

# Department of Forest and Natural Resources Management

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The Department of Forest and Natural Resources Management (FNRM) offers programs leading to bachelor's, master's and doctoral degrees at the main college campus in Syracuse, N.Y. and two programs leading to the associate in applied science (A.A.S.) degree at The Ranger School in Wanakena, N.Y. See page 134 for information about the associate of applied science degrees in forest technology and land surveying technology.

## Faculty

ABRAHAMSON (Integrated Vegetation Management, Woody Biomass Energy), ABDEL-AZIZ (Applied Mathematics), BEIER (Forest Ecology, Regional Analysis), BEVILACQUA (Forest Measurements, Statistics), BRIGGS (Forest Soils, Silviculture), CONAHAN (Applied Mathematics), DAWSON (Recreation Management, Wilderness Management), DREW (Tree Physiology, Forest Ecology, Physiological Ecology), GERMAIN (Sustainable Forestry Systems, Forest Operations), KUEHN (Recreation Resources Management and Tourism), LAVIE (Applied Mathematics), LUZADIS (Non-Market Values, Ecological Economics), MALMSHEIMER (Forest and Natural Resources Law and Policy), MAYNARD (Tree Improvement, Plant Tissue Culture and Transformation), MORRISON (Resource Sociology and Urban Forestry), NEWMAN, Chair (Forest Economics), C. NOWAK (Vegetation Management, Sustainable Forest Management, Silviculture), NYLAND (Silviculture and Forest Management), STEHMAN (Statistics, Environmental Sampling), STELLA (Watershed Management), VOLK (Woody Biomass Energy), VONHOF (Natural Resources History), WAGNER (Forest Resource Economics, Business), YANAI (Forest Soils, Ecosystem Nutrient Cycling, Simulation Modeling), ZHANG (Biometrics, Quantitative Silviculture)

## Adjunct Faculty

BICK, BURNS, CASTRO, CULKOWSKI, HEISLER, KELLEHER, KENNEDY, LAUTZ, D. NOWAK, PEREZ, ROBISON, SCHUSTER, SMITH, STOUT, VERVERS, D. WHITE, WIELOPOSKI

## Mission and Vision

ESF's forest and natural resources management programs are science-based and values-driven. The integration of values and scientific facts characterize professions that are successful in democracies. ESF-trained foresters and natural resource managers are able to integrate these two threads in America's complex society.

The mission of ESF forest and natural resources management programs is to produce knowledge and to transmit it to our customers; to encourage continual learning about forest and related renewable resources and their role in making people's lives better; and to develop leaders who will manage renewable resources on a sustainable basis.

The Department's vision of professional forest and natural resource managers is that they are problem solvers who master disciplinary knowledge and skills, then integrate them to protect and manage forest and natural resources; and leaders who help

people solve the more complex problems with the world's forest and natural resources.

ESF forest and natural resources management's educational goals are to:

- Understand forests and related natural resources — how they function and their dynamics;
- Be skilled in managing forests and other natural resources and predicting the consequences;
- Monitor citizen and owner values of forests and other natural resources and be respectful of them; and
- Integrate values with scientific facts and know the limits of our knowledge.

## Undergraduate Programs

The forest and natural resources management programs prepare students for work with public and private sector organizations and consultancies and for further professional or scientific study at the graduate level. Students develop professional skills, which employers look for in new employees:

- Management skills including leadership, communication abilities, and teamwork;
- Scientific knowledge and technical skills in measurements and analysis for management;
- The ability to analyze and solve resource management problems using both social and biophysical sciences; and
- A clear understanding of ethics and stewardship.

These skills are best developed by a broad base in the social sciences and humanities, communication, the natural sciences, and quantitative and qualitative methods. The majority of coursework taken during the first two years (lower division) is in these basics.

Students are required to complete general education requirements and a professional core. Forest resources management students may concentrate some of their technical electives. Natural resources management majors have a ready opportunity to earn a minor in an area of disciplinary interest.

## Bachelor of Science in Forest Resources Management

Professional forestry education has been featured at ESF since the College's founding in 1911. Today's forest resources management program is based on a clear vision that combines professional competency with a strong foundation in the biophysical sciences, humanities, and social sciences to meet society's needs for forest managers.

Many ESF students enjoy trees and forests and want to work in forested settings. They appreciate nature and want to master the knowledge and skills needed to conserve and manage forests and the environment. With 25,000 acres of College forest lands as teaching and research laboratories, ESF provides many opportunities to meet student needs for experiential learning. The forest technology program at ESF's Wanakena campus prepares students for careers in field forestry and is a route to the forest resources management program that emphasizes field practice. Internships with forest-based organizations in the private, public and nonprofit sectors amplify these hands-on experiences. Practical experience is combined with learning concepts and problem solving and critical thinking skills in the classroom and laboratory on ESF's Syracuse campus. The

educational outcomes of the forest resources management degree program are among the best anywhere in North America.

Forest resources management is an integration of forest ecology and biology, forest measurements, forest policy and administration, and courses to predict and evaluate the effects of manipulation. Timber, water, soils, recreation, wildlife, and a broad array of environmental values and services, such as biodiversity and healthy forest systems, are important results of effective management. This major prepares students to be well-rounded generalists who can practice forestry and succeed as professionals in a variety of allied natural resource management fields.

**The educational program in forest resources management, leading to the professional bachelor of science degree in forest management is accredited by the Society of American Foresters (SAF). SAF is recognized by the Commission on Recognition of Postsecondary Accreditation as the specialized accrediting body for forestry in the United States.**

Forest management offers a wide variety of employment opportunities. Our graduates are working throughout the United States as professional foresters and natural resource managers in public agencies, private industry, and for nonprofit organizations. Their duties range from timber management to recreation planning to environmental education, to name a few.

The undergraduate curriculum in forest resources management consists of two broad categories of courses. The first category, general education, provides students with knowledge and skills that are useful and important for all educated persons regardless of their profession as well as preparation for advanced courses leading to a specific profession. The second category, professional courses, provides students with direct preparation for a career. The first two years of college usually focus on general education and the second two on the professional studies.

### Summer Program

The Summer Program is required for ALL students in forest resources management. Students who completed an A.A.S. degree from the ESF Ranger School meet this requirement through transfer credits. The program is a four-week session that begins at the end of May and lasts through late June. It is taught at ESF's Wanakena Campus in the Adirondacks. The program consists of one course: FOR 304 Adirondack Field Studies. Students must complete the summer program before the junior year.

### Program Admission

Students may follow one of three paths to enter and complete the forest resources management program:

- The freshman path is for students who enter ESF as a freshman and complete all degree requirements at ESF with the Summer Program after the second year.
- The combined A.A.S./B.S. path is for students who wish to have more field measurement and field problem-solving skills and leadership development in context of forestry problems. The first year can be at ESF or another college and the second year is spent at The Ranger School, Wanakena campus. Students then complete their B.S. degree requirements at ESF. This path can be completed in a total of four years with careful planning.

- The transfer path is for students who complete all or part of their lower division coursework at another two- or four-year campus, attend the Summer Program the summer before entering ESF and complete the upper-division requirements at ESF. Students preparing to transfer to ESF with full junior status must have earned at least 60 credits of college coursework.

## Undergraduate Program Requirements

### Lower Division Required Courses (47 credits)

| Courses |             |  | Credits |   |
|---------|-------------|--|---------|---|
| APM     | 104         | College Algebra and Precalculus<br><i>Meets the requirements for general education skills and knowledge area. A complete listing of ESF or Syracuse University courses that meet general education standards established by SUNY in Undergraduate Education.</i> | G       | 3 |
| APM     | 391         | Introduction to Probability and Statistics   |         | 3 |
| CLL     | 190         | Writing and the Environment  | G       | 3 |
| CLL     | 290         | Writing, Humanities and the Environment  | G       | 3 |
| CMN     | 220         | Public Presentation Skills for Environmental Professionals   |         | 3 |
| EFB     | 101/<br>102 | General Biology I and Laboratory   | G       | 4 |
| EFB     | 336         | Dendrology   | PE      | 3 |
| ESF     | 200         | Information Literacy   |         | 1 |
| FCH     | 150/<br>151 | General Chemistry I and Laboratory   |         | 4 |
| FOR     | 132         | Orientation Seminar: Forest and Natural Resources Management<br><i>Required for all students (freshmen and transfers).<br/>Professional education course</i>   | PE      | 1 |
| FOR     | 203         | Western Civilization and the Environment   | G       | 3 |
| FOR     | 204         | Natural Resources in American History  | G       | 3 |
| FOR     | 207         | Introduction to Economics  | G       | 3 |
| FOR     | 232         | Natural Resources Ecology  | PE      | 3 |
| FOR     | 332         | Forest Ecology   | PE      | 3 |
| PHY     | 101/<br>102 | General Physics I and Laboratory (or EFB 200 3 hrs)  |         | 4 |

### Electives (6 credits)

|  |   |   |
|--|---|---|
| General Education Course: Other World Civilization | G | 3 |
| General Education Course: The Arts                 | G | 3 |

### Required Summer Courses (4 credits)

The summer following the second year, students must take:

|     |     |                          |    |   |
|-----|-----|--------------------------|----|---|
| FOR | 304 | Adirondack Field Studies | PE | 4 |
|-----|-----|--------------------------|----|---|

### Upper Division Required Courses (38 credits)

|     |     |  |    |   |
|-----|-----|--|----|---|
| ESF | 300 | Introduction to Geospatial Information Technologies                                    |    | 3 |
| ESF | 332 | Seminar for New Transfer Students Required for students who enter as transfer students |    | 0 |
| FOR | 360 | Principles of Management   |    | 3 |
| FOR | 322 | Forest Mensuration   | PE | 3 |
| FOR | 323 | Forest Biometrics  |    | 3 |
| FOR | 333 | Natural Resources Managerial Economics   | PE | 3 |
| FOR | 334 | Silviculture   | PE | 4 |
| FOR | 345 | Introduction to Soils  | PE | 3 |
| FOR | 370 | Forest Management Decision Making & Planning   | PE | 3 |
| FOR | 372 | Fundamentals of Outdoor Recreation   | PE | 3 |
| FOR | 373 | Forest Operations  | PE | 3 |
| FOR | 402 | Professional Forestry Mentoring Program  | PE | 1 |
| FOR | 465 | Natural Resources Policy   | PE | 3 |
| FOR | 490 | Integrated Resources Management  | PE | 3 |

### Electives (24 credits)

|  |    |    |
|--|----|----|
| Technical Electives<br><i>Technical electives must include at least one course in vegetation manipulation, water resources, forest health, wildlife management, and wood technology/science. Students should consult with their advisor and the Forest and Natural Resources Management Handbook for recommended courses</i> | PE | 15 |
| Electives  | PE | 18 |

**Total minimum credits for the degree 129 credits**

## Bachelor of Science in Natural Resources Management

The natural resources management program is based on a vision that combines professional competency in management skills with a strong foundation in the social and biophysical sciences. Students interested in this program typically are drawn to natural settings and environments, enjoy nature and want to develop the professional knowledge and skills needed to conserve, steward and manage natural resources and the environment. ESF provides a wide variety of opportunities to meet student needs utilizing 25,000 acres of forest lands as teaching laboratories and College faculty in many natural resource management disciplines. Experiential field learning is combined with learning concepts and skills in the classroom and laboratory on ESF's Syracuse campus.

The natural resources management program allows students to develop professional skills that employers tell us are the most important traits they look for in new employees. These traits are developed through a broad base of classes in the natural sciences, social sciences and humanities, communication, and quantitative and qualitative problem-solving skills. The majority of work scheduled during the first two years (lower division) is in these areas. This major prepares students to be well-rounded natural resources managers, provides them a ready opportunity to minor in specific areas of disciplinary interest, and prepares them with a foundation for future graduate degree work.

Natural resources management offers a wide variety of employment opportunities. Graduates work throughout the United States in public agencies, private industry, and for nonprofit organizations. Their duties range from policy analysis for federal agencies to resource managers for nonprofit organizations; from recreation planning for state park agencies to recreation management in federal wilderness areas; and from watershed hydrologists to land managers maintaining surface water quality.

### Summer Program

The Summer Program is required for ALL students in natural resources management. Students who completed an A.A.S. degree from the ESF Ranger School meet this requirement through transfer credits. The summer program is a four-week session that begins at the end of May and lasts through late June. It is taught at ESF's Wanakena Campus in the Adirondacks. The program consists of one course: FOR 304 Adirondack Field Studies. Students should complete the summer program before the junior year.

### Program Admission

Students may follow one of three paths to enter and complete the natural resources management program:

- The freshman path is for students who enter ESF as a freshman and complete all degree requirements at ESF with the Summer Program after the first or second year (first year preferred).
- The combined A.A.S./B.S. path is for students who wish to have more field measurement and field problem-solving skills and leadership development in context of forestry problems. The first year can be at ESF or another campus and the second year is spent at The Ranger School, Wanakena campus. Students then complete their B.S. degree requirements at ESF. This path can usually be completed in a total of four years.

- The transfer path is for students who complete all or part of their lower-division coursework at another two- or four-year campus, attend the Summer Program the summer before entering ESF and complete the upper-division requirements at ESF. Students preparing to transfer to ESF with full junior status must have earned at least 60 credits of college coursework.

## Undergraduate Program Requirements

### Lower Division Required Courses (40 credits)

| Courses    |                            | Credits  |      |
|------------|----------------------------|--|------|
| APM        | 104                        | College Algebra and Precalculus<br><i>Meets the requirements for general education skills and knowledge area. A complete listing of ESF or Syracuse University courses that meet general education standards established by SUNY in Undergraduate Education.</i> | G 3  |
| APM        | 391                        | Introduction to Probability and Statistics   | 3    |
| CLL        | 190                        | Writing and the Environment  | G 3  |
| CMN        | 220                        | Public Presentation Skills for Environmental Professionals   | 3    |
| EFB        | 101/<br>102                | General Biology I and Laboratory   | G 4  |
| EFB        | 103/<br>104                | General Biology II and Laboratory  | 4    |
| EFB        | 320                        | General Ecology  | 4    |
| ESF        | 200                        | Information Literacy   | 1    |
| FCH        | 150/<br>151                | General Chemistry I and Laboratory   | 4    |
| FCH<br>PHY | 152/<br>153<br>211/<br>221 | General Chemistry II and General Chemistry Laboratory II<br>or<br>General Physics I and General Physics Laboratory I   | 4    |
| FOR        | 132                        | Orientation Seminar: Forest and Natural Resources Management<br><i>Required for all students (freshmen and transfers).<br/>Professional education course</i>   | PE 1 |
| FOR        | 207                        | Introduction to Economics  | G 3  |
| FOR        | 360                        | Principles of Management   | 3    |

### Lower Division Elective Courses (18 credits)

|   |   |   |
|---|---|---|
| General Education Course: American History          | G | 3 |
| General Education Course: The Arts                  | G | 3 |
| General Education Course: Western Civilization      | G | 3 |
| General Education Course: Other World Civilizations | G | 3 |
| General Education Course: Humanities                | G | 3 |

|   |  |   |
|---|--|---|
| Sociology or Psychology course<br><i>FOR 202 Introduction to Sociology (3), SOC 101 Introduction to Sociology (3), or PSY 205 Foundations of Human Behavior (3)</i> |  | 3 |
|---|--|---|

### Required Summer Courses (4 credits)

The summer following the first or second year, students must take:

|     |     |                          |    |   |
|-----|-----|--------------------------|----|---|
| FOR | 304 | Adirondack Field Studies | PE | 4 |
|-----|-----|--------------------------|----|---|

### Upper Division Required Courses (30 credits)

|     |     |   |    |   |
|-----|-----|---|----|---|
| CLL | 405 | Writing for Science Professionals                   |    | 3 |
| ESF | 300 | Introduction to Geospatial Information Technologies |    | 3 |
| FOR | 321 | Forest Ecology and Silviculture                     |    | 3 |
| FOR | 333 | Natural Resources Managerial Economics              | PE | 3 |
| FOR | 340 | Watershed Hydrology                                 |    | 3 |
| FOR | 345 | Introduction to Soils                               | PE | 3 |
| FOR | 372 | Fundamentals of Outdoor Recreation                  |    | 3 |
| FOR | 465 | Natural Resources Policy                            | PE | 3 |
| FOR | 488 | Natural Resources Agencies and Administration       |    | 3 |
| FOR | 490 | Integrated Resources Management                     | PE | 3 |

### Upper Division Elective Courses (30 credits)

|  |  |   |  |    |
|--|--|---|--|----|
|  |  | Accounting or Finance Course<br><i>ACC 201 Introduction to Accounting for Non-Management Students (3) or FIN 301 Finance for Non-Management Students (3).</i>                                   |  | 3  |
|  |  | Human Dimensions Course<br><i>EST 390 Social Processes and the Environment (3), FOR 312 Sociology of Natural Resources (3), or FOR 475 Human Behavior and Recreation Visitor Management (3)</i> |  | 3  |
|  |  | Wildlife or Fisheries Course<br><i>EFB 390 Wildlife Ecology and Management (4) EFB 487 Fisheries Science and Management (3) or EFB 493 Wildlife Habitats and Populations (4)</i>                |  | 3  |
|  |  | Electives   |  | 21 |

**Total minimum credits for the degree 122 credits**

## Bachelor of Science in Forest Ecosystem Science

The bachelor of science in forest ecosystem science degree program is based on a vision that combines professional

competency in forest management skills with an enhanced understanding of ecological sciences. Students interested in this program typically are drawn to natural settings and environments, enjoy nature, and want to understand how forested ecosystems work. ESF provides a wide variety of opportunities to meet student needs utilizing 25,000 acres of forest lands as teaching laboratories. Internships with natural resource-based organizations in the business, public and nonprofit sectors provide additional hands-on experiences. Experiential field learning is combined with learning concepts and skills in the classroom and laboratory on ESF's Syracuse campus.

The program allows students to develop professional skills that employers look for in new employees. These skills are developed through a combination of core courses required in the undergraduate programs in forest resources management and in environmental biology. Forest ecosystem science offers a wide variety of employment opportunities. Graduates work throughout the United States in public agencies, private industry, and for nonprofit organizations. They also are well prepared to enter graduate programs in management of natural resources, ecological research, or other areas of applied forest biology.

The undergraduate curriculum in forest ecosystem science consists of two broad categories of courses. The first category, general education, provides students with knowledge and skills that are useful and important for all educated persons regardless of their profession as well as preparation for advanced courses leading to a specific profession. The second category, professional courses, provides students with direct preparation for a career. The first two years of college usually focus on general education and the second two on the professional studies.

## Summer Program

The Summer Program is required for ALL students in forest ecosystem science. Students who completed an A.A.S. degree from the ESF Ranger School meet this requirement through transfer credits. The program is a four-week session that begins at the end of May and lasts through late June. It is taught at ESF's Wanakena Campus in the Adirondacks. The program consists of one course: FOR 304 Adirondack Field Studies. Students must complete the summer program before the junior year.

## Program Admission

Students may follow one of three paths to enter and complete the forest ecosystem science program:

- The freshman path is for students who enter ESF as freshmen and complete all degree requirements at ESF with the Summer Program after the first or second year (first year preferred).
- The combined A.A.S./B.S. path is for students who wish to have more field measurement and field problem-solving skills and leadership development in context of natural resource problems. The first year can be at ESF or another campus and the second year is spent at The Ranger School on the Wanakena campus. Students then complete their B.S. degree requirements at ESF. This path can usually be completed in a total of five years.
- The transfer path is for students who complete all or part of their lower-division coursework at another two- or four-year campus, attend the Summer Program the summer before entering ESF, and complete the upper-division requirements at

ESF. Students preparing to transfer to ESF with full junior status must have earned at least 60 credits of college coursework.

## Program Requirements

### Lower Division Required Courses (44 credits):

| Courses |             |  | Credits |   |
|---------|-------------|--|---------|---|
| APM     | 105         | Calculus and Its Applications I<br><i>Meets the requirements for general education skills and knowledge area. A complete listing of ESF or Syracuse University courses that meet general education standards established by SUNY in Undergraduate Education.</i> | G       | 4 |
| APM     | 391         | Introduction to Probability and Statistics   |         | 3 |
| CLL     | 190         | Writing and the Environment  | G       | 3 |
| CLL     | 290         | Writing, Humanities and the Environment  | G       | 3 |
| EFB     | 101/<br>102 | General Biology I and Laboratory   | G       | 4 |
| EFB     | 103/<br>104 | General Biology II and Laboratory  |         | 4 |
| ESF     | 200         | Information Literacy   |         | 1 |
| FCH     | 150/<br>151 | General Chemistry I and Laboratory   |         | 4 |
| FCH     | 152/<br>153 | General Chemistry II and Laboratory  |         | 4 |
| FOR     | 132         | Orientation Seminar: Forest and Natural Resources Management<br><i>Professional education course</i>   | PE      | 1 |
| FOR     | 207         | Introduction to Economics  | G       | 3 |
| FOR     | 332         | Forest Ecology   | PE      | 3 |
| FOR     | 360         | Principles of Management   | PE      | 3 |
| PHY     | 211/<br>221 | General Physics I and Laboratory   |         | 4 |

### Lower Division Elective Courses (18 credits):

|  |    |   |
|--|----|---|
| Directed Electives: Basic Biology<br><i>Students should consult with their advisors and read the Forest and Natural Resources Management Handbook for lists of courses that can be elected to meet degree requirements</i> | PE | 6 |
| General Education Course: American History   | G  | 3 |
| General Education Course: The Arts   | G  | 3 |
| General Education Course: Western Civilizations  | G  | 3 |
| General Education Course: Other World Civilizations  | G  | 3 |

### Upper Division Required Summer Courses (4 credits):

The summer following the second year, students must take:

|     |     |                          |    |   |
|-----|-----|--------------------------|----|---|
| FOR | 304 | Adirondack Field Studies | PE | 4 |
|-----|-----|--------------------------|----|---|

Upper Division Required Courses (minimum 25 credits):

|     |     |   |    |   |
|-----|-----|---|----|---|
| EFB | 336 | Dendrology  | PE | 3 |
| ESF | 300 | Introduction to Geospatial Information Technologies | PE | 3 |
| FOR | 322 | Forest Mensuration                                  | PE | 3 |
| FOR | 323 | Forest Biometrics                                   | PE | 3 |
| FOR | 334 | Silviculture  | PE | 4 |
| FOR | 345 | Introduction to Soils                               | PE | 3 |
| FOR | 465 | Natural Resources Policy                            | PE | 3 |
| FOR | 490 | Integrated Resource Management                      | PE | 3 |

Upper Division Elective Courses (37 credits):

|  |    |    |
|--|----|----|
| Directed Electives: Advanced Biology   | PE | 6  |
| Directed Electives: Ecosystems/Ecology   | PE | 9  |
| Directed Electives: Management   | PE | 3  |
| Directed Elective: Human Dimensions  | PE | 3  |
| <i>Students should consult with their advisors and read the Forest and Natural Resources Management Handbook for lists of courses that can be elected to meet degree requirements.</i> |    |    |
| Free Electives   |    | 12 |

**Total minimum credits for the degree 128 credits**

## Graduate Programs

The Department of Forest and Natural Resources Management (FNRM) offers the master of science (M.S.), the master of professional studies (M.P.S.), the master of forestry (M.F.), and doctor of philosophy (Ph.D.) degrees. The graduate program is organized in areas of study designed to provide students with a strong background within specific interest areas. Faculty with nationally and internationally recognized expertise define the area of study's subject matter and guide students through an individually-designed program of study appropriate to student goals and aspirations. The FNRM graduate program prepares students for careers in resource administration, management, scientific research, professional education, and a variety of other specialized positions related to the sustainable management of forest ecosystems. Students with a non-natural resources bachelor's or master's degree and a strong interest in forests are encouraged to apply.

**Master of Forestry (M.F.):** The M.F. degree is designed to provide students with non-forestry baccalaureates a professional education in forestry. As such, the degree is designed to be students' first professional degree in forestry. The degree is appropriate for students who want to successfully function as professional foresters on multidisciplinary forest management teams and respond to the challenges related to the sustainable management of local, regional, and global forest resources.

The degree requires 37 graduate credits of coursework. At least 24 of the coursework credits must be taken in residence at ESF. Students must also complete a set of core forestry courses that meet the accreditation standards of the Society of American Foresters. The current Forest and Natural Resources Management Graduate Handbook ([www.esf.edu/for/GradHandbook.pdf](http://www.esf.edu/for/GradHandbook.pdf)) specifies these requirements.

**Master of Professional Studies (M.P.S.):** The M.P.S. degree is a coursework-based degree that enables students to increase, define, and integrate their natural science and social science knowledge and expertise in forest and natural resources management. The degree is designed to be the first professional degree in forest and natural resources management. It is appropriate for students with a baccalaureate degree in a natural resources-related discipline interested in enhancing their knowledge of forest and natural resources management, and for students with other baccalaureate degrees seeking an expertise in forest and natural resources management.

The degree requires at least 30 graduate credits of coursework. At least 24 of the course credits must be taken in residence at ESF. Within these credits, students must complete a core of required courses and other requirements. The current Forest and Natural Resources Management Graduate Handbook ([www.esf.edu/for/GradHandbook.pdf](http://www.esf.edu/for/GradHandbook.pdf)) specifies these requirements.

**Master of Science (M.S.):** The M.S. degree enables students to investigate practical forest and natural resources research problems and apply their specialized knowledge to solve those problems. The degree provides students with coherent body of theory and a set of appropriate methods to test that theory by completing a thesis. The M.S. degree is appropriate for students entering professions that require a research-based degree (such as environmental agencies and organizations that focus on science) and for students planning on completing a Ph.D. degree.

The degree requires at least 30 graduate credits, of which 24 are for coursework and six for the thesis. One-half of the 24 hours of coursework must be at the 600-level or above. At least 18 of the coursework credits must be taken in residence at ESF. All students must take one FOR 797 topical seminar and one additional graduate seminar.

**Doctor of Philosophy (Ph.D.):** The Ph.D. degree is normally built upon a M.S. degree, but in some instances it can be undertaken after a non-research based graduate degree (such as a J.D., M.B.A, M.P.A, or M.P.S. degree). The degree provides students with an opportunity for in-depth study and to conduct a comprehensive scientifically based research program using advanced research tools. Ph.D. dissertations are expected to lead to a number of peer-reviewed articles in influential journals. The degree is appropriate for students interested in advanced positions as forest and natural resources educators, managers, and analysts.

The degree requires at least 60 graduate credit hours, of which 48 are for coursework and 12 for the dissertation. One-half of the 48 hours of coursework must be at the 600-level or above. At least 24 coursework credits must be taken in residence at ESF. All students must take one FOR 797 topical seminar and one additional graduate seminar.

## Research Facilities and Faculty

FNRM students work with faculty in a variety of sophisticated laboratories. Graduate students have access to diverse analytical equipment and measuring devices, and comprehensive, investi-

gative computing capabilities. Field research occurs throughout the world, particularly in the Northeast. ESF's 25,000 acres on regional New York state campuses and field stations offer a broad diversity of forest ecosystems for teaching and intensive research that evaluates terrestrial and aquatic environments. Faculty and students also pursue research on lands managed by the state Department of Environmental Conservation, USDA Forest Service, U.S. Fish and Wildlife Service, National Park Service, and Bureau of Land Management. Many students also conduct research and serve internships in Washington, D.C., New York City, Albany, and other international, national, regional, and state resource management headquarters.

FNRM graduate students work closely with faculty recognized by their students and peers as among the best in the world. FNRM faculty include SUNY Distinguished Teaching Professors and Distinguished Service Professors, as well as recipients of the SUNY Chancellor's Award for Excellence in Teaching, the SUNY Chancellor's Award for Professional Service, and the ESF President's Public Service Award. More than a third of FNRM professors have been awarded the ESF Distinguished Teacher Award by the ESF student body, many more than once. ESF professors also serve in leadership roles in professional societies.

### **Funding Opportunities**

More than 70 percent of full-time FNRM graduate students receive partial or full support through graduate research or teaching assistantships. Awards range from \$11,060 to \$27,000 per year. All fully-supported students receive tuition scholarships and health insurance. In addition to assistantships, FNRM annually awards several fellowships, based on students' accomplishments and promise for future professional and personal development. We also offer some graduate student stipends to support semester-long and summer internship experiences.

### **Collaborative Arrangements**

FNRM encourages interdisciplinary graduate programs. This often involves selecting steering committee members from other ESF and Syracuse University departments, or more formally, by arranging for joint study with other college departments and with Syracuse University. Concurrent degree programs that provide the student with two masters' degrees, one from ESF and another from Syracuse University, are available with the following SU schools: Whitman School of Management, Maxwell School of Citizenship and Public Affairs, S.I. Newhouse School of Public Communications, and School of Education.

Concurrent degree programs usually add at least an additional year to a master's program of study. To be eligible, a student must have been matriculated full-time at the college for at least one semester, must have a grade point average of at least 3.500, and must be formally accepted into the concurrent degree program by the other school. Students who are interested in any of these programs must complete an application process through the ESF Office of Instruction and Graduate Studies within their first year of study.

### **Areas of Study**

The FNRM graduate degree program offers students opportunities to pursue individualized advanced study in seven areas of study or an interdisciplinary doctoral program. Each area of study description includes a sampling of faculty members' research interests and employment opportunities. With more than 75 graduate students currently in FNRM programs, these examples

are only highlights from the wealth of opportunities available. Additional information about each of these areas of study is available by telephone, e-mail, or written request to any of the professors listed, and at: [www.esf.edu/fnrm/grad.htm](http://www.esf.edu/fnrm/grad.htm).

### **Environmental and Natural Resources Policy (M.S., M.P.S.)**

Participating Faculty: GERMAIN, LUZADIS, MALMSHEIMER, NEWMAN, WAGNER

The environmental and natural resources policy area includes professional and scientific studies examining how society makes and implements decisions regarding its forest and natural resources. The program exposes students to a coherent body of theory, a set of appropriate methods, and challenging applications. The applications include:

#### **Forest, environmental, and ecological economics, and Forest and natural resources policy.**

Faculty members are conducting studies at international, national, state, and local levels on sustainability, implementation and administration of forest and natural resources programs, and economic and institutional influences and impacts of government and nongovernment policies.

Policy graduates find jobs with government, consulting firms, not-for-profit organizations, advocacy groups and academic institutions. Graduates often begin their careers as policy or program analysts and many become leaders in government, legislatures, corporations, consulting firms, and academia at institutions throughout the world.

Forest and natural resources policy students often supplement their ESF coursework with courses from Syracuse University's Maxwell School of Citizenship and Public Affairs. A number of students enroll in a concurrent master of public administration (M.P.A.) degree program.

### **Forest Ecosystem Science and Applications (M.S., M.P.S., Ph.D.)**

Participating Faculty: ABRAHAMSON, BEVILACQUA, BRIGGS, DREW, GERMAIN, MAYNARD, C. NOWAK, NYLAND, VOLK, YANAI

Graduate study in forest ecosystems includes the basic science of biophysical processes and how these processes are manipulated for ecological and social benefit. The applications include:

- Forest ecology and silviculture
- Forest genetics and tree improvement
- Forest soil classification and productivity
- Integrated vegetation management
- Intensive silviculture of plantations
- Nutrient cycling and simulation modeling
- Tree physiology and physiological ecology
- Urban and greenspace forestry

Students focusing on ecological physiology or forest ecology study competitive and synergistic interactions among plants or interactions among plants and the physical environment in urban or forest settings, in the northern hardwood region, or in the tropics. Study in forest genetics focuses on the genetic structure of natural and managed populations of forest trees, or on using the latest tools of biotechnology to enhance the ability of forest trees to resist biotic and abiotic stresses. Students studying nutrient cycling assess the impact of land use on the structure and function of forest soils, or explore methods for ensuring soil stability and productivity. Studies in silviculture and forest tree

improvement evaluate the means for altering the composition, character, and dynamics of tree communities of varying composition and the stages of development using information and understanding from ecological, managerial, and social sciences. Besides sustaining stable and resilient forested ecosystems, including plant and animal habitat, forest management often strives to provide ancillary values for recreation and aesthetics, water quality, and the recovery of wood products and other commodities. Students in this area of study frequently take courses in related disciplines such as forest pathology and entomology, plant biotechnology, hydrology and watershed management, wildlife and fisheries biology, landscape architecture, biometrics, forest economics, and forest policy management.

The growing concern with forests as forest ecosystems is expanding the need for professionals in this area of study. Graduates have careers as specialists or researchers with a wide variety of public agencies, universities, industrial firms, and nonprofit organizations. Opportunities are likely to grow steadily in the U.S. and other nations during the next decade.

### **Forest Hydrology and Watershed Management (M.S., M.P.S., Ph.D.)**

Participating Faculty: STELLA, YANAI

Water quantity and water quality are important to the highly urbanized northeastern U.S. and are among the most pressing environmental issues globally. Within the watershed management and forest hydrology area of study, students have the opportunity to investigate hydrological processes, land use and water quality, and water supply management and policy. The applications include:

- Forest and watershed hydrology
- Hydrologic processes and modeling
- Soil and water conservation
- Water resources policy
- Watershed geospatial modeling and analysis

Students enter this area of study with undergraduate backgrounds in natural resources, environmental sciences, management and policy, and many other areas. Courses in the option are watershed-based and highly interdisciplinary. The option also has strong links to other programs at ESF and Syracuse University in biogeochemistry, engineering, hydrogeology, ecology and numerical modeling. Faculty research focuses on the watershed as the fundamental landscape unit for studying the fluxes of water, energy and matter in the environment. Graduate students' research projects often have ties to externally funded research watersheds in the region and may take the form of combined field, laboratory and modeling studies. Career opportunities exist with all levels of government, and in consulting, research, and education.

### **Forest Management and Operations (M.F.)**

Participating Faculty: BEVILACQUA, BRIGGS, GERMAIN, NOWAK, WAGNER

The master of forestry (M.F.) graduate degree program enables students to integrate knowledge and expertise drawn from both the natural and social sciences and to apply their knowledge to solve practical forest management problems. The primary focus of the program is to provide an opportunity for graduates coming from diverse academic backgrounds with non-forestry baccalaureates to gain a professional education in forestry. As such, the program is designed to be the first professional degree in forestry attained by a student.

Graduates will successfully function as professional foresters on multidisciplinary forest management teams and respond to the challenges related to the sustainable management of local, regional and global forest resources.

Students with an undergraduate degree in a related discipline (e.g., ecology, biology, wildlife, chemistry) can complete the M.F. degree in 12-18 months. Students with a general science background, but little or no natural resources experience, will require 18-24 months to complete the program. More than four semesters may be required for students from non-science backgrounds who need additional basic undergraduate coursework as part of their program of study. The curriculum is designed for fall admission, but spring semester admission is possible.

### **Natural Resources Management (M.S., M.P.S., Ph.D.)**

Participating Faculty: BEIER, BRIGGS, DREW, GERMAIN, LUZADIS, MALMSHEIMER, NEWMAN, C. NOWAK, NYLAND, VOLK

The natural resources management area includes professional and scientific studies regarding how organizations make and implement decisions on the ground for forests and related natural resources. The applications include:

- Environmental and ecological economics
- Forest resource management
- International forest policy and management
- Multiple use planning and management
- Urban and community forestry

Graduate studies in this area often integrate other areas of study, especially forest ecosystems, watershed hydrology and management, environmental and natural resource policy, and quantitative methods. Most students include a specialty like economics, statistics, or ecology as part of their graduate program of study. Faculty members conduct studies on urban forests, harvesting practices on small forest ownerships in New York, sustainable forestry practices on private and public forestlands, multiple-use management throughout North America, and social forestry in several tropical nations.

Job opportunities are growing. Industry, government, consulting firms, and not-for-profit organizations employ graduates from this area of study as analysts and managers. Research opportunities are available in both research and operating organizations.

### **Quantitative Methods in Forest Science and Management (M.S., M.P.S., Ph.D.)**

Participating Faculty: BEVILACQUA, STEHMAN, WAGNER, ZHANG

Quantitative techniques are valuable both for managing forest resources and for conducting research on forests. Graduate study of quantitative methods is designed to develop skills in the application of mathematical, statistical, and computer-based problem analysis and solution. The applications include:

- Applied statistics
- Forest growth and yield modeling
- Forest inventory and mensuration
- Geospatial modeling and analysis
- Operations research
- Spatial sampling of environmental factors

Areas of faculty research include statistical methods of sampling and data analysis, optimization methodologies for forest resources management, forest biometrics, and natural resources applications of geographic information systems. Additional courses in

quantitative methods are available through Syracuse University. Students enter this area of study with diverse backgrounds. Some students have an undergraduate degree in areas such as the biological sciences, forestry, wildlife, or agriculture, and concentrate on strengthening their quantitative skills. Other students have earned degrees in mathematics, statistics, or computer science, and focus on resource management.

Students who earn their degrees in the quantitative methods area of study have career opportunities as specialists with a wide variety of public organizations, such as the U.S. Forest Service, U.S. Geological Survey, NASA, and state planning agencies. Industrial firms are looking for quantitative experts in a variety of applications, as are consulting firms and some of the major environmental non-profit organizations.

### **Recreation Resources Management (M.S., M.P.S., Ph.D.)**

Participating Faculty: DAWSON, KUEHN

Recreation and tourism, including ecotourism, are major economic factors in the U.S. and other nations. Graduate study in this area provides students with a broad understanding of the nature and purpose of outdoor recreation and tourism and how they relate to natural resources. The program emphasizes the role of and inter-relationships between the public and private sectors in providing facilities, services, and programs in recreation and tourism. The applications include:

- Human dimensions of recreational use
- Recreation resource planning
- Wilderness and wildlands management

Faculty research focuses on recreation resource management and the human dimensions of recreational use and management. Individual student programs combine study in resources management with relevant studies in the social and political sciences and the development of analytic capabilities needed to implement recreation management plans and programs. Examples of student interest include recreation planning, ecotourism planning, and wilderness visitor management. Coursework in environmental interpretation, management, and other disciplines is encouraged.

Career opportunities exist with a wide variety of public agencies, private firms, and nonprofit organizations. Recreation is a major economic sector in New York and many other states, and often is the top source of foreign exchange in developing nations and nations with strong natural resources bases such as Australia. Recreation studies in many colleges and universities offer career opportunities for graduates who want to combine teaching and research activities.

### **Environmental and Natural Resources Policy (Ph.D.)**

Participating Faculty: GERMAIN, LUZADIS, MALMSHEIMER, MANNO, MORAN, NEWMAN, NORDENSTAM, SENECAH, SMARDON, SONNENFELD, WAGNER

The environmental and natural resources policy Ph.D. program is a collaborative program offered by both the Department of Environmental Studies and the Department of Forest and Natural Resources Management. This study area investigates how societies formulate and implement decisions regarding environmental and natural resources. Doctoral students integrate the biophysical sciences and policy-related social sciences to solve important problems in environmental and natural resources policy with applications throughout the world. The program offers an opportunity to work with outstanding faculty members on applied and theoretical studies.

Faculty members conduct studies at international, national, state and local levels on sustainability, implementation and administration of environmental, natural resources, and forest management programs and economic and institutional influences and impacts of government and non-government policies. The applications include environmental, natural resources and forest policy and administration; and environmental, natural resources, forest and ecological economics.

The environmental and natural resources policy (ENRP) doctoral program is a highly individualized program with coursework and research determined in consultation with the student, major professor, and steering committee. Some coursework requirements may be met by transferring graduate credits as approved by the steering committee. Students may also fulfill coursework requirements by completing courses offered by the Maxwell School of Citizenship and Public Affairs at Syracuse University.

Specific degree requirements are described in the Handbook for Environmental and Natural Resources Policy Ph.D., available in 320 Bray Hall, 107 Marshall Hall, and on the ENRP Web site ([www.esf.edu/enrp](http://www.esf.edu/enrp)).

Students are expected to complete requirements resulting in a coherent body of theory, a depth of understanding in a specified area of biophysical science, appropriate research methods, and advanced policy analysis and understanding.

The following four core competencies must be satisfied prior to the doctoral candidacy examination. A minimum of 12 credits is required in each area.

- Natural science: graduate courses (500 level or higher) in a definable area of biophysical science
- Policy-related social science: 600-level or higher courses including at least one government course and one economics course
- Research methods: 600-level or higher courses including a general research methods course (required), qualitative methods, quantitative statistical methods, GIS, or spatial statistics
- Advanced environmental and natural resources policy: 600-level or higher courses including policy analysis and program evaluation (required).

Graduates have careers as university professors and advanced policy or program analysts. They often become leaders in government, legislatures, corporations, not-for-profit organizations, advocacy groups and academic institutions, consulting firms and village associations throughout the world.