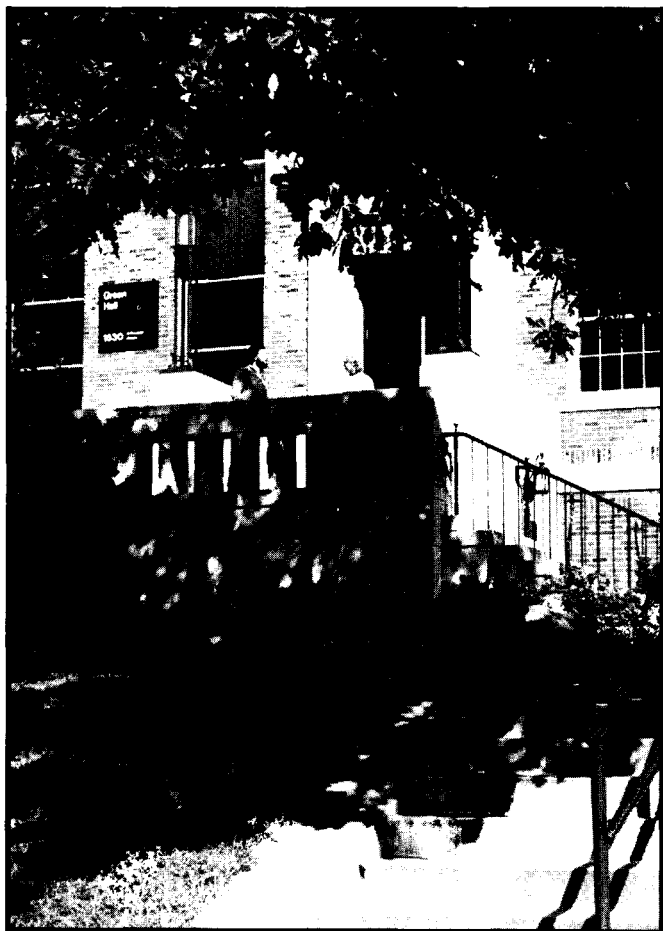


# University of Minnesota Bulletin



1984-86

# University of Minnesota

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## *College of Forestry Administration*

Richard A. Skok, Ph.D., Dean (110g Green Hall, 612/373-0833)  
Ira R. Adelman, Ph.D., Head, Department of Fisheries and Wildlife (204 Hodson Hall, 612/373-3029)  
Alan R. Ek, Ph.D., Acting Head, Department of Forest Resources (110d Green Hall, 612/373-0840)  
John G. Haygreen, Ph.D., Head, Department of Forest Products (220 Kaufert Laboratory, 612/373-1205)  
Frank D. Irving, Ph.D., Director of Forestry Graduate Studies (110b Green Hall, 612/373-0833)  
George R. Spangler, Ph.D., Director of Fisheries Graduate Studies (132a Hodson Hall, 612/376-2929 & 373-3028)  
James A. Cooper, Ph.D., Director of Wildlife Graduate Studies (320 Hodson Hall, 612/373-1722 & 3028)  
John V. Bell, M.S., Director of Student Services (10 Green Hall, 612/373-0842)  
Alvin R. Hallgren, Ph.D., Coordinator, Cloquet Forestry Center, Cloquet, MN 55720 (218/879-4528)  
Lawrence C. Merriam, Jr., Ph.D., Coordinator, Recreation Resource Management (309 Green Hall, 612/373-0847)  
Philip J. Splett, M.S., Coordinator, Career Opportunities, 110j Green Hall (612/373-1295)  
Nannette J. Wilkinson, B.S., Junior Student Personnel Worker, Office of Student Services (10 Green Hall (612/373-0842)

Green Hall is located at 1530 North Cleveland Avenue, St. Paul, MN 55108.

Hodson Hall is located at 1980 Folwell Avenue, St. Paul, MN 55108.

The Kaufert Laboratory of Forest Products and Wood Science is located at 2004 Folwell Avenue, St. Paul, MN 55108.

# College of Forestry

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*Cover Photos*

*Front*, the front entrance of Green Hall

*Back*, a student measuring the diameter of a tree

## INFORMATION SOURCES

This biennial bulletin, which focuses on the undergraduate offerings of the College of Forestry, should be kept handy for repeated reference. In addition, students should be aware of the following:

**Office of Student Services (10 Green Hall, 612/373-0842)**—Questions about College of Forestry programs and procedures may be directed to this office.

**Class Schedule**—This quarterly publication lists University day school courses complete with hours, rooms, instructors, prerequisites, registration instructions, fees, maps, final exam schedules, grading definitions, and other pertinent information.

**Other Bulletins**—The annual *General Information Bulletin* provides an overview of the University and its basic costs and regulations. Evening and summer courses are featured in the *Continuing Education and Extension Classes Bulletin* and *Summer Session Bulletin*, respectively. Separate bulletins are also published for the Lake Itasca Biology Session, College of Agriculture, and other University units. Most bulletins are available through the Office of Admissions and Records, 130 Coffey Hall.

### Bulletin Use

The contents of this bulletin and other University bulletins, publications, or announcements are subject to change without notice. University offices can provide current information about possible changes.

### Equal Opportunity

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, creed, color, sex, national origin, or handicap. In adhering to this policy, the University abides by the requirements of Title IX of the Education Amendments of 1972, by Sections 503 and 504 of the Rehabilitation Act of 1973, and by other applicable statutes and regulations relating to equality of opportunity.

Inquiries regarding compliance may be directed to Lillian H. Williams, Director, Office of Equal Opportunity and Affirmative Action, 419 Morrill Hall, University of Minnesota, 100 Church Street S.E., Minneapolis, MN 55455 (612/373-7969), or to the Director of the Office of Civil Rights, Department of Education, Washington, DC 20202, or to the Director of the Office of Federal Contract Compliance Programs, Department of Labor, Washington, DC 20210.

### Access to Student Educational Records

In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of enrollment and enrollment termination, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the Information Booth in Williamson Hall, Minneapolis, and at records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260e Williamson Hall (612/373-2106).



#### LETTER FROM THE DEAN

*The educational opportunities you will find described in this bulletin were developed for students who have a strong interest in renewable natural resources. The uses, management, and protection of forest, fish, and wildlife resources are the focus of curricula in Forest Products, Forest Resources, Forest Science, Recreation Resource Management, Urban Forestry, and Fisheries and Wildlife. These programs are designed to help students integrate scientific knowledge with the management and communication skills necessary for professional success.*

*Forests, fisheries, and wildlife play important roles in the lives of people worldwide. From their basic use as a source of firewood or food to their use for physical challenges and psychological rewards, these resources touch on the economic, social, and cultural well-being of each of us. If you would like to help make the most of them now and in the future, I am sure you will find this bulletin presents some interesting opportunities for preparing for such a role.*

*The College of Forestry is recognized nationally for its excellence. It has been accredited continuously since 1935, when forestry program accreditation was first offered, and graduates have played leadership roles in forest industry, public agencies, research, and education. Our strength is in the quality of our faculty, students, and staff and in the richness of the University as an educational and cultural resource.*

*Richard A. Skok*

Richard A. Skok  
Dean, College of Forestry

# General Information

## Mission

The College of Forestry—through its departments of Forest Resources, Forest Products, and Fisheries and Wildlife—seeks to increase the economic, social, and environmental benefits of our most important renewable natural resources. The only institution of higher learning in the state offering B.S., M.S., and Ph.D. programs in these natural resource disciplines, it is engaged in undergraduate and graduate education, basic and applied research, extension, continuing education, and public service.

A recent survey rated the College of Forestry among the top forestry schools in the United States. The University of Minnesota has offered a bachelor's degree program in forestry since 1903. Its forestry curriculum is one of only a few in the country to have been continuously accredited by the Society of American Foresters since 1935. Undergraduate and graduate degrees in fisheries and wildlife science have been offered at the University for nearly half a century. Curricular programs meet education certification requirements for the fisheries and wildlife professional societies.

## Facilities

The College of Forestry is based in three buildings on the St. Paul campus: Green Hall, the Kaufert Laboratory of Forest Products and Wood Science, and Hodson Hall. Green Hall houses the Dean's Office, Office of Student Services, Forest Resources Department, Forestry Library, and Remote Sensing Laboratory. The Forest Products Department is in the Kaufert Laboratory, which has well-equipped laboratories for teaching and research in such areas as wood products manufacturing, wood chemistry, mechanical testing, biodeterioration, and wood drying. The Department of Fisheries and Wildlife office, library, lecture, laboratory, and faculty facilities are in Hodson Hall. Also on the St. Paul campus, next to Green Hall and Kaufert Laboratory, is the regional headquarters of the North Central Forest Experiment Station of the U.S. Forest Service.

The College of Forestry uses several field centers for its programs:

The University's Lake Itasca Forestry and Biological Station is located in Itasca State Park in north central Minnesota. The state park, Minnesota's largest, embraces 50 square miles of virgin and second-growth forest, bogs, streams, and lakes, including Lake Itasca, the source of the Mississippi River. The station offers housing, dining, library, and laboratory facilities. Forest Resources, Forest Science, and Urban Forestry majors spend a 3½-week summer term at the station studying botany, ecology, and forest measurement.

The college's Cloquet Forestry Center includes more than 3,700 acres of virgin and second-growth timber in a major forest products manufacturing area of northeastern Minnesota. Forest Resources and some Forest Science seniors spend their fall quarter at the center taking 18 credits of field-oriented instruction in forest inventory, silviculture, engineering and harvesting, forest soils, hydrology, fisheries, wildlife, and recreation planning. Students interact with representatives of local industries and nearby state and federal resource agencies. The center has housing, dining, classroom, laboratory, and library facilities. A nationally known forest wildlife research project is based there.

The 300-acre John H. Allison Forest, about 10 miles from the St. Paul campus, is available for field laboratory work throughout the year.

Other field experiences, such as trips to southeastern Minnesota's hardwood forests, the industrial forest lands of the southern United States, and the Lake States' forest products mills and factories, are also offered to students.

## Degrees Offered

**Baccalaureate Degrees**—The bachelor of science (B.S.) degree is awarded to College of Forestry students who satisfactorily complete 192 required and elective credits in one of seven major programs: Fisheries, Wildlife, Forest Products, Forest Resources, Forest Science, Recreation Resource Management, or Urban Forestry. Curricular requirements are fully explained in the Baccalaureate Programs section of this bulletin. The degree may be earned "with distinction" or "with high distinction."

**Graduate Degrees**—The master of science (M.S.) and the doctor of philosophy (Ph.D.) in Forestry, Fisheries, or Wildlife, and the master of forestry (M.F.) degrees are offered through the Graduate School in cooperation with the College of Forestry. For detailed information, consult the appropriate Director of Graduate Studies (110b Green Hall, 373-0833, for Forestry; 200 Hodson Hall, 373-3028, for Fisheries and Wildlife) or the *Graduate School Bulletin*. Interested students should apply for admission through the Graduate School, 306 Johnston Hall, 101 Pleasant Street S.E., Minneapolis, MN 55455 (373-2973).

## Administration

The undergraduate curricula of the College of Forestry are organized within three academic departments—Fisheries and Wildlife (200 Hodson Hall); Forest Products (203 Kaufert Lab); and Forest Resources (110 Green Hall), which also offers the Forest Science, Recreation Resource Management, and Urban Forestry programs. The chief administrator of each department is the department head.

Each department has a Student Scholastic Standing Committee, composed of several faculty members, which is responsible for interpreting and administering faculty policies and requirements regarding admission, transfer of credit, curricula, academic standards, student credit loads, and other academic matters.

The college's Office of Student Services, 10 Green Hall, provides admission, registration, advising, placement, and other assistance to all undergraduate students. Individualized advising for Fisheries and Wildlife undergraduates is available in 142 Hodson Hall.

## Admission

Students seeking admission to the College of Forestry as undergraduates should apply through the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108 (373-0707). A \$20 nonrefundable application fee is required.

**Freshman Admission**—High school graduates must submit scores from the Preliminary Scholastic Aptitude Test (PSAT), Scholastic Aptitude Test (SAT), or American College Testing (ACT) program along with their high school rank percentile (HSR). High school courses required by the College of Forestry are three years of English, three years of mathematics (including elementary and higher algebra and plane geometry, with trigonometry recommended), and at least one year of natural science.

## General Information

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The College of Forestry uses the following admission criteria:

Formula	Minimum Score
HSR Percentile + PSAT Verbal + PSAT Math	140
HSR Percentile + (SAT Verbal ÷ 10) + (SAT Math ÷ 10)	140
HSR Percentile + (2 x ACT Composite score)	100

Applicants who attain at least the minimum score and meet course requirements will be admitted routinely. Others will be considered on an individual basis, taking into account such factors as high school performance and educational objectives.

**Admission with Advanced Standing**—Appropriate credits earned at other accredited colleges and universities or within other units of the University may be applied toward College of Forestry programs. Most students find they must transfer before their junior year to meet residence and upper-level course requirements of the College of Forestry.

Credits earned through special examination, Continuing Education and Extension, or adult special enrollment may also be eligible for transfer to the College of Forestry.

**Adult Special Admission**—Students may be admitted, after college and department approval, as adult specials. Such students are not degree candidates, but complete courses to satisfy individual needs.

## Field Session Fees

The following costs for the Forestry field training sessions at Itasca and Cloquet are based on the latest figures available at the time of publication. All fees are subject to review and revision, with yearly increases almost inevitable. (The annual *General Information Bulletin* contains residence regulations and the most current and complete breakdown of tuition and fees charged for the academic year.)

<i>Itasca Session</i>	<i>Cost per 3½-week Summer Term (1983)</i>
Resident and Nonresident Tuition	\$184.50 (sophomores); \$217.50 (juniors, seniors)
Student Services Fee	\$ 16.00

An additional fee is assessed for cabin rental. Meals are provided through a student cooperative on the basis of actual cost plus 5% of gross operating expenses for use of dining hall facilities, breakage, and other miscellaneous items.

Course fees and admission requirements are described in the annual *Lake Itasca Biology Session Bulletin*.

<i>Cloquet Session</i>	<i>Cost per Fall Quarter (1983)</i>
Resident Tuition	\$ 397.00
Nonresident Tuition	\$1,085.00
Health Fee	\$ 35.00

In addition, a fee is assessed for use of dormitories. Meals are provided at cost through a student cooperative.

## Financial Aid

Scholarships, grants, loans, and work-study programs available University-wide to eligible students are administered through the Office of Student Financial Aid (210 Fraser Hall, 106 Pleasant Street S.E., Minneapolis, MN 55455, 376-2424; or 199 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108, 376-2572). Application forms are available from either of these Student Financial Aid offices and from most Minnesota high school guidance



offices. Students should apply as soon after January 1 as possible. The ACT Family Financial Statement is the official need analysis document used in selecting financial aid recipients.

Scholarships and awards available only to College of Forestry students are listed below. These awards are administered by the college's scholarship committees. Those available to incoming freshmen and/or transfer students (indicated by an asterisk) are normally awarded the spring before the academic year of their use. Contact the college's Office of Student Services for application information.

## **COLLEGE OF FORESTRY SCHOLARSHIPS AND AWARDS**

**Mary Dwight Akers Loan**—Sponsor anonymous. Limited loans as needed and approved by the dean. Up to \$1,000 each.

**John H. Allison Scholarship**—Sponsored by former members of the Beta Chapter, Tau Phi Delta. For students with special interests in forest economics, forest management, and related areas. One \$500 award annually.

**\*Andersen Corporation Scholarships**—Sponsored by Andersen Corporation, Bayport, Minnesota. For Forest Products juniors and seniors in the marketing and production management specializations on the basis of academic achievement and professional promise. Three \$1,000 awards annually.

**R. M. Brown Scholarship**—Sponsored by donations to the College of Forestry. For a Forest Resources or Forest Science senior with a special interest in mensuration or statistics. One \$500 award annually.

**Carolind Scholarships**—Sponsored by the late Dr. Ralph M. Lindgren. For deserving and outstanding undergraduate students. Six \$300 to \$400 awards annually.

**E. G. Cheyney Memorial Scholarships**—Sponsored by the Minnesota Forestry Alumni Association. For juniors or seniors who have demonstrated outstanding ability and improvement in creative writing and speaking skills. Three \$200 awards annually.

**Caleb Dorr Scholarships**—Sponsored by the Caleb D. Dorr Fund. For the forestry student in each class with the highest grade point average. Four \$300 awards annually.

**Edward A. Everett Memorial Scholarship**—Sponsored by the late Edward A. Everett. For upper-division forestry students on the basis of financial need, acceptable scholarship, and professional promise. Number per year varies. \$300 to \$500 each.

**Federated Garden Clubs of Minnesota Scholarships**—Sponsored by the Federated Garden Clubs of Minnesota. For forestry students on the basis of special interest in Urban Forestry, academic aptitude, and personal attributes. Number per year varies. \$100 each.

**\*Forest Products Marketing Scholarship**—Sponsored by the Forest Industry Fraternity of Minneapolis and St. Paul. For a deserving and promising Forest Products junior or senior entering the marketing specialization. One \$500 award annually.

**\*Robert L. Goudy Memorial Scholarships**—Sponsored by Mr. and Mrs. F. X. Corbett, Georgetown, Colorado. For outstanding transfer students on the basis of academic ability, vocational promise, extracurricular activities, personality, and financial need. Two \$300 awards annually.

**Samuel B. Green Scholarship Medal**—Sponsored by the late Mrs. Samuel B. Green in memory of her husband. For the forestry senior with the highest scholastic average at the end of fall quarter. One honorary medal annually.

**\*Dayton Kirkham Scholarship**—Sponsored by the late Mr. Dayton Kirkham. For entering high school seniors on the basis of outstanding academic ability and strong desire to pursue careers in natural resource management. Three or more \$1,000 awards annually.

**Oscar L. Mather Scholarship**—Sponsored by the Minnesota Federation of Women's Clubs and Mrs. Oscar L. Mather, Madison Lakes, Minnesota, in memory of her husband. Book awarded to a forestry student displaying outstanding scholarship, leadership, and character.

**Ken Merriam Scholarship**—Sponsored by Dr. Lawrence Merriam. For a physically handicapped and/or Recreation Resource Management junior or senior. Professional promise emphasized. One \$500 award annually.

**William R. Miles Scholarship**—Sponsored by the William R. Miles Fund. For a Forest Resources junior on the basis of professional promise, character and integrity, academic aptitude, and leadership. One \$500 award annually.

**C. J. Mulrooney Endowed Memorial Scholarships**—Sponsored by WCCO AM and FM Radio and Television. For Forest Products juniors and seniors with a specialization in marketing. Two \$1,000 awards annually.

**Charles Lathrop Pack Awards in Forestry**—Sponsored by the Charles Lathrop Pack Foundation. For regularly enrolled undergraduate students who write the best essays of a popular nature on forestry or conservation subjects. Three awards annually of \$300, \$200, and \$100.

**\*Pulp and Paper Scholarships**—Sponsored by Sunds Defibrator, Inc.; Beloit Corporation; Blandin Paper Company; H. B. Fuller Company; Minnesota Section, Technical Association of the Pulp and Paper Industry; North Central Division, Paper Industry Management Association; Potlatch Foundation for Higher Education; St. Regis Paper Company; and Nalco Chemical Company. For Forest Products juniors and seniors in the pulp and paper specialization on the basis of academic performance and professional promise. \$1,000 to \$1,500 each.

## General Information

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**Henry Schmitz Forest Products Engineering Scholarship**—Sponsored by Dr. Stanley J. and Mertie W. Buckman, Memphis, Tennessee. For a Forest Products junior or senior on the basis of academic achievement and professional promise. One \$1,000 award annually.

**Henry Schmitz Student Leadership Awards**—Sponsored by Dr. Stanley J. and Mertie W. Buckman, Memphis, Tennessee. For juniors or seniors on the basis of demonstrated leadership and acceptable scholarship. Four \$300 awards annually.

**Augustus L. Searle Scholarship**—Sponsored by Augustus L. Searle. For women in the college, with preference given to Minnesota residents. Number per year varies. \$300 each.

**Helen A. Young Memorial Scholarship**—Sponsored by John Young, Rochester, Minnesota. To help qualified, competent, and needy students initiate and complete their forestry education. One \$150 award annually.

**Lake Itasca Summer Biology Session Scholarships**—Available to Fisheries and Wildlife students. See the *Lake Itasca Biology Session Bulletin* for details.

## Placement Services

The College of Forestry helps students locate summer jobs in fisheries and wildlife, forestry, and forest products as well as permanent employment following graduation. Placement services for students of the Forest Resources Department are provided by the career opportunities coordinator in 110j Green Hall. Students in the Forest Products pulp and paper specialization receive assistance in 102 Kaufert Lab; all other Forest Products students, in 240 Kaufert Lab. Fisheries and Wildlife students are assisted with placement matters in 142 Hodson Hall. Faculty providing placement service advise students on carrying out job searches, publicize openings, help arrange interviews, and periodically hold information meetings.

## Student Activities

**Governance**—Students have opportunities to participate in governance activities at the department, college, and campus levels. Within each department, several committees (including curriculum committees) have student representatives. Students also serve on College of Forestry committees and on the college's Student-Faculty Board, which advises the dean on student problems and concerns. Students also participate in the St. Paul Campus Board of Colleges, which directs student activities and acts as a liaison between the student body and administration, and in the Student Center Board of Governors, which establishes programs, operation policies, and budgets for the St. Paul Student Center.

**Clubs**—Student clubs in the college include the Forestry Club, Recreation Resource Management Club, Forest Products Club-Forest Products Research Society, Technical Association of Pulp and Paper Institutes (TAPPI), and Fisheries and Wildlife Club (with an affiliated student chapter of the Wildlife Society). Through these clubs, students hold an annual Foresters Day and a spring picnic, support a scholarship fund by selling Christmas trees, attend events like the Midwestern Foresters Conclave, and produce and market wood identification kits. Xi Sigma Pi Honor Society stages an annual banquet and administers a student speakers bureau. Forestry students also produce one of the few remaining University yearbooks, the *Gopher Peavey*.

# Baccalaureate Programs

## Seven Major Curricula

The College of Forestry offers seven major curricula leading to the bachelor of science (B.S.) degree: (1) Fisheries; (2) Wildlife; (3) Forest Products (with specializations in marketing, production management, pulp and paper, and wood science and technology); (4) Forest Resources; (5) Forest Science (with specializations in natural science and social and managerial sciences); (6) Recreation Resource Management; and (7) Urban Forestry. Because the first year of course work is somewhat similar, students may transfer between curricula at the end of their freshman year with little loss of credit.

## Academic Policies

**Adviser**—Each student, with assistance from an adviser, is responsible for studying curricular and graduation requirements and developing a course program and timetable to meet them. Freshmen and first-year transfer students in the Forest Resources curriculum are assigned an adviser in the college's Office of Student Services. All other students are assigned a faculty adviser within their curriculum.

**Credit Load**—The typical work load for each quarter is 14 to 18 credits, but may vary according to individual ability and circumstances. A credit requires an average of three hours of work per week, including class, laboratory, and preparation time. To carry more than 21 credits, a student must have attained at least a B average the previous quarter and permission from the department Student Scholastic Standing Committee.

**Repeating Courses**—Students may repeat a course, even if a passing grade was received. The grade received for the course the second time becomes the permanent grade. The original grade and credits are not included in the student's cumulative number of completed credits or grade point average.

**Auditing**—Students who register for a course as an auditor pay regular tuition and fees, but do not take examinations or earn grades or credits.

**Extra Credit**—Students may register for one to three extra credits in a course, with the instructor's approval. The extra work is mutually agreed to and conducted independently of class. Contact the Office of Student Services for more information.

**Independent Study**—Students may register to take regularly offered courses through independent study, without attending class, with the instructor's approval. Contact the Office of Student Services for more information.

**Class Attendance**—When students willfully miss class, instructors are under no obligation to help them make up work. The following reasons, however, are accepted to justify absences and make-up requests: (a) illness certified by the University Health

## ***Baccalaureate Programs***

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Service or another physician, (b) death or serious illness in the immediate family, (c) participation, certified by the Office of Student Affairs, in University-approved cocurricular activities, and (d) approval of the absence by the department Student Scholastic Standing Committee, which becomes involved only in special emergencies or as an appeal agency.

**Class Standing**—Students are classified according to the number of credits they have completed, as follows: freshmen—45 credits or under, sophomores—46 to 90 credits, juniors—91 to 135 credits, seniors—136 credits or above. Freshmen and sophomores are considered lower division; juniors and seniors, upper division.

**Registration**—General registration instructions are contained in the quarterly *Class Schedule*.

Forest Resources juniors and seniors may sign their own quarterly course request form. All other students in the college, regardless of class standing, must have their advisers sign their registration materials.

Students who find it necessary to cancel or add courses after registering for the quarter should contact the Office of Student Services for instructions and forms.

During the first week of the quarter, a course may be added to a student's schedule with the approval of only the adviser (providing the course is open). But after the first week, the approval of both the adviser and the instructor is needed in order to add a course.

During the first six weeks of a quarter, the adviser's approval is sufficient to cancel a course with a W (withdrawal). But after the sixth week, the approval of the adviser, the instructor, and the department Student Scholastic Standing Committee is necessary. A student doing passing work may be permitted to cancel a course after the sixth week with a W; if failing, an N (no credit) will be reported.

If a student withdraws from the college in mid quarter, all classes should be officially cancelled. Cancellation within the first six weeks entitles the student to a refund prorated according to the number of weeks classes were attended. Students may be entitled to a full refund, even after classes have started, if they obtain written certification from each instructor that they never attended class.

**Grading**—Two grading options, A-B-C-D-N and S-N, are offered, although use of the S-N option is limited. A grading option is chosen for each course at the time of registration. The following restrictions on the use of the S-N option apply to College of Forestry students:

1. A maximum of 25% of the residence credits presented for the baccalaureate degree may be in courses in which a grade of S was received.
2. Required courses must be taken under the A-N option. Prerequisites for required courses and courses in the major must also be taken A-N unless an exception is made.

University grading policies and letter definitions are explained in the quarterly *Class Schedule*.

**Honor System**—Under an honor system they adopted on the St. Paul campus, students accept responsibility for the supervision of student contact during examinations and pledge not to give or receive aid. A student or faculty member who observes an act of dishonesty may report the incident to the college Honor Case Commission, a committee of the Student-Faculty Board. For more information on how the honor system works, contact the Office of Student Services.

**Satisfactory Progress**—Students in the College of Forestry are expected to meet certain minimum academic standards. Students not meeting these standards are subject to probation and suspension actions by their department Student Scholastic Standing Committee. The following chart details conditions under which these actions will be taken.

**CONDITIONS FOR PROBATION AND SUSPENSION**

<i>Student Classification</i>	<i>Probation</i>	<i>Suspension</i>
Freshman Sophomore Upper Division	Cumulative GPA is below 1.90 2.00 2.00 or Any combination of three D and N grades in any one quarter	Cumulative GPA after first two quarters in college is below 1.60 1.90 1.90 or Two consecutive quarters of probation or Any combination of four D and N grades in three consecutive quarters

A probation action puts a student on notice that repeated low academic performance will lead to a suspension. A suspension action lasts for two academic quarters, and reinstatement in the program requires a petition to the department Student Scholastic Standing Committee. Students placed on probation or suspension may appeal the action.

The Itasca session for Forest Resources and Forest Science students is not counted as a separate quarter. Itasca grades are included with the fall quarter grades.

Students who are performing poorly academically should contact their adviser as soon as possible to take corrective action. Probation and suspension actions are rarely waived.

To appeal a suspension or probation action, the student must submit a written statement to the chair of the department Student Scholastic Standing Committee explaining the reasons for the appeal and including any supporting documents. The final decision rests with the department head, who will explain the decision on the appeal in a letter to the student.

**Policy Waivers**—Occasionally it may be to the educational advantage of both the student and the department to waive an academic policy or curricular requirement, provided the basic spirit of the regulation is maintained. A student may request, by petition, a departure from normal procedure. If approved by the adviser, the petition is routed to the department Student Scholastic Standing Committee for a final decision. Contact the Office of Student Services for more information.

## **Graduation Requirements**

To receive the bachelor of science (B.S.) degree, College of Forestry students must meet the following requirements:

1. Complete a minimum of 192 credits, including required and elective courses in the chosen curriculum. No more than 9 credits in physical education may be applied toward the degree. No more than 9 credits in music may be applied as elective credits toward the degree, with no more than 6 of these in Mus 1430 or concert band.
2. Achieve a grade point average of 2.00 or higher with no more than 5 credits of D in required forestry courses and 5 credits of D in other required courses.
3. Satisfy liberal education requirements (see below).
4. Satisfy residence and other general University requirements for graduation.

## Baccalaureate Programs

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**Graduation With Honors**—The B.S. degree may be earned "with distinction" or "with high distinction." Students who achieve a grade point average of at least 3.85 may be recommended to the faculty for graduation with high distinction. The recommendation is made on the basis of scholarship and other evidence of satisfactory achievement in the curriculum. Students who achieve a grade point average between 3.35 and 3.85 may be recommended for graduation with distinction.

Transfer students who have completed less than half the credits required for graduation while in residence in the College of Forestry are not eligible to graduate with honors.

**Quality Credits**—The number of free elective credits required for graduation may be decreased by one for every five grade points in excess of those required to reach a grade point average of 3.35. Free electives may be chosen without regard to curricular or college requirements. No more than one-twelfth of the total number of credits required for graduation may be gained through quality credits.

**Special Examinations for Credit**—Currently enrolled students who believe their knowledge of a subject is equal to that required to complete a particular course may request to take an examination for credit. If the Student Scholastic Standing Committee and the department approve, arrangements can be made with an appropriate instructor to take an examination. Usually no grade is assigned. A \$30 fee is assessed for each examination. Credit by special examination is not granted for language or mathematics courses taken in high school.

**College Level Examination Program (CLEP)**—Students may earn credit for the CLEP social science and humanities examinations prepared by the College Entrance Examination Board. CLEP also offers a number of subject examinations for credit. Information may be obtained from the Office of Student Services.

**Liberal Education Requirements**—The University of Minnesota believes that all students, regardless of their area of specialization or vocational goals, should have a broad liberal education. Therefore, in addition to its own curricular requirements, the College of Forestry requires course work in each of four liberal education categories. The minimum number of credits required in each category and a partial list of courses follow. *Note:* Individual College of Forestry curricula may require more credits in any of the four categories and place restrictions on which courses to complete and when. Students in doubt about the use of specific courses should consult their adviser.

All College of Forestry students must take Rhet 1101, 1104, 1151, 1222, and 3562 (except that Recreation Resource Management majors may substitute 3551 for 3562). Students who pass an English proficiency examination, administered by the Rhetoric Department, may be exempted from Rhet 1101 and/or 1104. Students with above average writing skills may also take exemption examinations, administered once each quarter by the Rhetoric Department, for Rhet 3562. Note that advanced composition courses taken at other institutions can be used to satisfy the Rhet 3562 requirement.

The College of Forestry accepts CLEP scores at the 75th percentile or higher for exemption from up to 8 credits in category D and, in special cases by petition, category C.

### A. Communication, Language, Symbolic Systems—26 credits minimum

1. English and Foreign Language Communication Skills  
Comp 1011, 1012, 1013, 1027  
Rhet 1101, 1104, 1151, 1222, 1506, 3254, 3266, 3562  
Spch 1101, 1102, 3605
2. Linguistics, Logic, and Philosophic Analysis  
Clas 1048, 3048  
Ling—all courses except 1005, 3970, 5970  
Phil 1001, 1005, 3631, 5105, 5201
3. Mathematics  
Math—all courses except 0009, 1005-1006, 5005-5006, 5090, 5703  
Stat 1051, 3081, 3091, 5021

### B. Physical, Biological, and Analytical Sciences—25 credits minimum

1. The Physical Universe  
Ast 1011, 1021  
BioC 1301-1302  
Chem 1001-1002, 1003, 1004-1005, 1006  
Geo 1001, 1002, 1111  
Phys 1041, 1042, 1045, 1046, 1271-1281-1291  
Soil 1122, 1262
2. The Biological Universe  
Biol 1009, 1103, 1105, 1106, 1107  
Bot 1009, 1012  
EBB 3004  
Ent 1005  
GCB 3022  
Phsl 1002

### C. The Individual and Society—8 credits minimum (with no more than 6 credits in any one discipline)

1. Analysis of Human Behavior and Institutions  
Afro 1025, 3055, 3061-3062, 3072, 3075-3076, 3091-3092, 3098, 5401  
AgEc 1020, 1030  
Anth 1102  
Econ 1001-1002, 1004-1005, 3001-3002  
FR 1201  
FSoS 1001, 1025  
Geog 1301, 1401  
Pol 1001, 1025, 1026, 1027, 1031, 1051  
Psy 1001, 1004-1005  
Rhet 5165  
Soc 1001, 1002, 3101  
Spch 3401  
SSci 3402
2. Development of Civilization: Historical and Philosophical Studies  
Afro 1015, 1025, 1036, 1441, 1442, 3081-3082  
Clas 1001, 1002, 1003, 1004, 1005, 1006, 1042, 3071, 3072, 3073  
Fren 3501, 3502  
Hist—all courses through 1954  
Ital 3501, 3502  
Jour 5601  
Phil 1002, 3001, 3002, 3003, 3004  
Pol 1041  
Rhet 1310, 1311, 3375  
Russ 3501 3502, 3503  
Span 3501, 3502

### D. Literature, Humanities, and Fine Arts—8 credits minimum

1. Literature  
Engl—all literature courses  
Foreign languages—all literature courses  
Rhet—all literature and humanities courses
2. The Arts  
Afro 1301, 3105, 3301  
Arch 1021, 1022, 1023  
ArtH—all courses except 5521, 5950, 5960, 5970, 5990, 5991  
ArtS—all courses except 3530, 3970, 3980, 5530, 5970  
Dsgn 1501, 1521  
Mus—all courses except 1052, 1053, 1340, 1351, 1602, 3970, 3980, 5253, 5330, 5340, 5364, 5365, 5540, 5667, 5950  
Th—all courses except 3412, 3980, 5321, 5540, 5950, 5970

**Itasca Session**—Forest Resources, Forest Science, and Urban Forestry majors are required to complete a 3½-week Lake Itasca Forestry and Biological Station summer term between their freshman and sophomore, or sophomore and junior, years. To attend, students must have completed 40 credits, attained a minimum cumulative grade point average of 2.00, and completed the following courses with a grade of C or better: Biol 1103, Chem 1001 or 1004, and Math 1008 (students with a C or better in high school trigonometry are exempt from Math 1008).

## Baccalaureate Programs

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It is the responsibility of students to supply the College of Forestry with a complete transcript of all course work and an application by July 15 before the start of the Itasca session they wish to attend.

**Cloquet Session**—Students in Forest Resources and in the natural science specialization of Forest Science are required to complete the Cloquet Forestry Session in the fall of their senior year. To attend, students must have attained a minimum cumulative grade point average of 2.00 at the end of the preceding quarter and completed the Itasca Forestry Session and FR 1100, 3220, 5100, 5114, 5200, 5212, and 5223. In addition, Forest Resources students must have completed CE 3100, FR 3103, 5215, 5232, and FW 3052.

## Fisheries and Wildlife

These curricula offer basic training in the biological and physical sciences and related nonscience disciplines to provide the broad background necessary for professional fisheries and wildlife careers. Undergraduates should recognize that they will satisfy only minimum requirements for professional employment; including some graduate-level study in their baccalaureate program is advisable. (The master's degree is required for many management, administrative, and research positions. The doctorate may be required for some positions and for college teaching.)

Beginning freshmen and new advanced standing students are admitted with pre-fisheries and wildlife status. Applications should be submitted before April 15 for fall quarter of the following academic year, or two months in advance for winter or spring quarter or the first or second summer term. Pre-fisheries and wildlife status enables students—in close consultation with their faculty adviser—to establish definite goals for their major or, if scholastic performance or interest proves lacking, to seek another curriculum at an early stage.

### PRE-FISHERIES AND WILDLIFE (FRESHMAN, SOPHOMORE YEARS)—90 credits

Courses in A and B below must be completed with a minimum grade point average of 2.75. Credits shown are for University courses but may vary for transfers.

#### A. Communication, Language, Symbolic Systems—18 credits

- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Rhet 1151—Writing in Your Major (4)
- Rhet 1222—Public Speaking (4)
- Math 1142—Short Calculus (5)<sup>1</sup>

#### B. Physical, Biological, and Analytical Sciences—50 credits

- Biol 1009—General Biology (5)
- Biol 1103—General Botany (5)
- Biol 1106—General Zoology (5)
- Biol 5041—Ecology (4)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- FW 1001—Orientation in Fisheries and Wildlife (2)
- FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)
- Phys 1041, 1045—Introductory Physics and Laboratory (4, 1)
- Phys 1042, 1046—Introductory Physics and Laboratory (4, 1)
- VB 1120—Comparative Vertebrate Morphology (5)

#### C. The Individual and Society—10 credits<sup>2</sup>

- AgEc 1020—Principles of Macroeconomics (5)
- Pol 1001—American Government and Politics (5)

<sup>1</sup>1142 is the minimum requirement; Math 1211-1221-1231 are recommended.

<sup>2</sup>Also recommended is FR 1201—Conservation of Natural Resources (3).



**D. Literature, Humanities, and Fine Arts—8 credits**

See suggestions under Liberal Education above.

**Elective or major credits—4 credits**

Consult adviser.

**FISHERIES MAJOR (JUNIOR, SENIOR YEARS)—102 credits**

**Required Core Courses—70-72 credits**

- AnSc 3301—Systemic Physiology (6)
- Chem 3100, 3101—Quantitative Analysis and Laboratory (3, 2)
- Chem 3301, 3305—Elementary Organic Chemistry I and Laboratory (4, 2)
- CSci 3102—Introduction to Pascal Programming (4)  
(or) CSci 3104—Introduction to Programming and Problem Solving (5)  
(or) an introductory computer science course (4)
- EBB 5136—Ichthyology (4)
- EBB 5601—Limnology (4)
- FW 5451—Ecology of Fish Populations (5)
- FW 5452—Fishery Management in Inland Waters (5)
- FW 5455—Aquaculture (4)
- FW 5457—Water Quality Management: Fisheries (2)
- FW 5458—Water Quality Management: Ecosystem Approaches (4)
- GCB 3022—Genetics (4)
- Geo 1001—Physical Geology (5)
- Rhet 3562—Writing in Your Profession (4)
- Stat 5021—Statistical Analysis I (5)
- Stat 5022—Statistical Analysis II (5)

**Supporting Courses—Select four of the following—19-20 credits**

- Bot 5231—Introduction to the Algae (5) (or) Bot 5811<sup>1</sup>—Freshwater Algae (5)
- Chem 1006—Principles of Solution Chemistry (4)
- Chem 3302, 3306—Elementary Organic Chemistry II and Laboratory (4, 2)
- EBB 5112—Invertebrate Biology (5)
- EBB 5606—Ecology of Fishes (5) (or) FW 5456<sup>1</sup>—Field Ecology of Fishes (5)
- Ent 3175—Introductory Entomology (5) (or) Ent 5020<sup>1</sup>—Field Entomology (5)
- MicB 3103—General Microbiology (5)

**Electives—10-13 credits**

Consult adviser to complete the 192 total credits required for graduation.

**WILDLIFE MAJOR (JUNIOR, SENIOR YEARS)—102 credits**

**Required Core Courses—48-49 credits**

- AnSc 3301—Systemic Physiology (6)
- Bot 3201—Introductory Taxonomy (4)
- EBB 5014—Ecology of Plant Communities (5) (or) EBB 5814<sup>1</sup>—Community Structure and Functioning (5)
- EBB 5134—Introduction to Ornithology (5) (or) EBB 5834<sup>1</sup>—Field Ornithology (5)
- EBB 5817—Vertebrate Ecology (5) (or) one course, intermediate or advanced, in ecology (4-5)
- FW 5129—Mammalogy (5)
- FW 5281—Senior Seminar: Wildlife (1)
- FW 5561—Wildlife Ecology, Management I: Planning (4)
- FW 5562—Wildlife Ecology, Management II: Populations (4)
- FW 5563—Wildlife Ecology, Management III: Habitats (3)
- FW 5564—Wildlife Ecology, Management IV: Field Problems in Wildlife Resource Management (4)
- VPB 5603—Parasites of Wildlife (3) (or) VPB 5604—Diseases of Wildlife (3)

**Supporting Courses—27-31 credits**

- BioC 1301, 1302, 1303—Elementary Biochemistry I, II, and Laboratory (5,3,2)  
(or) Chem 3301, 3305, 3302, 3306—Elementary Organic Chemistry I and Laboratory, II and Laboratory (4,2,4,2)
- CSci 3102—Introduction to Pascal Programming (4)  
(or) CSci 3104—Introduction to Programming and Problem Solving (5)  
(or) an introductory computer science course (4)
- Geo 1001—Physical Geology (5) (or) Soil 1122—Introductory Soil Science (4)
- Rhet 3562—Writing in Your Profession (4)
- Stat 5021—Statistical Analysis I (5)

**Electives—22-27 credits**

Consult adviser to complete the 192 total credits required for graduation.

<sup>1</sup>Offered during Itasca summer biology session.

## Baccalaureate Programs

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### FISHERIES AND WILDLIFE MINOR

This minor enables majors in the natural resource areas or fields like communications and education to deal with wildlands or water resources in a minor way. An overview of fish and wildlife natural history and the general principles applied to managing their populations and habitats is provided. Open to students who have completed the Required Background Courses or their equivalent, the minor is declared once Minor Core and Optional Courses are completed.

#### Required Background Courses—20-21 credits

FW 1001—Orientation in Fisheries and Wildlife (2)

Biol 1103—General Botany (5)

Biol 1106—General Zoology (5)

Biol 5041—Ecology (4)

One vertebrate biology course from the following:

FW 5129—Mammalogy (5)

EBB 5134—Introductory Ornithology (5) (or) EBB 5834—Field Ornithology (5)<sup>1</sup>

EBB 5136—Ichthyology (4)

EBB 5606—Ecology of Fishes (5) (or) FW 5456—Field Ecology of Fishes (5)<sup>1</sup>

VB 1120—Comparative Vertebrate Morphology (5) (or) EB 5114—Vertebrate Biology (4)

#### Minor Core Courses—12 credits

FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)

FW 5452—Fishery Management in Inland Waters (5)

FW 5563—Wildlife Ecology, Management III: Habitats (3)

#### Optional Courses—4-5 credits

FW 5451—Ecology of Fish Populations (5)

(or) FW 5455—Aquaculture (4)

(or) FW 5457—Water Quality Management: Fisheries (2)

(and) FW 5458—Water Quality Management: Ecosystem Approaches (4)

(or) FW 5561—Wildlife Ecology, Management I: Planning (4)

(or) FW 5562—Wildlife Ecology, Management II: Populations (4)

(or) FW 5564—Wildlife Ecology, Management IV: Field Problems in Wildlife Resource Management (4)

## Forest Products

This curriculum is for students interested in careers in the development, production, marketing, and utilization of the thousands of products that flow from forests—from plywood and furniture to biomass for energy. Courses emphasize the chemical, physical, and mechanical properties of wood and the newest technologies for converting this raw material into its many final forms. The four specializations are similar enough that students completing one can seek employment in another.

**Marketing**—This specialization is for students interested in the sales, distribution, and market development of forest products. The technical emphasis is on the physical-mechanical nature of wood-based building materials including lumber, plywood, fiberboard, particleboard, and newer composite products. In addition, course work focuses on marketing principles and analysis, management science, computer applications, and economics. Career opportunities include purchasing and selling all types of forest products at the wholesale and retail levels, work in urban renewal programs, technical sales, product promotion, and specialized marketing research.

<sup>1</sup>Offered during Itasca summer biology session.

**FRESHMAN YEAR—39-43 required credits**

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- Biol 1009—General Biology (5)
- Chem 1001—Chemical Principles and Covalent Systems (5)
- Chem 1002—Chemical Principles and Covalent Systems (5)
- Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
- Math 1142—Short Calculus (5)
- Psy 1001—General Psychology (5)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Electives and liberal education requirements

**SOPHOMORE YEAR—46 required credits**

- Acct 1024—Principles of Financial Accounting I (3)
- Acct 1025—Principles of Financial Accounting II (3)
- Acct 3001—Managerial Accounting (4)
- ForP 1301—Wood as a Raw Material (4)
- ForP 1303—Wood Structure and Identification (2)
- FR 1100—Dendrology (4)
- Mktg 3000—Principles of Marketing (4)
- Phys 1041—Introductory Physics (4)
- Phys 1042—Introductory Physics (4)
- Phys 1045—Introductory Physics Lab (1)
- Phys 1046—Introductory Physics Lab (1)
- Rhet 1151—Writing in Your Major (4)
- Rhet 1222—Public Speaking (4)
- Stat 3091—Probability and Statistics (4)
- Electives and liberal education requirements

**TOTAL GRADUATION REQUIREMENTS—192 credits**

Required courses listed above (153-157 credits), liberal education requirements in category D (8 credits), and electives (27-31 credits).

**Production Management**—This specialization is for students interested in production management careers in industries that manufacture lumber, plywood, particleboard, furniture, and other wood products. In addition to a basic wood science background, students gain knowledge in industrial engineering, labor management, and economics.

**FRESHMAN YEAR—34-38 required credits**

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- Biol 1009—General Biology (5)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
- Math 1142—Short Calculus (5)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Electives and liberal education requirements

**JUNIOR YEAR—34 required credits**

- BLaw 3058—Introduction to Law, and the Law of Contracts and Agency (4)
- CSci 3101—A FORTRAN Introduction to Computer Programming (4)
- (or) AgET 3030—Introduction to Problem Solving With Computers (4)
- ForP 3300—Wood Industry Tours (2)
- ForP 3303—Forest Products Marketing (3)
- ForP 5300—Wood-Fluid Relationships (3)
- ForP 5301—Mechanical Properties (3)
- ForP 5303—Wood Deterioration (3)
- Mktg 3010—Buyer Behavior and Marketing Analysis (4)
- Psy 5751—Psychology of Advertising (4)
- QA 3055—Introduction to Management Sciences (4)
- Electives and liberal education requirements

**SENIOR YEAR—34 required credits**

- ForP 5304—Wood Drying and Preservation Processes (4)
- ForP 5306—Manufacturing Processes (3)<sup>1</sup>
- ForP 5307—Wood-Base Panel Technology (4)
- ForP 5331—Senior Seminar (2)<sup>1</sup>
- ForP 5355—Mechanics and Structural Design With Wood Products (4)
- ForP 5356—Advanced Forest Products Marketing (3)
- FR 5264—Quantitative Techniques in Forest Management (3)
- FR 5265—Forest Policy Issues (3)
- Mktg 3020—Marketing Operations Management (4)
- Rhet 3562—Writing in Your Profession (4)<sup>1</sup>
- Electives and liberal education requirements

**SOPHOMORE YEAR—42 required credits**

- BioC 1301—Elementary Biochemistry (5)
- ForP 1301—Wood as a Raw Material (4)
- ForP 1303—Wood Structure and Identification (2)
- FR 1100—Dendrology (4)
- Phys 1041—Introductory Physics (4)
- Phys 1042—Introductory Physics (4)
- Phys 1045—Introductory Physics Lab (1)
- Phys 1046—Introductory Physics Lab (1)
- Psy 1001—General Psychology (5)
- Rhet 1151—Writing in Your Major (4)
- Rhet 1222—Public Speaking (4)
- Stat 3091—Probability and Statistics (4)
- Electives and liberal education requirements

<sup>1</sup>Two credits of Rhet 3562 are to be taken with ForP 5306 and 2 credits with ForP 5331, for a total of 4 Rhet 3562 credits. Students taking ForP 5306 and ForP 5331 in the same quarter should register for Rhet 3562Y (4 credits). Students taking ForP 5306 and ForP 5331 in different quarters should register for Rhet 3562X (2 credits) concurrently with each ForP course.

## Baccalaureate Programs

### JUNIOR YEAR—41 required credits

CSci 3101—A FORTRAN Introduction to Computer Programming (4)  
(or) AgET 3030—Introduction to Problem Solving With Computers (4)  
ForP 3300—Wood Industry Tours (2)  
ForP 3303—Forest Products Marketing (3)  
ForP 3361—Introduction to Adhesives (3)  
ForP 5300—Wood-Fluid Relationships (3)  
ForP 5301—Mechanical Properties (3)  
ForP 5303—Wood Deterioration (3)  
ForP 5355—Mechanics and Structural Design with Wood Products (4)  
IEOR 5000—Introduction to Industrial Engineering Analysis (4)  
IEOR 5030—Quality Control and Reliability (4)  
IEOR 5040—Introduction to Operations Research (4)  
IR 3002—Industrial Relations Systems: Labor Markets and the Management of Human Resources (4)  
Electives and liberal education requirements

### TOTAL GRADUATION REQUIREMENTS—192 credits

Required courses listed above (160-164 credits), liberal education requirements in category D (8 credits), and electives (20-24 credits).

**Pulp and Paper**—This specialization provides in-depth training in mathematics, physics, chemistry, and wood science and technology. It also includes specialized pulp and paper and related engineering courses on the technology of wood pulp production and the manufacture of paper and other fiber products. Graduates find careers in process engineering, technical services, industrial sales, and research.

### FRESHMAN YEAR—39 required credits

AgEc 1020—Principles of Macroeconomics (5)  
Chem 1004—General Principles of Chemistry (5)  
Chem 1005—General Principles of Chemistry (5)  
Chem 1006—Principles of Solution Chemistry (4)  
Math 1211—Calculus I (5)  
Math 1221—Calculus II (5)  
Math 1231—Calculus III (5)  
Rhet 1101—Writing to Inform and Persuade (4)  
Rhet 1104—Library Laboratory (1)  
Electives and liberal education requirements

### SOPHOMORE YEAR—42 required credits

Chem 3301—Elementary Organic Chemistry I (4)  
Chem 3302—Elementary Organic Chemistry II (4)  
Chem 3305—Elementary Organic Chemistry Lab I (2)  
Chem 3306—Elementary Organic Chemistry Lab II (2)  
ForP 1301—Wood as a Raw Material (4)  
ForP 1303—Wood Structure and Identification (2)  
Math 3221—Introduction to Linear Algebra and Linear Differential Equations (5)  
Phys 1271—General Physics (4)  
Phys 1275—General Physics Lab (1)  
Phys 1281—General Physics (4)  
Phys 1285—General Physics Lab (1)  
Phys 1291—General Physics (4)  
Phys 1295—General Physics Lab (1)  
Rhet 1151—Writing in Your Major (4)  
Electives and liberal education requirements

### SENIOR YEAR—43 required credits

ForP 5304—Wood Drying and Preservation Processes (4)  
ForP 5305—Pulp and Paper Technology (4)  
ForP 5306—Manufacturing Processes (3)<sup>1</sup>  
ForP 5307—Wood-Base Panel Technology (4)  
ForP 5331—Senior Seminar (2)<sup>1</sup>  
FR 5265—Forest Policy Issues (3)  
IEOR 5010—Introduction to Work Analysis (4)  
IEOR 5020—Engineering Cost Accounting, Analysis and Control (4)  
IEOR 5311—Management for Engineers (3)  
IEOR 5361—Inventory and Production Control (4)  
IR 3007—Collective Bargaining Negotiations and Modern Labor Relations (4)  
Rhet 3562—Writing in Your Profession (4)<sup>1</sup>  
Electives and liberal education requirements

### JUNIOR YEAR—39 required credits

CE 3400—Fluid Mechanics (4)  
CSci 3101—A FORTRAN Introduction to Computer Programming (4)  
(or) AgET 3030—Introduction to Problem Solving With Computers (4)  
ForP 3300—Wood Industry Tours (2)  
ForP 5300—Wood-Fluid Relationships (3)  
ForP 5301—Mechanical Properties (3)  
ForP 5302—Wood Chemistry I (3)  
ForP 5305—Pulp and Paper Technology (4)  
ForP 5310—Pulp and Paper Process Laboratory (3)  
ME 3301—Thermodynamics (4)  
Rhet 1222—Public Speaking (4)  
Stat 5021—Statistical Analysis I (5)  
Electives and liberal education requirements

### SENIOR YEAR—41 required credits

AgEn 5070—Automatic Control and Instrumentation (4)  
Chem 5520—Elementary Physical Chemistry (3)  
ForP 5306—Manufacturing Processes (3)<sup>1</sup>  
ForP 5312—Pulp and Paper Process Calculations (4)  
ForP 5313—Pulp and Paper Process Operations (5)  
ForP 5315—Paper Engineering Laboratory (2)  
ForP 5316—Coated Product Development (2)  
ForP 5331—Senior Seminar (2)<sup>1</sup>  
ForP 5353—Wood Chemistry II (3)  
ForP 5359—Surface and Colloid Chemistry of Papermaking (3)  
ForP 5361—Adhesion and Adhesives (3)  
FR 5265—Forest Policy Issues (3)  
Rhet 3562—Writing in Your Profession (4)<sup>1</sup>  
Electives and liberal education requirements

<sup>1</sup>Two credits of Rhet 3562 are to be taken with ForP 5306 and 2 credits with ForP 5331, for a total of 4 Rhet 3562 credits. Students taking ForP 5306 and ForP 5331 in the same quarter should register for Rhet 3562Y (4 credits). Students taking ForP 5306 and ForP 5331 in different quarters should register for Rhet 3562X (2 credits) concurrently with each ForP course.

**SUGGESTED ELECTIVES**

- CE 3500—Introduction to Environmental Engineering Problems and Analysis (4)
- CE 5500—Analysis and Design of Water Supply Systems (4)
- CE 5501—Analysis and Design of Wastewater Systems (4)
- Chem 5521—Elementary Physical Chemistry (3)

- IEOR 5020—Engineering Cost Accounting, Analysis and Control (4)
- ME 3201—Mechanical Engineering Systems Analysis (4)
- ME 3303—Applied Thermodynamics (4)
- ME 3701—Basic Measurements Lab I (2)
- ME 3702—Basic Measurements Lab II (2)
- ME 5283—Industrial Instrumentation and Automatic Control (4)

**TOTAL GRADUATION REQUIREMENTS—192 credits**

Required courses listed above (161 credits), liberal education requirements in categories C and D (11 credits), and electives (20 credits).

**Wood Science and Technology**—This specialization is designed for students who want broad and in-depth education in forest products. It provides a strong background in mathematics, the biological and physical sciences, the fundamental properties of wood, and the technology of wood products manufacturing.

**FRESHMAN YEAR—44 required credits**

- Biol 1009—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1004—General Principles of Chemistry (5)
- Chem 1005—General Principles of Chemistry (5)
- Chem 1006—Principles of Solution Chemistry (4)
- Math 1211—Calculus I (5)
- Math 1221—Calculus II (5)
- Math 1231—Calculus III (5)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Electives and liberal education requirements

**SOPHOMORE YEAR—46 required credits**

- Chem 3301—Elementary Organic Chemistry I (4)
- Chem 3302—Elementary Organic Chemistry II (4)
- Chem 3305—Elementary Organic Chemistry Lab I (2)
- Chem 3306—Elementary Organic Chemistry Lab II (2)
- ForP 1301—Wood as a Raw Material (4)
- ForP 1303—Wood Structure and Identification (2)
- FR 1100—Dendrology (4)
- Math 3211—Multivariable Calculus (5)
- Phys 1271—General Physics (4)
- Phys 1275—General Physics Lab (1)
- Phys 1281—General Physics (4)
- Phys 1285—General Physics Lab (1)
- Phys 1291—General Physics (4)
- Phys 1295—General Physics Lab (1)
- Rhet 1151—Writing in Your Major (4)
- Electives and liberal education requirements

**JUNIOR YEAR—40 required credits**

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- Chem 3100—Quantitative Analysis Lecture (3)
- Chem 3101—Quantitative Analysis Lab (2)
- Chem 5520—Elementary Physical Chemistry (3)
- ForP 3300—Wood Industry Tours (2)
- ForP 5300—Wood-Fluid Relationships (3)
- ForP 5301—Mechanical Properties (3)
- ForP 5302—Wood Chemistry I (3)
- ForP 5303—Wood Deterioration (3)
- Rhet 1222—Public Speaking (4)
- Stat 5021—Statistical Analysis I (5)
- Electives and liberal education requirements

**SENIOR YEAR—38 required credits**

- AgET 3030—Introduction to Problem Solving With Computers (4)
- (or) CSci 3101—A Fortran Introduction to Computer Programming (4)
- ForP 5304—Wood Drying and Preservation Processes (4)
- ForP 5305—Pulp and Paper Technology (4)
- ForP 5306—Manufacturing Processes (3)<sup>1</sup>
- ForP 5307—Wood-Base Panel Technology (4)
- ForP 5331—Senior Seminar (2)<sup>1</sup>
- ForP 5353—Wood Chemistry II (3)
- ForP 5355—Mechanics and Structural Design With Wood Products (4)
- ForP 5361—Adhesion and Adhesives (3)
- FR 5265—Forest Policy Issues (3)
- Rhet 3562—Writing in Your Profession (4)<sup>1</sup>
- Electives and liberal education requirements

**TOTAL GRADUATION REQUIREMENTS—192 credits**

Required courses listed above (168 credits), liberal education requirements in categories C and D (11 credits), and electives (13 credits).

<sup>1</sup>Two credits of Rhet 3562 are to be taken with ForP 5306 and 2 credits with ForP 5331, for a total of 4 Rhet 3562 credits. Students taking ForP 5306 and ForP 5331 in the same quarter should register for Rhet 3562Y (4 credits). Students taking ForP 5306 and ForP 5331 in different quarters should register for Rhet 3562X (2 credits) concurrently with each ForP course.

## Baccalaureate Programs

### Forest Resources

This curriculum prepares students to manage forest lands for timber, wildlife, recreation, water production, and environmental enhancement. Graduates may become directly involved in land management or play specialized supporting roles in areas ranging from nursery management to public relations. Still others find employment in related fields such as environmental education and interpretation.

All students take the *Core Curriculum* of required courses (including the Itasca and Cloquet sessions) listed by year below. In addition, students must complete a minimum of 20 credits in an *Area of Emphasis*, seven of which are listed below. A student may also submit a proposal for an individual area of emphasis, including an explanation of its professional relevance and the courses to be completed, to the faculty for their review and approval.

#### Core Curriculum

##### FRESHMAN YEAR—48-55 required credits

- Biol 1009—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1001—Chemical Principles and Covalent Systems (5)  
(or) Chem 1004—General Principles of Chemistry (5)
- Chem 1002—Chemical Principles and Covalent Systems (5)  
(or) Chem 1005—General Principles of Chemistry (5)
- Geo 1001—Physical Geology (5)
- IND 1600—Drafting (3) (Students with a C or better in high school mechanical drawing are exempt)
- Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
- Math 1111—College Algebra and Analytic Geometry (5)  
(or) Math 1201—Pre-Calculus (5)
- Math 1142—Short Calculus (5)  
(or) Math 1211—Calculus I (5)
- Phys 1001—The Physical World (4)
- Phys 1005—Physics Laboratory (1)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (4)
- Electives and liberal education requirements

##### SOPHOMORE YEAR—34 required credits

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1030—Principles of Microeconomics (4)
- CSci 3101—A FORTRAN Introduction to Computer Programming (4)  
(or) CSci 3102—Introduction to Pascal Programming (4)  
(or) AgET 3030—Introduction to Problem Solving With Computers (4)
- ForP 1301—Wood as a Raw Material (4)
- Rhet 1151—Writing in Your Major (4)
- Rhet 1222—Public Speaking (4)
- Stat 3081—Experimental Techniques and Statistical Inference (5)  
(or) Stat 5021—Statistical Analysis I (5)
- FR 1100—Dendrology (4) if recommended by adviser
- Electives and liberal education requirements

##### TOTAL GRADUATION REQUIREMENTS—192 credits

Required courses listed above (147-154 credits), liberal education requirements in categories C and D (11 credits), and electives and credits to satisfy area of emphasis (27-34 credits).

<sup>1</sup>Must be completed in conjunction with Rhet 3562X.

##### ITASCA SESSION—6 required credits

This summer term is to be taken between the freshman and sophomore, or sophomore and junior, years.

- FR 3100—Important Forest Plants (2)
- FR 3101—Field Forest Ecology (3)
- FR 3201—Field Forest Measurements (1)

##### JUNIOR YEAR—38 required credits

- CE 3100—Introduction to Surveying and Mapping (4)
- FR 1100—Dendrology (4)
- FR 3103—Meteorology and Climatology for Resource Managers (2)
- FR 3220—Beginning Forest Soils (2)
- FR 3232—Management of Recreational Lands (3)
- FR 5100—Silviculture (3)
- FR 5114—Forest Hydrology (3)
- FR 5200—Aerial Photo Interpretation (3)
- FR 5212—Natural Resources Inventory (3)<sup>1</sup>
- FR 5215—Forest Fire Management (2)
- FR 5223—Timber Management Planning (3)
- FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)
- Rhet 3562X—Writing in Your Profession (2)
- Electives and liberal education requirements

##### SENIOR YEAR—25 required credits

- Fall Quarter—Cloquet Session*
- FR 5101—Field Silviculture I (4)
- FR 5104—Field Silviculture II (1)
- FR 5115—Forest Hydrology, Field Applications (2)
- FR 5126—Field Forest Soils (2)
- FR 5220—Remote Sensing, Forest Resources Inventory (4)
- FR 5236—Forest Recreation Planning (1)
- FR 5248—Harvesting and Engineering (3)
- FW 3167—Techniques of Forest Wildlife Management (1)
- Winter and Spring Quarters—On Campus*
- FR 5222—Forest Policy and Economics (5)<sup>1</sup>
- Rhet 3562X—Writing in Your Profession (2)
- Electives and liberal education requirements

**Areas of Emphasis**

For an explanation of abbreviations, see *Course Numbering and Symbols* at the beginning of the *COURSE DESCRIPTIONS* section.

**Forest Hydrology**—This interdisciplinary emphasis is primarily concerned with developing skills to solve water resource problems. Students will qualify as hydrologists on the Civil Service register, and also meet the qualifying criteria for forest and range hydrologists as established by the Association of University Watershed Scientists. For more information, contact Dr. Kenneth N. Brooks, 301f Green Hall (612/376-4883) or Dr. James A. Perry, 301c Green Hall (612/373-0846).

**REQUIRED COURSES**—26 credits

- Math 1211, 1221f,w,s—Calculus I, II (10)
- FR 5153s—Advanced Forest Hydrology (4)
- CE 5401f,w—Water Resources Engineering (4)
- CE 5405w,s—Hydrology, Hydrologic Design (4)
- FR 5110s—Forest Water Quality Management (4)

**RECOMMENDED ELECTIVES**—at least four courses

- FR 5231w—Range Management (3)
- FR 5262w—Remote Sensing of Natural Resources (4)
- FR 3114s—Tree Physiology (3)
- FR 3115s—Tree Physiology Laboratory (1)
- FR 5264s—Quantitative Techniques in Forest Management (3)
- AgEn 5540f—Erosion Control, Watershed Engineering (4)
- AgEn 5550w—Drainage and Irrigation Engineering (4)
- CE 3400f—Fluid Mechanics (4)
- CE 3500f—Introduction to Environmental Engineering Problems and Analysis (4)
- CE 5402w—Hydraulic Analysis with Computer Applications (4)
- CE 5410f—Open Channel Hydraulics (4)
- CE 5425w—Groundwater Mechanics (4)
- CE 5505w—Water Quality, Treatment (4)
- CE 5506w—Environmental Water Chemistry (4)
- CE 5420s—Introduction to Water Resources Management (4)
- Geo 5251f—Geomorphology (Cr ar)
- Geo 5611s—Groundwater Geology (4)
- Soil 5232f—Soil Physics (4)
- Soil 5310f—Soil Chemistry (4)
- Soil 5240w—Microclimatology (5)
- Soil 5710s—Advanced Forest Soils (Cr ar)

**Forest Management**—This emphasis encompasses a wide range of forest land uses and the techniques applied in their production and coordination. For more information, contact Dr. Frank D. Irving, 110b Green Hall (612/373-0833) or Dr. Alan R. Ek, 110d Green Hall (612/373-0840).

**REQUIRED COURSES**—8 credits

- Ent 5050w—Forest Entomology (4)
- PIPa 5050s—Forest Pathology (4)

**RECOMMENDED ELECTIVES**—at least four courses

- ForP 5306f—Manufacturing Processes (3)
- FR 3104f,s—Forest Ecology (3)
- FR 5105w—Intensive Silviculture (3)
- FR 5110s—Forest Water Quality Management (4)
- FR 5153s—Advanced Forest Hydrology (4)
- FR 5231s—Range Management (3)
- FR 5233f—Principles of Outdoor Recreation Design and Planning (4)
- FR 5255s—Forest Resources Survey Design (3)
- FR 5257w—Recreation Land Policy (3)
- FR 5260w—Administrative Processes for Natural Resource Managers (3)
- FR 5261s—Advanced Forest Policy and Economics (3)
- FR 5262w—Remote Sensing of Natural Resources (4)
- FR 5264s—Quantitative Techniques in Forest Management (3)
- FR 5265s—Forest Policy Issues (3)
- FR 5500w—Urban Forest Management (3)
- FW 5561s—Wildlife Ecology, Management I (4)
- FW 5562w—Wildlife Ecology, Management II (4)
- Soil 5710s—Advanced Forest Soils (4)

## Baccalaureate Programs

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**Forest Soils**—This emphasis covers forest soil science, land use, management planning, and forest production. Students will qualify as soil scientists on the Civil Service register as well as satisfy requirements for a soil science minor (which can be entered directly on the transcript). For more information, contact Dr. David F. Grigal, S-325 Hodson Hall (612/373-1443).

**REQUIRED COURSES**—23-24 credits

- Soil 1122w—Introductory Soil Science (4)<sup>1</sup>
- Soil 3416w—Soil Fertility (5)
- Soil 3520s—Soil Morphology, Classification, and Genesis (4)
- Soil 5710s—Advanced Forest Soils (3)
- Soil 3210w—Soil Physical Properties (4)
- Soil elective (3-4)

**RECOMMENDED ELECTIVES**—at least two courses (including 3 Soil credits)

- FR 3104f—Forest Ecology (3)
- FR 3114s—Tree Physiology (3)
- FR 3115s—Tree Physiology Lab (1)
- FR 5102s—Regional Silviculture (3)
- FR 5105w—Intensive Silviculture (3)
- FR 5153s—Advanced Forest Hydrology (4)
- FR 5231w—Range Management (3)
- FR 5260w—Forest Administration (3)
- FR 5262w—Remote Sensing of Natural Resources (4)
- FR 5264s—Quantitative Techniques in Forest Management (3)
- Ent 5050w—Forest Entomology (4)
- Geo 5251f—Geomorphology (Cr ar)
- Geo 5261f—Glacial Geology (Cr ar)
- Soil 3610f—Soil Biology (4)
- Soil 3xxx1.w.s.—Seminars on Special Topics (1 each)
- Soil 5230w—Soil-plant Water Relations (3)
- Soil 5232w—Soil Physics (5)
- Soil 5240w—Microclimatology (5)
- Soil 5515f—Soil Development, Classification and Geography (4)
- Soil 5540s—Soil Resources and Environmental Relationships (2)
- Soil 5550w—Peatlands (3)
- Soil 5560s—Uses and Interpretation of Soil Survey Information (3)
- PIPa 5050s—Forest Pathology (4)

**Management and Administration**—This emphasis is for students interested in administrative careers in public resource agencies or forestry industries. Concepts and techniques used in managing people and processes in large organizations are explored, providing a framework for systematic individual development through experience and continuing education. For more information, contact Dr. Paul V. Ellefson, 110i Green Hall (612/373-0851); Dr. Hans M. Gregersen, 301d Green Hall (612/373-1754); Dr. Frank D. Irving, 110b Green Hall (612/373-0833); or Dr. Dietmar W. Rose, 101b Green Hall (612/373-1319).

**REQUIRED COURSES**—13 credits

- Mgmt 3001f,s—Fundamentals of Management (4)
- Acct 1024f,w,s—Principles of Financial Accounting I (3)
- Acct 1025f,w,s—Principles of Financial Accounting II (3)
- FR 5260w—Administrative Processes for Natural Resource Managers (3)
- (or) FR 5264s—Quantitative Techniques in Forest Management (3)

**RECOMMENDED ELECTIVES**—31 credits

- Acct 3001f,s.—Managerial Accounting (4)
- BLaw 3058f,w,s.—Introduction to Law, the Law of Contracts (4)
- BGS 3002f,w,s.—Business and Society (4)
- FR 5261s—Advanced Forest Policy and Economics (3)
- IR 3010f,w,s.—Human Relations and Applied Organization Theory (4)
- Mgmt 3002f,w,s.—Psychology in Management (4)
- MIS 5300f—Management Information Systems (4)
- PA 5515f—Introduction to Planning (4)

<sup>1</sup>Instead of FR 3220 in Core Curriculum.



**Quantitative Forest Management**—This emphasis deals with the application of quantitative methods to forest resource decision making. With proper planning, students satisfy the basic qualifications required for operations research analysts, as established by the U.S. Office of Personnel Management, including "36 quarter hours [credits] of course work in any combination of the following: operations research; mathematics; statistics; logic; and subject matter courses which require substantial competence in mathematics or statistics." For more information, contact Dr. Dietmar W. Rose, 101b Green Hall (612/373-1319).

**REQUIRED COURSES**—47 credits

- FR 5264s—Quantitative Techniques in Forest Management (3)
- Stat 5021f,w,s—Statistical Analysis I (5)
- Stat 5022f,w,s—Statistical Analysis II (5)
- IEOR 5040f,w,s—Introduction to Operations Research (4)
- IEOR 5441w—Operations Research II (4)
- Math 1221f,w,s—Calculus II (5)<sup>1</sup>
- Math 1231f,w,s—Calculus III (5)
- MIS 5300f—Survey of Computers and Management Information Systems (4)
- CSci 3101f,w,s—A FORTRAN Introduction to Computer Programming (4)
- IEOR 5000f,w,s—Introduction to Industrial Engineering Analysis (4)
- IEOR 5020f,w,s—Engineering Cost Accounting, Analysis, and Control (4)

**RECOMMENDED ELECTIVES**

- Econ 3101f,w,s—Microeconomic Theory (4)
- FR 5253s—Forest Biometry (3) (or) FR 5255s—Forest Resource Survey Design (3)
- Econ 5261f—Applied Econometrics (5)

**Resource Measurements and Information Systems**—This emphasis is for students with mathematics and computer skills who are interested in forest measurement and information systems. Focus is on such subjects as mensuration, sampling, mathematical modelling, statistics, computer science, remote sensing, and data base management. For more information, contact Dr. Alan R. Ek, 110d Green Hall (612/373-0840).

**REQUIRED COURSES**—27 credits

- FR 5253s—Forest Biometry (3; prereq FR 5212, Stat 5022, or #; offered s 84 and alt yrs)
- (or) FR 5255s—Forest Resource Survey Design (3; prereq FR 5212, Stat 5022, or #; offered s 84 and alt yrs)
- Stat 5021f,w,s—Statistical Analysis I (5; prereq college algebra)
- Stat 5022f,w,s—Statistical Analysis II (5; prereq Stat 5021 or #)
- Math 1221f,w,s—Calculus II (5; prereq Math 1211 with C or better)
- Math 1231f,w,s—Calculus III (5; prereq Math 1221 with C or better)
- CSci 3101f,w,s—A FORTRAN Introduction to Computer Programming (4; prereq Math 1111 or 1201)
- (or) other FORTRAN (4)

**RECOMMENDED ELECTIVES**—at least two courses

- FR 5264s—Quantitative Techniques in Forest Management (3; prereq FR 5212, 5222, 5223, or #)
- (or) IEOR 5040f,w,s—Introduction to Operations Resources (4; prereq Math 1231)
- FR 5262w—Remote Sensing of Natural Resources (4; prereq FR 5200 or #)
- Stat 5302f,s—Applied Regression Analysis (4; prereq Stat 5022 or #)
- Stat 5301f,s—Designing Experiments (4; prereq Stat 5022 or #)

**Silviculture**—This emphasis relates the biological sciences, such as silviculture, ecology, and physiology, to forest land use and management decisions. For more information, contact Dr. Alvin A. Alm, Cloquet Forestry Center, Cloquet, MN 55720 (218/879-4528).

**REQUIRED COURSES**—18 credits

- FR 3104f—Forest Ecology (3)
- FR 3114s—Tree Physiology (3)
- FR 3115s—Tree Physiology Lab (1)
- FR 5105w—Intensive Silviculture (3)
- Ent 5050w—Forest Entomology (4)
- PIPa 5050s—Forest Pathology (4)

<sup>1</sup>Students should take Math 1201 and 1211 (which counts toward the 36 credits required for operations research analysts) their freshman year.

## Baccalaureate Programs

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### RECOMMENDED ELECTIVES—at least two courses

- FR 5106w—Senior Silviculture Seminar (2-3)
- FR 5152w—Forest Genetics (3)
- FR 5153s—Advanced Forest Hydrology (4)
- FR 5215s—Forest Fire Management (2)
- FR 5231w—Range Management (3)
- FR 5260w—Forest Administration (3)
- FR 5262w—Remote Sensing of Natural Resources (4)
- Ent 5210w—Integrated Pest Management (5)
- Hort 3076s—Arboriculture (3)
- Soil 3210w—Soil Physical Properties (4)
- Soil 3416w—Soil Fertility (5)
- Soil 3520s—Soil Morphology, Classification, and Genesis (4)
- Soil 3610f—Soil Biology (3)
- Soil 5240w—Microclimatology (5)
- Soil 5550w—Organic Soils (3)
- Soil 5560s—Uses of Soil Survey Information (3)
- Soil 5710s—Advanced Forest Soils (3)

## Forest Science

This curriculum resembles Forest Resources but gives students a more in-depth basic science background and more opportunity for individuality in course selection. It is excellent preparation for graduate study and subsequent employment in forestry research, teaching, or related fields. Graduates may pursue forest management or similar careers without advanced degree work, but may not be qualified for some professional forestry positions.

Only students with a demonstrated potential for academic excellence should consider this curriculum. Forest Science students are expected to maintain a minimum grade point average of 3.00.

Specializations in natural science and in social and managerial sciences are offered:

### Natural Science

#### FRESHMAN YEAR—44 required credits

- Biol 1009—General Biology (5)
- Biol 1103—General Botany (5)
- Chem 1001—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1004—General Principles of Chemistry (5)
- Chem 1002—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1005—General Principles of Chemistry (5)
- Geo 1001—Physical Geology (5)
- Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
- Math 1211—Calculus I (5)
- Math 1221—Calculus II (5)
- Math 1231—Calculus III (5)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Electives and liberal education requirements

#### SOPHOMORE YEAR—41 required credits

- AgEc 1020—Principles of Macroeconomics (5)
- Chem 3301—Elementary Organic Chemistry I (4)
- Chem 3302—Elementary Organic Chemistry II (4)
- Chem 3305—Elementary Organic Chemistry Lab I (2)
- Chem 3306—Elementary Organic Chemistry Lab II (2)
- CSci 3101—A FORTRAN Introduction to Computer Programming (4)
- CSci 3131—FORTRAN Laboratory (2)
- ForP 1301—Wood as a Raw Material (4)
- Phys 1041—Introductory Physics (4)
- Phys 1042—Introductory Physics (4)
- Phys 1045—Introductory Physics Laboratory (1)
- Phys 1046—Introductory Physics Laboratory (1)
- Rhet 1222—Public Speaking (4)
- Electives and liberal education requirements

#### ITASCA SESSION—6 required credits

This summer term is to be taken between the freshman and sophomore, or sophomore and junior, years.

- FR 3100—Important Forest Plants (2)
- FR 3101—Field Forest Ecology (3)
- FR 3201—Field Forest Measurements (1)

**JUNIOR YEAR**—28 required credits

- FR 1100—Dendrology (4)
  - FR 3220—Beginning Forest Soils (2)
  - FR 5100—Silviculture (3)
  - FR 5114—Forest Hydrology (3)
  - FR 5200—Aerial Photo Interpretation (3)
  - FR 5212—Natural Resources Inventory (3)<sup>1</sup>
  - FR 5223—Timber Management Planning (3)
  - Rhet 3562X—Writing in Your Profession (2)
  - Stat 5021—Statistical Analysis I (5)
- Electives and liberal education requirements

**SENIOR YEAR**—43-45 required credits

*Fall Quarter—Cloquet Session*

- FR 5101—Field Silviculture I (4)
- FR 5104—Field Silviculture II (1)
- FR 5115—Forest Hydrology, Field Applications (2)
- FR 5126—Field Forest Soils (2)
- FR 5220—Remote Sensing, Forest Resources Inventory (4)
- FR 5236—Forest Recreation Planning (1)
- FR 5248—Harvesting and Engineering (3)
- FW 3167—Techniques of Forest Wildlife Management (1)

**TOTAL GRADUATION REQUIREMENTS**—192 credits

Required courses listed above (166-172 credits), liberal education requirements in categories C and D (11 credits), and electives (9-15 credits).

**Social and Managerial Sciences**

**FRESHMAN YEAR**—43-47 required credits

- Biol 1009—General Biology (5)
  - Biol 1103—General Botany (5)
  - Chem 1001—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1004—General Principles of Chemistry (5)
  - Chem 1002—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1005—General Principles of Chemistry (5)
  - Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
  - Math 1211—Calculus I (5)
  - Math 1221—Calculus II (5)
  - Math 1231—Calculus III (5)
  - Rhet 1101—Writing to Inform and Persuade (4)
  - Rhet 1104—Library Laboratory (1)
- Electives and liberal education requirements

**SOPHOMORE YEAR**—38 required credits

- AgEc 1020—Principles of Macroeconomics (5)
  - AgEc 1030—Principles of Microeconomics (4)
  - CSci 3101—A FORTRAN Introduction to Computer Programming (4)
  - ForP 1301—Wood as a Raw Material (4)
  - FR 1100—Dendrology (4)
  - FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)
  - Phys 1001—The Physical World (4)
  - Phys 1005—Physics Laboratory (1)
  - (or) Math 3142—Introduction to Linear Algebra (4)
  - Rhet 1222—Public Speaking (4)
- Electives and liberal education requirements

**TOTAL GRADUATION REQUIREMENTS**—192 credits

Required courses listed above (140-145 credits), liberal education requirements in categories C and D (10 credits), and electives (37-42 credits).

*Winter and Spring Quarters—On Campus*

- FR 5222—Forest Policy and Economics (5)<sup>1</sup>
  - Rhet 3562X—Writing in Your Profession (2)
- Select three of the following:
1. Ent 5050—Forest Entomology (4)
  2. PiPa 5050—Forest Pathology (4)
  3. FR 3103—Meteorology and Climatology for Resource Managers (2)
  - (and) FR 5215—Forest Fire Management (2)
  4. FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)
  5. FR 5232—Management of Recreational Lands (3)
- Select two of the following:
1. FR 5401—Senior Topics (4)
  2. PiPh 3131—Survey of Plant Physiology (4)
  - (or) FR 3114—Tree Physiology (3)
  - (and) FR 3115—Tree Physiology Laboratory (1)
  - (or) GCB 3022—Genetics (4)
  3. Soil 5232—Soil Physics (4)
  - (or) Soil 5520—Soil Development and Classification (3)
  - (or) Soil 5710—Advanced Forest Soils (3)
- Electives and liberal education requirements

**ITASCA SESSION**—6 required credits

This summer term is to be taken between the freshman and sophomore, or sophomore and junior, years.

- FR 3100—Important Forest Plants (2)
- FR 3101—Field Forest Ecology (3)
- FR 3201—Field Forest Measurements (1)

**JUNIOR YEAR**—32 or 33 required credits

- FR 3220—Beginning Forest Soils (2)
  - FR 5100—Silviculture (3)
  - FR 5114—Forest Hydrology (3)
  - FR 5200—Aerial Photo Interpretation (3)
  - FR 5212—Natural Resources Inventory (3)<sup>1</sup>
  - FR 5223—Timber Management Planning (3)
  - Rhet 3562X—Writing in Your Profession (2)
  - Stat 5021—Statistical Analysis I (5)
  - Stat 5022—Statistical Analysis II (5)
  - Stat 5302—Applied Regression Analysis (4)
  - (or) FR 5253—Forest Biometry (3)
  - (or) FR 5255—Forest Resources Survey Design (3)
- Electives and liberal education requirements

**SENIOR YEAR**—21 required credits

- FR 5222—Forest Policy and Economics (5)<sup>1</sup>
  - FR 5232—Management of Recreational Lands (3)
  - FR 5264—Quantitative Techniques in Forest Management (3)
  - FR 5401—Senior Topics (4)
  - PiPa 5050—Forest Pathology (4)
  - (or) Ent 5050—Forest Entomology (4)
  - Rhet 3562X—Writing in Your Profession (2)
- Electives and liberal education requirements

<sup>1</sup>Must be completed in conjunction with Rhet 3562X.

## Recreation Resource Management

The objectives of this curriculum are to prepare students for careers in the comprehensive planning and management of land and water for recreation, with emphasis on natural non-urban areas; for participation in government resource-oriented recreation programs as well as private planning and consulting; and for graduate work in resource planning and management. The traditional core courses usually required for federal forester positions are listed under the Federal Forestry option.

### Required Courses

#### FRESHMAN YEAR—47-51 required credits

Biol 1009—General Biology (5)  
Biol 1103—General Botany (5)  
Chem 1001—Chemical Principles and Covalent Systems (5)  
(or) Chem 1004—General Principles of Chemistry (5)  
Chem 1002—Chemical Principles and Covalent Systems (5)  
(or) Chem 1005—General Principles of Chemistry (5)  
FR 1201—Conservation of Natural Resources (3)  
Geog 1001—Physical Geology (5)  
Geog 1401—Physical Geography (5)  
(or) Geog 1301—Human Geography (5)  
Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)  
Math 1111—College Algebra and Analytic Geometry (5)  
(or) Math 1131—Finite Mathematics (5)  
(or) Math 1201—Pre-Calculus (5)  
Rhet 1101—Writing to Inform and Persuade (4)  
Rhet 1104—Library Laboratory (1)  
Soil 1122—Introductory Soil Science (4)  
Electives and liberal education requirements

#### SOPHOMORE YEAR—51-52 required credits

AgEc 1020—Principles of Macroeconomics (5)  
AgEc 1030—Principles of Microeconomics (4)  
Biol 5041—Ecology (4)  
FR 1100—Dendrology (4)  
LA 1024—Landscape Theory (4)  
(or) LA 3001—Environmental Design: People and Environment (4)  
Math 1142—Short Calculus (5)  
(or) Math 1211—Calculus I (5)  
Phys 1001—The Physical World (4)  
(and) Phys 1005—Physics Laboratory (1) (Students who have completed high school physics with a B or better may be exempt, but must first see their adviser)  
Pol 1041—Contemporary Political Ideologies (4)  
(or) Pol 1031—Selected Problems in American Public Policy (4)  
Psy 1001—General Psychology (5)  
Rhet 1151—Writing in Your Major (4)  
Rhet 1222—Public Speaking (4)  
Soc 1001—Introduction to Sociology (4)  
Electives and liberal education requirements

#### JUNIOR YEAR—37-38 required credits

AgEc 3610—Community Resource Development (4)  
(or) AgEc 5620—Regional Economic Analysis (4)  
AgET 3410—Hydrology, Water Control (4)  
(or) FR 5114—Forest Hydrology (3)  
FR 3232—Management of Recreational Lands (3)  
FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)

#### TOTAL GRADUATION REQUIREMENTS—192 credits

Required courses listed above (162-169 credits), liberal education requirements (8 credits), and electives (15-22 credits).

Geog 3511—Introduction to Cartography (5)  
Rec 3550—Park and Recreation Administration (5)  
(or) Rec 3530—Recreation, Park Areas, and Facilities (5)  
Rhet 3254—Advanced Public Speaking (4)  
(or) Rhet 3266—Communication, Discussion in Small Group Decision Making (4)  
Rhet 3551—Professional Writing (4)  
(or) Rhet 3562—Writing in Your Profession (4)  
Stat 3081—Experimental Techniques and Statistical Inference (5)  
(or) Stat 5021—Statistical Analysis I (5)  
(or) Soc 3801—Sociological Methods I: Descriptive Statistics (5)  
Electives and liberal education requirements.

#### SENIOR YEAR—27-28 required credits

EBB 5014—Ecology of Plant Communities (5)  
(or) EBB 5016—Ecological Plant Geography (5)  
FR 5200—Aerial Photo Interpretation (3)  
FR 5233—Principles of Outdoor Recreation Design and Planning (4)  
FR 5259—Analysis of Outdoor Recreation Behavior (3)  
(or) FR 5257—Recreation Land Policy (3)  
FR 5269—Interdisciplinary Seminar I (4)  
FR 5270—Interdisciplinary Seminar II (4)  
Soc 5401—Social Organizations (5)  
(or) Soc 5651—Rural Social Institutions (4)  
(or) Jour 5501—Communication and Public Opinion I (4)

Liberal education requirements

#### Recommended electives:

Hort 1021—Plant Materials I (4)  
(or) Hort 1022—Plant Materials II (4)  
Bot 1009—Minnesota Plant Life (4)  
Rhet 5170—Managerial Communications (4)  
AgEc 1250—Principles of Accounting (5)\*  
CSci 3101—A FORTRAN Introduction to Computer Programming (4)\*  
(or) CSci 3104 Introduction to Pascal Programming (4)  
(or) AgET 3030—Introduction to Problem Solving With Computers (4)  
(or) other computer course  
BLaw 3058—Introduction to Law and the Law of Contracts and Agency (4)\*  
Mgmt 3001—Fundamentals of Management (4)\*  
Mgmt 3002—Psychology in Management (4)  
Pol 1001—American Government, Politics (5)  
Rec 5250—Financing Leisure Services (3)\*  
Soc 1651—Rural Sociology (4)  
FR 5231—Range Management (3)\*  
FR 1101—Introduction to Air, Water Quality (4)

\*Required for Recreation Management option.

**Options**

In addition to the Required Courses listed by year above, students may elect one of the following options (with the consent of their adviser and the Recreation Resource Management faculty).

**Recreation Management**

- Approved Internship proposal (5) (or) FR 5269, 5270 (4,4)
- FR 5257—Recreation Land Policy (3)
- FR 5259—Analysis of Outdoor Recreation Behavior (3)
- Soc 5161—Criminal Law in American Society (4)
- Starred recommended electives under SENIOR YEAR above (23)

**Law Enforcement**

- Approved internship proposal (5) (or) FR 5269, 5270 (4,4)
- Rec 5250—Financing Leisure Services (3)
- FR 5257—Recreation Land Policy (3)
- FR 5259—Analysis of Outdoor Recreation Behavior (3)
- 20 Soc credits selected from the following:
  - Soc 3101—Introduction to American Criminal Justice (4) (or) Soc 5161—Criminal Law in American Society (4)
  - Soc 5102—Criminology (4)
  - Soc 5125—Policing in American Society (4)
  - Soc 5141—Juvenile Delinquency (4)
  - Soc 5162—Criminal Procedure in American Society (4)
  - Soc 5104—Community-Based Corrections (4)
  - Soc 5111—Sociology of Deviant Behavior (4)

**Federal Forestry** (minimum Civil Service qualifications)

- FR 3100—Important Forest Plants (4) (*Itasca session*)
- FR 1301—Field Forest Ecology (3) (*Itasca session*)
- FR 3201—Field Forest Measurements (1) (*Itasca session*)
- FR 5212—Natural Resource Inventory (3) (and) Rhet 3562X—Writing in Your Profession (2)
- FR 5222—Forest Policy and Economics (5) (and) Rhet 3562X—Writing in Your Profession (2)
- PIPa 5050—Forest Pathology (4)
- FR 5114—Forest Hydrology (3)
- FR 5215—Forest Fire Management (2)

**Urban Forestry**

Urban forestry involves planning and managing vegetation and associated natural resources in and near urban communities—along streets and in parks, greenbelts, and open spaces. Urban foresters help communities plan and design their urban forests, supervise tree selection and planting, design insect and disease protection programs, and provide related services. City governments are the principal employers, as well as state and federal forestry agencies, forestry consulting firms, tree service firms, and utility companies. Graduates are also qualified for traditional professional forestry positions, including those in the federal government.

**FRESHMAN YEAR—34-38 required credits**

- Biol 1009—General Biology (5)
- Biol 1103—General Botany (5)
- Math 1008—Trigonometry (4) (Students with a C or better in high school trigonometry are exempt)
- Math 1111—College Algebra and Analytic Geometry (5)
- Math 1142—Short Calculus (5)
- Phys 1001—The Physical World (4)
- Phys 1005—Physics Laboratory (1)
- Rhet 1101—Writing to Inform and Persuade (4)
- Rhet 1104—Library Laboratory (1)
- Rhet 1222—Public Speaking (4)
- Electives and liberal education requirements

**SOPHOMORE YEAR—32-34 required credits**

- AgEc 1020—Principles of Macroeconomics (5)
- AgEc 1250—Principles of Accounting (5)
- Chem 1001—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1004—General Principles of Chemistry (5)
- Chem 1002—Chemical Principles and Covalent Systems (5)
  - (or) Chem 1005—General Principles of Chemistry (5)
- Hort 1021—Woody Plant Materials (5)
- Soil 1122—Introductory Soil Science (4)
  - (or) FR 3220—Beginning Forest Soils (2)
- Stat 3081—Experimental Techniques and Statistical Inference (5)
  - (or) Stat 5021—Statistical Analysis I (5)
- Electives and liberal education requirements

## Baccalaureate Programs

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### ITASCA SESSION—6 required credits

This summer term is to be taken between the freshman and sophomore, or sophomore and junior, years.

- FR 3100—Important Forest Plants (2)
- FR 3101—Field Forest Ecology (3)
- FR 3201—Field Forest Measurements (1)

### JUNIOR YEAR—39 required credits

- ForP 1301—Wood as a Raw Material (4)
- FR 1100—Dendrology (4)
- FR 3103—Meteorology and Climatology for Resource Managers (2)
- FR 3114—Tree Physiology (3)
- FR 5100—Silviculture (3)
- FR 5200—Aerial Photo Interpretation (3)
- FR 5212—Natural Resources Inventory (3)<sup>1</sup>
- FR 5233—Principles of Outdoor Recreation Design (4)
- Hort 3076—Arboriculture (3)
- PIPa 5050—Forest Pathology (4)
- Rhet 1151—Writing in Your Major (4)
- Rhet 3562X—Writing in Your Profession (2)

### SENIOR YEAR—40 required credits

- BLaw 3058—Introduction to Law, and the Law of Contracts and Agency (4)
- CSci 3101—A FORTRAN Introduction to Computer Programming (4) (or) CSci 3102—Introduction to PASCAL Programming (4)
- Ent 5050—Forest Entomology (4)
- FR 5114—Forest Hydrology (3)
- FR 5222—Forest Policy and Economics (5)<sup>1</sup>

- FR 5232—Management of Recreational Lands (3)
- FR 5500—Urban Forest Management (3)
- FR 5501—Urban Forest Administration (3)
- Hort 5046—Nursery Management and Production I (3)
- Hort 5048—Nursery Management and Production II (4)
- IR 3010—Human Relations, Applied Organization Theory (4)
- (or) IR 3002—Industrial Relations Systems: Labor Markets, the Management of Human Resources (4)
- (or) Jour 5549—Public Relations (4)
- PA 5521—Strategy, Tactics in Project Planning (4)
- Rhet 3562X—Writing in Your Profession (2)
- Liberal education requirements

### Recommended electives (24-29):

- Ent 5210—Integrated Management (4)
- FW 3052—Introduction to Fisheries and Wildlife Biology and Management (4)
- FP 1303—Wood Structure and Identification (2)
- FR 3115—Forest and Shade Tree Biology Laboratory (1)
- FR 5233—Principles of Outdoor Recreation Planning and Design (4)
- Hort 1100—Biology of Horticultural Production (4)
- Hort 1036—Plant Propagation (4)
- Hort 3026—Residential Landscape Design (4)
- Hort 3072—Turf Management (4)
- Hort 3074—Landscape Management and Horticultural Practices (4)
- LA 1024—Landscape Theory (4)
- LA 1031—Introduction to Landscape Architecture (4)
- Mgmt 3001—Fundamentals of Management (4)
- Pol 5237—Local Government and Politics (4)

### TOTAL GRADUATION REQUIREMENTS—192 credits

Required courses listed above (152-157 credits), liberal education requirements in categories D and C (11 credits), and electives (24-29 credits).

<sup>1</sup>Must be completed in conjunction with Rhet 3562X.

# Course Descriptions

**Course Numbering and Symbols**—Courses primarily for freshmen and sophomores are numbered 1000 through 1998; for juniors and seniors, 3000 through 3998; for juniors, seniors, and graduate students, 5000 through 5998. Courses numbered 8000 and above are restricted to students registered in the Graduate School.

The following symbols are used throughout the course descriptions:

§ Credit will not be granted if the equivalent course listed after this symbol has been taken for credit.

‡ Concurrent registration is allowed (or required) in the course listed after this symbol.

† All courses preceding this symbol must be completed before credit is granted for any quarter of the sequence.

f,w,s,su Fall, winter, spring, summer (follows the course number).

When no abbreviated department prefix precedes the course number listed as a prerequisite, that prerequisite is in the same department as the course being described.

## Fisheries and Wildlife (FW)

- 1001. ORIENTATION IN FISHERIES AND WILDLIFE.** (2 cr; S-N only)  
Survey of technical requirements and training of fishery and wildlife technicians and scientists; introduction to fields of work, problems, and career outlets.
- 1002. WILDLIFE FOR NON-MAJORS: ECOLOGY, VALUES AND HUMAN IMPACT.** (3 cr)  
Controversial issues involving specific wildlife management principles and techniques. Designed for students without natural science background who are interested in natural resource topics, especially wildlife issues.
- 3052. INTRODUCTION TO FISHERIES AND WILDLIFE BIOLOGY AND MANAGEMENT.** (4 cr; prereq Biol 5041; 3 lect, 1 demonstration-discussion session per wk)  
Introduction to fishery and wildlife population ecology; environmental relationships of fish and wildlife populations and habitats; management and research methods; fishery and wildlife agency administration.
- 3167. TECHNIQUES OF FOREST WILDLIFE MANAGEMENT.** (1 cr; offered at Cloquet)  
Biology and management of important forest wildlife species; methods of evaluating forest wildlife populations and habitats.
- 5000. PROFESSIONAL EXPERIENCE PROGRAM.** (4 cr; prereq #: S-N only; free elective for fisheries and wildlife undergrads; not for grad cr)  
Professional experience in fish and wildlife firms or government agencies through supervised practical experience; evaluative reports and consultations with faculty advisers and employers.
- 5103. BASIC FISHERY BIOLOGY.** (Cr ar; prereq #)  
Academic opportunity to enhance biological background in fisheries biology.
- 5106. BASIC WILDLIFE BIOLOGY.** (Cr ar; prereq #)  
Academic opportunity to enhance biological background in wildlife biology.
- 5129. MAMMALOLOGY.** (5 cr, §EBB 5129; prereq Biol 1106 or 3011 or #)  
Recent families and orders of mammals of the world and genera and species of mammals of North America, with emphasis on morphology, evolution, and zoogeographic history.
- 5278. SPECIAL LECTURES IN WILDLIFE.** (Cr ar; offered when feasible)  
Lectures and/or laboratories in special fields of wildlife biology given by a visiting scholar or regular staff member.
- 5279. SPECIAL LECTURES IN FISHERIES.** (Cr ar; offered when feasible)  
Lectures and/or laboratories in special fields of fisheries biology given by a visiting scholar or regular staff member.
- 5281. SENIOR SEMINAR: WILDLIFE.** (1 cr)  
Discussion and presentation of papers in wildlife and related subjects.

## Course Descriptions

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- 5393. SPECIAL PROBLEMS IN FISHERY BIOLOGY.** (Cr ar; prereq #)  
Individual field, library, and laboratory research in various lines of fishery biology.
- 5398. SPECIAL PROBLEMS IN WILDLIFE BIOLOGY.** (Cr ar; prereq #)  
Individual field, library, and laboratory research in various areas of wildlife biology.
- 5451. ECOLOGY OF FISH POPULATIONS.** (5 cr; prereq Biol 5041 or equiv, EBB 5136, Stat 5022 or equiv or #)  
Conceptual models of exploited fish populations; description of population characteristics; computer-assisted estimation of population parameters; influence of exploitation on population structure; yield models; relationships between parental stock, recruitment and yield; influence of abiotic factors on year-class formation.
- 5452. FISHERY MANAGEMENT IN INLAND WATERS.** (5 cr; prereq Biol 5041 or #)  
Fundamental concepts and applications of fisheries management; pond and reservoir fisheries; lake and stream investigations, rehabilitation; lake fisheries management; warm-water and trout stream management. Field demonstrations on fish population surveys.
- 5455. AQUACULTURE.** (4 cr; prereq Biol 1009, 1103, 1106 or equiv, Chem 1001-2 or 1004-5 or equiv or #)  
Role of aquaculture in resource management and world food production; principles of husbandry of aquatic organisms; interactions between fish metabolism and water quality; nutrition and energetics; pathology; genetics and selective breeding.
- 5456. FIELD ECOLOGY OF FISHES.** (5 cr; prereq introductory course in ecology; offered at Itasca)  
Ecological studies, observation, and identification of fishes in their natural habitat including life histories, reproduction, behavior, food habits, interrelationships with other fishes, and general habitat requirements. Collection methods in streams and lakes.
- 5457. WATER QUALITY MANAGEMENT: FISHERIES.** (2 cr, 5457-5458†, §FR 5457; prereq Chem 1005 or equiv)  
Determination of suitable water quality for fish including methodology, data analysis, and general responses to natural stresses and pollutants.
- 5458. WATER QUALITY MANAGEMENT: ECOSYSTEM APPROACHES.** (4 cr, §FR 5458; prereq Chem 1005, 3101 or #)  
Anthropogenic influences on aquatic ecosystems. Influences include forest management, point and non-point pollution, and acid rain. Fishery impacts designed to supplement those discussed in FR/FW 5457.
- 5561. WILDLIFE ECOLOGY, MANAGEMENT I: PLANNING POLICY AND ADMINISTRATION.** (4 cr; prereq 3052, sr fisheries or wildlife major or #)  
Basic management concepts as related to wildlife resources. Establishment of goals, policies, and procedures. Strategic and operational planning. Development and evaluation of programs to achieve management goals. Application of simulation modeling and management science techniques in wildlife management.
- 5562. WILDLIFE ECOLOGY, MANAGEMENT II: POPULATIONS.** (4 cr; prereq 5561 or #)  
Characteristics of wildlife populations relevant to management, including natality, recruitment, and mortality rates, density and behavior.
- 5563. WILDLIFE ECOLOGY, MANAGEMENT III: HABITATS.** (3 cr; prereq sr standing or #)  
Habitat relationships of bird and mammal populations and the ecological basis for habitat management. Lectures, readings, library projects, and local field trips.
- 5564. WILDLIFE ECOLOGY, MANAGEMENT IV: FIELD PROBLEMS IN WILDLIFE RESOURCE MANAGEMENT.** (4 cr; prereq sr wildlife major or #)  
Problem-solving exercises in the management of wildlife resources. Emphasis on development of management goals; collection, synthesis, and evaluation of data; and development of management recommendations and/or plans. Lectures, readings, laboratory sessions, and local field trips; independent fieldwork usually required.
- 5890. RESEARCH PROBLEMS AT ITASCA IN FISHERIES AND WILDLIFE.** (Cr ar; prereq #)  
Undergraduate students may develop a short-term research project during one or both summer terms.

### FOR GRADUATE STUDENTS ONLY

(For course descriptions, see the *Graduate School Bulletin*)

- 8200. SEMINAR**
- 8364. RESEARCH IN FISHERY BIOLOGY**
- 8377. RESEARCH IN WILDLIFE BIOLOGY**
- 8448. FISHERY SCIENCE**
- 8451. PRODUCTION BIOLOGY OF FISHERY ENVIRONMENTS**
- 8457. ENVIRONMENTAL BIOLOGY OF FISHES**
- 8455. FISHERY ECOLOGY OF POLLUTED WATERS LABORATORY**
- 8574. WILDLIFE MANAGEMENT: UPLAND GAME**
- 8575. WILDLIFE MANAGEMENT: WATERFOWL**
- 8576. WILDLIFE MANAGEMENT: LARGE MAMMALS**
- 8577. PERSPECTIVES IN WILDLIFE ECOLOGY**
- 8578. WILDLIFE RESOURCE PLANNING AND DECISION MAKING**



## Forest Products (ForP)

- 1100. WOOD IN AMERICAN LIFE.** (3 cr; prereq Math 1111 or #)  
Past, present, and future uses of wood. Types of products, quantities of wood used, import/export balances, forest resource situation, prospects of substitution for wood and environmental trade-offs, wood conversion efficiency and impacts on quantities needed, wood for energy, and proper use of wood products.
- 1102. LEADERSHIP AND MANAGEMENT SKILLS FOR COLLEGE OF FORESTRY STUDENTS.** (1 cr [2 cr with project]; prereq #: S-N only)  
Discussions, guest talks, audiovisual programs, and in-class exercises on people management, planning and organization, meetings and group problem solving, technology transfer and introduction of change into organizations, mass media and publicity campaigns, time management, and career planning and development. Written project for an additional credit optional.
- 1301. WOOD AS A RAW MATERIAL.** (4 cr)  
The physical and chemical nature of solid wood and wood fibers as it relates to the requirements of major wood-based industries. World supply and consumption. Weekly demonstration laboratories dealing with structure and properties of wood and with manufacture of solid, particle, and fiber products.
- 1303. WOOD STRUCTURE AND IDENTIFICATION.** (2 cr; prereq 1301 or #)  
Features of wood structure vital to identifying various tree species and understanding the physical properties of wood. Lecture and laboratory.
- 3300. WOOD INDUSTRY TOURS.** (2 cr; prereq 1301, jr or sr standing)  
Visits to a number of firms involved with various facets of the forest products industry.
- 3303. FOREST PRODUCTS MARKETING.** (3 cr; prereq Mktg 3000)  
Historical and current considerations of forest products marketing at the manufacturing, wholesale, and retail levels. Lectures, guest speakers, and field trips.
- 3310. WOOD-FRAME BUILDING SYSTEMS AND MATERIALS.** (4 cr; prereq AgET 1015, Phys 1001 or equiv)  
Development and principles of manufactured housing systems. Wood-frame construction technology. Strength and other properties of wood and wood-based materials as related to design. Material and design optimization. Insulation materials and heat loss.
- 3312. BUILDING MATERIALS ESTIMATING.** (2 cr)  
Modern methods of estimating quantity, grade, and specifications of building materials for light frame construction.
- 3325. DIRECTED STUDY EXPERIENCE.** (1-5 cr; prereq #)  
Opportunity to pursue experiences not available under independent study or extra credit registration. The student develops, in consultation with the adviser for the project, a prospectus, and completes progress reports and a final report on his or her project.
- 5300. WOOD-FLUID RELATIONSHIPS.** (3 cr; prereq 1301)  
Moisture in wood and its relationship to density and specific gravity, shrinking and swelling, electrical properties, strength properties, thermoconductivity, sorption isotherms, dimensional stabilization, permeability and diffusion. Lectures only.
- 5301. MECHANICAL PROPERTIES.** (3 cr; prereq 1301 or #)  
Basic mechanics and strength of materials as applied to wood products.
- 5302. WOOD CHEMISTRY I.** (3 cr; prereq Chem 3302)  
Chemical composition, reactions, and analyses of wood, wood components, and derivatives.
- 5303. WOOD DETERIORATION.** (3 cr; prereq 1301 or #)  
Deterioration of wood and wood products by bacteria, fungi, insects, marine organisms, fire, and weathering; methods of preservation and preservatives used. Lecture and laboratory.
- 5304. WOOD DRYING AND PRESERVATION PROCESSES.** (4 cr; prereq 5300, 5303)  
Examination of materials, equipment, processes, and technical considerations inherent in the industrial drying and/or preservative treatment of wood products. Lectures, laboratory exercises, and plant visits.
- 5305. PULP AND PAPER TECHNOLOGY.** (4 cr; prereq 5300, 5302 or #)  
Pulping processes; fiber refining and processing; manufacture of paper; fiber and paper properties; recycling of paper; and water requirements and effluent treatment. Lecture and laboratory. Field trip optional.
- 5306. MANUFACTURING PROCESSES.** (3 cr; prereq 1301 or #, 3300 recommended)  
Manufacture of wood-based products from a systems point of view. Input requirements, machinery selection, methods of economic comparison. Technology related to lumber manufacture.

## Course Descriptions

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- 5307. WOOD-BASE PANEL TECHNOLOGY.** (4 cr; prereq 5300, 5301 or #)  
Design, manufacture, properties, and applications of plywood, particleboard, fiberboard, and composite panels. Adhesives and their application in the panel industry. Lecture, laboratory, and research project.
- 5310. PULP AND PAPER PROCESS LABORATORY.** (3 cr; prereq 5305 or #5305)  
Chemical and mechanical pulping, pulp preparation, secondary fiber, de-inking, wet end additives. Laboratory problems and exercises supplemented by lectures.
- 5312. PULP AND PAPER PROCESS CALCULATIONS.** (4 cr; prereq ME 3301 or #)  
Chemical and physical process calculations; steady and unsteady state material and energy balances applied to pulping and papermaking processes.
- 5313. PULP AND PAPER PROCESS OPERATIONS.** (5 cr; prereq CE 3400 or #)  
Application of the principles of momentum, heat, and mass transfer to unit operations in the pulp and paper industry: fluid transport, filtration, sheet forming, sedimentation, heat exchange, evaporation, gas absorption and stripping, distillation, leaching, extraction, crystallization, humidification, and drying.
- 5315. PAPER ENGINEERING LABORATORY.** (2 cr; prereq 5312 or #)  
Experiments designed to illustrate and apply the principles of momentum, heat, and mass transfer using the pilot-plant paper machine and coater.
- 5316. COATED PRODUCT DEVELOPMENT.** (2 cr; prereq 5310 or #)  
Coating process and products (primarily paper); theory, techniques, and procedures for formulating and applying coatings; properties and uses of coated products.
- 5317. INSTRUMENTATION AND PROCESS CONTROL.** (2 cr; prereq 5312)  
Measurements, analog and digital control systems, instrumentation, computers, computer control, system maintenance, fluidics, special applications.
- 5331. SENIOR SEMINAR.** (2 cr; prereq sr; A-N grading only)  
Current developments in forest products.
- 5350. WOODY TISSUE MICROTÉCHNIQUE.** (2 cr; offered when feasible)  
Use of sliding and rotary microtomes, maceration, differential staining, and special techniques in preparation of woody tissue for microscopic study. Laboratory.
- 5353. WOOD CHEMISTRY II.** (2 cr; prereq 5302, Chem 3100, Chem 3101 or equiv)  
Laboratory problems in the analysis of wood constituents and in the techniques of their isolation and purification.
- 5355. MECHANICS AND STRUCTURAL DESIGN WITH WOOD PRODUCTS.** (4 cr; prereq 5301)  
Mechanical behavior of lumber, plywood, and particleboard as applied to structural considerations in building construction. Lecture and laboratory.
- 5356. ADVANCED FOREST PRODUCTS MARKETING.** (3 cr; prereq 3303 or #)  
Lectures and case studies on retail, wholesale, manufacturer, and market analysis research concerning the forest products business.
- 5359. SURFACE AND COLLOID CHEMISTRY OF PAPERMAKING.** (3 cr; prereq Chem 5520 or #)  
Principles of surface and colloid chemistry applied to basic problems in pulp and paper manufacturing operations and product uses.
- 5360. STRUCTURE AND PROPERTIES OF IMPORTANT TROPICAL WOODS.** (2 cr; prereq 1303)  
Structure and methods of identification of commercially important tropical woods. Properties of these woods; relation of these properties to favored uses for the woods.
- 5361. ADHESION AND ADHESIVES.** (3 cr; prereq 5359 or Chem 5520 or #)  
Introduction to adhesion. Physico-chemical interactions at adhesive-adherend interface. Polymer adsorption. Polymer structure and adhesive utility. Wood as adherend. Adhesive-wood interface. Shelf-life of resins. Curing. Adhesive cohesion and performance. Adhesives from renewable resources.
- 5401. SENIOR TOPICS.** (Cr ar; prereq sr)  
Independent study in a field of interest to a forestry major. Planned with adviser.

### FOR GRADUATE STUDENTS ONLY

(For course descriptions, see the *Graduate School Bulletin*)

**8300. RESEARCH PROBLEMS**

**8301. RESEARCH PROBLEMS**

**8302. RESEARCH PROBLEMS**

**8303. ADVANCED TOPICS IN PANEL PRODUCTS TECHNOLOGY**

**8304. ADVANCED TOPICS IN WOOD DRYING**

**8305. INFLUENCE OF CULTURAL/GENETIC PRACTICES ON THE STRUCTURE AND UTILIZATION OF WOODY FIBROUS MATERIALS**

**8306. SEMINAR: FOREST PRODUCTS**

## Forest Resources (FR)

- 1100. DENDROLOGY.** (4 cr; prereq Biol 1103)  
Identification, nomenclature, classification, and distribution of about 200 important forest trees. Preparation and use of keys, systems of natural classification, and field and laboratory methods of identification.
- 1101. INTRODUCTION TO AIR AND WATER QUALITY.** (4 cr)  
Air and water quality problems. Basic processes that govern the accretion, depletion, and cycles of specific types and sources of pollution. Methods of pollution abatement and influence of political, social, and economic pressures on the maintenance of a "quality environment."
- 1102. LEADERSHIP AND MANAGEMENT SKILLS FOR COLLEGE OF FORESTRY STUDENTS.** (1 cr [2 cr with project]; prereq #: S-N only)  
Discussions, guest talks, audiovisual programs, and in-class exercises on people management, planning and organization, meetings and group problem solving, technology transfer and introduction of change into organizations, mass media and publicity campaigns, time management, and career planning and development. Written project for an additional credit optional.
- 1200. INTRODUCTION TO FOREST RESOURCES.** (3 cr)  
Multiple forest resources and their management. History, policy, and current issues in forest resources. Lectures and laboratory (including field trips).
- 1201. CONSERVATION OF NATURAL RESOURCES.** (3 cr)  
Development of thought on natural resource conservation in the United States. Renewable resources and their management problems; resource conservation and environmental management related to basic ecological principles.
- 1202. FARM AND SMALL WOODLANDS FORESTRY.** (3 cr for non-forestry majors, 2 cr for majors [3 cr with paper]; prereq for majors 1100 or §1100)  
Status and problems of the small woodland owner. Factors influencing tree growth. Cutting practices for and marketing products of small woodlands. Establishment and care of plantations, shelterbelts, and windbreaks. Field trips.
- 1203. INTRODUCTION TO MINNESOTA'S NATURAL RESOURCES.** (3 cr, §1201; for non-forestry students)  
Ecological, social, and economic implications of Minnesota's soil, water, forest, wildlife, and other resources are studied in field exercise and group discussions at nature centers and natural areas. Environmental teaching techniques for the elementary indoor classroom.
- 3100. IMPORTANT FOREST PLANTS.** (2 cr; prereq Biol 1103; given at Itasca)  
Identification of forest plants as related to forest types.
- 3101. FIELD FOREST ECOLOGY.** (3 cr; prereq Chem 1001 or Chem 1004; given at Itasca)  
Field examination of succession, soils, silvical characteristics, tree classification, stand structure, and the ecology of regeneration.
- 3103. METEOROLOGY AND CLIMATOLOGY FOR RESOURCE MANAGERS.** (2 cr; prereq Phys 1001, Phys 1005 or #)  
Fundamentals of meteorology and climatology as applied to wildland resource management.
- 3104. FOREST ECOLOGY.** (3 cr; prereq Itasca session)  
Ecological concepts and principles as a basis for silvicultural practice. The forest as an ecosystem.
- 3114. TREE PHYSIOLOGY.** (3 cr; prereq Chem 1001 or Chem 1004, 10 cr of biology)  
The growth, development, and functions of forest and shade trees. Lecture only.
- 3115. TREE PHYSIOLOGY LABORATORY.** (1 cr; prereq 3114 or §3114)  
Laboratory study of aspects of tree biology. Emphasis on the design and conduct of experiments.
- 3201. FIELD FOREST MEASUREMENTS.** (1 cr; prereq Math 1008 or #; given at Itasca)  
Introduction to land survey, tree and stand measurement, and basic forest sampling techniques.
- 3220. BEGINNING FOREST SOILS.** (2 cr; prereq Itasca session, Geo 1001)  
Basic soil properties and relationships to tree growth; soil development and classification.
- 3225. DIRECTED STUDY EXPERIENCE.** (1-5 cr; prereq #)  
Opportunity to pursue experiences not available under independent study or extra credit registration. The student develops, in consultation with the adviser for the project, a prospectus, and completes progress reports and a final report on his or her project.
- 3232. MANAGEMENT OF RECREATIONAL LANDS.** (3 cr; prereq #)  
Recreational use of the forest and associated land and water. Policy problems arising from recreational demands.
- 5100. SILVICULTURE.** (3 cr; prereq Itasca session, 1100)  
Introduction to silvics, forest regeneration and site preparation techniques, intermediate silvicultural practices, and silvicultural systems.

## Course Descriptions

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- 5101. FIELD SILVICULTURE I.** (4 cr; prereq 5100; given at Cloquet)  
Regeneration surveys, plantation inspection, site preparation, and reforestation prescription. Practice in marking for thinning and determining effect on stands. Compartment examination and prescription. Written and oral reports.
- 5103. ADVANCED FOREST TREE BIOLOGY.** (3 cr; prereq #)  
Current applications and research in forest tree biology.
- 5104. FIELD SILVICULTURE II.** (1 cr; prereq 5100; given at Cloquet)  
Application of even-age and all-age silvicultural systems to hardwood stands. Lectures, field trips, and exercises.
- 5105. INTENSIVE SILVICULTURE.** (3 cr; prereq forestry jr, sr, or grad, or #)  
Principles and techniques underlying silvicultural systems aimed at high productivity. Current practices in various forest regions of the United States and the world. Lectures and guest speakers.
- 5106. SENIOR SILVICULTURE SEMINAR.** (2 cr [3 cr with research paper]; prereq sr, FR 5100, or #; A-N only)  
Students prepare, present, and critique seminars on silvicultural topics of interest. Guest speakers.
- 5110. FOREST WATER QUALITY MANAGEMENT.** (4 cr; prereq 5114, Itasca session, or #)  
Water quality in natural systems; concentrations in undisturbed systems, processes influencing temporal and spatial variation, design and interpretation of monitoring programs. Land uses that impact water quality in forested environments, including expected changes in concentration of various parameters, assessment techniques, legal ramifications, and management alternatives.
- 5114. FOREST HYDROLOGY.** (3 cr; prereq Itasca session, 3103, Geo 1001 or #)  
Introduction to the hydrologic cycle and hydrologic processes. Effects of forest management activities on water yield, storm flow, and water quality.
- 5115. FOREST HYDROLOGY, FIELD APPLICATIONS.** (2 cr; prereq 5114 or #; given at Cloquet)  
Use of hydrologic instrumentation to measure precipitation, streamflow, infiltration capacity, soil moisture, air temperature, evaporation, and selected water quality constituents. Collection and interpretation of hydrologic information to evaluate forest-use impacts on water quantity and quality.
- 5126. FIELD FOREST SOILS.** (2 cr; prereq 3220, 5114; given at Cloquet)  
Field examination of forest soils and their relationship to site productivity and forest management.
- 5140. APPLICATION OF SILVICULTURE IN NORTH AMERICAN FOREST TYPES.** (3 cr; prereq FR 5100 or #)  
Current regeneration methods and intermediate stand treatments. Economic and biological principles. Primarily lectures. Student presentations, discussion of current literature, and field trips may also be included, depending on enrollment.
- 5150. FOREST ECOLOGY SEMINAR.** (3 cr; prereq sr, 3101, 5100 or #)  
Survey of classical concepts and contemporary developments in ecology as related to forestry. Discussion group format.
- 5152. FOREST GENETICS.** (3 cr; prereq sr)  
Genetic variation of forest-tree species and underlying principles; application of plant breeding principles to forestry.
- 5153. ADVANCED FOREST HYDROLOGY.** (4 cr; prereq 3220, 5114 or #)  
Current hydrologic problems in the management of forested watersheds. Analytical methods to evaluate effects of vegetation management on the quantity and quality of runoff. Lecture and laboratory.
- 5200. AERIAL PHOTO INTERPRETATION.** (3 cr)  
Types, characteristics, procurement, preparation, viewing, and interpretation of color, black-and-white, and color infrared aerial photographs; basic aerial photography; introduction to mapping; applications to resource surveys.
- 5212. NATURAL RESOURCES INVENTORY.** (3 cr; prereq Itasca session, AgET 1030 or equiv computer programming course with FORTRAN or BASIC language, Math 1142 or Math 1211, Stat 3081 or Stat 5021)  
Measurement of stand variables, forest products, forest growth and yield. Elementary statistics. Sampling methods for estimating characteristics of natural resources and resource use for management decision making. Lecture and laboratory.
- 5215. FOREST FIRE MANAGEMENT.** (2 cr; prereq 1100, Itasca session, 3103, 5100 or #)  
Concepts, principles, and techniques of fire control and use in wildland management.
- 5216. SPECIAL TOPICS IN FOREST FIRE MANAGEMENT.** (Cr ar; prereq 5215 or #)  
Independent study in selected aspect of forest fire management.
- 5217. FIELD TECHNIQUES FOR PRESCRIBED BURNING.** (1 cr; prereq 5215 or #)  
Field exercises in prescribed burn planning and execution.
- 5218. FIELD TECHNIQUES FOR FOREST FIRE CONTROL.** (1 cr; prereq 5215 or #)  
Supervised experience in presuppression and suppression activities.

- 5220. REMOTE SENSING, FOREST RESOURCES INVENTORY.** (4 cr; prereq 3220, 5200, 5212; given at Cloquet)  
Use of aerial photographs in property boundary location; interpretation and classification of forest vegetation types. Application of sampling methods for estimating natural resources and resource use for management decision making.
- 5222. FOREST POLICY AND ECONOMICS.** (5 cr or cr ar, §5265; prereq AgEc 1030 or #)  
Forest resource supply and consumption relationships, United States and world; legal and political factors; basic economic analysis of forestry activities (production, consumption, and investments).
- 5223. TIMBER MANAGEMENT PLANNING.** (3 cr; prereq 5212, 5222 or #)  
Introduction to fundamentals of forest planning, including sustained yield, measurement of growing stock, regulation models, and development of timber management plans. Modern harvest scheduling and planning models.
- 5231. RANGE MANAGEMENT.** (3 cr; prereq Biol 1103 or #)  
Important range plants; range livestock; range management methods and improvements; public grazing land administration; relationship of livestock grazing to wildlife, forest, watershed, and recreation management on public and private range lands.
- 5233. PRINCIPLES OF OUTDOOR RECREATION DESIGN AND PLANNING.** (4 cr; prereq 5232 or #)  
(Same as LA 5010) For advanced students associated with design, management, and planning of recreational facilities. Planning and design principles related to recreational land use and development; parks, campsites, water areas, highways, summer and winter recreational facilities.
- 5236. FOREST RECREATION PLANNING.** (1 cr; prereq 5232; given at Cloquet)  
Recreation area and site planning, examples and managerial concerns. Field work and presentation.
- 5248. HARVESTING AND ENGINEERING.** (3 cr; prereq AgET 1400; given at Cloquet)  
An introduction to harvesting systems, relationship to forest management, and preparation and administration of timber sales. Fundamentals of location, construction, and maintenance of forest roads.
- 5253. FOREST BIOMETRY.** (3 cr; prereq 5212, Stat 5022 or #; offered spring 1984 and alt yrs)  
Topics in forest measurements, sampling, inventory, and the modeling and analysis of forest growth and change.
- 5255. FOREST RESOURCES SURVEY DESIGN.** (3 cr; prereq 5212, Stat 5022, or #; offered spring 1983 and alt yrs)  
Advanced forest measurements, sampling, and survey design concepts and practices.
- 5257. RECREATION LAND POLICY.** (3 cr; prereq 5232 or #)  
Policy issues affecting the use and management of lands devoted entirely or in part to recreational objectives.
- 5259. ANALYSIS OF OUTDOOR RECREATION BEHAVIOR.** (3 cr; prereq 5232, RRM major or grad student or #)  
Development of environmental framework for understanding recreation behavior. Contributions of several disciplines, current cultural trends, management implications.
- 5260. ADMINISTRATIVE PROCESSES FOR NATURAL RESOURCE MANAGERS.** (3 cr; prereq forestry jr, sr, or grad, or #)  
Development of U.S. forestry and resource management organizations. Staffing, direction, organization, planning, budgeting, and related administrative practices.
- 5261. ADVANCED FOREST POLICY AND ECONOMICS.** (3 cr; prereq 5222 or #)  
Advanced topics concerning the quantitative techniques for analyzing forestry policy and economic activities; economic analysis of forestry projects; analyses of political and legal processes in forestry; review of literature on forest policy and economics; case studies.
- 5262. REMOTE SENSING OF NATURAL RESOURCES.** (4 cr)  
Introduction to remote sensing for natural resource inventories, land use analyses, and environmental monitoring activities; photographic, thermal, multispectral, and radar sensing procedures: airborne and satellite systems; visual and computer-assisted analysis techniques; oriented toward an interdisciplinary audience.
- 5264. QUANTITATIVE TECHNIQUES IN FOREST MANAGEMENT.** (3 cr; prereq 5212, 5222, 5223 or #)  
Forestry applications of quantitative techniques in allocation and other decision-making problems. Mathematical programming, simulation, and other techniques.
- 5265. FOREST POLICY ISSUES.** (3 cr, §5222)  
Processes by which forestry issues evolve and are resolved; systematic analysis of issues (defining issues, assessing special interest group concerns, defining objectives and alternatives); analysis of selected forestry issues such as sustained yield, clear-cutting, forest practice regulation, multiple and dominant use, and energy conservation.
- 5269. INTERDISCIPLINARY SEMINAR I.** (4 cr)  
Resource and community development analysis, implications for resource allocation. Selected speakers, readings, and discussion topics. Diverse disciplinary contributions reflected.
- 5270. INTERDISCIPLINARY SEMINAR II.** (4 cr)  
Development of ability to identify and analyze resource development problems. Student participation as team members; guest speakers. Diverse disciplinary contributions reflected.

## Course Descriptions

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- 5401. SENIOR TOPICS.** (Cr ar; prereq sr in forestry or #)  
Independent study in a field of interest to the student. Work must be planned with a forestry faculty member.
- 5406. FORESTRY WORKSHOP FOR TEACHERS.** (5 cr)  
Forest ecosystems and forest management studied in lecture and laboratory sessions conducted in a forest environment. In field exercises, techniques and materials are developed for teaching principles of forestry in indoor and outdoor classrooms. Tours to forest and wildlife research and management units and utilization locations, and discussions of contemporary forestry issues by guest lecturers.
- 5408. FORESTRY IN THE URBAN ENVIRONMENT.** (3 cr; prereq student teacher, teacher or #)  
Study of forest ecosystems and forest management in lecture and laboratory sessions. Field exercises emphasize techniques and materials useful for teaching principles of forestry in indoor and outdoor classrooms; forest areas in the Twin Cities used for field exercises. Special uses and problems of the urban forest. Discussions and presentations by guest lecturers on contemporary forestry issues.
- 5457. WATER QUALITY MANAGEMENT: FISHERIES.** (2 cr; prereq Chem 1005 or equiv)  
Determination of suitable water quality for fish including methodology, data analysis, and general responses to natural stresses and pollutants.
- 5458. WATER QUALITY MANAGEMENT: ECOSYSTEM APPROACHES.** (4 cr; prereq Chem 1005, 3101 or #)  
Anthropogenic influences on aquatic ecosystems. Influences include forest management, point and non-point pollution, and acid rain. Fishery impacts designed to supplement those discussed in FR/FW 5457.
- 5500. URBAN FOREST MANAGEMENT.** (3 cr; prereq 5100 or #)  
Discussion and development of basic concepts. Introduction to terminology and principles of urban tree inventory, propagation, and care; management case studies; equipment operation and costs.
- 5501. URBAN FOREST ADMINISTRATION.** (3 cr; prereq 5100, 5500, or #)  
Discussion and development of basic concepts; introduction to public relations, program building; staffing and labor relations; effect of legal restraints on ordinances and contracts; budget monitoring.

### FOR GRADUATE STUDENTS ONLY

(For course descriptions, see the *Graduate School Bulletin*)

- 8100. RESEARCH PROBLEMS: SILVICULTURE**
- 8101. RESEARCH PROBLEMS: FOREST-TREE PHYSIOLOGY**
- 8102. RESEARCH PROBLEMS: FOREST-TREE GENETICS**
- 8103. RESEARCH PROBLEMS: FOREST HYDROLOGY**
- 8105. ADVANCED FIELD SILVICULTURE**
- 8106. TOPICS IN SILVICULTURE-FOREST SOILS**
- 8107. SEMINAR: FOREST RESOURCES**
- 8108. FOUNDATIONS OF RENEWABLE RESOURCES RESEARCH**
- 8200. RESEARCH PROBLEMS: FOREST MANAGEMENT**
- 8201. RESEARCH PROBLEMS: FOREST ECONOMICS**
- 8202. RESEARCH PROBLEMS: FOREST BIOMETRY**
- 8203. RESEARCH PROBLEMS: FOREST RECREATION**
- 8204. RESEARCH PROBLEMS: FOREST POLICY**
- 8205. RESEARCH PROBLEMS: REMOTE SENSING**
- 8206. ADVANCED MANAGEMENT OF RECREATIONAL LANDS**
- 8207. ECONOMIC ANALYSIS OF FORESTRY PROJECTS**
- 8208. LEGAL AND POLITICAL PROCESSES IN FORESTRY**
- 8209. SEMINAR: FORESTRY AND ECONOMIC DEVELOPMENT**
- 8210. RESEARCH METHODS IN FORESTRY**
- 8211. SEMINAR: FOREST POLICY ISSUES**
- 8212. ADVANCED REMOTE SENSING**
- 8213. TOPICS IN WILDLAND HYDROLOGY**

## Rhetoric (Rhet)

- 1101. WRITING TO INFORM AND PERSUADE.** (4 cr. §Comp 1011; prereq ¶1104)  
Relationship of fact finding and clear thinking to informative and persuasive writing. Importance of thesis sentence, evidence, coherence, clarity, and correctness. Relatively short (500-750 words) assignments designed to complement instruction in the Library Laboratory.
- 1104. LIBRARY LABORATORY.** (1 cr; S-N only; taught by St. Paul campus library staff)  
On-site instruction in information retrieval techniques. Lectures, audiovisual presentations, and problem-solving assignments designed to strengthen skills in using the library.
- 1151. WRITING IN YOUR MAJOR.** (4 cr; prereq 1101, 1104, and soph status)  
Students investigate and write on subjects related to their majors. The criterion of appropriateness: good writing meets the expectation of readers and the conventions of a particular form. Assignments such as literature review, abstract, fact sheet, instructions, and feature article.
- 1222. PUBLIC SPEAKING.** (4 cr; prereq 1101 and 1104)  
Practical course in fundamentals of speechmaking. Emphasis on organizing the speech and projecting it to the audience.
- 3254. ADVANCED PUBLIC SPEAKING.** (4 cr; prereq 1222)  
Training for specific speech situations most likely to be encountered professionally. Emphasis on analysis, design, preparation, and delivery of presentations to provide greater flexibility within a variety of speech environments.
- 3266. COMMUNICATION, DISCUSSION IN SMALL GROUP DECISION MAKING.** (4 cr; prereq 1101)  
Role of communication techniques in the small group decision-making process. Emphasis on discussion within a variety of decision-making modes such as voluntary groups, business meetings, and conflict groups.
- 3562. WRITING IN YOUR PROFESSION.** (4 cr [may be taken for 2 cr at a time]; prereq 1101, 1104, 1151, and jr status)  
Projects in professional writing. Relationship between structuring information to meet the needs of particular readers and writing effectively. Assignments such as the feasibility report, proposal, memorandum, letter of application, and résumé.



# Faculty

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## Dean Emeritus

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## Department of Fisheries and Wildlife

### Professor Emeritus

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### Associate Professor

Ira R. Adelman, Ph.D., head

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A Forest Resources student monitors stream flow from a small bog in northern Minnesota.



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Allen L. Lundgren, Ph.D.<sup>5</sup>  
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<sup>4</sup>Associate member from Duluth Department of Parks and Recreation

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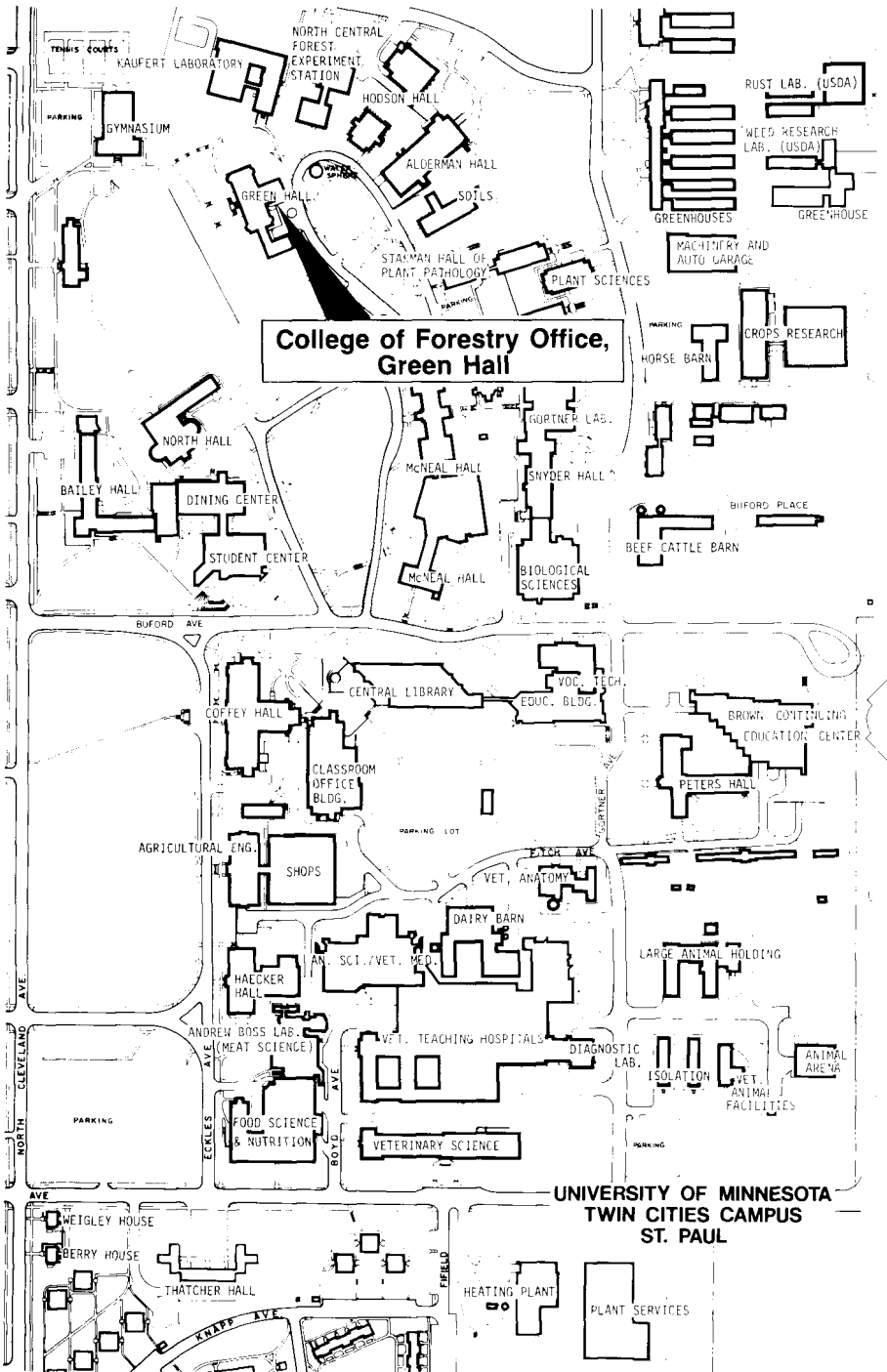
<sup>6</sup>Associate member from North Central Agricultural Experiment Station

<sup>7</sup>Associate member from Minnesota Department of Natural Resources

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