

Forest and Natural Resource Management (FNRM) B.S. Forest Ecosystem Management and Conservation Specialization (FEMC)

Curriculum Guide – Last updated Fall 2016

This guide is subject to change at any time.

Learn the science, practices, and techniques to manage forest ecosystems to protect and ensure their sustainable use. Graduates are involved in conservation planning, ecology, forest policy and protection, timber production, resource analysis, and more. This track is accredited by the Society of American Foresters (SAF) and successful completion qualifies a student for the SAF's Candidate Certified Forester program.

Communication Skills

- _____ Freshman Composition
- _____ COMM 1101 Introduction to Public Speaking [CIV] (3 cr, F/S/Sm)
or AFEE 2421 Professional Communication for Agriculture, Food, and the Environment (3 cr, F/S)

Physical and Biological Sciences

- _____ BIOL 1001 Introductory Biology: Evolutionary and Ecological Perspectives [BIOL] (4 cr, F/S)
or BIOL 1009 General Biology [BIOL] (4 cr, F/S/Sm, prereq high school chemistry)
- _____ BIOL 2022 General Botany (3 cr, F/S, prereq one semester of college biology)
- _____ SOIL 2125 Basic Soil Science [PHYS, ENV] (4 cr, F/S, prereq CHEM 1015/1017 or CHEM 1061)

Mathematical Thinking

- _____ MATH 1151 Precalculus II [MATH] (3 cr, F/S/Sm, prereq MATH 1031 or 1051 or by placement)
or MATH 1142 Short Calculus [MATH] (4 cr, F/S/Sm, prereq MATH 1031 or 1051 or by placement)
or MATH 1271 Calculus I [MATH] (4 cr, F/S/Sm, prereq MATH 1151 or 1155 or by placement)
- _____ ESPM 3012 Statistical Methods for Environmental Scientists and Managers [MATH] (4 cr, S, prereq 2 years high school math)
or STAT 3011 Introduction to Statistical Analysis [MATH] (4 cr, F/S/Sm)

Chemistry

- _____ CHEM 1015 Introductory Chemistry: Lecture (3 cr, F/S/Sm, prereq high school chemistry)
and CHEM 1017 Introductory Chemistry: Lab (1 cr, F/S/Sm)
or CHEM 1061 Chemical Principles I [PHYS] (3 cr, F/S/Sm, prereq CHEM 1101 or 1015 or placement)
and CHEM 1065 Chemical Principles I Lab [PHYS] (1 cr, F/S/Sm)

Social Sciences

- _____ ESPM 3261 Economics and Natural Resources Management [SOCS, ENV] (4 cr, S, prereq MATH 1031, 1051, 1142, 1155, or 1271 or ESPM 3012 or STAT 3011 or SOC 3811)
- _____ ESPM 3241W Natural Resource and Environmental Policy [SOCS, CIV, WI] (3 cr, S)

Major Professional Courses

- _____ FNRM 1001 Orientation and Information Systems (1 cr, F)
- _____ FNRM 1101 Dendrology: Identifying Forest Trees and Shrubs (3 cr, F)
- _____ FNRM 3131 Geographic Information Systems (GIS) for Natural Resources [TS] (4 cr, F/S, prereq soph, jr, sr, or UHP fr)
- _____ FNRM 4232W Managing Recreational Lands [WI] (4 cr, S)

Liberal Education Requirements and Writing Intensive

	Required Credits	FEMC courses that fulfill requirements
Diversified Core		
Arts/Humanities [AH]	3	-
Biological Science [BIOL]	4, must include lab or field experience	BIOL 1001 or 1009
Historical Perspective [HIS]	3	-
Literature [LIT]	3	-
Mathematical Thinking [MATH]	3	MATH 1151, 1142, or 1271 ESPM 3012 or STAT 3011
Physical Science [PHYS]	4, must include lab or field experience	SOIL 2125, CHEM 1015/1017 or CHEM 1061/1065
Social Sciences [SOCS]	3	ESPM 3261, ESPM 3241W
Designated Themes	<i>Four of the following five themes must be satisfied</i>	
Civic Life and Ethics [CIV]	3	COMM 1101, ESPM 3241W
Diversity and Social Justice in the US [DSJ]	3	-
The Environment [ENV]	3	SOIL 2125, ESPM 3261
Global Perspectives [GP]	3	-
Technology and Society [TS]	3	FNRM 3131
Writing Intensive [WI]: first year writing requirement and four writing intensive courses (two of which must be taken at the upper division level, one of which must be in your major)		

Forest Ecosystem Management and Conservation (FEMC) Core

- _____ FNRM 3104 Forest Ecology (4 cr, F, prereq BIOL 1001 or 1009, college chemistry recommended)
- _____ FNRM 3114 Hydrology and Watershed Management (3 cr, F, prereq MATH 1151, BIOL 1001 or 1009, and CHEM 1015/1017 or CHEM 1061/1065)
- _____ FNRM 3218 Measuring and Modeling Forests (3 cr, S, prereq MATH 1151 and ESPM 3012 or STAT 3011)
- _____ FNRM 3262 Remote Sensing of Natural Resources and Environment (3 cr, F)
- _____ FNRM 3411 Managing Forest Ecosystems: Silviculture (3 cr, F, prereq FNRM 3104; FEMC track students should take FNRM 5413 concurrently)
- _____ FNRM 5413 Managing Forest Ecosystems: Silviculture Lab (1 cr, F, prereq FNRM major or minor; FNRM-FEMC track students should take FNRM 3411 concurrently or instructor consent)
- _____ FNRM 3431 Timber Harvesting and Road Planning (2 cr, S, prereq FNRM 3411)
- _____ FNRM 3471 Forest Planning and Management (3 cr, F)
- _____ ESPM 3202W Environmental Conflict Management, Leadership, and Planning [WI] (3 cr, S)
- _____ PLPA 3003 Diseases of Forest and Shade Trees (3 cr, S)
or ENT 4251 Forest and Shade Tree Entomology (3 cr, F)
- _____ FW 2001W Introduction to Fisheries, Wildlife, and Conservation Biology [ENV] [WI] (3 cr, F, prereq BIOL 1001 or 1009)
or FW 4102 Principles of Conservation Biology [ENV] (3 cr, S)
or FW 4103 Principles of Wildlife Management (3 cr, S, prereq intro biology course, jr or sr)

Introductory Field Training in Assessment and Biology of Forests (at Cloquet Forestry Center in August)

- _____ FNRM 2101 Identifying Forest Plants (1 cr, Summer only)
- _____ FNRM 2102 Northern Forests: Field Ecology (2 cr, Summer only, prereq BIOL 1001 or 1009)
- _____ FNRM 2104 Measuring Forest Resources (1 cr, Summer only)

Advanced Field Training in Assessment and Management of Forest Resources

Take 2 of 3 courses (at Cloquet Forestry Center during May session)

- _____ FNRM 4511 Field Silviculture (2 cr, Summer only, prereq FNRM 3104 and 3411)
- _____ FNRM 4515 Field Remote Sensing and Resource Survey (2 cr, Summer only, prereq FNRM 3218 and 3262)
- _____ FNRM 4521 Field Timber Harvesting and Road Planning (2 cr, Summer only, prereq FNRM 3411 and 3431)

Experiential Learning

- _____ FNRM 4232W Managing Recreational Lands fulfills this requirement
or FNRM 2102 Northern Forests: Field Ecology fulfills this requirement or other course approved by major coordinator

Interdisciplinary Learning

- _____ One of the following courses fulfills this requirement:
 - ESPM 1011 Issues in the Environment [ENV] (3 cr)
 - ESPM 2021 Environmental Sciences: Integrated Problem Solving (3 cr)
 - ESPM 3575 Wetlands (3 cr)
 - ESPM 4021W Problem Solving: Environmental Review [WI] (4 cr)
 - ESPM 4041W Problem Solving for Environmental Change [WI] (4 cr)
 - AGRO 3203W Environment, Global Food Production, and the Citizen [GP, WI] (3 cr)
 - AGRO 3305 Agroecosystems of the World [GP] (3 cr)
 - AGRO 4103 World Food Problems [GP] (3 cr)
 - ANSC 3203W Environment, Global Food Production, and the Citizen [GP, WI] (3 cr)
 - APEC 3202 An Introduction to the Food System: Analysis, Management, and Design (3 cr)
 - APEC 4103 World Food Problems [GP] (3 cr)
 - BBE 4412W Biocomposites and Biomass Energy [WI] (4 cr)
 - CFAN 1501 Biotechnology, People, and the Environment [TS] (3 cr)
 - CFAN 3333 Insects, Microbes, and Plants [TS] (3 cr)
 - FSCN 1102 Food: Safety, Risks, and Technology [CIV] (3 cr)
 - FW 2001W Introduction to Fisheries, Wildlife, and Conservation Biology [ENV] [WI] (3 cr)
 - HORT 4850 Pollinator Protection in Managed Landscapes (3 cr)
 - PLPA 2003 Plague, Famine, and Beer: The Impact of Microscopic Organisms on Human Civilization [HIS] (3 cr)
 - SSM 4407W Sustainable Manufacturing Principles and Practices [WI] (3 cr)

Electives

At the University, 120 credits are required for graduation. After completing the major requirements, credits from any discipline may be used to reach 120 credits.

Minors and Certificates

Minors and certificates are an excellent way to further focus your studies in a related area of interest. The following are minors and certificates typically of interest to students in natural resources.

- Environmental Sciences, Policy and Management (16 cr)
- Fisheries and Wildlife (16-18 cr)
- Geographic Information Science (16 cr)
- Mass Communications-Emphasis in Public Relations (18 cr)
- Park and Protected Area Management (18-20 cr)
- Sustainable Tourism Certificate (12 cr in addition to FNRM 3101)
- Sustainability Studies (15-18 cr)
- Urban and Community Forestry (18 cr)

Study Abroad

The University encourages students to incorporate international study into their academic programs. In addition to those programs offered at the University level, the College of Food, Agricultural and Natural Resource Sciences also offers international programs specific to many of the majors housed within the college. Visit the Learning Abroad Center or CFANS International Programs Office to learn more about the many study abroad experiences available.

Subject/ Career Options

Students may also use their elective credits to develop additional coursework to further build knowledge and skill for employment. These are not required or equivalent to minors. See your advisor or faculty leader(s) noted for more information and assistance selecting courses. Subject and/or career option areas to consider include:

Forest Ecology and Silviculture	Human-Forest Interactions
Forest Fire and Health	Hydrologist Certification
Forest Operations	International Forestry
Forest-Wildlife Habitat Management	Resource Analysis, Measurements and Modeling
Geospatial Analysis	Graduate Study Preparation

The **Forest Ecology and Silviculture Option** (*Faculty: M. Windmuller-Campione, A. David, P. Bolstad, L. Frelich, R. Montgomery, P. Reich*) is for students interested in ecological principals of forest ecosystems and the design of ecosystem management and restoration strategies. Coursework could include FNRM 3203 Forest Fire and Disturbance Ecology, FNRM 3204 Landscape Ecology and Management, FNRM 4511 Field Silviculture, ESPM 3101 Conservation of Plant Biodiversity, EEB 4609W Ecosystem Ecology, EEB 4068 Plant Physiological Ecology, EEB 4611 Biogeochemical Processes, FNRM 3205/5205 Productivity and Ecology of Forest Soils, or HORT 5071 Restoration and Reclamation Ecology.

The **Forest Fire and Health Option** (*Faculty: A. Ek, L. Frelich, and M. Russell*) is for students interested in forest fire and health for careers focused in these areas. Coursework could include FNRM 3203 Forest Fire and Disturbance Ecology, PLPA 3003 Diseases of Forest and Shade Trees, ENT 4251 Forest and Shade Tree Entomology, or the MNDNR issued Wildland Firefighting Course Certificate.

The **Forest Operations Option** (*Faculty: C. Blinn, A. Ek, H. Hoganson*) is for students interested in managing forest land for investment returns and supplying forest products to associated markets. Both FNRM 4621 Field Timber Harvesting and Road Planning and BBE 1002 Wood and Fiber Science should be taken. In addition, coursework could include ACCT 2050 Introduction to Financial Reporting, ESPM 2041 Natural Resources, Consumption, and Sustainability, ESPM 3603 Environmental Life Cycle Analysis, ESPM 4242 Natural Resources and Environmental Policy, or Math 1142 Short Calculus or Math 1271 Calculus I.

The **Human Dimensions Option** (*Faculty M. Davenport, M. Kilgore, S. Carlson, K. Nelson, I. Schneider*) is for students interested in conflict management, sustainable land use planning, environmental policy and law governing natural resources, and outdoor recreation management. Coursework could include ESPM 2401 Environmental Education/Interpretation, ESPM 3202W Environmental Conflict Management, Leadership, and Planning, ESPM 3245 Sustainable Land Use Policy and Planning, ESPM 3271 Environmental Policy, Law and Human Behavior, ESPM 4256 Natural Resource Law and the Management of Public Lands and Waters, PHIL 3301 Environmental Ethics, FNRM 3201 Introduction to Travel and Tourism, SUST 3003 Sustainable People, Sustainable Planet, WRIT 3404 Environmental Communication, or FNRM 3206 Park and Protected Area Management Field Studies (prereq Soph or higher, 10-day session in Ely, MN).

The **Resource Analysis, Measurements and Modeling Option** (*Faculty: T. Burk, A. Ek*) is for students interested in advancing their skills in measuring, monitoring and analyzing forest and related natural resources and their dynamics. Coursework could include the following three courses MATH 1142 Short Calculus or MATH 1271 Calculus I, FNRM 4515 Field Remote Sensing and Resource Survey, and FNRM 5228 Advanced Assessment and Modeling of Forests. In addition, one course from the following; ESPM 3211 Survey, Measurement and Modeling for environmental analysis, STAT 5302 Applied Regression analysis (3 cr, F/S), or a credit or non-credit course in computer programming or database management.

The **Forest-Wildlife Habitat Management Option** (*Faculty: A. Ek, L. Frelich*) is for students interested in advanced understanding of forest-wildlife habitat relationships and corresponding habitat management for a career supporting wildlife management. Students should take BIOL 2012 General Zoology, FW 4103 Principles of Wildlife Management, and FW 5603W Habitats and Regulation of Wildlife. Other courses could include FNRM 3203 Forest Fire and Disturbance Ecology, FNRM 3204 Landscape Ecology and Management, EEB 4129 or EEB 4839 Mammalogy, EEB 4134 or EEB 4844 Ornithology.

The **Hydrology Certification (AIH) Option** (*Faculty: D. Karwan*) is for students seeking employment as a certified hydrologist. The requirements are CHEM 1022 Principles of Chemistry II, MATH 1271 and 1272 Calculus I and II, PHYS 1101W and 1102 Introductory College Physics I and II *or* PHYS 1301 and 1302 Physics for Scientists and Engineers. At least 6 additional credits must be taken from the following list; FNRM 5153 Forest and Wetland Hydrology, BBE 5513 Watershed Engineering, CE 4501 Hydrologic Design, CE 3502 Fluid Mechanics, ESPM 3111 Hydrology and Water Quality Field Methods, ESPM 4216 Contaminant Hydrology, GEO 5701 General Hydrogeology, and SOIL 5232 Vadose Zone Hydrology.

The **Geospatial Science Option** (*Faculty: P. Bolstad, J. Knight, and M. Falkowski*) is for students seeking to emphasize Geographic Information Systems (GIS), remote sensing, Global Positioning System (GPS), and spatial analysis. This option will prepare students for graduate studies in geospatial science programs. Coursework could include ESPM 3031 Applied Global Positioning Systems for GIS, ESPM 4295W GIS in Environmental Science and Management, FNRM 5412 Digital Remote Sensing, GEOG 3531 Numerical Spatial Analysis, GIS 5555 Basic Spatial Analysis, or GIS 5578 GIS Programming.

The **International Forestry Option** (*Faculty: A. Ek, D. Current*) is for students interested in forestry and agroforestry in developing regions of the world addressing economic and/or environmental issues. Coursework could include ESPM 2041 Natural Resources, Consumption, and Sustainability, ESPM 3251 Natural Resources in Sustainable International Development, ESPM 3703 Agroforestry in Watershed Management, ESPM 3101 Conservation of Plant Biodiversity, ESPM 3241W Natural Resources and Environmental Policy, FNRM 5142 Tropical Forest Ecology, or a study abroad experience.

Graduate Study Option (*Faculty: All*) Students interested in graduate school should strengthen their undergraduate core and take prerequisites for classes likely to be needed in graduate school. Students should meet with faculty in their area of interest to develop their coursework. Math, science and basic courses also help students prepare for the Graduate Record Exam (GRE).