

***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

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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)<sup>1</sup>.

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 21<sup>st</sup> century. Many other forestry schools and programs are also debating their future directions (Society of American Foresters 1992)<sup>2</sup>.

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

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

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

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.

### 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: NAFP, 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 Cinque 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 are carried 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 America, 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.

