

**External Review of the  
University of New Mexico  
Water Resources Program – Fall 2019**

An Academic Program Review (APR) of the University of New Mexico's Water Resources Program (WRP) was conducted on November 4-5, 2019, by the following team of invited external and internal reviewers:

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The WRP completed a self-assessment in 2019 according to the University of New Mexico (UNM) guidelines. This report was used as the starting point for the external review.

Information for the external review was gathered by 1) critical reading of the self-assessment report and 2) interviewing faculty, students, staff, alumni and interested water agency stakeholders over the two on-campus days. A total of 10 meetings, lasting between 45 and 90 minutes each, were conducted over the two days.

Faculty, staff, students, and administrators were open, active, and direct in sharing information, thoughts, and ideas related to the WRP. The self-assessment report was thoughtful and revealing – a useful and productive basis for the review. Information provided by the WRP and UNM was thorough and appropriate to what was needed to conduct the review.

**Overview of Program**

The WRP at UNM is fast approaching the milestone of three decades in existence. Filling the need for well-educated, interdisciplinary water resource professionals able to understand and balance competing ecological, economic, social, technological, and cultural requirements has remained a central goal for the program throughout its existence. The vision of F. Lee Brown in the late 1980s was to establish this interdisciplinary program. Since the WRP's inception in 1991, leadership has included six program directors (Lee Brown, Denise Fort, Mike Campana, Bruce Thomson, Bob Berrens, and John Fleck), and the program has graduated over 200 students.

The principal orientation of the WRP and the Master of Water Resources (MWR) degree is practice rather than research. The program seeks to train graduate students with an integrated perspective on water resources and to develop technical and communication skills. The Mission Statement for the WRP is “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.” The importance of the MWR degree is even more relevant today than at initiation of the program, as a warming planet, changing precipitation patterns, growing populations, and increasing demands put greater pressure on water resources.

The contributions of the WRP at UNM have been substantial, and these contributions deserve recognition by UNM. Graduates of the WRP use their interdisciplinary training to tackle complex socio-environmental water resource issues in Albuquerque, Santa Fe, rural New Mexico, on tribal lands and in federal, state, county, and municipal agencies. An extensive network of well-placed professionals is a resource UNM and the WRP should draw upon more effectively in future years. The WRP provides a professional network of research collaborators and interdisciplinary teams that compete locally and nationally for extramural resources for water research and professional education. The program and the graduates link UNM to public and private sector entities across New Mexico, and the professional projects and interdisciplinary courses produce useful, usable, and used knowledge critical to water resource management and guiding environmental and public policy.

A number of overall program strengths of the WRP should be noted up front. Currently, WRP is administered by Director and Professor of Practice John Fleck, Associate Director and Research Assistant Professor Rebecca Bixby, and Program Administrator Annamarie Cordova. The Director, Associate Director, program administrator and affiliated faculty are extremely dedicated to the program. The program is also located within the supportive and functioning home of the Office of Graduate Studies (OGS). Faculty from across UNM’s multiple schools and colleges are engaged and ensure the classes are current and germane. Additionally, the program has sufficient programmatic flexibility in the elective classes available for selection by the graduate students, enabling it to train and meet the diverse needs of its students. The majority of the students are independent, seeking interdisciplinary education, and staying on track for timely graduation, and the program administration and faculty offer students access to a strong professional network that includes many alumni connections. As a result, WRP has a notable record of carrying out well-regarded interdisciplinary training and of placing MWR graduates in good jobs.

Nonetheless, there are some clear overall program needs. The fact that the program has remained relatively stable over the long-term is a testament to the strength of the program, to the goodwill generated among students, faculty, and key employers that the program aims to serve, and to the hard work and dedication of the director, associate director, and program administrator. Although the WRP could continue along current lines, a real risk is that change or loss of staff at any moment could undermine program.

Furthermore, the program has consistently faced strong resource constraints, and the program has a substantial unfilled potential. Three staff, two part-time, is a delicate balancing act, and the budget has not increased in a decade. Finally, there is a distinct space problem with better places needed for students in the program to gather and for faculty, alums, and water professionals to meet. More details on the student experience, linkages across the university, the water resources community, strategic planning, and a summary of recommendations by the review team are presented in the rest of the report.

### **The Student Experience**

The WRP's primary aim is the training of students to become water resources professionals. Central to this is the need for students to develop knowledge of the many aspects of water resources, including the physical, environmental, legal, and social, as well as the skills necessary to function as a water resources professional. In this regard, the program provides interdisciplinary training. The core curricula include three courses (Contemporary Issues in Water Management, Models, and Field Problems) each of which aims to ensure literacy about the key topics water resources professionals will encounter in their work. The remainder of the coursework consists of elective courses selected from offerings in other departments and programs. All students are required to undertake courses from each of three categories: hydrologic science, policy and management, and utilities; however, the portion of classes in each category varies with whether a student focuses on the hydroscience or the policy and management concentration. Irrespective of the selected concentration, all students must complete a professional project that demonstrates an ability to independently perform professional quality work on a topic related to water resources management.

Overall, these curricula and set of requirements for the program appears to be quite effective. Students entering the program have varied backgrounds and professional goals. The flexibility of the curricula enables students to tailor the program based on their professional goals and to complement their knowledge base prior to entering the program. Yet the core curricula ensure all students gain understandings of the principal knowledge needed for water resources management. A number of students interviewed by the APR Committee cited the flexibility of the curricula and the interdisciplinary focus of the program as the primary reasons they applied to the program. Further, as a majority of students are finding employment prior to or soon after graduating, the skillsets these students are developing appear to match those sought by prospective employers.

Although the WRP is meeting student needs and expectations, some improvements could be made. Some students sail through the program, while others lag, often due to challenges in identifying mentors, developing and implementing their professional projects, or fitting the coursework into their schedules. Additionally, among the student population, there is a desire for increased interaction and community building particularly after completion of the core required courses. Small changes within the program have the potential to substantially address these challenges.

Professional Projects. In the Self-Study, the WRP specifically asked the APR Committee to address the question as to whether the professional project is appropriate. The APR Committee raised this issue during discussions with students, water professionals in the field, and alumni and reviewed the requirements of other MS Professional interdisciplinary degree programs in water and environmental fields. The APR Committee's view is that the professional project is appropriate and serves an important role in student education. Furthermore, completion of the project demonstrates to future employers the student's capacity to successfully complete self-directed work.

Although the APR Committee suggests the WRP should continue to require students complete a professional project, the APR Committee also recognizes that a small percentage of the students struggles with identifying a topic, finding an academic advisor, and implementing a project. This challenge both extends the time it takes for the student to graduate and consumes substantial time and effort on behalf of the WRP Director and Associate Director. The APR Committee has several ideas that may aid in this situation:

- The WRP could solicit professional project ideas from water resources professionals and alumni in the region. Many water resources agencies have long lists of projects they would like to have undertaken and would be keen to have a graduate student undertake the work. Some of those agencies would even be willing to fund the research, including the graduate student, in undertaking the work. Reaching out to these agencies and developing a process for matchmaking will initially require some effort yet, if done well, would become a regularized and sustaining process. Furthermore, it would serve to strengthen ties between the WRP, UNM, program alumni, and water agencies in the region. (See timelines below for more on this topic)
- The WRP could consider allowing students to work in teams on professional projects of greater complexity and breadth with the expectation that team projects would have greater depth to them than individual projects.

Peer-Mentoring Professional Project Course. Having completed the three core classes, students in the program primarily follow their own paths, crafted individually to provide each student with the skillsets and expertise that match their interests. As mentioned above, this flexibility is a strength of the program, yet can have two negative side-effects. The first is that students interact less frequently with one another, weakening the social capital built during the first year when taking the core curricula together. The second is that students lack a clear accountability mechanism to help keep them on track while completing their professional projects. Social capital among students is important – it provides a support network for students during their tenure in the program and, after they have graduated, it leads them to want to be active and contributing alumni. Furthermore, interaction with other students serves to create norms that can motivate students to take initiative and complete projects on time.

The APR Committee recommends the WRP consider changing the timing and the requirements for earning thesis credits such that students during their second year are

required to participate in a professional project development course. This course could take any variety of forms. One possibility is a 1-credit course that occurs across both semesters. The course could be coordinated by a faculty member but primarily conducted by the students themselves. During this class, students will read and comment upon each other's project proposals, provide feedback on methods and project content, and practice communicating their project results to one another.

Timelines. Although most of the students entering the program are self-starters, a few students struggle with putting together professional projects and finding the advising resources they need. These students consume a disproportionate share of the time of the Program Director and Associate Director. This phenomenon is not unique to the WRP, and in fact occurs across all departments. Yet given the scarce resources of the program, it is important that structural changes be put in place to address this issue. The APR Committee recommends the program develop a normative timeline for the program – recognizing such timelines will need to have variations for part-time students who are working while completing their studies. This timeline should set deadlines for submission and approval of professional project proposals.

### **Linkages Across the University**

The WRP serves as a unique linkage between faculty, students, departments, colleges, and schools across the university. Currently, this engagement occurs primarily in the auspices of student training, though it also occurs through intermittent formal and informal meetings of faculty associated with the program. Outside of the core courses, students in the WRP take classes from across colleges and schools within the university. Students also engage with research mentors for the Professional Project from across colleges and schools within the university. Notably, the majority of engagement is voluntary; faculty engage with students and the WRP because they enjoy the relationships built and find those relationships beneficial to their research, teaching, and service activities. These professional linkages are an important strength of the program. Through these interactions, both faculty and students are able to more easily engage in interdisciplinary work and to broaden the scope of water knowledge and research across the university.

Although there is currently strong dedication on the part of faculty involved in the WRP, faculty participation is based on individual commitment. A group of approximately 10-15 faculty members make up the core participants in the program (out of a total of ~60 affiliated faculty), and these faculty have been very willing to invest time, effort, and even financial resources in the WRP. Yet participation is constrained, as faculty must balance their involvement with the WRP with the demands and expectations placed upon them in their own departments, colleges, and schools. Although some faculty commented that their department recognized and attributed some form of credit to their activities in relation to the WRP (particularly Community and Regional Planning), other faculty mentioned tensions in balancing competing demands. One consequence of this is that participation, particularly among junior faculty, does not achieve its full potential.

Water Resources Program Committee (WRPC). The WRPC is comprised of 10 members. Membership includes the Director (who serves as chair), a student member, an alum, and seven faculty members from seven different departments. The WRPC currently meets about once each year to discuss needs of the WRP. This WRPC provides an invaluable opportunity to concurrently increase the capacity of the WRP while expanding and strengthening its linkages across the university. The APR Committee recommends the WRP consider having the WRPC meet more formally and more frequently, have clear roles for individual members, and serve as a way to engage faculty as well as enable placement of students with mentors. Formalizing the roles and responsibilities of the WRPC would increase the capacity of the WRP in meeting its goals as well as grow support for the WRP across the university. For example, subcommittees could be developed that focus on: (i) course curricula and offerings, (ii) Professional Project development, writing, and review, (iii) university support, linkages with other programs, and faculty engagement, (iv) WRP guidance and strategic planning.

University Administration. Given the reliance of the WRP on faculty members from throughout the university, as well as the benefits the WRP provides to those faculty members and the university as a whole, efforts could be made to review current evaluation procedures and incentivize systems within schools, colleges, and departments and to develop more formalized processes for recognizing and rewarding faculty for engagement within the WRP. This may be as simple as designating the WRPC on par with other college or university-wide committees, such that service is equally recognized. A more complicated approach might entail developing mechanisms for tracking student advising efforts across departments.

The Grand Challenge in Sustainable Water Resources at UNM. Sustainable water resources was recently identified as one of the three Grand Challenges that UNM will seek to address in the coming years. Research with student and community engagement are key elements for this Grand Challenge. The APR Committee recommends the WRP consider involving the program in some aspects of the planning associated with the UNM Grand Challenge in Sustainable Water Resources. As an entity that already facilitates linkages across faculty and students, as well as the greater Water Resources Community (see below), the Grand Challenge initiative is a potential opportunity for the WRP to further its role on campus, particularly in helping to connect students with faculty, students with other students (graduate students and undergraduates) and both students and faculty with water resources practitioners (potentially also helping faculty better develop the “broader impacts” aspects of their research).

### **Water Resources Community**

The WRP has developed a strong network with the local and regional Water Resources Community particularly within, but also beyond, Albuquerque and Santa Fe. The WRP Director, John Fleck, is very well-recognized throughout the Southwest as an interdisciplinary leader and thinker concerning water resources and water resources management. His award-winning books dig deeply into water resource challenges

facing the region. Many students in the WRP also work with the Water Resources Community as part of their professional projects. Many alumni from the program work for agencies and companies involved in managing scarce water resources throughout the region. The practitioner community is enthusiastic for continued and strengthened interactions with the WRP and its best-trained students. This connection is an important element on which the WRP can derive support and continue to thrive. Connections with the Water Resources Community benefit WRP students - offering opportunities for students to receive mentoring, internships, and post-program job placement in the Southwest. Some agencies have financial resources and needs for supporting students, which offer an outlet for those WRP students seeking a more applied than theoretical or research-focused Professional Project. Furthermore, connections, through guest lectures, advisory board membership and ad hoc interactions help ensure the WRP is providing the agile training students need to be effective water practitioners in a changing world. Lastly, relationships with the Water Resources Community benefit UNM as a whole by building recognition and support across the State of New Mexico and the west for the value of applied training and usable contributions to society.

The full value of the WRP's alumni network has not been developed and utilized. In part, this is due to the very limited capacity of the current WRP staff to take on additional assignments. As a result, there are missed opportunities for communication and connections between students and alums. Greater formalization of an alumni network and the creation of more formal events to foster interactions could lead to opportunities for mentorship, building program recognition, and additional placement of students in water resource jobs. Further, a more quantitative assessment of where the over 200 graduates of the WRP are employed and what their career pathways have been will provide the program with greater insights as to the job market and the needs of the Water Resources Community. It will also provide the WRP with necessary evidence for better strategic planning. The UNM Alumni Association in Hodgin Hall and former directors of the WRP at UNM may be able to help in tracking program alumni.

Suggestions. The APR Committee recommends the WRP consider: (i) formalizing student and practitioner mentor communication by the use of speed networking events, (ii) increasing current student and alumni networking through enhanced use of social media and regular, informal social events, (iii) tracking student outcomes and job placement assessment, and (iv) increasing community outreach and engagement through an annual water resources symposium (see example below).

Annual Water Resources Symposium. Another addition to the program that would serve to bolster networks between the WRP and the water resource community is an annual water resource symposium. This would further relationships across the university with program alumni and with the water sector. Students would present posters or give oral presentations on their Professional Projects. This annual symposium could start small and build over the years, inviting other students on campus to participate and alumni and water sector professionals and agencies to attend. The symposium could be self-organized by students, so as to reduce the staff time needed. An example (for the future, as this example took years to build) that the WRP may want to consider is the

Northeast Graduate Student Water Symposium (<https://www.negsws.com/>), which draws graduate students from across multiple states. The symposium could be offered at the end of the spring semester each year and could serve multiple needs: (i) feedback to students on Professional Project development and findings, (ii) strategic benchmarks for student progress and assessment, (iii) water faculty interactions across the university and engagement of the university and the WRP with the water resources community, and (iv) job placement and career networking for WRP students.

### **Strategic Planning**

Since its founding in 1991, the WRP has been centrally focused on the goal of professional training of master's students. Since inception and in the context of quite limited resources, it has successfully operationalized this mission, graduating students who have gone on to have careers in the field of water resources. Almost 30 years later, this mission is still important, and the WRP has adapted as shifts in the university and the professional world have occurred over time. Yet, other than maintaining the status quo, the WRP does not appear to have a long-term strategic plan for its future. The limited resources and staffing of the program, which require the full attention of the director and co-director, combined with some abrupt changes in directorship over the past few years have, understandably, led to a focus on the immediate rather than the long-term vision. None-the-less, and especially given nation-wide changes in higher-level education, the WRP would benefit from strategic planning. The self-study report provides a valuable reflection on the current state of the program, yet it does not extend into an assessment of where the program is headed and what the future may hold.

Specifically, the APR Committee recommends the WRP develop near and long-term goals for the program. Some questions to ponder include:

- In what ways (if any) does the WRP want to strengthen, grow and expand?
- Are there ways to better target or expand recruitment of students, faculty, and practitioners from underrepresented groups?
- What role does the WRP want to play and what relationships do they want to further with faculty, the university, alumni and the water resources enterprise? (Embedded within this can be questions about how the WRP can contribute to the University's Grand Challenge in Sustainable Water Resources)
- What pressures or stressors may affect the current functioning of the program?
- What changes are occurring in the water sector that may need to be addressed or reflected in the curricula?
- Are there ways to increase the visibility and recognition of the program?
- What steps can be taken to increase the program's access to resources?

By answering these questions, the WRP can then begin strategic planning to identify what steps need to be taken to help achieve desired goals.

Within this strategic planning, there is likely a need for the WRP to identify a long-term home within the university. The program is currently administratively located within the Office of Graduate Studies, and the support for the program in terms of space comes from Economics. These arrangements are currently working well, but changes in university personnel or other aspects of the university administration may occur in the

future. Thus, the WRP should consider where and how the program best fits within the university in relation to its long-term sustainability. In considering an appropriate home, the WRP will also want to look to where it can gain additional administrative and other support, so that the director and co-director can turn more of their attention to other aspects of the program.

The APR Committee also recommends the WRP, jointly with the Office of Graduate Studies, consider how the program can serve as a model for interdisciplinary graduate programs within the university and how the WRP can help the university adapt to the changing nature of higher education. New strategic planning for UNM is about to begin, and the prospect of state-wide free tuition for undergraduate education will mean that the university will increasingly rely on graduate tuition from programs like the WRP for maintaining, building, and growing interdisciplinary programs. Furthermore, Master's Degrees are increasingly becoming a necessary credential for employment in many employment sectors. With further planning, the WRP could be positioned to address both these changes, increasing its already useful value as an asset to UNM.

### **Summary of Recommendations by the Review Team**

In summary, the Water Resources Program (WRP) at UNM is an interdisciplinary program that facilitates the networking and placement of students into water resource professional jobs in NM and the Southwest. The program has been in existence for almost 30 years, and the program has been stable and functional for the past 10 years even though the budget hasn't increased during that time. Overall, the program is successful, despite significant challenges. Many of those challenges are related to the programs limited resources, which in turn affect the capacity of the director and associate director to engage in long-term planning and improvements to the program. Above, the APR Committee described a number of relatively short-term actions that could serve to strengthen the program. Yet it is important to recognize that not all of those actions can be taken at once. Below is a summary of those actions, with an emphasis on incremental steps that may have large benefits. These actions will likely help to bolster the experience of students, improve the effectiveness of the program for training and placement of students in professional jobs in water resources, and concurrently help increase WRP recognition at UNM and beyond.

1. Establish clearer curricular benchmarks/timelines for student progress at the beginning of the program and again after completion of the core courses. Require that students identify a professional project by the summer of the first year, offering the option of a student selecting from a list of faculty and water resource professional identified projects if they do not come up with a project on their own.
2. Add an additional practicum course for year two during which students meet regularly (does not have to be weekly) to provide peer-mentoring and accountability regarding their professional projects. This course can also include aspects of professional development.

3. Increase the role and the regularity of meetings of the WRPC, specifically helping to engage faculty, program alumni and water resource practitioners in program guidance along with helping to network and mentor graduate students.
4. Increase engagement with program alumni and, through them, the Water Resources Community. Specifically, developing an annual graduate student research symposium that would help to further integrate the WRP with UNM faculty and administration, WRP alumni, and the greater Water Resources Community.
5. Utilize the UNM Grand Challenge for Sustainable Water Resources as an opportunity to engage with additional faculty and students across the campus as well as with the university administration promoting this effort. In addition to direct engagement, ask the WRPC to aid in representing and incorporating the WRP into the strategic planning related to this challenge.
6. Begin a long-term strategic planning process, including consideration of the long-term administrative home for the WRP and succession planning for program leadership.

Irrespective of which actions are taken, the APR Committee sees the program as an important asset to UNM, the State of New Mexico, and the broader Water Resources Community. The APR Committee strongly recommends continued support and heightened administrative interest in the program. The WRP does great things with a limited budget, and judicious future investment in program enhancements are worth serious consideration.