Division of Forestry and Natural Resources

Programs of Study

If you are interested in natural resources and the out-of-doors, you may want to pursue a career through one of the four curricula offered by the Division of Forestry and Natural Resources - Forest Resource Management; Recreation, Parks and Tourism Resources; Wildlife & Fisheries Resources; and Wood Science Technology. If you are unsure about your major, you can be admitted to the pre-agriculture, forestry, and consumer sciences curriculum with a faculty member to advise you until a program major has been selected. If you have chosen a program major, you will be admitted directly to the major and be assigned a faculty advisor at your first registration.

The division, which has excellent facilities, is located in Percival Hall on the Evansdale campus in close proximity to the Evansdale Library and the Evansdale Residential Complex. In addition, 10,400 acres of forested tracts, including the 7,600-acre University Research Forest, are located near the campus and are used as extensive outdoor laboratories. The MeadWestvaco Natural Resource Center is the focal point of the division’s teaching, research, and service activities at the Research Forest.

Transfer Credits for Professional Courses

If you are a transfer student entering the Division of Forestry and Natural Resources from a one- or two-year technical school or from a four-year unaccredited forestry school, you may have to take an advanced standing examination to demonstrate proficiency in any required professional course offered by the Division of Forestry and Natural Resources for which transfer credit is sought. Advanced standing examinations can be arranged after you have enrolled in the Division of Forestry and Natural Resources. All other credits are accepted subject to the regulations of the Office of Admissions regarding transfer of credits. Currently, official articulation agreements are in place for two-year natural resource students transferring from specifically recognized programs at Allegany College, Maryland; Dabney Lancaster Community College, Virginia; Glenside State College, West Virginia; Penn State Mont Alto and Pennsylvania College of Technology, Pennsylvania, and Hocking College, Ohio, into the Division of Forestry and Natural Resources programs.

Accreditation of Forestry Programs

Two Programs, forest resources management and recreation, parks, and tourism resources, are accredited by the Society of American Foresters (SAF). SAF is recognized by the Council on Post-Secondary Accreditation and the U.S. Department of Education as the specialized accrediting body for forestry and natural resources programs in the United States.

The wood science and technology curriculum is accredited by the Society of Wood Science and Technology, the International Professional Society for Renewable Materials. It is one of only ten North American programs accredited.

Wildlife and Fisheries Resources offers a curriculum that meets the current professional certification coursework requirements for The Wildlife Society certification as a wildlife biologist and/or The American Fisheries Society’s professional certification as a fisheries biologist. Upon completion of the B.S. in Wildlife and Fisheries, students will have completed the coursework needed for certification by one or both societies depending upon the emphasis area the student chooses.

Summer Field Studies offered by the Division of Forestry and Natural Resources

The division offers a wide range of summer field study opportunities and international travel experiences for WVU students and division majors to gain valuable practical experience and apply what they’ve learned in the classroom. Every summer, a wide selection of field courses is offered through the off-campus Summer Programs office. These have included courses as varied as the Vegetation of WV to Stream Ecology to international expeditions to Fiji and Patagonia. For more information, see: http://www.forestry.caf.wvu.edu for details.

The six-hour Forest Resources Management Field Practice FMAN 400 course consists of a summer session and is designed for students who have completed the sophomore year of the forest resources management curriculum. Students live in Morgantown and travel daily to the University Research Forest for field studies. The course provides training in forest road layout and design, forest mensuration, GIS/GPS, forest management, and silviculture. Several trips are made to wood-using industries, the Fernow Experimental Forest, and to other forest operations and consultants to study current management techniques.

Students in the wood science and technology program are required to complete a three-hour internship, WDSC 491 Professional Field Practice, in the summer between the junior and senior years. Students obtain employment in a planned, paid work experience lasting at least ten weeks with a wood products company or government agency and are required to prepare progress reports and a final report for their academic advisor. Students in the wildlife and fisheries program are required to take a one- to three-hour internship, WMAM 491 Professional Field Experience. The RPTR 491 Internship is required of students who have completed the junior year of the recreation resources management curriculum. Eight weeks of full-time supervised professional field work is required of students who have completed the junior year of the recreation curriculum. The summer experiences acquaint students with management of park, recreation, and tourism enterprises.
Students in Wildlife and Fisheries Resources are also required to participate in a three-hour summer camp emphasizing field ecology and wildlife/fisheries sampling techniques between their freshman and sophomore years. This summer camp takes place immediately after the end of spring semester during a student’s freshman year. Students register for WMAN 205 during summer semester.

FACULTY

DIVISION DIRECTOR

• Joseph F. McNeel - Ph.D. (Virginia Tech)
  Professor, Forest Engineering, Forest Operation

PROGRAM COORDINATOR

• John R. Brooks - Ph.D. (University of Georgia)
  Forest Resources Management, Professor, Forest Biometrics
• David A. Smaldone - Ph.D. (University of Idaho)
  Recreation/Parks and Tourism, Leisure Studies
• James T. Anderson - Ph.D. (Texas Tech)
  Wildlife and Fisheries, Professor, Fisheries and Aquatic Ecology, Fish Management, Trophic Ecology
• Jingxin Wang - Ph.D. (University of Georgia)
  Wood Science, Professor, Forest Operations, Management, Bioenergy

PROFESSORS

• Benjamin E. Dawson-Andoh - Ph.D. (University of British Columbia)
  Wood Science (wood chemistry, wood preservation)
• John W. Edwards - Ph.D. (Clemson University)
  Wildlife and Fisheries (endangered species ecology and management, forest wildlife/habitat relationships)
• Kyle J. Hartman - Ph.D. (University of Maryland)
  Wildlife and Fisheries (Ecology)
• David W. McGill - Ph.D. (Pennsylvania State University)
  Forest Resources Management (extension specialist, forest resources, non-industrial private forestry)
• J. Todd Petty - Ph.D. (University of Georgia)
  Wildlife and Fisheries (fisheries and stream ecology)
• Steven W. Selin - Ph.D. (University of Oregon)
  Recreation, Parks and Tourism (human dimensions of natural resources, collaborative stewardship)
• Robert C. Whitmore - Ph.D. (Brigham Young University)
  Wildlife and Fisheries (wildlife management, avian ecology, quantitative ecology)

ASSOCIATE PROFESSORS

• Kathryn G. Arano - Ph.D. (Mississippi State University)
  Forest Resources Management (forest economics)
• Robert C. Burns - Ph.D. (Pennsylvania State University)
  Recreation, Parks and Tourism (leisure studies)
• Jinyang Deng - Ph.D. (University of Alberta)
  Recreation, Parks and Tourism (recreation and leisure studies)
• Chad D. Pierskalla - Ph.D. University of Minnesota
  Wildland Recreation Management and Policy

ASSISTANT PROFESSORS

• Gregory A. Dahle - Ph.D. (Rutgers University)
  Forest Resources Management (aboriculture)
• David B. DeVallance - Ph.D. (Oregon State University)
  Wood Science (sustainable product development)
• Kudzayi Maumbe - Ph.D. (Michigan State University)
  Recreation, Parks and Tourism (tourism marketing)
• Gloria S. Oporto - Ph.D. (University of Maine - Orono)
  Wood Science (wood-based composites and bioproducts)
• Kaushlendra Singh - Ph.D. (University of Georgia)
  Wood Science (biofuel and bioenergy production)
• Benjamin D. Spong - Ph.D. (Oregon State University)
  Wood Science (extension specialist, forest operations)
• Anthony C. Tomkowski - M.S.F. (West Virginia University)
  Forest Resources Management (forestry, fisheries, forest water quality)
• Amy B. Welsh - Ph.D. (University of California - Davis)
  Wildlife and Fisheries (ecology, conservation genetics)
• Nicolas P. Zegre - Ph.D. (Oregon State University)
  Forest Resources Management (forest hydrology)
• Mo Zhou - Ph.D. (University of Wisconsin)
  Forest Resources Management (forest economics)

RESEARCH ASSISTANT PROFESSORS
• Todd E. Katzner - Ph.D. (Arizona State University)
  Wildlife and Fisheries Resources (extension specialist)
• Stuart A. Moss - Ph.D. (West Virginia University)
  Forest Resources Management (forest business management)
• James S. Rentch - Ph.D. (West Virginia University)
  Forest Resources Management (forest ecology and management)

TEACHING ASSISTANT PROFESSOR
• George T. Merovich - Ph.D. (University of Arizona)
  Wildlife and Fisheries (fisheries and aquatic ecology, quantitative ecology)

ADJUNCT FACULTY
• Kelly Bricker - Ph.D. (Pennsylvania State University)
  Recreation, Parks and Tourism
• Adam E. Duerr - Ph.D. (University of Vermont)
  Wildlife and Fisheries
• Nathan J. Harlan - M.A. (Geneva College)
  Recreation, Parks and Tourism
• Patricia M. Mazik - Ph.D. (Memphis State University)
  Wildlife and Fisheries
• Gary Miller - Ph.D. (Virginia Tech)
  Forest Resources Management
• Margaret Pings - M.S. (West Virginia University)
  Recreation, Parks and Tourism
• Steven J. Storck - Ph.D. (West Virginia University)
  Recreation, Parks and Tourism
• Stuart A. Welsh - Ph.D. (West Virginia University)
  Wildlife and Fisheries
• Petra B. Wood - Ph.D. (University of Florida)
  Wildlife and Fisheries
• Sera J. Zegre - M.S. (Oregon State University)
  Recreation, Parks and Tourism

EMERITUS FACULTY
• James P. Armstrong - Ph.D. (State University of New York)
  Wood Science
• Eugene C. Bammel - Ph.D. (Syracuse University)
  Recreation, Parks, and Tourism
• Lei L. Bammel - Ph.D. (University of Utah)
  Recreation Parks and Tourism
• Samuel D. Brock - Ph.D. (University of Minnesota)
  Forest Resources Management
• Kenneth L. Carvell - D.For. (Duke University)
  Forest Resources Management
• Jack E. Coster - Ph.D. (Texas A&M University)
ABORICULTURE

MINOR CODE- U073

The minor in arboriculture is designed to provide students educational opportunities in the area of ornamental horticulture as it relates to current urban environments. Emphasis is given to the establishment and management of herbaceous and woody plants used in commercial, recreational, and home settings.

A minimum GPA of 2.0 is required in all minor courses

<table>
<thead>
<tr>
<th>Minor Requirements</th>
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</thead>
<tbody>
<tr>
<td>AGRN 410 Soil Fertility</td>
<td>3</td>
</tr>
<tr>
<td>FOR 205 Dendrology</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3</td>
</tr>
<tr>
<td>HORT 260 Woody Plant Materials</td>
<td></td>
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<tr>
<td>LARC 260 Ornamntl Woody Plant/Groundcovr</td>
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<tr>
<td>Select 9 hours from the following:</td>
<td>9</td>
</tr>
<tr>
<td>ENTO 404 Principles Of Entomology &amp; PPTH 401</td>
<td></td>
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<tr>
<td>&amp; PPTH 401 and General Plant Pathology</td>
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<tr>
<td>ENTO 470 Forest Pest Management</td>
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<tr>
<td>ENTO 471 Urban Tree and Shrub Health</td>
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<tr>
<td>FMAN 315 Survey of Arboriculture</td>
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<tr>
<td>FMAN 491 Professional Field Experience *</td>
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<tr>
<td>PLSC 491 Professional Field Experience *</td>
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<tr>
<td>PPTH 470 Forest Pest Management</td>
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<tr>
<td>PPTH 471 Urban Tree and Shrub Health</td>
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<tr>
<td>Select two of the following electives:</td>
<td>6</td>
</tr>
<tr>
<td>AGRN 315 Turfgrass Management</td>
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<tr>
<td>FMAN 440 Forestry Consulting</td>
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<tr>
<td>HORT 262 Herbaceous Plant Materials</td>
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<tr>
<td>HORT 441 Garden Center Management</td>
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</tbody>
</table>

Total Hours 24
* Must be related to an arboriculture topic and must be approved in advance by the director of the Division of Plant and Soil Sciences or the director of the Division of Forestry and Natural Resources.

**CONSERVATION ECOSYSTEM**

**MINOR CODE - U071**

This minor is designed to provide students specialized knowledge and skills in the area of conservation ecology. Completion of this minor allows new career opportunities, enhances lifelong learning, and promotes the role of an informed and active citizen.

<table>
<thead>
<tr>
<th>Minor Requirements</th>
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<tbody>
<tr>
<td>WMAN 150 Principle-Conservation Ecology 3</td>
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<tr>
<td>WMAN 200 Restoration Ecology 3</td>
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<tr>
<td>WMAN 313 Wildlife Ecosystem Ecology 4</td>
</tr>
<tr>
<td>WMAN 421 Renwabl Resources Policy/Govrn 3</td>
</tr>
<tr>
<td>Select one of the Following: 3-4</td>
</tr>
<tr>
<td>GEN 371 Principles of Genetics</td>
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<tr>
<td>WMAN 330 Conservation Genetics</td>
</tr>
</tbody>
</table>

Total Hours 16-17

**FOREST RESOURCE MANAGEMENT**

**MINOR CODE - U090**

The minor in Forest Resources Management is designed to provide students educational opportunities in the area of forest resources management. Emphasis is given to those courses that provide a specific skill set or knowledge base needed to understand sustainable forest management in the Appalachian region. This minor requires a grade of C or higher in each course.

A grade of C or higher must be earned in all minor courses

<table>
<thead>
<tr>
<th>Minor Requirements</th>
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</thead>
<tbody>
<tr>
<td>FMAN 212 Forest Ecology 3</td>
</tr>
<tr>
<td>FMAN 222 Forest Mensuration 4</td>
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<tr>
<td>FMAN 311 Silvicultural Systems 4</td>
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<tr>
<td>FMAN 433 Forest Management 3</td>
</tr>
<tr>
<td>FOR 205 Dendrology 3</td>
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<tr>
<td>Select one of the following: 3</td>
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<tr>
<td>FHYD 444 Watershed Management</td>
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<tr>
<td>FMAN 330 Principles-Forestry Economics</td>
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<tr>
<td>FMAN 440 Forestry Consulting</td>
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<tr>
<td>FOR 326 Remote Sensing of Environment</td>
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<tr>
<td>FOR 421 Renwabl Resources Policy/Govrn</td>
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<tr>
<td>WDSC 422 Harvesting Forest Products</td>
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<tr>
<td>WDSC 423 Forest Roads</td>
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</tbody>
</table>

Total Hours 20

**RECREATION,PARKS & TOURISM RESOURCES**

**MINOR CODE - U085**

The minor in Recreation, Parks, and Tourism Resources is designed to provide students with specialized knowledge and skills that may open the door to new career opportunities, enhance lifelong learning, and promote their role as an informed and active citizen. The minor emphasizes the ecological, economic, and social psychological aspects of managing outdoor recreation and tourism resources. A grade of "C" or higher must be earned in all courses counted toward the minor.

<table>
<thead>
<tr>
<th>Minor Requirements</th>
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</thead>
<tbody>
<tr>
<td>RPTR 142 Intro:Recreation/Parks/Tourism 2</td>
</tr>
<tr>
<td>RPTR 239 Sustainable Tourism Development 3</td>
</tr>
<tr>
<td>RPTR 242 Environment/Culturl Interpret 3</td>
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<tr>
<td>RPTR 335 Mang-Recretn/Park/Toursm Orgn 3</td>
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</tbody>
</table>
SUSTAINABLE LOW-RISE RESIDENTIAL CONSTRUCTION

MINOR CODE - U126

This minor is designed to provide students with a background in sustainable low-rise residential (i.e. single family, multi-family town houses and 2-3 story apartment buildings) construction materials and practices.

- WDSC 245 Residential Building Materials 3
- WDSC 320 Sustainable Construction 3
- SAFM 470 Managing Construction Safety 3

A minimum of nine hours selected from the following:
- WDSC 225 Finished Wood Products
- WDSC 341 Wood Mechanics
- ID 240 Codes/Interior Construction
- ID 325 Computer-Aided Drafting/Design
- DSGN 293 Special Topics

Total Hours: 18

WILDLIFE AND FISHERIES RESOURCES MANAGEMENT

MINOR CODE - U044

The Wildlife and Fisheries Resources minor is designed to provide students with the necessary background and skills to effectively conserve and manage fish and wildlife habitats and populations. A minimum GPA of 2.0 is required in all minor courses.

Minor Requirements
- WMAN 175 Intro to Wildlife & Fisheries 3
- WMAN 224 Vertebrate Natural History 3

Select Three of the following courses:
- WMAN 300 Wildlife/Fisheries Techniques
- WMAN 313 Wildlife Ecosystem Ecology
- WMAN 330 Conservation Genetics
- WMAN 425 Mammalogy
- WMAN 426 Ornithology
- WMAN 445 Intro/Fisheries Management
- WMAN 446 Limnology
- WMAN 450 Adv Wildlife/Fisheries Mang-CAP

Total Hours: 15-18

WOOD SCIENCE AND TECHNOLOGY

The minor in Wood Science and Technology is designed to provide students with specialized knowledge and skills in the properties, manufacture, and utilization of wood and related biomaterial products. Emphasis is given to courses that provide a fundamental education in the properties of wood, manufacturing processes for wood-based materials, and utilization of wood materials.

MINOR CODE - U045

A minimum GPA of 2.0 is required in all minor courses

Required Courses
- WDSC 223 Wood Anatomy and Structure 3

Select one of the following.
- WDSC 340 Physical Properties of Wood 3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WDSC 341</td>
<td>Wood Mechanics</td>
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<tr>
<td>WDSC 413</td>
<td>Wood Chemistry</td>
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</tbody>
</table>

Select four of the following: **12**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>WDSC 100</td>
<td>Forest Resources in US History</td>
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<tr>
<td>WDSC 232</td>
<td>Wood Grading &amp; Procurement</td>
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<tr>
<td>WDSC 320</td>
<td>Sustainable Construction</td>
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<tr>
<td>WDSC 330</td>
<td>Wood Machining</td>
<td></td>
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<tr>
<td>WDSC 337</td>
<td>Wood Adhesion &amp; Finishing</td>
<td></td>
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<tr>
<td>WDSC 340</td>
<td>Physical Properties of Wood</td>
<td></td>
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<tr>
<td>WDSC 341</td>
<td>Wood Mechanics</td>
<td></td>
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<tr>
<td>WDSC 351</td>
<td>Forest Products Protection</td>
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<tr>
<td>WDSC 362</td>
<td>Forest Product Decision-Making</td>
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<tr>
<td>WDSC 413</td>
<td>Wood Chemistry</td>
<td></td>
</tr>
<tr>
<td>WDSC 422</td>
<td>Harvesting Forest Products</td>
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<tr>
<td>WDSC 465</td>
<td>Wood-Based Composite Materials</td>
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</tbody>
</table>

**Total Hours** **18**

**FOREST MANAGEMENT COURSES**

**FMAN 212. Forest Ecology. 3 Hours.**
PR: FOR 205. Forest and environment factors; site and type characteristics.

**FMAN 222. Forest Mensuration. 4 Hours.**
PR: MATH 155 and STAT 211. Estimating volume and growth of trees and forest stands with emphasis on the mathematical and statistical techniques involved. Laboratories include practical field experience.

**FMAN 251. Forest Fire Protection. 2 Hours.**
Prevention, detection, and control of wildfires. Forest fuels, fire weather, and wildfire behavior. Use of fire for forest management purposes.

**FMAN 311. Silvicultural Systems. 4 Hours.**
PR: FOR 205 and (FMAN 212 and FMAN 222) or WMAN 313. The theory and practice of controlling forest stand establishment, composition, structure, and growth. Systems include: reproduction methods, release operations, and intermediate treatments. Pre-requisite(s) and/or co-requisite(s) may differ on regional campuses.

**FMAN 315. Survey of Arboriculture. 1 Hour.**
PR: HORT 260 or FOR 205. A self-study seminar that surveys the principles and practices involved in the field of arboriculture with major emphasis on the urban landscape.

**FMAN 320. Arboriculture & Urban Trees. 3 Hours.**
This course will discuss the biology and management (selection, maintenance and preservation) of landscape trees. Students will learn how to prune, install, evaluate risk and preserve individual trees in the landscape.

**FMAN 322. Advanced Forest Measurements. 3 Hours.**
PR: FMAN 222 or equivalent. Measurement and computer simulation of forest growth; principles of growth and yield; statistical methods applied to forest measurement problems.

**FMAN 330. Principles-Forestry Economics. 4 Hours.**
PR: (ECON 201 or ARE 150) and ECON 202. Production, distribution and use of forest goods and services. Emphasis on methods and problem solving techniques in the economic aspects of forestry.

**FMAN 400. Forest Resource Mang Field Prct. 6 Hours.**
PR: CE 200 and FMAN 322. Application and study of forest management practices with emphasis on field problems, including a one-week trip to observe forestry outside the Appalachian hardwood region. (Course will be taught during five consecutive six-day weeks.).

**FMAN 413. Regional Silviculture. 3 Hours.**
PR: FMAN 212 and PR or CONC: FMAN 311 or FOR 310 and Forestry major or consent. Major forest types of the United States; their composition, management, problems, and silvicultural treatment.

**FMAN 423. Urban Forest Management. 3 Hours.**
We will discuss the management of trees in the developed landscape. The focus will include trees growing along city streets, residential landscapes, parks and corporate/academic campus.

**FMAN 433. Forest Management. 3 Hours.**
FMAN 434. Forest Resources Mang Planning. 3 Hours.
PR: FMAN 322 and FMAN 400 and FMAN 311 and PR or CONC: (ENTO 470 or PPTH 470) and FMAN 330. Integrated planning of long-term management of forest resources. Development of a management plan for an actual forest tract. Emphasis on biological, social, economic and ethical considerations in decision-making.

FMAN 440. Forestry Consulting. 3 Hours.
PR: FMAN 311 and FMAN 330 or consent. The application of forest management principals and business concepts to the consulting forestry profession. Topics include: natural resource inventories, timberland appraisals, timber sale administration, and forest management planning.

FMAN 450. Forest Valuation & Investment. 3 Hours.

FMAN 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

FMAN 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

FMAN 493A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

FMAN 494A-Z. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.

FMAN 496. Senior Thesis. 1-3 Hours.
PR: Consent.

FMAN 498A-Z. Honors. 1-3 Hours.
PR: Students in Honors Program and consent by the honors director. Independent reading, study or research.

FORESTRY COURSES

FOR 101. Careers-Natrl Resources Mang 1. 1 Hour.
(Required only for students who rank as freshman in the Division of Forestry.) An introduction to professional activities in forest resources management, recreation and parks management, wildlife and fisheries management, and wood science and utilization. Survey of major issues in natural resources management and conservation.

FOR 140. W Va Natural Resources. 3 Hours.
Survey of policies and practices in development and use of soil, water, forest, wildlife, mineral, and human resources in West Virginia.

FOR 203. Careers-Natrl Resources Mang 2. 1 Hour.
Planning a career in forestry and natural resources professions. Developing a career strategy, resume building, and conducting a successful job search.

FOR 205. Dendrology. 3 Hours.
Classification and silvical characteristics of North American forest trees.

FOR 206. Winter Dendrology. 1 Hour.
PR: FOR 205 or equivalent. Field identification and classification of North American forest trees during leaf-off condition.

FOR 240. Intro Computing -Ntrl Resource. 3 Hours.
Introduction to computer applications in natural resource management. Emphasis on MS Excel statistical analysis tools, MS Access, Visual Basic Programming, hand held PCs and application examples.

FOR 293A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

FOR 310. Elements of Silviculture. 3 Hours.
PR: FOR 205 Basics of mensuration, site quality, tree and stand growth, forest structure, and development, intermediate treatments, natural disturbances and regeneration ecology, silviculture systems.

FOR 326. Remote Sensing of Environment. 3 Hours.
PR: (MATH 126A or MATH 126B or MATH 126C) and MATH 128. Measurement and interpretation of natural resources and environment from photography and radar, infrared, and microwave imagery.

FOR 340. Nat Resources Entrepreneurship. 3 Hours.
Principles of small business start-up, organization, marketing, finance, and management with an emphasis on natural resource-based enterprises.

FOR 421. Renwabl Resourcs Policy/Govrnc. 3 Hours.
PR: Consent. Forest, wildlife, fisheries, and recreation resource policies of world, with an emphasis on the U.S.: important federal and state laws; governance of public and private lands and renewable natural resources. (Crosslisted with WMAN 421.).
FOR 424. Vegetation of West Virginia. 3 Hours.
PR: FOR 205. Basics of plant taxonomy and community ecology use of technical field keys, study of selected plant families, field trips to unusual and/or important plant communities and forest types in West Virginia. (Summer, off campus.).

FOR 425. Global Forest Resources. 3 Hours.
Significance of renewable natural resources on a global scale and the ecological, economic, and social contexts in which they are managed. Emphasis is on world forest resources, including timber, wildlife, and social uses.

FOR 426. Global Forest Resources Practicum. 3 Hours.
PR: Consent. An intensive field practicum abroad provides students with experiential learning opportunities of global approaches to forest management, and imparts the historical context necessary for an appreciation of cultural diversity.

FOR 438. Human Dimensions of Natural Resource Management. 3 Hours.
This class is designed to provide junior-and-senior level forestry and natural resource management majors with a repertoire of social and communication knowledge and skills such as public facilitation, public participation, social impact assessment, conflict management, and collaborative planning techniques.

FOR 470. Problems: Wood Science/Wildlife. 1-4 Hours.
PR: Forestry senior or consent.

FOR 470A. Problems. 1-4 Hours.
PR: Forestry senior or consent.

FOR 470B. Problems: Freshwater Fishing. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470C. Problems: Forestry/Wildlife Rec. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470D. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470E. Problems: Intro To Birdwatching. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470F. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470G. Problems: Forest Biometrics. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470H. Problems: Phil Foundations-Rec/Parks. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470I. Problems: Orientation Natl Resource. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470J. Problems: Forestry Journalism. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470K. Problems: Social Research Methods. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470L. Problems: Aboriculture. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470M. Problems: Meanings of Place. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470N. Problems: Evaluation-Parks/Recreation. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470O. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470P. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470Q. Problems: Public Relations-Natural Resource. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470R. Problems: Principles-Experiential Ed. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470S. Problems. 0-4 Hours.
PR: Forestry senior or consent.
FOR 470T. Prbml:Forestry Journalism. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470U. Prbms:Fld Tree Idntfctn Pract. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470V. PRBLM:GPS Use & Applications. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470W. Prblm:Interpretive Graphics. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470X. Prblms:Phil Foundtns-Rec/Parks. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470Y. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 470Z. Problems. 0-4 Hours.
PR: Forestry senior or consent.

FOR 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

FOR 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

FOR 492A-Z. Directed Study. 1-3 Hours.
Directed study, reading, and/or research.

FOR 493A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

FOR 494A-Z. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.

FOR 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

FOR 496. Senior Thesis. 1-3 Hours.
PR: Consent.

FOR 498A-Z. Honors. 1-3 Hours.
PR: Students in Honors Program and consent by the honors director. Independent reading, study or research.

WILDLIFE AND FISHERIES MGMT COURSES

WMAN 100. The Tradition of Hunting. 3 Hours.
Introduction to the cultural and spiritual role of hunting; use of hunting as a wildlife management tool; and its economic value in wildlife conservation programs. Includes discussions on gun control, anti-hunting, and animal rights.

WMAN 150. Principle-Conservation Ecology. 3 Hours.
Overview of the science of conservation ecology with emphasis on the concepts of biological diversity, extension, habitat loss and fragmentation, establishment of protected areas, endangered species, and establishment and preservation of new populations.

WMAN 160. Ecology of Invading Species. 3 Hours.
Survey of invasive/exotic plant and animal species and their effects on native ecosystems, including the breakdown of natural barriers to invasion by the increase of world commerce which unifies widely dispersed resources.

WMAN 175. Intro to Wildlife & Fisheries. 3 Hours.
Introduction to the study and management of wildlife and fisheries resources of the Appalachians. Includes an overview of resource management history, career opportunities, natural resources policy, and the basic life of birds, mammals, and fishes.

WMAN 200. Restoration Ecology. 3 Hours.
Principles and practice of restoring natural ecosystem function, structure, and integrity.

WMAN 205. Wildlife-Fisheries Camp. 3 Hours.
A course in field ecology and wildlife/fisheries sampling techniques. Designed to introduce the beginning wildlife conservation professional to the science of collecting data on wildlife and fish populations in their natural habitats.

WMAN 221. Interpretive Bird Study. 3 Hours.
PR: BIOL 117 or consent. Intensive field studies in recognition through sight, song, and behavioral patterns of birds, and their ecology in the Central Appalachians. (2 hr. lec, 2 hr. lab.).
WMAN 224. Vertebrate Natural History. 3 Hours.
PR: BIOL 117 or consent. Relationships of fish, amphibians, and reptiles to the forest, with emphasis on the ecology, taxonomy, evolution, natural history, and field identification of these groups. Laboratory emphasizes natural history and anatomy of fish, amphibians, and reptiles.

WMAN 234. Forest Wildlife Management. 3 Hours.
Principles and problems of forest wildlife management with emphasis on habitat management at the stand and landscape levels. Habitat manipulations through use of appropriate silvicultural practices, wildlife enhancement techniques, and regulations are evaluated.

WMAN 250. Big Game Ecology & Management. 3 Hours.
Intensive field trip and online material emphasizing white tailed deer and black bear ecology with additional material on western game species and exotics.

WMAN 260. Waterfowl Ecology. 3 Hours.
Intensive field-trip and on-line material emphasizing the ecology of waterfowl and management of wetland habitats.

WMAN 293A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

WMAN 300. Wildlife/Fisheries Techniques. 3 Hours.
PR: WMAN 150 and WMAN 175 and WMAN 224 and WMAN 234 and FOR 205. Field and laboratory techniques for the scientific management and evaluation of wildlife and fisheries resources.

WMAN 313. Wildlife Ecosystem Ecology. 4 Hours.
PR: BIOL 115 and BIOL 117. Basic principles of ecosystem, community, and population ecology. Emphasizing structure, function, succession, physiological ecology, population growth and regulation, and systems modeling.

WMAN 314. Marine Ecology. 3 Hours.
Study of key coastal species and their interactions. Self-paced lectures and exercises culminating with one-week capstone trip to Atlantic coast for hands-on study of invertebrates, coastal fishes and birds, and marine ecology.

WMAN 330. Conservation Genetics. 3 Hours.
PR: BIOL 101 and BIOL 102 or equivalent or higher and (MATH 126A or MATH 126B or MATH 126C). Introduction to the principles of modern genetics needed to understand and manage important challenges in conservation of biodiversity including game, non-game, and endangered/threatened species. Also listed as GEN 330.

WMAN 421. Renewable Resources Policy/Gov. 3 Hours.
PR: Consent. Forest, wildlife, fisheries, and recreation resource policies of the world, with an emphasis on the U.S. important federal and state laws; governance of public and private lands and renewable natural resources. (Crosslisted with FOR 421.)

WMAN 425. Mammalogy. 3 Hours.
PR: BIOL 117 or consent. Mammals and their biological properties with emphasis on life history, ecology, and distribution of regional forms.

WMAN 426. Ornithology. 3 Hours.
PR: BIOL 115 and BIOL 117 or consent. Identification, distribution, and ecology of birds (particularly of forest lands.) (2 hr. lec, 1 hr. lab.).

WMAN 431. Wildlife Habitat Techniques. 3 Hours.
PR: Wildlife major or consent; WMAN 313 and FOR 205. Field and laboratory techniques necessary in management and study of wildlife; collection of field data, mapping, censusing, habitat evaluation, wetland delineation, use of literature and scientific writing.

WMAN 445. Intro/Fisheries Management. 3 Hours.
PR: WMAN 224 or consent. Basic principles of management of fishery resources, with an emphasis on freshwater stocks. Includes current environmental and management issues, concepts, and methods used in management of commercial and recreational fisheries.

WMAN 446. Limnology. 4 Hours.
PR: (BIOL 101 and BIOL 103) or WMAN 224 or consent. Physical, chemical, and biological characteristics of inland waters with emphasis on the structure and function of stream ecosystems.

WMAN 449. Stream Ecosystem Assessment. 3 Hours.
Self-paced lectures and exercises culminating in a one-week trip to the mountains of West Virginia for hands-on study of stream fishes, invertebrates, water and habitat quality, geomorphology, and ecology.

WMAN 450. Adv Wildlife/Fishery Mang-CAP. 4 Hours.
PR: WMAN 300. Principles and practices of wildlife and fisheries habitat and species management.

WMAN 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

WMAN 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

WMAN 492A-Z. Directed Study. 1-3 Hours.
Directed study, reading and/or research.
WMAN 493A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

WMAN 494A-Z. Seminar. 1-3 Hours.
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WMAN 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

WMAN 496. Senior Thesis. 1-3 Hours.
PR: Consent.

WMAN 498A-Z. Honors. 1-3 Hours.
PR: Students in the Honors Program and consent by the honors director. Independent reading, study or research.

WOOD SCIENCE COURSES

WDSC 100. Forest Resources in US History. 3 Hours.
Examines human use of forest resources in America from pre-Colombian times to present. Exploration of factors that impact the use of wood products.

WDSC 223. Wood Anatomy and Structure. 3 Hours.
PR: FOR 205. Anatomy and structure of commercial wood species of the U.S. Survey of basic properties of wood.

WDSC 225. Finished Wood Products. 3 Hours.
Exploration of the different materials used in low-rise residential and commercial construction applications for finishing and design aspects. Emphasis will be placed on wood products.

WDSC 232. Wood Grading & Procurement. 3 Hours.
PR: Forestry major or consent. Conversion and grading of raw materials in log form to primary wood products. Introduction to timber procurement systems.

WDSC 245. Residential Building Materials. 3 Hours.
Exploration of the different building materials used in residential and commercial construction. Emphasis will be placed on solid and engineered wood products as well as their manufacturing processes.

WDSC 293A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

WDSC 320. Sustainable Construction. 3 Hours.
Introduction to common building practices used in residential construction with emphasis on sustainable, "green" construction.

WDSC 330. Wood Machining. 3 Hours.
Introduction to basic concepts of wood machining with emphasis on production equipment and furniture manufacturing. Special topics of wood joining techniques and methods. Analysis of operational safety, health hazards and accident prevention. (Fall of even years.).

WDSC 337. Wood Adhesion & Finishing. 3 Hours.
PR: Wood Industry major or consent; WDSC 223. Fundamentals of the bonding and finishing of wood including preparation, processing, and evaluation of adhesive and finishing systems.

WDSC 340. Physical Properties of Wood. 3 Hours.
PR: WDSC 223. Specific gravity and density of wood; relationships between wood and liquids and applications in wood seasoning; thermal electrical and acoustical properties.

WDSC 341. Wood Mechanics. 3 Hours.
PR: Wood science major or consent; and WDSC 223, and MATH 155, and PHYS 101. Introduction to static properties of selections, elementary mechanics of deformable bodies, axial loading, column and beam analysis, and design considerations. (2 hr. lec., 1 hr. lab.).

WDSC 332. Forest Products Protection. 3 Hours.
PR: WDSC 223. Biological organisms responsible for deterioration of wood products, their control by preservative methods, and study of fire retarding methods.

WDSC 362. Forest Product Decision-Making. 4 Hours.
PR: Junior standing in forestry and MATH 155 and STAT 211. Use of decision making tools and techniques by forest products industry professionals, including examples of control chart techniques and acceptance sampling techniques, simulation modeling, linear programming, forecasting and network analysis. (4 hr. lec.).

WDSC 400. Forest Measurement Field Pract. 3 Hours.
PR: Wood industry major and FOR 205 and FMAN 322 and CE 200. Application of surveying and mensurational practices with emphasis on field problems.

WDSC 430. Wood Industries Field Trip. 1 Hour.
A one-week trip to observe manufacturing methods and techniques of commercial wood industry plants. Plants visited include furniture, plywood, veneer, hardboard, pulp and paper, sawmilling, and preservation.
WDSC 413. Wood Chemistry. 3 Hours.
PR: Wood science major or consent, and CHEM 231 or CHEM 233. Chemical composition of wood including cellulose, hemicellulose, and extractives. Chemical processing of wood.

WDSC 422. Harvesting Forest Products. 3 Hours.
PR: MATH 128 or equivalent and WDSC 232. Analysis of ground-based and cable harvesting systems, including time and motion studies, productivity and cost analysis, occupational safety and health, environmental issues, equipment evaluation and selection, and trucking of forest products. (2 hr. lec., 1 hr. lab.).

WDSC 423. Forest Roads. 4 Hours.
PR: CE 200 and CS 101. A study of techniques and methods of design, layout and construction details of various standards of forest roads.

WDSC 444. Bio-based Energy Systems. 3 Hours.
Introduction to biomass feedstock production for bioenergy application, preprocessing and characterization, biofuel conversion technologies, economic and environmental impacts, and greenhouse gas emissions.

WDSC 460. Plant Layout Wood Industries. 3 Hours.
PR: Senior standing. Relates knowledge of wood product processes to optimize production. Study of proper arrangement of machines, and work and storage areas.

WDSC 465. Wood-Based Composite Materials. 3 Hours.
PR: WDSC 232 and WDSC 340 and WDSC 341. Fundamentals of manufacturing wood-based composite materials, including processing, products, evaluation, and applications in the marketplace. (2 hr. lec., 1 hr. lab.).

WDSC 470. Marketing Forest Products. 3 Hours.
This course will examine techniques used by the forest products industry to market commodity, value-added specialty, and sustainable (i.e., "green") products.

WDSC 480. Senior Projects 1 - CAP. 2 Hours.
Senior project requires students to identify manwood science related problem, perform a literature review, and develop a plan for research to be completed in WDSC 481.

WDSC 481. Senior Projects 2 - CAP. 2 Hours.
PR: WDSC 480. Senior project requires students to use knowledge from other courses to conduct research proposed in WDSC 480 and analyze results and prepare a technical report.

WDSC 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

WDSC 491. Professional Field Experience. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

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WDSC 496. Senior Thesis. 1-3 Hours.
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