

WATR 5350-001

Spring 2026

Groundwater management and field investigations

Lecture: (ONLINE/Hybrid)

Dr. Pride Abongwa

Changes will be announced in class and as a news item on Blackboard.

Instructor: Dr. Pride Abongwa

Class Meeting: Tuesdays & Thursdays 7– 8:15 PM

Lecture Room:

<https://tamusa.zoom.us/j/84710523348?pwd=WhPBkwakaqjhPNqr7jHISjxRet5AYm.1>

Zoom ID: 847 1052 3348

Password: 337760

Office Hours: Appointment via email/zoom meet

Office: 349C Science and Technology

Office Hours: Use email or make phone calls (for appointments)

Tel. #: 210-784-2819

Cell #: 405-408-8574

Email: pabongwa@tamusa.edu

Course Description:

This course investigates the various approaches to water resources geography within the US and beyond. The course addresses practical applications of sustainability in aquatic environments and cover topics on water and health, water quality and quantity, and governance. Topics covered also include assessing the aquatic environment, water treatment technologies, environmental mitigation, and impacts of climate change. In general, our topics shall fall under engineering, law, economics, risks assessment, conflict resolution, and the fine-arts.

Learning Outcomes: After completing the Water Management and Field Investigations course, you will be able to:

- Understand the interactions between humans and the natural environment.
- Comprehend governance and the scientific methods used to maintain water resources.
- Describe various water quality improvement measures.

- Appreciate the role water plays in all aspects of sustainability and the future challenges posed by climate change.
- Demonstrate management, communication and teamwork skills needed to work constructively and professionally on multi-disciplinary teams.

Recommended Textbooks and Online Class Resource (No required textbook for this course)

- *Chasing Water*, Brian Richter
- *Key Concepts in Water Resources management*, Jonathan Lautze
- *Blue Revolution: Unmaking America's Water Crisis*, Cynthia Barnett
- Readings:
 - AWRA IWRM Case Studies (pdf)
 - AWRA Flood and Drought Management (pdf)
 - IMPACT Issue on IWRM-May 2011 (pdf)

BLACKBOARD: <https://tamusa.blackboard.com>

Blackboard will be used to communicate information pertaining to the course. Course documents, lecture material, videos, and links will be available on blackboard for downloading, viewing, or printing. You will also be able to check the status of your performance in this course. It is your responsibility to check Blackboard for new announcements and course materials, and to report promptly any errors in your grades.

Additional required materials: Please bring the following to class: Writing instrument of your choice (pen, pencil, etc.), calculator, and notebook or scratch paper.

Attendance:

Students are expected to attend all class meetings. Material outside the text will be covered in class and students will be held accountable for that material. The instructor also reserves the right to modify assignments (reading and homework) during the meeting period.

Missed Assignments or Exams:

If a student misses a deadline or an exam for an excused reason (illness, etc.), please notify the instructor in advance if possible or by the following class period in person. Notification techniques include phone, email, letter, fax or one of the many modern or ancient forms of communication. **EXCUSES MUST BE PROVIDED IN WRITING.** Providing excuses after the following class session will result in a grade of zero on the missed assignment or exam.

Make-up Exams:

See the instructor to schedule a time as soon as possible.

Prerequisites:

There are no listed prerequisites for this class. Note that some equations and derivations will be presented in the class and readings. Ask for assistance if needed.

Mode of teaching:

This course consists of two lectures per week; some of these sessions will be problem based.

Course Structure and Policies:

1. Course schedule: The lecture topics, readings, and exam dates are shown on the course calendar. The professor reserves the right to shift lecture topics as required. However, exam dates will not be changed. You are expected to have completed the reading assignments prior to each lecture.

Week	Date	Topic	Readings (do before class)
1		Introduction/Expectations	
		Review of Hydrology/Water of the US/Intro to IWRM	
2		Water Management; Water Scarcity & Water Budgets	
3		Water Governance	
		Sustainability and Water Resources	
		Case Study	
4		IWRM Case Studies	
5		Conflict Management: Case Studies	
6			
		Western Water	
7		Transnational Water Management:	
		Canada-US-Mexico	

	2/24	Paper 1 due	
8		Texas Water Management Districts	
		Water Management in the West (CA/OR/WA)	
9		Spring Break	
10		Florida Water Management	
		Floods and Disaster Mitigation	
11			
		Water Quality and Field Investigation	
		Nature of Groundwater	
12		Groundwater Rights in the US	
	March 31	Paper 2 due	
13		Groundwater Management:	
		Water for Oil Production (Hydraulic Fracking/Fracturing)	
14		Groundwater Law in the US: Law of the biggest pump	
15		The Dam Debate: Elwha River	
		Basin Case Study: Klamath, USA	
16			
		Final Exam Review	
	May	Final Exam (Comprehensive)	

2. Class Meetings: Our class meetings will be interactive. Although traditional lectures will be used to transmit the basic information necessary to understand the topics, there will also be time spent engaging with problems hands on. Your participation is crucial to your success in the course and **attendance is mandatory!** Although all the factual material is in the textbook and

PowerPoint slides, class time allows us the opportunity to highlight the important points, look at the interrelationships among the different parts of the science, discuss current events and discoveries, and clarify questions you may have with the readings. **Classes are 75 minutes** long and we will need all of that time to consider the subject of the day. Please be prompt, but if you are unavoidably delayed or must leave early **please be quiet when entering or leaving the classroom**. Courtesy during class is important. Pay attention to what we are doing. Please come to class prepared to engage in the material.

3. Lectures and Readings - The goal of the readings is to prepare for the subject under discussion. The reading assignments will parallel the lecture material. If you keep current with the readings, then you will get more out of the course and you'll also have an easier time preparing for the exams. In order to do well in this course, you will be expected to attend all lectures, take good notes, actively participate in the in-class exercises and discussion, and *read the assigned material*. It is to your advantage to read the material before class. **The exams will be based on the material presented in class and on the assigned readings.**

4. Weekly assignments and exercises: Throughout the semester, we will be having weekly exercises and assignments. In class exercises will be due by end of class period and assignments (take-home) are due the following Tuesday either in class or on blackboard by midnight CST. The exercises and assignments will account for **40%** of the course grade.

5. Written Papers: 15% each. There will be assigned writings to be submitted after 4 to 5 weeks (see syllabus).

6. Final Exam: The final exam is comprehensive and constitutes **30%** of the course grade. **You must bring #2 pencils, an eraser and a calculator; I will not provide these items. Exam results will be posted on BLACKBOARD.** If you have any questions or concerns about a grade you receive on an exam, you must bring them to my attention within one week of the day that the grades are posted. After this week has passed, the exam grade will stand as recorded and will not be changed. All exams will be held during class-time (See schedule).

7. Excused Absences: If you must miss an exam or a class because of participation in any university sanctioned activity or other legitimate reason, you must notify me **before** the event so that we can make arrangements for missed work (note from faculty, coaches or other officials is required). If you miss an exam or a class because of **illness**, you must contact me as soon as possible by email. If need-be, have a friend or parent contact me; **communication is essential**. If you do miss class, lecture material will be available online at Blackboard. Social events, fundraisers, etc. are not valid reasons for missing exams.

8. Grade computation and grading procedure:

-Weekly Assignments/Exercises:

Short and long answer type questions, articles summary/presentation and scientific problem solving **(40%)**

-2 Papers (15% each): Scientific format

-Final Exam (30%): Comprehensive

Percentage	Letter Grade
90 – 100	A
80 – 89	B
70 – 79	C
60 – 69	D
Below 60	F

Disability Services and The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disability. If you believe you have a disability that may require accommodations, please contact *Disability Support Services (DSS)* for the coordination of services. DSS is located at the Main Campus on the 2nd floor of the Central Academic Building in room 210. The phone number for DSS is (210) 784-1335 and email is dsupport@tamusa.edu.

Academic Dishonesty is any act, or attempt, which gives an unfair advantage to the student. Academic dishonesty includes, but is not limited to –Plagiarism-Cheating-Lying-Bribery

As a member in an academic community, students at Texas A&M University- San Antonio are expected to exhibit a high level of honesty and integrity in their pursuit of higher education, be mature, be self-directed and be able to manage their own affairs. Students who are unwilling to abide by these basic expectations will find themselves facing academic and/or disciplinary sanctions. Students are expected to share in the responsibility and authority with faculty and staff to challenge and make known acts that violate the Texas A&M University- San Antonio Code of Conduct. Texas A&M University- San Antonio faculty has the discretion to impose grade penalties as deemed necessary and are **obliged to and will report** any form of academic dishonesty. For more information on the process of reported academic misconduct, please refer to

<http://www.tamusa.edu/studentengagementsuccess/StudentRightsAndResponsibilities/Academic-Misconduct/index.html>

Academic Dishonesty falls under Acts of Dishonesty in the Student Handbook's Code of Conduct.

Veterans and active duty military personnel are welcomed and encouraged to communicate, in advance if possible, and special circumstances (e.g., upcoming deployment, drill requirements, disability accommodations). You are also encouraged to visit the Patriots' Casa in person room 202, or to contact the *Office of Military Affairs* with any questions at military@tamusa.edu or (210)784-1397

University Email Policy and Course Communications: All correspondence between professors and students must occur via University email accounts. You must have your Jaguar email account ready and working. If it is not working, contact the help desk at sahelp@tamus.edu or at 210-784-HELP (4357). If you don't hear back within 48 hours, contact them again. They have a lot of requests during the first part of the semester, so you may need to follow up with them.

The Six-Drop Rule: Students are subject to the requirements of Senate Bill (SB) 1231 passed by the Texas Legislature in 2007. SB 1231 limits students to a maximum of six (6) non-punitive course drops (i.e., courses a student chooses to drop) during their undergraduate careers. A non-punitive drop does not affect the student's GPA. However, course drops that exceed the maximum allowed by SB 1231 will be treated as "F" grades and will impact the student's GPA.

The Jaguar Writing Center provides writing assistance to graduate and undergraduate students in all three colleges. Writing tutors work with students to develop reading skills, prepare oral presentations, and plan, draft, and revise their written assignments. Students can make individual or group appointments with a writing tutor. The Writing Center has two locations: Central Academic Building, Suite 208. The writing center can be reached by emailing writingcenter@tamusa.edu or calling (210)-784-1222. Appointments can also be made through JagWire using under the student services tab.

The Academic Learning Center offers free, appointment-based tutoring to Texas A&M University-San Antonio students. The Learning Center is made up of subject-area tutoring

for Math and Sciences (including Statistics for most majors). Please call us at **210-784-1332** to see if the ALC offers tutoring for your course. Also, please come visit us in Modular C, Room 140 to learn more about our subject specific hours.

WHAT YOU CAN EXPECT

A. You will get a broad introduction to water management, the scientific principles upon which it is based, and the importance of water in our daily lives.

B. Class meetings will be interactive, with numerous in-class activities and exercises. Grades will be based on both individual and group assignments, and your participation in these exercises.

WHAT WE EXPECT

A. Regular attendance, keeping-up with the readings in the text, active participation during class, completion of the in-class exercises, and attendance and participation in the laboratory.

B. Courtesy during class. This means arriving to class on time, paying attention to what we are doing that day, and participating actively in class discussions and exercises.

How can I earn an "A" in this class? You can earn it if you follow these suggestions:

- **Attend** all classes and engage in the material
- **Review** your class notes that evening; *what's not clear to you?* Write it down
- **Review** the previous class notes while waiting for class to begin; *do you have any questions for me?*
- **Participate** in and complete all in-class exercises/assignments (**worth 40% of your grade**)
- **Participate** actively with your groups
- **Ask** questions, participate, get involved with the material
- **Seek** help with your questions

IMPORTANT POLICIES AND RESOURCES

Academic Accommodations for Persons with Disabilities: The Americans with Disabilities Act Amendments Act (ADAAA) of 2008 and the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights protection for persons with disabilities. Title II of the ADAAA and Section 504 of the Rehabilitation Act require that students with disabilities be guaranteed equal access to the learning environment through the provision of reasonable and appropriate accommodation of their disability. If you have a diagnosed disability that may require an accommodation, please contact Disability Support Services (DSS) for the coordination of services. The phone number for DSS is (210) 784-1335 and email is dss@tamusa.edu.

Academic Learning Center: All currently enrolled students at Texas A&M University-San Antonio can utilize the Academic Learning Center for subject-area tutoring. The Academic Learning Center is an appointment based center where appointments are made through the Navigate platform. Students access Navigate through Jagwire in the Student Services tab. The Center is active on campus outreaching to students to highlight services offered. You can contact the Academic Learning Center by emailing tutoring@tamusa.edu or calling (210)-784-1332. Appointments can also be made through JagWire under the services tab.

Counseling Resources: As a college student, there may be times when personal stressors interfere with your academic performance and/or negatively impact your daily functioning. If you or someone you know is experiencing life stressors, emotional difficulties, or mental health concerns at Texas A&M University – San Antonio, please contact the Student Counseling Center (SCC) located in Modular C, Room 166 (Rear entrance) or call 210-784-1331 between the hours of 8:00AM and 5:00PM. All mental health services provided by the SCC are free, confidential (as the law allows), and are not part of a student's academic or university record. SCC provides brief individual, couples, and group therapy, crisis intervention, consultation, case management, and prevention services. For more information, please visit www.tamusa.edu/studentcounseling. In a crisis situation, please walk-in to the Student Counseling Center (SCC) any time between the hours of 8:00AM and 5:00PM to be seen by a licensed clinician. After hours, please contact UPD at 911 or text "HOME" to 741-741 24/7/365 to connect with a trained crisis counselor. The National Suicide Prevention hotline also offers a 24/7/365 hotline at 1-800-273-8255.

Emergency Preparedness: JagE Alert is Texas A&M University-San Antonio's mass notification. In the event of an emergency, such as inclement weather, students, staff and faculty, who are registered, will have the option to receive a text message, email and/or phone call with instructions and updates. To register or update your information visit: <https://tamusa.bbcportal.com/>.

More information about Emergency Preparedness and the Emergency Response Guide can be found here: <https://www.tamusa.edu/upd/index.html>.

Financial Aid and Verification of Attendance: According to the following federal regulation, 34 CFR 668.21: U.S. Department of Education (DoE) Title IV regulation, a student can only receive Title IV funds based on Title IV eligibility criteria which include class attendance. If Title IV funds are disbursed to ineligible students (including students who fail to begin attendance), the institution must return these funds to the U.S. DoE within 30 days of becoming aware that the student will not or has not begun attendance. Faculty will provide the Office of Financial Aid with an electronic notification if a student has not attended the first week of class. Any student receiving federal financial aid who does not attend the first week of class will have their aid terminated and returned to the DoE. Please note that any student who stops attending at any time during the semester may also need to return a portion of their federal aid.

Jaguar Writing Center: The Jaguar Writing Center provides writing support to graduate and undergraduate students in all three colleges. Writing tutors work with students to develop reading skills, prepare oral presentations, and plan, draft, and revise their written assignments. The Writing Center is currently holding all appointments digitally. Students can schedule appointments with the Writing Center in JagWire under the student services tab. Students wanting to work in realtime with a tutor can schedule an “Online Appointment.” Students wishing to receive asynchronous, written feedback from a tutor can schedule an “eTutoring” appointment. More information about what services we offer, how to make an appointment, and how to access your appointment can be found on our website at www.tamusa.edu/Writing-Center. The Writing Center can also be reached by emailing writingcenter@tamusa.edu.

Meeting Basic Needs: Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students (DOS@tamusa.edu) for support. Furthermore, please notify the professor if you are comfortable in doing so. This will enable them to provide any resources they may possess.

Military Affairs: Veterans and active-duty military personnel are welcomed and encouraged to communicate, in advance if possible, and special circumstances (e.g., upcoming deployment, drill requirements, disability accommodations). You are also encouraged to visit the Patriots’ Casa in-person room 202, or to contact the Office of Military Affairs with any questions at military@tamusa.edu or (210)784-1397.

Religious Observances: Texas A&M University-San Antonio recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes for regular session classes.

Respect for Diversity: We understand that our students represent diverse backgrounds and perspectives. When we are equity-minded, we are aware of differences and inequalities and are willing to discuss them so we can act to resolve them. The University is committed to building cultural competencies, or the attitudes, skills, and knowledge that enable individuals and organizations to acknowledge cultural differences and incorporate these differences in working with people from diverse cultures. Respecting and accepting people different than you is vital to your success in the class, on campus, and as a future professional in the global community.

While working together to build this community we ask all members to:

- Share their unique experiences, values, and beliefs.
- Be open to the views of others.
- Honor the uniqueness of their colleagues.
- Value each other’s opinions and communicate respectfully.
- Keep confidential discussions that the community has of a personal (or professional) nature.
- Use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the A&M-San Antonio community.

The Six-Drop Rule: Students are subject to the requirements of Senate Bill (SB) 1231 passed by the Texas Legislature in 2007. SB 1231 limits students to a maximum of six (6) non-punitive course drops (i.e., courses a student chooses to drop) during their undergraduate careers. A non-

punitive drop does not affect the student's GPA. However, course drops that exceed the maximum allowed by SB 1231 will be treated as "F" grades and will impact the student's GPA. Statement of Harassment and Discrimination: Texas A&M University-San Antonio is committed to the fundamental principles of academic freedom, equality of opportunity and human dignity. To fulfill its multiple missions as an institution of higher learning, A&M-San Antonio encourages a climate that values and nurtures collegiality, diversity, pluralism and the uniqueness of the individual within our state, nation, and world. All decisions and actions involving students and employees should be based on applicable law and individual merit. Texas A&M University-San Antonio, in accordance with applicable federal and state law, prohibits discrimination, including harassment, on the basis of race, color, sex, religion, national origin, age, disability, genetic information, veteran status, sexual orientation, gender identity, or gender expression. Individuals who believe they have experienced harassment or discrimination prohibited by this statement are encouraged to contact the appropriate offices within their respective units.

Texas A&M University-San Antonio faculty are committed to helping create a safe learning environment for all students and for the university as a whole. If you have experienced any form of sex- or gender-based discrimination or harassment, including sexual assault, sexual harassment, domestic or dating violence, or stalking, know that help and support are available. A&M-San Antonio has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, and more. The university strongly encourages all students to report any such incidents to the university. Please be aware that all A&M-San Antonio employees (other than those designated as confidential resources such as counselors and other healthcare providers are required to report information about such discrimination and harassment to the university. This means that if you tell a faculty member about a situation of sexual harassment or sexual violence, or other related misconduct, the faculty member must share that information with the university's Title IX Coordinator. If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact the Student Counseling Center at (210) 784-1331, Modular C. Students' Rights and Responsibilities:

The purpose of the following statement is to enumerate the essential provisions for the student freedom and responsibility to learn at Texas A&M University-San Antonio. All students are required to follow all policies and regulations as set forth by The Texas A&M University System. This includes the [A HYPERLINK](#)

["https://www.tamusa.edu/uploadfile/folders/fcestrad/pdf/pdf-635767864704349879-10.100.150.124.pdf"](https://www.tamusa.edu/uploadfile/folders/fcestrad/pdf/pdf-635767864704349879-10.100.150.124.pdf)& HYPERLINK

["https://www.tamusa.edu/uploadfile/folders/fcestrad/pdf/pdf-635767864704349879-10.100.150.124.pdf"](https://www.tamusa.edu/uploadfile/folders/fcestrad/pdf/pdf-635767864704349879-10.100.150.124.pdf)M-San Antonio Student Code of Conduct.

Students' Rights

- A student shall have the right to participate in a free exchange of ideas, and there shall be no university rule or procedure that in any way abridges the rights of freedom of speech, expression, petition and peaceful assembly as set forth in the U.S. Constitution.
- Each student shall have the right to participate in all areas and activities of the university, free from any form of discrimination, including harassment, on the basis of race, color, national or ethnic origin, religion, sex, disability, age, sexual orientation, genetic information or veteran status in accordance with applicable federal and state laws.

- A student has the right to personal privacy except as otherwise provided by law, and this will be observed by students and University authorities alike.
- Each student subject to disciplinary action arising from violations of university student rules shall be assured a fundamentally fair process.

Students' Responsibilities

- A student has the responsibility to respect the rights and property of others, including other students, the faculty and the administration.
- A student has the responsibility to be fully acquainted with the published University Student Rules found in the Student Handbook, Student Code of Conduct, on our website, University Catalog and students must comply with them and the laws of the land.
- A student has the responsibility to recognize that student actions reflect upon the individuals involved and upon the entire university community.
- A student has the responsibility to recognize the University's obligation to provide an environment for learning.
- A student has the responsibility to check their university email for any updates or official university notification.
- We expect that students will behave in a manner that is dignified, respectful, and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.