Master of Science in Water Resources

Graduate Program Guide

About the Program

The M.S. in Water Resources (CIP Code 40.0605) provides graduate students with an integrated perspective across environmental and social dimensions to address the complex challenges of sustainable water management. The program prepares graduates to meet the growing demand for interdisciplinary leaders in water research, decision-making, policy, and management, grounded in applied water resources science and watershed management practice.

The Water Resources graduate program is unique at Virginia Tech in that it is administered by the Graduate School rather than housed within a single academic department or college. The program is facilitated by the Virginia Water Resources Research Center in partnership with faculty from across the university. Students may select an advisor from any academic program at Virginia Tech. As a result, students in the program span multiple departments and colleges while maintaining an academic home in the department of their primary advisor. Throughout this document, references to the "department" should be understood as referring to the department of the primary advisor.

Both a thesis option and a non-thesis option are available, allowing students to tailor their training to diverse academic interests and career goals. The program is offered on the Blacksburg campus with admission in both fall and spring terms.

This guide is intended to orient students to program-specific expectations. Students should consult the Graduate School Policies and Procedures (GSPP), found in the Graduate Catalog, for the full set of university-wide requirements that apply to all Virginia Tech graduate students. Successful completion of degree requirements is ultimately the responsibility of the student.

Program Administration

Graduate Program Director (GPD): Dr. Kevin McGuire (kevin.mcguire@vt.edu)

The program is governed by a Program Committee composed of faculty from across the University who have an interest in water resources education and research. The Program Committee, chaired by the GPD, is responsible for setting and overseeing academic policies, reviewing curriculum, and supporting the overall direction of the program. Students with questions about academic requirements or policies should contact the GPD.

The Graduate Program Coordinator (GPC) is a staff position that handles the day-to-day logistics and paperwork of the program, including Plan of Study submission, form processing, and general administrative support. Students should direct logistical and administrative questions to the GPC.

Admissions

The following minimum requirements apply for admission to the program:

- Undergraduate GPA of 3.0 or higher
- Letters of recommendation: 2 required, at least one of which must be from a faculty member familiar with their academic performance and/or undergraduate research.CV
- Academic statement
- Names of potential advisors
- GRE: optional

International applicants must meet the following minimum test scores: TOEFL iBT total of 90, with sub-scores of at least 20 in reading, listening, and speaking; or IELTS of 6.5.

Application deadlines follow the Graduate School defaults: August 1 for fall admission and January 5 for spring admission.

Students are strongly encouraged to contact potential advisors prior to submitting an application, as securing an advisor is an important part of the admissions process.

Advising and the Advisory Committee

Each student must form an Advisory Committee before submitting a Plan of Study. The committee chair serves as the student's primary research or project advisor and major professor. Students may also designate a co-chair if appropriate. The full committee must include at least three members (four if there is a co-chair) and should reflect the interdisciplinary nature of water resources or the nature of student’s project; members

may come from any relevant department across the university and from faculty approved by the Graduate School.

The Advisory Committee serves three purposes: it provides quality control over the student's academic program and offers expertise and guidance in support of the student's research or project. Students are encouraged to treat the committee as a resource throughout their program, not only at formal review points.

Committee composition may be changed at any time with the approval of all relevant members and the GPD.

Plan of Study

The Plan of Study must be submitted by the end of the student's first semester, unless an extension is negotiated with the advisor and GPD due to extenuating circumstances. The signed, completed form is submitted to the GPC, who will officially submit it to the Graduate School for approval.

The Plan of Study must include all required core courses, elective courses, and research or project credits, and must be signed by all Advisory Committee members and the GPD. It should only contain the minimum requirements. Students can take additional courses without a change of POS form; however, if POS courses change, a plan of study change request form must be completed with the Graduate School.

Core Courses (15 credit hours required)

All students complete the following core curriculum regardless of option:

- CSES 5314: Water Quality for Professionals (3 credits)
- GEOG 5134/GEOS 5844: Advanced Interdisciplinary Issues and Ethics in Water Resources (3 credits)
- FREC/CSES 5144: Watershed Hydrology (3 credits)
- FREC/WATR 5244G: Advanced Hydroinformatics (3 credits)
- WATR 5004: Seminar in Water Science and Society (1 credit; P/F)
- WATR 5614G: Advanced Watershed Assessment, Management, and Policy (2 credits)

Substitutions for core courses are allowed with committee approval and approval by the GPD. A Substitution Form and supporting justification, including syllabi of the proposed replacement courses, must be submitted.

Elective Courses
Students select elective courses in consultation with their advisor. For the thesis option, students must select a minimum of 6 elective credit hours so that total graded credits (core plus electives) reach at least 20 hours. For the non-thesis option, students must select a minimum of 10 elective credit hours so that total graded credits reach at least 24 hours.

Up to 6 credit hours on the Plan of Study may be 4000-level courses, with committee approval. Up to 6 total credits may come from independent study (5974), special study (5984), or special study (6984).

Research and Thesis or Project and Report Credits
Thesis option students register for Research and Thesis (5994) course credit, with a minimum of 6 credit hours required. Non-thesis option students register for Project and Report (5904), with a maximum of 6 credit hours allowed. The course designator for research or project & report credits reflects the department of the student's advisor (e.g., GEOS, FREC, CEE) and the Course Request Number (CRN) selected is based on the student's advisor.

Total Credit Hours
The total program must include a minimum of 30 credit hours.

Ethics Requirement

The Graduate School requires documentation of ethics and integrity training on every student's Plan of Study. For the M.S. in Water Resources, this requirement is fulfilled by completing GEOG 5134G/GEOS 5844G, which is already required as a core course. Students who receive an approved substitution for this course may instead complete CITI training; a copy of the CITI certificate of completion must be submitted to the GPC by the end of the first semester.

Annual Progress Reports

The Graduate School requires all graduate students to submit an annual progress report and evaluation. Students in the M.S. in Water Resources program should submit their annual report to the GPC in April. The report documents research progress, coursework, presentations, and plans for the coming year. Prior to submission, students should share a draft with their Advisory Committee and hold a committee meeting to discuss progress. The committee chair will provide a written evaluation following the meeting.

Students who cannot submit their report on time should communicate with the GPD in advance.

GPA and Academic Standing

Students must maintain a cumulative GPA of 3.0 or higher to remain in good academic standing and to be eligible for assistantship support. A student whose GPA falls below 3.0 will be placed on probation by the Graduate School. For further detail on probation and dismissal procedures, students should consult the GSPP.

Enrollment

Students on full-time assistantships must maintain full-time enrollment as defined by the Graduate School and by any applicable assistantship contract. Students who are not enrolled for the required number of course credits must register for research or project credits (5994 or 5904) to meet enrollment minimums.

Students must be enrolled during the semester in which they graduate. Continuous enrollment is required for any student actively working on their degree. Refer to the Graduate School's Continuous Enrollment Policy in the GSPP for complete details.

Assistantships

Graduate Teaching Assistantships (GTAs) and Graduate Research Assistantships (GRAs) may be available through the advisor's home department. Students on assistantships are expected to work an average of 20 hours per week for full-time appointments and must follow any department policies for students on assistantship. The assistantship is provided in exchange for work performed. Students on assistantship should clarify work expectations with their advisor at the start of each semester.

Continuation of an assistantship is contingent on satisfactory academic progress, satisfactory performance of assigned duties, and professional conduct. Students should review their assistantship contract carefully for specific terms.

Thesis Option: Key Steps

Students pursuing the thesis option work with their advisor to develop an original research project. Key milestones include:

- Forming an Advisory Committee and submitting the Plan of Study by the end of the first semester
- Presenting a thesis proposal to the Advisory Committee, typically within the first year
- Conducting research and meeting regularly with the advisor and committee
- Submitting an annual progress report each April
- Completing all required coursework and a minimum of 6 credit hours of thesis research (5994)
- Scheduling and passing a final thesis defense

The thesis defense is open to the public for the presentation portion, followed by a closed session with the Advisory Committee. The written thesis must be submitted to committee members at least two weeks prior to the defense. All Graduate School requirements for thesis formatting and electronic submission (ETD) apply. Students should confirm all graduation deadlines with the Graduate School in the semester they plan to graduate.

Non-Thesis Option: Key Steps

Students pursuing the non-thesis option complete a project and report in lieu of a thesis. Key milestones include:

- Forming an Advisory Committee and submitting the Plan of Study by the end of the first semester
- Completing all required coursework and up to 6 credit hours of project and report (5904)
- Submitting an annual progress report each April
- Presenting a project report at the time of the final examination
- Passing a final examination administered by the Advisory Committee
- A draft of the project report, approved by the major advisor (chair of the graduate committee), must be provided to committee members at least two weeks prior to the examination.

Changing Thesis Options

Students in the MS non-thesis program may transfer into the thesis option and vice versa. The thesis option is formalized when the Plan of Study is approved by the Graduate School. If the plan of study has already been approved with no thesis, the student should submit

the Change of Thesis form to the GPC. Note that the thesis option may only be changed once according to Graduate School Policy.

Application for Graduation

Students must apply for graduation by the deadlines set by the Graduate School:

August (summer): apply by August 1

December (fall): apply by November 1

May (spring): apply by April 1

Students planning to participate in the Graduate School ceremony should review additional ETD and participation deadlines well in advance.

Program Expectations

Graduate students are integral members of our academic community and a vital part of the collaborative network of students, faculty, and staff. Graduate education lies at the very core of our research mission, with training and mentorship of graduate students serving as the foundation of our scholarly approach. Accordingly, we engage M.S. students as professional scientists and conceive of graduate education as a *de facto* apprenticeship in the practice of science. In close collaboration with their advisors, graduate students develop proficiency in all components of the scientific method and assume responsibility for managing their research and overall graduate program.

The Water Resources graduate program is unique at Virginia Tech whereby the program is hosted by the Graduate School rather than a department in a college, and it is facilitated by the Virginia Water Resources Research Center in partnership with faculty from across campus. As such, students in the program cross departments and colleges at Virginia Tech, but they also have an academic home in the department of their primary advisor. When "department" is discussed in this document, it refers to the department of the primary advisor.

Execution of Science and Deliverables

Graduate students are expected to fully participate in communicating their science. For most, this entails (1) oral or poster presentations at meetings of relevant professional societies and (2) for the thesis option, contributing peer-reviewed articles in high-quality journals appropriate to their research. Presenting at professional meetings, within or

outside the university, is typically expected once the second year of graduate study has commenced. Presentations at external meetings are encouraged, contingent upon funding availability. First-authored, peer-reviewed articles are expected from M.S. thesis option students and many non-thesis option students who develop significant contributions to water resources through their projects. However, publishing norms vary by sub-discipline; therefore, students and advisors should discuss these expectations as they develop their graduate program goals.

Authorship guidelines vary by sub-discipline, but advisors should be assumed to be co-authors for all science communication related to their student's graduate research, including conference participation and journal articles. Consultation with advisors on author order and the potential inclusion of other co-authors is needed for each manuscript or other science communication.

Responsibilities of Students and Advisors

The working relationship between the graduate student and their advisor(s) is the most important element of a successful graduate program. Below are responsibilities to consider for collaborations between students and advisors, and separately for each. Graduate students also have many outlets beyond their advisor to seek assistance if needed; these include resources at the departmental or program level (department head, graduate program director, graduate program coordinator) and at the university level (graduate school, graduate school Ombuds).

<u>Students and advisors collaboratively:</u>

- Maintain a professional relationship
- Have regular communication to discuss programmatic and research progress
- Develop graduate committees with final approval by the advisor Select courses for the plan of study (along with the committee)
- Develop the expectations and agenda for the committee meetings
- Engage in field and lab safety conversations and develop safety plans
- Discuss timing for final exams (within required timelines)
- Discuss expectations for professional presentations and publishing journal articles, including authorship expectations
- Discuss expectations for assistantship duties, including research and/or teaching

<u>Students:</u>

- Demonstrate professionalism in all aspects of academic integrity, ethical research, and interactions with faculty, students, staff, and external stakeholders

- Know and follow departmental and university policies that pertain to travel, vehicle use, and facility use
- Complete and submit forms (plan of study, etc.) within required timelines
- Organize and lead committee meetings (e.g., schedule meetings, reserve rooms, come prepared, take notes)
- Plan and organize regular meetings with your advisor(s) (e.g., weekly/biweekly, take notes, create agendas, demonstrate progress)
- Prepare materials for annual review prior to committee meetings
- Discuss travel plans (for research, presentations, etc.) well in advance with advisor and department administration
- Follow developed plans for field and laboratory safety
- Generate project proposal and thesis/report drafts early enough to receive feedback from the advisor before sending them out to the committee
- Discuss plans to archive data, samples, reports, etc. and open science upon completion of the graduate program
- Communicate with the advisor any plans to pursue outside employment or research activities unrelated to the thesis

<u>Advisors (Graduate Committee Chairs):</u>

- Demonstrate professionalism in the role of educator, advisor, and research collaborator Inform students of timelines (e.g., deadlines for plan of study, working plan, preliminary exams, final exams)
- Be accessible to answer questions, offer suggestions and regular meetings, and provide feedback about degree progress
- Perform annual review (along with the committee)
- Oversee final exam
- Review drafts of research proposal and thesis/project report and provide student comments prior to sending to the committee

Annual Progress Reviews

Graduate students are required to complete an annual progress review with their committee each year, by the end of the spring semester. Students are expected to fill out Section 2 of the form prior to the scheduled committee meeting; this section provides details regarding progress toward degree requirements and research and teaching accomplishments. It is strongly encouraged that students schedule enough time in a committee meeting to discuss their annual progress and for the committee to provide a collective review.

Proposal Guidance

The proposal is a document proposing the graduate research project for approval by the student's committee. The document should be provided and presented to the committee, with approval and submission to the Graduate Program Coordinator by the end of the student's first year in residence. There is a template that should be followed for the title page; however, there is not a template for the remainder of the document. Major sections to consider include: i) background (e.g., literature review and knowledge gaps); ii) objectives and/or hypotheses; iii) methods (e.g., site details, experimental design, lab/field and analytical methods); iv) timeline, and v) expected results (e.g., conceptual figures, expected graphs). The length and scope of each section should be discussed with the student's advisor(s) and committee. Students are strongly encouraged to use this document after committee approval as a working document building toward their thesis or project report.

Teaching Assistantships

Students may be expected to contribute to their department's teaching mission depending on funding source. Details of teaching assistantships and expectations should be discussed with the student's advisor, course instructor, and department.

Field and Laboratory Safety

Field and laboratory work are important components of many graduate research programs. Regarding laboratory safety, graduate students should complete all required training prior to any lab work. Further, many projects and courses require travel to remote locations for field work, which often have limited cellular service and few local services. Even in readily accessible locations, safety should always be a primary consideration. Prior to starting fieldwork or a teaching assistantship in a field course, every graduate student must work with their advisor/instructor to develop a safety plan. Due to the varied nature of student backgrounds and field work requirements, the document will vary in detail. At a minimum, every plan should include: i) preparation (e.g., checklists for materials and safety supplies, check-in and check-out contacts and plans, location details, training of field assistants); ii) responsibilities in the field (e.g., communication, tasks, goals, limitations); and iii) post-trip follow-up (e.g., check-out procedures, assessment to improve future trips).

Additional Resources

Graduate School Policies and Procedures (GSPP)

Graduate School Deadlines for Academic Progress

Virginia Water Resources Research Center

The Graduate School Office of the Ombuds, for confidential assistance with concerns or conflicts