



Cooperative State Research, Education, and Extension Service
Natural Resources and Environment
1400 Independence Avenue, SW
Washington, DC 20250-2210

Academic and Program Review

School of Forestry Northern Arizona University Flagstaff, Arizona

draft Final Report

August 2004

REPORT OF COMPREHENSIVE REVIEW
OF THE
RESEARCH AND GRADUATE EDUCATION PROGRAMS
AT THE
SCHOOL OF FORESTRY
NORTHERN ARIZONA UNIVERSITY
Flagstaff, Arizona
April 5-8, 2004

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Table of Contents

I.	Introduction	4
II.	Faculty	5
	Strengths	
	Weaknesses	
	Recommendations	
III.	Graduate Education	8
	Strengths	
	Weaknesses	
	Recommendations	
IV.	Research	11
	Strengths	
	Weaknesses	
	Recommendations	
V.	Extension	13
VI	Administration and Management	14
	School of Forestry	
	Strengths	
	Weaknesses	
	Recommendations	
	Northern Arizona University	
	Strengths	
	Weaknesses	
	Recommendations	
VII	Facilities/Infrastructure	16
	Strengths	
	Weaknesses	
	Recommendations	

INTRODUCTION

This specific review of the research and graduate program of the School of Forestry of Northern Arizona University was requested by Dr. David R. Patton, Dean of the School, and conducted April 5-8, 2004. This is the first CSREES (Cooperative State Research, Education and Extension Service) review of the School. This review was requested to provide an external and objective assessment of the strengths and weaknesses of the program as the University undergoes re-structuring and program consolidation (compressing the University to 4 or 5 colleges).

This report makes recommendations and observations based on the Review Team's site visit, Self-Study Report, interviews with internal and external cooperators, faculty, graduate students, administration, and other materials provided by the School.

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FACULTY

The faculty members of the School of Forestry at Northern Arizona University represent the core strengths of the program and define, in many ways, the future of the program in terms of teaching, research, and outreach. As the School is located in a relatively unique ecological region of the country, it is important that the faculty be comprised of scientists and educators with the talent and training to meet the challenges of this region. Our site visit suggests that the School has worked diligently to develop a highly focused and well-trained cadre of faculty capable of developing a significant research program focused predominantly on forest ecology in the high desert region.

Strengths

- The School of Forestry at Northern Arizona University employs 21 full-time faculty members. There is a good mix of experience in the faculty, with Assistant and Associate Professors comprising about 43 percent of the faculty and Full Professors comprising about 57 percent.
- The faculty is well educated, with many holding degrees from well-known and prestigious universities. The selection by the University of two (2) Board of Regents

Professors from the School suggests that the University System recognizes that Forestry has a reputation for faculty excellence.

- There is also a diversity of educational experience within the faculty, with several faculty members possessing degrees in different disciplines. Many have a significant background in forest and wildland ecology and, as a result, the School has developed a highly focused research program in ecosystem science. Several have received both national and international recognition as experts in ecosystem science issues. The Ecological Restoration Institute (ERI), developed by faculty in the School, is a significant example of the degree to which ecological issues drive faculty performance.
- The faculty members collaborate with a large number of scientists from other Colleges. This is evident in the collaborations developed through ERI, as well as individual efforts by faculty members in the School. There is also a significant level of collaboration with external agencies and clients, particularly with the USDA Forest Service. Conversations with research scientists at the Rocky Mountain Research Station (RMRS) during the site visit indicate that faculty members in the School of Forestry are considered significant contributors to the research mission of the US Forest Service in the region. Through these and other research-based relationships with external agencies, the School of Forestry has been able to leverage every state dollar with approximately 2.8 externally funded dollars.
- Even with the extensive level of funded research, the Review Team was very impressed by the level of productivity by some faculty. One faculty member cites seven (7) publications in peer-reviewed journals in a single year, while another listed at least 14 ongoing research projects. Faculty members participate, through presentations and posters, in regional, national, and international society meetings. They have a strong level of journal editorial responsibilities.
- Finally, the faculty exhibit a strong level of entrepreneurial skill exhibited by the faculty, specifically illustrated by ERI, the management of the Centennial Forest, and the fledgling distance-learning consortium.

Weaknesses

- While faculty members in the School have significant expertise in forest and wildland ecology, the visiting team was concerned that the School, as a whole, lacked sufficient quantitative expertise. This concern is focused in several key disciplines; specifically in modeling, fire science, geo-spatial science, forest hydrology, and statistics. There are also opportunities to expand expertise in several other key areas including forest policy, human dimensions, forest based economic development, wildlife ecology, and aquatic ecology. Several of these disciplines represent critical opportunities for the School, particularly in terms of research with existing collaborators. The Review Team was unanimous in its opinion that, unless the School and the University invest in these opportunities through additional faculty, the School would miss a significant chance to expand its research program.
- The Review Team noted several other important issues. Specifically, some faculty members, based on the submitted vitae, were not considered to be as productive as appropriate, given their positions within the School. In contrast, some faculty members are spread too thin or take on too much. A specific example was provided earlier, where a faculty member listed 14 ongoing research projects. In addition, some faculty members may be teaching too many courses, given their combined teaching and research load.
- Finally, faculty members are generally paid significantly less relative to peers at other Universities. This could prove an issue relative to retention of highly successful faculty members in the School.

Recommendations

The Review Team recommends the following:

- 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.

The Review Team believes that, with these efforts, the School of Forestry at Northern Arizona University (NAU) will continue to expand in critical and relevant areas, as well as develop a stronger and more broadly based educational forestry program.

GRADUATE EDUCATION

Strengths

- Graduate students are highly qualified and motivated. Students attended high quality undergraduate institutions and have a passionate commitment to the NAU graduate program.
- There is a diverse population of graduate students. They have varying backgrounds and most students are from out of state. A number of international students from different countries have been attracted to the program. There are also a number of non-traditional students who work and attend graduate school.
- There is a good ratio of graduate students to faculty – 3.5:1. Some faculty, however, have a much higher ratio.
- The enrollment and production of MS and PhD students have been stable over a number of years indicating that the program is strong.
- Students are strongly encouraged to attend scientific meetings and present papers and posters. The School of Forestry provides good travel support for students to attend meetings.

- Students are encouraged to fill knowledge gaps by taking courses outside the School of Forestry if they can't find appropriate course in the School. Students commonly take courses outside the school in biology, environmental science, geography, chemistry, geology, statistics, etc.
- Almost all of the graduate students receive research assistantships (stipends).
- There is a strong relationship with the USDA Forest Service Rocky Mountain Research Station located in the other half of the shared building. Many Forest Service scientists are adjunct faculty in the School and serve on student committees and provide support for projects.
- There are many high quality graduate courses.
- Most faculty provide excellent mentoring support to the graduate students.
- Some students are in labs where they are encouraged to meet regularly. Students in adjacent lab also meet. Lab group meetings are a positive experience for students.
- Field research sites are located close to campus. For example, the Centennial Forest is only about a 20 minute drive. Many diverse ecosystems are located within short driving distances, including juniper, ponderosa pine and mixed conifer ecosystems.
- Labs, equipment and student office spaces are relatively new. Students have good access to field vehicles. Computer facilities are excellent and IT support is high. Library facilities are very good and the library staff is very helpful. Chemical analysis facilities in the Chemistry Department are up to date and the staff is well trained and helpful. The price structure is kept as low as possible. The stable isotope facility on campus is well equipped and operated. Student support services are excellent.
- Many graduate students are supported by ERI which provides research opportunities and financial support. Professional ERI staff complement the faculty and add to the value of the graduate program.
- Faculty in many departments outside the School of Forestry, including biology, environmental science, geography, geology, and chemistry are available and willing to serve on graduate committees.

- Preliminary PhD exams are rigorous.
- Opportunities for native Americans to participate in graduate education in the School of Forestry are excellent. The new MFR (Master of Forest Resources) program should be an excellent recruiting tool to increase native American enrollments.

Weaknesses

- There are limited opportunities for PhD students to gain teaching experience because classes are relatively small and faculty do most of the teaching.
- There appear to be too many low enrollment courses, and graduate courses are lacking in some areas such as fire science, systems modeling, understory ecology, spatial statistics, GIS, and policy.
- Co-convened undergraduate and graduate courses may not be at the level of rigor needed by grad students. It is recognized, however, that for efficiency purposes some courses need to be co-convened.
- Although most graduate students receive research assistantship stipends they are required to pay tuition. Most RA's at other institutions not only receive stipends, but have their tuition paid. It is important that students fully understand the situation with out-of-state tuition and tuition waivers before they come.
- Once students pay tuition from stipends the remaining support is low; increasing tuition in recent years has exacerbated this problem. Having to pay tuition from stipends may reduce the attractiveness and competitiveness of the graduate program.
- Graduate students felt that there was a lack of group discussion between faculty and students on important issues.
- It was noted that faculty and Dean are not regular attendees at the School-wide seminars arranged by the graduate students.

Recommendations

- 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

The School of Forestry has a long history in conducting timely and important research that has guided forest management in the American Southwest. More recently, research has emphasized aspects of ecosystem science, restoration ecology, and forest health. Whereas the research is timely, relevant, and cutting-edge, critical research areas are under-represented. These include traditional forestry topics, human dimensions, and aquatics/riparian ecology.

The research program may be somewhat vulnerable in that a large proportion of funding is derived from two sources: Ecological Restoration Institute (ERI) and Rocky Mountain Research Station (RMRS). The School of Forestry should take steps to establish formal agreements for commitments from both ERI and RMRS for continued support.

Strengths

- Collaboration with significant partners, specifically ERI (about \$1,000,000/year) and RMRS (about \$3,000,000) total. Both have strong influence on the School's research program.

- Opportunities to collaborate with many other partners such as US Fish and Wildlife Service, Bureau of Land Management, National Forest Systems, State resource agencies, US Geological Service.
- Strong expertise in ecosystem science, particularly in ecology, restoration, and forest health. Clearly, this expertise has established the School as an international leader in these fields.
- Successful in acquiring grants and extramural funding from numerous and diverse sources.
- Able to repetitively acquire grants from the same competitive and noncompetitive funding sources demonstrates that faculty meets the needs of funding organizations.
- Attracts a cadre of motivated and productive faculty and graduate students.
- Proximity to public forests and wild lands provides a natural and easily accessible research setting.
- Research addresses relevant and timely topics related to contemporary natural resource management, focusing on Southwestern issues.
- Able to develop synergy and collaboration with other college programs, within and outside of NAU.

Weaknesses

- Low technology transfer emphasis. Faculty are extremely successful in publishing research results as journal articles, book chapters, and symposia proceedings, but a more concerted effort is needed to translate and transfer that information to practitioners.
- Unstructured research program. Research seems more a collection of individual studies than a cohesive package related to over-arching theme.
- Need greater research emphasis and expertise in aquatic/riparian ecology, natural resource policy, forest utilization, forest operations, hydrology, human dimensions, geospatial science.
- Fragmented emphasis areas dilute overall program effectiveness. For example, faculty members with wildlife expertise are in School of Forestry, Biological

Sciences Department, and Environmental Sciences and Education. If all were aligned programmatically, it would have greater visibility and potentially greater impact.

This dilution applies to other disciplines as well.

- Highly dependent on funds and resources from ERI and RMRS, thus may be vulnerable to loss of funds or redirection of ERI's and RMRS's research programs.

Recommendations

- 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.

EXTENSION

The School of Forestry 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.

ADMINISTRATION AND MANAGEMENT

The stature of an academic program results from the scholarship in science and education including outreach demonstrated by the program to peer and constituent groups over time. Scholarship, in turn, is influenced significantly by the administrative and managerial guidelines, policies, and procedures of both the organizational unit immediately responsible for the program and of the parent institution. For this reason and for related issues of interest, this review includes a brief assessment of some administrative and managerial characteristics of the School of Forestry and of the University as they relate directly to the School of Forestry.

School of Forestry

Strengths

- There is a highly effective leadership in place which has the support and confidence of the faculty, staff, and students. One factor contributing to the effectiveness of the leadership is the established position of assistant dean.
- There is an efficient and effective support staff as, for example, the Information Technology staff.
- The faculty is collegial and works well with the staff, the students, and personnel from elsewhere within the university and with collaborating agencies of state and federal government.
- The large Centennial Forest serves as a unique outdoor laboratory, classroom, and demonstration area and offers considerable potential for contributing further to the goals and performance of the School and the University.
- Enrollment in the undergraduate student program has increased impressively at a time when resources to support the program have not increased commensurately and when undergraduate enrollment in most forestry education programs throughout the nation has been decreasing.

- Enrollment in the graduate program has been stable during the recent period, characterized by insufficient budgets and an increasing undergraduate enrollment which competes for many of the same resources.
- The program is reasonably well-funded because of, in large part, the impressive success of the faculty and the administration in obtaining extra-mural support funds.
- Most significantly, the School has demonstrated a remarkable resiliency which has enabled it to function effectively during some difficult times of transition in both leadership and organizational structure.

Weaknesses

- Program components, personnel, and external relationships have been influenced detrimentally by the prolonged transitional status of both the organizational structure within which the program functions and the program leadership. Stability in both is essential.
- The lack of a current, completed, comprehensive strategic plan has contributed some uncertainty to the status and future direction of the program.

Recommendations

- 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.

Northern Arizona University

Strengths

- The strong, nationally recognized programs of the School of Forestry and the Ecological Restoration Institute are acknowledged by the University.

Weaknesses

- The University does not have in place a well-defined process for allocating limited resources among university programs/units based on the stature, priority, productivity, and performance of the program/units.
- There is an apparent lack of coordination among senior officials of the university responsible for various aspects of forest resources science and education.

Recommendations

- 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.

FACILITIES/INFRASTRUCTURE

The School of Forestry is blessed with a unique forest considered to be the largest continuous span of ponderosa pine in the world, and is co-located with the US Forest Service Rocky Mountain Research Station in a beautiful 100,000 sq ft Southwest Forest Science Complex on the south campus of the University.

Strengths

- Computing facilities are excellent.

- University Analytical Labs (Analytical and Stable Isotope Labs) are well used by the School of Forestry (SOF) research.
- A centralized state of the art and well organized analytical laboratory serves the various units of the University and operates very cost effectively to the point of being self-supporting. It is run on a fee basis under the Office of the Vice President for Research.
- The School Forest is unique in that it is managed not only for education and research but for various uses (recreational, harvesting, and others) with an impressive management plan.
- The USFS labs and equipment are readily accessible to faculty and graduate students, and provide means for collaboration.
- Excellent physiological and ecological equipment support a world class ecosystems science research.
- Impressive library holdings and personnel provide an excellent support for research and teaching.
- Sharing of equipment within the School and across campus is very helpful to research productivity.
- Vehicle fleet for research and other activities is adequate.
- Faculty are successful in competitively acquiring research equipment.

Weaknesses

- Distance to collaborating programs in the University poses some challenges.
- The Centennial Forest is inadequately funded and relies heavily on grant funding for its effective management. Its management plan is impressive but fiscal resources are limited to implement it.
- Potential mold issue due to past roof leakage of the SWFS(Southwest Forest Science) Complex poses liabilities and potential health problems.
- Inadequate space for SOF, ERI, geography, and Parks and Recreation

Recommendations

- Assess space needs for collaborating programs to allow equitable allocation.
- Implement the existing plans for the Centennial Forest by securing state and private support.
- Solve the mold problem immediately before it becomes a huge financial and legal issue.
- 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.