WATER SCIENCE AND MANAGEMENT

Graduate Program Information

New Mexico faces serious challenges concerning the supply, development, quality, management and administration of water resources; responses to the challenges will have major impacts on the regional economy, environmental quality and the quality of life of the residents of New Mexico. A major need exists to train the next generation of water resource researchers, educators, and managers to address these challenges, both inside and outside New Mexico. To help meet these needs, an interdisciplinary program in Water Science & Management (WSM) has been developed at NMSU by the departments of

- Agricultural Economics and Agricultural Business,
- Animal and Range Science,
- Civil Engineering,
- Geography, and
- Plant and Environmental Sciences.

The primary purposes of the interdisciplinary masters and doctoral degree programs in WSM are to provide graduate education for addressing state, national, and international water issues, and to train the next generation of water professionals needed to meet the challenges noted above. A Master of Science WSM degree can be earned with 26 credits of formal course work, plus additional thesis research credits, and a Doctor of Philosophy WSM can be earned with 30-40 credits of formal course work beyond the masters, plus additional dissertation research credits.

Five (5) fields of study are offered in the program and are detailed below (suggested classes for each area are detailed in the following section):

- **Agricultural Water Resources** relates to the major use of ground and surface water in providing safe and secure food systems while ensuring ecosystem services. This field of study includes water allocation, water conservation and water management issues facing urban water supply and irrigated agriculture.

- **Watershed, Riparian and Aquatic Systems** includes the processes of organizing and guiding land and other resources used in a river basin to provide desired goods and services without adversely affecting soil and water resources. Watershed, riparian, and aquatic system management involves an array of nonstructural (vegetation management) practices, as well as an array of structural (engineering) activities, when conditions warrant.

- **Water Quality and Treatment** includes processes used to make water acceptable for desired end-uses. These can include use as drinking water, industrial processes, agricultural uses and environmental management. The goal of water treatment processes is to remove existing contaminants in the water or reduce the concentration of such contaminants so the water becomes fit for its desired end-use.

- **Water Economics and Policy** examines the demand for water by all its competing uses, including irrigated agriculture, energy, urban supply, and environmental restoration and management. Policies are examined for their influence on water supplies, water demands, and economic values of water reallocations among agricultural, environmental, energy, and urban users. It examines the role of water markets, water user decisions, institutional adjustments, and water-related policies with respect to resource costs, water quality, profitability, and environmental effects.

- **Water Informatics** is an interdisciplinary science primarily concerned with the collection, classification, manipulation, storage, retrieval and especially the dissemination of water information, including both human and machine readable documents. Examples of human readable documents include maps, field data sheets, operational schedules, and long term asset management plans with narrative text. Machine readable documents include files for geographic information systems (GIS), Global Positioning Systems (GPS), relational database management systems and emerging applications.

Admission Requirements

**Admission Requirements for the Master of Science (MS)** in water science and management include all general requirements for a graduate degree as set forth in the NMSU Catalog, plus the following:

- Possession of a bachelor’s degree from an accredited university grade point average of 3.5 or higher on a 4.0 scale. However, students with grade point averages between 3.0 and 3.5 will be given consideration, this degree being preparatory to the Water Science and Management degree.

- A letter of intent or statement of purpose that addresses individual professional and personal goals related to water science and management and discusses how these goals fit within the degree programs at NMSU. It is expected that the candidate will have made contact with prospective advisor(s) at NMSU and speak to how he or she would work with said advisor(s) to advance their research and study.

- Three letters of recommendation submitted directly from persons who know the applicant professionally, including a recommendation from the candidate’s current employer/sponsor. These letters should provide evidence of professional ability, research experience and the potential for professional development.

- A brief resume or curriculum vitae not to exceed five pages that summarize the candidate’s background and qualifications.

**Admission Requirements for the Doctor of Philosophy (Ph.D.)** in water science and management include all general requirements for a graduate degree as set forth in the NMSU Catalog, plus the following:

- Possession of a master’s degree from an accredited university with a grade point average of 3.5 or higher on a 4.0 scale. However, students with grade point averages between 3.0 and 3.5 will be given consideration. This degree being preparatory to the Water Science and Management doctorate.

- Three letters of recommendation submitted directly from persons who know the applicant professionally, including a recommendation from the candidate’s current employer/sponsor. These letters should provide evidence of professional ability, research experience, and the potential for professional development.

- In addition, applicants to the Ph.D. program should provide evidence of research experience. This could include a master’s thesis, a professional paper, peer reviewed manuscripts, consulting reports, or other evidence of experience conducting research.

- A letter of intent or statement of purpose that addresses individual professional and personal goals related to water science and management and discusses how these goals fit within the degree programs at NMSU. It is expected that the candidate will have made contact with prospective advisor(s) at NMSU and speak to how he
or she would work with said advisor(s) to advance their research and study.

- A brief resume or curriculum vitae not to exceed five pages that summarize the candidate's background and qualifications.

**Degree Requirements**

**Water Science & Management Graduate Courses**

The following courses are courses deemed likely to support each of the five fields of study, but this list is not meant to be all inclusive. Variations from or additions to this list may be made by the candidate, subject to the approval by the thesis or dissertation committee chairperson.

**Agricultural Water Resources**

- **A EN 459**  Design of Water Wells/Pumping Systems  3
- **A EN 475**  Soil and Water Conservation  3
- **A EN 478**  Irrigation and Drainage Engineering  3
- **AGRO 620**  Instrumentation in Agronomy  3
- **C E 452**  Geohydrology  3
- **C E 482/E S 452/GEOL 452**  Hydraulic Structures  3
- **C E 483**  Surface Water Hydrology  3
- **C E 485**  Design of Earth Dams  3
- **C E 506**  Advanced Soil Mechanics  3
- **C E 531**  Open Channel Hydraulics  3
- **C E 557**  Water Resources Development  3
- **C E 581**  Ground Water Hydrology  3
- **C E 582**  Statistical Hydrology  3
- **C E 583**  Topics in Hydrodynamics II  3
- **GEOG 467**  Transportation Geography  3
- **GEOG 552**  Landscape Ecology  4
- **GEOG 553**  Geomorphology  3
- **M E 530**  Intermediate Fluid Mechanics  3
- **M E 533**  Computational and Theoretical Fluid Mechanics  3
- **SOIL 456**  Irrigation and Drainage  3
- **SOIL 477**  Environmental Soil Physics  3
- **SOIL 477 L**  Environmental Soil Physics Laboratory  1
- **SOIL 479**  Environmental Soil Chemistry  3
- **SOIL 652**  Advanced Soil Physics  3

**Watersheds, and Aquatic and Riparian Wetlands**

- **BIOL 533**  Environmental Physiology of Plants  3
- **C E 483**  Surface Water Hydrology  3
- **C E 557**  Water Resources Development  3
- **C E 581**  Ground Water Hydrology  3
- **C E 682**  Topics in Hydrodynamics II  3
- **FWCE 459**  Aquatic Ecology  4
- **FWCE 482**  Ichthyology  4
- **FWCE 532**  Environmental Biology of Fishes  4
- **FWCE 534**  Aquatic Contaminants and Toxicology  4
- **GEOL 452**  Geohydrology  4
- **RGSC 518**  Watershed Methods and Management  3
- **SOIL 456**  Irrigation and Drainage  3
- **SOIL 472**  Soil Morphology and Classification  4
- **SOIL 477**  Environmental Soil Physics  3
- **SOIL 477 L**  Environmental Soil Physics Laboratory  1
- **SOIL 652**  Advanced Soil Physics  3

**Water Quality and Treatment**

- **BIOL 477**  Applied and Environmental Microbiology  4
- **ENVE 456**  Environmental Engineering Design  3
- **ENVE 462**  Sampling and Analysis of Environmental Contaminants  3
- **ENVE 551**  Unit Processes/Operation of Water Treatment  3
- **ENVE 552**  Unit Processes/Operation of Wastewater Treatment  3
- **ENVE 552 L**  Unit Processes/Operation of Wastewater Treatment Laboratory  1
- **ENVE 557**  Surface Water Quality Modeling  3
- **ENVE 630**  Fate and Transport of Environmental Contaminants  3
- **FWCE 534**  Aquatic Contaminants and Toxicology  4

**Water Economics and Policy**

- **AEEC 575**  Economics of Water Resource Management and Policy  3
- **PHLS 452**  Environmental Health  3
- **ECDV 651**  Economic Development Theory  3
- **ECDV 661**  Regional Economic Modeling I  3
- **ECDV 662**  Regional Economic Modeling II  3
- **ECDV 664**  Population Economics  3
- **ECDV 668**  Economic Development Finance  3
- **ECDV 671**  Sustainable Economic Development  3
- **MPH 550**  Environmental Public Health Issues  3
- **MPH 565**  International Health Problems  3
- **MPH 567**  Rural Health Issues  3
- **MPH 569**  U.S.-Mexico Border Health Issues  3

**Water Informatics**

- **GEOG 521**  GIS & T Applications and Modeling  3
- **GEOG 571**  Cartography and Geographic Information Systems  4
- **GEOG 572**  Geodatabase Design  3
- **GEOG 573**  Introduction to Remote Sensing  4
- **GEOG 578**  Fundamentals of Geographic Information Science and Technology (GIS & T)  4
- **GEOG 581**  System Design for Geographic Information Science and Technology (GIS & T)  3
- **GEOG 582**  Advanced Remote Sensing  4
- **GEOG 585**  Advanced Spatial Analysis  3

**Degrees for the Department**

Minors for the Department

Both minors within the WSAM program are affiliated with other departments.

Geographic Information Science and Technology (GIS&T) - Graduate Minor (http://catalogs.nmsu.edu/nmsu/agricultural-consumer-environmental-sciences/water-science-mgmt/geographic-information-science-technology-gis-graduate-minor)


Affiliated Faculty – S. Angadi, Ph.D. (University of Manitoba, Canada); S. Archambault, Ph.D. (UNM); A. Salim Bawazir, Ph.D. (NMSU); M.P. Bleiweiss, M.S. (California State-Los Angeles); W. Boeing, Ph.D. (Louisiana State); K. Boykin, Ph.D. (NMSU); C. E. Brewer, Ph.D. (Iowa State); C. Brown, Ph.D. (San Diego State/California-Santa Barbara); S. W. Brown, Ph.D. (NMSU); C. A. Caldwell, Ph.D. (Tennessee); K. C. Carroll, Ph.D. (Arizona); D. E. Cowley, Ph.D. (Wisconsin); D. S. Cram, Ph.D. (NMSU); M. N. DeMers, Ph.D. (Kansas); C. M. Downes, Ph.D. (New Mexico); D. W. DuBois, Ph.D. (Nevada); D. P. Dugas, Ph.D. (Oregon); A. G. Sam Fernald, Ph.D. (Colorado State); A. Ghassemi, Ph.D. (NMSU); R. M. Goss, Ph.D. (Nebraska); W. R. Gould, Ph.D. (North Carolina State); S. J. Guldan, Ph.D. (Minnesota); P. Gutierrez, Ph.D. (J. Herrick, Ph.D. (Ohio State); B. H. Hurd, Ph.D. (California-Davis); M. D. Johnson, Ph.D. (NMSU); N. Khandan, Ph.D. (Drexel University); J. P. King, Ph.D. (Colorado State); A. S. Lara, Ph.D. (NMSU); B. Leinauer, Ph.D. (Hohenheim University, Germany); H. Luo, Ph.D. (Tulane); M. C. Mitchell, Ph.D. (Minnesota); M. O’Neill, Ph.D. (Arizona); L. Papelis, Ph.D. (Stanford); J. T. Peach, Ph.D. (Texas); G. A. Picchioni, Ph.D. (Texas A&M); R. C. Pratt, Ph.D. (Purdue); A. Rango, Ph.D. (Colorado State); D. A. Rockstraw, Ph.D. (Oklahoma); R. Sallenave, Ph.D. (University of Guelph-Canada); Z. A. Samani, Ph.D. (Utah State); M. K. Shukla, Ph.D. (University of Agricultural Sciences-Vienna, Austria); G. Sims, Ph.D. (Purdue); G. B. Smith, Ph.D. (North Carolina State); R. G. Smiths, Ph.D. (Purdue); S. N. Smirnov, Ph.D. (Novosibirsk University, Russia); R. St. Hilaire, Ph.D. (Iowa State); C. M. Steele, Ph.D. (King’s College, University of London-UK); K. Stevens, M.S. (NMSU); B. L. Stringam, Ph.D. (Utah State); A. L. Ulery, Ph.D. (California-Riverside); J. Urquidi, Ph.D. (Texas Tech); F. A. Ward, Ph.D. (Colorado State); N. Webb, Ph.D. (University of Queensland, Australia); B. Widner, Ph.D. (Colorado State); P. Xu, Ph.D. (Ecole Nationale de Gunie Rural, Des Eaux Et Des Forets, France)

WSAM 589. Landscape Hydrology Modeling

Understand the landscape scale of hydrologic cycle and related hydrological processes. Quantitatively evaluate hydrological system components. Retrieve, visualize and model some of the physical processes using some of the available tools. Consent of Instructor required.

WSAM 599. Masters Thesis

1-15 Credits (1-15)


WSAM 605. Arid Land Water Resources

3 Credits (2+2P)

The course will cover various issues of relevance to water resources and water supply management within the Southwest US and other semiarid and arid regions. Discussions may include development and sustainability, climate change and drought, socioeconomic and cultural, and transboundary issues.

WSAM 610. Water and Sustainable Economic Development

3 Credits

For graduate students in the Water Science and Management or other research degree programs, use the water economics literature as a model for student research leading to an M.S. thesis or Ph.D. dissertation.

WSAM 700. Doctoral Dissertation

15 Credits (15)


Name:

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Coordinating Institute

• Water Resources Research Institute, (575) 646-4337

Sponsoring Departments

• Agricultural Economics and Agricultural Business, (575) 646-3215, http://aeab.nmsu.edu
• Animal and Range Sciences, (575) 646-2514, http://anrs.nmsu.edu
• Civil and Engineering, (575) 646-3801, http://ce.nmsu.edu
• Geography, (575) 646-3509, http://geography.nmsu.edu
• Plant and Environmental Sciences, (575) 646-3405, http://aces.nmsu.edu/academics/pes