

Department of Aquatic, Watershed, and Earth Resources

Department Head: Chris Luecke
Location: Natural Resources 210
Phone: (435) 797-2459
FAX: (435) 797-1871
E-mail: chris.luecke@usu.edu
WWW: <http://www.cnr.usu.edu/awer>

Undergraduate Advisor: Maureen A. Wagner, Natural Resources
120, (435) 797-2448, maureen@cc.usu.edu

Degrees offered: Bachelor of Science (BS) in Fisheries and Aquatic Sciences; BS in Watershed and Earth Systems; Master of Science (MS) and Doctor of Philosophy (PhD) in Watershed Science; MS and PhD in Ecology; MS and PhD in Fisheries Biology

Graduate specializations: *MS, PhD in Ecology*—Aquatic Ecology; *MS, PhD in Fisheries Biology*—Aquatic Ecology, Conservation Biology, Fisheries Management

Undergraduate Programs

Objectives

The Department of Aquatic, Watershed, and Earth Resources (AWER) offers comprehensive educational opportunities for graduate and undergraduate students in hydrology, geomorphology, biogeochemistry, water quality, watershed management, fisheries, aquatic ecology, remote sensing, and geographic modeling. Departmental faculty provide expertise in fisheries, the hydrologic cycle, conservation biology, restoration and management of aquatic and riparian ecosystems, and in the remote sensing and geographic analysis of the earth's landcovers. Graduates of departmental programs become scientists and managers for natural resource agencies, professionals with consulting and nonprofit environmental firms, and teachers and researchers at major universities.

Career Opportunities

Graduates in Aquatic, Watershed, and Earth Resources occupy an expanding niche in the fields of natural resources and environmental management. Degree holders often work as environmental scientists, hydrologists, fisheries biologists, or specialists in geographic information analysis and remote sensing. With experience and/or advanced degrees, AWER graduates may do natural resource assessment, management planning, and resource impact analysis.

Federal agencies, such as the Forest Service, Fish and Wildlife Service, Geological Survey, Bureau of Land Management, Environmental Protection Agency, National Park Service, Bureau of Reclamation, and National Marine Fisheries Service, hire graduates of AWER academic programs. Graduates also find employment with state natural resource agencies, nongovernmental conservation organizations, and private consulting firms.

Requirements

Departmental Admission Requirements

Admission requirements for the department are the same as those described for the College of Natural Resources (see pages 117-118).

Graduation Requirements

All courses listed as major subject courses must be taken on an A-B-C-D-F basis. A grade of C- or better is required for all AWER courses

used to meet the requirements for a major or minor in the department. The grade point average for all courses taught by the College of Natural Resources must be 2.5 or higher.

For information about changes in requirements, course sequence, and scheduling, students should confer with a departmental advisor. The undergraduate program can be readily tailored to individual student needs with the help of a faculty advisor.

In addition to completing the University Studies course requirements, all students earning an undergraduate degree in the Department of Aquatic, Watershed, and Earth Resources must complete the Common Departmental Core and Capstone Course, as listed below. Some of these courses may be used toward the University Studies requirements, as indicated by the University Studies designations listed in parentheses following the course numbers.

A. Common Departmental Core (19 credits)

| | |
|--|---|
| AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation (F)..... | 1 |
| AWER 3700 (CI) Fundamentals of Watershed Science (Sp)..... | 3 |
| AWER 4490 Small Watershed Hydrology (F)..... | 4 |
| AWER 4500 Freshwater Ecology (Sp)..... | 3 |
| AWER 4930 Geographic Information Systems (F)..... | 4 |
| AWER 4980 Undergraduate Seminar (F,Sp)..... | 1 |
| ENVS 5320 Water Law and Policy in the United States (F)..... | 3 |

B. Capstone Course (3 credits minimum)

| | |
|--|---|
| AWER 4510 Aquatic Ecology Practicum (F)..... | 3 |
| AWER 4530 Water Quality and Pollution (Sp)..... | 3 |
| AWER 4950 ST: Watershed Analysis (Sp)..... | 3 |
| AWER 5330 Large River Management (F)..... | 3 |
| AWER 5930 Geographic Information Analysis (Sp)..... | 4 |
| OR | |
| Approved Natural Resources Capstone Experience..... | 3 |

Bachelor of Science in Fisheries and Aquatic Sciences

Students in the Fisheries and Aquatic Sciences major must meet the course requirements for University Studies, as well as complete the Common Departmental Core and Capstone Course listed above. They must also complete 51 credits of Science Foundation and Fisheries Courses, plus 23 credits of Directed Electives, as listed below.

The first two years of study include courses designed to give the student a sound scientific background, an introduction to the field of natural resources management, and an introduction to aquatic and earth resources.

A. Scientific Foundation (35 credits)

| | |
|--|---|
| BIOL 1210 Biology I (F)..... | 4 |
| BIOL 1220 (BLS) Biology II (Sp)..... | 4 |
| CHEM 1210 Principles of Chemistry I (F,Sp)..... | 4 |
| CHEM 1230 Chemical Principles Laboratory I (F,Sp)..... | 1 |
| CHEM 1220 (BPS) Principles of Chemistry II (F,Sp,Su)..... | 4 |
| CHEM 1240 Chemical Principles Laboratory II (F,Sp)..... | 1 |
| MATH 1050 (QL) College Algebra (F,Sp,Su)..... | 4 |
| MATH 1100 (QL) Calculus Techniques (F,Sp,Su)..... | 3 |
| NR 2220 General Ecology (F,Sp)..... | 3 |
| PHYX 2110 The Physics of Living Systems I..... | 4 |
| STAT 3000 (QI) Statistics for Scientists (F,Sp)..... | 3 |

B. Fisheries Courses (16 credits)

| | |
|--|---|
| AWER 3100 (DSC/CI) Fish Diversity and Conservation (F)..... | 3 |
| AWER 3110 Fish Diversity Laboratory (F)..... | 1 |
| AWER 4510 Aquatic Ecology Practicum (F)..... | 3 |

Department of Aquatic, Watershed, and Earth Resources

| | |
|--|---|
| AWER 4650 Principles in Fishery Management (Sp)..... | 3 |
| AWER 5200 Fish Habitat Relationships in Managed Forests (F) | 3 |
| AWER 5550 Freshwater Invertebrates (Sp)..... | 3 |

C. Directed Electives

Students must choose a minimum of 23 elective credits to complete the Fisheries and Aquatic Sciences degree requirements. The majority of these elective credits must come from courses directly related to the degree program. **All elective courses must be approved by the student's faculty advisor before enrollment.** The following is a list of recommended courses that could be used to satisfy this requirement.

| | |
|--|---|
| AWER 3000 Oceanography (Sp) | 3 |
| AWER 3820 (QI) Climate Change (Sp)..... | 3 |
| AWER 4530 Water Quality and Pollution (Sp) | 3 |
| AWER 5150 Fluvial Geomorphology (F) | 3 |
| AWER 5640 Riparian Ecology and Management (Sp)..... | 3 |
| ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (F) | 3 |
| FRWS 4880 Genetics in Conservation and Management (F) | 3 |
| HIST 3950 (DHA/CI) Environmental History (Sp) | 3 |
| PHIL 3510 (DHA) Environmental Ethics (F,Sp)..... | 3 |
| POLS 4820 (DSS) Natural Resources and Environmental Policy: Political Economy of Environmental Quality (Sp) | 3 |

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS0400/0482.HTM>

D. General Electives

Students may take the remainder of the 120 credits from any department. The guidelines described under *General Education Requirements* and *University Studies Depth Education Requirements* (see pages 46-54) should be consulted to ensure meeting University Studies Requirements.

Fisheries and Aquatic Sciences Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

Freshman Year (29 credits)

Fall Semester (15 credits)

| | |
|---|---|
| AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation | 1 |
| BIOL 1210 Biology I | 4 |
| ENGL 1010 (CL) Introduction to Writing: Academic Prose | 3 |
| MATH 1050 (QL) College Algebra..... | 4 |
| Breadth American Institutions (BAI) Course | 3 |

Spring Semester (14 credits)

| | |
|---|---|
| AWER 4980 Undergraduate Seminar | 1 |
| BIOL 1220 (BLS) Biology II..... | 4 |
| MATH 1100 (QL) Calculus Techniques | 3 |
| Breadth Creative Arts (BCA) Course | 3 |
| Breadth Humanities (BHU) Course | 3 |

Sophomore Year (29 credits)

Fall Semester (15 credits)

| | |
|---|---|
| AWER 3100 (CI) Fish Diversity and Conservation | 3 |
| AWER 3110 Fish Diversity Laboratory | 1 |
| CHEM 1210 Principles of Chemistry I | 4 |

| | |
|--|---|
| CHEM 1230 Chemical Principles Laboratory I | 1 |
| ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (3 cr) or | |
| Other approved Breadth Social Sciences Course (3 cr) | 3 |
| ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode | 3 |

Spring Semester (14 credits)

| | |
|---|---|
| AWER 3700 (CI) Fundamentals of Watershed Science | 3 |
| CHEM 1220 (BPS) Principles of Chemistry II | 4 |
| CHEM 1240 Chemical Principles Laboratory II | 1 |
| NR 2220 General Ecology | 3 |
| STAT 3000 (QI) Statistics for Scientists | 3 |

Junior Year (33 credits)

Fall Semester (18 credits)

| | |
|---|---|
| AWER 4490 Small Watershed Hydrology | 4 |
| AWER 4930 Geographic Information Systems | 4 |
| ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (3 cr) or | |
| Other approved Depth Social Sciences (DSS) Course (3 cr)..... | 3 |
| FRWS 3810 Plant and Animal Populations (suggested elective) | 3 |
| PHYX 2110 The Physics of Living Systems I | 4 |

Spring Semester (15 credits)

| | |
|---|---|
| AWER 4500 Freshwater Ecology | 3 |
| AWER 4650 Principles in Fishery Management | 3 |
| AWER 5550 Freshwater Invertebrates..... | 3 |
| USU Depth Humanities and Arts (DHA) Course | 3 |
| Elective Course | 3 |

Senior Year (29 credits)

Fall Semester (15 credits)

| | |
|--|---|
| AWER 4510 Aquatic Ecology Practicum | 3 |
| AWER 5200 Fish Habitat Relationships in Managed Forests | 3 |
| ENVS 5320 Water Law and Policy in the United States..... | 3 |
| Elective Courses | 6 |

Spring Semester (14 credits)

| | |
|--|----|
| AWER 5330 Large River Management..... | 3 |
| Elective Courses | 11 |

Fisheries Science Minor Requirements (18 credits)

All courses required for the Fisheries Science minor must be taken on an A-B-C-D-F basis. A grade of C- or better is required for all AWER courses used to meet requirements for this minor.

Fisheries Science Core Courses (9 credits)

| | |
|---|---|
| AWER 3100 (CI) Fish Diversity and Conservation (F) | 3 |
| AWER 3700 (CI) Fundamentals of Watershed Science (Sp)..... | 3 |
| NR 2220 General Ecology (F, Sp) | 3 |

They must also complete 9 credits of Electives, by selecting three courses from the following:

Electives (9 credits)

Select three courses from the following:

| | |
|--|---|
| AWER 4500 Freshwater Ecology (Sp) | 3 |
| AWER 4650 Principles in Fishery Management (Sp)..... | 3 |
| AWER 5200 Fish Habitat Relationships in Managed Forests (F) | 3 |
| AWER 5550 Freshwater Invertebrates (Sp)..... | 3 |
| FRWS 3810 Plant and Animal Populations (Sp) | 3 |

Department of Aquatic, Watershed, and Earth Resources

Bachelor of Science in Watershed and Earth Systems

Students in the Watershed and Earth Systems major must meet the course requirements for University Studies, as well as complete the Common Departmental Core and Capstone Course listed above. They must also complete 34 credits of Science Foundation and Watershed and Earth Systems courses, plus 34 credits of Directed Electives, as listed below.

A. Science Foundation (19 credits)

| | |
|---|---|
| CHEM 1210¹ Principles of Chemistry I (F, Sp) | 4 |
| GEOL 1150 (BPS) The Dynamic Earth: Physical Geology (F, Sp)..... | 4 |
| MATH 1210 (QL)² Calculus I (F, Sp, Su)..... | 4 |
| STAT 3000 (QI) Statistics for Scientists (F, Sp)..... | 3 |
| PHYX 2210 (QI) General Physics—Science and Engineering I..... | 4 |

¹CHEM 1210 requires a Math ACT score of at least 25 or completion of MATH 1050 or higher. High School chemistry is recommended.

²MATH 1210 requires completion of both MATH 1050 and 1060, or an AP calculus score of at least 3 on the AB test, or a math ACT score of at least 27.

B. Watershed and Earth Systems Courses (15 credits)

| | |
|--|---|
| AWER 3820 (QI) Climate Change (Sp)..... | 3 |
| AWER 4750 Fundamentals of Remote Sensing Science (F)..... | 3 |
| AWER 5150 Fluvial Geomorphology (F)..... | 3 |
| AWER 5170 Fluvial Geomorphology Lab (F)..... | 2 |
| SOIL 3000 Fundamentals of Soil Science (F,Sp)..... | 4 |

C. Directed Elective Courses (34 credits)

Students must choose a minimum of 34 elective credits to complete the Watershed and Earth Systems degree requirements. The majority of these elective credits must come from courses directly related to the degree program. **All elective courses must be approved by the student's faculty advisor before enrollment.** The following lists of recommended courses could be used to satisfy this requirement.

Watershed Science

| | |
|--|---|
| AWER 4510 Aquatic Ecology Practicum (F) | 3 |
| AWER 4530 Water Quality and Pollution (Sp) | 3 |
| AWER 5200 Fish Habitat Relationships in Managed Forests (F) | 3 |
| AWER 5640 Riparian Ecology and Management (Sp)..... | 3 |
| AWER 5660 Watershed and Stream Restoration (Sp)..... | 2 |
| CHEM 1220 (BPS) Principles of Chemistry II (F, Sp, Su)..... | 4 |
| FRWS 5350 Wildland Soils (Sp)..... | 3 |

Geographic Information Science

| | |
|---|---|
| AWER 5250 Remote Sensing of Land Surfaces (Sp) | 4 |
| AWER 5760 Remote Sensing: Modeling and Analysis (Sp) | 3 |
| AWER 5930 Geographic Information Analysis (Sp) | 4 |
| MATH 1220 (QL) Calculus II (F, Sp, Su) | 4 |
| PHYX 2220 (BPS/QI) General Physics—Science and Engineering II..... | 4 |
| STAT 6810 Topics in Statistics (Spatial Statistics) (F)..... | 3 |

D. General Electives

Students may take the remainder of the 120 credits from any department. The guidelines described under *General Education Requirements* and *University Studies Depth Education Requirements* (see pages 46-54) should be consulted to ensure meeting University Studies Requirements.

Note: Students wanting to pursue federal employment should check the following U.S. Office of Personnel Management website for a listing of required coursework:

<http://www.opm.gov/qualifications/SEC-IV/B/GS1300/1315.HTM>

Watershed and Earth Systems Major Recommended Four-Year Plan of Study

Students should meet regularly with their faculty advisor and carefully plan their academic program, keeping in mind that many upper-division courses have prerequisites and must be taken in sequence. Students following the recommended schedule listed below should be able to complete degree requirements in four years (eight semesters).

Freshman Year (31-32 credits)

Fall Semester (15 credits)

| | |
|---|---|
| AWER 1020 Aquatic, Watershed, and Earth Resources Professional Orientation | 1 |
| CHEM 1210 Principles of Chemistry I..... | 4 |
| ECON 1550 (BSS) Introduction to Environmental and Natural Resource Economics (or other approved Breadth Social Sciences course)..... | 3 |
| ENGL 1010 (CL) Introduction to Writing: Academic Prose | 3 |
| GEOL 1150 (BPS) The Dynamic Earth: Physical Geology | 4 |

Spring Semester (16-17 credits)

| | |
|--|--------|
| AWER 3700 (CI) Fundamentals of Watershed Science..... | 3 |
| CHEM 1220 (BPS) Principles of Chemistry II (4 cr) or Other approved elective course (3-4 cr)..... | 3 or 4 |
| MATH 1210 (QL) Calculus I | 4 |
| Breadth Creative Arts (BCA) Course | 3 |
| Breadth Humanities (BHU) Course | 3 |

Sophomore Year (29-31 credits)

Fall Semester (16-17 credits)

| | |
|--|--------|
| ENGL 2010 (CL) Intermediate Writing: Research Writing in a Persuasive Mode | 3 |
| MATH 1220 (QL) Calculus II (4 cr) or Other approved elective course (3-4 cr)..... | 3 or 4 |
| PHYX 2210 (QI) General Physics—Science and Engineering I..... | 4 |
| STAT 3000 (QI) Statistics for Scientists | 3 |
| USU Depth Course (CI)..... | 3 |

Spring Semester (13-14 credits)

| | |
|---|--------|
| AWER 3820 (QI) Climate Change..... | 3 |
| PHYX 2220 (BPS/QI) General Physics—Science and Engineering II (4 cr) or Other approved elective course (3-4 cr)..... | 3 or 4 |
| SOIL 3000 Fundamentals of Soil Science..... | 4 |
| Breadth American Institutions (BAI) Course | 3 |

Junior Year (30 credits)

Fall Semester (17 credits)

| | |
|---|---|
| AWER 4490 Small Watershed Hydrology | 4 |
| AWER 4750 Fundamentals of Remote Sensing Science | 3 |
| AWER 4930 Geographic Information Systems | 4 |
| ENVS 5320 Water Law and Policy in the United States..... | 3 |
| Breadth Life Sciences (BLS) Course..... | 3 |

Spring Semester (13 credits)

| | |
|--|---|
| AWER 4500 Freshwater Ecology | 3 |
| Depth Humanities and Creative Arts (DHA) Course..... | 3 |
| Elective Course(s)..... | 7 |

Senior Year (30 credits)

Fall Semester (15-16 credits)

| | |
|--|--------|
| AWER 4980 Undergraduate Seminar | 1 |
| AWER 5150 Fluvial Geomorphology..... | 3 |
| AWER 5170 Fluvial Geomorphology Lab..... | 2 |
| ENVS 4000 (DSS) Human Dimensions of Natural Resource Management (3 cr) or Other approved DSS course (3-4 cr)..... | 3 or 4 |
| Elective Courses | 6 |

Department of Aquatic, Watershed, and Earth Resources

Spring Semester (15 credits)

| | |
|---|----|
| AWER 4530 Water Quality and Pollution (3 cr) or Approved Natural Resources Capstone Experience (3 cr) | 3 |
| Elective Courses | 12 |

Geographic Information Science Minor Requirements (18-19 credits)

All courses required for the Geographic Information Science minor must be taken on an *A-B-C-D-F* basis. A grade of *C-* or better is required for all AWER courses used to meet requirements for this minor.

A. Watershed and Earth Resources Core Courses (12 credits)

| | |
|--|---|
| AWER 4930 Geographic Information Systems (F)..... | 4 |
| AWER 5930 Geographic Information Analysis (Sp) | 4 |
| CS 1700 Introduction to Computer Science—CS 1 (F,Sp,Su) | 3 |
| CS 1710 Introduction to Computer Science—CS 1 Lab (F,Sp,Su) | 1 |

B. Electives (6-7 credits)

Select two courses from the following:

| | |
|--|---|
| AWER 4750 Fundamentals of Remote Sensing Science (F)..... | 3 |
| AWER 5250 Remote Sensing of Land Surfaces (Sp) | 4 |
| FRWS 5750 Applied Remote Sensing (Sp)..... | 3 |
| AWER 5760 Remote Sensing: Modeling and Analysis (Sp) | 3 |
| CEE 6440 Geographic Information Systems in Water Resources (F)... | 3 |

Watershed Science Minor Requirements (15-16 credits)

All courses required for the Watershed Science minor must be taken on an *A-B-C-D-F* basis. A grade of *C-* or better is required for all AWER courses used to meet requirements for this minor.

A. Required Courses (10 credits)

| | |
|---|---|
| AWER 3700 (CI) Fundamentals of Watershed Science (Sp)..... | 3 |
| AWER 4490 Small Watershed Hydrology (F)..... | 4 |
| AWER 4530 Water Quality and Pollution (Sp) | 3 |

B. Electives (5-6 credits)

Select two courses from the following:

| | |
|---|---|
| AWER 4500 Freshwater Ecology (Sp)..... | 3 |
| AWER 5150 Fluvial Geomorphology (F) | 3 |
| AWER 5640 Riparian Ecology and Management (Sp)..... | 3 |
| AWER 5660 Watershed and Stream Restoration (Sp)..... | 2 |

Financial Assistance

The main sources of undergraduate financial assistance include University scholarships, grants-in-aid, work-study, and loans. In addition, more than 30 scholarships are offered for eligible students in the College of Natural Resources.

Scholarships are awarded for scholastic and professional achievements at the department, College of Natural Resources, and University level. For more information, contact College of Natural Resources academic advisors. Grants-in-aid and work-study are available from the Financial Aid Office. In addition, departmental faculty often employ undergraduate students to assist in research, extension, and outreach projects. These projects often involve field and laboratory data collection, data management and analysis, and report preparation.

Departmental Honors

Students who would like to experience greater academic depth within their major are encouraged to enroll in departmental honors. Through original, independent work, Honors students enjoy the benefits of close supervision and mentoring, as they work one-on-one with faculty in select upper-division departmental courses. Honors students also complete a senior project, which provides another opportunity to collaborate with faculty on a problem that is significant, both personally and in the student's discipline. Participating in departmental honors enhances students' chances for obtaining fellowships and admission to graduate school. Minimum GPA requirements for participation in departmental honors vary by department, but usually fall within the range of 3.30-3.50. Students may enter the Honors Program at almost any stage in their academic career, including at the junior (and sometimes senior) level. The campus-wide Honors Program, which is open to all qualified students regardless of major, offers a rich array of cultural and social activities, special classes, and the benefit of Honors early registration. Interested students should contact the Honors Program, Merrill Library 374, (435) 797-2715, honors@cc.usu.edu. Additional information can be found online at:

<http://www.usu.edu/honors/>

Additional Information

For additional information about the Bachelor of Science requirements, course sequencing, and departmental specialization options and their related coursework, as well as updated information describing current programs and courses offered by the Department of Aquatic, Watershed, and Earth Resources, visit the Aquatic, Watershed, and Earth Resources main office, Natural Resources 210, or visit <http://www.cnr.usu.edu/awer>. Major requirement sheets may be obtained at the departmental office, or online at: <http://www.usu.edu/ats/majorsheets/>

Graduate Programs

Admission Requirements

General admission requirements apply, in addition to the requirements which follow. Although admission to the graduate program is treated on an application-by-application basis, the following are usually required: (1) a bachelor's degree from an accredited college or university; (2) a GPA of 3.2 or better (out of 4.0) for the most recent two years of academic coursework; (3) combined verbal and quantitative GRE scores above the 40th percentile; and (4) a letter of "interest and purpose" detailing the applicant's reasons for seeking an advanced degree. Foreign students should have a TOEFL score of at least 550. The written statement of interest helps match applicants with faculty advisors. A faculty member must agree to serve as the major professor in order for an applicant to be accepted. Prospective students are encouraged to contact faculty members early in the application process to investigate mutual interests, projects, and prospects for financial support.

Previous training in the field is not a prerequisite for admission, although a sound background in the physical and biological sciences is recommended. Successful applicants without the necessary background will be expected to obtain it in the course of their studies for the advanced degree.

Department of Aquatic, Watershed, and Earth Resources

Degree Programs

A Master of Science degree in Fisheries Biology or Watershed Science, with emphasis on the management of fisheries or watershed resources directed toward decision-making roles in natural resource agencies, is offered for the applicant with previous agency experience and for the student motivated toward an administrative career. A Doctor of Philosophy degree in Fisheries Biology, Ecology, or Watershed Science is provided for students interested in pursuing a research or academic career.

A thesis or dissertation based on original research performed by the student is required. Written comprehensive examinations are required of all students pursuing the PhD degree. At the discretion of the student's graduate supervisory committee, an additional oral examination may be required.

The minimum requirement for an MS degree is 30 credits, including at least 24 credits in residency and 6 credits of thesis research. The minimum requirement for a PhD degree is 60 approved graduate credits in addition to an MS degree, or 90 approved graduate credits with no MS degree. At least one year (a minimum of 32 credits), including a minimum of two consecutive semesters, of full-time registration must be in residence at USU.

With committee approval, graduate credit may be transferred from accredited graduate schools, provided the minimum residency requirement (including thesis and dissertation credit) at USU is met. Transfer credit, which must not have been used for any other degree, will be shown on official USU transcripts at completion of the degree.

Master of Natural Resources

The department also participates in the College of Natural Resources Master of Natural Resources (MNR) degree program. For more information, see page 369.

Specializations

The MS and PhD degrees in Fisheries Biology and Ecology allow students to specialize in either Fisheries Management or Aquatic Ecology.

Financial Assistance

General aspects of financial support for graduate students at Utah State University are listed on pages 92-93 in the *Graduate Financial Assistance* section. This includes important information on the University-wide policies and terms of reference for research and teaching assistantships, graduate tuition obligations and benefits, Western Regional Graduate Programs, and competitive University-wide fellowships and scholarships.

Assistantships

Research assistantships are available through individual faculty members who hold research grants or contracts. Occasionally, teaching assistantships are available through the department. Recipients of teaching assistantships are usually selected from among PhD students.

Western Regional Graduate Programs

The MS and PhD in Watershed Science are Western Regional Graduate Programs. For more information, see page 92.

Aquatic, Watershed, and Earth Resources Faculty

Professors

Todd A. Crowl, aquatic ecology and conservation biology
Charles P. Hawkins, stream ecology, conservation biology, and biomonitoring
Chris Luecke, lake ecology and fisheries
Wayne A. Wurtsbaugh, limnology, fish ecology, and watershed biogeochemistry

Research Professor

Jeffrey L. Kershner, USDA Forest Service, national habitat coordinator, stream ecology and fish-habitat relationships

Adjunct Professors

Christopher Neale, remote sensing
David G. Tarboton, geomorphology, hydrology
James P. Dobrowski, watershed hydrology, management, and restoration

Professors Emeriti

John A. Kadlec, wetland ecology and biogeochemistry
John M. Neuhold, fisheries biology

Associate Professors

Robert R. Gillies, remote sensing and meteorology
John C. Schmidt, fluvial geomorphology and water policy
Helga Van Miegroet, biogeochemistry, soils, and ecosystem ecology

Adjunct Associate Professor

Joanna L. Endter-Wada, cultural anthropology, natural resource policy and sociology

Assistant Professors

Phaedra E. Budy, assistant leader, fisheries, Utah Cooperative Fisheries and Wildlife Research Unit, fisheries management and aquatic ecology
Nancy O. Mesner, water quality, water policy, and modeling
Michael A. White, ecosystem modeling, remote sensing, and global climatology

Research Assistant Professor

Mark R. Vinson, aquatic invertebrate ecology and biomonitoring

Adjunct Assistant Professors

Michelle A. Baker, ecology, hydrology
David A. Beauchamp, food webs, bioenergetics models, predator-prey interactions, visual foraging
Nicolaas W. Bouwes, Jr., fisheries management, aquatic ecology
Anne Brasher, ecology specialist, water quality assessment
David G. Chandler, hydrology
David Naftz, geochemist
Joel L. Pederson, geomorphology, paleoclimatology, and sedimentology
Brett Roper, USDA Forest Service Aquatic Monitoring Center Program Leader, aquatic ecologist
Juergen Symanzik, computational and graphical statistics
J. Christopher Wilson, director, State of Utah Division of Wildlife Resources Fisheries Experiment Station, fish pathologist/nutritionist

Course Descriptions

Aquatic, Watershed, and Earth Resources (AWER), pages 455-458