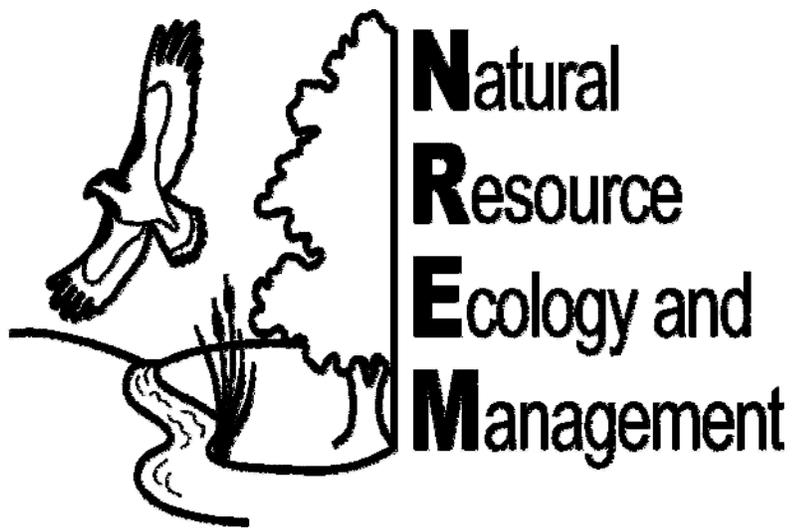


D. SELF-STUDY

**Department of Natural Resource Ecology and Management
Iowa State University**

April 23-25, 2008



Department of Natural Resource Ecology and Management

Self-Study Report

Introduction

This Self-Study Report has been developed as a part of the preparation for an external review of the department. The purpose of the self-study was to conduct a comprehensive review of all departmental activities and functions and to assess strengths and areas for improvement. This document, along with suggestions from the review team, and the department's strategic plan will help guide activities in the department for the next 5 years.

Because this is the first external review of the department since the merger of the former Departments of Animal Ecology and Forestry in 2002, there is no reference to progress made in relation to a former external review. Instead, the report refers to progress made in achieving selected goals from the 2003 strategic plan that was developed shortly after the two departments merged to become the Department of Natural Resource Ecology and Management.

The draft document was compiled by an Ad Hoc Review Committee consisting of:

Dr. Sue Fairbanks, Co-chair
Dr. Steven Jungst, Co-chair
Dr. Jesse Randall,
Dr. David Engle, and
Valerie Hentges, graduate student,

with input from several faculty and staff members. The draft document was then provided to the entire faculty and staff with opportunity for them to provide additional input leading to the completed document.

Numerous information items are provided as appendices to this document, and additional items will be provided as exhibits for review by the external review team.

We welcome the input and guidance of the external review team as we work to become even more productive and effective in our departmental mission.

**Department of Natural Resource Ecology and Management
External Review Team
April 23-25, 2008**

Dr. Robert Swihart (Chair)
Professor and Head
Department of Forestry
& Natural Resources
Purdue University

Dr. Jo Ellen Force
Professor and Head
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Dr. Winifred Kessler
Regional Director
Wildlife, Fisheries, Ecology
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USDA Forest Service

Dr. Tom Coon
Director
Michigan State University Extension

**Iowa State University
Department of Natural Resource Ecology and Management
Department Review Agenda**

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Chapter I. Administration

Executive Summary

The Department of Natural Resource Ecology and Management (NREM) is a new department formed in the reorganization of the life sciences at Iowa State University which began in 2001. Drawing faculty from the Department of Forestry and Department of Animal Ecology, the department seized the opportunity to create a synergy along common interests in instructional excellence, mission-oriented research, and engagement. NREM was officially approved as a new department on July 1, 2002, and relocation of forestry faculty and staff from Bessey Hall to a Science II was completed by 2004. In March, 2003, NREM's faculty finalized a strategic plan and governance document, both of which were instrumental in guiding the addition of several faculty members and support members enabled by agreement with the College administration. The agreement assured funding for two technical support staff members for five years and assured that faculty positions would not be lost to attrition for the first five years of the department's life (through June 30, 2007). This agreement enabled the department to thrive through a period of budget shortfalls so that research, extension, and teaching programs remained competitive.

The success of the Department can be attributed to leadership within the faculty and the College administration, all believing that the newly configured department would prosper given the synergistic strengths contributed by the former departments. A common commitment to undergraduate and graduate student education/professional development and career placement coupled with a history of prominence in mission-oriented, solution science have since emerged as distinctive trademarks of the Department. The faculty is committed to the premise that fundamental progress in each of the mission areas is predicated upon excellence of individual faculty members in the context of a collaborative, multi-disciplinary, integrative approach. Coupled with the collective desire to provide the professions with the highest quality graduates from the university, the faculty is dedicated to maintaining undergraduate majors recognized by the respective professional societies through either program accreditation or certification of graduates.

With a total faculty staffing of more than 28 FTE (20.5 FTE in tenure-eligible/tenured faculty), the department enjoys a healthy level of faculty staffing. Recent additions to the faculty have provided a boost to faculty morale and the department's stature and competitiveness. Faculty staffing decisions will remain a key challenge for the department over the next five years as a significant number of senior faculty members retire. Maintaining sufficient faculty strength across program areas to meet NREM's goal of maintaining forestry accreditation and fisheries and wildlife certification while meeting the requirements for scholarly research in a major research university presents is a tall order. During the first five years of its existence, the department has successfully redirected several faculty positions. Redirecting programs remains an alternative given a high level of expected retirements over the next five years. Additional financial and other resources (e.g., building space) are important needs the faculty have identified to move the department to the next level of competitiveness.

The vision and mission statement guided our newly revised (December 2007) departmental strategic plan (<http://www.nrem.iastate.edu/review/>), parts of which are excerpted and modified where appropriate for purposes of this external review self-study document. The Department's strategic plan aligns closely with the strategic plans of the University (<http://www.iastate.edu/~strategicplan/>) and College of Agriculture and Life Sciences (<http://www.ag.iastate.edu/agcoll/sp/05-10sp.php>). Other portions of this document contain information excerpted from the department's Governance Document.

<http://www.nrem.iastate.edu/review/>

Description of the Department

July 1, 2002 marked the beginning of a new era in natural resource education, research, and extension at Iowa State University. The formation of the Department of Natural Resource Ecology and Management (NREM) through the merger of the Departments of Animal Ecology and Forestry provided the means and facilities to continue growth of forestry, fisheries, wildlife, and wood science programs while providing the platform on which to build new programs. Because NREM is a new venture, this review is the department's first. Therefore, we do not refer to the previous review as a milestone in the department's progression, but rather, on occasion use the department's 2003 strategic plan as a guidepost.

NREM is a member of the College of Agriculture and Life Sciences (CALs). Historically, and NREM's undergraduate program serves the needs of about 300 to 400 students (approximately 75 to 80% Animal Ecology and 20 to 25% Forestry majors). Graduates successfully gain employment with various natural resource agencies or organizations, both public and private, and our programs have been successful in providing the appropriate educational background. A strong commitment to undergraduate teaching and learning is an important focus of our department. Approximately 50 graduate students are currently affiliated with NREM. Similar to our undergraduate programs, NREM is committed to excellence in graduate education through formal coursework and support of research activities.

The department has a distinguished history of conducting high-quality research in the area of natural resource management and ecology. Major contributions are in the areas of tree improvement, nursery seedling production, valuation of the wood industry in Iowa, use of woody plants for shelterbelts, riparian buffers, woodlot management, urban forestry and urban ecology, composite wood and agriculture fiber products, soy flour based glues for the forest products industry, water quality, habitat management, avian habitat development in agricultural landscapes, population dynamics, predator-prey relationships, age and growth of fishes, fish culture, animal behavior, environmental education, and restoration ecology. Many of these contributions have been made through formal collaborative efforts with the Iowa Cooperative Fish and Wildlife Research Unit (75 years old and the first in the nation) and numerous informal efforts with groups such as the Leopold Center for Sustainable Agriculture, the U.S. Department of Agriculture ARS National Soil Tilth Laboratory, Iowa Department of Natural Resources, the North Central Region Aquaculture Center, agriculture commodity groups, and various nongovernmental organizations.

The department hosts two units funded through federal appropriations outside USDA-CSREES. The Iowa Cooperative Fisheries and Wildlife Unit and the North Central Region Aquaculture Center, through funding of the Center's Associate Director. [More?](#)

The Extension program in the department is well known and respected in the state and region. Extension faculty and staff are engaged in a variety of programs that transfer research results to natural resource managers, community groups, and private landowners. In addition to our formal Extension programs, NREM faculty members actively participate in outreach activities that maintain a close connection with practicing natural resource professionals and other stakeholder groups.

NREM reflects a diversity of disciplines, including ecology and other biological sciences, social science, economics, sustainable resource management and utilization, and human dimensions. NREM serves society through the land-grant tradition of working with undergraduate and graduate students, state and federal government agencies, non-governmental organizations, businesses, and the public.

Department Vision and Mission

The Department of Natural Resource Ecology and Management is dedicated to the understanding, effective management, and sustainable use of our renewable natural resources through the land-grant missions of teaching, research, and extension. NREM's disciplinary focus is broad in scope, ranging from individual organisms to landscapes, from natural to managed ecosystems, from wilderness to agricultural and urban systems, from local to international environments, and from resource preservation to sustainable use. Understanding and effectively managing our natural resources requires long-term vision and multidisciplinary approaches involving NREM personnel working with people from other diverse disciplines across the university and within federal and state agencies and non-governmental organizations. NREM reflects a diversity of disciplines, including ecology and other biological sciences, social science, economics, sustainable resource management and use, and human dimensions. NREM serves society through the land-grant tradition of working with undergraduate and graduate students, state and federal government agencies, non-governmental organizations, businesses, and the public. As such, NREM provides answers to natural resource problems in Iowa, the Midwest, and the nation.

The vision that drives NREM is multidimensional and consists of the following:

- Providing a student-centered environment for instruction and advising, and promoting activities that foster social, learning, and professional networking;
- Producing graduates who are widely considered top-quality professionals - competent, capable, collaborative, dependable, and disciplined;
- Maintaining mutually productive and supportive relationships with stakeholders (landowners, agencies, parents, students, and conservation groups);
- Conducting excellent applied and basic research, particularly "solution science" that is relevant and focused on Iowa and the Midwest, but also has global application;

- Providing outreach and extension that serves the interest of stakeholders and promotes natural resource sustainability.

Department Governance

Information below is excerpted from the department's governance document. Additional information on governance can be found in the department's governance document available on-line (<http://www.nrem.iastate.edu/review/>). The faculty and Chair share responsibility for departmental operations. The faculty has an important voice in setting policy and the Chair is responsible for departmental administration; however, there are often no clear boundaries between areas of responsibility of faculty and Chair. It is expected that the faculty and Chair will approach departmental governance in a cooperative and positive spirit.

Responsibilities of the Chair relative to departmental governance include:

- Preparing and administering the Department's teaching, experiment station, and extension budgets and ISU Foundation accounts in consultation with the faculty as appropriate in the spirit of shared governance
- Recommending personnel actions (faculty hiring and promotion and tenure decisions) to the Dean as directed by the faculty
- Assigning teaching and committee responsibilities consistent with position responsibility statements of individual faculty members, the Department's strategic plan, and course staffing plans developed by the Curriculum Committee
- Conducting faculty performance reviews with the goals of retaining excellent faculty members, encouraging excellence of individual faculty members, achieving University performance benchmarks, and implementing the Department's strategic plan
- Recommending to the Dean salary adjustments for faculty and staff, and starting salary for new members of the faculty
- Facilitating recruitment and retention of outstanding faculty and encouraging competitiveness and productivity of the faculty
- Establishing ad hoc committees, assigning ad hoc committee membership and responsibilities, and terminating ad hoc committees
- Assigning membership to standing committees

The Department's faculty enjoy the University's practice of shared governance in which the faculty are self-directed in matters of setting priorities for departmentally-funded staffing (faculty, staff, and technical support positions), decisions on interviewing and recommendations on hiring of departmentally-approved open faculty positions, decisions on promotion and tenure (see Article VI), and content and delivery of academic programs.

Responsibilities of the faculty relative to departmental governance include:

- Strategic planning necessary to address the Department's mission, to address the Department's role in executing the University and College strategic plans, to meet University and College benchmarks for productivity, to promote excellence of the faculty, and to enhance the Department's competitiveness
- Developing a faculty staffing plan that fully supports the Department's strategic plan

- Execution of the Department's faculty staffing plan including composing announcements for open positions, conducting candidate searches, conducting interviews, and selecting candidates to recommend to the Dean
- Setting departmental benchmarks for teaching, research, extension/outreach, and citizenship
- Establishing standing committees, their responsibilities, and membership guidelines
- Conducting promotion, tenure, and post-tenure reviews of faculty members
- Conducting performance reviews of the Chair at the request of the Dean

Resources

Organization and Personnel

NREM's budget includes salary for 20.5 FTE's in tenure-eligible/tenured faculty lines (not including 3.0 FTE in the Iowa Cooperative Fisheries & Wildlife Research Unit), 0.6 FTE senior lecturer, 3.0 FTE adjunct faculty, 6 Professional & Scientific staff, and 3 Merit staff that carry out the Department's mission. The Department has 1.0 FTE faculty member budgeted elsewhere (**Where specifically**) but holding academic rank in the department. This faculty member actively participates in limited ways that help the Department achieve its goals.

A faculty already skewed to newer, lower-rank tenure-eligible faculty members will likely become more so. Including two vacant faculty lines, eleven faculty lines are yet-to-be-tenured faculty (10 assistant professors and one associate professor). Although the department is staffed by fewer tenure-eligible faculty lines than the combined Forestry and Animal Ecology departments were staffed with in the mid- to late 1990's, several faculty lines arose since the NREM's formation through an agreement with the College administration that selectively rewarded the department for merging proactively. As described in the Department's 2003 strategic plan, the faculty chose to fill these faculty lines with expertise that either did not exist in either of the former departments or was lost due to attrition of faculty members to the Department of Ecology, Evolution, and Organismal Biology (EEOB). Thus, NREM has achieved an effective level of staffing of core faculty disciplines in the past five years despite overall budget declines in the university. With expected retirements over the next five years, filling tenure-eligible faculty lines to support core programs while taking advantage of emerging opportunities that requires change will be both an opportunity and a challenge. Staffing non-tenure eligible faculty lines in NREM has benefited in the past five years from the university's aggressive support of dual-career couples through spousal and partner accommodations (<http://www.provost.iastate.edu/office/acadplan/dcof.html>). These faculty members provide teaching and research expertise that generally would not be guided by the department's strategic plan, but our experience indicates that the added disciplinary diversity strengthens the department's ability to accomplish its mission.

The department's faculty is composed of tenured faculty, tenure-eligible faculty, and non-tenure eligible faculty (adjunct, affiliate, and collaborator). Appendix I.I shows faculty members whose positions are budgeted through the department or are scientists in the Iowa Cooperative Fish and Wildlife Research Unit (ICFWRU). The Unit scientists enjoy all rights

and responsibilities of university budgeted faculty members. The single faculty member listed in the third section of the table is budgeted wholly through grant funding secured by the faculty member.

The College's expectation for the standard research-teaching faculty appointment is a split of 45% teaching, 45% research, and 10% service (committees, outreach, and professional service). The normal teaching assignment in the department for this appointment is 3 courses per year, one of which is a graduate course. Teaching-research faculty are expected to provide meaningful service on departmental committees, advise undergraduate students (teaching faculty), advise graduate students (research faculty), and engage in meaningful outreach.

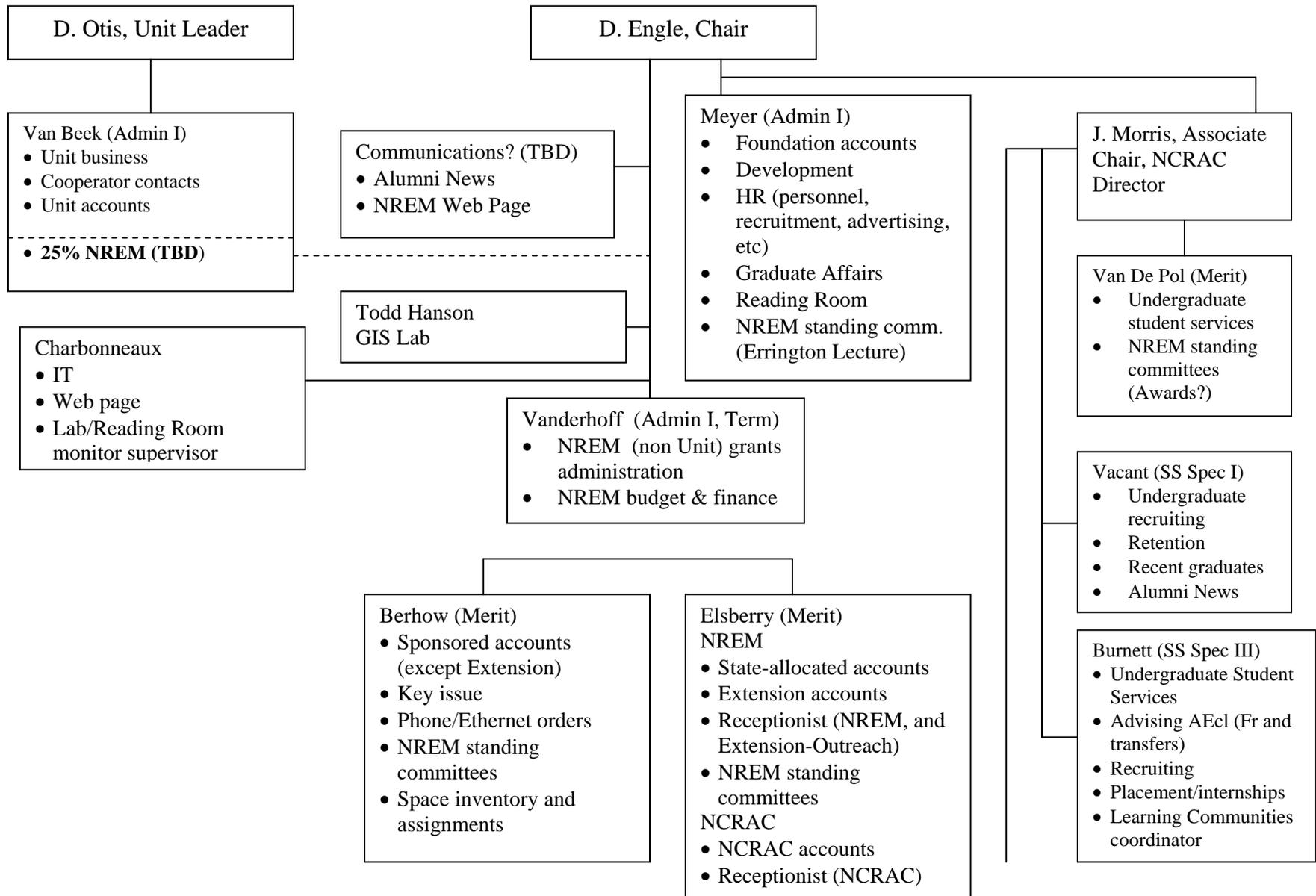
Responsibilities of the department Chair include providing leadership for the department, integrating strengths and resources of the department to serve the needs of students and stakeholders and to fulfill the land-grant mission; communicating the mission, vision and strengths of the department within Iowa State University and to national and international forums; stimulate and facilitate excellence in all aspects of departmental functions: teaching, research, extension programs and outreach and service; help the department obtain resources through extramural funding; and conduct scholarly activities in teaching, research, or extension.

The Chair has the authority to appoint a Director of Graduate Education (DOGE) and an Associate Chair to administer responsibility areas within the department that involve activities of a magnitude to require a person to take primary administrative responsibility. The DOGE, by coordinating with the chair and the Graduate Affairs Committee, oversees recruiting, screening applicants, admission and correspondence. The DOGE also serves as the first order of contact to resolve grievances between graduate advisor and graduate student. Dr. Jan Thompson is the current DOGE. The Associate Chair assists the Chair in administration of the department with emphasis on curriculum and overseeing operations of NREM Student Services. Dr. Joe Morris is the current interim Associate Chair.

Staff

The department's staff includes central administrative support staff, NREM Student Services support staff, extension support staff, and technical support staff. A portion of the extension support staff is supported by grants and contracts. Other staff members include research associates and technical support staff that are supported by grants and contracts (not listed herein). Figure I.1 shows the organization of departmental support staff. Brief responsibility statements for staff positions shown on the diagram can be found in Appendix I.2.

Figure I.1 Departmental Support Staff Organization Chart



Strategic Staffing Plan (2008-2013)

Faculty Plan

The department's mission is to maintain a balanced and outstanding program in teaching, research, and outreach and extension in the area of natural resource ecology and management. The focus of natural resources is by nature broad and includes the aquatic, terrestrial, and human systems of Iowa and the world. The goal of the department is to maintain a faculty that is competent in teaching about, and conducting research in all of these systems. Problems that are addressed in these systems require a collaborative approach not only because they interact with each other, but also because they are found in a mosaic of native, agricultural, and urban settings in Iowa and the Midwest.

The University and CALS recognize scholarship in the three major land-grant university missions of teaching, research and extension. As a consequence appointments of new hires in the department should reflect the current departmental needs in those three areas of scholarship. Typically new hires should be able to teach at least two courses in the department, as well as provide a unique research tool set that allows them to conduct individual and collaborative research both within and outside of the department. Extension faculty need to have appointments and skills sets appropriate to Extension needs, as well.

Hiring of new faculty members should progress in a manner that supports the broad mission of the department. Persons who can conduct research collaboratively across the department and teach undergraduate courses across majors should be encouraged. In a time when refilling faculty positions that have been vacated is not assured, a good strategy is to hire persons who can teach courses useful to both majors or multiple options within majors. However, specific teaching needs of the Animal Ecology and Forestry majors warrant special attention, as these are professional degrees that must meet certification and accreditation requirements of their respective professional organizations. Any courses taught by new hires should strive to meet the requirements of at least one of the professional societies related to our curricula: The Wildlife Society, the American Fisheries Society, and the Society of American Foresters.

The current NREM faculty includes 8.3 FTEs with 1 Extension position and 5 collaborator/adjunct positions that serve the Animal Ecology program (Fisheries and Wildlife), and 8 FTEs with 1 extension position and 2.5 adjunct/affiliate positions that serve the Forestry program. Future staffing considerations should reflect anticipated future changes in NREM faculty composition, present and future undergraduate and graduate enrollment, and the needs of maintaining certified and accredited programs.

The plan below lists teaching, research, and extension/outreach needs that may arise during the time frame of this plan due to anticipated retirements. Also included are potential needs that may arise because of changing issues confronting natural resource ecology and management. Numerous opportunities now exist where specific courses can fill the needs of more than one major. The potential of an undergraduate NREM major further emphasizes the

need for faculty with broad backgrounds. While this plan proposes needs that will be created by retirees and other departures, some needs could be satisfied by changing responsibilities of existing faculty. An example of such a need might be the use and application of GIS/GPS in natural resources.

The following is a list of possible retirements/resignations during the life of this plan as well as faculty lost to another department:

- Bill Clark (population biologist, mammalogist; transferred to EEOB)
- Brent Danielson (landscape ecologist, mammalogist; transferred to EEOB)
- Diane Debinski (community ecologist; transferred to EEOB)
- John Downing (limnologist; transferred to EEOB)
- Rick Hall (tree genetics, silviculture for biomass production and wildlife habitat)
- Steve Jungst (bio-remote sensing, GIS/GPS)
- Mon Lin Kuo (wood adhesives and biomaterials for wood composites)
- Jim Miller (landscape ecology, conservation biology)
- Carl Mize (forest biometrics – biometrics)
- Jim Pease (Interpretation, social, wildlife extension)
- Lita Rule (economics, policy, administration)
- Dick Schultz (terrestrial ecology, soils, watershed)

The retirements and resignations will have an especially major impact on the faculty responsible for teaching the majority of content specific Forestry Major required courses. They will also result in the loss of the primary instructor and advisor to the interpretation options in both majors. The loss of faculty to the Department of Ecology, Evolution and Organismal Biology has also resulted in loss of courses required in the Animal Ecology Major that these faculty were expected to continue teaching. The retirements and/or loss of this set of faculty will also have a major impact on the research activities of the department, especially in the areas of restoration ecology, woody plant genetics, silviculture, biometrics, human dimensions, policy and resource valuation, and sustainable materials science.

A general description of the areas of responsibility that will no longer be covered or will have a major reduction in coverage with these retirements include:

- Natural resource biometrics (basic sampling, data analysis in fisheries, wildlife, and forestry, design, regression, correlations, modeling)
- Natural resource valuation (ecosystem goods and services – bioeconomy, socio-economic)
- Sustainable perennial plant community management for multiple products & ecosystem services (forest, prairie, wetland)
- Wildlife habitat management
- Land use planning
- Ecotoxicology
- Biodiversity
- Social and human dimensions of resource management
- Natural resource interpretation

- Wildlife extension
- Urban plant communities
- Hydrology and watershed management
- Restoration
- Tree genetics
- Biomass production

The tool sets that will suffer major losses include:

- Biometrics
- Community ecology
- Econometrics
- Extension
- GIS/GPS
- Habitat modeling
- Hydrology and watershed management
- Human dimensions
- Limnology
- Natural resource interpretation
- Plant growth and development
- Soil ecology
- Toxicology
- Wood chemistry
- Woody plant genetics

One strategy that is not strongly recommended at this time is to hire faculty that are shared with other departments. While this may have some appeal to administrators, it is perceived as a difficult position for the individual faculty member. Also, with the potential for refilling only limited positions in the near future, dilution of the NREM faculty could have devastating impacts on our ability to maintain excellence in teaching, research, and extension. Loss of dedicated faculty lines is especially problematic considering the losses that have already occurred and the potential to develop a new integrated NREM major.

As retirements occur, position announcements should be developed that address both the general subject areas of the lost positions and the tool sets that have been lost. These two should be integrated to provide the kind of person(s) needed to address the holes that need to be filled to meet teaching, research, and outreach/extension needs of the department. Retirements should be viewed as opportunities for reevaluating course needs in the various major and research directions of the department. Teaching needs must take into account the requirements of certification by the American Fisheries Society, The Wildlife Society, and the Society of American Foresters. These requirements are shown below:

American Fisheries Society Certification Requirements

The American Fisheries Society (AFS) views a fisheries professional as an individual with a specialized education in the sciences and technologies involving the structure, dynamics, and interactions of fishes, habitat, other aquatic organisms, and humans. Certified fisheries

professionals may be generalists in fishery resources management or a specialist in one or more of the allied disciplines (e.g., aquaculture, physiology, genetics, toxicology, pathology). As such, course requirements for certification as a Fisheries Professional (Associate or Certified ranks) are broad. Relevant requirements for NREM include 42 credits in the biological sciences and 6 credits in human dimensions. Twelve of the biological science credits must be related to fisheries and aquatic sciences and include at least four courses. Of these courses, two must be directly related to fisheries science and at least one must cover principles of fisheries science and management. The course focused on fisheries science and management must be an upper division course (i.e., junior, senior, or graduate level), must be at least 3 credits, and must focus on fish population dynamics and habitat assessment and management. The remaining 30 credits in the biological sciences may be met with any number of courses (e.g., general biology, microbiology, zoology, ecology, ornithology). In addition to these requirements, AFS requires 6 credits in human dimensions. Appropriate courses include named courses in human dimensions of natural resource science and courses in policy, planning, administration, law, ethics, public relations, leadership, conflict resolution, and economics. These courses must focus directly on natural resource management.

Society of American Foresters Accreditation Requirements

The Society of American Foresters provides accreditation to professional forestry schools, and Iowa State has been accredited through SAF since 1935. This accreditation program stipulates that a minimum of 8 full-time equivalent faculty members with primary responsibility to the forestry major are required for continued accreditation. In addition, the forestry curriculum is required to lead to specific competencies in four general areas as per the following: (1) Ecology and Biology (including taxonomy and identification of forest and other tree species, their distribution, and associated vegetation and wildlife; soil properties and processes, hydrology, water quality, and watershed functions; ecological concepts and principles including the structure and function of ecosystems, plant and animal communities, competition, diversity, population dynamics, succession, disturbance, and nutrient cycling; assessments of ecosystems, forests and stands; and tree physiology and effects of climate, fire, pollutants, moisture, nutrients, genetics, insects and diseases on tree and forest health and productivity; (2) Measurement of Forest Resources (including identification and measurement of land areas and spatial analysis; design and implementation of comprehensive inventories that meet specific objectives using appropriate sampling methods and units of measurement.; and analysis of inventory data and projection of future forest, stand and tree conditions; (3) Management of Forest Resources (including development and application of silvicultural prescriptions appropriate to management objectives, including methods of establishing and influencing composition, growth and quality of forests and understand the impacts of those prescriptions; analysis of the economic, environmental, and social consequences of forest resource management strategies and decisions; development of management plans with specific multiple objectives and constraints; use of valuation procedures, market forces, processing systems, transportation and harvesting activities that translate human demand for timber-based and other consumable forest products into the availability of those products; use of valuation procedures, market, and non-market forces that avail humans the opportunity to enjoy non-consumptive products and services of forests; and description of the administration, ownership, and organization of forest management enterprises; and (4) Forest Resource Policy, Economics, and Administration (including development of forest policy; use of federal, state, and local laws to govern the practice of forestry; the importance of

professional ethics, including the SAF Code, and recognition of the responsibility to adhere to ethical standards in forestry decision making on behalf of clients and the public; and integration of technical, financial, human resources, and legal aspects of public and private enterprises).

The Wildlife Society Certification Requirements

A primary goal of The Wildlife Society is to support the education, training, and ethical practice of wildlife professionals throughout their careers. To that end, The Wildlife Society recognizes professional credentials with three distinct certificates: Certified Wildlife Biologist, Associate Wildlife Biologist, and Professional Development. Holding a certificate from The Wildlife Society places you in a category distinct from other wildlife professionals due to the integrity of the organization and the high standards of the certification process. You earn credibility and respect, which offers you an added advantage when applying for jobs, in public forums, and in legal proceedings. Many disciplines contribute to the title of wildlife biologist, so certification requirements must be broad to encompass the full breadth of the wildlife profession. The Society recognizes that strict application of rigid criteria would be detrimental to the continued growth of the profession. Course requirements for certification as a Certified Wildlife Biologist by The Wildlife Society are thus broad. Relevant requirements for NREM include 36 credits in biological sciences (6 credits in wildlife management, 6 credits in wildlife biology, 3 credits in ecology, 9 credits in zoology, 9 credits in botany, and 3 additional credits in any category), 9 credits in quantitative sciences (biometry and modeling are important options not currently available at ISU), and policy, administration, and law (6 credits).

Research Foci

Iowa State University is a land-grant institution with a mission to create, share and apply knowledge to make Iowa and the world a better place. The Department of Natural Resource Ecology and Management has as one of its goals to maintain an excellent research program that spans basic to applied aspects of natural resource management that meet the needs of Iowa citizens, state and federal natural resource agencies, and other constituents. To accomplish this, the department research focus is aimed at three broad systems and their ecology and management. These include the aquatic, terrestrial, and human systems of Iowa and the world. Each of these systems interacts with the other two requiring strong collaborative approaches to solving their problems. NREM maintains a faculty and staff that are competent in addressing issues in all three of these systems and are able to conduct collaborative research that will provide the holistic answers needed to solve problems. Problems that are addressed in these systems require a collaborative approach not only because the systems interact with each other, but because they are found in a mosaic of native, agricultural, and urban settings in Iowa and the Midwest.

The following are general areas of focus that the department presently addresses and that should be considered when writing faculty positions descriptions as they arise:

- Perennial plant community management
- Fisheries and aquatic resource management

- Wildlife management
- Improving surface water quality/quantity & aquatic communities
- Development of agroforestry conservation practices
- Perennial plant community restoration for multiple products & ecosystem services
- Biofuels & bioproduct development, production, and ecological effects
- Urban natural resource management
- Quality of life for rural and urban residents
- Social impacts & interactions with natural resources and their management

Non-tenure Faculty Positions

The goal of the department is to be able to hire new tenure-track faculty who will be successful in balancing teaching, research and outreach responsibilities. Typically new faculty will be expected to teach at least two required courses each year. At present, the retirements we anticipate over the next five years are among faculty that teach more than two courses per year. Ideally, the department should seek to increase the number of tenured faculty positions, especially considering the loss of positions associated with the movement of four previous positions to EEOB. However, in the short run the department will probably rely to some degree on non-traditional faculty (full-time and part-time adjunct untenured faculty positions) to teach a number of critical courses or the number of courses offered by the department will have to be reduced. At the time of this writing, the following positions were being supported: 1) Restoration and Management of Perennial Plant Communities in Agricultural Landscapes; 2) Human Dimensions and Natural Resource Economics; 3) Natural Resource History and Policy; 4) Research Position in Tropical Terrestrial Ecosystems/Teaching Position in Applied Ecosystems Ecology; and 5) Wildlife Specimen Curator and Conservation Genetics, Systematics, Conservation of Freshwater Organisms. Each of these positions is assumed to have teaching, research, and outreach responsibilities. Critical issues to consider for these and any future positions include longevity and funding of the positions to provide continuity for both the persons and the responsibilities that they are assigned. Persons filling these positions should be given consideration for any applicable tenure-track positions that open.

In addition to the positions required to directly support the teaching program in the department, consideration must be given to provide continued support to members of the Iowa Cooperative Fish and Wildlife Research Unit housed in the department. Members of the Unit provide many cooperative research opportunities, train graduate students, and teach some important graduate courses. Members of the Unit are not tenured and their positions depend on continued federal funding. Retirements of members of this unit could take place during the

period of this plan (5 years) and extended delays in refilling these positions might occur similarly to those for tenure-track faculty.

Support-Staff

The following positions provide important services to the department that allow faculty, graduate students, and undergraduates to function effectively and efficiently. These positions should be maintained unless duties are assigned to existing or new hire tenure-track faculty or staff positions. Persons in the curatorial positions would be required to hold and maintain applicable state and federal permits and certifications or make sure that such permits were secured for the department where applicable.

- Computer Specialist—position maintained at full-time person.
- Recruiting —½ time person to conduct active recruiting.
- Curator— ¼ time person to update and maintain dendrology collections.
- Curator—½ time person to update and maintain vertebrate collections for a 2-3 year period and then become a ¼ time position. If discussions of maintaining both teaching and research collections supports maintaining both, then this position should be maintained at ½ time.
- GIS Specialist—maintain this full-time position for department wide support.

Staffing Implementation Plan 2008-2013

Following approval in December 2007 of the NREM Strategic Plan, which concluded with the foregoing strategic staffing plan, an ad hoc committee was tasked with developing an implementation plan for faculty staffing. The committee convened in early January 2008 with the goal of comprehensively aligning vacated responsibility areas, tools sets, and research opportunities to address open positions resulting largely from expected faculty attrition. Advanced, definitive planning for incrementally vacated positions is not possible because individual faculty members rarely announce a resignation far in advance. Therefore, the implementation plan will seek to describe in general terms positions to fill the likely opening of five tenure-eligible faculty positions in the next five years. This comprehensive faculty staffing implementation plan was under development at the time this document was written, but an update/draft implementation plan will be provided to the review committee at the time of the review.

Departmental Space and Facilities

One of the objectives of the merger of the Animal Ecology and Forestry Departments was to improve the effectiveness and efficiency in building space utilization. Table 1 shows the space available to the new NREM Department at the start of the merger and the current space allocated to the Department. One sub-objective of the reorganization was to position all departmental offices, dedicated teaching areas, and laboratories in one building, not counting the specialized operations in the forestry greenhouse. As shown in Table 1, that has not happened.

The department is still spread across the same set of buildings as before the merger. However, there is more concentration of activities in the two Science buildings.

Table I.1. **Original and current space allocated to NREM by building.** All data taken from The FPM web site: <http://www.fpm.iastate.edu/planning/fp/spacebybuilding.asp>. See Appendix I.3 for floor plans.

Original NREM Allocation	Square Feet	Current NREM Allocation	Square Feet
Bessey	16,501	Bessey	1,342
Science II	11,230	Science II	29,670
Science I	6,584	Science I	6,633
Genetics Lab	4,193	Genetics Lab	2,106
Forestry Greenhouse	9,586	Forestry Greenhouse	9,586
Original Total	48,094	Original Total	49,337

There were some definite gains in the quantity and quality of useable space, but some space challenges remain for the department. Prior to the merger, many faculty did not have their own laboratory space or what they had was inadequate. Most faculty now have good laboratory space, but it has been difficult to find good space for our most recent hires. Some inefficiencies were created in the research space for the Wood Science group because the mechanical processing and dry kiln facilities could not be moved to Science 2 to be close to the wet chemistry and image analysis labs that were moved from Bessey Hall to Science 2. The number of faculty, staff and graduate student offices remained about the same during the reorganization, but total space declined (Table 2). As in many of the ecosystems we study, not only did total area decline, but the graduate student space is highly fragmented between three buildings. Office and laboratory space are definitely limited now for any of the desired expansion of the faculty, staff and graduate student numbers. Office space for post-doctoral appointees and visiting professors is already inadequate.

After substantial renovations, that were finally completed in 2007, the department has an improved level of teaching space that is well tailored to the student-centered learning and unique technical teaching needs of the department. One significant teaching space problem remains. The NREM Department took over responsibility of teaching Dendrology from the Botany Department that was merged into the new EEOB Department. However, the teaching, specimen preparation/storage, and greenhouse areas for the course stayed with EEOB. To accommodate teaching the course in Science 2, we have had to “borrow” the use of one teaching room from the GDCB Department and convert one area of our research greenhouse to housing live teaching materials. Without remodeling, the teaching room is too small and the greenhouse operations have been assumed by a greenhouse budget that was already shrinking. General study areas and computer rooms for students have declined in both number and area. This problem has been compensated for by more computer availability in the classrooms and more use of classrooms for group study.

Reorganization of space to serve Extension personnel and their clients was begun in 2007 and is not yet complete.

A major benefit negotiated during the merger was the addition of significant new storage areas for large and specialized field equipment at the Hinds Farm and Horticulture Station. However, there remains a need for special storage areas for Extension materials and field research equipment that needs to be kept close at hand on campus. Table I.2 shows changes in space allocations to the department.

Table I.2. Changes as a result of the departmental merger and reorganization of space.

Category	New NREM Space	NREM Space Vacated Elsewhere	Net Change
Classrooms	3,252	3,045	207
Wood Science	2,258	2,214	44
Offices	8,158	9,230	-1,072
Conference Rooms	659	412	247
Study Rooms	932	1,355	-423
Storage Areas	789	1,007	-218
Research Laboratories	11,498	9,831	1,667
Net Gain			452

A potential solution to all of the space concerns would be a new building built specifically to serve the department’s current and expansion needs. As part of the merger, this concept was put forward and accepted as a medium term goal. However, that goal has not been given high priority in subsequent years as we focus on building our learning, discovery, and outreach programs based on the quantity and quality of our personnel. Before long, the availability of good space will be a major obstacle.

Financial Resources

Current Budget Model

The primary funding source in the Department is through the College of Agriculture and Life Sciences (CALs). Funds from the College originate from the University General Fund (teaching), IAHEES (research), and University Cooperative Extension (Agriculture and Natural Resources Extension, CALs). Departmental research and extension also enjoy special federal formula funding through McIntyre-Stennis (forestry research) and Renewable Resources Extension Act (forestry, fisheries, and wildlife extension).

New Budget Model (Resource Management Model)

The university will implement fully, in FY10, a new model (Resource Management Model; <http://www.public.iastate.edu/~budget/>) for budgeting to Resource Responsibility Centers (RRC). For NREM, the RRC is the College. The department expects no significant

change in departmental funding, but because of potential rewards for program growth, the Dean encourages the department to explore growth opportunities in all three mission areas but especially in teaching. Several areas of potential growth, such as distance education, also might help the department increase funding while enhancing the department's ability to address its mission. At this writing, decisions by upper administration on funding mechanisms for some programs, including distance education, have not been made. However, the department might well benefit by pursuing non-traditional programs that are coupled with positive budget feedback.

Budget support for FY08 consisted of \$1,362,570 from the Agriculture and Home Economics Experiment Station, \$1,570,555 from the College of Agriculture and Life Sciences, and \$212,843 from the Cooperative Extension Service in Agriculture and Home Economics for a total of \$3,145,968. Private donor support to the department for FY08 amounted to \$767,208. Details of both university support and private donor support are provided in Appendix I.4 and I.5

Numerous scholarship opportunities exist for NREM students each year. For the academic year 2006-2007, a total of \$42,750 was awarded with 46 undergraduates and 7 graduate students receiving awards. 6I.4 shows the details of undergraduate and graduate scholarship awards.

Raising Funds from the Private Sector (NREM's Development Plan as a Contribution to Campaign Iowa State 2008-2013)

Campaign Iowa State is a 5-year campaign to raise \$800 million in private donor support by 2010. The campaign targets four priority areas: student support, faculty support, program support, and facilities support. The following development plan for the department represents a starting point and focuses critical needs in each of the four campaign priority areas. The department's implementation plan leverages professional development officers with the ISU Foundation, one of which is assigned specifically to raising funds for NREM. Other development officers, as part of an assignment to a specific region of the US or under various Foundation programmatic assignments, raise support for the department. For its part, the department focuses its alumni newsletter on raising awareness of opportunities for donations among alumni, hosts four annual alumni events at professional/scientific meetings, and supports travel by the chair to cultivate and steward individual donors.

Student Support

Undergraduate Student Scholarships

Wildlife and Fisheries undergraduate academic scholarships (especially freshman and transfer students)

Goal: Endowment \$400,000 to yield \$20,000/year in scholarships; expendable \$1000-\$2500 in 10 to 15 scholarships

Rationale: The department currently has no scholarships to recruit the brightest students in Animal Ecology (options in Wildlife and in Fisheries).

Undergraduate and Graduate Research Scholarships

Goal for *Undergraduate Scholarship*: \$250,000 endowment; expendable \$12,500 in 5 to 10 awards

Rationale:

- Student travel to meetings. Students compete best for jobs and perform better in their academic career when given the opportunity to travel to scientific and professional meetings to present the results of their research.
- Research scholarships for undergraduates. Students learn best by doing, and conducting research alongside a faculty mentor is the best way for undergraduate students to learn about the discipline, to explore their interest in a research career, and to gain the confidence and networks needed to excel in a professional career.

Goal for *Graduate Scholarship*: \$1,000,000 endowment; expendable \$50,000 in 10 awards

Rationale:

- Needed to maintain excellence and national prominence.
- Tuition scholarships for recruiting and assisting graduate students in Fisheries, Wildlife, and Forestry. With 30 of 50 students requiring tuition assistance of \$5000/student/year, this is necessary to compete nationally for the best students.

Faculty Support

1. Wildlife and fisheries endowed professorships

Goal: Endowment \$1,000,000 with one each in fisheries and wildlife.

Rationale: Animal Ecology (fisheries and wildlife), a program with a history of national prominence, has no endowed professorships. NREM competes with other nationally prominent fisheries and wildlife programs that use endowed faculty professorships to support excellence.

2. Study Abroad Faculty Fellowships

Goal: Endowment \$500,000; expendable \$20,000/year

Rationale:

- NREM faculty members teach several Travel Abroad courses to locations that include Costa Rica, Brazil, Uganda, China, and Korea.
- Departmental resources necessary to encourage and support faculty involvement are increasingly scarce.
- These funds will be used for salary and travel for instructional faculty in Travel Abroad courses.

Programmatic Support

1. NREM undergraduate camp operational support

Goal: \$3,700,000 endowment; \$132,000 expendable.

Rationale:

- The department currently conducts a 3-week fall camp for sophomore Forestry students. Continuing the forestry camp experience, highly valued by Forestry alumni and current students, and extending a camp experience to Fisheries and Wildlife students is a strategic priority for the department. Continuing the current Forestry camp and extending the camp to all undergraduate students requires private funding. (Note: Forestry Alumni Centennial Fund provides about \$5,500/year to offset some of the student travel expenses to Forestry Camp).
- Camp expenses include travel, meals, and lodging. A future camp experience also will require faculty salary support to offset salary faculty members forego in research grants (Note: previous camps were staffed by faculty members on 12-month salary).

appointments; all staffing soon will be by faculty members on 9-month appointments who must secure grants and conduct summer research to cover summer salary. Therefore, most faculty members will be unable to lead a camp experience.

- Because departmental resources are increasingly inadequate to support faculty involvement in extended, off-campus instruction, an NREM Camp will require resources for faculty stipends and travel of about \$32,000/year (travel \$6000/year and faculty stipend of \$26,000/year--2 faculty members for 6 weeks each @3 weeks camp and 3 weeks preparation).
2. NREM Excellence Fund (account established, but is not endowed)
Goal: \$1,000,000 endowment; \$50,000 expendable.
Rationale: Venture fund support for unanticipated opportunities to support students and faculty.

Capital Support

1. Green campus office, instructional, and research laboratory building for NREM
Goal: \$10,000,000 minimum
Rationale: Science II, constructed in 1971, presents considerable challenges to recruiting faculty and students and to learning, engagement, discovery, and development. An environmentally and ecologically sensitive building design with modern facilities is needed.
2. Field locations with endowments for operating undergraduate student learning
 - Land and surface water (river, stream, pond, and lake) access (160 acres in one location near Ames).
 - Building with dining facility, large classroom, storage
Goal: \$500,000
 - Operational endowment.
Goal: \$2,000,000; \$100,000 expendable annually from equivalent proceeds in land rental, timber production, etc.-- to provide for transportation, facilities operation and maintenance, instructional faculty support.Rationale:
 - NREM (Animal Ecology and Forestry) has a history of excellence in active learning, and field laboratories are a key element of this experience.
 - An outdoor laboratory devoted to and equipped for student learning is desperately needed.

Relationship with Other Departments and Interdepartmental Graduate Programs???

Major Strengths

1. The faculty and staff carry heavy workloads and are highly productive given the limited resource base.
2. Disciplinary and demographic diversity of faculty and students, and a commitment to enhancing diversity within the department.
3. Faculty dedication to providing students with a competitive edge in the employment market and with the professional skills to perform at the highest level.
4. A student body that meets or exceeds expectations for learning, is engaged in a broad range of learning activities, is professionally active, and contributes to the department's collective sense of purpose and community.
5. Two undergraduate majors with large numbers of students compared to peer universities.
6. A faculty composed of highly productive researchers and effective, scholarly teachers.
7. A faculty committed to engaging stakeholders and making a difference in natural resources management.
8. A collegial atmosphere and high level of esprit de corps among faculty, staff, and students.
9. A nationally prominent faculty with a reputation for excellence in solution science research and for collaborative research.
10. A staff that functions effectively to support faculty success in each of the department's missions.
11. The Department consistently encourages faculty development.
12. The faculty includes campus leaders in student study abroad courses and student-centered learning.
13. Two externally funded units, NCRAC and ICFWRU, provide the Department with additional resources including faculty members.
14. The Department shares faculty resources with other departments, both within and outside the College.
15. The Department enjoys a supportive, constructive relationship with the College administration and with other departments and department chairs.

Major Areas for Improvement

1. Faculty staffing and program development to support student recruitment and student success in the employment arena.
2. Increasing students in under-subscribed undergraduate options.
3. Providing equal amount of discipline-appropriate learning opportunities for students in all majors and options (e.g., providing a camp-like experience to students in both undergraduate majors).
4. Increasing research visibility and **branding** by focusing research and by publishing sufficient numbers of articles in journals with high impact and broad readership.
5. Increasing research productivity across the faculty.
6. Increasing budgeted resources for natural resources extension.
7. Improving the quality and quantity of space for all faculty, staff, and students across program areas.
8. Increasing private donor support for critical program areas, endowed professorships, capital needs, and student scholarship support.

Benchmarks for Administration

1. The Department maintains faculty numbers and curriculum sufficient to maintain SAF accreditation and certification for wildlife and fisheries options.
2. The Department adapts its funding model and faculty staffing to a changing environment including potential student recruits, educational delivery methods, research opportunities, the university's RMM, and external competition for resources.
3. The Department effectively uses appropriated and donor supplied funding to build excellence in the faculty, enable faculty productivity, attract outstanding students, meet expectations of stakeholders and university benchmarks, and facilitate overall competitiveness of the Department.
4. The Department increases diversity of faculty, staff, and students.
5. The Department increases its reputation for producing graduates with skill sets valued in the marketplace of the professions and for conducting and extending high quality mission-oriented research consistent with the Department's mission and vision and the University's motto of "Science with Practice".

Key Questions

1. What are the Department's major opportunities to balance faculty resources with opportunities in research, teaching, and extension?
2. What opportunities, including internal opportunities associated with the Resource Management Model (new budget model), represent the best investments in future faculty staffing decisions? In what ways does (and does not) the department's strategic plan address adequately these opportunities?
3. Of the expected loss of faculty tool sets over the next five years, which should receive priority when the Department develops position descriptions that will meet both current demand and future opportunities?
4. What approaches might represent the best opportunities to meet expected loss in teaching expertise with retirement of key teaching faculty in other departments, especially EEOB?
5. What actions should the department take to increase effectiveness and awareness of the department's **branding** for student education, research, and extension/outreach?

Chapter II. Undergraduate Programs

Executive Summary

The Department of Natural Resource Ecology and Management offers majors in Animal Ecology and Forestry. Immediately following the department merger, a committee was formed to develop student learning outcomes and to assess each of the options within each major. Recommendations from that committee resulted in the adoption of ten student learning outcomes applicable to both majors. Appendix II.I shows the current departmental student learning outcomes. During Fall Semester, 2007, the College of Agriculture and Life Sciences (CALs) faculty voted to accept a revised set of outcomes. The NREM Outcomes Committee has begun the process of modifying our current outcomes to reflect additions made to the CALs core outcomes.

In addition to developing an initial set of learning outcomes, the Fisheries and Aquatic Sciences option in Animal ecology was split into two separate options, giving students five options to choose from in that major. A new option, Interpretation of Natural Resources was added to the Forestry major, giving students a choice of five options in that major as well.

Within the Animal Ecology major, the Wildlife Option is certified by The Wildlife Society, and the Fisheries option is certified by the American Fisheries Society. The Forestry major is accredited by The Society of American Foresters. Both majors require the equivalent of at least one summer of work experience in a field related to the student's major prior to graduation.

Enrollment has declined by approximately 100 students since the department merger with a slightly higher percentage decrease in Animal Ecology majors than in Forestry majors. Percent of Forestry majors versus percent of Animal Ecology majors increased slightly since the department merger. During that same time period, undergraduate enrollment in CALs declined from 2624 in Fall of 2002 to a low of 2369 in Fall of 2003. Since that time, college enrollment has rebounded to 2697 during Fall, 2007. At present, NREM undergraduates constitute approximately 11% of the total undergraduate enrollment in CALs.

Undergraduate academic advising for freshmen, sophomores and new transfer students is initially handled by two advisers (one for forestry students and one for animal ecology students). Once students select an option within their major, they are promoted to a new advisor more closely aligned with their option. All tenured and tenure-track faculty with teaching appointment contribute to upper-class advising.

Graduates in both majors are highly competitive in the job market with an average of 94% of the forestry graduates and **% of the animal ecology graduates finding employment or going on for an advanced degree after graduation.

Program Description

Students initially enroll in either animal ecology or forestry without selecting an option. During the first two years of their academic careers, they take basic coursework in a number of areas. Total enrollment for animal ecology and forestry since the department merger is shown in Table II.1.

Table II.1 Enrollment by Major from 2002 to present

Major		F02	S03	F03	S04	F04	S05	F05	S06	F06	S07	F07
AECL	Male	158	Na	157	143	153	141	144	138	146	140	132
	Female	158	Na	153	146	145	132	119	112	134	109	102
	Total	316	300	310	289	298	273	263	250	280	249	234
FOR	Male	80	Na	65	63	60	60	61	61	73	60	61
	Female	12	Na	15	17	15	13	15	16	13	16	11
	Total	92	88	80	80	75	73	76	77	86	85	72
NREM	Male	238	Na	222	206	213	202	205	199	219	209	193
	Female	170	Na	168	163	160	144	134	128	147	125	113
	Total	408	388	390	369	373	346	339	327	366	334	306
CALS	Male	1505		1361		1488		1452		1478		1520
	Female	1119		1008		989		996		1061		1177
	Total	2624		2369		2477		2448		2539		2697

During their sophomore year, students select an option from within their major and spend the remainder of their time taking coursework that helps them to specialize in that area. Although there is some overlap in coursework among options, much of the course content is specific to that option. Current options within Animal Ecology are: 1) Aquatic Sciences, 2) Fisheries, 3) Interpretation of Natural Resources, 4) Pre-veterinary and Wildlife Care, and 5) Wildlife. Options currently available in Forestry are: 1) Forest Ecosystem Management, 2) Interpretation of Natural Resources, 3) Natural Resource Conservation and Restoration, 4) Sustainable Materials Science, and 5) Urban and Community Forestry. Option sheets showing current course requirements for each of the options in Animal Ecology and Forestry are provided as an exhibit in the review team work area.

Forestry students are assisted in the selection of their option through a set of six courses they take as a package during fall semester of their sophomore year. One of those courses is a three-week fall forestry camp that takes them to a part of the United States where forestry is a significant part of the regional economy. The purpose of the camp, beyond providing prerequisites for future course work, is to help students see the many different employment options that are available in forestry. At present, there is not a similar course package available for animal ecology students.

Prior to graduation, all NREM students are required to complete at least one practical work experience related to their major. The minimum requirement is one summer for forestry

students or 300 hours for animal ecology students, but most go well beyond the minimum requirement.

Since Fall Semester, 2002, the department has awarded 447 B.S degrees. On average, NREM graduates make up about 15% of the undergraduate students receiving B.S. degrees in the College of Agriculture and Live Sciences. Table II.2 shows number of degrees awarded by major as well as total number of B.S. degrees awarded by CALS.

Table II.2 Number of Students Receiving Bachelor of Science Degree by Major and Year

	F02	S03	I03	F03	S04	I04	F04	S05	I05	F05	S06	I06	F06	S07	I07
A. Ecol.	25	37	4	20	44	4	23	33	6	24	38	7	27	44	7
Forestry	7	16	2	12	2	2	3	16	2	6	11	3	4	14	2
NREM Tot.	32	53	6	24	56	6	26	49	8	30	49	10	31	58	9
CALS Tot.	205	413	48	176	361	37	182	383	34	195	373	41	174	349	56
% of CALS	15.6	12.8	12.5	13.6	15.5	16.2	14.3	12.8	23.5	15.4	13.1	24.4	17.8	16.6	16.1

The Mean ACT composite scores for students in NREM are somewhat lower than the averages for CALS and the University. Table II.3 shows a comparison of ACT scores for incoming freshmen for the department, college, and university.

Table II.3 Comparison of ACT-Composite Scores for Incoming Freshmen

	NREM	College	ISU
Fall 2007	23.6	23.6	24.6
Fall 2006	22.6	23.8	24.5
Fall 2005	21.7	23.4	24.4
Fall 2004	23.8	23.6	24.6
Fall 2003	24.2	23.8	24.6
5-Year Avg.	23.4	23.6	24.5

Graduation rates for four and five years after entry are shown in Table II.4 for students who entered in 2002. For that time period, graduation rates for NREM students are consistently above graduation rates for the College and University.

Table II.4. Cumulative Graduation Rates for entering freshmen (Percentage)

	Entry Year	4-Years	5-Years
Animal Ecology	2002 (n=41)	48.8%	Na
Forestry	2002 (n=6)	50.0%	Na
Combined NREM	2002 (n=47)	48.9%	74.5%
CALS	2002	47.8%	69.8%
University	2002	33.6%	62.5%

Table II.5 shows the racial/ethnic make-up of the Fall 2007 freshmen in both Animal Ecology and Forestry as compared to the College.

Table II.5. Percentage of Fall Semester 2007 New Freshmen by Race/Ethnicity

Race/Ethnicity	Animal Ecology	Forestry	CALS
American Indian	0%	0%	0.44%
African-American	4.55%	0%	2.42
White/Caucasian	90.91%	100%	91.41
Asian-American	0%	0%	1.32%
Hispanic	0%	0%	1.54%
Prefer not to indicate	0%	0%	0.22%
No Information	4.55%	0%	2.64%

Student Clubs

Students in NREM have eleven different clubs to choose from, ranging from professional chapters such as Society of American Foresters and National Association of Interpreters to interest area clubs such as ISU Trumpeter Swan Restoration Committee and Forestry Club. Many NREM students are actively involved in multiple clubs. A brief description of each of the departmental clubs is provided in Appendix II.2

Progress on Previous Strategic Plan Goals for Teaching

The first strategic plan for NREM listed two goals for the teaching programs in the department.

- Sustain excellence in instructional capabilities, curriculum composition and operation, and focus on teamwork and student-centered learning
- Better capitalize on emerging trends in learning, technology and outcomes assessment.

Prior to the merger, Animal Ecology offered 30 undergraduate courses, and Forestry offered 33. During the initial review of courses taught in forestry and animal ecology following the department merger, a number of changes were made to help unify the department and its undergraduate programs. Courses in both animal ecology and forestry were reviewed, and

courses that had content potentially applicable to both majors were given an NREM designator. Four animal ecology courses and six forestry courses were changed to NREM designators. In addition, six courses that had existed in both departments prior to the merger were combined and changed to NREM designators. With the addition of one new NREM course, initial changes following the merger resulted in 17 NREM courses taught by the department. The animal ecology major offered 22 undergraduate courses, and forestry offered 24. Since that time, we have gone through two curriculum revisions as part of the university's two-year catalog cycle. As a result of those reviews, new courses have been added, some courses have been dropped, and some have been changed to NREM designators. Current course counts are: Animal Ecology, 25; Forestry 24; NREM, 29. Appendix II.3 shows the current NREM catalog description and course listings.

Teaching responsibilities have been fairly constant through the period of the merger, although retirements, new hires, and loss of faculty positions to the Ecology, Evolution and Organismal Biology Department have caused some modification in teaching responsibilities. Table II.6 shows teaching responsibilities for spring and fall semesters 2006 and 2007.

Table II.6. NREM Teaching Responsibilities for Spring and Fall Semesters, 2006 and 2007.

	Animal Ecology	Forestry	NREM
Tenured/Tenure Track			
Heidi Asbjornsen		460	390, 468X
Gary Atchison			460
Julie Blanchong	365		
Stephen Dinsmore	458X,		
Sue Fairbanks	451, 459X,		303
Richard Hall		206 ^d , 302	120
Thomas Isenhart	312		120
Steven Jungst		203, 205 ⁺ , 206 ^d	110 ^c , 112, 345, 446
Monlin Kuo		202, 481 ^a , 483 ^a , 487 ^a	
Carl Mize		205 ⁺ , 342	
Joseph Morris	440, 442,		305
James Pease			110 ^c , 303, 330, 430
Michael Quist	321, 366 ⁺ , 441,		
Lita Rule		204, 205 ⁺ , 206 ^d , 451, 453	
Lisa Schulte	363n, 366 ⁺ ,	452 ^{co}	452 ^{co}
Richard Schultz		454 ⁺	301, 407
Tim Stewart	362 ⁿ , 364 ⁿ , 366 ⁺		303
Janette Thompson		201, 206 ^d , 475	112
Adjunct Faculty			
Franz			402

Cathy McMullen		356	256
James Miller			465
James Pritchard			120, 285X, 385
Kevin Roe	361 ⁿ , 455		475X
Doug Stokke		280, 480 ^a , 485, 486 ^a	303
John Tyndall		201, 452 ^{+co} , 454 ⁺	452 ^{co} , 460
John Burnett			110, 111X, 211
Coop Unit Faculty			
Clay Pierce	418		
EEOB Faculty			
William Clark	371,		
John Downing	486, 486L		
Plant Pathology Faculty			
Tom Harrington		416	

⁺ Team taught

^a Alternate year offering

^c Responsibility for freshman section of 110 alternates between Jungst and Pease

^{co} Converted from Forestry to NREM during 2006-2007

^d Two different forestry faculty are responsible for 206 each year.

ⁿ No longer available in the 2007-2009 academic catalog

X Denotes course being offered experimentally

Enrollment in Animal Ecology, Forestry and NREM courses for the 2007 calendar year is shown in Table II.7.

Table II.7. Enrollment in departmental courses for Spring and Fall, 2007 semesters combined.

	Majors ⁺	Non-majors ⁺⁺
Animal Ecology	354	234
Forestry	313	8
NREM	494	399

⁺ Includes both animal ecology and forestry majors

⁺⁺ All other majors

To further guide curriculum development, the department has been actively involved in learning outcomes assessment along with all other departments in the College of Agriculture and Life Sciences. During the years 2004, 2005, and 2006, students who had earned their B. S. degree either 2 years previously or 5 years previously were surveyed to find out how well they felt their undergraduate degree program had prepared them to accomplish the duties and responsibilities of their current job. Combined results from those three surveys are shown in Table II.7.

Table II.6. Average responses by professionally employed NREM graduates

1. Develop, explain and evaluate their own beliefs, values and behavior in relation to professional and societal standards of ethics.

2 yr grads	3.97*	(n=65)	5 yr grads	4.02	(n=57)
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2. Anticipate, analyze and evaluate natural resource issues and explain the ecological, economic, and social consequences of natural resource actions at various scales and over time.

2 yr grads	4.03	5 yr grads	4.14
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3. Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

2 yr grads	3.80	5 yr grads	3.57
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4. Assess, analyze, synthesize, and evaluate information fairly and objectively.

2 yr grads	4.15	5 yr grads	4.16
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5. Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem solving approaches.

2 yr grads	4.19	5 yr grads	4.14
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6. Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

2 yr grads	4.00	5 yr grads	3.98
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7. Communicate clearly and effectively with different types of audiences using appropriate oral, visual, electronic, and written techniques.

2 yr grads	4.37	5 yr grads	4.04
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8. Recognize and interpret resource problems across spatial scales from local to global.

2 yr grads	3.91	5 yr grads	3.84
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9. Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

2 yr grads	3.83	5 yr grads	3.71
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10. Exercise life-long learning skills developed before graduation.

2 yr grads	4.14	5 yr grads	4.40
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* 1=Very Poorly, 2=Moderately Poorly, 3=Average, 4=Moderately Well, 5=Very Well

**1= Not Important, 2=Moderately Unimportant, 3=Neutral, 4=Moderately Important, 5=Very Important

Major Strengths

Benchmarks
Where we are:

Where we want to be:

1. Maintain excellence in teaching and learning
2. Maintain curricula that meet or exceed professional standards.
3. Determine the efficacy of adding a third undergraduate major that will appeal to a broader undergraduate constituency.
4. Continue to develop and implement outcomes assessment practices that effectively guide curriculum improvements.
5. Maintain excellence in undergraduate advising and mentoring.
6. Enhance recruitment and retention of undergraduate students in the department.
7. Enhance diversity through recruitment and retention of minority students and faculty in the department.
8. Establish an advisory council to help guide decisions and provide feedback on quality of program graduates.

Chapter IV. Departmental Scholarly Activity

Executive Summary

Many of the most staggering challenges on the local, national, and global levels, both currently and in the near future, involve our planet's natural resources. We are on the eve of major changes in human interactions with, and attitudes toward, natural resources and ecosystems. Forces such as climate change and the movement toward a bioeconomy will profoundly impact Iowa's landscape and lifestyle, as well as the rest of the world. The Department of Natural Resource Ecology and Management is well-positioned to address these challenges through basic and applied research, outreach and extension, striving to fulfill the goal of assisting the public with change in a dynamic world. Through both collaborative and individual efforts, scholarly activity in the department addressing terrestrial, aquatic, and human systems can be summarized in three broad themes: 1) natural resource products and services; 2) mitigating effects of large-scale agriculture and anticipating change; and 3) the scholarship of teaching.

Complementing a solid reputation for research in natural resources, nine new tenured and tenure-eligible faculty have joined the NREM Department since the merger of the Forestry and Animal Ecology Departments. These faculty members, in addition to several adjunct faculty, have brought new skills and expertise to the department, and play important roles in our ability to develop vigorous research programs directed at emerging natural resource issues. However, because of the high number of faculty retirements expected over the next 5 years or so, and due to the loss of 4 Animal Ecology faculty lines and the 4 highly productive individuals in those positions during the reorganization of departments, there is concern about maintaining important areas of research to meet the needs of our constituents and maintain a strong, diverse graduate program.

Rates of publication and other dissemination of research results by the department have increased substantially over the years since the NREM Department was formed. Although the department has been successful in obtaining a significant amount of external funding for scholarly activity, grantsmanship is one of the areas identified for improvement in the Strategic Plan, with goals and strategies to increase total amount of external funding and increase the number of major grants in the department.

Program Description

The Department maintains strength in research addressing three broad, interacting systems: terrestrial, aquatic, and human. Due to the complexity of the ecology of these systems, and the challenges of managing these systems in agricultural, native, and urban landscapes, integrative and interdisciplinary approaches complement strong research programs in each of the systems. New faculty hires are facilitating research collaborations with nationally- and internationally-recognized peers, and will broaden our expertise, increasing opportunities for interdisciplinary collaborations within our department. Active collaborations also exist between NREM faculty and other departments, colleges, and Research Centers within ISU, and with city, county, state, and federal agencies. The Northcentral Regional Aquaculture Center is based in the NREM department.

NREM also houses the Cooperative Fish and Wildlife Research Unit, currently staffed by a Unit Leader, 2 Assistant Unit Leaders, and an administrative specialist. The research and education programs of the Unit are designed to develop and disseminate information and knowledge that contribute to wildlife and fisheries sciences, as well as to the needs of the cooperating agencies. Research conducted by graduate and post-graduate employees as part of their education program is the major vehicle through which the Unit accomplishes its goals. However, formal classroom teaching, in-service training, technical assistance, and expansion of the particular expertise of Unit staff also meet program desires and Unit goals.

Research by NREM faculty contributes to the discovery, sharing, and application of new knowledge within the Iowa Agriculture and Home Economic Experiment Station and Cooperative Extension Service (AES), which provides a significant proportion of NREM faculty salaries. Our program is an important component of the Natural Resources Theme in the AES Plan of Work, but also contributes to other themes, from time to time.

While NREM does not own permanent field facilities to conduct research, we have worked well with managers and superintendents of College of Agriculture and Life Sciences Research Farms and other Iowa State University holdings to conduct natural resource-related research. In addition, the department has a long history of working with private landowners, nongovernmental organizations, and local, state, and federal agencies to conduct research in agroecosystems, native ecosystems, and urban landscapes.

Areas of Scholarship. While it is not possible to adequately represent all scholarly activities of each member of the NREM department, a few broad themes emerge and are presented here. More complete pictures of the scholarly activities of individual faculty can be gained from the brief, 2-page vitae provided in General Information later in this chapter.

Mitigating Effects of Large-Scale Agriculture and Anticipating Change. Natural resources in the state of Iowa exist in a landscape dominated by large-scale agriculture. Research addressing how components of natural ecosystems interact with and survive in such an environment, as well as how management of agroecosystems might improve the quality of our natural resources, is currently a major focus of the department. Anticipating the effects on natural resources of landscape-level change, such as climate change and establishment of a bioeconomy, is an emerging area of research in the department. Primary research strengths of NREM faculty in this area include: aquatic and terrestrial ecosystem responses to disturbance; restoration and sustainable management of natural resources; interactions between agriculture, humans, and wild animals and plants with respect to emerging infectious diseases; quantitative population ecology of wildlife in native and agriculture-dominated landscapes; and human dimensions of natural resources.

Scholarship of Teaching. The Department is well-known for its work in the scholarship of teaching and pedagogy. Several faculty in the department have published in the area and lead efforts across campus to encourage and support this area of scholarship. Primary research strengths of NREM faculty in this area include: development of learning-centered approaches to teaching; and techniques and importance of pre-professional development and leadership training in natural resource fields.

Natural Resource Products and Services. The development of natural resource products and an understanding of the ecosystem services provided by ecological systems will be important in guiding change in the relationship between humans and our natural resources as the implications of climate change and a switch to a bioeconomy become apparent. Research in this area necessarily involves, not only biological aspects, but economic and human dimensions as well. Primary research strengths of NREM faculty in this area include: design and function of riparian buffer systems for multiple ecosystem services; biodiversity services in annual vs. perennial plant systems; problems and opportunities for natural resources in an urbanizing landscape; alternative fibers, natural wood adhesives, and wood preservatives; biomass production and biomass conversion for energy and chemical production; and economics and policy in the natural resource and bioenergy arenas.

Faculty and Adjunct Faculty Vitae.

The brief vitae on the following pages are meant to provide a synopsis of the types of scholarly activities conducted by individual NREM faculty. Quantitative measures of faculty productivity are summarized for the department in the section following the vitae.

Quantitative Measures of Faculty Productivity.

Tables IV.1 through IV.3 summarize the overall contribution of NREM faculty to the scientific community, based on standardized data provided by ISU Institutional Research. The data indicate an increase in the level of publication and dissemination of research findings as the department has come together and added new faculty, but we are quick to point out that our goals are to increase these benchmarks, particularly grantmanship, and to energetically seek opportunities to enhance our department’s scholarly excellence.

Table IV.1 Peer-Reviewed Publications by Calendar Year

	2002	2003	2004	2005	2006	2007
Tenured and Tenure Eligible Faculty + Coop Unit	19	33	24	51	50	53
Other Faculty on Payroll or Housed in NREM	1	2	6	12	5	NA ¹
TOTAL	20	35	30	63	55	53

¹Data not yet available

Table IV.2 Paper and Poster Presentations and Other Supportive Expressions by Calendar Year

	2002	2003	2004	2005	2006	2007
Tenured and Tenure Eligible Faculty + Coop Unit	39	42	66	84	110	NA ¹
Other Faculty on Payroll or Housed in NREM	-	-	9	19	20	NA ¹
TOTAL	39	42	75	103	130	NA ¹

¹Data not yet available

Table IV.3 Number and Amount of External Grants and Contracts Awarded by Fiscal Year

	Number of External Grants	Number of Faculty with ≥ 1 grant as PI or Co-PI	Total Amount of External Grants
2003	33	18	\$3,625,332
2004	53	18	\$4,115,233
2005	33	17	\$1,885,077
2006	42	19	\$2,545,959
2007	42	19	\$2,563,225

Major Strengths

NREM has established and maintained excellence in basic and applied research related to natural resource ecology and management at multiple spatial scales. Combining the Forestry and Animal Ecology departments facilitated collaborations leading to holistic approaches to the study of entire ecosystems, e.g. the riparian buffer project. With the addition of new faculty over the past 5 years, we now have expertise to conduct research at all levels from the genetic to the landscape scale. Research collaborations with colleagues in other departments and disciplines at ISU and around the world is another major strength of the department.

Much of NREM's success in research has been a result of the strong relationships with government agencies and nongovernmental organizations that use the products of NREM research. While the Cooperative Fish and Wildlife Research Unit is a primary vehicle for research with government agencies, faculty have also been successful at obtaining competitive funding from private foundations and nongovernmental organizations, as well as from state and federal agencies. Nevertheless, as funding from government agencies becomes more difficult to obtain, improving grantsmanship in the department is an important strategy in our goal to maintain excellence in research (Strategic Plan, Goal 2, Strategy 1).

Major Areas for Improvement

An important research goal for the department is to identify, evaluate, and promote our role in emerging and on-going natural resource management issues (Strategic Plan, Goal 1), most immediately in the area of biofuels biomass production and processing, and the anticipated changes associated with a bioeconomy. We have begun to do this by partnering with the Department of Agricultural and Biosystems Engineering in the hire of a new faculty member researching in the area of biomass conversion for energy and chemicals and participating in (the discussions that Rick Hall has been involved with). We have also begun to develop research capacity in the area of emerging diseases in wild species with the recent hire of a disease ecologist and establishment of relationships with the ISU College of Veterinary Medicine and the USDA/ARS/National Animal Disease Center, also located in Ames. More work to develop NREM's role in these current issues, and anticipate upcoming problems, is needed.

The adequacy of facilities and infrastructure to maintain and expand research programs in the department is also a concern. In our Strategic Plan, we have put into place strategies to develop and maintain up-to-date, prioritized lists of needs with respect to laboratory space, field sites, and equipment, in order to effectively use available funds (Strategic Plan, Goal 3).

Increasing external grant support of scholarly activity is an area identified for improvement. The Strategic Plan (Goal 2, Strategy 1) details several actions designed to assist in meeting this goal. In addition, while dissemination of research results has been very good, we have developed strategies to improve delivery of results outside the scientific community (Strategic Plan, Goal 4, Strategies 3 and 5, and Goal 5). Finally, while our research programs involve a number of women and people from many different countries, we have established a goal to increase participation in our research programs by underrepresented groups (Strategic Plan, Goal 7).

Benchmarks

Where We Are

- Tenured and tenure-eligible faculty published 50-53 peer-reviewed publications per year in the last 3 years; 2.17 refereed publications per tenured or tenure-eligible faculty member in 2006; 2.21 in 2007
- Total amount of external grants for fiscal years 2003-2007 was \$14,734,826; averaging just over \$2.9 million per year

Where We Want to Be

Key Questions

Chapter V. Extension / Outreach

Executive Summary

As a Land Grant institution, Extension plays a critical role in helping the university to accomplish that mission. Our goal, as the NREM Extension Unit, is to assist in accomplishing all three portions of the Land Grant mission: creating, sharing, and applying knowledge.

Although the Land Grant mission was initially aimed at solving agricultural problems, it rapidly expanded, based on early successes, to other areas of need. Today, extension professionals apply their expertise to a plethora of society's problems and a diversity of clientele. Natural resource problems in Iowa are diverse and are not confined to the few remaining "wild areas" of Iowa. Rather, they cut across a diverse landscape: from rural to suburban to urban; from forests to prairies to wetlands and streams; from row crops to tree farms and plantations, from farm ponds to fish hatcheries and to private aquaculture facilities.

Despite dramatic changes in demographics of the Midwest, there have been few changes in the composition of field extension staff. During extension reorganization in the 1990s, ISU extension administration appointed more specialized livestock specialists to field positions. Despite the dramatic changes in the federal Farm Bills since 1985 as well demographic shifts, extension resources for natural resources were left largely unchanged or shrinking. The natural resources of forests, fisheries, and wildlife (and other natural systems) were left to the responsibility of 1.25 faculty line FTEs, 0.5 P&S extension line FTE and 2 P&S soft money line FTE's located in ISU's NREM department. These individuals based on campus are responsible for delivering programming to the entire state of Iowa and often receive requests from across the Midwest.

Wildlife Program Description

The Wildlife Extension program reflects the diversity of its past, the realities of the present, and the planning for the future of wildlife resources in Iowa. It is characterized by several major programs that seek to deliver research-based information to the public and assist them to manage the wildlife that, in reality, are theirs. It also reflects our best efforts to extend what are very limited FTEs devoted to the program by leveraging the loyalties and abilities of other non-Extension natural resource agencies in the state. As was noted earlier in this document, there are no Extension field staff with wildlife (or forestry or aquaculture) expertise. The split appointment of the wildlife program leader (Pease) with teaching, while diminishing the time able to be spent on Extension programs, has allowed him to connect closely with NREM students. Many have graduated and become employed by County Conservation Boards, the Iowa DNR, zoos, and other agencies and organizations. Their loyalty to ISU and NREM is strong and their knowledge of Wildlife Extension is broad and thus they often partner with us to achieve common goals. In a sense, they become proxy Extension staff in natural resources.

The major programs of wildlife extension are direct-delivery programs to Iowans:

- The *Iowa NatureMapping* program (<http://www.extension.iastate.edu/naturemapping/>) is a citizen science program that trains Iowans to observe terrestrial vertebrate species (birds, mammals, reptiles, and amphibians) and report them with geographical accuracy to a central database. That information is then available to scientists and the wider public for a variety of projects and uses. Over 1,100 Iowans have been trained, to date, and

have reported over 66,000 observations of 360 species on over 1,300 locations in the state. Begun in 1999 when we became the third state in the nation to adopt it, the program has been supported largely as a result of numerous grants from a diversity of organizations, including the U.S. EPA, Iowa Resource Enhancement And Protection-Conservation Education Program, Iowa DNR State Wildlife Grants, Living Roadway Trust, and others, with periodic support from the NREM department and the ISU College of Agriculture and Life Sciences. Workshops are often cosponsored with other agencies and organizations.

- The **Master Conservationist Program** (<http://www.extension.iastate.edu/mcp/>) is a state-wide adult environmental education program, training adults in ecological concepts, wildlife diversity, habitats and their management, sustainable agriculture, and energy and waste management. The goal is to engage citizens in the active conservation management of their land. To complete the program, participants volunteer at least 32 hours of service in a variety of conservation projects after the training. It was begun in 1997 on a pilot basis and taken statewide in 1999. To date, some 40 counties have participated, co-sponsored on the county level by the county Extension office and the County Conservation Board. Some small grants from the Leopold Center for Sustainable Agriculture and the Iowa Association of Naturalists have helped support the program along with fees from program participants. Assessment of the program by a graduate student showed significant change in both long-term knowledge and environmentally relevant behaviors when compared to a control group of adults who did not participate in this program.
- The **Iowa Youth Hunter Education Challenge** is co-sponsored with the Iowa DNR and works with 150-200 youth and adults annually. It culminates in a weekend-long competition and learning experience that demonstrates and enhances the youths' hunting skills and outdoor knowledge. In 2007, we completed our 15th consecutive year of the program. It has proven to be a program that provides both invaluable adult role models for youth and recruitment for ISU students. It is supported largely by donations solicited from 15 organizations along with staff support from us and from IDNR.
- The **Wildlife Media Program** includes radio programs and interviews, television spots, printed publications, and Web pages (the two above plus <http://www.extension.iastate.edu/wildlife/>) that enhance the image and reputation of Iowa State and ISU Extension, and educate the public about natural resources and about our other program opportunities. They include monthly appearances on state-wide WOI radio "Talk of Iowa", interviews with other radio stations, twice-yearly programs on the Gardening in the Zone television series, 56 co-authored and/or edited publications, a video, and three wildlife extension websites.

Wildlife Extension also provides cooperation and service to other Extension "Master" programs, including regular teaching of sessions to Master Gardener and Master Woodland Manager programs.

General Information:

Wildlife Extension Leaders:

James Pease, NREM (0.50 FTE-ANR Extension)
Jason O'Brien, NREM (P&S Level 1.0 FTE-Extension)

Contributing Faculty and Staff:

Richard Clayton, NREM
Joe Morris, NREM
Jesse Randall, NREM

Wildlife Major Strengths

The Wildlife Extension program is widely known across the state, resulting in a high demand for our resources. Phone and email questions about wildlife, habitat, and nuisance and damage problems from wildlife exceed 4,000 per year. We get excellent cooperation from other agencies and organizations that allow us to counter-balance the small amount of financial resources that ISU Extension puts into this program. The development of a statewide constituency—through teaching of NREM courses, guest lectures in 6-10 other courses and departments annually, involvement in a variety of professional organizations, etc.—has helped both expand the reach and reputation of the program. We are often looked to as partners in many related efforts and have strong credibility with Iowans.

Wildlife Major Areas for Improvement

Challenges to the program include two major areas: *personnel* and *program*.

The personnel challenges are several and have programmatic consequences. The Extension/teaching split appointment of the program leader capitalizes on the strengths of the current occupant of the Wildlife Specialist's position and has helped engender knowledge and support for Wildlife Extension programs that endure beyond graduation. At the same time, teaching and advising responsibilities limit the Specialist's ability to deliver Extension programs on most teaching days and time to write or re-write publications and otherwise expand the program. The split appointment and mentoring of graduate students has also meant that new professionals are being trained in Extension as Extension Wildlife Assistants. Several are now in Extension or extension-like positions around the country. It has also resulted, however, in a need to rely on their relative inexperience in the absence of the Specialist. The other major personnel issue is related to this. The P & S position, currently occupied by Mr. O'Brien, is critical to the success of both the *NatureMapping* and *Master Conservationist* programs but is supported largely by soft money. This results in the necessity to spend considerable time (of both Pease and O'Brien) writing grants rather than delivering programs. It has sometimes resulted in our taking on related but mostly peripheral duties in order to support the P & S position. (The writing of a business plan for development of a national database of wildlife and habitat information is the most recent example of grant-scrambling distracting us from mainline programs.) A more solid base of funding for that position must be found in order to concentrate on the more important programmatic challenges.

The programmatic challenges are similar. We are attempting to serve a broad audience—from youth through senior citizens, from rural to urban, from renters to large land owners—with few resources. We could and should do much more but lack the human and financial resources to do so. We need to update our publications, teach the public how to use and apply data gathered from *NatureMapping* to their communities and help other agencies see its utility and not “reinvent the wheel”, improve and update our web-pages, improve reporting of MCP and *NatureMapping* volunteer hours and projects, follow up on requests for on-site assistance, and, of course, better integrate with the total NREM Extension program. We need to find better ways to communicate with NREM faculty and grad students to get their research results to the public.

ISU Wildlife Extension has expanded dramatically since 1986 but we must continue to grow and expand our service to the people of Iowa. At present, that is not possible given the current resources.

Forestry Program Description

Almost all of Iowa's 2.5 million acres of woodlands are owned and managed by small non-industrial woodland owners and by Iowa's farmers. Both the owners and the resource will benefit from improved management and utilization of the resource. Iowa's other natural resources are its soil, water, and air; the use and sound management of woody vegetation will protect and preserve these resources. Practices such as shelterbelts and windbreaks, riparian plantings, strip cropping with trees can provide protection for the resource, improved wildlife habitat, improved aesthetics of the Iowa landscape and potential for alternative sources income

Forestry Major Strengths

The audiences are as variable as the programs and linkages to external agencies. Audiences include: citizens, volunteers, tree care professionals, private businesses, educators, youth of Iowa, agriculture producers, landowners, agriculture businesses, acreage owners, private woodland owners, public land managers and natural resource professionals. The diverse list of programs below helps meet the audience needs:

- Cooperation between multiple federal, state, and private agencies (ie Iowa DNR, County Conservation, USDA Forest Service, Trees Forever).
- Provide educational information and programs in multiple formats (ie Web publications, mail order publications, newsletters, ICN, Breeze).
- Balanced programming
 - Rural Woodland and Urban
 - Youth to Adults

Forestry Major Areas for Improvement

As in most extension activities, the reduction in personnel devoted solely to programming is hurting the overall land grant mission. ISU's Forestry Extension lost a tremendous resource when Paul Wray retired in 2005. His 100% extension appointment allowed him to maintain a large extension programming schedule and ISU was known throughout the Midwest as a Forestry Extension hotspot. The university opted to fill his position with another forestry extension line but the appointment was split between extension and research. This appointment shift is causing ISU Forestry Extension to undergo a realignment of focus. Programs will be shifted to better utilize the resources of Dr. Randall and Mr. Tivon Feeley. Both Randall and Feeley are committed to the realignment and between them, they will absorb the lost 25% so that all forestry extension programming will continue and if possible grow in new areas. Given the advances in technology, extension's written materials will shift to more online formats enabling a global audience to be engaged while reducing our overhead costs.

External programming: Outcome indicators are the following: consistent meeting evaluations and survey of program participants after one year evaluating the usefulness of the program, changes in attitudes and behavior, management practices adopted and implemented, level of public service contributions and the economic benefits anticipated. Creating new and updating existing publication to meet changing client requests.

Internal functions: Better communication between the three NREM Extension disciplines along with better documentation and coordination of publications utilized by the stakeholders.

Fisheries Program Description

The aquaculture and fisheries extension position was previously occupied by Dr. Joseph Morris (1988 – 2004). This position was developed in the Department of Animal Ecology when ISU became a partner with Michigan State University in hosting the North Central Regional Aquaculture Center (NCRAC). In September 2004, Richard Clayton took over the extension position. At this time, the position changed from a ¼ time faculty position to a ½ time professional and scientific position. Although Clayton's appointment also includes substantial time commitments to other non-fisheries extension tasks, and funding sources in fisheries extension areas are minimal, he has continued to maintain a strong fisheries extension program creating several extension and peer reviewed papers, updated several extension publications and has assisted in several stakeholder workshops. Mr. Clayton is converting all extension materials to a more up-to-date electronic format to reach a global audience. During Dr. Morris's tenure with ISU Extension he produced numerous extension publications, conducted a wide variety of related workshops and helped to initiate the Iowa Aquaculture Association. In addition, he helped to develop a summer workshop that focused on aquaculture training for adult students.

The current focus of Fisheries Extension better aligns itself with Iowa's shifting demographics. More time and resources are being spent delivering materials and educational programming in the urban settings to better serve the underrepresented communities in Iowa.

General Information:

Extension Leaders: Prior to 2004 Joe Morris, NREM (0.25 FTE-Extension)

2004-present Rich Clayton, NREM (0.4 P&S Level FTE-Extension)

Contributing Faculty: James Pease, NREM
Jesse Randall, NREM

Fisheries Major Strengths:

One of the major strengths in the ISU Fisheries Extension program is the diverse background that Mr. Clayton brings to the position. Not only does he possess a fisheries biologist background but he is well versed in aquaculture. In conjunction with his active applied peer reviewed research program in fisheries and aquaculture the constituents in Iowa obtain the most up-to-date and relevant material possible. The fact that a majority of his appointment is directly supported by the North Central Regional Aquaculture Center helps to bring a broader more regional aspect to his programming. Additional fisheries extension strengths are:

- Cooperation between multiple federal, state, and private agencies (ie Iowa DNR, County Conservation, USDA, Iowa Aquaculture association, NCRAC)
- Provide educational information and programs in multiple formats (ie Web publications, mail order publications, newsletters)
- Responding to shifts in stakeholder demographics

Fisheries Major Areas for Improvement

As in Wildlife and Forestry Extension Programming, the reduction in direct support and limited FTE's devoted to fisheries is a major concern. Fisheries extension, to continue to maintain and grow its programming will strive to collaborate with recently hired ISU faculty associated with fisheries teaching and research. Fisheries Extension is responding to the demographic shift and will provide an expanding suite of programming aimed at the urban stakeholder. Many of the new urban centered questions will directly integrate into Mr Clayton's active research program such that answers to these questions will not need the extensive research and time commitment typically needed for implementation and/or material delivery. Additional Clayton hopes to:

- Update older publications – several publications are over 10 years old
- Create new publications
 - Water Gardens: FAQ's
 - In the works – Challenges of ornamental water features in the Midwest.
- Urban Focus
 - New group of stakeholders with interest in ornamental garden ponds
 - Urban pond management (i.e. water retention ponds)
- In the aquaculture area, work with the producers in the state to see if the industry can expand into other aquatic areas
 - World wide web tools
 - Development of promotional material (posters etc.)
- Web site development – develop an aquaculture/fisheries web site similar to the new forestry site

Forestry and Fisheries Benchmarks: 2007

The differences in programming outreach is a direct result of the past 30 years and the wide disparity in funding provided at the state and university level to the individual programs. Forestry Extension is an amalgam of rural and community outreach programs enabling a larger more diverse audience to be engaged. These numbers are not intended for comparison between extension programs due to the vast array of internal and external differences in each program.

Are these annual figures?

	Forestry	Fisheries
Number of Participants at Workshops	14,946	250
Publications Purchased	2,800	Unknown
Publications Downloaded	Unknown	Unknown
Phone Calls	Over 6,000	500
Letters, Emails, and Faxes	Over 6,000	1,000

Face to Face Consultations (on and off campus)	100	15
Radio Spots	30	2
Newsletter Mailing	Over 6,500	NA
Volunteer Hours Since 1988	69,136	NA
Financial Benefit of the Master Woodland Managers Program Since 1988 (13.36/hour)	\$314,441	NA
Financial Benefit of the Community Tree Steward Program Since 1991 (13.36/hour)	\$304,608	NA

Future Extension Benchmarks: Reference Strategic plan (Goals & Strategies)

- Increase and improve the NREM extension programming to facilitate stewardship of natural resources in Iowa and the Midwest.
 - Continue to seek out and form partnerships with agencies and NGO's
 - Create, update, and maintain written and web based resources
- Expand integration of NREM research and extension programs with those of other departments, agencies, and organizations in Iowa and the Midwest.
 - Increase communication between extension and faculty researchers to facilitate extension opportunities early on in the project formation phase
 - Invite researchers to present findings at formal extension events
- Expand the internal and external financial resources of NREM Extension to better serve the needs of Iowans.
 - Target external grants to leverage for more University support for FTEs devoted to NREM Extension

Appendix I.1 Tenured and Tenure Track Faculty

Employment date -
Tenure/promotion

	Specialty	Rank		Teach	Res	Ext	FTEs		FTE total
							Serv	Other	
Asbjornsen, Heidi	For. Ecol./Ecosystem. Mgmt.	Assoc Prof	Employed Sept. 2000 Tenure date 2006	0.45	0.45		0.1		1
Blanchong, Julie	Wildlife Disease Ecology	Assist Prof	Employed Jan. 2007 Tenure date 2014	0.45	0.45		0.1		1
Dinsmore, Stephen J.	Avian Ecology - Population Biology	Assist Prof	Employed Aug. 2005 Tenure date 2009	0.45	0.45		0.1		1
Engle, David M.	Chair/Rangeland Ecology	Prof	Employed Aug. 2005 Tenure date 2005		0.1			0.9	1
Fairbanks, W. Sue	Wildlife Ecology	Assoc Prof	Employed Aug. 2003 Tenure date 2003	0.45	0.45		0.1		1
Hall, Richard B.	Forest Genetics/Biomass	Prof, Wallace endowed Prof	Employed Jan. 1974 Tenure date 1978	0.45	0.45		0.1		1
Isenhart, Thomas M.	Forest Ecology/Water Resources	Assoc Prof	Employed Aug. 2004 Tenure date 2011	0.45	0.45		0.1		1
Jungst, Steven E.	Forest Biometry	Prof, Endowed Harmon Family Prof	Employed Dec. 1978 Tenure date 1985	0.45	0.45		0.1		1
Kim, Tae Hyun	Biorenewable Engineering	Assist Prof; join with Ag & Bio Eng	Employed Aug 2007 Tenure date 2014	0.15	0.15				0.3
Koford, Rolf R.	Wildlife & Conservation Biology	Collaborator-Assist Prof, ICFWU	non tenure	0.2	0.7	0.1			1
Kuo, Monlin	Wood Science	Assoc Prof	Employed Aug. 1980 Tenure date 1986	0.45	0.45		0.1		1
Miller, James	Landscape Ecology	Assist Prof; joint with Landscape Arch.	Employed Aug. 2001 Tenure date 2008	0.1	0.1				0.2
Morris, Joseph	Fisheries - Aquaculture	Assoc Prof and Center Director, NCRAC	Employed Aug. 1988 Tenure date 1995	0.4	0.25		0.1	0.25	1
Otis, David L	Population Biology - Biometrics	Collaborator-Prof, ICFWU	non tenure	0.1	0.5	0.1		0.3	1
Pease, James	Human Dimension of Wildlife Mgmt	Assoc Prof	Employed Aug. 1985 Tenure date 1994	0.4		0.6			1
Pierce, Clay L	Fisheries Ecology & Management	Collaborator-Assist Prof, ICFWU	non tenure	0.2	0.7	0.1			1
Quist, Michael	Fisheries Management	Assist Prof	Employed Apr. 2005 Tenure date 2012	0.45	0.45		0.1		1

Randall, Jesse	Forestry Extension	Assist Prof	Employed Feb. 2007 Tenure date 2014	0.25	0.75			1
Rule, Lita	Forest Economics – Policy	Assoc Prof	Employed Dec. 1989 Tenure date 1996	0.45	0.45		0.1	1
Schulte, Lisa	Landscape Ecology	Assist Prof	Employed Sept. 2003 Tenure date 2010	0.45	0.45		0.1	1
Schultz, Richard	Forest Ecology - Hydrology	Prof	Employed May 1979 Tenure date 1981	0.45	0.45		0.1	1
Stewart, Tim	Aquatic Ecology	Assist Prof	Employed Aug. 2006 Tenure date 2013	0.45	0.45		0.1	1
Thompson, Janette R	Forest Biology - Urban Forestry	Assoc Prof	Employed Aug 1998 Tenure date 2004	0.25	0.4		0.35	1
Open line	Previously Forest Econ - Quantitative Analysis	Assist/Assoc Prof	Expected Start Aug 2008	0.45	0.45		0.1	1
Open line	Previously Forest Biometry - Shelterbelts	Assist/Assoc Prof	Start date TBD	0.45	0.45		0.1	1
Other faculty on NREM payroll								
Harris, Mary	Forest Entomology	Adjunct Assist Prof; joint with Ento.	Employed Aug. 2007	0.45	0.45		0.1	1
McMullen, Cathy Mabry	Restoration Ecology	Adjunct Assist Prof	Employed Aug. 2003	0.45	0.05			0.5
Pritchard, James	Natural Resource History and Policy	Adjunct Assist Prof; joint with Landscape Arch.	Employed Jan. 2002	0.35	0.1		0.05	0.5
Roe, Kevin	Aquatic Biology - Systematics	Adjunct Assist Prof; joint with EEOB in FY 2009	Employed Aug. 2005	0.5	0.3		0.1 0.1	1
Stokke, Doug	Wood Science	Senior Lecturer	Employed May 2006	0.5			0.1	0.6
Faculty not on NREM payroll								
Russell, Ann	Ecosystem Ecology	Affiliate Assist Prof	Employed Sep. 2002		1			1
FTE total				10.80	11.80	1.65	1.95	28.1

Appendix I.2. Position Descriptions for NREM Support Staff

Central Administrative Support

Berhow – Secretary II

Manage and reconcile research accounts (department and unit). Facilitate travel and reimbursements, purchase supplies, equipment and services. Process and maintain hourly payroll records and vacation/sick leave records. Process: phone and Ethernet orders, space and equipment inventory, key issue, building maintenance coordinator, special course fees, boat and equipment registration, and safety committee.

Elsberry – Secretary II

Department receptionist greets guests, clients, faculty, and staff. Answers multi-line phone, take messages for faculty and staff. Maintain records and prepare travel arrangements, out of state travel authorizations, and expense vouchers online for department. Coordinate, pick up, sort, and distribute mail daily. Audio visual equipment checkout, maintain copy machine, and order department office and class supplies. Secretarial support for all extension staff: Prepare, type, and proof correspondence, reports, publications, and conference materials. Assist Associate Director, North Central Regional Aquaculture Center (NCRAC) in managing the center's outreach and extension activities, make purchases, and update online databases and maintain records for NCRAC. Address client requests for NCRAC publications, manage NCRAC funded budgets.

Meyer – Administrative Specialist I

Manage day to day operation of department office for department chair schedule, correspondence, departmental Human Resource issue, faculty and staff personnel records, foundation account Memorandum of Agreements and financial management, alumni contacts and correspondence, statistics and reporting. Provide and maintain support for departmental staff and faculty meetings. Understand and keep current on university policies and procedures. Coordinate faculty and staff searches. Coordinate graduate student correspondence, records and scheduling. Use independent judgment and knowledge based on departmental operation and anticipate future needs of the faculty, staff, students and public.

Administrative Specialist I, vacant as of January 2008

Assist Unit Leader, Assistant Leaders, cooperating faculty, staff and students in operation of all aspects of the USGS Iowa Cooperative Fish & Wildlife Research Unit (Unit). Understand the complexity of the agreement that governs the Unit and advise staff regarding relevant federal, state, and university policies and procedures to ensure smooth operation, a cooperative working environment, responsible management and growth in Unit programs. Provide administrative duties in support of the NREM department, as assigned by the department chair.

Vanderhoff – Administrative Specialist II, Term Position

Manage departmental state appropriated and sponsored project budgets, fiscal operations including contracts and grants, and to ensure compliance with all financial regulations. Assists

and advises the department chairman regarding budget policies, procedures, and planning; personnel; and reports. Assist the department faculty in the preparation of proposal budgets.

Extension Staff

Clayton – Extension Program Specialist III

The purpose of this position is to serve as the Aquatic Extension Specialist III/North Central Regional Aquaculture Center Program Assistant to the state of Iowa and other states in the north central region by providing leadership with aquatic information (aquaculture, fisheries research, and pond management). Act as a liaison to the general public, organizations, and private producers; and to assist the Associate Director of the North Central Regional Aquaculture Center (NCRAC) in supporting aquaculture research, development, demonstration, and extension education to U.S. aquaculture. Specific extension duties will be to respond to public questions regarding aquaculture/fisheries as well as water quality issues.

Feeley - Extension Program Specialist III

The purpose of this position is to serve and provide leadership as a forestry extension specialist throughout the state, act as a liaison to urban forestry organizations, and to assist the forestry extension faculty in coordinating and delivering educational programs. Development of new programs and contributions to existing programs will be the primary mission. The main focus will be on urban forestry issues and youth/teacher education, but the specialist will also be involved in traditional woodland management programs and activities.

O'Brien - Extension Program Specialist II

Maintain and Update the Iowa NatureMapping website, where volunteers statewide enter data on wildlife in their area, download reports of data previously entered, and view statewide summaries of the NatureMapping Program. Manage the NatureMapping wildlife database, including maintaining an updated summary of the database, posting the latest database summary on the website, communicating database summaries to NatureMapping volunteers and the Iowa Dept. of Natural Resources, and tracking volunteers and maintaining their personal information. Update database features as needed.

Student Services Staff

Burnett - Student Service Spec III

Coordinate: departmental undergraduate and graduate recruitment, orientation, retention, academic advising, career placement and outreach; articulation agreements with Iowa community colleges; outcomes assessment; scholarship program; two learning communities. Responsible for coordination of course scheduling and room assignments for all departmental offerings; monitor and analyze departmental enrollment data. Prepare reports in areas of responsibility. Provide instruction in two courses: NREM 110 and NREM 211.

Student Service Specialist I, vacant as of December 6, 2007

Assist with departmental undergraduate recruiting, orientation, retention, and outcomes assessment; implement an aggressive e-recruiting program for undergraduate students; maintain enrollment data; cultivate faculty, staff, and students at Iowa community colleges; assist with the

department's career information services; assist with report writing; assist with the department's learning communities; and serve as an occasional presenter/facilitator for the new student orientation class.

Van De Pol – Secretary II

Maintain undergraduate student records(student files & File Maker Pro database); phone/e-mail requests for information; manage student service center; maintain student directory, curriculum & program materials; instruct students on registration; assist with orientation & administer CIRP exams; maintain contact with CALS Student Service; maintain class lists; assist with grade reports, print midterms/finals & maintain files; assist students with graduation questions & track process; coordinate practical work experience reporting; assist faculty with class materials, evaluation reports, memos, vehicle reservations; textbook coordinator; SSS receptionist; process undergraduate university forms; course fee coordinator; assist with department alumni newsletter; prepare monthly undergraduate newsletter; assist with departmental banquet; assign room use for courses & process all paperwork (enrollment & use of rooms, prelim & final room assignments, etc.); coordinate TA assignments to courses; assist in set up for academic advising & orientation, scholarships, assessments; back-up to administrative office phones, requests, mail & graduate student secretary; fall Forestry camp support secretary.

Technical Support Staff

Charbonneaux – System Support Specialist II

Supervise and coordinate activities of the department's computer resources and the student computations laboratories. Provide administrative support for the development and maintenance of a modern, networked computer environment for a department of 58 faculty and support staff as well as more than 500 students. Supervise hourly help on projects designated by the department chair. Supervise computer lab monitors. Work with the departmental technology committee to identify and meet current and future computer and network needs. Develop and deliver educational materials and programs to faculty, staff and students. Administrate, develop and maintain the departmental web presence.

Hanson – System Support Specialist II

Manage the NREM GIS Lab. Assists Faculty and Graduate students in the management of various aspects of their research and teaching as it pertains to GIS. Occasionally offer classroom assistance to facilitate the ease of using GIS in classroom projects both in class and during filed trips. Act as a departmental source in GIS to assist undergraduates in using GIS to accomplish assigned task. Oversee the operation of the GIS lab to ensure adequate use of this NREM asset. Update and maintain the Computers in the GIS lab to ensure they perform when needed.

Volkers – Greenhouse Manager (0.33 FTE)

Manage NREM greenhouse. Responsibilities include applying pesticide as needed, supervising maintenance and cleaning, ordering supplies and maintaining inventory, scheduling and supervising watering, collecting and submitting hourly student time cards, and advising students and staff as to horticultural techniques and safe equipment use.

Appendix I.3 NREM Floor Plans

Appendix I.4 FY08 Budget Support

Agriculture & Home Economics Experiment Station

Department Salaries	965,334
Graduate Assistants	66,575
Total Salaries and Wage	1,031,909
Supplies and Services	49,263
Employees Benefits	281,398
<i>Total</i>	<i>1,362,570</i>

College of Agriculture and Life Sciences

Department Salaries	1,146,768
Graduate Teaching Assistants	58,460
Supplies and Services	66,959
Supplies and Services – Stewart	-37,410
Employees Benefits	335,778
<i>Total</i>	<i>1,570,555</i>

Coop Ext Service in Agriculture & Home Economics

Department Salaries	164,988
Employees Benefits	47,855
<i>Total</i>	<i>212,843</i>

Combined Total *3,145,968*

Appendix I.5 Summary of Private Donor Support to NREM

Overall Type of Donor Support by Fiscal Year (as of November 26, 2007)				
Support Type	2006	2007	2008	Total
Student	\$59,113	\$653,886	\$8,584	\$721,583
Faculty	\$445,021	\$2,000	\$0	\$447,021
Program	\$27,100	\$111,322	\$7,130	\$145,552
Total	\$531,234	\$767,208	\$15,714	

Details of Donor Support by Fiscal Year				
Support Type	2006	2007	2008	Total
Equipment	\$1,170	\$3,490	\$3,050	\$7,710
Faculty Professorships	\$445,021	\$0	\$0	\$445,021
Faculty/Staff Support	\$0	\$2,000	\$0	\$2,000
General Support	\$11,050	\$73,295	\$4,080	\$88,425
Lectureship	\$800	\$950	\$0	\$1,750
Other	\$4,080	\$600	\$0	\$4,680
Other Student Support	\$3,625	\$35,100	\$100	\$38,825
Research - General	\$10,000	\$26,200	\$0	\$36,200
Research - Organized	\$0	\$6,787	\$0	\$6,787
Student Loan Funds	\$140	\$400	\$250	\$790
Undergrad/Graduate Scholarship	\$55,348	\$618,386	\$8,234	\$681,968
Total	\$531,234	\$767,208	\$15,714	

Investment Type by Fiscal Year				
Investment Type	2006	2007	2008	Total
Endowed	\$458,379	\$693,008	\$3,905	\$1,155,292
Expendable	\$72,855	\$74,200	\$11,809	\$158,864
Total	\$531,234	\$767,208	\$15,714	

Departmental Faculty Support

Endowed Professorships: 2; total endowment: \$????

- Harmon Family Professorship is to recognize and support the activities of a tenured or tenure-track faculty member who is an instructional innovator capable of developing and demonstrating innovative techniques.
- Arthur L. and Frances S. Wallace Endowed Professorship (Wallace Professor) is to support the scholarly activity of a tenured or tenure-track faculty member who is active in the field of forestry.

Departmental Programmatic Support

- Forestry Alumni Centennial Fund: total endowment \$????
- Forestry equipment funds: total endowment \$????
- Miscellaneous other: total endowment \$????

Appendix I.6 Undergraduate and Graduate Scholarships

Animal Ecology Undergraduate Scholarships

Open to all current undergrads	1 award -- \$200 total
Restricted to:	
Incoming freshmen	No awards available
Upper class students	5 awards -- \$3500 total
Junior/senior students only	1 award -- \$500 total
Graduating senior in Fish/Wildlife	1 award -- \$300 total
Wildlife option students (jr/sr only)	1 award -- \$500 total
Fisheries options students	2 awards -- \$1000 total
Fish/Wildlife option students	3 awards -- \$2000 total
Wildlife/Pre-vet and Wildlife Care option	4 awards -- \$4000 total

Forestry Undergraduate Scholarships

Open to all current undergrads	15 awards -- \$16,700 total
Restricted to:	
Incoming freshmen	2 awards -- \$1,500 total
Upper class students	1 award -- \$1000 total
Sophomores/camp related	7 awards -- \$4,050 total
Forest Products option	2 awards -- \$2500 total
Urban & Community Forestry	1 new award coming – unknown amount

Animal Ecology Graduate Scholarships

Open to all graduate students – shared with undergraduates. Annual award # varies	4 awards -- \$3000 total
Restricted to:	
Fisheries or Wildlife students	2 awards -- \$1300 total
Fish Biology students	1 award \$1000

Appendix II.1 Current NREM Student Learning Outcomes

1. Develop, explain and evaluate their own beliefs, values and behavior in relation to professional and societal standards of ethics.

For any given situation, graduates should be able to state their beliefs and values as they relate to that situation. They should be able to elaborate on how those values and beliefs impact their behavior, and they should be able to explain which specific canons of the professional code of ethics are applicable to a particular situation.

2. Anticipate, analyze and evaluate natural resource issues and explain the ecological, economic, and social consequences of natural resource actions at various scales and over time.

In the case of existing natural resource issues, graduates should be able to explain the ecological, economic, and social consequences that could reasonably be expected to occur as the result of actions taken to address the issue. The explanation should include considerations of the geographic area influenced by the issue as well as the time frame over which the consequences can be expected to occur. In the case of evolving circumstances, graduates should be able to predict natural resource issues that may arise as a result of the circumstances and explain the ecological, economic and social consequences of those issues.

3. Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

Graduates should be able to identify the comprehensive list of stakeholders who may be impacted by particular natural resource problems and issues. They should be well versed in techniques for seeking and incorporating input and perspectives from those stakeholders and they should be able to appropriately incorporate those inputs and perspectives into the decision making process.

4. Assess, analyze, synthesize, and evaluate information fairly and objectively.

Not all information is equally sound or applicable in a particular situation. Graduates should be able to evaluate the validity and importance of information obtained from any source. Once evaluated, they should be capable of using the information accordingly in the solution of natural resource problems.

5. Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem solving approaches.

Effective solution of natural resource problems often involves input from diverse constituencies with diverse value scales. When working individually, graduates should be capable of incorporating those values into the solution of problems. Where necessary, graduates should be able to work effectively with diverse stakeholders to reach consensus on problem solutions.

6. Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

The natural resource base with which we deal is capable of providing numerous goods and services to numerous publics. Graduates are capable of formulating multiple alternatives to achieve stakeholder objectives. They are capable of evaluating each of the feasible alternatives in terms of biological possibility, economic feasibility and social acceptability. They are capable of recommending best alternatives based on the stakeholders' objectives, and they can justify their recommendations on the basis of sound science.

7. Communicate clearly and effectively with different types of audiences using appropriate oral, visual, electronic, and written techniques.

Graduates are capable of identifying the best form, or forms, of communication for effectively conveying information to, or seeking input from, a particular audience. They can adjust their style of communication to suit differing audiences, and they are proficient in all four forms of communication.

8. Recognize and interpret resource problems across spatial scales from local to global.

Graduates are able to recognize where resource problems can or could exist and be able to evaluate and interpret those problems for others. They should be capable of recognizing, evaluating and interpreting for individual landowners at a very local scale as well as for problems that span multiple ownerships, regions, and ecosystems.

9. Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

Different cultures, population densities, and income classes value and use natural resources in very different ways. Because natural resources often are used simultaneously by different groups, it is important for graduates to be able to account for those differing uses and valuations when making management decisions about natural resources.

10. Exercise life-long learning skills developed before graduation.

Graduates have the necessary skills to find answers to their questions as they arise throughout life. They are capable of determining what they need to know to effectively deal with an issue or situation, and they know how to obtain the necessary knowledge. They have learned how to learn in the absence of teachers.

Appendix II.2 Departmental Student Clubs

The **Ames Forester** is an annual publication written and compiled by the students, staff, and alumni of the Department of Natural Resource Ecology and Management. 2007 marked the second year of doing that publication online, but hard-copy editions date back to 1914. Club members solicit, edit, and write articles, and publish those articles online. Typically, the staff is composed of two or three editors, and the club advisor. However, students, staff, and alumni outside of the club contribute to the majority of the content.

(<http://www.stuorg.iastate.edu/forester/>)

Arboriculture Club currently has 5 members. Tivon Feeley serves as club advisor. Arboriculture Club is considered the "urban forestry" club but it extends to all aspects of Arboriculture. Arboriculture is simply "selection, planting, care, and removal of individual trees, shrubs, vines, and other perennial woody plants and the study of how they grow and respond to cultural practices and the environment." In 2007/2008, the club is working to recruit new members and provide chainsaw safety certification. Members are involved with volunteer opportunities that provide opportunities to work with neighborhood groups to inventory their trees and and conduct a pruning demonstrations for local neighborhoods. Members have also assisted with landscaping for Habitat for Humanity.

The **Fisheries and Wildlife Biology Club** consists of about 20 undergraduate students with bi-monthly meetings. Meetings usually consist of hands on activities regarding wildlife or fisheries, or wildlife/outdoors related topics. Meetings in fall, 2007 have consisted of: Opening BBQ, Hiking at Ledges State Park, speaker on the Jack rabbit study, and wildlife photography with Ann Hawkins. Members also organize a camping/canoeing trip every year. For many years, the group has been actively involved in running a food stand for the annual University VEISHA celebration where they sell Bison burger and brats.

Forestry Club provides students with an opportunity to participate in forestry related activities. A Christmas tree plantation, which funds all other activities, is owned and operated by the club. The Forestry Club competes in an annual timber sports competition known as the Midwestern Foresters' Conclave. Community service projects include but are not limited to: tree plantings, highway cleanup, charity events, and the Reiman Gardens Halloween display. Social activities include: intramural hockey and soccer, bonfires, Halloween social and more. Overall, the Forestry Club is a place for like-minded individuals to connect and share their love of forestry.

The **Forest Products Society** is a professional organization with the Iowa Chapter being a member of the Midwestern Region. The society currently has eight student members and two advisors. Club members do numerous wood working projects as fund raisers. They also organize tours of facilities such as lumber mills, wood veneer mills, and window & door manufacturers. ISU forest products alumni who are currently working in the forest products industry are often invited to be guest speakers at society meetings.

The **Iowa State University Ducks Unlimited Student Chapter** was started in 1983. The chapter's objective is to raise awareness and funds to promote wetlands conservation. Ducks

Unlimited is the world's largest wetland conservation group. Traditionally, the chapter has limited its activities to a fall fund-raising banquet, which is attended by approximately 120 people. Starting in 2007, activities were expanded to include participation in the VEISHEA parade. Currently, the chapter has 31 members, including undergrads, graduate students, and University staff, under supervision of faculty advisors from NREM and EEOB.

The purpose of the **Iowa State University Student Subunit of the Iowa Chapter of the American Fisheries Society** is to provide members with numerous opportunities to be active in the community while gaining valuable field experience and networking with other fisheries professionals. Each year this subunit has worked with the public to conduct fish monitoring on the Squaw Creek watershed, run fishing clinics for children and send students to professional meetings to get a chance to meet people in the profession. Other activities include working alongside the Iowa DNR on numerous projects, becoming Fish Iowa Certified and running a booth at VEISHEA. Monthly meetings consist of presentations given to the subunit by a professional or a graduate student about work they have recently done or are working on currently. This subunit has won the award of the Most Active Student Subunit in the North Central Division two of the last three years.

The **Iowa State University Trumpeter Swan Restoration Committee** assists the Iowa Department of Natural Resources in restoration efforts for the Trumpeter Swan. The Committee accomplishes this goal by providing educational opportunities, by publishing a newsletter about the restoration efforts, and by raising funds by hosting a banquet for partners in the restoration efforts. Membership is open to all registered students, faculty, and staff at Iowa State University. Each year, approximately 10 students, ISU staff and other interested parties participate in committee activities. More information is available on the committee's web page: <http://www.stuorg.iastate.edu/swan/>

National Association for Interpretation, ISU chapter, averages around 10 members each semester. The goals of the club include: Allowing students to develop their professionalism through association with a professional society, conducting education programs for the community to promote the organization and allow student to gain further experience, and providing students with mean to develop leadership experience. Major activities of the chapter include night hikes in fall, developing an interpretative booth for VEISHEA, organizing events for students to gain certifications like Project Wild Certified, and helping with a variety of NREM activities.

The **Society of American Foresters (SAF)** student chapter provides students with professional skills and networking opportunities to prepare members for the challenges and the changes that face natural resource professionals. “SAF Core Values are: 1) Forests are a fundamental source of global health and human welfare, 2) Forests must be sustained through simultaneously meeting environmental, economic, and community aspirations and needs, 3) Foresters are dedicated to sound forest management and conservation, and 4) Foresters serve landowners and society by providing sound knowledge and professional management skills.”

Society for Conservation Biology (SCB) has approx 60 members. Members promote conservation awareness through research and community involvement. They host a symposium, give nature walks to children, and show public information videos on conservation.

Appendix II.3. NREM Catalog Description and Course Listings

Natural Resource Ecology and Management

David Engle, Chair of Department

University Professors (Emeritus):

Atchison, Hinz, McNabb
Professors: Colletti, Engle, Hall, Harrington, Jungst, Payne, Schultz

Professors (Emeritus): M.

Bachmann, R. Bachmann, Best, Countryman, J. Dinsmore, Hart, Klaas, Manwiller, Menzel, Moorman, Prestemon, Summerfelt, Wray

Professors (Collaborators): Brandle, Buijnzeel, Burger, Isebrands, Otis, Riemenschneider

Associate Professors: Asbjornsen, Fairbanks, Isenhardt, Kuo, Mize, Morris, Rule, Thompson

Associate Professors

(Collaborators): Guntenspergen, Palik, Tomer

Assistant Professors: Blanchong, S. Dinsmore, Miller, Pease, Quist, Schulte, Stewart

Assistant Professors (Adjunct):

McMullen, Pritchard, Roe

Assistant Professors (Collaborators): Koford, Kolka, Negreros-Castillo, Pierce, Westphal

Senior Lecturer: Stokke

The department addresses a broad spectrum of natural resource and environmental issues in a holistic approach to learning, discovery and engagement. Our vision of natural resources is that informed protection and management of natural resources involves an integration of biological, economic, and social considerations. Such an integrated and comprehensive approach to the education of future generations of natural resource managers and scientists is needed in order to sustain viable landscapes, facilitate strong communities, and produce desired goods, services, and functions from our natural resources.

Our educational mission for the undergraduate and graduate programs is to provide those learning experiences and opportunities that will ensure students can learn to function effectively in their chosen fields.

Central to that effective functioning are the abilities to:

Develop, explain and evaluate their own beliefs, values and behavior in relation to professional and societal standards of ethics.

Anticipate, analyze and evaluate natural resource issues and explain the ecological, economic, and social consequences of natural resource actions at various scales and over time.

Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

Assess, analyze, synthesize, and evaluate information fairly and objectively.

Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem solving approaches.

Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

Communicate clearly and effectively with different types of audiences using appropriate oral, visual, electronic, and written techniques. Recognize and interpret resource problems across spatial scales from local to global.

Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

Exercise life-long learning skills developed before graduation.

Undergraduate Study

The Department of Natural Resource Ecology and Management offers work for the bachelor of science degree with majors in animal ecology or forestry (see College of Agriculture, Curricula). The department participates in interdisciplinary programs in biology, environmental studies, international studies, and pest management. By proper selection of free and restricted elective courses, students can obtain a minor or a second major in these programs or other disciplines.

The Department provides numerous scholarships; application information is

available in the departmental Student Services Center.

Animal Ecology (A Ecl)

The animal ecology curriculum provides its majors with an understanding of ecological principles and processes and their applications to natural resource management. It is oriented toward students desiring a general and flexible program in environmental biology and for those planning graduate study. Students may select from five options: Aquatic Sciences, Fisheries, Interpretation of Natural Resources, Prevetinary and Wildlife Care, or Wildlife. Graduates find employment as aquaculturists, aquatic ecologists, wildlife biologists, fisheries biologists, resource managers, and ecologists for industry, environmental consulting firms, natural resource and environmental agencies and organizations, zoos, and as educators.

Graduates of the Animal Ecology major understand the basic principles of animal biology, ecology and management, and relevant aspects of scientific communication, basic mathematics and sciences, computing applications, and personal and professional development. Five specific options prepare students for careers in aquatic sciences, fisheries, wildlife, interpretation of natural resources, wildlife care and veterinary sciences.

Each option has specific outcomes expectations that include (1) the scope of the specialization and its relationships to broader aspects of animal ecology, biotic resource management, and other allied scientific disciplines and professions, (2) career opportunities and requirements, and (3) knowledge and skills appropriate for employment at technical and practitioner levels in each discipline. Graduates are able to communicate and work effectively in the multidisciplinary arena of ecology and natural resource management.

All options require three months of relevant work experience or study at a biological station prior to graduation. The latter may be accomplished at the university's affiliate field stations: Iowa Lakeside Laboratory at West Lake Okoboji, and Gulf Coast Research Laboratory at Ocean Springs, Mississippi. Information on these laboratories is available from the department's Student Services Center.

Preveterinary medicine preparation may be achieved while satisfying degree requirements in animal ecology. Additional education and training can lead to other opportunities in such areas as research and management, natural resources planning and administration, teaching, and environmental consulting, among others. Graduate training is necessary for many specialized positions within the fields of animal ecology. Majors preparing for graduate study should consult with their academic adviser concerning appropriate coursework.

Students seeking certification to teach biology in secondary schools must meet requirements of the College of Human Sciences as well as those of the Animal Ecology curriculum. In addition, they must apply formally for admission to the teacher education program (see Index, Teacher Education Program). Students with an interest in careers in outdoor writing are encouraged to obtain a minor or a second major in journalism (see Index, Journalism and Communication, Courses and Programs). Students who wish to pursue a job as a conservation officer may wish to minor in criminal justice (see Index, Criminal Justice Studies).

The department offers a minor in animal ecology that may be earned by taking 15 credits in the department including 312, 365, NREM 120, plus four additional credits of Animal Ecology courses at the 300 level or above.

Forestry (For)

The forestry curriculum offers courses dealing with the management of forest ecosystems for multiple benefits including wood and fiber products, biodiversity, recreation, water, wilderness, and wildlife. Conservation and preservation of natural resources are emphasized. The department offers work for the bachelor of science degree with a major in forestry and options in forest ecosystem management, interpretation of natural resources, urban and community forestry, natural resource conservation and restoration, or sustainable materials science and technology. All options lead to a professional degree in forestry (Bachelor of Science). The forestry major has been accredited by the Society of American Foresters (SAF) since 1935. The Council for Higher Education Accreditation recognizes SAF as the specialized accrediting body for forestry education in the United States. The primary goal of the undergraduate curriculum in forestry is to educate foresters to be capable of scientifically

managing the nation's forest lands and related ecosystems - private and public.

Graduates understand and can apply scientific principles associated with forests, forest ecosystem management, and wood and non-wood products. Graduates are able to communicate effectively and work well in teams. They are capable of preparing and delivering effective oral and written communication of scientific and technical decisions to professional and lay audiences. They are proficient in technical skills such as measurements, computer usage, inventory, economic analysis, data and situation analysis, and ecosystem assessment. They recognize the importance of ethics in forestry and are sensitive to cultural diversity and broad environmental concerns.

Graduates of the forest ecosystem management option are skilled at understanding how forests function and how forests can be managed to produce desired goods (wood, fiber, recreation, wildlife habitat) and services (clean water, carbon sequestration, wilderness) in the long-run. They are skilled at interpretation of interactions and effects of abiotic and biotic factors in forests and quantification of bio-physical, social, and economic outputs from forest ecosystems. They are skilled at complex decision-making involving private and public forest resources where ethical, legal, social, economic, and ecological dimensions are explicitly considered.

Graduates of the interpretation of natural resources option are skilled at communicating with the public about the values associated with forest ecosystems and providing educational programs for all ages

Graduates of the urban and community forestry option are able to combine biological, social, legal, and economic expertise to effectively manage trees or forests in an urban setting. They are skilled at decision-making related to site assessment, and long-term management of urban trees and forests to achieve multiple goals.

Graduates of the natural resource conservation and restoration option are skilled at assessing the natural functions of the environment and human impacts. They are skilled at interpretation of forest and other natural environments and making decisions relating to their conservation and preservation. Graduates of the sustainable materials science and technology option understand the anatomical, physical, and chemical properties of wood and other bio-renewable materials and know

wood processing operations involved in drying, composite materials manufacturing, and chemical treatment.

Elective courses related to the forest ecosystem management option can be selected to emphasize forest ecology; wildlife, wilderness, and recreation management; water quality and erosion protection; quantitative-analytical techniques; business and marketing; and other areas related to natural resource management. Elective courses in the urban and community forestry option can be selected to emphasize plant health, policy and planning, ecology, hydrology, sociology, business administration, or horticulture/design. Elective courses related to the natural resource conservation and restoration option can be selected to emphasize, ecology, wildlife, recreation, nature interpretation, landscape design, sociology and ethics of conservation and preservation. Similarly, elective courses in the sustainable materials science and technology option can be selected to emphasize wood production, bio-renewable materials, wood fiber, business and marketing, and quality assurance. Elective courses in the interpretation of natural resources option can be selected to emphasize natural history, animal ecology, and environmental education.

Many private firms as well as national, regional, state, and local agencies seek forestry graduates to fill positions in management of natural resources for commodity and non-commodity multiple benefits. Graduates in forestry are prepared to be involved with evolving forestry systems, such as agroforestry and urban forestry. Wood processing industries, such as composite products, plywood, particle board, lumber, and pulp and paper offer professional opportunities in production, product development, quality control, and marketing.

With advanced graduate study, the range of professional job opportunities for a person with a B.S. in forestry is expanded. Opportunities include research and education as well as more specialized managerial and administrative positions with private firms and public agencies.

During fall semester of the second year of study (sophomore year, typically), forestry students are required to enroll in the department's integrated forestry modules consisting of 201, 202, 203, 204, 205, and 206. That semester, consisting entirely of forestry coursework, is designed to give students an early understanding of the

many aspects of forestry and how they are interrelated. In addition to work in the classroom, students will spend time in laboratory and field work each week. A 3-week off-campus fall camp during the semester will reinforce concepts learned both in the classroom and during laboratory/field sessions. Transfer students should check with the department for counsel on timing their completion of the integrated forestry modules.

The department offers a minor in forestry which can be earned by completion of a minimum of 15 credits in forestry courses. Students wishing to emphasize management and environmental aspects of forestry must select at least 15 credits from the following courses: 302, 451, NREM 120, 301, 310, 345, 390, and 407. Students wishing to emphasize wood products and wood utilization must complete 280 and an additional 12 credits from the following courses: 480, 481, 483, 485, 486, 487.

Graduate Study

The Department of Natural Resource Ecology and Management offers work for the degrees master of science and doctor of philosophy with majors in animal ecology, fisheries biology, forestry, and wildlife biology. A non-thesis masters degree is available for students desiring a general degree program without thesis research. Students may also major in interdepartmental graduate majors in biorenewable resources technology, ecology and evolutionary biology, environmental science, genetics, plant physiology, sustainable agriculture, or toxicology (see Index).

Animal Ecology

Graduates have a broad understanding of the basic principles of animal biology, ecology and management, and relevant aspects of basic mathematics and natural sciences, computing applications, and personal and professional development. They are able to execute rigorous independent research, have developed problem-solving and critical-thinking skills, and can communicate effectively with scientific colleagues and the general public in both formal and informal settings.

Personnel of the Natural Resource Conservation Service Wildlife Management Institute and the Biological Resources Division of the U.S. Geological Survey, through the Iowa Cooperative Fish and Wildlife Research

Unit, and the Iowa Department of Natural Resources contribute to the graduate programs of the department.

No more than two dual-listed animal ecology courses may be applied for major graduate credit. Additional work is expected of students taking a dual-listed course for credit at the 500 level

Forestry

The department offers programs leading to the degrees of master of science and doctor of philosophy with a major in forestry and minor work to students taking major work in other departments. Areas of specialization for the M.S. degree are forest administration and management, forest biology, forest biometry, forest economics and marketing, and wood science. Areas of specialization for the Ph.D. are forest biology, wood science, forest biometry, and forest economics.

Graduates are skilled at defining a research problem in forestry, applying scientific principles and appropriate methods, and analyzing the results. They are capable of understanding the many facets of forest and wood science and are very knowledgeable in specific areas in forestry. They are able to deal with complex forestry problems, and where appropriate, they are capable of blending ecological, social, ethical, legal, and economic factors in the research process. They are very skilled at communicating, both in written and oral form, research results to professional and lay audiences. They are sensitive to cultural diversity and work effectively with peers, natural resource professionals, and the public.

The graduate program is open to, and suitable for, students who have majored in forestry or related natural resource fields. A non-thesis master's option is available. All students are required to teach and conduct research as part of their training for the Ph.D. degree.

The department participates in the Masters in Business Administration (M.B.A.), with specialization in the agriculture program administered by the College of Business, providing an opportunity to obtain an M.B.A. degree while taking advanced courses in forestry and maintaining contact with the profession of forestry. The department also participates in interdepartmental majors in ecology and evolutionary biology, plant physiology, genetics, and environmental science (see Index).

Courses open for nonmajor graduate credit: A Ecl 371, 419L, 451, 455, 486,

486L; For 302, 342, 416, 451, 452, 453, 454, 475, 480, 481, 483, 485, 486, 487; NREM 301, 345, 390, 402, 430, 452 and 460.

Animal Ecology (A Ecl)

Courses primarily for undergraduate students

A Ecl 301I. Iowa Natural History.

(Cross-listed with Ia LL). Cr. 4. Alt. SS., offered 2008. Prereq : One course in the biological sciences. Biological diversity and its causes examined through lectures and field trips to native lake, marsh, forest, and prairie habitats; topics include measuring the environment, sampling and identifying organisms, experimenting with the ecosystem, understanding species interactions, and appreciating influences of past and present climates and geological events on natural ecosystems of the region.

A Ecl 312. Ecology. (Cross-listed with Biol, EnSci). (3-3) Cr. 4. F.SS. Prereq: Biol 211L and 212L. Fundamental concepts and principles of ecology dealing with organisms, populations, communities and ecosystems. Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats.

A Ecl 312I. Ecology. (Cross-listed with Ia LL, EnSci). Cr. 4. SS. An introduction to the principles of ecology at the population, community and ecosystem level. Field studies of local lakes, wetlands and prairies are used to examine factors controlling distributions, interactions, and roles of plants and animals in native ecosystems.

A Ecl 321. Fish Biology. (2-3) Cr. 3. S. Prereq: 365. Anatomy, physiology, behavior, and ecology of fishes. A Ecl 326I. Ornithology. (Cross-listed with Ia LL). Cr. 4. SS. The biology, ecology, and behavior of birds with emphasis on field studies of local avifauna. Group projects stress techniques of population analysis and methodology for population studies.

A Ecl 360. Natural History of Aquatic Biota. (0-3) Cr. 1. F. Prereq : 312. Natural history and ecology of aquatic biota, excluding vertebrates. Includes identification, survey methods, habitat requirements, energetics and nutritional requirements, reproduction, communities, and other ecological factors which affect species well-being.

A Ecl 365. Vertebrate Biology. (Cross-listed with Biol). (3-2) Cr. 4. F. Prereq : Biol 212, 212L. Evolution, biology, and

classification of fish, amphibians, reptiles, birds, and mammals. Emphasis on a comparative analysis of the structure and function of organ systems. Laboratory exercises concentrate on morphology and identification of orders of vertebrates.

A Ecl 366. Natural History of Iowa Vertebrates. (2-3) Cr. 3. S. Prereq: Biol 211, 211L, 212, 212L. Vertebrate fauna of Iowa, including fishes, amphibians, reptiles, birds, and mammals. Species identification, habitat requirements, community structure and assessment, conservation issues that include historical population changes and value of wild animals to the region's ecological and economic health.

A Ecl 371. Ecological Methods. (Cross-listed with Biol). (2-2) Cr. 3. S. Prereq: 312; Stat 101 or 104. Quantitative techniques used in management of natural resources with emphasis on inventory and manipulation of habitat and animal populations. Nonmajor graduate credit.

A Ecl 401. Introductory Aquatic Animal Health and Medicine. (Cross-listed with VDPAM). (1-2) Cr. 1. S. 8 weeks. Introductory course with focus on fin fish production, health and medicine. Course content will help define future roles for veterinarians, producers, and service providers. Emphasis will be placed on anatomy, pathology, infectious diseases, nutrition, regulatory constraints in production, food safety, and current research. Field trip to aquaculture facility.

A Ecl 404I. Behavioral Ecology. (Cross-listed with Ia LL). Cr. 4. Alt. SS., offered 2008. Prereq: Two semesters of biology. Animal coloniality, courtship, territoriality, predator defense, habitat selection, foraging, mating systems, and parental care will be examined in the field in order to evaluate various ecological and evolutionary theories of animal behavior.

A Ecl 418. Stream Ecology. (Dual-listed with 518). (Cross-listed with EnSci). (2-3) Cr. 3. Alt. F., offered 2007. Prereq: 486. Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

A Ecl 419I. Vertebrate Ecology and Evolution. (Cross-listed with Ia LL). Cr. 4. SS. Field and laboratory study of representative vertebrates of northwestern Iowa. Observations and

experimentation emphasize ecological histories by integrating concepts of functional morphology, behavioral ecology, and evolutionary biology. Nonmajor graduate credit.

A Ecl 420I. Amphibians and Reptiles. (Cross-listed with Ia LL). Cr. 4. Alt. SS., offered 2008. Prereq: Two semesters of biology. Ecology, behavior, and conservation biology of amphibians and reptiles with emphasis on their anatomy and morphology; temperature and water regulation; locomotion; life history; reproduction; population and community ecology; and conservation.

A Ecl 425. Aquatic Insects. (Dual-listed with 525). (Cross-listed with Ent). (2-3) Cr. 3. Alt. S., offered 2009. Prereq: Biol 312 or equivalent. Courtney. Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

A Ecl 440. Fishery Management. (Dual-listed with 540). (2-3) Cr. 3. F. Prereq: 312, 321; credit or enrollment in 486; Stat 101 or 104. Biological basis of fishery management, fishery problems, and management practices for freshwater, anadromous, and marine fisheries.

A Ecl 441. Fisheries Techniques. (Dual-listed with 541). (2-3) Cr. 3. F. Prereq: 321 and Stat 104. Overview of field, laboratory, and analytical techniques associated with managing fisheries and aquatic resources. Specific topics include sampling design, fish and habitat sampling techniques, structural indices, age and growth, and biotelemetry.

A Ecl 442. Aquaculture. (Dual-listed with 542). (3-0) Cr. 3. S. Prereq: 486, credit or enrollment in 321. Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetics, diseases, and marketing.

A Ecl 451. Wildlife Ecology and Management. (2-3) Cr. 3. F. Prereq: 371. Ecological theory and practice of wildlife management, including, population ecology, habitat management, and current issues in the field. Course involves a series of case studies addressing actual wildlife issues using field and quantitative methods. Nonmajor graduate credit.

A Ecl 455. International Wildlife Issues. (3-0) Cr. 3. Alt. S., offered 2008. Prereq: 365, 312 or graduate standing; NREM 120. Biological, political, social,

and economic factors affecting the management of international wildlife resources. Nonmajor graduate credit.

A Ecl 457. Herpetology. (Dual-listed with 557). (Cross-listed with Biol). (2-3) Cr. 3. F. Prereq: A Ecl 365 or Biol 351. Biology, ecology, and evolution of amphibians (salamanders, frogs, caecilians) and reptiles (lizards, snakes, tuatara, turtles, crocodylians). Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of amphibians and reptiles in ecosystems, and conservation. Laboratory focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

A Ecl 458. Ornithology. (Dual-listed with 558). (Cross-listed with Biol). (2-3) Cr. 3. S. Prereq:

A Ecl 365 or Biol 351. Biology, evolution, ecology and taxonomy of birds. Emphasis on structure, physiology, behavior, communication, navigation, reproduction, and conservation. Laboratory exercises complement lecture topics, emphasize identification and distribution of Midwest birds, and include field trips.

A Ecl 459. Mammalogy. (Dual-listed with 559). (Cross-listed with Biol). (2-3) Cr. 3. S. Prereq: Biol 351. Biology, ecology, and evolution of mammals. Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of mammals in ecosystems, and conservation. Laboratory focus on identification, distribution, habits, and habitats of mammals.

A Ecl 480. Studies in Marine Biology. Cr. 1-8. Repeatable. SS. Courses taken at Gulf Coast Research Laboratory and other marine biological stations are transferred to Iowa State University under this number.

A Ecl 486. Aquatic Ecology. (Cross-listed with Biol, EnSci). (3-0) Cr. 3. F. Prereq: Biol 312 or EnSci 381 or EnSci 402 or NREM 301. Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology. Nonmajor graduate credit.

A Ecl 486L. Aquatic Ecology Laboratory. (Cross-listed with Biol, EnSci). (0-3) Cr. 1. F. Prereq: Concurrent enrollment in 486. Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic

research and monitoring techniques and concepts. Nonmajor graduate credit.

Courses primarily for graduate students, open to qualified undergraduate students

A Ecl 515. Ecology of Freshwater Invertebrates. (2-3) Cr. 3. Alt. F., offered 2007. Prereq : 312.

Identification, general biology, and ecological requirements of freshwater invertebrates, with additional emphasis on community sampling methods and analysis. Use of invertebrates as tools for aquatic ecosystem health assessment.

A Ecl 516. Avian Ecology. (3-0) Cr. 3. Alt. S., offered 2008. Prereq : 365, 312, or graduate standing. Current topics and theories including avian breeding and foraging ecology, community structure, habitat selection, field methodologies, and data interpretation. Strong evolutionary emphasis.

A Ecl 518. Stream Ecology. (Dual-listed with 418). (Cross-listed with EnSci). (2-3) Cr. 3. Alt. F., offered 2007. Prereq : 486. Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

A Ecl 520. Fisheries Science. (3-0) Cr. 3. Alt. S., offered 2009. Prereq : 312, 321. Concepts, approaches, and techniques for assessment of recreational and commercial fisheries. Scope will range from individual fish to entire ecosystems, both freshwater and marine.

A Ecl 523I. Fish Ecology. (Cross-listed with Ia LL). Cr. 4. Alt. SS., offered 2008. Basic principles of fish interaction with the biotic and abiotic environment. Field methods, taxonomy, and biology of fish with emphasis on the fish fauna of northwestern Iowa.

A Ecl 525. Aquatic Insects. (Dual-listed with 425). (Cross-listed with Ent). (2-3) Cr. 3. Alt. S., offered 2009. Prereq : Biol 312 or equivalent. Courtney. Morphology, ecology, diversity and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

A Ecl 526I. Advanced Field Ornithology. (Cross-listed with Ia LL). Cr. 2. SS. Prereq: Concurrent registration in Ia LL 326I. Field study of birds of the upper Midwest; extended

field trip to Minnesota and Wisconsin; individual or group project.

A Ecl 531. Conservation Biology. (Cross-listed with EEOB). (3-0) Cr. 3. Alt. S., offered 2008. Prereq : 312; Biol 313 or graduate standing. Examination of conservation issues from a population and a community perspective. Population-level analysis will focus on the role of genetics, demography, and environment in determining population viability. Community perspectives will focus on topics such as habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

A Ecl 531I. Conservation Biology. (Cross-listed with Ia LL, EEOB). Cr. 4. Alt. SS., offered 2008. Prereq : Ia LL 312I. Population-and community-level examination of factors influencing the viability of plant and animal populations from both demographic and genetic perspectives; assessment of biodiversity; design and management of preserves.

A Ecl 535I. Restoration Ecology. (Cross-listed with Ia LL, EEOB, EnSci). Cr. 4. Alt. SS., offered 2008. Prereq : A course in ecology. Ecological principles for the restoration of native ecosystems; establishment (site preparation, selection of seed mixes, planting techniques) and management (fire, mowing, weed control) of native vegetation; evaluation of restorations. Emphasis on the restoration of prairie and wetland vegetation.

A Ecl 540. Fishery Management. (Dual-listed with 440). (2-3) Cr. 3. F. Prereq : 312, 321; credit or enrollment in 486; Stat 101 or 104. Biological basis of fishery management, fishery problems, and practices for management of freshwater, anadromous, and marine fisheries.

A Ecl 541. Fisheries Techniques. (Dual-listed with 441). (2-3) Cr. 3. F. Prereq : 321 and Stat 104. Overview of field, laboratory, and analytical techniques associated with managing fisheries and aquatic resources. Specific topics include sampling design, fish and habitat sampling techniques, structural indices, age and growth, and biotelemetry.

A Ecl 542. Aquaculture. (Dual-listed with 442). (3-0) Cr. 3. S. Prereq: 485, credit or enrollment in 321. Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetic, diseases, and marketing.

A Ecl 551. Wildlife Behavioral Ecology. (2-2) Cr. 3. Alt. S., offered 2008. Prereq : a course in ecology or animal behavior. The study of how an animal's behavior affects its ability to survive and reproduce in its environment. Topics represent the interface of ecology, evolution, and behavior. Wildlife defined broadly.

A Ecl 557. Herpetology. (Dual-listed with 457). (Cross-listed with EEOB). (2-3) Cr. 3. F. Prereq : A Ecl 365 or Biol 351. Biology, ecology, and evolution of amphibians (salamanders, frogs, caecilians) and reptiles (lizards, snakes, tuatara, turtles, crocodilians). Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of amphibians and reptiles in ecosystems, and conservation. Laboratory focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

A Ecl 558. Ornithology. (Dual-listed with 458). (Cross-listed with EEOB). (2-3) Cr. 3. S. Prereq: A Ecl 365 or Biol 351. Biology, evolution, ecology and taxonomy of birds. Emphasis on structure, physiology, behavior, communication, navigation, reproduction, and conservation. Laboratory exercises complement lecture topics, emphasize identification and distribution of Midwest birds, and include field trips.

A Ecl 559. Mammology. (Dual-listed with 459). (Cross-listed with EEOB). (2-3) Cr. 3. S. Prereq: Biol 351. Biology, ecology, and evolution of mammals. Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of mammals in ecosystems, and conservation. Laboratory focus on identification, distribution, habits, and habitats of mammals.

A Ecl 570. Landscape Ecology. (Cross-listed with EEOB). (2-3) Cr. 3. Alt. F., offered 2008. Prereq : Permission of instructor; EEOB 588; a course in calculus. The study of ecological and evolutionary processes within a spatial context with emphasis on behavior, population, and community dynamics.

A Ecl 573. Techniques for Biology Teaching. (Cross-listed with Ia LL, EEOB). Cr. 1-2. Repeatable. SS. The development and implementation of laboratory exercises suitable for inclusion in elementary, middle, high school, and community college biology and environmental courses. Exercises will be built around common organisms

and ecosystems in Iowa. Field trips. A. Animal Biology (Same as Ia LL 573A) G. Limnology (Same as Ia LL 573G) H. Animal Behavior (Same as Ia LL 573H) W. Project WET (Same as Ia LL 573W)

A Ecl 589. Population Ecology. (Cross-listed with EEOB). (2-2) Cr. 3. F. Prereq : Biol 312, Stat 101 or 104, a course in calculus, or graduate standing. Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

A Ecl 590I. Graduate Independent Study. (Crosslisted with Ia LL, EEOB, Anthr). Cr. 1-4. Repeatable. SS. Prereq: Graduate classification and permission of instructor.

A Ecl 599. Creative Component. Cr. arr. Prereq : Nonthesis M.S. option only.

Courses primarily for graduate students

A Ecl 600. Seminar. (2-0) Cr. 1. Repeatable. F.S. Current topics in ecological research, fish and wildlife management, and environmental problems related to fish or wildlife resources.

A Ecl 611. Analysis of Populations. (Cross-listed with EEOB). (2-2) Cr. 3. Alt. F., offered 2008. Prereq : Biol 312; Stat 401; a course in calculus. Quantitative techniques for analyzing vertebrate population data to estimate parameters such as density and survival. Emphasis on statistical inference and computing.

A Ecl 698. Animal Ecology Teaching Practicum. Cr. 1-3. Repeatable. F.S.SS. Prereq: Graduate classification in animal ecology and permission of instructor. Graduate student experience in the animal ecology teaching program. Satisfactory-fail only.

A Ecl 699. Research. Cr. arr. Repeatable.

A Ecl 699I. Research. (Cross-listed with Ia LL, Anthr, GDCB, EEOB). Cr. 1-4. Repeatable.

Forestry (For)

Courses primarily for undergraduate students

For 201. Forest Biology. (2-0) Cr. 2. F. Prereq : Concurrent enrollment in 202, 203, 204, 205, and 206. Discussion of ecological concepts, individual tree structure and growth, variation and diversity in tree populations. Physical

environment of trees and forests, ecological processes in forest communities, and introduction to different regional forest communities.

For 202. Wood Utilization. (2-0) Cr. 2. F. Prereq : Concurrent enrollment in 201, 203, 204, 205, and 206. Processing of sustainable materials including wood into products and general properties and proper use of these products.

For 203. Resource Measurements /Evaluation. (2-0) Cr. 2. F. Prereq : Concurrent enrollment in 201, 202, 204, 205, and 206; Math 140. Survey techniques involved in quantification, valuation, and evaluation of tree and stand growth and other variables in the forest environment (e.g., recreational use, wildlife habitat value, biomass, and solid wood).

For 204. Forest Ecosystem Decision-Making. (2-0) Cr. 2. F. Prereq : Concurrent enrollment in 201, 202, 203, 205, and 206. Methods of decision-making related to forest ecosystems including communications, teams and conflict resolution. Current issues relating to public, private, and urban forests; quantification of processes, services, and goods produced by the forest and expected by the public such as wildlife, water, range, recreation, wilderness, biodiversity, as well as wood and fiber products.

For 205. Integrated Forestry Laboratory. (0-8) Cr. 3. F. Prereq : Concurrent enrollment in 201, 202, 203, 204, and 206. Field and laboratory exercises integrating the evaluation and management of forest goods, services, and the processing of wood products.

For 206. Fall Forestry Camp. Cr. 4. F. Prereq : Concurrent enrollment in 201, 202, 203, 204, and 205. Three-week field camp to address topics and issues covered in 201, 202, 203, 204, and 205.

For 280. Wood Properties and Identification. (3-3) Cr. 4. S. Properties of wood and how they relate to its successful use. Comparative anatomical characteristics, scientific nomenclature, and hand lens identification of commercially important North American woods.

For 283. Pesticide Application Certification. (Crosslisted with Ent, Agron, Hort). (2-0) Cr. 2. S. Holscher. Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide

applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

For 290. Special Problems. Cr. 1-4. Repeatable. Prereq : Freshman or Sophomore classification, permission of instructor. A. Leadership in Forestry Teams (LIFT) Learning Community B. Forest Ecosystem Management C. Natural Resource Conservation D. Urban and Community Forestry E. Wood Science and Technology

For 302. Silviculture. (2-3) Cr. 3. S. Prereq: 201. Manipulation of forest vegetation based on ecological principles for the production of goods and services. Nonmajor graduate credit.

For 342. Dynamics of Forest Stands. (2-3) Cr. 3. F. Prereq : 203, Stat 101. Examination of factors affecting individual tree and forest growth. Estimation of growth and yield of even-aged and all-aged stands. Examination of ways to assess site quality and competition. Review of simple random sampling and introduction to stratified random sampling and other sampling techniques. Nonmajor graduate credit. Natural Resource Ecology and Management 308 2007-2009

For 356. Dendrology. (Cross-listed with Biol). (2-4) Cr. 4. F. Prereq : Biol 211. Identification and ecology of North American woody plant species. Importance of woody plants in timber production and wildlife habitat. Natural disturbances, human impacts, management and restoration concerns for major North American forest regions will be addressed.

For 416. Forest Insect and Disease Ecology. (Cross-listed with PI P). (3-3) Cr. 4. S. Prereq: 8 credits in biological sciences, including Biol 211. Harrington. Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests. Nonmajor graduate credit.

For 451. Forest Resource Economics and Quantitative Methods. (3-3) Cr. 4. S. Prereq: 203, Econ 101, Math 150. Application of economic principles to forest resource management considering both market and non-market goods and services. Methods of identifying and specifying problems in the management and use of forest resources. Application of mathematical and statistical models to the solution of managerial problems. Nonmajor graduate credit.

For 452. Ecosystem Management. (Cross-listed with NREM). (2-3) Cr. 3. F. Prereq : Junior classification, and NREM 301 or A Ecl 312. Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints. Nonmajor graduate credit.

For 453. Forest Resource Policy and Administration. (3-0) Cr. 3. S. Prereq: 451. Forest and related natural resource policies and contemporary policy issues. Integration of elements of policy development processes, various participants in these processes, and resulting programs. Ethics in professional forestry and natural resource conservation, and conflict resolution. Participation in the policy process involving communication with policy makers and natural resource professionals, study of current issues, promotion of issues with students as issue educators. Participation in policy meetings to identify/determine various elements and applications of strategies associated with the policy development process. Nonmajor graduate credit.

For 454. Forestry Practicum. (1-4) Cr. 3. S. Prereq: 20 credits in student's major at 300 level or above. Integrated decision-making related to the conservation, management, and preservation of private and public forests, wildlands, urban/community forests, and/or the production and utilization of wood products. Student teams work with a client and develop management plans that incorporate ecological, social, economic, ethical, and institutional/political factors. Effective teamwork, written/oral/visual communication, and problem-solving stressed. Multiple trips to project site and client. Nonmajor graduate credit.

For 475. Urban Forestry. (Cross-listed with Hort). (2-3) Cr. 3. F. Prereq : Junior or senior classification, 3 credits in biology. Discussion of establishment and management of woody perennials in communityowned urban greenspaces, consideration of urban site and soil characteristics, plant physiology, plant culture, urban forest valuation, inventory methods, species selection, and urban forest maintenance (health care and pest management). Nonmajor graduate credit.

For 480. Wood Anatomy and Fiber Analysis. (2-3) Cr. 3. Alt. F., offered 2007. Prereq : 280 or permission of instructor. Microscopic anatomy and

ultrastructure of wood and other industrial lignocellulosic materials. Microscopy techniques for fiber analysis. Comparison of fiber properties. Nonmajor graduate credit.

For 481. Chemical Conversion of Wood. (2-3) Cr. 3. Alt. F., offered 2008. Prereq : 280. Chemical properties of wood. Pulp and paper technology. Other fiber products. Cellulose derivatives. Nonmajor graduate credit.

For 483. Wood Deterioration and Preservation. (Cross-listed with PI P). (2-3) Cr. 3. Alt. F., offered 2007. Prereq : For 280. Deterioration of wood in use by biological and physical agents. Wood preservation and fire retardant treatments. Environmental impact of wood treating. Nonmajor graduate credit.

For 485. Lignocellulosic Composite Materials. (2-3) Cr. 3. Alt. F., offered 2008. Prereq : 280. Consolidation behavior of lignocellulosic materials. Principles of adhesion. Manufacturing processes for wood and lignocellulose composites such as plywood, oriented strand products, laminated lumber, particleboard, and medium density fiberboard. Extrusion processing of natural fiber/plastic composites. Nonmajor graduate credit.

For 486. Moisture Interactions of Lignocellulosic Materials. (2-3) Cr. 3. Alt. S., offered 2008. Prereq : 280. Principles of moisture relations in hygroscopic materials; adsorption, desorption, equilibrium moisture content. Transport processes in natural materials such as wood. Drying processes for wood and other lignocellulosic materials. Influence of moisture on dimensional stability and durability of lignocellulosics and composites. Nonmajor graduate credit.

For 487. Physical Properties of Wood. (3-3) Cr. 4. Alt. S., offered 2008. Prereq : 280. Mechanical, thermal, electrical, and acoustical properties of wood. Lumber grading and stress rating, nondestructive evaluation of wood and wood composite products. Nonmajor graduate credit.

Courses primarily for graduate students, open to qualified undergraduate students

For 599. Creative Component. Cr. 1-12. Repeatable for maximum of 12 credits. A. Forest Biology B. Forest Biometry C. Forest and Recreation Economics D. Forest Management and Administration E. Wood Science

For graduate students

For 603. Tree Growth and Development. (4-0) Cr. 4. Alt. S., offered 2008. Prereq : NREM 301 or a course in plant physiology. Structure and function of individual trees and shrubs. Emphasis is on factors that make woody plants different from herbaceous plants. Response of individuals to such environmental factors as radiation, temperature, water stress, flooding, and compaction, air pollution, fire and wind.

For 696. Research Seminar. (Cross-listed with GDCB, Agron, BBMB, Hort, P Phy). Cr. 1. Repeatable. Research seminars by faculty and graduate students. Satisfactory-fail only. P. Plant Physiology and Molecular Biology

For 699. Research. Cr. 1-12. Repeatable for maximum of 12 credits. A. Forest Biology - Wood Science B. Forest Biometry C. Forest Economics D. Forest Management and Administration E. Wood Science F. Plant Physiology

Natural Resource Ecology and Management (NREM)

Courses primarily for undergraduate students

NREM 104. Practical Work Experience. Cr. R. Three months of relevant work experience in natural resources, animal ecology, or forestry. Study at a summer biological station may be applicable. See adviser for specific requirements and approval process.

NREM 110. Orientation in Natural Resource Ecology and Management. Cr. R. F. Orientation to the University and to the Department of Natural Resource Ecology and Management. Discussion of departmental learning outcomes, strategies for academic success and academic planning. Satisfactory-fail only.

NREM 112. Orientation to Learning and Productive Team Membership. (Cross-listed with Aer E, FS HN, Hort, TSM). (2-0) Cr. 2. F. Introduction to developing intentional learners and worthy team members. Learning as the foundation of human enterprise; intellectual curiosity; ethics as a personal responsibility; everyday leadership; effective team and community interactions including team learning and the effects on individuals; and growth through understanding self, demonstrating ownership of own learning, and internalizing commitment to helping others. Intentional mental

processing as a means of enhancing learning. Interconnectedness of the individual, the community, and the world.

NREM 120. Introduction to Renewable Resources. (Cross-listed with Agron, Env S). (3-0) Cr. 3. F.S. Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

NREM 130. Natural Resources and Agriculture. (Cross-listed with Env S). (3-0) Cr. 3. S. Survey of the ecology and management of fish, forest, and wildlife resources in areas of intensive agriculture, with emphasis on Iowa. Conservation and management practices for private agricultural lands. Designed for nonmajors.

NREM 211. Careers in Natural Resources. Cr. 1. F.S. Prereq: Sophomore classification. Career planning exploration in natural resources. Discussion of the job application process, including techniques for successful interviewing and development of an effective resume. Satisfactory-fail only.

NREM 256. Midwestern Prairie Plants. (1-2) Cr. 1. F. Offered 1st half semester only. Survey of the major plant families, genera, and representative species of Midwestern prairies with emphasis on plant identification and use of keys. Prairie restoration, conservation, and management issues will also be considered.

NREM 285. The National Parks: Culture and Nature. (Cross-listed with L A). (1-0) Cr. 1. S. Reviews cultural setting for park establishment and management, ideas about wilderness, and philosophy of parks as types of land use. History of landscape architecture in the National Park Service, the development of American parks, the history of park wildlife management and nature interpretation. Recent initiatives in ecosystem management, community conservation, and international points of comparison. Readings, discussion, exercises.

NREM 301. Forest Ecology and Soils. (Cross-listed with EnSci). (3-3) Cr. 4. F. Prereq : Biol 211, 211L; For 201 or a second course in biology. Effects of environmental factors on ecosystem structure and function. Special emphasis is given to soil forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics.

Additional emphasis is given on human influences on natural ecosystems. Nonmajor graduate credit.

NREM 303. Internship. Cr. 1-3. Repeatable for maximum of 6 credits. F.S.SS. Prereq: Permission of instructor and sophomore standing. Placement with county conservation boards, camps, zoos, parks, etc., for experience as interpreters, rangers, and technicians.

NREM 303I. Undergraduate Internship. (Cross-listed with Ia LL). Cr. 1-5. Repeatable for maximum of 5 credits. SS. Prereq: Permission of instructor and sophomore standing. Placement with county conservation boards, camps, parks, etc. for experience as interpreters, rangers, and technicians.

NREM 305. Seminar. (2-0) Cr. 1. Repeatable. F.S. Prereq: Permission of instructor. Current topics in natural resources or related issues. Natural Resource Ecology and Management 2007-2009 309

NREM 330. Interpretation of Natural Resources. (2-3) Cr. 3. S. Prereq: 6 credits in biological sciences. History, objectives, forms, and techniques of natural resources interpretation in the settings of county, state, national parks, and zoos.

NREM 345. Natural Resource Photogrammetry and Geographic Information Systems. (Cross-listed with EnSci). (2-3) Cr. 3. F. Prereq : Junior classification. Measurement and interpretation of aerial photos in resource management. Introduction to Geographic Information Systems (GIS) using ArcGIS including digitizing, development and query of attribute tables, georeferencing, and use of multiple GIS layers in simple spatial analyses. Nonmajor graduate credit.

NREM 385. Natural Resource Policy. (Dual-listed with 585). (3-0) Cr. 3. Alt. F., offered 2008. Prereq : Junior standing. History, theory, and practice of natural resource policy. Integrative approach with emphasis on wildlife and forest policies in the United States, and their relationship to public agencies and other major environmental policies. The role of science in policy.

NREM 390. Fire Ecology and Management. (3-0) Cr. 3. F. Characteristics and role of fire in forest ecosystems. Major topics covered include fuels, fire weather, fire behavior, fire danger rating systems, fire control, prescribed burning, and fire dynamics in

major ecosystem types. Nonmajor graduate credit.

NREM 402. Watershed Hydrology and Surficial Processes. (Cross-listed with Agron, EnSci, Geol). (3-3) Cr. 4. F. Prereq : Credit or enrollment in EnSci 381 or Geol 100 or 201, Math 165 or 181. Examination of watersheds as systems wherein biological and physical factors control hydrology, soil formation, and nutrient transport. Laboratory emphasizes field investigation of watershed-scale processes. Nonmajor graduate credit.

NREM 407. Watershed Management. (Dual-listed with 507). (Cross-listed with EnSci, Env S). (3-3) Cr. 4. S. Prereq: A course in general biology. Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

NREM 430. Media Techniques in Natural Resources Interpretation. (3-0) Cr. 3. Alt. F., offered 2007. Prereq : 330. Media techniques used by interpreters for teaching the public about natural resources. Nonmajor graduate credit.

NREM 446. Integrating GPS and GIS for Natural Resource Management. (Dual-listed with 546). (Cross-listed with EnSci). (2-3) Cr. 3. S. Prereq: 12 credits in student's major at 300 level or above, NREM 345 or equivalent experience with ArcGIS. Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

NREM 452. Ecosystem Management. (Cross-listed with For). (2-3) Cr. 3. F. Prereq : Junior classification, and NREM 301 or A Ecl 312. Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints. Nonmajor graduate credit.

NREM 460. Controversies in Natural Resource Management. (Cross-listed with Env S). (3-0) Cr. 3. F.S. Prereq: 120, and A Ecl 312 or NREM 301, and

Junior classification. Analysis of controversial natural resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding. Ecological, social, political, economic, and ethical implications of issues will be analyzed. Nonmajor graduate credit.

NREM 465. Landscape Change and Conservation. (Dual-listed with 565). (Cross-listed with L A). (3-0) Cr. 3. F. Prereq : L A 202. Exploration of issues in landscape ecology and conservation biology relevant to landscape change, design, and planning. Examination of foundational principles and their applications across a continuum of land uses, from wilderness to urban areas.

NREM 471. Agroforestry Systems; Local and Global Perspectives. (Dual-listed with 571). (2-3) Cr. 3. F. Prereq : 6 credits in biological science at 300 level or above. Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

NREM 472. Landscape Ecology and Natural Resource Management. (Dual-listed with 572). (2-2) Cr. 3. F. Prereq : NREM 301 or A Ecl 312 or equivalent and NREM 345 or CRP 451 or equivalent. Analysis and management of spatial patterns and processes in populations, communities, and ecosystems with emphasis on broad spatial scales. Human influences on natural systems are strongly considered.

NREM 490. Independent Study. Cr. 1-4. Repeatable for maximum of 4 credits. Prereq : Junior or senior classification, permission of instructor. A. Animal Ecology B. Forestry H. Honors Program

NREM 490I. Undergraduate Independent Study. (Cross-listed with Ia LL). Cr. 1-4. Repeatable for maximum of 4 credits. Prereq : Junior or senior classification and permission of the instructor.

NREM 493. Workshop. Cr. 1-3. Repeatable. Prereq : Permission of instructor. Ecological concepts and management practices for landowners, teachers and others. Not for students majoring in animal ecology or forestry. NREM 493 may be taken more than once for graduation credit.

NREM 496. Travel Course. (Dual-listed with 596). Cr. 1-3. Repeatable for

maximum of 3 credits. Prereq : Permission of instructor. Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. A. International B. Domestic

NREM 498. Cooperative Education. Cr. 1-3. Prereq : Permission of departmental chair. Required of all cooperative education students. Students must register prior to commencing each work period.

Courses primarily for graduate students, open to qualified undergraduate students

NREM 501. Genecology. (3-0) Cr. 3. Alt. F., offered 2007. Prereq : Gen 320 or Biol 313. Genecology principles as they apply to natural and improved populations of plants and animals. Genetic systems as they interact with long-term natural selection to produce clinal or ecotypic variation. The impact of current environments and genetic modifications of domesticated organisms on short-term selection pressures. Special coverage of species of interest to students enrolled in the course.

NREM 504. Forest Landscapes, Wildlife, and Silviculture. (3-3) Cr. 4. Alt. F., offered 2008. Prereq : 301. Detailed analysis of factors and processes underlying forest and stand growth and development. Applications of this knowledge to forest culture to support a diversity of use and protection objectives. Discussions of regional silviculture, tropical forests, and experimentation in forest biology.

NREM 505. Seminar. (2-0) Cr. 1. Repeatable for maximum of 3 credits. F.S. Prereq: Permission of instructor or graduate classification. Current topics in natural resources research and management.

NREM 507. Watershed Management. (Dual-listed with 407). (Cross-listed with EnSci). (3-3) Cr. 4. S. Prereq: A course in general biology. Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

NREM 508I. Aquatic Ecology. (Cross-listed with Ia LL, EnSci). Cr. 4. SS. Prereq: Courses in ecology, chemistry,

and physics. Analysis of aquatic ecosystems; emphasis on basic ecological principles; ecological theories tested in the field; identification of common plants and animals.

NREM 529. Publishing in Biological Sciences Journals. (Cross-listed with Agron, Hort). (2-0) Cr. 2. S. Prereq: Permission of instructor; evidence of a publishable unit of the student's research data. Process of preparing a manuscript for submission to a refereed journal in the biological sciences. Emphasis on publishing self-generated data from thesis or dissertation research.

NREM 532. Human Dimensions of Natural Resource Management. (3-0) Cr. 3. Alt. F., offered 2008. Prereq : A Ecl 312 or equivalent plus 6 credits of biological sciences; permission of instructor. Exploration of institutions that help shape natural resource management and policies. Current research on interaction of humans with natural resources. Roles of social forces, politics and economics in natural resource management.

NREM 535. Restoration Ecology. (Cross-listed with EnSci, EEOB). (2-3) Cr. 3. F. Prereq : Biol 366 or 474 or graduate standing. Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

NREM 542. Introduction to Molecular Biology Techniques. (Cross-listed with GDCB, BBMB, BCB, B M S, FS HN, Hort, NutrS, VDPAM). Cr. 1. Repeatable. F.S.SS. Prereq: Graduate classification. Workshops in basic molecular biology techniques and related procedures. A. DNA Techniques. Includes genetic engineering procedures, sequencing, PCR, and genotyping. (F.S.SS.) B. Protein Techniques. Includes fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, immunophenotyping, and monoclonal antibody production. (S.SS.) C. Cell Techniques. Includes immunophenotyping, ELISA, flow cytometry, microscopic techniques, and image analysis. (F.S.) D. Plant Transformation. Includes Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. (S.) E. Proteomics. Includes two-dimensional electrophoresis, laser scanning, mass

spectrometry, and database searching. (F.)

NREM 546. Integrating GPS and GIS for Natural Resource Management. (Dual-listed with 446). (Cross-listed with EnSci). (2-3) Cr. 3. S. Prereq: 12 credits in student's major at 300 level or above, NREM 345 or equivalent experience with ArcGIS. Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

NREM 565. Landscape Change and Conservation. (Dual-listed with 465). (Cross-listed with L A). (3-0) Cr. 3. F. Prereq : L A 202. Exploration of issues in landscape ecology and conservation biology relevant to landscape change, design, and planning. Examination of foundational principles and their applications across a continuum of land uses, from wilderness to urban areas.

NREM 570. Advanced Decision-making in Natural Resource Allocation. (2-2) Cr. 3. Alt. S., offered 2008. Prereq : For 451 or two courses in economics. Analytical approach to economic aspects of forest resource management problems. Theory and application of economic decision-making criteria to traditional and modern forest resource management issues. Current problems in the allocation of forest resources.

NREM 571. Agroforestry Systems. (Dual-listed with 471). (Cross-listed with SusAg). (2-3) Cr. 3. F. Prereq : 6 credits in biological science at 300 level or above. Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

NREM 572. Landscape Ecology and Natural Resource Management. (Dual-listed with 472). (2-2) Cr. 3. F. Prereq : NREM 301 or A Ecl 312 or equivalent and NREM 345 or CRP 451 or equivalent. Analysis and management of spatial patterns and processes in populations, communities, and ecosystems with emphasis on broad spatial scales. Human influences on natural systems are strongly considered.

NREM 580. Research Orientation. (2-0) Cr. 2. F. Prereq : 20 credits in biological sciences and a course in statistics. Research design, proposal preparation, and technical writing.

NREM 581. Methods for Presenting Scientific Results. (2-0) Cr. 2. S. Prereq: Permission of instructor. Techniques of proper platform presentation. Discussion of effective audio/visual techniques for presentation of research findings. Practice in development of overheads and slides. Use of computer generated and projected visuals. Practice in oral presentation with critical review. Development of effective posters for scientific presentation.

NREM 585. Natural Resource Policy. (Dual-listed with 385). (3-0) Cr. 3. Alt. F., offered 2008. Prereq : 12 credits of biological sciences. History, theory, and practice of natural resource policy. Integrative approach with emphasis on wildlife and forest policies in the United States, and their relationship to public agencies and other major environmental policies. The role of science in policy.

NREM 590. Special Topics. Cr. 1-4. Repeatable for maximum of 4 credits. Prereq : Permission of instructor. A. Animal Ecology B. Forestry

NREM 593. Workshop. Cr. 1-3. Repeatable. Prereq : Graduate classification.

NREM 596. Travel Course. (Dual-listed with 496). Cr. 1-3. Repeatable for maximum of 3 credits. Prereq : Permission of instructor. Limited enrollment. Extended field trips to study ecological topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. A. International B. Domestic

NREM 599. Creative Component. Cr. arr.

Courses for graduate students

NREM 600. Seminar. Cr. 1. Repeatable. F.S. Current topics in natural resources research and management.

NREM 699. Research. Cr. 1-12. Repeatable for maximum of 12 credits.

