# Syllabus

## 1. Course Information

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|---|---|
| Title: | Introduction to Watershed Management |
| Course Number: | NRM 370 |
| Semester: | Fall 2023 |
| Credits: | 3 |
| Lecture: | Tuesday and Thursday 11:30 am – 12:30 pm |
| Lab: | Thursday 2 – 5 pm |
| Location: | William A. O'Neill Resources, Room 359 (Soils Teaching Lab) |
| Prerequisites: | NRM F101 or instructor approval |

Instructor: Christina Buffington. M.S., M.Ed., Grad.Cert. (You may call me Christi)
Phone: 907-474-2794
E-mail: cbuffington@alaska.edu
E-mail Etiquette: **Subject line must have NRM 370**; Allow 48 hours for response
Office: Akasofu 203E (International Arctic Research Center)
Office Hours: Thursday 12:45 – 1:15 pm, in between lecture and lab (or by appointment)

## 2. Land Acknowledgement and Course Intentions

A watershed is a land area that drains to a stream, lake, river, wetland, or sea. All lands are ancestral Indigenous lands and the waters are interconnected with the people. This course takes place at the Troth Yeddha' campus on the homelands of the Lower Tanana River Dené peoples. The instructor and students in this course acknowledge the intergenerational land stewardship and honor the place-based knowledge of the Dené and all Indigenous people and nonhuman relatives connected by land and waters. The aim of the habitat restoration activities is to help heal the lands from impacts of mining and development and to restore juvenile salmon habitat. Pedagogy for the course follows the Arctic and Earth STEM Integrating GLOBE and NASA Learning Framework, which centers Elder knowledge and 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 water and everything that depends on it; this central concept of watershed management frames every aspect of the course. Within the setting of the Chena River Watershed, which provides key habitat for terrestrial and aquatic species including migrating Yukon River salmon, 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 using 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 through the use of GLOBE investigations and collaboration with scientists and watershed practitioners.

## 6. Student Learning Outcomes:

By the end of the course, undergraduate students will have:

- An increased 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.
- An increased skill set for watershed planning, non-point source pollution prevention, scientific investigation, and mathematical literacy.
- An increased 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).
- Earned the Environmental Protection Agency (EPA) Watershed Management Training Certificate.
- Designed and implemented an inquiry-based monitoring investigation in collaboration with a scientist or watershed manager to address an identified watershed-related issue.
- Presented a project and published an abstract and 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 Watershed Academy's distance learning program published by EPA — Watershed Academy Web — includes self-paced training modules and quizzes. Completing 15

required modules with self-test scores over 70% earns the Watershed Management Training Certificate. The online training is available at https://www.epa.gov/watershedacademy/online-training-watershed-management

**Supplemental Text (copies are available to borrow):**

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:**

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

Technical and journal readings are on Canvas. All course materials comply with copyright/fair use policies.

## 8. Instructional Methods

Through in-person field trips/labs, guest speakers, weekly assignments, and culturally sustaining learning pedagogies, and Universal Design for Learning strategies, students will investigate and apply real data about hydrology, watershed management and climate change issues affecting local communities. The in-person labs will include data

collection at campus field sites, a canoe trip on the Chena River, and a visit to Cripple Creek, the site of a channel bypass and channel restoration project. Students will be 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, and goal setting. 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 second exam (see below). Active learning strategies are implemented. For example, lectures are broken up by activities. Information is displayed in various ways. Notes are posted in advance and use ALT Text where possible.

## 9. Course Assignments, Tests and Grading

| | |
|---|---|
| Module Assignments (10 x 25 points) | 250 points |
| Module Discussions (8 x 25 points each) | 200 points |
| GLOBE Investigation (broken into parts) | 200 points |
| Exam 1 | 100 points |
| Exam 2 (this is an oral exam or written exam) | 100 points |
| Final Exam | 150 points |
| **Total Points** | **1000 points** |

There are opportunities to earn 30 total points extra credit by completing anonymous pre- and post- surveys and the anonymous course evaluation at the end of the semester. The surveys and the course evaluation are worth 10 points extra credit each.

**General Assignment Information**

- **Module Assignments are due on designated Thursdays by 11:59 pm**. The course will have ten assignments. These assignments always include a screenshot of the Watershed Academy Web's self-test of the assigned readings and reflection questions about the labs. During weeks with guest speakers, the assignment includes the questions students prepare and the notes students took when listening to guest speakers. These notes will be collated and made available to peers in exam study sheets. The assignments also include problem sets and lab reflections. Some assignments involve activities from the Arctic and Earth STEM Integrating GLOBE and NASA (SIGNs) Curriculum (used with permission).
- **Module Discussion Posts are due Tuesdays by 11:59 pm and Replies are due Thursdays by 11:59 pm**. Eight discussion posts prepare students for engaging in real-world watershed planning work and for developing, doing and

presenting a GLOBE investigation. The discussions are graded by a rubric. The original post is due on Tuesday and the substantive comments to peers as well as a reply on the original post is due on Thursdays.

- A semester-long **GLOBE investigation** culminates in publishing an abstract and poster to www.globe.gov by **Monday, November 20 at 11:59 pm**. Presentations will take place during the last week of class. Discussion and lab assignments will prepare students for this culminating project.
- **Exam 1 and the Final Exam** may be in Canvas or on Google Forms. **Exam 2** is an oral exam (like a job interview) or essay exam following Universal Design for Learning guidelines. In Exam 2, students can either do an oral exam or an essay exam. The questions are given in an advance and a subset of questions is randomly chosen. **The Final Exam has an essay portion. Students may opt-out of the essay** by submitting either an URSA proposal using GLOBE (due November 5) or GLOBE International Virtual Science Symposium report and poster or video.
- Submit all coursework and access tests in Canvas with your UA online ID and password

**Evaluation and Grading Scale**

| **Assignment / Project / Exam Weights** | Percent |
|---|---|
| Assignments (including readings, guest speaker notes and lab reports) | 25% |
| Discussion Posts & Replies (on Readings and GLOBE Investigation) | 20% |
| GLOBE Investigation. Abstract, Poster, Publication, and Presentation | 20% |
| Exam 1 | 10% |
| Exam 2 | 10% |
| Final | 15% |
| Total | 100% |

*It is possible to earn over a 100% if students complete pre survey, post survey and the course evaluation.

**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

## 10. Course Schedule

| Day | Date | Topic | Assignment | Due 11:59 pm |
|---|---|---|---|---|
| **Unit I: Observing and Restoring the Chena River and its Tributaries** | | | | |
| 1 | 8/29 Tue | Land Acknowledgement, Intros, Learning Framework, Incredible Journey Game | Check Canvas on Thursday | |
| 2 | 8/31 Thu | Elder knowledge about channel changes – Sam Demientieff on Project Jukebox | | |
| Lab | 8/31 Thu | **Guest: Dr. Bob Henszey** Chena River in the Last 100 years | Pre-survey extra credit | 9/5 |
| **Module 1: Our Changing Chena River – its banks and flows** | | | | |
| 3 | 9/5 Tue | Channel Form and Riparian Function Streambank Rehabilitation | Discussion 1 | 9/5 post 9/7 replies |
| 4 | 9/7 Thu | Streamflow monitoring: stage & discharge **Guest: Frank Olive** Pre-trip put in talk – Safety on the Chena River | | |
| Lab | 9/7 Thu | **Field Trip: Canoeing the Chena River in downtown Fairbanks.** Bank stabilization best management practices (BMPs) | Assignment 1 | 9/14 |
| 9/8: 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: We can help heal the land, restore habitat and monitor changes** | | | | |
| 5 | 9/12 Tue | Green Infrastructure. GLOBE surface temperature, soil temperature, land cover | Discussion 2 | 9/19 post 9/21 replies |
| 6 | 9/14 Thu | Yukon River salmon, dissolved oxygen and temperature | | |
| Lab | 9/14 Thu | **Field Trip: Cripple Creek Restoration Project** (at Happy Creek junction by Welcome to Fairbanks Sign). Install vegetated mat. GLOBE soil, landcover, water quality investigation. | Assignment 2 | 9/21 |
| **Module 3: "Water always wins" so make space and soak it in** | | | | |
| 7 | 9/19 Tue | Make Space Soak it in & data analysis | **Discussion 3: GLOBE Research Question** | 9/26 post 9/28 replies |
| 8 | 9/21 Thu | **Guest: Cynthia Nelson** DOT Stormwater Sampling and Environmental Review | | |
| Lab | 9/21 Thu | **Field Trip to Fairbanks Soil and Water Conservation District.** Geomorphology Stream Table, Hydrograph demonstration **Hosts: Scott Faulkner & Emily Cheney** | Assignment 3 | 10/2* Extra time |
| 9 | 9/26 Tue | Online Class - GLOBE Research Question and Inquiry Investigation (recorded) | | |

| Day | Date | Topic | Assignment | Due 11:59 pm |
|---|---|---|---|---|
| 10 | 9/28 Thu | No Class – **Exam 1 online – today only** | | |
| No Lab | 9/28 Thu | **Exam 1 in Canvas** | **Take Exam online today** | 11:59 pm |
| **Unit II: Surface water hydrology – from Indigenous ways and data to decisions** | | | | |
| **Module 4: Water, weather, and habitat – how do we know restoration works?** | | | | |
| 11 | 10/3 Tue | **Field Trip to National Weather Service** NWS Operations and Services and the Connection to Watershed Management **Host: Edward Plumb** | Discussion 4 | 10/10 post 10/12 reply |
| 12 | 10/5 Thu | Precipitation, Interception, Evapotranspiration (ET) | | |
| Lab | 10/5 Thu | **Field Trip to Happy Creek and Cripple Ck. Drain (Welcome to Fairbanks Sign) Stream Quantification Tool (SQT)** | Assignment 4 | 10/12 |
| **Module 5: Where does the water go when we don't see it?** | | | | |
| 13 | 10/10 Tue | Soil Moisture, Pore Space, Infiltration Case Study: Kenai Southern Lowlands | Discussion 5 | 10/17 post 10/19 reply |
| 14 | 10/12 Thu | Percolation, Groundwater Case Study: Flathead River (Montana) | | |
| Lab | 10/12 Thu | Arctic and Earth SIGNs Field Activity (on UAF Trails): Permafrost and Thermokarst | Assignment 5 | 10/19 |
| **Module 6: Budgeting for water withdrawals and surplus** | | | | |
| 15 | 10/17 Tue | Water use in urban environments Potential ET and Lake Evaporation | Discussion 6 | 10/24 post 10/26 reply |
| 16 | 10/19 Thu | Calculating a Water Budget Case study: Lake Michigan Basin | | |
| Lab | 10/19 Thu | Incredible Journey Activity: Climate Change and the Water Cycle | Assignment 6 | 10/26 |
| Choose How to Take Exam 2: Oral Exam or Written Essay Exam | | | | |
| **Module 7: "Decolonizing watershed governance"** (Sarna-Wojcicki et al. 2019) | | | | |
| 17 | 10/24 Tue | Sovereignty: Decentralizing the watershed approach (Sarna-Wojcicki) | Discussion 7 | 10/31 post 11/2 reply |
| 18 | 10/26 Thu | Klamath River dam removal on homelands of Shasta, Karuk, Hupa and Yurok peoples | | |
| Lab | 10/26 Thu | Written Essay Exam (for those who did not choose the oral exam). Work time for optional URSA proposal (due Nov. 5). | Assignment 7 | 11/2 |

| Day | Date | Topic | Assignment | Due 11:59 pm |
|---|---|---|---|---|
| **Unit III: Watershed modeling, planning, water law, and safety** | | | | |
| **Module 8: How much water is stored in snow, ice and glaciers?** | | | | |
| 19 | 10/31 Tue | Comparing GLOBE and NASA SnowEx methods (go outside!) | Discussion 8 (the last one!) | 11/7 post 11/9 reply |
| 20 | 11/2 Thu | **Virtual Guest: Kaila Banister** GLOBE poster and NASA SnowEx internship | | |
| Lab | 11/2 Thu | **Guest: Dr. Carl Schmitt** Light Absorbing Particles on Snow | Assignment 8 | 11/9 |
| 11/3: Last day for student- and faculty-initiated withdrawals (W grade appears on academic transcript) | | | | |
| **Water Law - EPA Watershed Academy** (Instructor on Medical Leave) | | | | |
| 21 | 11/7 Tue | Online Lecture – Point source and non-point source pollution and stormwater | Work on your GLOBE data analysis and poster! | |
| 22 | 11/9 Thu | No class – online Watershed Web | | |
| Lab | 11/9 Thu | No lab – online Watershed Web | | |
| **Module 9: Freshwater ice – Why we need to observe freeze up and breakup** | | | | |
| 23 | 11/14 Tue | **Field Trip to National Weather Service** Breaking Down the Breakup Process **Host: Edward Plumb** | | |
| 24 | 11/16 Thu | Fresh Eyes on Ice: Community Needs Assessment (potential guest speaker) | | |
| Lab | 11/16 Thu | Observing freeze up. Poster presentation with students in New York or Canada | Assignment 9 | 11/30 |
| | | | | |
| 25 | 11/21 Tue | Review, Data Analysis, GLOBE Poster & International Virtual Science Symposium | **Publish poster, abstract** | **11/21** |
| Thanksgiving – No Class or Lab | | | | |
| **Module 10: Climate change and our change – planning for the future** | | | | |
| 28 | 11/28 Tue | Where is it wetter and dryer in Alaska? Data from Alaska Center Climate Assessment and Policy | | |
| 29 | 11/30 Thu | Play the Incredible Journey game (Reflect from where we started on Day 1) | | |
| Lab | 11/30 Thu | Play the Systems Thinking “Fish Game” (by the Cloud Institute) | Assignment 10 | 12/7 |
| 28 | 12/5 Tue | Review for the Final Go over schedule for Thursday | All Late Work Due | |

| Day | Date | Topic | Assignment | Due 11:59 pm |
|---|---|---|---|---|
| 29 | 12/7 Thu | GLOBE Poster Presentations | | |
| Lab | 12/7 Thu | GLOBE Poster Presentations, Reception and Review | | |
| Final Exam on Canvas – may be taken on your schedule during Finals Week | | | | |

## 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
- Flipgrid (optional for some Lab assignments). https://info.flipgrid.com/

## 12. Course Policies and Procedures

### Conduct in Lecture and Lab

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

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.

### 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 and improper citation of sources.

### Late Work

- Discussion Posts/Replies are graded according to a set rubric. Late posts and/or replies are accepted, but earn fewer points.
- Late Weekly and Lab Assignments are accepted for partial credit (up to 70%) if turned in less than one week after the due dates. Late Weekly and Lab Assignments are accepted for up to half credit (up to 50%) if turned in prior to **Tuesday, December 5 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 5 at 11:59 pm, the final day and time to submit late work.**

**Attendance Policy, Excused Absence and Make-up Work**

Missing lab and class results in missing important information. You are responsible for learning any material covered in class and lab. 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 (e.g. sickness, time conflict with other required activities, accommodations, etc.)

To arrange an excuse for an expected absence which will result in a missed deadline at the start of the semester, submit an email request by the end of the second week of the course. Explain the reason for the absence and the dates.

**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 indicated 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.

Syllabus Addendum (Revised 8/18/2021)

**COVID-19 statement**: Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19. Stay home if students do not feel well.

**Student protections statement**: UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. 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.

**Student Academic Support**:

- Speaking Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 8th floor)
- UAF Math Services, uafmathstatlab@gmail.com, Chapman Building (for math fee paying students only)
- Developmental Math Lab, Gruening 406
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, 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/lr/SKM_364e19011717281.pdf)

**Student Resources:**

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)
- Student Health & Counseling **[6 free counseling sessions]** (907-474-7043, https://www.uaf.edu/chc/appointments.php, Whitaker 203)
- Center for Student Rights and Responsibilities (907-474-7317, uaf-studentrights@alaska.edu, Eielson 110)
- 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 affirmative action/equal opportunity employer and educational institution. 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 Department of Equity and Compliance
1692 Tok Lane, 3rd floor, Constitution Hall, Fairbanks, AK 99775
907-474-7300
uaf-deo@alaska.edu

Additional syllabi statement for courses including off-campus programs and research activities:
University Sponsored Off-Campus Programs and Research Activities
We want you to know that:

1. UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: 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 P&R 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 click here.