strategies (things to

implement immediately or within the next two years) and medium-term strategies (things to implement over the next 3-5 years).

Criterion 1: Total undergraduate (B.S.F.) enrollment

Short-Term Strategies⁶:

1. Maintain Student Services Coordinator position (this is an existing position; while it does have a significant cost, it is not a new cost).
2. Ensure that the Student Services Coordinator is provided with a part-time student worker to assist with maintaining the jobs list, help with various recruiting and retention events, and other duties (again, this is a current, not a new, cost and is borne by the School of Forestry).
3. Continue to refresh and improve the School of Forestry's website and, in particular, its appeal to prospective students.
4. Continue to refresh and improve the School of Forestry's participation in Open House and Orientation events.
5. Continue to refresh and improve the School of Forestry's recruiting materials, including brochures, folders, displays, etc.
6. Expand our recruiting materials to include use of videos on our website and on YouTube.
7. Continue to support community-building/retention-improving activities, including the Centennial Forest Campout, student clubs and the Tree House learning community.
8. Maintain close contact with employers in order to continually assess how well our students are prepared, to keep up to date on employment opportunities, etc.
9. Solicit suggestions for recruiting, assistance with videos, etc. from current students.
10. Work with NAU admissions personnel to find ways to increase the number of out-of-state students.

Medium-Term Strategies:

1. Complete articulation agreements with at least five key feeder institutions.
2. Offer on-line versions of all pre-professional forestry courses and/or arrange to have some of these courses taught at the key feeder institutions.

⁶ Given recent positive trends in enrollment, these short-term recommendations are mainly about preservation of existing capacity and ensuring that we keep current recruiting- and retention-related activities "fresh."

3. Offer on-line versions of up to four more upper division courses to help students maintain good progress despite the scheduling challenges associated with our professional program.
4. Revise the professional program and/or devise means to increase the capacity in our professional program courses (Semesters A-D).
5. Create more and larger endowed scholarships designed to help recruit and retain students at financial risk.

Criterion 2: Total undergraduate (B.S.F.) enrollment of Native American students

Short-Term Strategies:

1. Survey (or conduct a facilitated discussion with) existing Native American forestry students to determine how they see the program and how it could better meet their needs.
2. Sponsor periodic events (e.g., the breakfasts that Thom Alcoze used to organize) for current Native American students.
3. Ensure that each Native American student is approached at about mid-year to see if s/he has summer employment in forestry and help them to find a job if they don't (assuming they want one).
4. Visit SIPI and other key feeder schools at least once per year.
5. Submit grant proposals in response to funding opportunities aimed at scholarships or other forms of assistance for Native American (and other minority) students.
6. Develop highly visual brochure targeted to Native American high school students and disseminate it widely.
7. Identify current Native American students who would be willing to attend recruiting events and participate in career fairs.
8. Expand on current efforts to work jointly with state and federal government agencies to recruit Native American students and place them once they graduate.

Medium-Term Strategies:

1. Develop a system specifically for advising current Native American students and identifying any early warning signs.
2. Create more and larger endowed scholarships designed specifically to help retain Native American students at financial risk.
3. Re-establish the Native American Forestry Program, or at least hire a part-time advisor to work specifically with Native American students.
4. Develop network of Native American School of Forestry alumni who would work with us by attending recruiting events, speaking to high school classes, giving guest lectures to current forestry students, etc.

Criterion 3: Graduate program enrollment and number of graduate students

Short-Term Strategies:

1. Encourage faculty to submit more proposals for support of Ph.D. students.
2. Offer Ph.D. students more opportunities to gain teaching experience (and make this known to prospective students).
3. Shift the balance of McIntire-Stennis supported projects towards ones that support Ph.D. students.
4. Encourage top M.S. students to stay and pursue a Ph.D.

Medium-Term Strategies:

1. Develop fellowship program(s) to encourage recruitment of top level graduate students.

Criterion 4: Research productivity on a per-capita faculty basis

Short-Term Strategies:

1. Maintain and enhance research support positions (e.g., IT Manager, Centennial Forest Manager, Vehicle and Equipment Manager).
2. Encourage faculty to get additional training in grant writing and to write more proposals for federal funding (NSF, USDA-AFRI, etc.), including by providing in-house training opportunities such as short workshops or presentations at faculty meetings.
3. Keep the faculty well informed about funding opportunities and trends.
4. Encourage and facilitate the creation of inter-disciplinary teams to seek funding for the larger and longer term projects that will be offered by NIFA, NSF, etc.
5. Encourage faculty to submit their manuscripts to the highest impact journals possible, given their respective sub-disciplines and the type of manuscripts they have to submit.
6. Allow the School of Forestry to use its existing workload policy, which has historically allowed us to allocate faculty time more to research or teaching, depending on an individual faculty member's interests and talents.
7. Allow more flexibility in assigning workloads to junior faculty than has been allowed in the past. This might mean shifting some junior faculty from the "traditional" 60-30-10 (teaching, research, service) assignment to one with a higher percentage of research.
8. Work with the ERI to ensure that as much of their productivity as possible is counted as School of Forestry productivity (i.e., work to ensure School of Forestry authors are on all appropriate ERI publications, etc.).

9. Ensure that more graduate students publish their work, ideally with School of Forestry faculty as co-authors.
10. Encourage more faculty to participate on grant review panels.

Medium-Term Strategies:

1. Build the faculty to a size that ensures greater depth in some areas and that all the major sub-disciplines are represented. A list of the sub-disciplines needed for a “full-strength” forestry program is provided in Appendix 1.
2. Recruit a moderate number (~5) of research faculty members, with an emphasis on individuals who would collaborate with existing tenure-track faculty and who have good prospects for bringing in sustained research funding, including their own salaries.
3. Obtain funding for a new, high-profile center, institute or program to be based within the School of Forestry. A couple of ideas include the “Kyl Forest Bioenergy Center,” and the “McCain Center for Ethnic and Cultural Diversity in Forestry.”
4. Explore opportunities to collaborate with the U.S. Agency for International Development through university programs or as part of an Indefinite Quantity Contract Consortium.

Criterion 5: School of Forestry Endowment

Short-Term Strategies:

1. Work with Development Officer, Dean, faculty and staff to develop a specific list of development needs and priorities.
2. Take at least two trips per year with Development Officer to meet potential donors.
3. Get faculty and staff more involved in development, including visits to potential donors and by offering some basic development training to faculty and staff members.

Medium-Term Strategies:

1. Establish at least one *fellowship* program designed to attract top graduate students.

Strategies for Raising the Profile of the School of Forestry

As mentioned above, the School of Forestry seems to perform better when judged on objective criteria than many other forestry programs, but nonetheless seems to be perceived by its peer institutions as lower in rank than it should be. Less is known about how we are perceived by employers relative to other forestry programs, but anecdotal information suggests we are quite highly rated in this regard, especially by our major employers such as the US Forest Service.

In the past, we simply haven't made as much effort to publicize our accomplishments as many other forestry programs. It also seems likely that our faculty members are a less frequent presence at some types of meetings and events (and in certain types of roles) than we should be if we want to be perceived by our peers and the employers of our students as a major program at the national and international levels.

Short-Term Strategies:

1. Continue to regularly publish the *Forest Seasons* newsletter. Include NAUFRP members on mailing list.
2. Work with NAU, ERI and other public relations personnel to get the School of Forestry message out more often and in higher profile outlets.
3. Hire our own public relations person to develop stories and to improve our newsletter. This might have to be a part-time position or work done on a piece-meal basis, or perhaps this could be combined with another staff function to make a full-time position.
4. Play a bigger role in next year's SAF convention in Albuquerque than already anticipated.
5. Get more School of Forestry faculty to serve as reviewers for professional journals.
6. Raise the profile of our SAF student chapter even further by creating a high quality student chapter website.
7. Reach out more to School of Forestry alumni. Make sure they are informed and ask them to help spread the word about our school, help recruit students, etc.
8. Begin efforts to recruit more international students at the undergraduate level, through targeted advertising and closer coordination with NAU's Center for International Education and its international student recruiters.

Medium-Term Strategies:

1. Get more School of Forestry faculty into high profile and national-level positions with key professional organizations. We have done better recently with some organizations (e.g., the Society for Conservation Biology and the Wildlife Society) than we have with the Society of American Foresters.

2. Get more School of Forestry faculty to serve as editors or associate editors of professional journals.
3. Get more faculty to serve on SAF accreditation teams and as external reviewers for other university forestry programs.
4. Increase faculty participation in international activities, including research, teaching and consulting.
5. Highlight and build on our international activities, including the Peace Corps Masters International program and the International Seminar on Forest Administration and Management.

What do we want to be known for?

To help raise our profile, it might be useful to have some “30-second elevator messages” that could be delivered to people that would quickly summarize our program and why it is so good. The actual message delivered in any one case might vary considerably depending on the audience, and could be student-oriented, research-oriented, etc. Here are a few suggestions for what could be part of those messages:

1. We’re one of the “biggest and best” – one of the biggest undergraduate forestry programs and one of the best all-around research programs (on a per capita basis) in the U.S.
2. We have a diverse student body, with about 21% minority students and 29% female students for the school as a whole (undergraduate and graduate combined).
3. A unique curriculum, with its integrated professional program and requirement to also complete a specialized certificate.
4. Our research is having an impact from our own backyard to countries in Latin America, Africa and elsewhere around the world, and we are able to bring that experience and expertise directly into the classroom.
5. Our highest impact research is in the areas of forest ecology and restoration, conservation biology, forest health, fire ecology, and climate change/carbon issues.
6. We are co-located in the same building with two research and outreach powerhouses – the Rocky Mountain Research Station and the ERI.
7. We are working on some of the most important issues of today and for tomorrow... climate change, carbon cap-and-trade issues, etc.
8. We have a school with lots of positive energy and a sense of community.

Benefits to CEFNS and NAU

If this plan was to be successful, or even close to fully successful, there would be numerous benefits to both CEFNS and NAU as a whole. Some of these include:

1. A “Point of Pride.” Liz Grobsmith once told the School of Forestry faculty and staff that the school was one of NAU’s “jewels in the crown.” This would even more clearly be the case in the future, especially when it is shown that we (NAU) can compete so well against flagship and other major universities.
2. Healthy enrollment at both the undergraduate and graduate levels. While forestry will never be the biggest program on campus, strong enrollment clearly is a benefit to the college and university, perhaps most so at the graduate (and especially Ph.D. levels).
3. Considerably more research dollars and indirect cost returns for the college and university.
4. A record of service to the state of Arizona that can be touted to legislators and other key decision makers.
5. A record of service to Native Americans (both to students and, through our increased research and associated outreach, to the tribes) that also can be touted to legislators and other key decision makers.

Potential Barriers to Achieving the Goals in this Plan

While the School of Forestry’s faculty has been remarkably productive in research and in the classroom, there are some potential barriers to further progress that need to be considered and, ideally, addressed. A key consideration is that our faculty salaries are lower on average than for virtually all of the other western forestry schools⁷; this could conceivably be incompatible with the goal of becoming the #1 forestry program in the nation. Our relatively low salaries have resulted in the loss of several highly productive faculty members in recent years and have also impacted our ability to recruit new faculty. Other significant challenges include (1) teaching-related responsibilities that are almost certainly higher than at most of the other top forestry schools, (2) the recent decline in the number of faculty and staff within the school, and (3) the recent decline in funding provided by the university. The School of Forestry faculty and staff share a common desire to be among the very top ranked forestry programs nationwide and hope that these potential barriers, some of which are by no means unique to NAU, will not prevent this goal from being achieved.

⁷ See the data presented at <http://faculty.washington.edu/bare/naufrpsurvey.html>.

Literature Cited:

Laband, D.N. and D. Zhang. 2006. Citations, publications, and perceptions-based rankings of the research impact of North American forestry programs. *Journal of Forestry* 104(5): 254-261.

Appendix 1: Proposed New Faculty Positions

As mentioned in the “Brief Overview of Other Forestry Programs” section, many forestry programs have a larger faculty than ours. In Table A-1, the size of the faculty of the top five programs based on the “perceptions-based composite score” of Laband and Zhang (2006) is listed, along with the NAU School of Forestry for comparison.

Table A-1. Size of the faculty (tenured or tenure-track only) at the NAU School of Forestry and the five top ranked programs based on the “perceptions-based composite score” of Laband and Zhang (2006). Faculty numbers were determined from each program’s website.

University	Number of Faculty	Comments
Northern Arizona University	21	School of Forestry, including Executive Director.
Oregon State University	60	Includes the Department of Forest Engineering, Resources and Management and the Department of Forest Ecosystems and Society. There is one other department in the College of Forestry.
Virginia Tech	32	Includes only the Department of Forest Resources and Environmental Conservation. The College of Natural Resources has three other departments.
North Carolina State University	42	Includes only the Department of Forestry and Environmental Resources. The College of Natural Resources has two other departments. Does not include faculty listed in positions such as “Associate Dean” or “USDA Associate Professor.”
University of Washington	42	School of Forestry, formerly the College of Forestry and now part of the College of the Environment.
University of Georgia	46	Warnell School of Forestry and Natural Resources. A stand-alone unit. Does not include dean and associate deans.

It should not be hard to imagine that, given the larger size of the other faculties listed in Table A-1, that they have more forestry sub-disciplines represented in their programs than we do. While we realize that we will not be as large as these programs in the

relatively near future, and perhaps ever, it should be clear that to be regarded as a top program we need to be bigger than we are now.

We have developed a list of eight disciplines that we believe are important to have and that would clearly make us stronger, and have briefly described them below. In some cases we already have some capacity in the areas listed -- in those cases we have outlined the reason why we think greater capacity is important. The positions are not listed in a priority that has been decided upon by the faculty as a whole.

1. Soils/Ecosystem Ecology: Soils are the substrate on which all forests grow. They also are critical for many other reasons; one of the most recent to be a subject of considerable research is their role in carbon storage. The person who last occupied this position was able to bring in large federal grants and advise about six graduate students at a time. Losing the position entailed a significant loss of capacity for research and graduate student advising. This is the position that was voted on by the faculty as its highest priority during the fall of 2008; a search process was begun but halted just before the position was advertised.

2. Fire Management/Ecology: Although we have one full-time fire ecologist, another tenured faculty member who also does research in this area, and a part-time non tenure-track faculty member with this type of expertise, we could really use more. This is a sub-discipline for which we should really be one of the top institutions in the U.S., given our location. We also have a larger outreach program in wildland fire ecology and management than any other area.

3. Forest and Natural Resources Policy: Modern forestry is as much (or more) about working with people and resolving conflicts as it is a technical issue. All other major forestry programs have forest and natural resource policy faculty, and we no longer do.

4. Wood Utilization, Forest Products, and/or Forest Enterprises: The School of Forestry has no active research in the area of wood utilization or forest products. In order to more effectively serve the state of Arizona, we need to be able to help promote forest products and bioenergy industries, ideally ones that could make use of all the small diameter wood that is available and that really needs to be removed from so many of our forests.

5. Ecological Statistics/Modeling: An ecological statistician/modeler would be in a position to work quite effectively with our ecologists (and those in other departments) on a wide variety of cutting edge issues. The success of most research projects depends on sound consultation and collaboration with statisticians. NAU's current capacity in ecological statistics is insufficient considering the large amount of research at the University. Modeling of ecological processes and social behavior over forest landscapes and into the future is essential for current and future policy decisions, yet, NAU has little capability in this area.

6. International Forestry: While we have faculty that do work in other countries, we don't have a full-time faculty member dedicated to this type of work. Major opportunities exist to attract funding, attract international graduate students, and conduct research on topics as diverse as carbon offset plantations, international trade in forest products (including timber and non-timber products), community forestry and agroforestry.

7. Ecological Genetics: A faculty member with expertise in this field would be an excellent complement to existing faculty in the School of Forestry, Biological Sciences, and the School of Earth Science and Environmental Sustainability who are working on issues related to biodiversity, endangered species protection and ecosystem management. It would also help build on NAU's already strong reputation for research in the field of conservation biology.

8. Forest Meteorology/Climatology: In this era of climate change, with its potentially profound impact on southwestern forests, a faculty member in this area would be able to develop a large and highly relevant research program. This is another position that would almost certainly be of considerable benefit to faculty and students in other departments, virtually all of which are in CEFNS.