Natural Resources Science, Ph.D.

Degree Offered

- Doctor of Philosophy

Areas of Emphasis Offered

- Forest Resource Management
- Recreation, Parks, and Tourism Resources
- Wildlife and Fisheries Resources
- Wood Science and Technology

Within these major fields of study, specialization is limited only by the range of competencies in the graduate faculty.

Nature of the Program

The Ph.D. in Natural Resources Science is an interdisciplinary program that allows doctoral students the opportunity to specialize in a range of competencies. As a graduate student in the School of Natural Resources, you’ll advance your research knowledge and prepare to become a leader in your chosen field. With the guidance and support of faculty mentors, you’ll develop an advanced understanding of and appreciation for the principles of economics, stewardship and sustainability of our natural resources.

Admissions

A regular graduate student is a degree-seeking student who meets all the criteria for regular admission to a program of their choice and be under no requirements to make up deficiencies.

For regular admission, a student must:

- Possess a baccalaureate degree from a college or university and have at least a grade point average of 2.75 on a 4.0 scale (or an average of 3.0 or higher for the last sixty credit hours).
- Provide three letters of reference from persons acquainted with the applicant’s professional work, experience, or academic background.
- Submit a written statement of 500 words or more indicating the applicant’s goals and objectives relative to receiving a graduate degree, and identify a potential faculty advisor.
- Have an adequate academic aptitude at the graduate level as measured by the Graduate Record Examination (GRE) or the New Medical College Admissions Test (New MCAT).

* International students have the additional requirement to submit a minimum score of 550 on the paper TOEFL examination or 213 on the electronic TOEFL examination if their native language is not English.

A student seeking admission for a Ph.D. in Forest Resources Science degree may choose a major field of study in forest resource management; recreation, parks, and tourism resources; wood science and technology; or wildlife and fisheries resources. Within these major fields of study, specialization is limited only by the range of competencies in the graduate faculty.

Major Code: 0738

A candidate for the Ph.D. degree in Natural Resources Science must meet all University, College, Division, and Program requirements as outlined in the WVU Graduate catalog.

Program Requirements

All Ph.D. degree students are required to follow a planned program of study. The student develops the plan of study during their first year in the program in conjunction with the graduate committee. The plan must be approved by the Director of the Division and the Associate Dean for Academic Affairs of the Davis College.

A minimum cumulative GPA of 3.0 is required in all courses applied toward degree requirements.

Course Requirements as determined by the Plan of Study

<table>
<thead>
<tr>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidacy Exam</td>
</tr>
<tr>
<td>Dissertation</td>
</tr>
<tr>
<td>Dissertation Defense</td>
</tr>
</tbody>
</table>
Curriculum requirements for all Ph.D. candidates include a block of graduate courses in the major field, which will constitute a comprehensive review of the significant knowledge in that field and a block of graduate courses in a minor field of study. A minimum of sixty semester hours beyond the bachelor’s degree and exclusive of the dissertation is required.

**DISSERTATION AND FINAL EXAMINATION**

The research work for the doctoral dissertation must show a high degree of scholarship and must present an original contribution to the field of forest resources science. In addition to coursework and the dissertation, the candidate is required to pass a qualifying examination and a final examination.

**Major Learning Outcomes**

**NATURAL RESOURCES SCIENCE**

To train students to become leaders in sub-fields within the broad area of Natural Resources Science (in one of four program areas: Forest Resource Management; Recreation, Parks and Tourism Resources; Wildlife and Fisheries Resources; and Wood Science and Technology).

To prepare students for assuming positions in academia, industry, government, or nonprofit agencies. Within this framework the learning outcomes of the PhD in Natural Resources Science are to develop students that demonstrate the following abilities:

1. Conduct independent, novel research in their sub-discipline.
2. Interpret and critically evaluate the existing literature published within their field.
3. Demonstrate critical thinking skills for application of statistics.
4. Effectively communicate their research in oral and written formats.

**FOREST MANAGEMENT COURSES**

**FMAN 512. Silvicultural Practices for Hardwood Forest Types. 3 Hours.**
PR: FMAN 311. Designing proper silvicultural systems for managing Appalachian hardwood stands; reconstructing stand histories, recognizing problems, and prescribing appropriate silvicultural treatment.

**FMAN 523. Advanced Urban Forest Management. 3 Hours.**
Introduction to management of tree in developed landscapes (City streets, residential landscapes, parks, and corporate/academic campuses); review of urban forest management; strategies and concepts for urban tree management.

**FMAN 540. Current Issues in Forest Management. 3 Hours.**
PR: Consent. Analysis of environmental issues in forest management and current controversies surrounding the management of forested lands. Emphasis on traditional and ecosystem-based forest management policy, philosophy, and practices.

**FMAN 591. Advanced Topics. 1-6 Hours.**
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

**FMAN 593. Special Topics. 1-6 Hours.**
A study of contemporary topics selected from recent developments in the field.

**FMAN 611. Advanced Forest Ecology. 3 Hours.**
PR: FMAN 212 or equivalent; FMAN 311. Ecological relationships in forests with emphasis on biogeochemical cycles.

**FMAN 631. Forest Stand Dynamics. 3 Hours.**
PR: Undergraduate courses in ecology or silviculture, and statistics. Examination of the processes causing temporal and spatial changes in communities of trees including: stand establishment, growth, competition, disturbance and mortality. Labs focus on the quantification of stand development patterns.

**FMAN 640. Advanced Forest Biometrics. 3 Hours.**
PR: FMAN 222 and STAT 511. Review and application of mathematical and statistical models used in forest volume, taper and height estimation procedures.

**FMAN 641. Forest Growth a Yield Modeling. 3 Hours.**
PR: FMAN 640. Review and application of mathematical and statistical models used in forest growth and yield modeling.

**FMAN 644. Forest Growth and Yield Modeling. 3 Hours.**
PR: FMAN 640. Review and application of mathematical and statistical models used in forest growth and yield modeling.

**FMAN 650. Forest Valuation and Investment. 3 Hours.**
Asset valuation concepts, with special emphasis on forests. Financial analyses of forest operations. Concepts and strategies in forestland investment and portfolio management.

**FMAN 693. Special Topics. 1-6 Hours.**
A study of contemporary topics selected from recent developments in the field.

**FMAN 695. Independent Study. 1-9 Hours.**
Faculty-supervised study of topics not available through regular course offerings.
FMAN 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

FMAN 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of forest management. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.)

FMAN 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

FMAN 792. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

FMAN 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

FMAN 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

FMAN 796. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

FMAN 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

FORESTRY COURSES

FOR 525. 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.

FOR 575. Forest Soils: Ecology and Management. 3 Hours.
PR: AGRN 410 or AGRN 425 or consent. Properties, nutrient cycling processes, and sustainable management of forest soils, with examples from the most important wood fiber producing regions of the U.S.: the southeast, Pacific Northwest, and the central hardwood forest.

FOR 590. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of forestry. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.)

FOR 591. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

FOR 592. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

FOR 593. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

FOR 594. Seminar. 1-6 Hours.
Special seminars arranged for advanced graduate students.

FOR 595. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

FOR 596. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.
FOR 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

FOR 698. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

FOR 699. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use of the University's facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department's 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is S/U; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.

FOR 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

FOR 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

FOR 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

RECREATION PARKS TOURISM RES COURSES

RPTR 536. Sustainable Trails: Engagement. 3 Hours.
Develop management plans, incorporate interpretive signage, and activate greenspace and public trails with civic engagement while planning for post-construction maintenance. Online, 3 credit hour graduate course, cross listed with RPTR 436 (for undergraduate students).

RPTR 570. Meanings of Place. 3 Hours.
Study of place as a psychological and social phenomenon with implications for community development, historic preservation, interpretation design, management, natural and cultural sustainability, and human well-being. (Equivalent to LARC 570.).

RPTR 608. Recreation and Park Management Practicum. 2-4 Hours.
PR: Consent. Field experience and conference in the study, analysis, and solution of management problems in private, commercial and governmental recreation and park organizations.

RPTR 680. Non-Personal Interpretation. 3 Hours.
This course focuses on the theoretical underpinnings and application of non-personal communication methods. This is a project-based course about interpreting historical, cultural, and natural resources.

RPTR 685. Personal Interpretation. 3 Hours.
This course focuses on the theoretical underpinnings and applications of personal communication methods. This is a project-based course about interpreting historical, cultural, and natural resources.

RPTR 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

RPTR 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

RPTR 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading will be S/U.)

RPTR 714. Outdoor Recreation Behavior. 3 Hours.
This course explores the biophysical, psychological, social psychological, and sociological constructs that contribute to a contemporary, interdisciplinary understanding of outdoor recreation behavior. These concepts will be related to recreation resource management.

RPTR 715. Leisure and Recreation. 3 Hours.
PR: Consent. Study of leisure as a social phenomenon and its implications for recreation.

RPTR 718. Participatory Approaches Natural Resource Management. 3 Hours.
This seminar style class focuses on the adoption of more participatory approaches to managing natural resources. Specific topics will include the use of advisory committees, mediating conflicts, facilitation skills, management partnerships and public participation plans.

RPTR 738. Tourism Planning. 3 Hours.
Use of natural settings; integration of tourism development with respect to environmental protection concerns. (Field trip required; some transportation and food costs.).
RPTR 752. Tourism and Natural Resources Marketing. 3 Hours.
Apply the principles of marketing to tourism and natural resources emphasizing the convergence of increasing tourism demand and destination/resource competitiveness and sustainability.

RPTR 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in college teaching of recreation, parks, and tourism resources. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading may be S/U.).

RPTR 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

RPTR 792. Directed Study. 1-6 Hours.
Directed study, reading, and/or research.

RPTR 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

RPTR 795. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

RPTR 796. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

RPTR 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.).

WILDLIFE AND FISHERIES MGMT COURSES

WMAN 512. Advanced Wildlife Population Ecology. 3 Hours.
PR: WMAN 313 or equivalent, or consent. Case history approach to wildlife population ecology with emphasis on ungulates, gallinaceous birds, large predators; forest invertebrates and their vertebrate predators; endangered species; genetics and conservation of wildlife populations. Emphasis on current and historical literature. (3 hr. lec.).

WMAN 534. Ecology and Management of Upland Wildlife. 4 Hours.
PR: Consent. Ecology and management of upland game birds and mammals with emphasis on recent literature. (Offered in fall of even years.).

WMAN 536. Ecology and Management of Wetland Wildlife. 4 Hours.
PR: Consent. Ecology and management of waterfowl and wetland fur bears with emphasis on recent research and management literature.

WMAN 547. Applied Wetlands Ecology and Management. 3 Hours.
The management and ecology of wetland vegetation, soils, hydrology, and wildlife. (Cross listed as CE 547 and PLSC 547.).

WMAN 550. Fish Ecology. 3 Hours.
PR: WMAN 445. Study of the interrelations between fish and the biotic and abiotic environment and the influence of these interactions upon fisheries. Includes trophic dynamics, reproductive ecology, predatory-prey interactions, and anthropogenic factors.

WMAN 593. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

WMAN 630. Conservation Genetics. 3 Hours.
Study of population genetic concepts relevant to small fish and wildlife populations, with a focus on interpretation of the management implications of genetic data and current application of conservation genetics.

WMAN 633. Quantitative Ecology. 3 Hours.
PR: STAT 511 or equivalent, and WMAN 313 or equivalent. A survey of techniques and strategies for the quantitative analysis of complex ecological data sets.

WMAN 639. Conservation Biology. 3 Hours.
Discussion of current topics in conservation biology, the applied science of maintaining earth's biological diversity. Emphasis is on current literature with some guest lectures by topic experts.

WMAN 640. Fish Physiology. 3 Hours.
This course will cover all of the physiological systems in fish. Included are sensory, digestive, circulatory, nervous and endocrine, feeding, osmoregulation, movement, reproduction, and development systems.

WMAN 641. Aquatic Toxicology. 3 Hours.
Class will cover toxicity testing, the environmental fate of contaminants and toxicological assessment. The class will emphasize fish toxicity.

WMAN 642. Advanced Fish Management. 3 Hours.
Class covers important topics in fisheries assessment and management. Primary areas discussed include fish sampling, indices, and exploitation and harvest regulations.
WMAN 643. Advanced Ichthyology. 3 Hours.
An in-depth study of fishes, with emphasis on ecology, morphology, systematics, and zoogeography. Identification of fishes within the Appalachian region is emphasized through lab and field study.

WMAN 644. Wildlife Data Analysis 1. 3 Hours.
This course will cover data interpretations, statistical power, data techniques, use of correct data methods and alternatives, and interpretation of results.

WMAN 645. Wildlife Data Analysis 2. 3 Hours.
PR: WMAN 644. This course will cover statistical power and sample size, selection of proper methods, identify assumptions of methods and use of proper alternatives, and identify results.

WMAN 691. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

WMAN 692. Directed Study. 6 Hours.
Directed study, reading, and/or research.

WMAN 693. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

WMAN 694A. Seminar. 1-6 Hours.
Seminars arranged for advanced graduate students.

WMAN 695. Independent Study. 1-9 Hours.
Faculty supervised study of topics not available through regular course offerings.

WMAN 696. Graduate Seminar. 1-3 Hours.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

WMAN 697. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

WMAN 770. Wildlife Seminar. 1 Hour.
Per semester; PR: Consent. May be repeated for a maximum of 4 credit hours.) Discussion of current developments in wildlife management.

WMAN 790. Teaching Practicum. 1-3 Hours.
PR: Consent. Supervised practice in the college teaching of wildlife and fisheries management. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.).

WMAN 791. Advanced Topics. 1-6 Hours.
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

WMAN 792. Directed Study. 1-6 Hours.
Directed study, reading and/or research.

WMAN 793. Special Topics. 1-6 Hours.
A study of contemporary topics selected from recent developments in the field.

WMAN 797. Research. 1-9 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading will be S/U.)

WMAN 900. Professional Development. 1-6 Hours.
Professional development courses provide skill renewal or enhancement in a professional field or content area (e.g., education, community health, geology). The continuing education courses are graded on a pass/fail grading scale and do not apply as graduate credit toward a degree program.