Program Guidelines

Master of Water Resources Degree

Water Resources Program

University of New Mexico

August 2016

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Important Note: These *Program Guidelines* are not a comprehensive collection of the requirements for Master's degrees at UNM. Such information can be found on in the current UNM Catalog. All MWR students should familiarize themselves with UNM requirements and procedures for Master's degrees.

Rev 21: August 2016

The Master's Degree in Water Resources

MISSION STATEMENT AND INTRODUCTION

The Water Resources Program (WRP) offers the Master of Water Resources (MWR) degree, an interdisciplinary professional degree designed to prepare students for careers in water resources management and related fields. The University of New Mexico's location in the Southwestern USA means that there is a natural emphasis on dry-region water issues; however, the MWR degree is designed to provide its students a firm grounding in water resources that is applicable throughout the world. The MWR degree is generally directed towards students wishing to further develop their qualifications and expertise in the practice of water resources management. Therefore, although it does include considerable exposure to research topics and methods in this area, its principal orientation is towards practice rather than research. Entering students are assumed to have a basic proficiency in at least one water-related discipline (defined rather broadly) such as engineering, sociology, management, public administration, environmental studies, economics, law, chemistry, planning, political science, geology, geography, and biology, or professional experience in a water-related field. The program seeks to expand and deepen students' knowledge of their primary disciplines, provide them with an integrated perspective on water in nature and society, improve their capacity to think carefully and comprehensively, and develop their technical and communications skills.

The MWR degree is obtained by following one of two tracks or options: the Hydroscience (HS) track or the Policy/Management (PM) track. Each track consists of 39 semester credits: 36 credits of coursework plus 3 credits for a professional project. The Hydroscience track is designed primarily for students with technical backgrounds and interests (biology, chemistry, earth/environmental sciences, mathematics, toxicology, physics, physical geography, engineering, etc.) who wish to complement their primary discipline by obtaining expertise in the scientific and/or engineering aspects of water resources and its management. Students without technical backgrounds may select this track but may need to take remedial HS classes to prepare for graduate level course work. The Policy/Management track is designed for students with backgrounds in the natural sciences, political science, economics, sociology, management, engineering, geography, psychology, public administration, law, community and regional planning, public health, etc. who wish to emphasize aspects of water dealing with economics, policy, administration, management and planning. The curriculum for each track is flexible, enabling a student, with guidance from their advisor and committee, to design a course of study in accord with their career objectives.

The interdisciplinary nature and practical orientation of the MWR program reflect the growing complexity of water issues. Over the past several decades, population shifts, industrial developments, changes in water law, and advances in technology have intensified competition for water resources and placed new burdens of decision on the people who manage them. Increasing problems of water pollution, for example, require not only an understanding of water chemistry and transport systems, but also an appreciation for the short- and long-term implications of water allocation and land-use practices, and the valuation of negative externalities, as well as an ability to communicate and work effectively with specialists in

various fields, policymakers, and concerned citizens. In short, effective water resource professionals need many competencies. The WRP strives to provide these competencies.

The broad vision of the program emphasizes the interdisciplinary nature of the MWR degree, and the inherent links to sustainability issues. The WRP Mission Statement (from the 2010, *Academic Program Review*), identifies the program goal as: "to become a regionally prominent center of expertise on water-related issues and training for environmental professionals, promoting fair, healthy and sustainable solutions to the challenges of water use in New Mexico and the southwest."

HISTORY

The Master of Water Resources Administration (MWRA) degree was formally initiated at the University of New Mexico in 1991 in response to the need for well-educated water resources administrators, who could balance competing economic, social, technological, ecological and cultural requirements. This 39 semester-credit professional degree helped organize and package the considerable water expertise of the UNM campus in a manner that made it readily available to students and citizens of New Mexico. The interdisciplinary nature of the degree assured that its graduates were exposed to the issues and conflicts facing today's water managers as well as the solutions being proposed. The core of the degree brought diverse faculty together to present their knowledge in an integrated manner. Without the MWRA degree, this integrated view of water management problems and potential solutions was not possible within highly structured, discipline-focused university departments and traditional degree programs. Our first student graduated in 1991.

In 1995, a Professional Project was initiated in place of the Master's comprehensive examination. No semester credits were given for the project.

In 1998, the highly-structured MWRA degree became the current Master of Water Resources (MWR) degree. The more flexible two-track MWR degree affords students greater options in their coursework program (Policy/Management or Hydroscience) and expands the number of available participating faculty. Three semester credits were given for the Professional Project, bringing the total number of semester credits to 39. The Water Resources Program (WRP), the graduate unit responsible for administering the degree, was transferred to UNM's University College in 1998. In part because University College is primarily focused on lower division education advisement and also because other interdisciplinary graduate programs have been instituted at UNM, UNM and the WRP established a dialog regarding possible administrative relocation to another academic unit. In Summer 2013, the WRP was transferred to Graduate Studies at UNM, reporting to the Dean of Graduate Studies (Dean Julie Coonrod). Also in Summer 2013, Professor Robert Berrens (Economics) replaced the retiring Director, Professor Bruce Thomson (Civil Engineering), who had successfully led the program for seven years. John Fleck (Water Policy and Governance, Economics) took over as director in Summer 2016.

WHAT DO WRP GRADUATES DO?

Graduates of the Water Resources program enjoy a wide range of employment opportunities. These fall into four categories, all of which employ one or more MWR alumni:

- Public resource management agencies including federal (US Bureau of Reclamation, US Park Service, US Forest Service, US Fish and Wildlife Service, US Geological Survey),

state (NM Environment Department, NM Office of the State Engineer), and local (city and county water utilities, public works departments, and environmental health departments).

- Consulting firms, which often provide consulting services to federal, state, and local water resource management agencies. Many of these firms also provide consulting services to industries and other entities that are large users of water.
- Private industries and other entities that use large amounts of water such as electric power, mining, and agricultural businesses
- Further graduate education leading to the Ph.D. degree or professional degrees in fields such as law, engineering or public health.

WATER RESOURCES PROGRAM CONTACT INFORMATION

The Water Resources Program is housed in the Social Sciences - Economics Building (#57), on Roma Avenue. It is directly north of Zimmerman Library, south of Parish Memorial Library, and east of the University House (campus map is available at http://iss.unm.edu/PCD/campus-map.html). The WRP office is located in room 1048 (voice: 505-277-7759; fax: 505-277-5226; email: Annamarie Cordova: acordova@unm.edu). The program is administered by:

Name	Title	E-Mail	Phone
John Fleck	WR Director & Professor of Practice in Water Policy and Governance	fleckj@unm.edu	505-277-0124
Becky Bixby	WR Associate Director Research Assistant Professor, Biology	bbixby@unm.edu	505-277-8158
Annamarie Cordova	Administrative Assistant	acordova@unm.edu	505-277-7759

The mailing address is:

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The program's web site is wrp.unm.edu and its e-mail address is wrp@unm.edu.

GOVERNANCE

The Water Resources Program is administered by Director, Professor of Practice John Fleck; Associate Director, Research Assistant Professor Becky Bixby; and a Program Administrator, Annamarie Cordova. Together they are responsible for day-to-day operations of the program including advising students, supervising the academic program, and preparing and administering program budgets. A Program Committee is responsible for setting policy and establishing the rules and regulations governing the WRP and its Master of Water Resources degree. The 2014-2017 Program Committee members include: Dr. Robert Berrens (Economics); Dr. Bruce Milne (Sustainability Studies Program, and Biology), Dr. Mark Stone (Civil Engineering); Dr. Caroline Scruggs (Community and Regional Planning); Dr. David Gutzler (Earth and Planetary Sciences); Reed Benson, J.D. (School of Law); Dr. Melinda Harm Benson (Geography); and Dr. Becky Bixby (Biology); and Katie Emmers (Alumni Representative, New Mexico Copper Corporation).

ADMISSION

Information on UNM admission and application procedures is available at: http://admissions.unm.edu/. Applications must include a transcript of all previous college work, three letters of recommendation and a letter of intent. Admission deadlines are **November 15** for the spring semester and **July 15** for the fall semester. Only former MWR students seeking readmission are admitted for the summer semester. ***Early application is encouraged for best consideration.***

Graduate Studies may be reached at 505-277-2711 or grad@unm.edu; its web address is http://grad.unm.edu/.

The admission requirements for the MWR degree program are:

- A Bachelor's degree from an accredited college or university.
- A GPA of at least 3.0 out of 4.0 for the last two years of undergraduate work. A student with a GPA under 3.0 may be admitted if he/she has other exceptional qualifications indicating their likelihood of success in the program.
- Three references from individuals (not friends) qualified to assess the applicant's academic and/or professional qualifications. At least one of these letters must be from a former professor. Letters from friends or personal acquaintances are not acceptable.
- A 1-2 page *letter of intent* describing the student's background, interests in water resources, experience in the field, objectives, desired concentration, and future plans.
- A current *resume* or *curriculum vitae* (CV) complements but does not replace the letter of intent. Both the letter of intent and the resume/CV can be sent to the WRP Office, not Graduate Studies. Please include name, address and complete contact information.
- Successful completion of the MWR prerequisites in the student's intended area of study (see below).

The Graduate Record Examination (GRE) is not required for admission.

MWR students who have not been enrolled for three or more consecutive semesters will be dropped from the degree program by Graduate Studies. Application forms for readmission are available at www.unm.edu/apply/. The application fee must be repaid. Readmission is not automatic.

Admission can be deferred for up to one calendar year. Students must submit a written request to Graduate Studies and the WRP requesting deferral.

Prerequisites

Admission to the program requires completion of the prerequisite courses listed below. Generally, it is recommended that students should not apply until all prerequisites have been completed (or are in the process of being completed). However, students with a strong academic preparation may, upon occasion, be admitted with one unfulfilled prerequisite.

Hydroscience (HS) Concentration

- Calculus I (Math 180 or 162L), Calculus II (Math 181 or 163L), and Statistics (Stat 145). Note: Math 162L and 163L are highly recommended.

- Introductory Microeconomics (Economics 106) or Intermediate Microeconomics I (Economics 300).
- Three semesters of introductory (or higher) science courses (UNM 100-level) in at least two different disciplines

Policy/Management (PM) Concentration

- Calculus I (Math 180 or 162L) and Statistics (Stat 145)
- Introductory Microeconomics I (Economics 106) or Intermediate Microeconomics I (Economics 300). Note: EC 300 is highly recommended.
- Two semesters of introductory (or higher) science courses (UNM 100-level)
- One introductory or higher course in: sociology (Sociology 101); political science (Political Science 110); or psychology (Psychology 105). Note: a student entering with a degree in one of the above must have taken a course in one of the other two disciplines.

INTERNATIONAL APPLICANTS

International students (non-U.S. citizens) must apply through the UNM Office of International Admissions. Application materials may be requested from the Office of International Admissions, Student Services Building, MSC06 3270, 1 University of New Mexico, Albuquerque, NM 87131-0001 USA. This office may be reached via phone at 505-277-5829 (http://geo.unm.edu/admission_graduate.html).

International applicants must have a TOEFL exam score of at least 550 on the paper exam or 213 on the computer exam, a certification of financial responsibility form, three copies of their official transcripts and certified English translations (if necessary) with their application package. Deadlines for international applicants for the MWR degree program are August 1 for the Spring semester and March 1 for the Fall semester.

Amigo International Scholarship information and applications can be found at geo.unm.edu/admission_grad_scholarships.html#International Amigo Scholarship.

STUDENT RESPONSIBILITIES

Each graduate student is responsible for complying with all regulations and meeting all deadlines of the University and the Department and College or School in which he or she is enrolled. The student is responsible for reading the UNM Catalog. The catalog is available on-line at http://catalog.unm.edu/catalogs/2016-2017/. Particular attention should be paid to the section on *The Graduate Program* which contains the requirements and regulations governing graduate degrees, many of which are not covered in the *Program Guidelines*. The Catalog also has course descriptions. Some departments have course syllabi on their home pages (go to www.unm.edu and click on "Departments").

Students should give careful attention to the sections in the UNM Catalog on General Academic Regulations and Master's Degrees and, in particular, the following items from those sections.

- Students must maintain a cumulative GPA of at least 3.0 in all courses offered for graduate credit at UNM. Failure to maintain a 3.0 GPA will result in a student being placed on Academic Probation, and may lead to dismissal from UNM by Graduate Studies.

- UNM requires that all work applied to a Master's degree, including transfer work from another institution or work taken as a UNM non-degree student, must be completed within a seven-year period.
- Incomplete ("I") grades must be resolved within one year from the published end date of the semester in which the grade was assigned. An unresolved "I" grade reverts to an "F".
- Students must be registered for at least one credit of graduate course work at UNM during the semester in which they complete their degree requirements. Usually this is WR 598.
- The Graduate Studies' *Program of Studies* (PoS) form is due to Graduate Studies by October 1 (Spring graduation), March 1 (Summer graduation), or July 1 (Fall graduation) no later than the semester before the student intends to graduate. Ideally the PoS form will be submitted after the student has completed 24 to 30 credits of classes. The PoS form will not be processed until an approved *Coursework Proposal* form, a WRP internal form, has been submitted to the WRP Office. Non-degree and transfer courses are listed on the PoS form.

Students in the MWR degree program are encouraged to confer with their advisor at least once a semester regarding their course plan in order to avoid any problems. Students are advised to refer to *The Pathfinder – the UNM Student Handbook,* which has additional information on policies, procedures and services applicable or available to UNM students (http://pathfinder.unm.edu/).

On occasion, students may wish to seek interpretation or modification of requirements. This can be done by submitting a petition to the Program Committee or the Dean of Graduate Studies. Petitions must be submitted in writing to the WRP office at least two weeks prior to a Program Committee meeting. Consult the Graduate Studies homepage for instructions regarding the preparation of petitions. Students should consult with their faculty advisor and the Director before submitting a petition.

All students are eligible for e-mail accounts through UNM. The WRP uses e-mail and its web site to inform students and faculty of important issues. UNM e-mail can be obtained on-line at http://it.unm.edu/accounts/index.html.

A flow chart depicting the sequence of events in moving through the MWR degree program is in Appendix IV of this document.

THE MWR CURRICULUM

Prerequisites

The MWR degree prerequisites are:

Hydroscience (HS) Concentration

- Calculus I (Math 180 or 162L), Calculus II (Math 181 or 163L), and Statistics (Stat 145). Note: Math 162L and 163L are highly recommended.
- Introductory Microeconomics (Economics 106) or Intermediate Microeconomics I (Economics 300)
- Three semesters of introductory (or higher) science courses (UNM 100-level) from at least *two different* disciplines

Policy/Management (PM) Concentration

- Calculus I (Math 180 or 162L) and Statistics (Stat 145)

- Introductory Microeconomics I (Economics 106) or Intermediate Microeconomics I (Economics 300). Note: EC 300 is highly recommended.
- Two semesters of introductory (or higher) science courses (UNM 100-level)
- One introductory or higher course in: sociology (Sociology 101); political science (Political Science 110); or psychology (Psychology 105). Note: a student entering with a degree in one of the above must take a course in one of the remaining two disciplines.

Students entering the MWR program with deficiencies in the prerequisites must take them as soon as possible. They must be taken for a letter grade. A student who takes a prerequisite course as an MWR student must receive a grade of B or better in that course. Students will not be admitted to the MWR program if they are lacking more than one of these prerequisites.

Degree Requirements

The MWR degree is recognized by Graduate Studies as a Plan II (non-thesis) degree. There are two concentrations: 1) Hydroscience (HS); and 2) Policy/Management (PM). The student's concentration will appear on his/her transcript.

Thirty-nine (39) credits are required for the degree. Three (3) of these are WR 598 - Professional Project; the remaining 36 credits are distributed as follows:

All Students

All students must take the core curriculum (WR 571, WR 572, and WR 573) and 3 credits of WR 598 - Professional Project (note: you can take as many credits of WR 598 as you want, but only 3 count towards the degree). This is a total of 15 credits. The remaining courses are taken from three different groups ("distribution requirements"); the distribution of courses taken from these groups depends upon the student's concentration.

MWR-HS Concentration. 15 credits from Group I, with at least one course from each category; 6 credits from Group II, from two different categories; 3 credits from Group III (total: 24 credits).

or

MWR- PM Concentration

6 credits from Group I with courses from two different categories; 15 credits from Group II, with at least one course in any 3 of the 4 categories; 3 credits from Group III (total: 24 credits)

Water Resources Course Categories

Courses for the MWR program are divided into three groups and, within each group, further subdivided into categories. The courses listed below are not all-inclusive as courses are continually being added and deleted, or offered as Topics courses. Students seeking to substitute other courses, such as Problems, Topics, or other courses, must consult with the Director and his/her Advisor before taking them. Course titles and descriptions can be viewed in the catalog (http://catalog.unm.edu/catalogs/2015-2016/). Note that WR policy precludes acceptance of any 300-level courses for credit towards the MWR degree, except CE 335 – Introduction to Water and Wastewater Treatment.

Group I: HS Courses (3 categories)

- **Hydrology and Hydraulics** (WR 576, E&PS 562, 572, 576, 580, 581L; Civil Engineering 442, 540, 541, 542, 543, 544, 545, 549)
- **Ecosystems, Environment, Health, and Water Quality** (Biology 502, 507L, 558, 535, 495 or 514; E&PS 515, 558; Civil Engineering 335, 531, 532, 534, 536, or 537L; Environmental Science 530; Public Health 502)
- **Climatology** (E&PS 522, 536, 570)

Group II: PM Courses (4 categories)

- **Law** (Law 547, 554)
- **Economics** (Economics 442, 542, 544)
- **Policy, Administration and Management** (Geography 514, 561, 562, 563; CRP 527, 524, 564, 577; Public Administration AD 500, 521, 524, 525, 544, 546, 577; Political Science 470, 475; Public Health 501, etc.)
- **Sociology, Communication, and Culture** (CRP 569, 574; American Studies 523, 524, 525; C&J 554)

Group III: Utilities Courses (3 categories)

These are courses that are not classifiable as HS or PM courses but are applicable to a variety of water issues and include:

- **GIS** (CE 547; Geography 559, 587L, 588L)
- **Methods** (Statistics 527, 528; Economics 504; E&PS 533; Political Science 581; CRP 515)
- **Modeling** (E&PS 557L; Economics 540 and 543; CE 543,)

WR 590 - Internship can substitute for a Group I, II, or III course, depending upon the nature of the internship.

Students taking 400-level courses should ensure that these courses are available for graduate credit and that they are registered for graduate credit (see the instructor). 400-level courses available for graduate credit are marked with an asterisk in the UNM Catalog. Dual-listed (400/500) courses must be taken as the 500 number to receive graduate credit.

Courses

Each semester the WR Program compiles a list of all of the water-related graduate classes to be offered at UNM for the following semester. This list is available on the WR web site, or by contacting the WRP Office.

The following list of courses is not exhaustive. New courses are continuously being developed and existing courses deleted. Indeed, other courses may be suitable for a student's program of study. Students considering courses not listed here should contact their advisor or the Director to confirm their applicability to their program before enrolling in the course.

Main-campus course descriptions and prerequisites are available in the UNM Catalog http://catalog.unm.edu/catalogs/2015-2016/. Each semester the UNM course schedules are available from a link on the UNM home page. Law School courses and schedules are listed under the "Class Schedules" menu at http://lawschool.unm.edu/academics/index.php.

To obtain detailed information on a particular course, contact the instructor. Note that some of the courses listed below may have prerequisites beyond those required for the MWR degree. It is up to the student to satisfy these or seek the instructor's permission to take the course.

Group I: Suggested Hydroscience Courses

The number of credit hours for each course is in parentheses; "AOA" means "also offered as".

Hydrology and Hydraulics Category

Water Resources

576 Physical Hydrology (AOA E&PS 576) (3)

Earth and Planetary Sciences

562 Hydrogeology (3)
572 Subsurface Fate and Transport Processes (3)
576 Physical Hydrology (AOA WR 576) (3)
580 Advanced Hydrogeology (3)
581L Geomorphology and Surficial Geology (4)

Civil Engineering

442 Hydraulic Engineering and Hydrology (3)
541 Groundwater Engineering (3)
542 Intermediate Hydrology (3)
543 Introduction to Groundwater and Contaminant Transport Modeling (3)
544 Water Resources Engineering (3)
545 Open Channel Hydraulics (3)
549 Vadose Zone Hydrology (3)

Ecosystems, Environment, Health, and Water Quality Category

Biology

495 Limnology (3)
496L Limnology Laboratory (1)
507L Bosque Biology (3)
514 Ecosystem Studies (3)
535 Freshwater Ecosystems (AOA E&PS 535) (3)
558 Geomicrobiology (AOA E&PS 558) (3)

Civil Engineering

335 Introduction to Water & Wastewater Treatment (3)
531 Physical-Chemical Water and Wastewater Treatment (3)
532 Advanced Physical-Chemical Water and Wastewater Treatment (3)
534 Environmental Engineering Chemistry (3)
536 Biological Wastewater Treatment (3)
537L Aqueous Environmental Chemistry and Analysis (3)

Earth and Planetary Sciences

515 Geochemistry of Natural Waters (3)
535 Freshwater Ecosystems (AOA Biology 535) (3)
558 Geomicrobiology (AOA Biology 558) (3)

Environmental Science

530 Advanced Environmental Science (3)

Public Health

502 Epidemiologic Methods I (3)

Climatology category
Earth and Planetary Sciences
522 Hydrometeorology of the Southwestern USA
536 Climate Dynamics (3)
570 Physical Climatology (AOA Geography 570) (3)
Geography
570 Physical Climatology (AOA E&PS 570) (3)

Group II: Suggested Policy/Management Courses

The number of credit hours for each course is in parentheses; "AOA" means "also offered as".

Law Category
Law
547 Water Law (3)
554 Indian Water Rights (2-3)
Geography
517 Law and Geography. (3)

Economics Category
Economics
442 Topics in Environmental and Natural Resource Economics (3)
542 Topics in Environmental, Resource and Ecological Economics (3)
544 Environmental Economics (3)

Policy, Administration, and Management Category
Community and Regional Planning
524 Environmental Planning Methods (3)
527 Watershed Management (3)
564 Foundations of Natural Resources (3)
577 Practice of Policy Development (AOA Public Administration 577) (3)
Geography
514 Natural Resources Management Seminar(3)
561 Environmental Management (3)
562 Water Resources Management (3)
563 Public Land Management (3)
467/567 Governing the Global Environment
Public Administration
500 Public Management and Policy (3)
521 Institutional Development and Behavior (3)
524 Intergovernmental Administrative Problems (3)
525 Human Resources Management in the Public Sector (3)
544 Public Budgeting (3)
546 Public Financial Administration (3)
577 Practice of Policy Development (AOA CRP 577) (3)
Public Health
501 Principles of Public Health (3)

Sociology, Communication, and Culture Category
American Studies
523 Environmental Justice (3)

524 Environmental Conflicts in the U.S. West (3)
525 Environmental Theory and Practice (3)
Communication and Journalism
554 Diffusion of Innovations (3)
Community and Regional Planning
569 Rural Community Development (3)
574 Cultural Aspects of Community Development Planning (3)
Geography
564/464 Food and Natural Resources (3)
515 Cultural and Political Ecology (3)
566/466 The City as Human Environment (3)

Group III: Suggested Utilities Courses

The number of credit hours for each course is in parentheses; "AOA" means "also offered as".

GIS Category
Civil Engineering
547 GIS in Water Resources Engineering (3)
Community & Regional Planning
CRP 583 Introduction to GIS (3)
Geography
587L Intermediate Geographic Information Systems (3)
588L Advanced Geographic Information Systems (3)
Earth and Planetary Sciences
555L Computational and GIS Applications in Geomorphology (3)

Modeling Category
Civil Engineering
543 Intro. to Groundwater and Contaminant Transport Modeling (3)
Earth and Planetary Sciences
557L Mathematical Modeling in the Geosciences (3)
Economics
540 Natural Resource, Environmental and Ecological Modeling I (3)
543 Natural Resource, Environmental and Ecological Modeling II (3)
Geography
521 Environmental Modeling and Geographic Information Systems (3-6)

Methods Category
Community and Regional Planning
515 Natural Resources Field Methods (3)
Earth and Planetary Sciences
433 Statistics and Data Analysis in Earth Science (3)
Economics
409 Intermediate Econometrics (3)
508 Statistics and Introduction to Econometrics (3)
Geography
580L/480L Quantitative Methods in Geography (3)
Statistics
427/527 Advanced Data Analysis I (3) [Fall Semester]
428/528 Advanced Data Analysis II (3) [Spring Semester]

Political Science
581 Statistics for Social Research (3) [Fall Semester]

Water Resources Internships (WR 590)
The WRP recognizes the value of "real-world" experience. To that end, students may obtain three (3) semester credits by serving an internship with a government agency, NGO, private firm or other organization. The topic of the internship should be consistent with the student's concentration (HS or PM). A key element of the internship is that the student work under the mentorship of a water resources professional. It is not intended to be an "independent studies" or Problems course.

The student must obtain advance approval from his/her Advisor and the Director before the semester in which he/she intends to serve an internship. The student must submit a proposal, signed by their proposed mentor, of at least two (2) pages with the following elements:

- where the internship will be served;
- nature of the tasks to be performed and/or the problem to be solved;
- how the internship will benefit the student and its relevance to the student's concentration;
- course requirement (concentration, group, category) it will fulfill;
- the student's mentor/supervisor;
- outline of final report describing the student's internship experience.

This proposal must be submitted to the WRP office at least one month prior to the start of the intern semester. Once approved, the student will register for 3 credits of Internship (WR 590). Students may not take WR 590 for any reason other than serving an internship according to the above requirements.

At the end of the semester, the student must submit a report describing the internship experience, what was accomplished, and giving recommendations for improvements. This report should be written as a formal technical report with title page, abstract, table of contents, text, and references. The report should be signed by their mentor for the internship, verifying that the internship was completed in satisfactory manner. Figures, photos, and tables should be included to document the experience. The final report should not exceed 15 pages total.

The Water Resources Interdisciplinary Courses
The core of the WR curriculum consists of three 4-credit classes, WR 571, WR 572 and WR 573, which are intended to be taken in sequence, if at all possible. They are described below.

WR 571. Water Resources I - Contemporary Issues (4)
(also offered as Economics 546) Students examine contemporary issues in water resource systems, including water quality; ecosystem health; stakeholder concerns; economics; and water supply, policy, management and allocation. Emphasis on teamwork, cooperation, and oral, written and graphic communication. [Fall].

This course is normally taken at the start of a student's program. Students must have completed a course in microeconomics or be taking one concurrently to enroll in this class [Fall].

WR 572. Water Resources II - Models (4)
(also offered as Economics 545). Practical aspects of the different technical models used by water resource professionals: hydrological, economic, ecological, etc. Students use models to solve problems. Emphasis is on oral, written and graphic communication. Prerequisites: calculus, WR 571, microeconomics, and a course in hydrology or hydrogeology (e.g., E&PS 562, WR 576, CE 541, CE 542); or permission of instructor. [Spring].

This course emphasizes the use of models: hydrologic, economic, and other related models. It is not an in-depth exposure to modeling but is designed to give the students an appreciation of the limitations and uses of models. Students are given exercises using computer models of water resources systems (hydrology, economics, etc.).

This course should be taken after students have had (at a minimum) calculus, microeconomics and a previous course in hydrology or hydrogeology (e.g., E&PS 562, WR 576, CE 542, CE 441).

WR 573. Water Resources III - Field Problems (4)
Intensive experience with a field-based problem or suite of problems. Students work through problem identification and definition, collect/analyze data, propose solutions and present conclusions and recommendations in an appropriate forum. Restrictions: WR major and permission of instructor. [Summer].

This is the last of the interdisciplinary courses and is offered each summer. This course is co-taught by an interdisciplinary group, and requires integration of knowledge gained from the previous classes (WR 571 and WR 572) in the WRP. In the course, teams of students work on actual field problems to produce a final written and/or oral report that quantitatively analyzes the issues. This course is a field course, with a field component of a week or less, typically taken in early June (requiring a full-time commitment during that component), and time commitments for both preparation and ex poste lab analysis and report writing to be determined by the co-instructors. Links to some previous WR 573 class reports are on the WR web site.

Policy on Substitutions for WR 573
Occasionally students in the WRP believe that they have gained knowledge and experience in field methods of water resources investigations equivalent to that covered in WR 573. They request that this requirement be waived and that they be allowed to substitute alternative courses to meet the credit requirements for the MWR degree. In considering such requests the WRP will compare the student's knowledge and experience to that taught in the WR 573. The objectives of WR 573 are:

- Learn to design a field study to collect information on the hydrology, hydraulics, and quality of a watershed, together with its socio-economic characteristics.
- Learn common field and laboratory methods for evaluating watersheds including methods of measuring flow, water quality, stream morphology, and biological characteristics of stream
- Learn to integrate the hydrologic information with economic, legal, and cultural knowledge that is relevant to management of the watershed.
- Learn the basic principals of quality assurance and quality control (QA/QC).
- Learn to process data collected from field investigations to develop a quantitative and qualitative understanding of the characteristics of the watershed and stream

- Learn to work in a group to prepare a comprehensive written report and corresponding technical presentation that describes the results of the investigation.

Students who can demonstrate experience, knowledge, and competence that achieve at least half of these objectives through employment experience may request a substitution of WR 573. This is accomplished by submitting a petition that contains the following:

- A summary (1 to 2 pages) describing the student's experience and how it achieves the objectives of WR 573
- A proposed course work substitution plan to make up the 4 credits that would otherwise be earned by taking WR 573.
- Copies of work products (i.e. technical reports or other documents) that demonstrate knowledge and experience

The WRP Director will review the material and approve/deny the request. The student may appeal the Director's decision to the WRP Program Committee.

WR 598 Professional Project (1-3)
Required for Master of Water Resources degree. Maximum of 3 credits can be counted toward degree. **Offered on a PR/CR/NC basis only.**

All students must take at least 3 credits of WR 598. More than 3 credits can be taken, and usually are, but only 3 count. It should generally not be taken until a student has a committee and an approved Professional Project proposal. Not all the credits must be taken in the same semester. There are many different sections of WR 598 – sign up for the section corresponding to your committee chair. If one does not exist, contact the Director. A student must be registered for at least 1 credit of graduate course work during the semester in which he/she graduates. Typically this is WR 598.

DUAL DEGREE PROGRAM WITH COMMUNITY & REGIONAL PLANNING

A dual degree program leading to the Master of Water Resources (M.W.R.) and Master in Community and Regional Planning (M.C.R.P.) was established in 2009. As described in the UNM Catalog (http://catalog.unm.edu/catalogs/2015-2016/graduate-program.html):

"A dual degree between the M.W.R. and M.C.R.P. will prepare students to make important contributions in both water resources and planning through a familiarity with the scientific discourse of water resources and the language and methodologies from community-based planning. Diverse groups are brought together to collaborate in the mediation of water disputes, especially in the Southwest where demands on limited water resources are increasing exponentially. Students will be exposed to the pedagogy of instructors in diverse fields of expertise, such as resource planning and management, dispute resolution and negotiation, hydrology, economic development, and collaborative planning."

The course requirements are (total of 57 credits):

<u>Classes in Planning (30 credits):</u>
CRP 500 - Planning Theory and Process (4)
CRP 510 - Planning Communications Workshop (2)

CRP 580 - Community Growth and Land Use Planning (3)
CRP 511 - Analytical Methods for Planning (4)
CRP 532 - Foundations of Natural Resources Planning (3)
CRP 527 - Watershed Management (3)
CRP 588 Professional Project and Thesis Preparation (2)
CRP 589 Professional Project or Thesis (6)
General CRP elective approved by advisor – 1 class (3)

Classes in Water Resources (27 credits):
WR 571 - Contemporary Issues in Water Resources (4)
WR 572 - Water Resources Models (4)
WR 573 – Field Methods (4)
Electives from MWR groups 1, 2 and 3 (15)
- Hydroscience electives – 2 classes (6)
- Policy & Management electives – 1 class (3)
- Utilities elective – 1 class (3)
- General elective approved by advisor – 1 class (3)

A Coursework Proposal form must be submitted to the WRP that identifies the courses to be taken for the dual degrees when the student has completed roughly half of his/her classes. The Program of Studies (PoS) form must be approved by both the CRP and WRP departments and must be submitted to Graduate Studies at least one semester prior to graduation.

FACULTY ADVISOR

Each student will be assigned a temporary faculty advisor upon admission – usually the Director or Associate Director. As the student progresses through the program, he/she will select an advisor that will likely also serve as Chair of their Professional Project committee. As the student develops a proposal for their professional project, he/she should work with the advisor to select a Professional Project Committee consistent with his/her interests in the broad field of water resources. The Committee usually consists of three members, two of whom must be UNM tenure/tenure track or research faculty. Qualified professionals from off-campus frequently serve on Professional Project Committees. UNM requirements for graduate committee membership are listed under "Faculty Approvals" in the Graduate Studies section of the UNM Catalog (http://catalog.unm.edu/catalogs/2015-2016/graduate-program.html).

Each student, in consultation with his/her faculty advisor, must complete a Coursework Proposal form (downloadable from the WRP web site, or available from the WRP Office) by the time the student has taken 15 to 18 graduate credits. This will be submitted to the WRP Office and serve as a guide for future course selection. The courses listed on this form may change, but it will help the student focus his/her interests and more importantly, prevent taking courses that will not count towards the degree.

The role of the faculty advisor is to mentor the student with regard to academic questions relating to the MWR degree and to support the student in his/her professional development. At least once each semester, the student should meet with the advisor to review his/her progress, proposed coursework, and to consider future academic and career decisions. A student may change his/her

advisor, but must keep the WRP Office informed. Once a student selects a chair for his/her Professional Project committee, that person becomes the student's advisor.

NON-DEGREE AND TRANSFER STUDENTS

Prospective MWR students may choose to enroll in MWR classes as non-degree students. Non-degree students are limited to a maximum of 9 credit hours per semester. Non-degree application information and forms is available at http://grad.unm.edu/prospective-students/admissions-criteria.html. A maximum of 12 graduate credit hours taken in non-degree status may count towards the MWR degree. A maximum of 18 credits of graduate courses taken at another accredited institution may count towards the MWR degree, however, these courses must be approved by the WRP. Each course, whether non-degree or transfer, must have been taken for a letter grade with a grade no lower than B and must not have counted towards another degree. The seven-year rule applies to course work taken in non-degree and transfer status. Non-degree and transfer courses are listed on the Graduate Studies Program of Studies form.

IMPORTANT DEADLINES AND FORMS

Application Deadlines

Admission deadlines for US citizens and permanent residents are November 15 for the Spring semester and July 15 for the Fall semester. For international students the deadlines are August 1 for the Spring semester and March 1 for the Fall semester. Students (except those seeking readmission to the MWR degree program) are not admitted for the summer session. Students seeking financial aid should apply as early as possible. Students are encouraged to apply early as the WRP may limit the number of students admitted each semester.

Administrative Requirements for MWR Students

All students must familiarize themselves with UNM administrative requirements for this academic program and bear ultimate responsibility for complying with these criteria. A flow chart depicting the sequence of events in progressing through the MWR program is given in Appendix II. Students should consult the *Program Guidelines* frequently to ensure they are familiar with all degree requirements.

Note: The UNM Office of Graduate Studies strictly enforces all deadlines. Failure to comply may delay the student's graduation. It is the student's responsibility to be aware of these dates and to meet these deadlines. A list of deadlines is available at http://grad.unm.edu/index.html.

Coursework Proposal (WRP form)

Submit a ***Coursework Proposal*** to the WRP Office after the student has completed 15 to 18 graduate credits. This is a WRP internal form and is downloadable from the WRP web site. Graduate Studies *Program of Study* forms will not be signed until the *Coursework Proposal* form is on file.

Professional Project Proposal

Students must submit a proposal describing their Professional Project. The proposal should have a signature page similar to the Professional Project signature page, and must be signed by each committee member. The Graduate Studies form specifically pertaining to graduation (the *Announcement of Examination* form) ***will not be signed*** nor will a student be placed on the Graduate Studies Graduation List until an approved *Professional Project Proposal* has been submitted.

Program of Studies (POS; Graduate Studies form)
The UNM Graduate Studies requires that students submit a ***Program of Studies*** (http://grad.unm.edu/resources/gs-forms/index.html) at least one semester prior to that in which they expect to graduate. The deadlines are: October 1 for Spring graduation; March 1 for Summer graduation; and July 1 for Fall graduation. This form lists the courses that apply towards the degree, including non-degree and transfer courses. Submit the form to the WRP Office at least four working days prior to the Graduate Studies due date. The POS requires the signatures of the student, his/her advisor, and the WRP Director.

The following information is required on the POS.

- The graduate unit is the "Water Resources Program"
- The major code is 429
- The degree name is "Master of Water Resources" and its abbreviation is "MWR"
- The MWR degree is a Plan II (non-thesis) degree
- The concentrations are either Hydroscience or Policy/Management.

Once a student has submitted the POS, he/she must not deviate from the courses listed without his/her advisor's permission and without informing the WRP and Graduate Studies. This is done in the form of a short petition to the Director of the WRP and through him, to the Dean of Graduate Studies. Unreported deviations may delay a student's graduation when Graduate Studies performs its final graduation check.

Notice of Intent to Graduate – Graduate Studies Graduation List
Students must notify the WRP Office of their intent to graduate according to the following deadlines: December 1 (Spring graduation); May 1 (Summer graduation); and July 15 (Fall graduation).

Announcement of Examination (AOE; Graduate Studies form)
An *Announcement of Examination* form must be submitted to Graduate Studies at least two weeks before the date of the Professional Project defense. Submit to the WRP office at least four working days prior to the Graduate Studies due date.

Graduation/Defense Dates
All graduation requirements including defense of the Professional Project, except for completion of courses in progress must be completed by: November 15 for fall graduation; April 15 for spring graduation; and July 15 for summer graduation.

A student can schedule his/her Professional Project defense after these dates, but the graduation date will extend to the end of the following semester. For example, a student who defends her professional project after April would receive her degree in August (the end of the summer session).

A student must be registered for at least one credit of graduate course work (typically WR 598) during the semester in which graduation occurs.

OTHER RELEVANT INFORMATION

Students are often in a quandary about where to submit forms, whom to ask about certain matters, etc. This section will help clear up those issues.

Flow Chart
A flow chart depicting the sequence of events in moving through the MWR degree program is in the Appendix IV of the Program Guidelines. Students should consult it frequently to ensure they are on track for completing all degree requirements.

"Nuts and Bolts"
Questions involving deadlines, status of applications (admissions, financial aid, etc.), the scheduling of professional project defenses, all forms, and similar issues should be directed to the Water Resources Program's Administrative Assistant II, Annamarie Cordova (Economics Building room 1048; Fax: 277-5226; Voice: 277-7759; Email: acordova@unm.edu).

Coursework, Advisement, Program of Study
Questions involving coursework, program of study, etc., (i.e., advisement issues) should be addressed to the Director or the student's advisor/committee chair (the Director serves as a student's interim advisor until the student selects a permanent advisor). A student's advisor serves as the chair of his/her Professional Project committee.

For questions about a specific course (prerequisites, topics covered, etc.) it is best to contact the course instructor. Courses evolve over time, so the best source of information is the instructor. All main campus UNM course descriptions, including prerequisites, are in the UNM Catalog, (http://catalog.unm.edu/catalogs/2015-2016/ . School of Law courses and schedules are at lawschool.unm.edu/courses/. Note that School of Law classes may have different start/end dates than classes on the Main Campus

Professional Project
Guidance on selecting a topic and completing a Professional Topic is provided in Appendix II of the Program Guidelines. Questions involving the Professional Project, the Professional Project report, and Professional Project defense should be directed to the chair of the student's Professional Project committee. The time/date of the Professional Project defense is set by the student and his/her committee. Once the time and date are set, the WRP Office will provide assistance in scheduling a room and completing the *Announcement of Examination* form.

Students are encouraged to examine previous Professional Project reports. All MWR projects since 1999 are available electronically in the UNM Libraries' digital collection (https://repository.unm.edu/dspace/).

Forms-R-Us
There are a number of UNM forms associated with the graduate program. Most are available on the Graduate Studies web site under the "Forms" menu (http://grad.unm.edu/resources/gs-forms/index.html). All forms are submitted to Graduate Studies through the WRP Office. If an advisor or committee chair's signature is required on the form and it is someone other than the Director, please obtain the signature(s) before submitting it to the WRP Office. Please note that the WRP Office needs to receive Graduate Studies forms at least four working days before they are due to Graduate Studies.

Staying Enrolled after Completing Coursework, Readmission
After completing all coursework students are strongly encouraged to continue to enroll for at least 1 credit of classes to retain their UNM privileges (e-mail, library access, etc.) and prevent disenrollment. The most expedient strategy is to register for at least one credit of Professional Project (WR 598) each semester. However, only 3 credits of WR 598 will count towards the degree.

Students must also be registered for at least one credit of WR 598 during the semester in which they complete their degree requirements

Students who have not been enrolled for three or more consecutive semesters may be disenrolled by Graduate Studies. To apply for readmission (Fall, Spring or Summer semesters) visit http://grad.unm.edu/prospective-students/admissions-criteria.html**.** An application fee is required. Applications for readmission are reviewed by the WRP and evaluated based on the student's academic record and progress toward their degree.

Deferral of Admission
Admission can be deferred for up to one calendar year. Students must submit a written request to Graduate Studies and the WRP requesting deferral.

Computer Lab and Other Resources
The WRP has a Computer Lab for student use located in room 1036 of the Economics Building. Students may purchase a proximity card from the Lobo Card office to obtain access to the building after hours. The Computer Lab also is equipped with a monitored alarm system. You will receive instructions on how to arm/disarm the system. The computer lab contains several computers, scanners and printers. Limited printing is available to WRP students.

Please note that WRP computers are for the use of WRP students, faculty and staff. Friends and relatives are not permitted to use them. Lock the doors and arm the alarm system when leaving.

The WRP has a student workroom (room 1040) with a microwave oven, coffeemaker, refrigerator, couch and desks.

Building Access - Keys
All WRP students may obtain a proximity card to the Economics Building (outside entrance) by visiting the Lobo Card office in the lower level of the Student Union Building (there is a small fee for proximity cards – regular Lobo ID's are free). The WRP computer lab and the workroom require keys and the WRP Administrator (Annamarie Cordova) will issue key authorization cards. Keys must be turned in to the Lock Shop when you graduate.

E-mail & WaterStudents List Serve
All students must have an e-mail account and should check it frequently as it is the principal form of communication between faculty and students in the program. The WRP uses e-mail and its web site to inform students and faculty of important issues. UNM e-mail can be obtained on-line at http://it.unm.edu/accts/.

The WRP maintains a list serve of water students at UNM that circulates information regarding seminars, course offerings, job opportunities, and other information relevant to grad students. Contact the WRP Administrator (Annamarie Cordova) to be added to this list.

7-Year Rule
UNM requires that students complete their Master's degree within seven years. Classes older than seven years will not count towards the degree and students will therefore have to take additional courses to fulfill the 39 credit total required for the degree.

Incomplete Grades ("I")
Incomplete ("I") grades must be resolved within one year from the end date of the semester in which the grade was assigned. An "I" grade that is not resolved within this time frame automatically reverts to an "F" which cannot be removed from the student's transcript. Students have sole responsibility for removing their "I" grades.

WRP Web Site
The Program's web site **(**wrp.unm.edu**)** is a useful resource—links, recent developments, news, speakers, etc. Suggestions for improving it are welcome.

FINANCIAL AID AND HOUSING

The MWR degree at UNM participates in the Western Regional Graduate Program (also known as the WICHE program), which allows out-of-state graduate students from the participating 14 western states to enroll at NM resident tuition rates. Participating states are: AK, AZ, CO, HI, ID, MT, NV, NM, ND, SD, OR, UT, WA and WY. A separate application to the WRP is not necessary, but the WRP Administrator should be notified of your status or interest.

Out of state students are encouraged to establish NM residency as soon as possible to qualify for in-state tuition rates. Consult the criteria for determining residency in the UNM Catalog.

The WRP does not have base funding in our operating budget to support assistantships, or offer them to incoming students. However, in recent years, Graduate Studies has provided funding for a limited number of Teaching Assistantships (TAs), Research Assistantships (RAs) or other Graduate Assistantships (GA) to appropriately-qualified MWR students. In 2014-2016, this funding has averaged over $30,000, annually, and distributed across a number of WRP students (e.g., who have completed one or more of the core classes). Standard Graduate Studies assistantship salary rates and benefits apply. When assistantship funds become available, a notice will be sent by WRP staff, requesting a statement of interest and qualifications for specific positions (e.g., having successfully completed core classes (WR 571, 572 573 and all pre-requisites, etc.)) and current resume or curriculum vitae. In addition, the WRP sometimes has fellowships, work-study positions, or internships available. Students are encouraged to keep a brief (2-3 pages) up-to-date *resume* or *curriculum vitae* in their files in the WRP office so the Director may effectively match them with internship/employment opportunities.

Individual faculty members sometime have student employment or RAs available for students who wish to work in their labs, on research projects, etc. Internships are often available with government agencies such as the City of Albuquerque, U.S. Geological Survey (USGS), Bernalillo County, New Mexico Environment Department, Office of the State Engineer, etc.

Notifications of such opportunities are sent using the WaterStudents list serve so it is important that students read their e-mail on a regular basis.

The work-study program provides Federal funds to work on campus; the campus hiring unit provides funding as well, usually 30% or so, with the rest provided by the Federal government. Students must qualify for work-study funds. Work-study funds are available for qualified students; regular student employment is also available. Information on both programs is at http://stuemp.unm.edu/ or the Work-Study and Student Employment (277-3511) Office in Mesa Vista Hall 1040 (wsestudy@unm.edu).

There are also University-wide fellowships and other aid programs. The Office of Graduate Studies offers a number of financial aid options, including various fellowships: Challenge Assistantships; Graduate Fellowships; Graduate Scholars Program; and Graduate Tuition Fellowships. Application procedures and deadlines for the aforementioned programs vary; a pamphlet describing these programs is available from the Graduate Studies. The WRP Office will keep students informed of these opportunities, but students can also check with the Graduate Studies. Financial aid information can be found at the end of this document and at http://finaid.unm.edu/.

Funding for travel and research related to Professional Projects is available from the Graduate and Professional Student Association (GPSA) through the Student Research Allocations Committee (SRAC) grants, which are competitive. Visit http://gpsa.unm.edu/ for more information. The GPSA also offers Research, Project and Travel (RPT) grants. Deadlines for proposals are generally in late September and January.

The Web provides a venue for exploring scholarship and possible funding opportunities. A few examples are provided below. The first is an example of a site sponsored by graduate departments (at UC-Berkeley), which are specifically science-related The next two are examples of sites with organizations that offer scholarships/funding (note that many other professional societies offer scholarships/fellowships: American Water Resources Association, American Geophysical Union, American Society of Civil Engineers, American Society of Agricultural Engineers, Soil Science Society of America, American Society of Limnology and Oceanography, etc.). The last two web sites are clearinghouse/scholarship search sites.

www.cnr.berkeley.edu/community_forestry/
www.aauw.org/fga/fellowships_grants/index.cfm
www.geosociety.org/grants/gradgrants.htm
www.scholarsite.com/
www.back2college.com/library/scholarships.htm

STUDENT ASSOCIATIONS

University of New Mexico students have a combined student chapter of the Water Environment Federal and the American Water Works association. More information: http://waterunm.weebly.com/.

APPENDIX I - FACULTY

There are approximately 60 UNM continuing faculty members, or emeritus, who are affiliated with the Water Resources Program. They constitute a diverse group of individuals from six different schools or colleges with expertise in just about every aspect of water resources. The schools or colleges represented by the faculty are Arts and Sciences, Architecture and Planning, Engineering, Law, Medicine and the UNM Libraries. Affiliation with the program is on a voluntary basis and there are no specific selection criteria nor are there any specific responsibilities required (faculty who are members of the 2014-2017 Program Committee are indicated by an asterisk (*)).

Biology

Rebecca Bixby*, Research Assistant Professor
505-277-3411, bbixby@unm.edu
Ph.D., Michigan. Aquatic ecology.

Clifford N. Dahm, Professor
505-277-2850, cdahm@sevilleta.unm.edu
Ph.D., Aquatic Ecology, Oregon State University. Aquatic ecology, stream/groundwater interactions, microbial ecology, nutrient cycling, microbial and chemical processes in volcanic environments.

Marcy Litvak, Associate Professor
505-277-5580, mlitvak@unm.edu
Ph.D., University of Colorado. Plant physiological ecology.

Kelly Miller, Associate Professor
505-277-2496, kbmiller@unm.edu

Bruce Milne*, Director, Sustainability Studies Program, Professor
505-277-5356, bmilne@sevilleta.unm.edu
Ph.D., Rutgers University. Botany and plant physiology.

Esteban Muldavin, Research Associate Professor, Division Leader, Natural Heritage NM
505 277-3882 muldavin@unm.edu
Ph.D., New Mexico State University. Conservation biology, community ecology, vegetation mapping.

Thomas Turner, Professor, Associate Dean, Arts and Sciences
505-277-7541, turnert@unm.edu
Ph.D., Florida International University

Chemistry

Stephen E. Cabaniss, Professor and Dept. of Chemistry Chair
505-277-4445; cabaniss@unm.edu, http://www.unm.edu/~cabrsrch/index.htm
Ph.D., University of North Carolina. Environmental chemistry, molecular spectroscopy, HPLC, stochastic and deterministic programming.

Chemical and Nuclear Engineering

Edward Blandford, Assistant Professor, Chemical Nuclear Engineering
505 277-5431, edb@unm.edu
Ph.D., Stanford. Risk assessment radwaste management

Robert Busch, Principal Lecturer
505 277-8027, busch@unm.edu
Ph.D., University of New Mexico, Criticality, Radwaste Management

Civil Engineering

Julia E. Allred Coonrod, P.E., Professor, Dean, Graduate Studies
505-277-6062, jcoonrod@unm.edu
Ph.D., Environmental and Water Resources, University of Texas at Austin. Water resources, GIS applications.

John C. Stormont, P.E., Professor
505-277-6063, jcstorm@unm.edu
Ph.D., Geological Engineering with minor in Civil Engineering, University of Arizona. Vadose zone hydrology, geotechnical engineering.

Kerry J. Howe, P.E., Associate Professor
505-277-2702, howe@unm.edu
Ph.D., Civil Engineering, University of Illinois at Urbana-Champaign. Environmental engineering, water treatment processes and design, membrane technologies.

Andrew Schuler, P.E., Associate Professor
505-277-4556, schuler@unm.edu
Ph.D. Civil Engineering, University of California, Berkeley. Environmental engineering, wastewater microbiology & wastewater treatment.

Mark Stone*, P.D., Assistant Professor
505-277-0115, stone@unm.edu
Ph.D. Civil Engineering, Washington State University. Water resources, arid hydrology, hydraulics.

Bruce M. Thomson, P.E., Regents' Professor, Emeritus, and Research Professor
505-277-4729, bthomson@unm.edu
Ph.D., Environmental Science and Engineering, Rice University. Environmental engineering, water management, chemistry and treatment.

Gonzalez-Pinzon, Ricardo, Assistant Professor
505 277-2621, gonzaric@unm.edu
Ph.D. Oregon State. Surface water quality modeling.

Cerrato Corrales, Jose Manuel, Assistant Professor
505 277-2722, jcerrato@unm.edu
Ph.D. Virginia Tech. Water chemistry, chemical treatment.

Communication and Journalism
Tema Milstein, Assistant Professor
505-277-5305, tema@unm.edu
Ph.D., Communication, University of Washington. Environmental communication, Cultural approaches to human relations with nature.

Community and Regional Planning
Claudia B. Isaac, Associate Professor
505-277-5939, cisaac@unm.edu
Ph.D., University of California-Los Angeles. Community and regional economic development, social theory, gender and development, Latin American studies.

Theodore Jojola, Professor
505-277-6428, tjojola@unm.edu
Ph.D., University of Hawaii. Community development, environmental design, indigenous rights, tribal economic development, microcomputer applications in education and planning.

James R. Richardson, Professor
505-277-6460, jrich@unm.edu
M.Arch./A.S., M.C.P., Massachusetts Institute of Technology. Land-use planning, community development, citizen participation, negotiation and environmental dispute resolution, urban design.

José A. Rivera, Research Scholar
505-277-2257, jrivera@unm.edu
Ph.D., Brandeis University. Social policy and planning, strategic management, and rural community development in a regional setting.

David S. Henkel, Jr., Professor Emeritus
505-277-5050, cymro@unm.edu
Ph.D., Cornell University. Cultural aspects of community development, natural resources and regional planning.

William M. Fleming, Associate Professor
505-277-6455, fleming@unm.edu
Ph.D., University of British Columbia. Watershed management, impacts of land use on water quality.

Caroline Scruggs*, Assistant Professor
505-277-5050, cscruggs@unm.edu
Ph.D. Stanford University. Environmental planning.

Earth and Planetary Sciences
Abdulmehdi Ali, Senior Research Scientist I
505-277-1637, mehdiali@unm.edu
Ph.D. Chemistry, University of Arizona. Water chemistry, analytical methods.

Yemane Asmerom, Professor
505-277-4434, asmerom@unm.edu
Ph.D., Geochemistry, University of Arizona. Applications of radiogenic isotopes (U-Series, Nd-Sr-Pb-Hf) to the study of the solid earth, oceans and climate through time.

Laura J. Crossey, Professor
505-277-5349, lcrossey@unm.edu
Ph.D., Geochemistry, University of Wyoming. Clastic diagenesis and organic geochemistry, with emphasis on interaction of organic and inorganic constituents of sedimentary rocks during progressive burial, and diagenetic model development.

Peter J. Fawcett, Associate Professor
505-277-3867, fawcett@unm.edu
Ph.D., Paleoclimatology and Sedimentology, Pennsylvania State University. Long-term evolution of the climate system and patterns of past global change, quaternary paleoclimatology, and climatic influences on sedimentation.

Joseph Galewsky, Associate Professor
505-277-2361, galewsky@unm.edu
Ph.D., University of California - Santa Cruz. Interactions between meteorological and land surface processes, climate dynamics, orographic precipitation.

David S. Gutzler*, Professor
505-277-3328, gutzler@unm.edu
Ph.D., Climatology and Meteorology, Massachusetts Institute of Technology. Data analysis and modeling of interactions between the atmosphere, ocean, and land surfaces and climatic variability of Southwestern North America.

Grant A. Meyer, Professor
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Ph.D., Earth and Planetary Sciences, University of New Mexico. Hillslopes and fluvial systems; climatic, tectonic and environmental geomorphology; Quaternary geology and ecosystem processes.

Leslie D. McFadden, Professor
505-277-6121, lmcfadnm@unm.edu
Ph.D., Quaternary Geology, University of Arizona. Soil development in arid and semiarid regions; applications of soil studies to geomorphology, paleoclimate, environmental research, and geohazard evaluation.

Louis A. Scuderi, Professor
505-277-2644, tree@unm.edu, epswww.unm.edu/faculty.htm
Ph.D., Geography, University of California-Los Angeles. Paleoclimatic reconstructions utilizing dendrochronology, climatology, geographic Information Systems (GIS), image processing, global positioning systems (GPS), creation and analysis of historical and paleoclimatic databases.

Gary A. Smith, Professor
505-277-2348, gsmith@unm.edu
Ph.D., Sedimentology and Physical Volcanology, Oregon State University. Sedimentology related to rift tectonics, aquifer heterogeneity, and volcanism, physical volcanology of pyroclastic deposits and composite volcanoes.

Zachary D. Sharp, Professor
505-277-2000, zsharp@unm.edu
Ph.D., University of Michigan. Stable isotope geochemistry, with application to paleoclimate reconstruction, metamorphic and igneous petrology and structural geology.

Gary Weissmann, Professor
505- 277-3636 weissman@unm.edu
Ph.D., University of California, Davis. Hydrogeology, sedimentology, and basin analysis. Research focuses on a basin analysis approach to characterizing and modeling groundwater flow and contaminant transport.

John W. Shomaker, Adjunct Professor
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Ph.D., University of Birmingham (England). Hydrogeology, water resources planning and management.

Economics
Robert Berrens*, WR Director and Professor
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Ph.D., Agricultural and Resource Economics, Oregon State University. Environmental economics, nonmarket valuation, sustainability and ecological economics, environmental equity, institutional economics, riverine and public lands management, survey research, wildfire and watersheds.

David S. Brookshire, Distinguished Professor Emeritus, and Research Professor
505-277-1964, brookshi@unm.edu
Ph.D., Economics, University of New Mexico. Environmental and resource economics, policy issues associated with endangered species, natural hazards and water resources.

Janie Chermak, Professor and Chairperson
505-277-4906, jchermak@unm.edu
Ph.D., Mineral Economics, Colorado School of Mines. Environmental economics and natural resources, applied microeconomics, empirical testing of the theory of exhaustible resources, exhaustible resource production.

Catherine (Kate) Krause, Dean, University College, Professor
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APPENDIX II - THE PROFESSIONAL PROJECT

Introduction

The Professional Project is the culmination of the student's graduate experience and demonstrates the student's ability to perform professional quality independent work on a topic related to water resources management. The topic of the project is selected by the student in an area of his/her choosing, and with guidance of a faculty advisor and graduate committee. The project can be related to a student's employment, however, additional independent work is required for the project to serve as a UNM Professional Project. The end product of the Professional Project is a formal, professional report that is defended before a faculty graduate committee in a public forum.

Identifying a research topic, performing the appropriate research and writing a Professional Project is one of the most under estimated requirements associated with a graduate degree. This requirement demonstrates the student's ability to independently formulate a research question, develop an appropriate scope of work, generate information to address the question, communicate the ideas and conclusions in a written document and defend the work before a committee of experts.

There are nearly as many ways of conducting graduate research as there are university faculty. Nevertheless, experience has allowed identification of some common attributes that can provide guidance to students in developing their own research proposals, then performing the work needed to complete the project.

Identifying a Topic

Identifying a topic for one's Professional Project research is, perhaps, the single most difficult task in all of graduate school. The difficulty lies in selecting a topic that satisfies many different criteria. For example the project must be interesting and meaningful to the student and his/her advisor, and there must be adequate resources available to perform the work. The resources that are needed include intellectual resources (i.e. expertise from one's advisors), financial resources, laboratory/library/computing resources, and time; the project must be something that can be accomplished within the time constraints available to the student. Under the best circumstances the graduate student is working as a Research Assistant (RA) for a professor on a funded research project, the professor becomes the student's advisor and the project, or some component of it, forms the basis of the student's Professional Project. These few lucky students often enjoy the additional advantage that the professor has already written a research proposal. In this case the structure and ideas from the proposal can be incorporated into the student's own research program.

Before selecting a topic the student should understand the attributes of a good research proposal. These include:

- The proposed project has a clear and concise title.
- The proposed project has a clearly stated hypothesis or clearly articulated research question.
- The proposed project has a clear statement of objectives. The statement of objectives is important because once they have been achieved, the research for the project is finished.
- Resources should be available to assist in conducting the project. These include time, library resources, laboratory or field access, and most importantly, one or more faculty members knowledgeable in the topic and willing to work with you.

There are two approaches one can take to identify a research project referred to here as the Traditional Approach and the Inverse Approach. Clearly there is some overlap between the two, but it is useful to describe them as it can lead a student to new ideas for developing their proposal.

Traditional Approach to Identifying a Project

The traditional method for identifying a research project is for the student to develop a research hypothesis or question in their field of interest after extensive reading, analysis, careful thinking and discussion with their advisor. A clear statement of this hypothesis or question then leads to a research program that is designed specifically to answer that question. The student performs the scope of work, collects the data, analyses it to answer the hypothesis or question then writes it up to complete the Professional Project. Thus, the traditional approach to identifying a research project follows the following steps:

- Develop a research hypothesis/question
- Develop a plan of study to address the hypothesis/question
- Follow the research plan to generate data or information
- Analyze the data or information to test the hypothesis or answer the question
- Write and defend the Professional Project

It is called the traditional approach because historically most graduate students were full time students and had the luxury of using some variation of this method. The really lucky students are those supported by research projects where the professor has already formulated a research hypothesis or question in the grant proposal and the student simply joins the project and is given guidance on what needs to be done.

Inverse Approach to Identifying a Project

Most part time or unsupported grad students cannot use the traditional approach for selecting a research project because they don't have the time or financial resources needed to address an academic topic. Nevertheless, many of these students work professionally and often have access to large amounts of interesting information that, with proper analysis, can tell an interesting story. In the inverse approach the research project follows these steps:

- Consider and conduct a preliminary analysis of information or data to determine if it is of suitable quality and sufficient quantity to answer a well formulated research question.
- Using the data, develop a research hypothesis/question that can be answered by the data.
- Develop a plan of study to address the hypothesis/question.
- Analyze the data. Generate more data/information if needed.
- Write and defend the Professional Project.

The inverse strategy is frequently used by part time students who have employment in a field closely related to their area of study. Most employers are very willing to support this kind of research because it provides information or analysis that can benefit their firm or agency, as well as providing additional training and credentials to their employee.

Regardless of the strategy one uses in identifying a research project, the student should expect to work closely with their advisor; the enthusiastic and willing participation of the advisor is essential to the success of the project. It is equally important that the student recognize that

identifying a research project is very challenging. It will almost certainly require multiple iterations in which an idea is proposed, some preliminary information is gathered on the topic and a scope of work is developed, then the ideas are discussed with the advisor. It is not uncommon for students to take 6 months or longer to develop a proposal for a Masters project or thesis.

Bad Research Statements

One of the most common problems encountered with student research proposals begins when the student states "I want to look at ….." While this might be appropriate for a career goal it offers no guidance towards developing a scope of work that will lead to completion of a Professional Project. "Looking at" a topic might be as simple as reading a couple of papers, or as complex as devoting the next five years of one's life to become a world class expert. A much better proposal might starts with "I believe that the following will occur if…," This constitutes a hypothesis that can be tested, at least in principle. Properly phrased it will lead to articulation of a set of objectives. The student will then devise a way of generating data or information to achieve those objectives, thereby testing the hypothesis. A clear ending point is achieved when the hypothesis has been successfully tested. Then the student graduates, has a big celebration party, and everybody lives happily ever after.

Bad Research Proposal Statements	Better Research Proposal Statements
I want to look at methods of removing arsenic from water	I believe that better removal of arsenic from water can be achieved through adsorption onto amorphous ferric hydroxide
How does bosque restoration affect ground water?	Will bosque restoration cause reduced measurable evapotranspiration losses from shallow ground water?
Evaluate the effectiveness of various water conservation measures.	The following water conservation measures can successfully be implemented to achieve at least XX% reduction in water use.

The Research Proposal

As the student develops a research topic in conjunction with her advisor, she/he needs to begin thinking about preparing a research proposal. Graduate research proposals are formal documents and should be written as though they were to be submitted to a funding agency. There are two objectives to be accomplished in the research proposal:

- Clearly identify the problem or issue to be addressed and convince the graduate committee that it is a topic worthy of investigation. Provide a clear statement of objectives that will be accomplished in the research.
- Develop a research plan that will accomplish these objectives and present it in sufficient detail that the graduate committee has confidence in the project's success.

The research proposal is written as a formal document; all statements of fact are referenced, tables and figures have captions, and the language is careful, concise, and to the point. The body of the research proposal should not exceed 15 pages. The organization of a research proposal is usually very simple. It should have the following components:

Title Page
Abstract (1 page)
Introduction

- General description of the problem under consideration
- Clear statement of the research question or hypothesis to be addressed
- Clear statement of the research objectives
- General summary of the methods that will be used to achieve the objectives

Background or Literature Review

- Provide a thorough review of relevant information that has been done on the topic. This should include a summary and analysis of published literature and reports. If the topic involves a field study, maps, diagrams and photos should be included. This chapter will draw heavily on previous work by others and other sources of data and should be extensively referenced.
- It is suggested that references be cited as Last Name (date). For example (Smith, 1995; Jones and Allen, 2002; Sanchez et al., 2005). Remember, you're citing the paper not the individuals. List the references in alphabetical order at the end of the paper.
- This section will almost certainly form the basis of the second chapter of the Professional Project, and therefore should have the same organization as expected in the final document.

Research Methods

- Describe how the research will be conducted. Identify methods of collecting data. Provide diagrams of experimental equipment to be built. Identify analytical methods to be use (give references). Provide maps showing locations of field sampling stations. Develop the theory of modeling studies. Identify sources of information.
- Provide a research schedule with specific tasks and specific milestones that can be used to track the progress of the project.

Expected Results and Methods of Analyses

- Describe the data or information expected to be generated by the research. Identify its form (statistical data from questionnaires, tables of data from instruments, papers from library & internet searches, computer model results, etc.).
- Describe how the data will be processed, summarized, or analyzed. Identify statistical methods to process the data. Describe how literature, interviews, or other non-quantitative information will be assimilated and interpreted.

References

- References should be presented using the same formatting style as will be used in the final Professional Project.

Students should expect to put a lot of work into their research proposal. Keep in mind that the proposal constitutes the first draft of the Professional Project. In this respect, the research proposal establishes the organization for the final document. Indeed, if done well, nearly every bit of material contained in the proposal will be used in the final Professional Project. Thus, extra effort devoted to producing a high quality research proposal will be recovered in the form of a more efficient and productive research process, and ultimately, a better final document.

The Graduate Committee

Throughout this document emphasis has been placed on the need for close collaboration between the student and their advisor. It is important to remember that the student's graduate committee is also an integral part of the process and should be utilized as a resource to assist in all phases of the research project. Most university faculty members choose this career because of a desire to

help students learn. Assisting with a productive and successful research project is one of the more rewarding parts of the job because not only do you have the opportunity to play a role in the professional development of a bright young person, but there is the additional satisfaction associated with the intellectual rewards of contributing new knowledge to one's profession. Conversely, one of the most difficult situations a faculty member can be in is to be added to a student's graduate committee after most of the work has been completed, only to find the project is weak. In such cases, the committee member's role is limited to that of gate keeper – a person who is forced to make the very difficult decision as to whether a weak piece of work is nevertheless good enough to allow the student to graduate.

Choosing the Committee

Committees for masters students at UNM require a minimum of three members, two of which must be regular or research faculty. The third member must be have qualifications appropriate for the student's area of study. Ph.D. committees must have four members, three must be regular or research faculty, and one of these must be from a different graduate unit than the student's major department (i.e. a different department at UNM or a different university). All committees must be approved by Graduate Studies. Specific guidance on the composition of graduate committees is given in the UNM catalog.

Generally, students pick a committee based on faculty they know and/or people they work with. The characteristics of an ideal committee member are: 1) they are knowledgeable in the field of interest, 2) they are available and willing to serve on the committee, and most importantly, 3) the student has confidence that they will provide constructive assistance during the course of the project. Part-time students who have selected a topic related to work are encouraged to select a supervisor or other senior member of the organization for their committee. Senior staff from work are beneficial because they have frequent contact with the student, usually have good knowledge of the subject, understand the constraints the student faces, and can provide immediate suggestions when questions arise. Furthermore, because the student's project is work-related, a supervisor can sometimes make resources available to assist in completing the project.

Working with the Committee

Students are strongly encouraged to take full advantage of the expertise, knowledge, and experience of their entire graduate committee by involving them in the research project from the beginning. At the same time, this involvement must be balanced against the challenges of obtaining meaningful input from very busy people. In other words, most committee members do not want to have weekly reports on the student's progress. But neither is it appropriate for the student to simply show up one day after months or years without contact, plop a document on the desk and say, "here's my Professional Project, let me know what you think."

It is suggested that during the research project the student arrange two formal meetings of their full committee. The occasion of these meetings and their objectives are:

- 30% Completion Meeting – Obtain Committee Buy-In. This meeting should be held when the student has completed roughly one third of the proposed research. The objective of this meeting is to obtain the committee's agreement that the research project is well framed, the methods are appropriate, and the project has a high chance of success. The student will formally present their research proposal to the committee, describe the project objectives, the scope of work and the research methods.

- 70% Completion Meeting – Identify Fatal Flaws. This meeting occurs after the student has collected most of the information needed for the project. The objective is for the committee to consider this information and the student's preliminary conclusions and determine whether the work has been done with sufficient care and the results have been interpreted by proper methods to support these conclusions. It is important to have this meeting while the research is still in progress so that if new data is needed, or new experiments must be conducted, it can be accomplished with minimal additional work.

In addition to these formal committee meetings, it is important to continue regular meetings with the student's advisor. It is suggested that biweekly progress reports is an appropriate frequency if there is not regular personal contact. Similarly, monthly reports to the rest of the committee are helpful. These reports need not be overly detailed and in many cases can be one page bulleted lists of Accomplishments and Planned Activities. The purpose is to maintain regular contact and avoid surprises.

Conducting Research and Writing the Professional Project

It is difficult to provide generic guidance to students conducting research projects because each project, each advisor, and each discipline is so different. Thus, a strategy that works well for lab oriented engineering research is likely of limited value for a project investigating cultural characteristics. Listed below are some ideas that may appropriate for some projects.

Prepare a Schedule and Regularly Update It

A detailed scope of work and research schedule should be part of the research proposal. Periodically go back to this schedule and consider your scope of work and the progress made towards completing it. Revise as appropriate.

Keep a Project Notebook

Science and engineering students are strongly encouraged to keep a project notebook, a recommendation that has value to students in other fields as well. Project notebooks should be bound (not 3 ring binders) and the pages numbered. Entries should be made in ink. Errors are crossed out by a single line through the erroneous material. The notebook thus becomes a combination of diary and repository of information collected in the library, field or laboratory. While data files might be stored on a computer, the procedures used to collect the data, any hand written notes or information, and the name of the data file should be written in the notebook.

Backups

Back up your work and data by storing it on a flash drive or CD. Back it up frequently. All of it.

Writing

Writing a Professional Project is always much more time consuming than students estimate. The rule of Pi should be used in predicting how long it takes to write the final document: Estimate the time required then multiply by Pi.

The Professional Project is a formal academic document and should be written as such. It is generally written in the third person impersonal tense and should be clear and succinct. Adjectives should be used sparingly and superlatives are almost never used. In my experience the style editor in MS Word has apoplexy when analyzing most well written projects/theses/dissertations.

Most academic documents including papers/projects/theses/dissertations as well as technical reports should be written in the past tense to the extent reasonable because the document describes work that has been done. While it sometimes makes sense to write in the present tense, six months, a year or a decade later it won't make any sense at all (unless you're still working on the darn project).

The Professional Project should follow the formatting and organization criteria set by the UNM Office of Graduate Studies (www.unm.edu/~grad). The report should be double-spaced, with 1" (1.50" left-hand) margins, and generally contain the following:

- A title page including student name, month and year of graduation, and the citation that this document is submitted in partial fulfillment of the requirements for the degree of Master of Water Resources, Water Resources Program, University of New Mexico. A sample title page can be downloaded from the WRP web site.
- A signature page, signed by all committee members. The signature page can be downloaded from the WRP web site.
- A table of contents and separate lists of tables and figures.
- Acknowledgements page.
- An abstract stating the problem or hypothesis, its significance, results, summary and conclusions. The abstract should not exceed two pages.
- An introductory chapter or section identifying the problem/hypothesis, previous work, etc.
- Other chapters or sections, as cited in the table of contents.
- A glossary of terms.
- Appendices (where appropriate).
- Literature cited (references). Because of the diversity of water resources disciplines, citation styles vary. Choose one style that is dominant in the particular field and stick with it. For water resources, the *Journal of the American Water Resources Association* (JAWRA) is a good reference. The student's committee can provide guidance.

For issues of style, references, and formatting there are numerous books on writing academic papers. One is: A Manual for Writers of Term Papers, Theses and Dissertations by K. Turebian, 6th ed., University of Chicago Press. There are many others.

Web Sites With Good Information
http://www.ldeo.columbia.edu/~martins/sen_res/how_to_thesis_proposal.html

The Oral Exam/Professional Project Defense
Once the student has finished the report, he/she submits a draft to the committee for their comments. Usually the Chair reviews it before submitting to the rest of the committee. The committee may require corrections to the draft prior to scheduling the oral exam. The student should provide a Draft Final copy of their report to the committee
at least two full weeks prior to the defense.

Students must inform the WRP office by December 1 (Spring graduation), May 1 (Summer graduation), July 15 (Fall graduation) of their intention to graduate in the following semester. No form is required.

The oral exam is open to the public and Graduate Studies must be notified two weeks before it occurs by submitting and *Announcement of Examination* form. The student and the committee should decide on a time and date for the examination. After the student and their committee have agreed on a date and time, the WRP Administrator must be notified who will help fill out the proper forms. The student should also reserve a room and audio-visual equipment for the defense (usually an LCD projector and a laptop computer).

During the exam, the student makes a formal presentation lasting 30 minutes or less. The presentation should follow the same organization as the written report and should emphasize work done by the student and especially his/her analysis, interpretation and conclusions. Following the presentation the graduate committee and the audience will be encouraged to ask questions about the project.

After the presentation and public questioning, the committee may close the meeting to the public and continue the examination. At the conclusion of the examination the committee and student will discuss the results.

On the final exam, the student can receive a grade of "Pass", "Fail", "Pass with Distinction", or "Conditional Pass". Almost always the committee will identify some changes needed to the written report. Depending on the nature of the changes, the final report may need to be re-reviewed by the entire committee or simply by the advisor. Obtaining the committee members' signatures on the second page of the final report is their indication that the student has submitted a report satisfying the requirements of the MWR program.

Final Copies of the Professional Project Report

Two soft-bound copies of the final, committee-approved report will be submitted to WRP Office for filing; two of these will be deposited in the UNM Library. Binding should be permanent (glued, wire spiral, or similar); looseleaf or similar binding (plastic "comb" binding) is unacceptable. Glued binding is preferable. The front and back covers of the final report must be on heavy paper stock, not the same paper used for the body of the report. Do not include a clear plastic page in front of the cover.

All Professional Projects must include a CD containing a PDF of the completed project in a CD envelope pasted to the inside front cover of the bound copies of the final report. This CD may also contain supporting data, spreadsheets or computer results, photographs, PDFs of important references or other information the student believes is relevant to the project. The electronic copy of the report will be placed on the WRP web site. The CD should have a computer generated label that contains the title of the project, the student's name, and date.

The title page (see the end of this document or the WRP web site) is the first page of the report and the signed signature page follows that page. The student may use the title page as the cover or can design his/her own cover, perhaps with a picture or drawing. At a minimum, the cover should display the title, degree name and option, and student's name, with the following at the bottom:

A Professional Project Report Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Water Resources
Hydroscience or Policy/Management Concentration

Water Resources Program
The University of New Mexico
Albuquerque, New Mexico
Month Year

The month and year will be that month (May, August, or December) and year in which the student will *graduate*, not the month in which the student *defended.* As a matter of courtesy, the student should provide each committee member with a copy of the PP (either paper or electronic depending on the member's preference). A final grade in WR 598 will not be issued until the WRP Office receives the final report signed by all committee members.

Some Common Pitfalls

Below are some of the common problems associated with professional projects.

- Waiting too long to identify a project.
- Poor topic definition or too broad a topic.
- Inadequate resources (time, financial, faculty or other intellectual assistance) to complete the task.
- Failure to seek committee help, especially during the initial stages of project development.
- Inadequate data to complete the project.
- Believing one draft will be sufficient.
- Underestimating the amount of time it will take. This is especially true of projects involving a field and/or lab component. In the field or lab, things rarely go as planned; Murphy's Law ("If things can go wrong, they will.") often controls.
- Leaving school before turning in a first draft of the report. Students may leave school before completing all requirements, often to accept a job. Keep in mind that doing so will, in most cases, greatly prolong the amount of time (perhaps by a factor of 3 – 6 times) it will take a student to finish the degree. It is not uncommon for a student to leave, thinking he or she is just a few months away from finishing up and; before one knows it, a year has gone by. The demands of a new job often preclude work on a professional project. If a student must leave before finishing, he/she should endeavor to turn in a first draft of the Professional Project report to his/her committee.

If a student experiences problems, he/she should promptly discuss them with their advisor and then their graduate committee. An informed advisor and committee is the student's best ally in completing their degree.

Publishing Your Professional Project

WRP students are strongly encouraged to publish their PP work in journals and/or present their results at regional and national professional meetings. The following language should be included to provide recognition for the program.

"This work is based upon the Professional Project of (your name), submitted in partial fulfillment of the requirements for the degree of Master of Water Resources at the University of New Mexico."

APPENDIX III - PREVIOUS PROFESSIONAL PROJECTS

(Note: professional projects were not required prior to 1995. All those completed after 1999 are in Zimmerman Library. The committee chair is shown in parentheses)

Harwood, A. Kyle. *The Urban Stormwater Contribution of Dissolved Trace Metals from the North Floodway Channel, Albuquerque, NM, to the Rio Grande*. April 1995. (M. Campana and C. White)

Sandoval, Tina Marie. *Striking A Balance: Potential Legal And Institutional Constraints On The Use Of San Juan-Chama Water and Groundwater As-Needed To Meet Albuquerque's Long-Term Water Demand*. November 1995. (F. L. Brown)

Newman, Gretchen. *Erosion Study in Tajique Watershed*. February 1996. (R. Heggen)

Hofstad, Steven C. *Sediment and Nutrient Loss Following Prescribed Fire in Semiarid Grasslands: the Potential for Water Resource Impairment.* December 1996. (F.L. Brown)

Nelson, Terry. *Past and Present Solid Waste Landfills in Bernalillo County, New Mexico.* June 1997. (F. L. Brown)

Hauck, Bill. *A Water Audit of Albuquerque Manor Retirement Home: A Potential for Water Savings Study and Economic Analysis*. June 1998. (F. Lee Brown)

Krause, Tom. *Who Speaks for the Rio Jemez? A Management Plan for the Lower Jemez River Basin.* June 1998. (M. Campana)

Fitzner, April. *Physical and Legal Aspects of River Rehabilitation, Middle Rio Grande, New Mexico.* December 1998. (M. Campana)

Brouillard, Elaine S. *Erosion Potential of the Main Branch of the Piedras Marcadas Watershed, Petroglyph National Monument, New Mexico.* March 1999. (M. Campana)

Renn, Richard M. *Assessment and Management of the Arroyo Del Coyote Watershed, Sandia National Laboratories and Environs, New Mexico.* March 1999. (W. Fleming)

Childs, Marquis B. *Soil Radionuclide Concentrations and Preliminary Stormwater Model Assessment at Material Disposal Area G, Los Alamos National Laboratory.* April 1999. (M. Campana)

Peterson, Jeffrey L. *Coordinated Water Resource Planning for the Sandia Basin - A Perspective into Regional Water Planning Needs.* May 1999. (M. Campana)

Sato, Hirotaka. *Water Pricing Strategy for the City of Albuquerque's Sustainable Water Use.* July 1999. (D. Brookshire)

Gordan, Linda I. *Water Supply Sustainability Through Water Banking*. April 2000. (M. Campana)

McLean, Christopher T. *Estimates of Radionuclide Loading to Cochiti Lake from Los Alamos Canyon using Manual and Automated Sampling*. April 2000. (M. Campana)

McDonald, William S. *Urbanization of Seven Springs, New Mexico: An Evaluation of Current and Projected Impacts on Ground- and Surface-Water Resources*. June 2000. (M. Campana)

Gillard, Nancy J. *An Environmental Analysis of the Drycleaning Industry: A New Mexico Perspective*. July 2000. (B. Thomson)

O'Neil, Joy K. *Volunteer River Monitoring Plan for the Urban Reach of the Santa Fe Watershed.* July 2000. (W. Fleming)

Gray, Neil W. *Issues in Managing Erosion: The Spring Timber Sale Case Study, El Rito Ranger District, Carson National Forest, New Mexico.* July 2000. (W. Fleming)

Just, Robin L. *Modeling Flow and Sediment Transport in the Rio Puerco Using a SWAT/GIS Interface*. September 2000. (W. Fleming)

Cook, Casey W. *A Mixing Cell Model of the Fernley, Nevada, Groundwater System.* November 2000. (M. Campana)

Smith, Katherine A. *Comparison of Two Riparian Assesment Surveys: Proper Functioning Condition and the New Mexico Watershed Watch Riparian Survey.* November 2000. (W. Fleming)

Walters, Tobin K. *PCB Remediation Alternatives on the St. Lawrence River near Massena, New York: Quantitative Impacts to the Industry the Mohawk Indian Nation and the United States Environmental Protection Agency*. November 2000. (M. Campana)

Bitner, Kelly A. *Cost of Compliance with a Lower Arsenic Drinking Water Standard in New Mexico*. January 2001. (B. Thomson)

Vardaro-Charles, Patricia. *An Evaluation of Water Treatment Technologies Piloted at LANL to Improve Cooling Tower Water Efficiency*. February 2001. (B. Thomson)

Hunter, Andrea. *Environmental Disturbance of Oligotrophic Bacteria and Effects on Water Quality in Deep Karst Pools.* March 2001. (C. Dahm)

Cotter, T. Jeffery. *Point-of-Use Arsenic Remediation Using Activated Alumina*. June 2001. (B. Thomson)

Mandeville, Debby. *Erosion Impacts from Recreation in the Enchanted Tower Climbing Area, New Mexico*. August 2001. (T.J. Ward)

Kerven, Claire. *Benefits and Costs of Diverting 0.2 MGD Influent from Los Alamos County Wastewater System to Los Alamos National Laboratory Sanitary Wastewater System.* November 2001. (W. Fleming)

Evans-Carmichael, Sherry. *Rancho West Estates Water Distribution System Replacement Funding Project.* November 2001. (M. Campana)

Diehl, Danielle D. *Microbially Mediated Reduction of U(VI) in Groundwater at a Site in Konigstein, Germany.* December 2001. (B. Thomson)

Grassel, Kathy. *Taking Out the Jacks: Issues of Jetty Jack Removal in Bosque and River Restoration Planning.* April 2002. (M. Campana)

Shean, Jr, Frederic L. *Assessment of Conjunctive-Use Strategies for Water Resources Development in the South Valley Area, Bernalillo County, New Mexico*. July 2002. (B. Thomson)

Romero, Orlando C. *A Convective Thunderstorm Case Study in Albuquerque, New Mexico: Does the Urban Heat Island Affect Precipitation?* July 2002. (J. Coonrod)

Van Eeckhout, Mark. *Integrating HEC-RAS and ArcView in Predicting Post-wildfire 100-year Floodplains on the Pajarito Plateau, Los Alamos, New Mexico*. August 2002. (J. Coonrod)

Nims, Joshua S. *Effects of Summer Climate on Water Demand in Albuquerque, New Mexico.* August 2002. (D. Gutzler)

Bruerd, Barak. *Designing A Village Water Supply System in Papua New Guinea: A Case Study in Third World Development.* May 2003. (J. Coonrod)

Gabora, Michael M. *A $\delta^{18}O$ Calibrated Compartmental Mixing Cell Model of Groundwater Flow in the Roswell Basin, Southeastern New Mexico*. May 2003. (M. Campana)

Riebsomer, Eric. *Chemistry Variation During Purging of Alluvial Wells at Los Alamos National Laboratory*. May 2003. (M. Campana and D. Rogers)

Bentley, Jessica. *Constructed Surface Flow Wetlands for Oil Refinery Wastewater Treatment in New Mexico*. May 2003. (M. Campana)

Paretchan, Lynne M. *Water Resource Management Strategies: Deschutes Basin, Oregon* August 2003. (M. Campana)

Ewing, Amy. *Water Quality and Public Health Monitoring of Surface Waters in the Kura-Araks River Basin of Armenia, Azerbaijan and Georgia.* August 2003. (M. Campana)

Stropki, Cody Lee. *Restoration Treatments in the Middle Rio Grande Bosque: Effects on Soil Compaction.* December 2003. (J. Coonrod)

Gregg Bassore, Kerry. *Evaluating Stormwater Best Management Practices in a Small Urban Watershed: A Case Study of the Adobe Acres Drainage Basin in Bernalillo County, New Mexico*. December 2003. (J. Coonrod and W. Fleming)

Joshi, Uday V. *Selective Tree Thinning in the Santa Fe Municipal Watershed for Water Yield Augmentation*. May 2004 (W. Fleming)

Kolk, Stephen M. *Assessment and Preliminary Design of a Water Supply Project for the Village of Altos de las Paz, Honduras*. May 2004. (J. Coonrod)

Amato, Ron. *Surface Water Quality of the Gallinas River in and around Las Vegas, New Mexico.* August 2004. (L. Crossey)

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Brown, Kathyrn D. *Pharmaceutically Active Compounds in Residential and Hospital Effluent, Municipal Wastewater, and the Rio Grande in Albuquerque, New Mexico.* December 2004. (B. Thomson)

Louise, Amy. *Sustainable Water Supply for the Village of Kpandu Dafor, Volta Region, Ghana.* December 2004. (M. Campana and V. Perry)

Iwhish, Hani. *Fresh Water Supply Enhancement Through Rooftop Rainwater Harvesting for West Bank Rural Communities.* December 2004. (M. Campana)

Marcell, Nicole L. *Exposure Evaluation of an Aviation Gasoline Release at a Municipal Airport in Central Wisconsin.* December 2004. (M. Campana)

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Luna, Melanie L. *Potential for Ground-Water Contamination from Deep Well Injection of Produced Waters in the Salt Basin, New Mexico.* May 2005. (M. Campana)

Chora, Rosemarie. *The Management of Nonpoint Sources of Contamination from the Embudo Watershed in the Vicinity of Albuquerque, New Mexico*. August 2005. (W. Fleming)

Klise, Geoffrey T. *Potential Options to Reduce ESA Liability for Private New Mexico Irrigators Who May be Liable for a Section 9 'Take'*. August 2005. (O.P. Matthews)

Henderson, Heidi R. *Nutrient Criteria Recommendations for Eutrophication Management of New Mexico Reservoirs.* August 2005. (M. Campana)

Kundargi, Darrell. *Effects of Bovine Exclosure Fencing on Water Quality and Vegetative Conditions, Bluewater Creek, New Mexico.* August 2005. (M. Campana and R. Jemison)

Campbell Parrish, Jules. *Dynamic Simulation Modeling of Groundwater Basins in the Upper Rio Grande Basin, Colorado-New Mexico*. August 2005. (M. Campana)

Stansifer, Gary. *Analysis of the Mixing of Treated Effluent Discharge, Surface Water and Shallow Ground Water Using Anionic Constituents.* December 2005. (C. Dahm)

Neir, Alyssa. *The History of the Federal Government's Involvement in Water Resources: An Attempt to Correct Externalities?* December 2005 (D. Brookshire)

Sanchez. Blane M. *Chical Area On-Site Wastewater Treatment System Management, Pueblo of Isleta, New Mexico.* December 2005 (B. Thomson)

Heemink, Barbara. *An Assessment of Domestic Water Consumption Discrepancies Between Commercial Farms and Majengos Along South Moi Lake Road, Lake Naivasha, Kenya.* December 2005 (M. Campana)

Demint, Ann. *Integrating a GIS-Produced, Reach-Based Hydrological Analysis into a Dynamic Surface Water Model of the Middle Rio Grande, New Mexico.* December 2005. (J. Coonrod)

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Casey, Christine. *Community Management for Improved Sustainability: Case Studies of Three Rural Community Water Supply and Sanitation Projects in Honduras.* December 2005. (C. Issac)

Rawlings, Matthew. *Variables to Consider When Transferring Water Rights in New Mexico.* December 2005. (O.P. Matthews)

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Arvidson, Julie. *Relationship of Forest Thinning and Selected Water Quality Parameters in the Santa Fe Municipal Watershed, New Mexico.* May 2006. (T. J. Ward)

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Putney, Tara. *The Sustainable Restoration and Development of Parque Landeta and the Presa de Las Colinas Wetland Through Effective Community Participation San Miguel de Allende, Guanajuato, Mexico.* May 2006. (M. Campana)

Matthew Lane. *Corrective Action Plan for the New Mexico Landfill*. August 2006. (M. Campana)

Berrin Basak Vener. *The Kura-Araks BasinL Obstacles and Common Objectives for an Integrated Water Resources Management Model among Armenia, Azerbaijan, and Georgia.* August 2006. (M. Campana)

Funk, Andrew. *The Potential of Water Saving and Water Capturing Innovations: A Case Study of Albuquerque Single Family Homes*. December 2006. (J. Chermak, J. Coonrod)

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Dyer, James R. *Groundwater-Surface Water Interactions: Effects of Geothermal Spring Inputs to Jemez River Water Quality.* May 2007. (L. Crossey)

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Kindel, Sharon. *Ten Things You Should Know About Water before Going to High School: Incorporating Local Water Resources Issues Into the Albuquerque, New Mexico Public School System Science Curriculum.* August 2007. (W. Fleming)

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Jones, Kerry M. *Relationship Between a 700-MB "Dry/Wind" Index and Springtime Precipitation and Streamflow Within Four Snowmelt-Dominated Basins in Northern New Mexico and Southern Colorado*. December 2007. (D. Gutzler)

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LeJeune, Christian. *Multi-Year Investigation of Groundwater – Surface Water Interactions in the Vicinity of the Albuquerque Drinking Water Diversion Dam*. August 2008. (J. Stormont)

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Curtis, Jan M. *An Assessment of Surface Water-Groundwater Interactions and Water Quality in Bluewater Creek New Mexico*. December 2008. (L. Crossey)

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Martinez, Louis. *Utility Response to Drought: Business of Water Management Practices and Function In View of Decreased Consumption.* August 2009. (B. Thomson)

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Kryder, Leslie R. *Preparing Water Users in the Lower Rio Grande for Adjudication Through an Informative Workshop*. December 2009. (D. Henkel)

LaBadie, Katherine. *Identifying Barriers to Low Impact Development and Green Infrastructure in the Albuquerque Area.* May 2010. (W. Fleming)

Schoener, Gerhard. *Comparison of AHYMO and HEC-HMS for Runoff Modeling in New Mexico Urban Watersheds.* May 2010. (J. Coonrod)

Rae, Rebecca. *Utilizing Jicarilla Apache Knowledge to Enrich the Watershed Watch Program Curriculum for the Benefit of the Jicarilla Apache Youth.* December 2009. (T. Jojola)

Padilla, Mariana. *An Analysis of the Los Padillas Wildlife Sanctuary a Place-Based Environmental Education Model.* May 2010. (T. Jojola)

Young, Rick. *Performance of a Green Roof Lysimeter in an Arid Climate.* August 2010. (B. Thomson)

Gunning, Christian. *Estimating Phreatophyte Evapotranspiration from Diel Groundwater Fluctuations in the Middle Rio Grande Bosque*. December 2009. (B. Thomson)

Marsee, Megan. *Integrating External Costs into Water Utility Asset Management: An Application of the Threshold Break Rate Method*. August 2010. (J. Thacher)

Tulley-Cordova, Crystal. *Using Polymer Ligand Films for Rapid Radiochemical Analysis.* May 2011. (B. Thomson)

Tsinnajinnie, Lani. *An Analysis of Navajo Nation Snow Courses and Snowpack Data in the Chuska Mountains.* May 2011. (D. Gutzler)

Khan, Yasmin. August 2011.

Scherff, Eric. *Channel Rehabilitation to Increase Aquatic Habitat and Reestablish Floodplain Connectivity on the Upper Gila River.* December 2011. (C. Dahm)

Shendo, Marwin. *Polychlorinated Biphenyls (PCBs) in Stormwater From the Pajarito Plateau, Northern New Mexico.* December 2011. (B. Thomson)

Zemlick, Catherine. *Suitability Assessment of Non-Potable Water Resources in the Western United States for Future Thermoelectric Cooling Needs.* December 2011. (B. Thomson)

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Johnston, Jessica. *Wetland and Riperian Management Plan Alcalde/Velarde Valley, Upper Rio Grande, New Mexico.* December 2011. (W. Fleming)

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Monfort, Ralph. *Adaptive Management for the Middle Rio Grande Endangered Species Collaborative Program: Analysis and Issues*. May 2012. (M. Harm Benson)

Reese, David. *Groundwater, Economic, and Legal Analysis of a Proposed Diversion from the San Agustin Basin of New Mexico*. December 2012. (B. Thomson)

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Rehder, Belle T. *Salinity of the Lower Middle Rio Grande, Socorro County, New Mexico*. May 2013. (B. Thomson)

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Miller, Amy R. *Assessing Change and Resilience in a Northern New Mexico Acequia Irrigation Community*. May 2013. (W. Fleming)

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Wolff, Christopher N. *Interpolation of Rainfall for the Albuquerque Area: A Comparison of the Primary Local Climatological*. December 2013. (D. Gutzler)

Piccarello, Matthew J. *The Pueblo of Santa Clara (Kha P'o Owinge) Resilience Project: Maintaining Identity While Preparing for an Uncertain Future*. December 2013. (W. Fleming) Embargo lift date: 11/06/2015.

Paul, Maxine. The domestic Well Exemption in the West: A Case Study of Santa Fe's Municipal Ordinance. August 2014. (R. Berrens)

Weinstock, Barry. Comparison of Electrofishing Fish Surveys and Angler Observation on Three Reaches of the Upper Rio Grande. August 2014. (B. Thomson)

Hooper, Ashley. Use of Incentive-Based Pricing: Cataloguing Current Water Rate Structures and Analyzing Community Adopter Characteristics for Select Municipalities in New Mexico. August 2014. (R. Berrens)

Brown, Jeb. Estimation of Suspended-sediment Concentration Using In-stream Turbidity as a Surrogate in the Middle Rio Grande, New Mexico. August 2014. (C. Dahm)

Isaacson, Zoe. *Past, Present, Future: The Evolution of a Wetland Treatment System in Dutchman Canyon on Vermejo Park Ranch*. December 2014. (B. Thomson)

Fontenelle, Bernadette Benally. *Examining the Rights-of-Way Process for Indian Allotment Lands Navajo-Gallup Water Supply Project*. December 2014. (R. Berrens)

Hall, Martha A. *Presence of Total and Hexavalent Chromium in Albuquerque Bernalillo County Water Utility Authority Water Supply and Correlation with Other Constituents*. December 2014. (B. Thomson)

Stauffer, Sophie J. *Inundation Patterns and Their Effect on the Physical and Hydraulic Properties of Floodplain Soils in the Middle Rio Grande Floodplain*. December 2014. (M. Stone)

Porter, Meredith. *Assessing Nitrate Levels in the Private Well Water of the Albuquerque and Espanola Basins*. May 2015. (F. Frost)

Affinati, Joseph A. *Route 66 Open Space: Environmental Inventory and Restoration Plan.* May 2015. (W. Fleming)

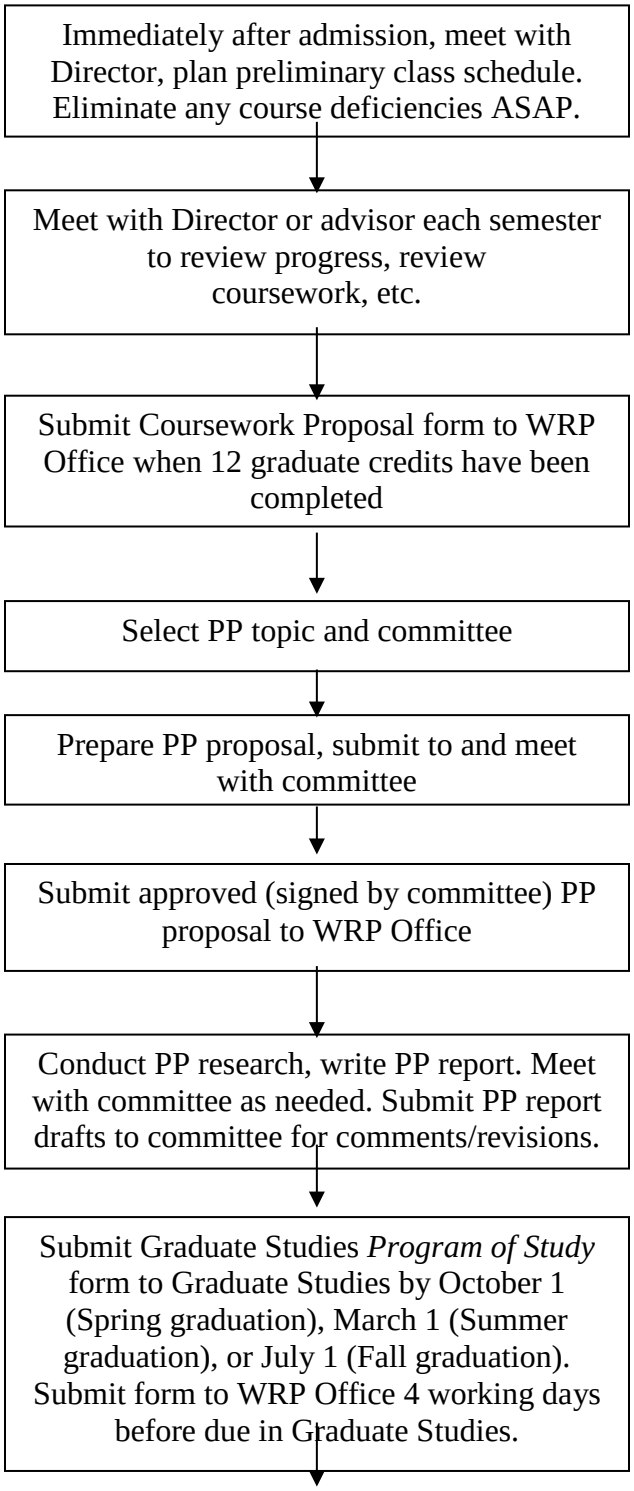
Schulte, Kathryn Cydne. *Connecting Stakeholders to Water Information: An Assessment of New Mexico's Leading Water Resources Websites*. May 2015. (J. Rivera)

Sanderson, Christopher. *Ecotone Conditions Along Pinon-Juniper and Ponderosa Pine Elevational Ranges, Jemez Mountains, NM*. August 2015. (W. Fleming)

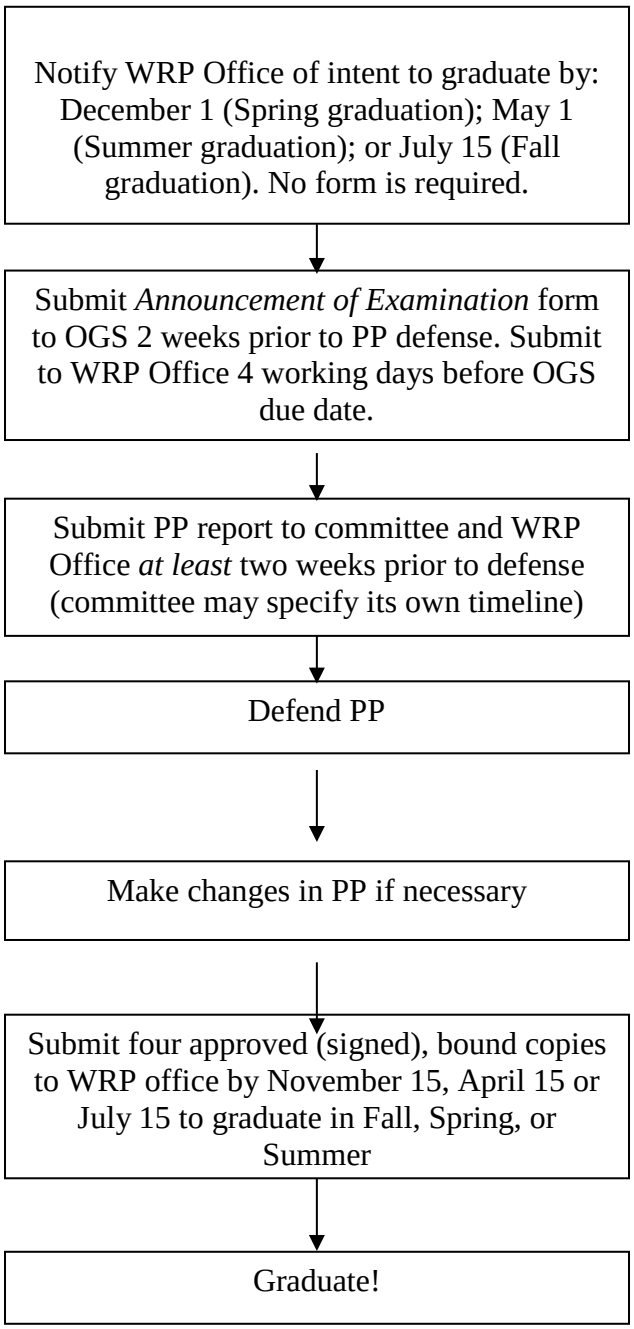
Iacona, Brian. *Evaluation of the Geochemical Stability of the Sandia Canyon Wetland*. August 2015. (B. Thomson)

Smith, Schuyler. *Understanding Trends in the New Mexico Dairy Industry, and Accounting for Direct and Indirect Water Use in Dairy Production*. August 2015. (R. Berrens)

APPENDIX IV - MWR Degree Flow Chart



MWR Degree Flow Chart
(Continued)



APPENDIX V – Coursework Proposal Form

Water Resources Program

Master of Water Resources Degree

Coursework Proposal Form

Name_____**Date**_____**Concentration** (HS or PM)_____
Semester & Year Entered_____**Expected Graduation** (Semester & Year)_____
Prerequisites (for each one: circle course (or equivalent) taken, must list semester/year taken)
All Students: 1) Microecon (Econ106 or 300)_____2) Statistics (Stat 145)_____
3) Calc I (Math 180 or 162)_____, 4) 2 semesters of Science _____
PM Students: 1 semester Social Science_____
HS Students: Calc II (Math 181 or 163)_____ 3rd semester of Science_____

Courses in Concentration (HS or PM) (15 credits minimum; list school if not UNM); For HS, must have at least 1 in each of 3 categories (H&H; EEHWQ; CLIM); For PM, must have at least 1 in any 3 of 4 categories (LAW; EC; PA&M; SC&C).
Course (Dept., No. & title) **WRP Category** **Semester & Year** **School** ***note if proposed substitution**

Other HS or PM Water Courses (6 cr. minimum; list school if not UNM). If your concentration is HS, these need to be PM courses and vice-versa. Must come from 2 different categories.
Course (Dept., No. & title) **WRP Category** **Semester & Year** **School** ***note if proposed substitution**

Utilities Course (3 cr.; list school if not UNM). Courses in GIS, modeling, or methods categories.
Course (Dept., No. & title) **WRP Category** **Semester & Year** **School** ***note if proposed substitution**

Water Resources Interdisciplinary Courses (12 credits)

Course	**Semester & Year**
WR 571	
WR 572	
WR 573	

Professional Project (3 credits)	**Semester & Year**	**Advisor**
WR 598		

Professional Project Title (tentative)_____
_____
Committee (if you have one; indicate chair*; must meet Graduate Studies guidelines)_____
_____
Student Approval_____**Date**_____

Advisor/Chair Approval_____**Date**_____

Director Approval_____**Date**_____

APPENDIX VI – Professional Project Cover Page Format

Title Goes Here (18 pt. Bold Font)

by

Name Goes Here (16 pt. Bold Font)

Committee
Dr. Bruce M. Thomson, Chair
Dr. William M. Fleming
Dr. Timothy J. Ward

A Professional Project Proposal Submitted in Partial Fulfillment of the Requirements
for the Degree of
Master of Water Resources
Water Resources Program
The University of New Mexico
Albuquerque, New Mexico
September 2010

Committee Approval

The Master of Water Resources Professional Project Proposal of **Your Name** is approved by the committee:

Chair	Date