

Department of Forest Resources Strategic Plan

August 2014

University of Minnesota
College of Food, Agricultural and Natural Resource Sciences

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Department of Forest Resources Strategic Plan¹

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Introduction

This document describes the Department of Forest Resources' (FR) current teaching, research, and outreach portfolio and priorities in each of these three areas over the next five years. The plan was developed in consultation with FR faculty, staff, and students, as well as our teaching, research, and outreach partners and stakeholders. Further, this planning was undertaken because society is facing major challenges that are arguably without precedent. Consider, for example: forests and related natural resources now face myriad stressors such as a changing climate and invasive species; forests are increasingly recognized for their potential contributions to addressing important social and environmental challenges such as increasing reliance on renewable energy and decreasing atmospheric carbon; advancing technologies are producing new and novel forest-based products and corresponding new markets are evolving; society shows increasing value in forest-based ecosystem services. Yet in addressing this set of problems, tradeoffs, and opportunities and our understanding of the dynamics of the earth, its natural resources, and society has never been greater. Additionally, natural resource managers now have access to information and analytic tools that facilitate assessments ranging from organism to landscape to global scales. It is with recognition of these contexts that FR initiated a process to update its strategic plan. Finally, our history has been one of constructive involvement in the challenges of the times. Below we outline how we will continue and enhance that effort.

Mission

FR's core mission is to advance the science and management of forest and related natural resources.² We do so by delivering research, education, and outreach that advances and informs the conservation, protection, and use of these resources, while embracing diversity and excellence. We accomplish our mission through core expertise focused on research and discovery, education, and outreach that integrates and translates the physical, biological, social and managerial sciences. We address issues and information needs that are local to global in

¹ FR Strategic Planning Committee: Anthony D'Amato, Mae Davenport, Michael Kilgore, Linda Nagel, Kristen Nelson.

² In developing this plan, we are guided by Minnesota Statutes Chapter 89.001 Definitions... "Forest resources" means those natural assets of forest lands, including timber and other forest crops; biological diversity; recreation; fish and wildlife habitat; wilderness; rare and distinctive flora and fauna; air; water; soil; and educational, aesthetic, and historic values. Additionally, Minnesota Statutes Chapter 89.66 describes the respective responsibilities of the Agricultural Experiment Station and Extension in providing scientific information on forest resources.

scale. In doing so, we seek solutions to problems that enhance our forests and related natural resources and the economic, ecological, and social benefits they provide to society.

Vision

As a national and international leader in advancing solution-driven science, FR delivers extraordinary education, breakthrough basic, applied and integrating research, and inspired outreach and community engagement in the science and practice of forest and natural resources management.

Who We Are

People

FR’s faculty and researchers represent a breadth of disciplines in the forest and natural resource sciences that garner local, regional, national, and international recognition as leaders in their fields. The department has 22 professorial faculty with 21 of these being tenured or tenure-track appointments (Table 1). Four of these faculty are located outstate but linked closely with those in St. Paul. FR also has 28 full-time research, scientist, and teaching staff that play a major role in carrying out the department’s mission. FR has four support staff to assist the department’s teaching, research, and outreach efforts, as well as build community and provide an important connection with alumni and partner organizations. Additionally, CFANS provides administrative support to the NRSM graduate program and undergraduate advising. Accounting and other administrative support functions are also provided by CFANS.

Table 1. Department of Forest Resources professorial appointments, May 2014.

Faculty	Expertise	Appointment	Location
Ek, A.	Measurements and resource analysis	Professor and Department Head	SP
Bauer, M.	Remote sensing	Professor	SP
Becker, D.	Natural resource & environmental policy	Associate Professor	SP
Blinn, C.	Management, harvesting, economics	Professor, Extension Specialist	SP
Burk, T.	Resource assessment, information systems	Professor	SP
Karwan, D.	Hydrology & watershed management	Assistant Professor	SP
Bolstad, P.	Geographic info. systems, geospatial analysis	Professor	SP
Hoganson, H.	Management, planning, economics	Professor	NCROC
D’Amato, A.	Silviculture, applied forest ecology	Associate Professor	SP
Davenport, M.	Human dimensions, park & protected areas	Associate Professor	SP
David, A.	Forest genetics	Associate Professor	NCROC
Falkowski, M.	Remote sensing and landscape analysis	Research Associate Professor	SP, NRCOC
Johnson, G.	Urban & community forestry	Extension Professor	SP
Kilgore, M.	Economics, policy, and administration	Professor, Director of Graduate Studies	SP
Knight, J.	Remote sensing & geographic info science	Associate Professor	SP
Montgomery, R.	Forest ecology, ecophysiology	Associate Professor	SP
Nagel, L.	Silviculture, applied forest ecology	Professor, Director of Operations, CFC	CFC
Nelson, K.	Human dimensions	Professor	SP
Reich, P.	Forest ecology, ecophysiology	Regents Professor, Hubachek Endowed Chair	SP
Schneider, I.	Park & protected areas management, tourism	Professor, Director, Tourism Center	SP
Russell, M.	Forest ecosystem health	Assistant Professor, Extension Specialist	SP
Stafford, S.	Applied statistics, environmental issues	Professor	SP

SP – St. Paul Campus; CFC – Cloquet Forestry Center; NCROC – North Central Research and Outreach Center

FR is strongly committed to the development and success of its junior faculty. FR's mentoring committee, consisting of faculty from assistant, associate, and full professor ranks, mentors junior and especially new faculty. FR's mentoring efforts focus on topics such as University policies and processes, contact administration, and expectations for new faculty and other employees to ensure their success. The mentoring is developed through whole-group meetings and smaller sessions, the latter involving agreed upon mentors (1 to 2) for each new faculty member or employee. Subject coverage may vary depending upon faculty interests and needs. The department head also mentors through formal and informal visits and discussions with new faculty.

Undergraduate and Graduate Programs

The department develops and administers an SAF-accredited undergraduate forestry program that is consistently top-ranked nationally among its peer programs.³ For more than a century, the University's forestry program has provided an experiential learning environment to train students to fill leadership positions in natural resources education, research, government, and industry globally (including Nobel Prize winner Dr. Norman Borlaug). Of the regional forestry programs, the department consistently attracts very strong students both in terms of ACT scores and high school rank.

The undergraduate forestry curriculum, Forest & Natural Resource Management (FNRM), was called the Forest Resources curriculum prior to Fall 2013. Within the FNRM major, students specialize in one of three areas (tracks): Forest Ecosystem Management & Conservation (FEMC), Park & Protected Area Management (PPAM), and Urban & Community Forestry (UCF). The department also administers the Recreation Resource Management (RRM) program that was recently reconfigured as the PPAM specialization within the FNRM major. The RRM program will be phased out as students currently enrolled in this major complete their degree. During the past four years, enrollment in these undergraduate programs has averaged 60 enrolled majors, with an additional 20 to 30 enrolled minors.

In collaboration with other departments and faculty within the College of Food, Agricultural, and Natural Resource Sciences (CFANS), FR faculty play a major role in instruction and advising in the Environmental Science Policy & Management (ESPM) undergraduate program. One of CFANS' most popular undergraduate majors, averaging 291 students annually, ESPM attracts highly competitive students with its interdisciplinary, science-based curriculum. As the second largest major in the college, ESPM trains the next generation of environmental professionals and leaders through a strong focus on interdisciplinary knowledge, research, and experiential learning. ESPM's specializations include Environmental Science (ES), Conservation and Resource Management (CRM), Policy/Planning/Law and Society (PPLS), Environmental Education and Communication (EEC), and Corporate Environmental Management (CEM). See Table 2 in the "Accomplishments" section for additional detail on FR's contributions to undergraduate education.

³ Gourman Report on Graduate Programs. 1997. 8th edition. Random House, Inc., NY. Gourman Report: A rating of Undergraduate programs in American and International Universities. 1993. 8th Edition. National Education Standards. D.N. and D. Zhang. 2006. Citations, publications, and perceptions-based rankings of the research impact of North American Forestry Programs. *Journal of Forestry* 254-257.

FR faculty also have major responsibilities in graduate education. The majority of FR faculty and adjunct faculty members have appointments in several University graduate programs, including Natural Resources Science and Management (NRSM), Conservation Biology, and Water Resources, among others. The most common appointment is in the NRSM program, which has eight areas of specialization focused on the forest and related natural resource sciences. The NRSM program is among the top ranked programs of its kind in the nation, rated as high as number two nationally among its peers.⁴ The NRSM program currently has more than 100 students pursuing Master of Science and Doctor of Philosophy degrees in one of eight areas of specialization that cover the biological, physical, ecological, social, managerial, and engineering sciences. The NRSM graduate student body represents a wide variety of educational backgrounds, geographic origins, and career objectives. This, coupled with broad expertise and international involvement by the faculty, provides a local to global perspective to the program. The majority of NRSM students are advised by the program's 116 graduate faculty who reside in several University departments, the most common being Forest Resources; Fisheries, Wildlife, and Conservation Biology; Bioproducts and Biosystems Engineering; and Applied Economics. Program faculty come from six colleges within the University and include adjunct faculty from other departments and outside agencies. Additional detail on FR's contributions to graduate education can be found in Tables 3 and 4 of the Accomplishments section.

Outreach

FR faculty and staff provide leadership to the University's Extension Forestry activities. This work is conducted in partnership with the Extension Forestry Team, which has resulted in strong linkages between their outreach efforts and FR's research and outreach programs. FR's outreach and partnerships has enabled faculty and staff to better connect to on-the-ground issues which, in turn, influences our teaching and research focus by making each more relevant. These connections also enhance our ability to secure research funds and implement field studies.

FR's outreach and engagement efforts fall under the following four program areas:

1. *Agroforestry and Bioenergy*. This program area helps Minnesota landowners and producers achieve economic productivity while enhancing the ecological sustainability and productivity of the land. It also assists all sectors of the biomass industry (i.e., landowners, loggers, natural resource professionals, businesses, local policy makers) through dissemination of research related to land management practices, feedstocks, processes and technology in biomass energy.
2. *Forest Ecosystem Health*. This program area provides outreach addressing silviculture, forest management, forest health, and productivity content targeting natural resource professionals and management-oriented landowners. Primary offerings include conferences, workshops, webinars, and other online content.
3. *Forest and Tree Invasive Species*. This program area includes information and training related to plant and insect invasive species content directed at master volunteers, landowners, and professionals. Delivery venues include workshops and volunteer trainings sessions.

⁴ National Research Council. 2011. A Data-Based Assessment of Research-Doctorate Programs in the United States. Committee on an Assessment of Research Doctorate Program, J. Ostriker, C. Kuh, J. Voytuk eds. National Academies Press, Washington, D.C.

4. *Urban and Community Forestry*. Extension's role in urban and community forestry includes transferring technology that assists communities and property owners to prepare for managing large tree populations that contribute to the quality of life for the 80% of Minnesotans who live in residential communities. Outreach and technical support efforts provide the best information available for maintaining tree health and safety, contributes to clean water conservation, and engaging citizens in the management of their community forests.

Centers and Facilities

The department's core research, teaching, and outreach mission is facilitated by centers and world class facilities both on the St. Paul Campus, as well as at out-state facilities. FR faculty and supporting research and scientist staff are involved with more than 13 centers that focus collaborative efforts and partnerships within CFANS, the University, Minnesota, the USA, and globally (see <http://www.forestry.umn.edu/CentersCooperatives/index.htm> for a few examples). Some of these Centers are housed within Green Hall (the campus home of the department), which includes ecological, remote sensing, geospatial, biogeochemical, dendrochronological, and hydrological research laboratories, as well as modern teaching and meeting space for small and large audiences. The Tourism Center and Cedar Creek Ecosystem Science Reserve are two examples of long-term collaborations within the University and with critical partners in Minnesota and the nation, there are many more.

Out-state facilities include the Cloquet Forestry Center, Hubachek Wilderness Research Center, and North Central Research and Outreach Center. The Cloquet Forestry Center is a state-of-the-art field station encompassing 4,100 acres of forests and wetlands and providing housing and meeting space for up to 140 people. This location serves core functions as both the nexus for our experiential field courses in forestry and forest resources conservation, and is home to numerous research projects in northern Minnesota.

Funding

Base funding for the department's mission comes from numerous sources (Figure 1). In addition, a portion of indirect costs recovery (ICR) generated from research grants is allocated to department activities and ranges from \$50,000 to \$100,000 per year. A portion of that is also returned to the principle investigators (PIs) generating this ICR.

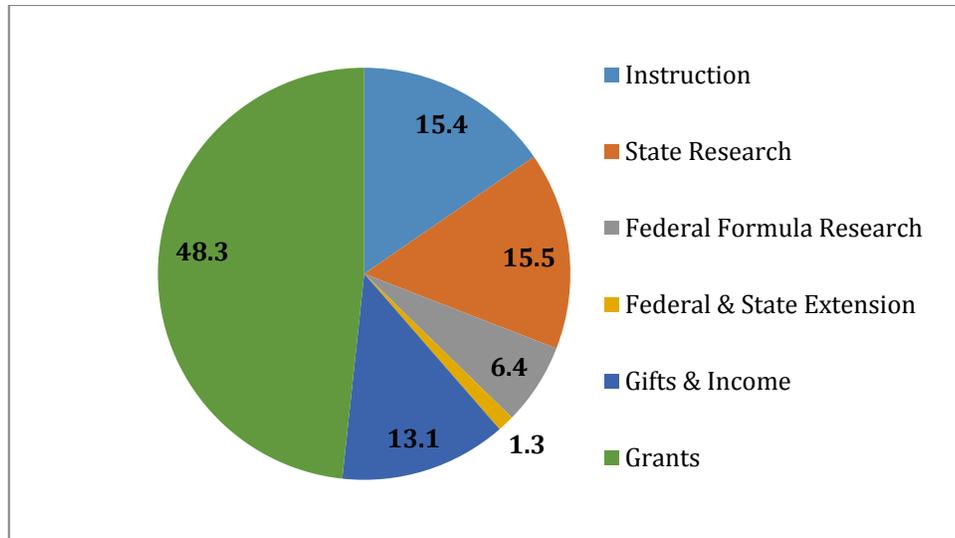


Figure 1. FR budget percentages by source, 2014.

How We Serve the State and Beyond

FR serves Minnesotans in the breadth and depth of education, research, and outreach programs and with the expertise its faculty and staff offers. FR programs span and integrate the biological, social, physical, and managerial sciences to address today's complex natural resource management problems and meet the needs of Minnesota's diversifying communities as well as regional, national, and global communities in forested systems. FR faculty and staff serve on numerous professional, government, and nongovernment boards, commissions, and committees, often in leadership roles. FR's commitment to and impact on our constituents is far-reaching and continues to grow. Faculty and staff have expanded research, teaching, and outreach initiatives globally. For example, we recently co-sponsored an international research symposium at Mizoram University in northeastern India. The department also provides for active membership in the International Union of Forestry Research Organizations (IUFRO) for CFANS.

In the last two years alone, examples of scientific discovery and problem-solving initiatives led by FR faculty and staff include:

- Improving lake and wetland mapping, monitoring, and assessment methods.
- Understanding economic and policy aspects of carbon market assistance programs.
- Reducing the effects of forest harvesting practices on water quality.
- Anticipating the consequences of climate warming on Minnesota's forests.
- Informing the development of best management practices.
- Integrating traditional and western scientific ecological knowledge in forest management.
- Estimating the supply of forest carbon offsets from private and public forests
- Increasing regional bioenergy policy effectiveness.
- Improving wildland fire management.
- Identifying diverse influences on urban biogeochemistry and their pollution potential.
- Improving our understanding of how diverse stakeholders manage multifunctional systems.

- Reducing the ecological and hydrologic impacts of Emerald Ash Borer.
- Enriching environmental education programs.
- Enhancing woody biomass markets.
- Improving the financial efficiency of state timber sale programs.
- Enhancing natural resource dependent communities' ability to adapt to ecological change.
- Improving the management and health of urban forests.
- Developing management strategies for addressing global change impacts on forests.
- Developing rapid and detailed forest inventory methods.
- Linking forest change with implications for forest health and productivity.
- Incorporating habitat value and implications with forest inventory projections.
- Examining Minnesota's logging infrastructure.
- Quantifying trends in silvicultural practices.
- Increasing county harvest and income levels through forest planning model applications.
- Increasing the efficiency of bioenergy feedstocks.
- Building community capacity for sustainable water resource management.
- Strengthening water resource conservation programming.
- Enhancing parks and trails planning.
- Building a Northern Great Lakes Silviculture Prescription Library.
- Hosting a National Advanced Silviculture Certification Program for Professionals.
- Quantifying forest structure and function in Papua New Guinea.
- Quantifying global change impacts on carbon exchange physiology of Eucalyptus.
- Comparing Scandinavian and US policy approaches for biofuels development.

Accomplishments

Undergraduate Education

Table 2 illustrates undergraduate enrollment trends (for both majors and minors) in the FNRM and ESPM undergraduate degree programs over the last four academic years. On average, approximately 60 students have been majoring in forest resource-related undergraduate programs at a given time over the past four years. During this period, the number of students minoring in forest resource-related undergraduate programs has ranged from 22 to 45 per semester. Enrollment trends in the ESPM major have ranged from 288 to 301 students per semester since fall 2010. ESPM minor enrollment has averaged approximately 50 students per semester. FR currently advise 50 FNRM students (new FNRM freshmen are advised by the department's professional academic advisor; FR faculty advise FNRM students after their first year). FR faculty also advise 93 of the 288 students currently enrolled in the ESPM major.

Table 2. Student undergraduate enrollment by term and degree programs for which FR faculty have major teaching and advising responsibilities, Fall 2010 to Spring 2014.

	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014
FR Major	50	58	53	53	39	37	na	na
FNRM Major							44	50
FEMC Track							25	25
PPAM Track							6	7
UCF Track							6	8
Undecided							7	10
FR Minor	20	22	30	39	34	29	na	na
FEMC Minor							21	24
RRM Major	12	12	17	17	17	15	11	8
RRM Minor	0	1	0	3	3	3	0	0
PPAM Minor							2	2
UCF Major	3	2	1	0	1	1	na	na
UCF Minor	2	2	1	3	4	4	4	7
TOTAL FNRM-Related Majors	65	72	71	70	57	56	55	58
TOTAL FNRM-Related Minors	22	25	31	45	41	36	27	29
ESPM Major	293	284	291	286	301	295	295	288
ESPM Minor	29	36	41	50	52	58	55	69

Old Majors / minors:

FR = Forest Resources

RRM = Recreation Resource Management

UCF = Urban and Community Forestry

New Major with tracks; the track names are also used as minor names

FNRM = Forest and Natural Resource Management major

FEMC = Forest Ecosystem Management and Conservation track

PPAM = Park and Protected Areas Management track

UCF = Urban and Community Forestry track

ESPM = Environmental Science Policy and Management

Graduate Education

More than 96% of NRSMS graduate students were funded on grants, fellowships, scholarships, and other forms of financial support during the 2011-12 and 2012-13 academic years. During this same period, NRSMS students were sole or co-authors on 114 publications, gave 198 presentations at various conferences and professional meetings, and were the recipients of 86 different merit-based fellowships, scholarships, grants, and awards. Table 3 identifies graduate student advising activity by FR faculty. FR faculty currently advise 92 graduate students across University graduate programs. Since Fall 2010, they have advised 221 graduate students and served on examination committees for an additional 254 graduate students. Table 4 contains information on the number of NRSMS students who graduated over seven semesters ending in fall 2013. Of the 72 NRSMS students who graduated during this period, 54 of them were advised by FR faculty.

Table 3. FR graduate student advising across all University graduate programs, current and from Fall 2010 to Spring 2014.

Current MS advisees	Current PhD advisees	Total MS advised F10-S14	Total PhD advised F10-S14	Nonadvising committee assignments F10-S14
52	40	151	70	254

Table 4. Number of NRSM graduates by program track, Fall 2010 through Fall 2013. Data reported program-wide and for students whose major advisor was FR faculty or staff.

Program track	NRSM program		FR advised	
	MS	PhD	MS	PhD
Forests: Biology, Ecology, Conservation, and Management	15	2	15	2
Recreation Resources, Tourism, and Environmental Education	6	1	6	1
Economics, Policy, Management, and Society	16	5	12	3
Forest Hydrology and Watershed Management	4	0	4	0
Assessment, Monitoring, and Geospatial Analysis	4	5	4	4
Wildlife Ecology and Management	5	1	0	0
Paper Science	0	1	0	0
Forest Products	1	0	0	0
Other	5	1	3	0
TOTAL	56	16	44	10

Faculty Productivity

Metrics of FR faculty productivity are contained in Table 5. During 2013, FR faculty and staff were authors of 68 refereed publications and 52 nonrefereed reports (e.g., staff papers, research notes, agency reports). FR faculty and staff made scores of presentations at scientific and professional conferences, and provided 6,589 hours of instruction (measured as student credit hours (SCH)) or 1,292 per instructional FTE (compared to the CFANS average instructional load of 709 SCH per faculty instructional FTE).

Table 5. FR faculty accomplishments, 2013.

Metric	FR Faculty Accomplishment
Refereed publications	68
Nonrefereed publications	52
SCH for 2012-13	6,589
SCH per instructional FTE (5.1)	1,292

Sponsored Research

FR faculty currently manage 73 research grants totaling more than \$17 million dollars. These competitive grants were awarded to FR faculty from local (e.g., watershed organizations), state (e.g., MN Department of Natural Resources, Pollution Control Agency, Board of Water and Soil Resources, Environmental Trust Fund), and federal (e.g., National Science Foundation, United States Departments of Agriculture and Energy, NASA) sources, as well as from foundations and private sources. The value of individual grants ranges from less than \$10,000 to nearly \$4 million. Table 6 indicates the number of active grants for which FR faculty are the principal

investigators by grant value. Note these figures do not include in-kind matches. Additionally, they do not include research grants for projects that FR faculty members are collaborators but not principal investigators.

Table 6. Number of active grants for which FR faculty are the principal investigators, stratified by grant value. Data as of March 2014.

Grant Value	< \$50,000	\$50,000 to \$100,000	\$100,001 to \$500,000	\$500,001 to \$1,000,000	>\$1,000,000	Total
Number of Grants	23	14	30	4	2	73

Departmental Strengths and Opportunities

FR has a rich history of notable faculty, staff, and departmental accomplishments going back to and even prior to 1903, when the department (actually the Division of Forestry) was established. These accomplishments occurred, in large part, as a result of individual and departmental expertise, initiative, and productivity. Looking forward, FR’s research, teaching, and outreach initiatives intend to build on these strengths and the opportunities they provide. These strengths and opportunities include the following.

Location

FR is located in a northern latitude at the junction of three major biomes and in a state with abundant natural resources and strong stakeholder connections. These conditions provide opportunities for addressing highly relevant research questions affecting the management, use, and protection of forests and related natural resources. As part of a large research university, FR students have access to unparalleled instructional and multidisciplinary research opportunities. FR’s proximity to a major metropolitan area (e.g., state capitol, regional federal offices, Fortune 500 companies, environmental nongovernment organizations) also provides students collaborative research opportunities not found at many peer institutions.

Faculty Expertise

FR has highly productive faculty and staff and strong leadership. Faculty and staff are recognized as state, regional, national, and international leaders and have strong reputations for their commitment to outreach programming. This reputation creates opportunities for FR faculty and staff to play a leadership role in solving science and management problems affecting forests and related natural resources, as well as train the next generation of forest and natural resource managers and scientists.

Faculty Partnerships and Engagement

FR faculty and staff have developed an extensive network of teaching, research, and outreach collaborators and partnerships that enhance our ability to carry out our mission. Our research is highly interdisciplinary with relevance to both science and management. FR faculty and staff also have strong linkages with and a commitment to serving Minnesotans, Minnesota’s natural resource and environmental organizations, and natural resource programs. These partnerships provide opportunities for addressing complex and pressing problems affecting forests and related natural resources.

Historical Roots

FR has a long tradition of instructional excellence, providing formal forestry training including experiential learning, since the late 1800s. Many of FR's graduates have held highly visible leadership positions in the private sector, government, and nongovernmental organizations. The department's sizable alumni base with a long history of linkages to FR's programs provides substantial opportunities for student support through numerous fellowship and scholarships, as well as stakeholder support for FR's teaching, research, and outreach mission.

Facilities

The Cloquet Forestry Center, Hubachek Wilderness Research Center, and the University's numerous research and outreach centers (especially the Grand Rapids ROC) are outstanding venues for field-based instruction, research, and outreach. They provide opportunities for expanding FR's field-based experiential learning opportunities and conducting long-term studies on forests and related natural resources.

Student Life, Learning and Engagement

For students, the above also translates to numerous housing, transportation, and part-time employment opportunities, plus broad and deep learning opportunities. These learning settings include both formal and extracurricular and student organization activities. Additionally, the active and engaged faculty also means important linkages to career employment opportunities.

Forest Resources Department Strategies

Going forward, a number of factors will shape FR's efforts to carry out its research, teaching, and outreach mission. Among these are institutional factors such as tuition rates and basic program support levels including budget/funding allocation and incentive models. Subject area factors include new technologies affecting: wood products manufacturing, renewable energy, information and communication, data management and analysis; increased demand for distance learning; market globalization; invasive species; changing climate; new governance practices and institutions; new markets for forest-based ecosystem services; forest land parcelization and fragmentation; an increasingly urbanizing population (and students); and associated changing attitudes and perspectives on forests and natural resources. Considering these factors and focusing on FR's strengths and the opportunities they provide, the following describes FR's strategies for advancing the department's research, teaching, and outreach mission by building on current strengths and growing to meet new challenges.

Teaching

FR's strategy for advancing the department's teaching mission will be to place a priority on instruction that:

- Builds on FR's long-standing excellence in delivering forest and related natural resource education for our majors and in introducing nonmajors to this area
- Addresses the skills sets and core competencies demanded by employers.
- Consolidates and grows our strengths in the undergraduate programs we currently support (FNRM, ESPM), while growing key graduate course offerings.

- Focuses on courses that are unique to our department, can be supported by our current and prospective faculty, and have the potential to generate substantial student credit hours and their associated revenue back to FR.
- Uses the ROCs and especially the CFC in a greater capacity for teaching across the curriculum, and across disciplines. One example is to link research with teaching by integrating data collection and analysis through CFC learning experiences.
- Grows the FNRM undergraduate program through enhanced marketing and recruiting efforts, introductory courses on the Minneapolis campus, and periodic reassessment of the curriculum to ensure student training matches employer needs and priorities, student vocational interests, technology, and forest management issues and practices.
- Continues to provide experiential learning opportunities that utilize FR facilities (e.g., CFC, Hubachek Wilderness Research Center) to meet growing needs of FR, CFANS, and beyond.
- Continues to provide leadership, advising, marketing, and other support to the ESPM major to increase the capacity of that program to satisfy a wide range of employer and stakeholder needs.
- Offers additional graduate-only courses (i.e., 5xxx and 8xxx-level) that focus on MS- and PhD-level theoretical and methodological gaps necessary for a strong interdisciplinary graduate program. Example course offerings might include methods in complex systems analysis, anticipatory governance and policy in forested systems, and interdisciplinary landscape analysis.
- Increase e-learning capabilities through the development of course modules and individual courses that offer enhanced learning opportunities for existing students and for attracting more students into our programs. Doing so will also recognize the increasing diversity of platforms (largely electronic) for the delivery of instruction.

Research

FR's strategy for advancing the department's research mission continues the current research foundation and strengthens new areas of research our stakeholders and Minnesota citizens have identified. Individual scholarship across the diverse, productive portfolio represented by our faculty and partner organizations serves as a foundation for the next five years. It places a priority on research that:

- Describes and assesses the ecological, physical, economic, and social changes affecting forest systems at scales ranging from local to global and on short- to long-time horizons.
- Describes how changes in forest systems impact the policies and practices that influence their management, use, and protection.
- Describes and evaluates how forest and related natural resource changes affect individuals, communities, specific economic sectors, and society in general.
- Develops decision support tools that integrate the policy, social, geospatial, ecological, and physical sciences.
- Addresses theoretical questions of importance in the biophysical and social sciences.
- Addresses issues affecting Minnesota's forests and related natural resources.
- Is responsive to the information and management needs of forest, natural resource, and environmental organizations.
- Emphasizes interdisciplinary scholarship.

- Builds capacity through education and outreach of our student and stakeholder audiences.
- Fosters research partnerships that include cross-college, University, Extension, public agency, tribal, industry, and nongovernment partners.
- Encourages innovative funding mechanisms (e.g., shared positions/joint funding with other UMN departments and external organizations (e.g., Northern Research Station, MN DNR)).

Over the next five years, FR has the opportunity to lead nationally and internationally by addressing critical research needs. Specifically, we suggest the following.

- A first step would be to achieve a better understanding of current faculty research skills, questions, and priorities as well as the research skills and questions of collaborating partners. This could be developed through a seminar series and/or retreat. This could go a long way toward fostering greater collaboration on interdisciplinary research. New faculty members and collaborators create the potential for innovative research programs that have not been developed due to limited time and resources.
- Growing challenges related to landscape-level phenomena such as invasive species and climate change, among others, call for new faculty positions that enhance research and instruction in cross-institutional governance and law, and quantitative landscape ecology. These positions would fill a critical void and significantly expand graduate mentoring and core courses offered by FR faculty (see “Priority New Faculty Positions” below).
- Providing information and analysis that enables forest and related natural resource organizations to more effectively carry out their mission.
- Growing the capacity to develop and evaluate economic opportunities presented by our forest and related natural resources and to evaluate tradeoffs with respect to ecological and social considerations.
- Given the current issues facing the conservation and management of northern forest systems and the continued commitment of FR to developing solutions to such challenges, the department proposes holding a Northern Forest Symposium to catalyze cross-disciplinary discussions among faculty for addressing these challenges and engage stakeholders on critical issues, including climate change, changing markets, and invasive species.

Outreach

FR’s strategy for advancing the department’s outreach mission will be to place a priority on outreach initiatives that:

- Utilize state-of-the art science, information, and technology that integrate and translate relevant information to natural resource professionals, landowners, loggers, stakeholders, policy-makers, and the general public through effective outreach programs.
- More closely integrate work of Extension Educators, whose primary area of work is on the Forestry Team, with departmental faculty to enhance both research and outreach linkages.
- Effectively reach key audiences using a variety of delivery mechanisms (e.g., face-to-face, internet-based).
- Utilize field facilities such as the CFC, NCROC, and possibly additional sites for continuing outreach development and program offerings.

- Better align FR with the Sustainable Forests Education Cooperative (SFEC) to utilize untapped teaching potential in areas that would add value to current SFEC offerings.
- Encourage faculty, staff, and students of FR to be involved in SFEC events and programs involving Extension Educators as instructional staff.
- Provide greater seminar opportunities for faculty, staff, students, and stakeholders. An ongoing FR seminar series on contemporary forest and natural resource management topics would be one such example.
- Expand outreach efforts to incorporate formal scientific research in program offerings.
- Sponsor broad, theme-based conferences that integrate the work from several FR faculty representing different disciplines.

Departmental

The FR Department will strengthen and enhance its ability to effectively carry out its core teaching, research, and outreach mission through attention to the following:

Departmental Development Efforts. The department will continue and expand efforts to develop gifts and associated endowments to enrich program capabilities. The focus will be on undergraduate scholarships, graduate fellowships, endowed faculty positions, and teaching, research and outreach program operations. Additionally, we will seek funds for facilities improvements, including seeking named gifts for improvements and new buildings for the St. Paul Campus and the Cloquet Forestry Center, Hubachek Wilderness Research Center and possibly other locations. For Cloquet, there is an urgent need for additional research and dormitory space. FR will also support nearby St. Paul Campus improvements that can provide needed space and capability for FR research, instruction and outreach. One example is a visitor/experiential center near the forest plots on the campus in close proximity with the Bell Museum.

Library Facilities. The University of Minnesota's collections and access in the broad area of natural resources and specifically forest resources have long been an advantage to faculty and students here compared to other higher educational institutions nationally and across the world. The forest resource collections are among the top 2 or 3 in the world. While libraries are increasingly focusing on digital delivery, we will work with the library to urge a continued high level of acquisitions (journals, books, gray literature) in various formats to maintain our advantage. Of special importance is retention of older U.S., regional, and Canadian literature often invaluable to the study of environmental and forest change over long-time horizons.

Organizational Structure (i.e., school vs department). The department will seek renaming as a "School" to elevate our state, region, national, and international visibility and to enhance recruitment of students and faculty. A number of peer institutions have already moved in that direction. Such designation would also be consistent with the naming for much of our history since 1903.

Space. In the coming decade, FR will seek to recover needed space (two offices and three laboratories) in Green Hall currently used by other CFANS departments. This space is especially critical for the growth of the department's research program. We will also work with nearby departments to enhance instructional space on the north end of the St. Paul Campus.

Technology. Communications, computing, and research technologies (for laboratory, remote sensing, and field observation) are changing rapidly with many new capabilities that are important if not crucial to our program capabilities and success in delivering discovery and problem solving. Often these technologies are added as grants or special equipment funds are available. We will also be considering development efforts to support such capabilities. One area of attention now and for the next several years is technology for e-learning and potentially distance education to diverse audiences.

Laboratories. The space and facilities available for both wet and dry research is crucial for undergraduate and graduate student training and for discovery. Currently the department lacks both sufficient space and quality facilities and equipment for effective research and training in areas such as tree physiology, ecophysiology, hydrology, silviculture, forest health, genetics, and remote sensing.

Diversity. The makeup of our society has been evolving since the nation's inception. Likewise, the interests and needs of students and society in general have also been changing. The programs we offer relating to forests and related natural resources are also important to all of society, directly and indirectly, thus it is important to be inclusive in terms of student and faculty recruiting and stakeholder involvement. In fact, inclusivity underlies much of what we do as a department. Given that, FR has developed a diversity plan, focused heavily on student recruiting, as a separate document in support of this strategic plan. This plan is currently undergoing revision with an anticipated update available fall semester 2014.

Priority New Faculty Positions

Approximately half of FR's tenured and tenure-track faculty are at least 55 years old, suggesting several potential retirements may occur in the next 5 to 10 years. Two FR faculty members are currently in the University's Phased Retirement Program. In order to maintain FR's level of research, teaching, and outreach productivity, any faculty vacancies created through retirement will need to be filled immediately once those positions are vacated.

In addition to retaining FR's existing faculty complement by filling any vacancies created through retirement, additional strategic hires are needed. These faculty positions represent opportunities to more effectively address the department's mission. They also enable FR to recoup some of its lost discipline capacity that has occurred in recent years due to faculty appointments to administrative positions, attrition, and budget reallocation. FR currently needs additional faculty expertise to replace these lost positions, address unmet instructional needs, and invest in the high-impact, research, teaching, and outreach priority areas it has identified.

The list below identifies (in priority order) the additional faculty positions that are needed to address FR's strategic research, teaching, and Extension/outreach areas, fill existing gaps in discipline expertise, and shore-up understaffed areas.

- **Forest/natural resource/environmental policy and law** – focused on addressing critical instructional and research needs related to the political and legal dimensions of forest

ownership and use and cross-institutional governance associated with local, regional, and global landscape-level environmental planning, scenario development, and decision analyses.

- **Forest landscape ecology** – focused on simulation modeling and quantitative analysis for addressing anthropogenic and natural environmental change with research incorporating remote sensing, geospatial analysis scenario development on local to regional to global scales.
- **Environmental statistics** – focused on environmental informatics, including applied statistics and forest measurements and monitoring.
- **Forest and natural resource economics** – focused on strategic marketing and economic development of forests and related natural resources in an era of great change in forest-based products and usage by society.
- **Forest soils** – focused on environmental change, biogeochemical cycling, and forest health and productivity.

Additional areas for positions with substantial opportunity to grow CFANS capabilities via FR are:

- **Social system analysis** – focused on addressing an increasingly complex society and their relationship, spatially and culturally, to forests and related natural resources, from local to global. This position also promises to aid in further FR and CFANS student, faculty, and stakeholder diversity considerations.
- **Water quality** – focused on water resource quality and land use interactions in forested landscapes.
- **Forest/wildlife ecology and management** – focused on forest-wildlife population assessments and their interactions in response to various habitat use, management, and protection strategies.

Summary

FR envisions an increased emphasis and incentive for interdisciplinary research within the department, enhanced course offerings for training our students, stronger formal commitment and guidance to continuing educational offerings with Extension Educators on the Forestry Team, through the Sustainable Forests Education Cooperative, and other programs. We further envision increased faculty capacity in conjunction with our partners to develop a deeper understanding of future forest landscape conditions in response to environmental and social drivers. FR faculty and staff will build capacity and partnerships in the areas of adaptive management during a time of significant change, with challenges to the viability of communities and ecosystem services, and advantages of breakthrough technology in natural resource inventory, analysis, and decision-making across levels of governance and at temporal and spatial scales. This common initiative will support our core missions of teaching, research, and outreach.

Appendices

- A. Input to FR's Strategic Planning Process: Ideas to Consider from FR Faculty/Staff/Students and Stakeholders, Fall 2013.
- B. FR's Diversity and Equity Goals and Initiatives.

Appendix A

Input to FR's Strategic Planning Process --Ideas to Consider From FR Faculty/Staff/Students & Stakeholders-- Fall 2013

Nongovernment Organization

Climate change impacts & adaptation

Herbivory (white tailed deer): lasting economic and ecological consequences for forest resilience and a search for statewide solutions to address/mitigate impacts

Invasive species (with attention to plants): particularly associated with logging / equipment as a vector—quantify the scope of the problem, assess the ability of equipment cleaning, etc. to slow the spread, and develop/adopt real best practices on this front to incorporate into the Site Level Guidelines, educate practitioners, etc.

Alumni

The current and potential impacts of climate change on Minnesota's forests, forest-based economy, and forest-based communities, and the impacts of forests and trees (from the BWCAW to street trees in downtown Minneapolis) on mitigating climate change.

The current and potential impacts of both exotic invasive and native invasive insects, diseases, invertebrates, herbivores, and plants on the health of Minnesota's forests.

The health and well-being of Minnesota's primary and secondary forest products industries and resort and tourism industry.

Government

Climate change and adaptation

The two most pressing forest resource issues I see are the impacts of climate change and terrestrial invasive species. We need to make sure that future management and research considers these global changes to the landscape.

Industry

Integration of technology for data collection and management (both high and low cost products)

Increased University website functionality, specifically searchable database of forest trees species, forest health issues, and current research being done. Currently the website and some of the extension publications need updating (put dates on everything) and should be more easily searchable.

There seems to be a decrease in forestry students and an increase in environmental students who take forestry-related jobs, but lack some of the forestry training. Require more natural resource field training for Environmental students.

Minnesota DNR

Forestry Division

On behalf of Minnesota DNR Forestry we would like to provide the following important issues:

1. An examination of how to recruit new timber consumers, and research into what is required to fuel emerging industries that can utilize wood as a raw material. As a large manager of timberlands in Minnesota it is important for us to have markets for our timber. The Permanent School Trust Fund relies on timber markets for revenue generation. And young forest habitat is declining due to reduced timber harvests in the state.
2. As the largest employer of foresters in the state, it is important for us to have quality forester candidates to fill a rising number of vacancies. The forestry program at the U of M is not producing enough graduates to fulfill our demand. We would like to see an increased effort to recruit students into the forest management program and an increased emphasis on field work skills, including fire suppression. We are willing to work with you as a team to provide fire training, comment on your courses, and attract top students into forestry programs. We anticipate hiring about 20 new foresters per year for the next 5 years. Anything that can add graduates to the program in less than four years would be the most help.
3. We need insights into the effects of climate change and management strategies to mitigate potential adverse impacts. Suggestions include provenance and genetic testing of tree species potentially suitable for establishment where they do not currently exist and management prescriptions that diversify existing timber stands and enhance forest health in the face of anticipated changes.
4. Applied research into forest inventory and monitoring techniques to help create state-of-the-art forest inventory data and improve decision making. We have a current proposal with the LCCMR to design an inventory system that would be compatible with Dr. Ek's inventory modeling efforts. Support for this effort is a high priority.

MN DNR Section of Wildlife

- Climate change and the ability of our forests to adapt, and the role that forest planning/management will play
- Impact of invasive species and tools to manage/control them
- Fragmentation: retaining an important viable timber industry to combat forest conversion/loss
- The need for social science work with landowners to identify management options other than timber harvest (if the timber industry continues to diminish), and what it might take to entice them into implementing these management options to achieve early successional forest goals

FR Faculty

- Forest pest and forest health threats
- Climate change
- Partnerships with stakeholder organizations to support research and educational activities.
- Impact of depressed market conditions on our ability to manage our forests
- Plausible large loss of forest land in MN as corn and soybean production expands in MN because of higher corn prices
- Loss of forest industries and associated weak local economy throughout forested region of northern MN
- Aging MN forests with increased insect and disease problems, changing climate and declining forest health.
- Lack of recognition of Agroforestry as a discipline that can be used as a natural resource management tool. With the new program now called “Forest & Natural Resource Management,” agroforestry must now be recognized as an important discipline in the department. A State Specialist or Tenured track position must be developed to conduct to teach, conduct a robust research agroforestry, and perform outreach activities. The ability to deliver excellent quality education on agroforestry would be greater with more Research Faculty involved in applied research at a level requires a research appointment. Having that someone working on that capacity to develop homegrown information will strengthen and provide credible extension programming on Agroforestry.
- Agroforestry is a unique land management approach that provides opportunities to integrate productivity and profitability with environmental stewardship, resulting in healthy and sustainable agriculture and forest ecosystems. The USDA Agroforestry Strategic Framework 2011-2016 stated a vision of creating productive and healthy farms, ranches, and woodland communities through agroforestry. The health of state's forest and agricultural resources will depend in part of integrating the production and conservation benefits of trees and shrubs on lands used crop and animal production. Active, informed monitoring and management such the use of agroforestry can positively affect agriculture and forest health and resilience.
- The Framework now exists and the department must develop agroforestry program in order to be recognized as one of the leaders of agroforestry education in the county and in the World. A number of potential students, both local and international, want to pursue agroforestry program at the U but the Department doesn't have a recognized agroforestry program.
- Integration of basic forest management with carbon analysis and energy lifecycle analysis. This includes basic science of carbon cycles but also increased integration with policy and economic scenario analyses for the state and nation.
- We do a good job communicating the value of forests and related natural resources but we have to do better given the immediate future of declining funding support. To do that, we need to become more relevant in large-scale cross-cutting research and teaching that demonstrates functional linkages between basic forest management and other ecology, economic, and political dimensions. We all do it on a smaller level but many of us could up our game. Also a greater role in emerging industrial ecology efforts in the college

could benefit us research-wise while also playing a greater role in how those plans unfold.

FR Staff

- Diversity (in student body, faculty, department culture, and in cultural inclusion in courses)
- Managing forests for complexity and uncertainty
- Urban natural resource management
- Maintaining a healthy forest products industry in the face of invasive insects and pathogens.
- Develop mechanisms that will encourage private landowners to actively pursue forest management on their land.
- Provide students with a broad, interdisciplinary education, engaging them in topics that include intensive forest management, conservation, entomology, pathology, soils, and genetics.
- The effects of climate change on forest ecosystems and environmental services.
- The role of forest management in mitigating and adapting to climate change.
- The valuation of ecosystem services provided by forests (e.g. clean water, carbon storage, wildlife habitat, outdoor recreation opportunities) and the role of forest management in maximizing the value (economic, environmental, and aesthetic) of our forests.
- The plan could have more emphasis on interdisciplinary collaboration across colleges, departments and units. There could also be more emphasis on international forestry and on community engagement/outreach.

NRSM Graduate Students

- Climate Change (issues like restoration, assisted migration, etc.)
- Invasive species (plants, earthworms, insects etc.)
- Bioproducts, renewable energy.

FNRM and ESPM Undergraduate Students

- Ensuring that outgoing students are providing healthy and sustainable natural resources for future generations to enjoy.
- Planning for ecosystem level changes due to changing climatic conditions and changes due to insect and disease.
- A new forest initiative creating jobs in the natural resource sector.

No affiliation

- State and National Parks
- Connecting the public to forests and natural resources through science and recreation so that they might value them
- Changing management approaches for changing climate
- Climate change and associated outcomes (invasive species etc.)
- Urbanization—economic changes, human dimensions
- Globalization... Internationalization
- Impact of climate to natural resources
- Specific classification of natural resources (which specific values for which resource)
- Conservation mechanism/policy of natural resources
- There are many issues facing the forests and natural resources of the state, nation, and world. These issues are complex and wide-ranging yet have many inter-related components. Given this, I believe teaching should encompass teaching technical understanding of forest and ecosystem issues (e.g., climate change, balancing ecosystem services) to students and the general public.
- Many complex and technical issues are debated today by policymakers who have minimal understanding of core scientific principles and processes which govern the ecosystems in question. In addition, many members of the general public also have minimal understanding of said principles and processes. This lack of technical understanding between major groups of decision-makers means that sound and scientifically-based management decisions for our forests and natural resources are and will be difficult to come by. Helping policy-makers and the general public understand technical principles of the lands which they manage should be a major priority for academic institutions and the Department of Forest Resources in order to attain and maintain healthy ecosystems. To this end, student curricula (for all departmental degrees) should be enhanced with more technical coursework which provides a strong foundation in chemical, physical, and mathematical topics associated with ecosystem processes. This will in turn provide a highly knowledgeable workforce capable of making sound decisions and conveying complex principles related to our forests and ecosystems.
- Finally, research and outreach should continue to focus on achieving and disseminating technical knowledge of forest and ecosystem processes through rigorous experimental design, measuring/sampling, analyses, and effective communication.

Faculty Meeting: FR Department Strategic Planning Input November 8, 2013

Future research questions: What are common areas of research and potential strengths?

- Climate change
- Dynamic processes (scales/timeframes)
- Landscapes (larger scale analysis)
- Economic viability of communities/timber industries
- Viability of infrastructure for forested landscapes
- Energy
- Wildlife and habitat
- Stewardship; best practices
- Technology tools for assessment and modeling
- Decision making and governance
- Community adaptation/readiness
- Economic tools
- Water and wetlands
- Invasive species

What sets us apart from other research universities?

- Unique latitude; where biomes meet
- Continental research (including Canada)
- Diverse mix of land ownership
- Strong governance interest in natural resource management and stewardship mentality (e.g., watershed approach)
- State Legacy funds for water, natural resources and parks and trails
- More active urban and community forestry than other programs
- Active stakeholders (e.g., Forestry Council)
- Highly advantaged in the area of geospatial analysis and remote sensing (e.g., statewide Lidar)
- Strong research capacity with progressive natural resource managers

How can we better take advantage of our unique strengths and capacities?

- Better identify how we connect with MnDrive
- Establish ourselves as national/global leaders (not just state/Midwest leaders)
- Linking technological capacity and expertise (landscape modeling) with governance/decision making expertise (new position in landscape modeling/decision modeling?)
- Further develop strengths in ecosystem health

FR faculty response to: What new directions do we need to consider for the FR 5–yr. Strategic Plan?

Research:

- continued and enhanced interdisciplinary integration of carbon, climate and related topics among social and physical sciences, within Dept. but also with other programs
- stronger relevance and coordination of research with forest products industry beyond current portfolio; we're relevant to landowners and agencies but less beyond
- transparency of Dept. fellowships has improved but would like to see more in the way of announcing and sharing history of who gets funded
- Great coordination and collaboration among applied and basic biophysical and social scientists in department to address questions related to adaptive management in face of global change, invasives, changing management priorities, etc.
- Better understanding of who each faculty member is regarding research skills, questions, and priorities (Seminar series?, retreat?). This would go a long way towards fostering greater collaboration on interdisciplinary research. We all think we know what each other studies, but I would predict that our preconceived assumptions might be quite a bit off.
- Given historic and current commitment of FR to teaching excellence and its large piece of the CFANS instructional "pie," greater reflection is needed regarding how much more our research mission can grow without compromising our teaching mission or overtaxing faculty relative to other units.
- Human community adaptive capacity (for environmental change) and cross-cultural understanding of change and impacts of change (i.e., environmental justice).
- Continued/greater emphasis on integrated approaches. Most critical issues can be better addressed by integrated/team interdisciplinary research.
- Exploring and refining cutting edge concepts in sustainable forest management.
- Ecosystem and forest landscape modeling.
- Further development of state of the art tools and techniques in quantitative forest management and ecology.
- We have a good start on international courses (Nepal, Costa Rica). Would like to grow these types of programs and require that all students have some type of international academic experience. Not sure if the Peace Corps program is still in place.
- Would like to see more research with minority communities (Somali, Southeast Asian, Native American) that use natural resources. What are current practices? What are their information needs? MWMO has done some research on the Hmong community in Saint Paul related to WSM, but just scratching the surface.
- Social/community vulnerability related to climate change and adaptation. Have just received a NOAA grant to look at vulnerability of coastal communities to climate change (esp. major floods)
- Within FR, I am excited to grow my research in interdisciplinary directions to include more of the following (1) studies directly addressing the hydrologic outcomes of forest and vegetation management and (2) the hydrologic (water quantity and quality) outcomes of anthropogenic landscape management. As the only hydrologist in the department, I look more within the department for some of the interdisciplinary aspects I just mentioned and look outside the department for collaborations with other hydrologists and aquatic scientists.

- This isn't specifically a research area, but it is at least conceptually related: I think it's time to explore acknowledging the broad range of issues we study in FR by changing the name of the department as we did with the undergrad major. Something incorporating more of a natural resource/conservation/management focus would be best, in my opinion.
- Forest carbon management economic incentives and supply estimates; economic analysis of alternative investments in forest management and productivity; policy and economic tools that promote forest conservation and stewardship.
- Effective layering of climate change, invasive management and decision making on what is happening now.
- Build insights in multi-functional, managed systems to inform decision making in government, civil society, market
- Forested systems - interplay with alternative landscapes overtime. Mid-continental research collaboratives.

Teaching:

- ESPM is a primary revenue stream; need to protect ESPM as a core function and provide more staff resources for assistance such as we do for FR
- Increased equity in teaching load relative to appointment; problem with faculty getting stuck teaching a course because others won't volunteer—could envision rotating assignment
- Better use and showcasing of Cloquet Forestry Center as centerpiece for delivering core forestry field courses, as well as potential for broader ESPM experiential offerings
- Use of new faculty hires or rotating teaching assignments to maintain/sustain general course offerings in ESPM curriculum.
- Human community adaptive capacity (for environmental change) and cross-cultural understanding of change and impacts of change (i.e., environmental justice). Continued support for field courses. Perhaps add internship requirement?
- Exploring and refining cutting edge concepts in sustainable forest management.
- Ecosystem and forest landscape modeling.
- Further development of state of the art tools and techniques in quantitative forest management and ecology.
- Maybe someone has already done this, but maybe do a survey of current students to find out what other courses/content would be of interest to them in the future. Where the gaps, and what are we missing?
- Invasive species management, decision making under uncertainty about future conditions, timber procurement.
- With the emphasis on water on water in our state and region, I think that updating some of the material in the intro hydrology course and offering an advanced course in hydrology which examines watersheds broadly and directly addressing the link between water cycling and the movement of key elements and macronutrients will serve students well. My current understanding is that this will be useful for students looking to work in the public sector at the state level. Other areas that I have interest in and see a need to teach involve some hands-on field methods of these skills and two interactions with hydrology and water resource instruction that (I think) may currently exist - (1) watershed spatial

analysis (hydro + GIS + remote sensing), and (2) watershed planning (water resources + human behavior + land use planning).

- I think we're doing very well in FR in terms of teaching. Not sure I have any suggestions here.
- Greater emphasis on course offerings in the social sciences (policy, policy analysis, analytic methods, law); mid-career Professional Masters degree in natural resources science and management.
- Enhance graduate offerings WHILE maintaining undergraduate offerings in FSM.
- Need support in policy/governance, cultural studies-so we don't burn out current faculty.

Outreach:

- Support effort to develop "School" within the College.
- Better communication with local and national stakeholders regarding the education mission of the department (I know we're better than Stevens Point, but they don't).
- Stronger "ownership" and integration of Sustainable Forestry Education Cooperative within Department to connect with stakeholders and deliver cohesive and meaningful workshops to practitioners.
- Increased recognition of 0% service appointments of faculty making contributions that far exceed this percentage so as to balance other departmental expectations regarding teaching and research.
- Human community adaptive capacity (for environmental change) and cross-cultural understanding of change and impacts of change (i.e., environmental justice).
- Exploring and refining cutting edge concepts in sustainable forest management.
- Ecosystem and forest landscape modeling.
- Further development of state of the art tools and techniques in quantitative forest management and ecology.
- Would like to see more student recruitment from minority communities, especially at the graduate level.
- Forest dependent wildlife management.
- I am less sure of what currently exists here, but some basic skills for land managers on identifying and defining watersheds, basic hydrology, and understanding of water flow pathways might be future opportunities.
- Again, extension is a fundamental part of our role, and I think we do a good job.
- Communication has been fairly effective on research side; needs improvement on teaching content & outcomes to prospective employers and beyond.
- Human Capital. More in-training for current employees or re-training for retired folks with 15 yrs. more of volunteer desire.

Appendix B

Diversity and Equity Goals and Initiatives Department of Forest Resources

2009-2010

March 31, 2009

The department is committed to fostering teaching, research and service environment on campus and beyond that respects the diversity of its faculty, staff, students, and society. In doing so, we seek to function in a professional and truly helpful manner without regard to race, gender, national origin, sexual orientation, age, etc. This functioning would follow from our dedication to service and adherence to University policies. Our overarching goal is to be broadly inclusive in all of our efforts.

The college has articulated seven areas in which to consider in this planning. These are:

- Teaching
- Incentive structure
- Training/professional development
- Recruiting, retaining and graduating students of color
- Outreach, inreach
- Research
- Professional climate

and articulated at http://www.cfans.umn.edu/diversity/departmental_resources.htm.

Overall Efforts

Below is a brief description of current and continuing efforts in the above seven areas. Following that we elaborate on the selected area to be emphasized, the resources required, and the specific steps in plan implementation.

Teaching: The goal is to *increase* experiential learning opportunities, especially those involving multi-cultural issues and experiences beyond the classroom and on big picture problems, primarily for Forest Resources (FR), Recreation Resources Management (RRM) and Environmental Science, Policy and Management (ESPM) Students. This is a growing effort for field and problem solving courses and the differing cultural views of land use provide a natural entre for beginning discussions with students. We will also move to revamp courses for such experience with respect to CFANS instructional planning, the new liberal education requirements, and UROP potentials.

Incentive Structure: The goals expressed by the college and this document *will be* explicitly incorporated into annual faculty and staff review and notably in discussions within the department's new faculty mentoring committee.

Training/professional development: Capacity building opportunities will *continue* but with increased activity and will include diversity training, our departmental seminar series and guest

speakers, visiting faculty, support for travel abroad, and diversity related conference participation.

Recruiting, Retaining and Graduating Students of Color: This will be our major area of effort, *intensifying* the effort we started in 2007-08. We will focus on the FR and RRM undergraduate majors and for the Natural Resource Science and Management (NRSM) graduate program tracks most relevant to the department. We will establish recruitment goals, set aside needed resources, and develop specific plans to recruit, including the building of partnerships with relevant institutions, encourage faculty to actively participate in recruitment events, build effective and tailored first year programs (including for transfer students) as well as retention strategies for underrepresented students.

Hiring: We will *continue* to implement best practices for recruitment, i.e., increased search effort, mentoring for retention of faculty, and socialization to bring in more diversity from historically underrepresented racial and ethnic groups.

Outreach (Inreach): We will *continue* to develop new collaborations and partnerships serving nontraditional stakeholder groups and communities, notably in the metro area and with Native Americans outstate. Such efforts are increasingly linked with extension programs and new groups whose view of natural resources is different from the historic and predominately European culture of this region. In doing so, we increasingly partner with the Minnesota Department of Natural Resources and local communities.

Research: Needs, partners and stakeholders are changing with an increasing mix of local and global focused projects, e.g., local biomass energy and global climate change and implications. To expand these linkages will require both local applied research projects and federal competitive grants, the latter focusing on broad natural resources issues and our environment. We will *continue* to expand our historically large numbers of stakeholder contacts in the region to ensure the development of the desired mix of research efforts.

Professional Climate: Fostering a positive and creative departmental climate for pursuing diversity efforts is clearly important. We will *continue* do so by highlighting and encouraging it in the conduct of all of the above six areas and associated activities.

Special Effort

Given that we have been working on aspects of each of the above efforts for over a decade, and we will continue to do so, we have decided, beginning in 2007, to focus on student recruiting for a 5-7 year period. A study of employer needs by Minnesota Forest Industries in 2007 indicated a need for 400 forest resources graduates in the region (Minnesota and Wisconsin through 2016). As a result, the department has moved to increase its efforts in undergraduate and graduate student recruiting. In the past year, the department has hired a major focused recruiter and communications specialist (Jenna Williams) to add capability to our efforts to reach and connect with New High School (NAS) and New Advanced Standing (NAS) students, the latter from both within and beyond the University, especially from community colleges statewide. In doing so, we have worked increasingly with CFANS Student Services Office in recruiting and in offering

scholarship support (\$1,000 minimum and up \$14,000 over four years, in part from FR scholarship endowments) for newly admitted students. We are also working with the Minnesota Chapter of the Society of American Foresters (SAF) to extend their recruiting efforts (posters and visits to MN High Schools). Specific steps undertaken by the department include a 2+2 transfer agreement and the improvement of transfer guides for northern Minnesota community colleges; major specific banners and materials for visitors, program marketing via billboards in central and northern Minnesota; program advertising in the *Minnesota Daily*; web page enhancements to aid prospective students; and efforts to increase media exposure for the department and its programs overall. At the graduate level, specifically for the NRSM program, we have moved to match and extend support to Graduate School Dove Scholars Program fellowship candidates to encourage their enrollment and retention using a combination of support from research grants and departmental endowments.

The above steps have been taken to increase the number of SAF accredited forestry graduates because they are in high demand by employers in the region and nationwide. We will now extend our recruiting effort to target underrepresented students and especially students of color. In doing so, we will also recruit for the companion Recreation Resources Management (RRM) major. We will do so by working with local high schools, local community colleges, and with associated natural resources youth programs having significant numbers of students of color. Our goal is to grow our undergraduate enrollment by 50% to 75+ students in FR with 20% of the 75 being students of color. Similar percentage goals will apply to RRM. For the NRSM program, we seek to reach 10% students of the U.S. student enrollment as students of color.

This initiative will target three audiences:

High Schools to encourage NHS applications, notably at local schools with large percentages of typically underrepresented students. These include African American, Asian, Hispanic and Native American students. We have reviewed programs and planned school linkages to include:

Minneapolis North Community High School

This school has a high proportion of African American students. The school has recently been revamped to focus on becoming a smaller neighborhood school.

Minneapolis Washburn High School

This school has a significant population of all underrepresented students groups and the highest proportion of college bound students in the Minneapolis School District

St. Paul Johnson High School

This school has a *Natural Resources and Environmental Sciences Academy* with a focus on fostering an appreciation for balancing outdoor activities and urban development with the protection of the natural world. Students have opportunities to explore Minnesota's natural resources while pursuing interests in ecology, forestry and biotechnology.

St. Paul Open School

This school is small (400 k-12 students) but has an active *Outward Bound Adventure Trip* service program.

St. Paul Arlington High School

This nearby school has a large and diverse population of underrepresented students.

St. Paul Como High School

This nearby school has a large and diverse population of underrepresented students.

Youth programs or groups with emphasis on those having a natural resources focus and including:

Multicultural Excellence Program (MEP). This program provides guidance and support to promote the academic success of students culminating in the acquisition of a college degree. It works within the St. Paul public schools. See <http://mep.spps.org/>

Admission Possible (AP). This program is a nonprofit organization dedicated to helping promising, low-income students obtain admission to college. It serves 1,300 students in 17 high schools across five school districts in the Greater Twin Cities. See: <http://www.admissionpossible.org/>

Upward Bound Programs (UB). This is a federally funded, U.S. Department of Education equal educational opportunity program working through the U of MN Student Services Office. Specifically, it is a college preparatory program for low-income and educationally disadvantaged high school students. Upward Bound works with students on a long-term and intensive basis and helps generate the skills needed for selected high school students to succeed in post-secondary education. It offers both summer resident and academic year programs. See: <http://cehd.umn.edu/students/Trio/ub/default.html>

North American Indian Science and Engineering Society. This is a national organization with that also conducts programs locally, i.e., in Minnesota. It is a private nonprofit that nurtures building of community by bridging science and technology with traditional Native values. It further offers financial, academic and cultural support to American Indians through graduate school. See www.aises.org.

Metro Community Colleges with greater than 20% students of color with the intent on recruiting well prepared NAS students. Schools we will target include:

Century College. This community college has historically been a steady source of transfer students; the Century enrollment is approximately 22% students of color.

Minneapolis Community and Technical College. Working with this school will be a first effort for our program; this school's enrollment is approximately 45% students of color.

Normandale Community College. This community college has historically been a steady source of well-prepared transfer students; Normandale's enrollment is approximately 22% students of color.

Action steps will be:

1. Gather background on the programs of these groups and schools, including site visits.
2. Development a long term contact strategy for each school and group including FR staff visits, special programs/events with the schools, school counselor and faculty contacts, individualized student contacts, specialized recruiting materials and St. Paul Campus visits.
3. Follow-up with individual students in terms of advising, scholarship offers, and interaction with present FR (and RRM) students other CFANS multicultural programs or events.
4. Annual evaluation of efforts and success and plan refinement.
5. For NRSM enrollment, we will focus on identifying Graduate School Dove Fellowship candidates and offer multi-year matching support to attract and retain these students.

FR staff resources for this effort will include

Department head: Alan Ek (5% time)

Department recruiter and communications coordinator: Jenna Williams (15% time)

FR and RRM professional advisor: Tracene Marshall (advising and contact role)

FR and RRM major coordinators: Tom Burk and Ingrid Schneider as needed

NRSM Director of Graduate Studies Mike Kilgore as needed

FR faculty volunteers as needed (faculty with experience with these programs include Charlie Blinn, Stephen Carlson and Carl Vogt.

FR students and student groups as needed

Materials and special events

Total \$20,000 annually (approximate). Additionally, departmental endowments may provide scholarship support to promising students upon their enrollment.

Request to CFANS:

\$10,000 for the first year (or other significant amount) to support the above individuals time, special events, materials, etc.