Syllabus

1. Course Information

Title:	Introduction to Watershed Management
Course Number:	NRM 370
Semester:	Fall 2025
Credits:	3
Lecture:	Tuesdays at 5:30 – 7:30 pm in O'Neill 201
Lab:	Mondays at 2:15 – 5:15 pm in O'Neill 359
Office hours:	O'Neill 313 on Tuesdays 4:00 – 5:00 pm, or by appointment
Prerequisites:	NRM F101 or instructor approval

Instructor: Kelsey Aho
E-mail: kbaho@alaska.edu Please include "NRM 370" in the subject line. Allow 48 hours for response.

2. Land Acknowledgement and Course Intentions

All lands are ancestral Indigenous lands. A watershed delineates which lands drain to a specific location on the landscape. People culturally and socially influence watersheds. This course takes place at the Troth Yeddha' campus on the homelands of the Lower Tanana River Dené peoples. The campus is located in the lower Chena River watershed. The instructor and students in this course acknowledge the land stewardship and place-based knowledge of the Dené people. The course lab will include indoor and outdoor opportunities to restore degraded salmon habitat. Course pedagogy follows the Arctic and Earth SIGNS' culturally sustaining teaching methods.

3. Academic Catalogue Description

The hydrologic cycle and the influence of land management techniques on water quantity, quality and timing. Water yield, soil erosion and non-point pollution, snowpack management, and land use alternatives.

4. Full Course Description

What happens on land affects the waters up and downstream, and the linkages between people, biotic, and abiotic beings that depend on water. Within the setting of the Chena River Watershed students will build employable skills in restoring and quantifying habitat, assessing land use impacts, planning for flood events, and monitoring water quality, soils,

atmosphere and snow/ice. The Chena River Watershed provides key habitat for terrestrial and aquatic species including migrating Yukon River salmon. Lab activities will be based on select methodologies such as the Global Learning and Observations to Benefit the Environment (GLOBE) protocols. Students will calculate how inputs and outputs in the hydrologic cycle are affected by urban development, gain experience with field work and the scientific process, learn directly from watershed practitioners, and explore relevant career opportunities.

5. Course Goals:

- To enhance students' awareness of the connection between watershed management, hydrology, water quality, community science monitoring, and their own major/career path.
- To increase student ability to contribute to watershed management and stewardship in the local community by using GLOBE investigations and collaborating with scientists and watershed practitioners.

6. Student Learning Outcomes:

By the end of the course, students will have had the opportunity to:

- Increase understanding of the concepts of hydrology, including the water budget, water flow and stream flow analyses, erosion and sedimentation, fluvial processes, water quality, habitat restoration, and best management practices.
- Increase skill set for watershed planning, non-point source pollution prevention, scientific investigation, and mathematical literacy.
- Increase ability to implement monitoring protocols (including GLOBE or other protocols for monitoring atmosphere, hydrology, water quality, land cover, soils, frost, and active layer above permafrost).
- Earn the Environmental Protection Agency (EPA) Watershed Management Training Certificate.
- Design and implement an inquiry-based monitoring investigation in collaboration with a scientist or watershed manager to address an identified watershed-related issue.
- Present a project and publish an abstract and/or poster on the GLOBE website, with the opportunity to participate in the GLOBE International Virtual Science Symposium.

7. Course Materials

Required Reading (Open Source): Watershed Academy Web

The EPA Watershed Academy includes self-paced training modules and quizzes. Completing 15 modules with self-test scores over 70% earns the Watershed Management Training Certificate: www.epa.gov/watershedacademy/online-training-watershed-management

Supplemental Text:

Brooks, K.N., Ffolliott, P.F., Magner, J.A. 2013. *Hydrology and the management of watersheds, 4th Ed*. Wiley-Blackwell Publishing. ISBN-13: 978-0-4709-6305-0

Technical Plans/Guides:

Chambers, I. 2017. Alaska Water Law: An Overview. Alaska Sea Grant. https://seagrant.uaf.edu/bookstore/pubs/MAB-69.html

Fairbanks Green Infrastructure Group. 2019. Green infrastructure for Interior Alaska: Local benefits and implementation of best management practices. Available from http://www.fairbanksgig.com/benefits

Walter J., Hughes D., Moore N., Inoue J. 2005. Streambank revegetation and protection: A guide for Alaska. Revised 2005. Alaska Department of Fish and Game, Division of Sport Fish. Available from https://www.adfg.alaska.gov/static/home/library/pdfs/habitat/98_03.pdf

Yukon River Inter-Tribal Watershed Council. 2013. Yukon River Watershed Plan. Tribes and First Nations of the Yukon River and Yukon River Inter-Tribal Watershed Council. Available from https://www.yritwc.org/

Journal Articles:

Sarna-Wojcicki D., Sowerwine J., Hillman L., Hillman L. and Tripp B. 2019. Decentering watersheds and decolonising watershed governance: Towards an ecocultural politics of scale in the Klamath Basin. *Water Alternatives* 12(1): 241- 266.

Walker C. M., Whigham D. F., Bentz I. S., Argueta J. M., King R. S., Rains M. C., Simenstad C. A., Guo C., Baird S. J., and Field C. J. 2021. Linking landscape attributes to salmon and decision-making in the southern Kenai Lowlands, Alaska, USA. Ecology and Society 26(1):1. https://doi.org/10.5751/ES-11798- 260101

8. Instructional Methods

Through in-person field trips/labs, guest speakers, weekly assignments, culturally sustaining learning pedagogies, and Universal Design for Learning strategies, students will explore and collect real data about hydrology, watershed management and climate change issues affecting communities in Alaska. The in-person lab includes a canoe trip on the Chena River, a visit to Cripple Creek and Fairbanks Soil & Water, and campus field sites. Students will collect data at these locations and are expected to dress for the weather.

Universal Design for Learning (UDL): There are multiple paths for the "why," "what" and "how" of learning in this course. UDL is a framework for providing options to students for the goal of engagement, motivation, action, and expression. Indigenous knowledge is honored. Teaching practices activate background knowledge that students already have while highlighting patterns and relationships. The instructor provides choice and autonomy for the semester project and for showing comprehension in the final exam. Active learning strategies are implemented. For example, lectures are broken up by activities. Information is displayed in various ways.

9. Course Assignments, Tests and Grading

10 Assignments (25 points each)	250 points
8 Discussions (25 points each)	200 points
GLOBE Investigation (broken into parts)	200 points
Exam 1	100 points
Exam 2	100 points
Final Exam	150 points
Total Points	**1000 points**

Grading Scale

89.5% - 100% = A
84.5% - 89.4% = B+
79.5% - 84.4% = B
74.5% - 79.4% = C+
69.5% - 74.4% = C
64.5% - 69.4% = D+
59.5% - 64.4% = D
0% - 59.4% = F

There are opportunities to earn up to 20 extra credit points. 10 points for a pre-course survey. 10 points for a post-course survey.

General Assignment Information

- **Assignments** are due at the end of the week on Sundays by 11:59 pm. There are 10 assignments. These assignments can include a screenshot of the Watershed Academy Web's self-test of the assigned readings and/or reflection questions about the labs. During weeks with guest speakers, assignments include the questions students prepare and the notes students took when listening to guest speakers. Some assignments include problem sets and lab reflections. Submit assignments on Canvas.
- **Discussion Posts** are due Thursdays by 11:59 pm and Replies are due Sundays by 11:59 pm. There are eight discussion posts. Students will reflect either on real-world watershed planning questions or their semester-long GLOBE investigation question. The discussions are graded with the rubric shared in Canvas. The original post is due on Thursday and the substantive comments to peers as well as a reply on the original post is due by the end of the week on Sundays. Submit Discussion Posts on Canvas.
- Discussion and lab assignments will prepare students for this culminating project. The semester-long **GLOBE investigation** includes identifying a question, collecting data, creating a poster with the results and writing an abstract or report about the poster. See assignment for deadlines of these specific activities. The poster and abstract will be published on www.globe.gov and presentations will take place on December 1st.
- **Exam 1** will be in Canvas.
- **Exam 2** is a written exam. The questions are given in advance. Each exam will include a subset of randomly chosen questions. Students will take this exam at the testing center on campus. Students can schedule their exam time here: https://ecampus.uaf.edu/student-support/exam-info-students/ . Exams need to be completed by Tuesday 11/4 at 11:59pm.
- The **Final Exam** has series of questions and an essay. All students will answer the short answer and multiple choice questions. For the essay, students have three options: 1) students can write the essay the day of the exam or 2) students can write and submit an URSA proposal using GLOBE (due November 2) or 3) students can write and submit a GLOBE International Virtual Science Symposium report (date: TBD).

10. Course Schedule

	Day	Date	Topic	Assignment	Due
Unit I: Our watershed					
WEEK 1	Lab 1	8/25 Mon	Introductions and land acknowledgement. **Topics**: hydrology, watershed	Pre-speaker handout	
	Class 1	8/26 Tues	The last 100 years in and along the Chena River with Dr. Bob Henszey. **Topics**: channelization, morphology, non-point source pollution, sedimentation, turbidity	Pre-survey for extra credit	9/5
	Module 1: The landscape of the Chena River Watershed				
WEEK 2	C2	9/2 Tues	Pre-trip safety talk with Frank Olive. GLOBE protocols. **Topics**: hydrologic equation, intermittent stream, perennial stream, pools, riffle, riparian zone, thalweg, perennial stream	**Discussion 1**: Elder and Personal Observations of Change	**Post**: 9/4 **Reply**: 9/7
	9/6: Last day to change/drop a course for a full refund without a grade of "W". Last day to pay tuition and fees.				
	Module 2: Social landscape of the Chena River Watershed				
WEEK 3	L2	9/8	**Field Trip:** Canoeing the Chena River **Topics**: Best Management Practices (BMPs), discharge, dissolved oxygen, erosion, gaging station, streambank stabilization	**Assignment 1**: Watershed Academy & Interpretive Sign	9/14
	C3	9/9	GLOBE Research Question and collecting field data with Christi Buffington. **Topics**: anthropogenic impacts, mitigation, water quality standards	**Discussion 2**: Research Question & Design	**Post**: 9/11 **Reply**: 9/14
	Module 3: "Water always wins" so let's make space to soak it in				
WEEK 4	L3	9/15	**Field Trip:** Cripple Creek Restoration Project with Dakota Keller (UAF), Matt Strickler and Eloise Bellingham (USGS), Chandra McGee (USGS), Cory Whiteley (TVWA). **Topics:** cubic feet per second (cfs) / discharge (Q), bioindicators, fragmentation, land use, macroinvertebrates, monitoring, restoration, situation assessment	**Assignment 2**: Stream Corridor & GLOBE	9/21
	C4	9/16	**Guest**: Cynthia Nelson on Stormwater and permitting **Topics**: designated uses, eutrophication,	**Discussion 3:** Fun with Geomorphology Stream Table	**Post**: 9/18 **Reply**: 9/21

			heavy metals, impaired water, impervious surface, infiltration, stormwater runoff, Total Maximum Daily Loads (TMDLs)	Videos	
WEEK 5	L4	9/22	**Lab with UAF facilities:** Smith Lake to Chena River **Topics**: River Continuum Concept, Flood Pulse Concept, Fish Zones Concept, Stream Functions Pyramid, Riverine Productivity Model, Functional Process Zones, Index of Watershed Integrity, Lane's equation	**Assignment 3**: Asking and answering water sampling questions	9/28
	C5	9/23	**Field Trip:** Fairbanks Soil and Water Conservation District with Scott Faulkner **Topics**: aerobic, algal blooms, green infrastructure, hydric soils, no-till farming, nutrient management, pore space, soil moisture	**Discussion 4**: This is my GLOBE site …	**Post**: 9/25 **Reply**: 9/28
WEEK 6	L5	9/29	**Exam 1**: Take online via Canvas. The deadline is **11:59 pm on 9/29.**	**Assignment 4**: Watershed Planning and GLOBE data	10/5
	C6	9/30	**Water always wins online activity**		
Unit II: Hydrologic cycle					
	Module 4: From the top down: Atmosphere				
WEEK 7	L6	10/6	**Lab/Field Trip:** Moose Creek dam with USACE. Make Space to Soak it in & data analysis. **Topics**: baseflow, buffer, groundwater, Manning equation	**Assignment 5**: Watershed planning	10/12
	C7	10/7	**Topics**: Darcy's Law, evapotranspiration, GIS, hydrography, HUC, rain-on-snow events	**Discussion 5**: Yukon River Watershed Plan	**Post**: 10/09 **Reply**: 10/12
	Module 5: From the top down: Surface water				
WEEK 8	L7	10/13	**Field Trip:** National Weather Service Operations and Services and the Connection to Watershed Management **Topics**: Breakup, Connectivity	**Assignment 6**: Urban Landscaping	10/19
	C8	10/14	**Guest**: Erik Anderson (ADF&G) **Topics**: anadromous waters, biodiversity, exotic species, habitat	Work on your GLOBE data	

	Module 6: From the top down: Subsurface water				
WEEK 9	L8	10/20	**Field Trip:** with Arctic and Earth SIGNs on UAF Trails) with Tori Brannan. **Topics:** frost tube, ground ice, permafrost		
	C9	10/21	**Guest:** Amy Jo Jensen (UAF GI) Where does the water go when we don't see it? **Topics**: Glacial Lake Outburst Floods, glaciers	**Assignment 7**: Water pollution	10/26
	Module 7: How much water is there?				
WEEK 10	L9	10/27	**Field Trip to ACCAP**: Where is it wetter and dryer in Alaska? Incredible Journey Activity: Climate Change and the Water Cycle **Topics**: aquifer, wetlands	**Discussion 6**: Poster Introduction and Research Methods Sections	**Post**: 10/30 **Reply**: 11/2
	C10	10/28	Water use in urban environments. Potential ET and Lake Evaporation. **Topics**: mitigation banking, water balance, water withdrawals	Work on your GLOBE data	11/9
	10/31: Last day for student- and faculty-initiated withdrawals (W grade appears on academic transcript)				
WEEK 11		11/3	Exam 2 (available Monday 11/3 at 12:01 am until Tuesday 11/4 at 11:59pm). Schedule your exam time here: https://ecampus.uaf.edu/student-support/exam-info-students/		
		11/4			
	Unit III: Watershed science, law, and stewardship				
	Module 8: Watershed science academy				
WEEK 12	L10	11/10	No lab – online EPA Watershed Academy	**Assignment 8**: CWA and 5 Watershed Academy modules	11/11
	C11	11/11	No class – online EPA Watershed Academy		

	Module 9: Water law and decolonizing watershed governance				
WEEK 13	L11	11/17	**Field Trip with Fresh Eyes on Ice**: Community Needs Assessments and observations with Katie Spellman (NR&E) and Sarah Clement (IARC)	**Assignment 9**: public comment	11/23
	C12	11/18	Observing freeze up and observing the Law. **Topics**: Clean Water Act, Wild and Scenic Rivers Act, Katie John, Riverine Rights and Declaration of Rights of Rivers	**Discussion 7**: Decolonizing watershed governance	**Post**: 11/20 **Reply**: 11/23
	Module 10: Watershed stewardship				
WEEK 14	L12	11/24	**Lab:** Light Absorbing Particles on Snow with Dr. Carl Schmitt. Compare GLOBE and NASA SnowEx methods. **Topics**: Runoff	**Assignment 10**: Watershed Reflections	11/30
	C13	11/25	Review, Data Analysis, GLOBE Poster & International Virtual Science Symposium	Publish GLOBE poster and abstract	11/25
WEEK 15	L13	12/1	Play the Incredible Journey game (Reflect from where we started on Day 1) Play the Systems Thinking "Fish Game" (by the Cloud Institute) **GLOBE Poster Presentations**	**Discussion 8:** Poster Presentation Peer Review	**Post**: 12/7
	C14	12/2	Review for Final	**All Late Work Due**	
	Final Exam is on Canvas – may be taken on Monday or Tuesday. **Deadline: 11:59pm on Tuesday December 9th.**				

11. Technology Requirements

Lectures, surveys, assignments, rubrics, tests, and links to articles are located on Canvas. To participate in learning activities and complete assignments, you will need:

- Computer access and reliable internet
- Microsoft Word, Excel and PowerPoint (available free of charge from University's Microsoft 365 Account) or Google Docs, Sheets and Slides.
- Vernier Graphical Analysis App or Software
- GLOBE Observer. https://observer.globe.gov/about/get-the-app

12. Course Policies and Procedures

Conduct in Lecture and Lab

Punctuality in class and lab is expected. Engaged participation and respect for instructors, guests and other participants is expected, including storing digital devices during lecture and lab unless being used as instructed for specific learning activities. It is expected that cameras will be on during zoom sessions, including guest presentations.

Title IX: Students at University of Alaska Fairbanks are protected against sexual harassment and discrimination and minors have additional protections. If the instructor notices or is informed of certain types of misconduct, then the instructor is required to report it to the appropriate authorities.

Academic Integrity

Plagiarism will not be tolerated and will result in the student earning a failing grade in the assignment and will result in additional disciplinary measures. Plagiarism includes using another person's work or improper citation of sources.

Late Work

- Late Discussion posts and/or replies are accepted for fewer points.
- Late Assignments are accepted for partial credit (up to 70%) if turned in less than one week after the due date. Late Assignments are accepted for up to half credit (up to 50%) if turned in prior to **Tuesday, December 2 at 11:59 pm, the final day and time to submit late work.**
- Late GLOBE abstract and poster will be accepted for partial credit (up to 70%) if submitted to Canvas prior to **Tuesday, December 2 at 11:59 pm, the final day and time to submit late work.**

Attendance Policy, Excused Absence and Make-up Work

Missing lab or class results in missing important information. You are responsible for learning any material covered in lab and class. The instructor does not take attendance. Absences that result in missed assignments may be excused for legitimate reasons when the instructor is contacted in advance (sickness, time conflict with other required activities etc.)

Incomplete (I), Withdrawal (W), and No Basis (NB) Grades

According to the University of Alaska Fairbanks' Incomplete Grade Policy, an Incomplete (the letter "I") is a temporary grade that indicates the student completed with a C or better the majority of the coursework, but due to reasons outside the student's control, the student has not been able to complete the course during the regular semester. A Withdrawal (the letter "W") can be student or faculty initiated, resulting in a W on the transcript. A No Basis ("NB") is rarely given; it is used when the instructor has no basis on which to assign a grade.

Course Policy on Artificial Intelligence Platforms

A large component of the assessments in this course requires critical thinking and synthesis of ideas in writing. Artificial Intelligence (AI) platforms such as ChatGPT could easily be used as a "student proxy" for this work. The danger in letting an AI platform do the synthesis and writing is that the student will not develop these important skills as part of the course learning objectives. Additionally, AI platforms such as ChatGPT are notorious for making things up, and it is difficult to ascertain if the information is correct or not. Therefore, the course policy is for students not to use AI platforms at all in this course. It is critical for students to develop core research and writing skills first before adding AI and other technological tools to their research toolbox. For additional details on the misuse of AI assistive technology, please go to the Academic Integrity section of the course syllabus.

Syllabus Addendum (Revised 8/5/2025)

Student protections statement: The university respects and upholds the principles of due process and a fair and equitable process as specified in the Board of Regents' Policy 09.02 Student Rights and Responsibilities. For more information regarding the rights and responsibilities of students, refer to the Office of Rights, Compliance and Accountability website. You are encouraged to read the Board of Regents' policy carefully to fully understand your responsibilities to our community.

We strive to create a safe and respectful environment for all members of our community. If you have questions about expectations of you as a student or believe your rights are being violated, we encourage you to reach out to the Office of Rights, Compliance and Accountability for help. UAF reserves the right to suspend, expel or take other necessary and appropriate actions in cases where a student is unable or unwilling to uphold community standards and campus safety.

For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site: https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/.

Disability services statement: I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

ASUAF advocacy statement: The Associated Students of the University of Alaska Fairbanks, the student government of UAF, offers advocacy services to students who feel they are facing issues with staff, faculty, and/or other students specifically if these issues are hindering the ability of the student to succeed in their academics or go about their lives at the university. Students who wish to utilize these services can contact the Student Advocacy Director by visiting the ASUAF office or emailing asuaf.office@alaska.edu.

Student Academic Support:

- Communication Center (907-474-7007, uaf-commcenter@alaska.edu, Student Success Center, 6th Floor Room 677 Rasmuson Library)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Student Success Center, 6th Floor Room 677 Rasmuson Library)
- UAF Math Services (907-474-7332, uaf-traccloud@alaska.edu)

Drop-in tutoring, Student Success Center, 6th Floor Room 672 Rasmuson Library)

1:1 tutoring (by appointment only), 6th Floor Room 677 Rasmuson Library

Online tutoring (by appointment only) available

https://www.uaf.edu/dms/mathlab/, available at the Student Success Center

- Developmental Math Lab (Gruening 406, https://www.uaf.edu/deved/math/)
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 102, https://www.ctc.uaf.edu/student-services/student-success-center/)
- For more information and resources, please see the Academic Advising Resource List https://www.uaf.edu/advising/students/index.php

Student Resources:

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, 110 Eielson Building)
- Student Health & Counseling **[free counseling sessions available]** (907-474-7043, https://www.uaf.edu/chc/appointments.php, Whitaker Building, Room 206, Health, Safety & Security Bldg - same building as Fire and Police)
- Office of Rights, Compliance and Accountability (907-474-7300, uaf-orca@alaska.edu, 3rd Floor, Constitution Hall)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

Nondiscrimination statement: The University of Alaska is an equal opportunity/equal access employer, educational institution and provider. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination.

For more information, contact:

UAF Office of Rights, Compliance and Accountability

1692 Tok Lane

3rd floor, Constitution Hall, Fairbanks, AK 99775
907-474-7300
uaf-orca@alaska.edu

Additional syllabus statement for courses that include off-campus programs and research activities:

University Sponsored Off-Campus Programs and Research Activities

We want you to know that:

1. UA is an Equal Opportunity/Equal Access employer, educational institution and provider and prohibits illegal discrimination against any individual: http://www.alaska.edu/nondiscrimination.
2. Incidents can be reported to your university's Equity and Compliance office (listed below) or online reporting portal. University of Alaska takes immediate, effective, and appropriate action to respond to reported acts of discrimination and harassment.
3. There are supportive measures available to individuals that may have experienced discrimination.
4. University of Alaska's Board of Regents' Policy & University Regulations (UA BOR P&R) 01.02.020 Nondiscrimination and 01.04 Sex and Gender-Based Discrimination Under Title IX, go to: http://alaska.edu/bor/policy-regulations/.
5. UA BOR Policies & University Regulations apply at all university owned or operated sites, university sanctioned events, clinical sites and during all academic or research related travel that are university sponsored.

For further information on your rights and resources visit the student placement guidelines page of the equity and compliance site.