Field Education

Out in Nature, into Science

Dear Participant,

Welcome, and greetings from Jackson Hole, Wyoming! We're excited that you will be joining us at the Kelly Campus of Teton Science Schools for the **January Term Winter Ecology Course from January 2-14, 2023.**

Please review the enclosed course logistics for arrival, the syllabi, and purchase the required textbook **Marchand, P.J. 2013. Life in the cold: an introduction to winter ecology, 4th edition. University Press of New England**. This text is available for purchase on Amazon through this link ***Life in the Cold 4th edition***. We look forward to sharing the winter world of the Greater Yellowstone Ecosystem with you in January.

Enclosed is a packet of information that will assist you in preparing for your courses. For more information, please contact us via e-mail or Melanie Matthews melanie.matthews@uwyo.edu with any questions specific to the University of Wyoming.

Kind Regards,

Joanna Ahlum
TSS January Term Faculty
joanna.ahlum@tetonscience.org

Course Summary

Three (1 credit) courses will be offered at Teton Science Schools' Kelly Campus:

Course Number: ENR 4010 (Open Enrollment)
Course Title: **Winter Ecology — Skills of the Winter Naturalist**
Description: This course is an introduction to the winter environment and emphasizes developing winter naturalist skills, animal tracking, and safety in winter. This course focuses on students acquiring the necessary winter field skills to successfully study winter ecology through lectures and inquiry-based field activities. Students will learn cross-country skiing, engage in observations of plants and animals, create a naturalist journal based on their observations, and share their observations with peers.
Dates/Times: **Monday - Thursday, January 2-5**

Course Number: ENR 4011 (Pre-requisite ENR 4010)
Course Title: **Winter Ecology - Snowpack Science and Dynamics**
Description: This course focuses on snow science, subnivean dynamics, and winter research skills through lectures and inquiry-based field laboratories. This course will allow for an in-depth study of the Jackson Hole snowpack through direct engagement in studying snow formation, metamorphism, and properties of snow significant to winter ecology. Snow science will become a tool to better understand the winter environment.
Dates/Times: **Friday - Sunday, January 6-8**

Course Number: ENR 4012 (Pre-requisite ENR 4011)
Course Title: **Winter Ecology — Wildlife and Plant Adaptations**
Description: This course emphasizes the effects of winter abiotic conditions on organisms and subsequent adaptations to these conditions. This course focuses on animal and plant adaptations to cope with the stresses of winter as well as the impacts of climate change through lectures and inquiry-based field laboratories. Students will also conduct research in small groups focused on a winter ecology topic and present their results.
Dates/Times: **Tuesday - Saturday, January 10-14**

Arrivals & Departures

- **Transportation:** All participants will need to provide their own transportation to and from the Kelly Campus of Teton Science Schools. Transportation will be provided during the course.
- **Arrival**: 3-5 PM **Monday, January 2nd**, the afternoon before the course begins. Dinner will be provided.
- **Check-in:** Dining Lodge on the Kelly Campus
- **Departures**: **5:00 pm January 5th**; **5:00 pm January 8th**; (departure on these days does not include dinner unless enrolled in the following course) **10:00 am January 14th** (includes breakfast)
- **Delayed Arrival**- Please let us know if you are delayed traveling to Teton Science Schools due to road conditions/closures. You can contact the on-call staff at **307.413.3616** or Joanna Ahlum at **831.252.8679** on the arrival day to update us on your travel plans or delays.

Getting to Jackson Hole, WY

By Air: Jackson Hole Airport (JAC) is 20 minutes from our campus and is serviced by American, Delta, Skywest, United, and Frontier Airlines. You may also want to check rates and availability through Salt Lake City, Utah (a five-hour drive to Jackson) or Idaho Falls, Idaho (a two-hour drive).

Car Rental: If you plan on renting a car before, during, or after the program, Alamo, Avis, and Hertz are available at the Jackson Hole airport. We recommend you make your car rental reservation in advance of the program.

Shuttles: Teton Science Schools can provide transportation to and from the Jackson Hole Airport or the Idaho Falls Airport. Transportation arrangements must be made in advance; there may be an additional charge for airport transportation.

By Car or Bus: If you are driving to Jackson Hole, there is limited parking at the Kelly Campus and there may be restrictions to personal car use based on the nature of the program. Please try to carpool in the winter due to limited parking on campus.

Driving Directions to the Kelly Campus:

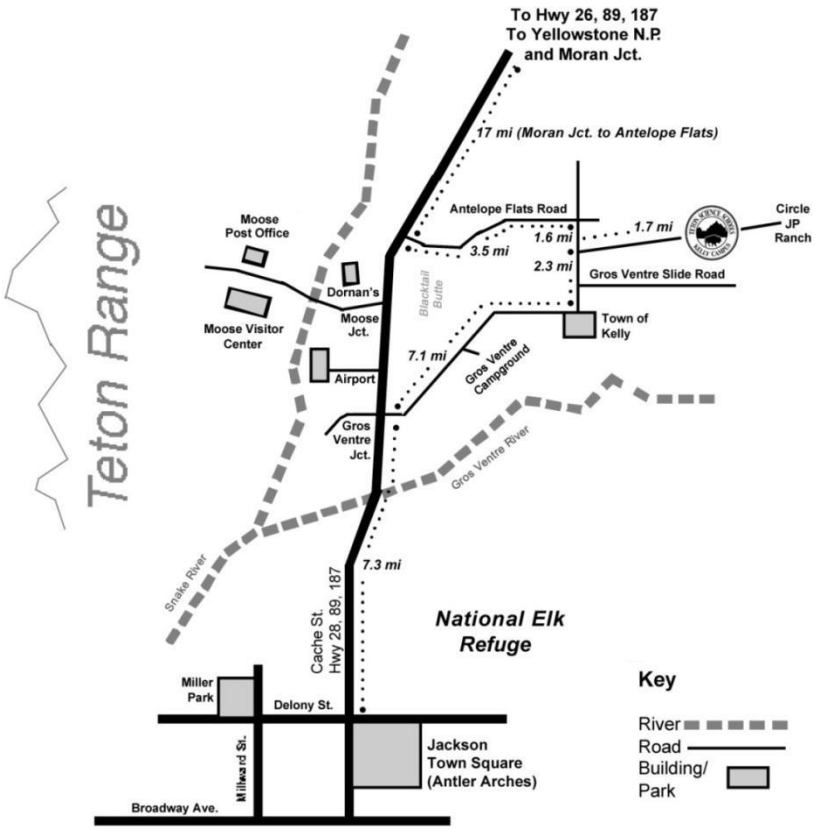
(Physical address is 1 Ditch Creek Rd, Kelly, WY 83011)

From the north:

From Highway 26/89/187, enter the roundabout and turn LEFT onto Gros Ventre Road. After approx. 7.1 miles you will see the town of Kelly (don't blink!) and the road will take a sharp turn to the left. From here it is approx. 2.3 miles to the turnoff for the Kelly Campus of the Teton Science Schools, marked by a small sign on the left. Turn RIGHT onto the school road and travel approx. 1.7 miles to our buildings.

From the south:

From Highway 26/187/187, enter the roundabout and turn RIGHT onto the Gros Ventre Road almost immediately after crossing the Gros Ventre River. From here, the same directions apply for arriving from the North once you've made the turn onto Gros Ventre Rd.



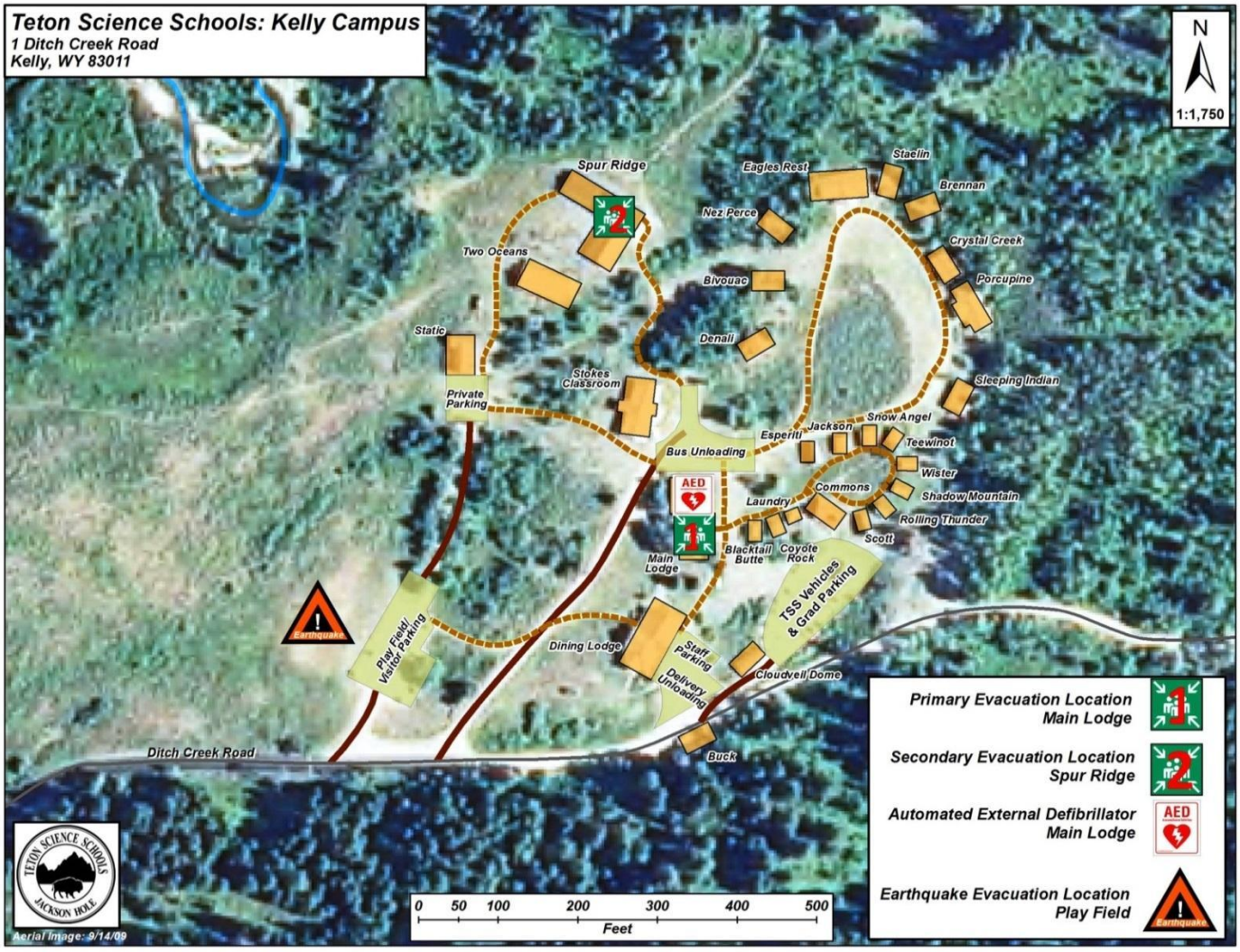
Approximate Distances to the Kelly Campus:

From the West/North

Moran Junction	24 Miles
Moose Junction	9 Miles
Airport	13 Miles

From the South

Jackson Town Square	19 Miles



Teton Science School Field Education Program
Winter Ecology – Skills of the Winter Naturalist
January Term 2022

For more information on course content contact:
joanna.ahlum@tetonscience.org

Course Title: Winter Ecology – Skills of the Winter Naturalist
Faculty of Record: Melanie Matthews
Faculty: Joanna Ahlum, M.S., Sylvia Doyle, M.S., Lena Goss, and Alex Sivitskis
Course Number: ENR 4010
Semester Credits: 1
Contact Hours: 21
Dates: January 3-5, 2022
Classroom: Spur Ridge Classroom and field sites at Teton Science Schools' Kelly Campus in Jackson Hole

REQUIRED TEXT: Marchand, P.J. 2013. Life in the cold: an introduction to winter ecology, 4th edition. University Press of New England, London. 305 pp. (Available for purchase on Amazon.com)

Course Description:
This course offers a hands-on introduction to the winter environment and emphasizes developing winter naturalist skills, animal tracking, and safety in winter. Students will acquire the necessary winter field skills to successfully study winter ecology through lectures and inquiry-based field activities. Students will learn cross country skiing, engage in observations of plants and animals, create a naturalist journal based on their observations, and share their findings with peers.

Disability Statement:
If you have a physical, learning, sensory or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with and provide documentation of your disability to University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.

Attendance/Participation Policy:
University-sponsored absences are cleared through the Office of Student Life.

Academic Honesty:
UW Regulation 6-802. The University of Wyoming is built upon a strong foundation of integrity, respect and trust. All members of the university community have a responsibility to be honest and the right to expect honesty from others. Any form of academic dishonesty is unacceptable to our community and will not be tolerated [from the UW General Bulletin]. Teachers and students should report suspected violations of standards of academic honesty to the instructor, department head, or dean. Other University regulations can be found at: http://www.uwyo.edu/generalcounsel/info.asp?p=3051

The instructor may make changes to the syllabus as the course proceeds. If necessary, these changes will be announced in class. Substantive changes made to the syllabus shall be communicated in writing to the students.

Educational Objectives:
Students will:

1. Gain hands-on experience with skills necessary to study winter ecology in the field.
2. Be exposed to major topics in the teaching of winter ecology including
    a. animal tracking;
    b. adaptations to winter environments;
    c. wildlife behavior; and
    d. cross country skiing.

3. Create a naturalist journal of winter observations.
4. Present their summary findings to peers.

Assessment and expectations: This is a letter grade course. Daily attendance is expected per policy. Rubrics will be provided for each category of assignment. Complete work in a timely and professional manner. One point per day on the 4 point-rubric scale will be deducted for late assignments.

Quizzes 20%
Quizzes cover class and field material. Quizzes may be field practical or lab.

Full participation in field, classroom, and presentations 20%
Students are required to attend all course meetings and events and take an active role in field and classroom activities.

Naturalist Journal 40%
Students compile and organize naturalist observations using methods suitable for winter ecology data collection.

Summary presentation of naturalist findings 20%
Students will prepare and deliver a creative presentation of naturalist observations to their peers.

Course Schedule:

Day 1; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Course Introduction, Intro to Winter Ecology,
Field: trail system, cross country skiing, animal tracking and plant identification field exercises, start naturalist journal observations
Assigned Reading: *Life in the Cold* by Peter J. Marchand, Chapter 1 *Winter Paths: Options for Overwintering Success* and Chapter 8 *Humans in Cold Places*

Day 2; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Introduction to animal tracking, species accounts
Field: natural history field observations and data collection,
Assigned Reading: *Life in the Cold* by Peter J. Marchand, Chapter 6 *Plant-Animal Interactions: Food for Thought;* Selected readings from**:** *Field Guide to Tracking Animals in Snow* by Louise R. Forrest

Day 3; 9:00 AM–5:00 PM, Spur Ridge Classroom and Field
Classroom: Animal Behavior observation methods
Field: National Elk Refuge, Miller Butte, & National Museum of Wildlife Art- animal behavior research and naturalist observations, journaling
Classroom & Field: Creative presentation of natural history observations and animal behavior data, Course evaluations.
Assigned Reading: *Life in the Cold* by Peter J. Marchand, Chapter 7 *Winter Profiles: A Season in the Lives of Selected Animals p.176-194*; *Exploring Animal Behavior in Laboratory and Classroom* by Plogger, B.J. 2003 Ch.1 Learning to Describe and Quantify Animal Behavior

Teton Science School Field Education Program
Winter Ecology – Snowpack Dynamics and Snow Science
January Term 2022

For more information on course content contact:
joanna.ahlum@tetonscience.org

Course Title: Winter Ecology – Snowpack Dynamics and Snow Science
Faculty of Record: Melanie Matthews
Faculty: Joanna Ahlum, M.S., Sylvia Doyle, M.S., Lena Goss, and Alex Sivitskis
Course Number: ENR 4011
Semester Credits: 1
Contact Hours: 21
Dates: January 6-8, 2022
Classroom: Spur Ridge Classroom and field sites at Teton Science Schools' Kelly Campus in Jackson Hole

REQUIRED TEXT: Marchand, P.J. 2013. Life in the Cold: an introduction to winter ecology, 4th edition. University Press of New England, London. (Available for purchase on Amazon.com)

Course Description: This course focuses on snow science, snowpack dynamics, and winter research skills through lectures and inquiry-based field laboratories. This short course will allow for an in-depth study of the Jackson Hole snowpack through direct engagement in studying snow formation, metamorphism, and properties of snow significant to winter ecology. Snow science will become a tool to better understand the winter environment.

Disability Statement:
If you have a physical, learning, sensory or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with and provide documentation of your disability to University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.

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The instructor may make changes to the syllabus as the course proceeds. If necessary, these changes will be announced in class. Substantive changes made to the syllabus shall be communicated in writing to the students.

Educational Objectives:
Students will:

1. Gain hands-on experience with snow science, snowpack dynamics, and winter research skills by studying the snowpack outdoors in the winter environment.
2. Be exposed to major topics in winter ecology including
    a. snow crystal formation and metamorphism
    b. snowpack dynamics including material physics
    c. conduct snowpack evaluation and avalanche risk assessment in the field

    d. avalanche safety (This course is not a dedicated avalanche safety course and will not address this topic in as much detail as a Level 1 Avalanche Safety Course. Please seek out appropriate training if you intend to travel in avalanche terrain.)
    e. subnivean microclimate.
3. Conduct a winter field research project on snowpack dynamics.
4. Present research findings to peers.

Assessment and expectations: This is a letter grade course. Daily attendance is expected per policy. Rubrics will be provided for each category of assignments. Complete work in a timely and professional manner. One point per day on the 4 point-rubric scale will be deducted for late assignments.

Quizzes 30%
Quizzes cover class and field material. Quizzes may be field practical or lab.

Full participation in field, classroom, and presentations 20%
Students are required to attend all course meetings and events and take an active role in field and classroom activities.

Research project and presentation 50%
Students conduct a research investigation and experience the preparation and delivery of a research presentation to their peers. Students will be assessed on the following components: research proposal, investigation design, field data collection, analyses, and conclusions, presentation quality.

Course Schedule:

Day 1; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Course Introduction, Introduction to Snow Science, Snow Crystal Formation and Metamorphism.
Field: Snow pit analysis and data collection, snowshoeing.
Assigned Reading: *Life in the Cold* by Peter J. Marchand Chapter 2: The Changing Snowpack, pp 24-36

Day 2; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Avalanche dynamics and snowpack stability.
Field: Field snow stability assessment, avalanche awareness, subnivean microclimate.
Assigned Reading TBD: The Avalanche Handbook selected readings from Ch. 4 Avalanche Formation

Day 3; 9:00 AM–5:00 PM, Spur Ridge Classroom and Field
Classroom: AM Review snow science research proposals
Field: Conduct field research project on snowpack dynamics.
Classroom: PM Analyze research data and prepare presentations.Research Presentations and Course Evaluations.
Assigned Reading TBD: Literature review required appropriate to research topic.

Teton Science School Field Education Program
Winter Ecology – Wildlife and Plant Adaptations
January Term 2022

For more information on course content contact:
joanna.ahlum@tetonscience.org

Course Title: Winter Ecology –Wildlife and Plant Adaptations
Faculty of Record: Melanie Matthews
Faculty: Joanna Ahlum, M.S., Sylvia Doyle, M.S., and Lena Goss
Course Number: ENR 4012
Semester Credits: 1
Contact Hours: 21
Dates: January 9-12, 2022
Classroom: Spur Ridge Classroom and field sites at Teton Science Schools' Kelly Campus in Jackson Hole

REQUIRED TEXT: Marchand, P.J. 2013. Life in the cold: an introduction to winter ecology, 4th edition. University Press of New England, London. 305 pp. (Available for purchase on Amazon.com)

Course Description: This course emphasizes the effects of winter abiotic conditions on organisms and subsequent adaptations to these conditions. This short course focuses on animal and plant adaptations to cope with the stresses of winter as well as the predicted impacts of climate change through lectures and inquiry-based field laboratories. Students will also conduct research in small groups focused on a winter ecology topic and present their results.

Disability Statement:
If you have a physical, learning, sensory or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with and provide documentation of your disability to University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.

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The instructors may make changes to the syllabus as the course proceeds. If necessary, these changes will be announced in class. Substantive changes made to the syllabus shall be communicated in writing to the students.

Educational Objectives:
Students will:
1. Gain hands-on experience with ecological processes and winter skills.
2. Be exposed to major topics in winter ecology including
    a. Basic introduction to energy flux in a winter environment;
    b. Coniferous and deciduous plant adaptations to winter;

c. Morphological and physiological adaptations of organisms to winter;
d. Climate change impacts on winter ecology; and
e. Winter ecology research methods.

3. Conduct a winter field research project.
4. Share research findings with peers.

Assessment and expectations: This is a letter grade course. Daily attendance is expected per policy. Rubrics will be provided for each category of assignment. Complete work in a timely and professional manner. One point per day on the 4 point-rubric scale will be deducted for late assignments.

Quizzes 30%
Quizzes cover class and field material. Quizzes may be field practical.

Full participation in field, classroom, and presentations 20%
Students are required to attend all course meetings and events and take an active role in field and classroom activities.

Research project and presentation 50%
Students design and conduct a research investigation. Students will be assessed on the following components: research proposal, investigation design, field data collection, analyses and conclusions, presentation quality.

Course Schedule:

Day 1; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Plant and Animal adaptations to winter focusing on the flora and fauna of Jackson Hole WY.
Field: Animal and plant adaptations and microclimates
PM: Introduction to Research & Research Proposals
Assigned Reading: *Life in the Cold* by Peter Marchand: Chapter 3: Plants and the Winter Environment, pp 47-90 and *Life in the Cold* Chapter 4: Animals and the Winter Environment, pp 91-134
Student equipment required: Winter clothes, camera (optional), field notebooks, binoculars, hand lens

Day 2; 9:00 AM-5:00 PM, Spur Ridge Classroom and Field
Classroom: Climate change impacts and adaptations to winter, Review research projects proposals
Assigned Reading: *Life in the Cold* by Peter J. Marchand Ch. 9 The Changing Snowpack II; HCN- *Can snowshoe hares outrace climate change*
Field: Climate change and resilience
PM: Data Analysis and Presentation Prep
Student equipment required: Winter clothes, camera (optional), field notebooks, discussion article, binoculars, hand lens

Day 3; 9:00 AM–5:00 PM, Spur Ridge Classroom and Field
Classroom: Research Progress Check-in
Assigned Reading: Literature review relevant to research project
Field: Winter ecology field research
PM: Data Analysis and Presentation Prep
Student equipment required: Winter clothes, camera (optional), field notebooks, binoculars, hand lens

Day 4; 9:00 AM–5:00 PM, Spur Ridge Classroom
Classroom: AM Data Analysis and Research Presentation Preparations
Assigned Reading: Literature review relevant to research project
Classroom: 2-4 PM Research Presentations
PM: Closing and Course evaluations

Clothing & Equipment

Laundry services are not available on the Kelly Campus of Teton Science School.

Footwear
___ 1 pair warm/waterproof snow boots, felt liners recommended (Sorels, snowmobile boots with liners, etc.).
___ 3-4 pairs warm wool or synthetic socks. Students will wear 2 pairs of wool socks at a time on cold days. 2 pairs of polypropylene liner socks are optional but useful.

Upper Clothing Layers
___ 1 warm winter coat: wool, down or fleece recommended (or parka shell plus additional thick layers)
___ Waterproof shell jacket
___ 1 or 2 warm, fleece layers (wool sweaters also are good)
___ 2 long-sleeved shirts or turtlenecks (capilene and polypropylene are recommended)
___ 1 warm winter cap or balaclava (must cover ears)
___ 1 pair thick wool or insulated mittens good to 0° F (if wool, please bring 1 pair of nylon over mitts or shells); an extra pair of mittens is optional, but encouraged

Bottom Clothing Layers
___ 1 pair long underwear (wool or synthetic, not cotton)
___ 1 pair pants for snow or cold weather: wool or synthetic
(Army surplus wool pants are fine)
___ 1 pair warm loose fitting pants (jeans or comfortable pants for evening)
___ Changes of underwear appropriate for your length of stay

Other Necessary Items
___ Personal toiletries: towel, washcloth, toothbrush, comb, soap, etc.
___ Personal bedding: fitted & flat sheets, blanket or sleeping bag, pillow case
___ Notebook and writing materials
___ Sunscreen/sunblock/chapstick, SPF 15 or higher
___ Glasses or goggles
___ Small flashlight and batteries
___ Duffel bag or suitcase (for storage of gear)

Optional Items
___ Personal pillow (Teton Science Schools supplies pillows to each student)
___ Camera and film
___ Colored pencils
___ Binoculars
___ Laptop computer

Teton Science Schools will provide
___ Cross-country skis, boots, poles and snowshoes
___ Gaiters, day pack, sitpad
___ Water bottle, lunch container
___ Binoculars

Typical Kelly Campus Daily Schedule

*detailed course schedules will be provided upon your arrival

Time	Activity

7:25 am	Arrive at the dining lodge
7:30 - 8:15 am	Breakfast Pack lunch Dining Lodge clean-up
8:15 - 9:00 am	Prep for Field Day
9:00 am	Typical course start time (sometimes earlier) which will usually begin in the classroom.
~12:00 pm	Lunch in the field
4:00 pm	Return from the field (time may change based on the location of fieldwork), quiz time, clean lunch containers
5:30 - 6:15 pm	Dinner Dining Lodge clean-up
7:00 pm	Evening programs if planned If not, evenings are left for reading time and academic work assigned in class
10:00 pm — 7:00 am	Quiet Hours

Teton Science School Field Education Program
Winter Ecology – UW January Term 2023

Instructor Bios

Joanna Ahlum

Director of Field Education: Curriculum & Instruction
M.S. Environmental Studies, San Jose State University
B.A. Biology, Westmont College

Before coming to Teton Science Schools, Joanna taught in the Environmental Studies and Sciences Department at Santa Clara University for seven years. She has also been a practitioner in the fields of restoration ecology, conservation agriculture, and environmental education. As an ecologist, she's interested in how regenerative practices in agriculture and elsewhere can enhance human livelihoods and biodiversity. As an educator and a learner, she's invested in curating experiences that awaken desire to reconnect with the rest of nature. She loves exploring the world with her husband and their two young girls, getting out in the mountains, and reading great books.

Sylvia Doyle

Field Education Faculty
M.S. Environmental Studies, University of Montana
B.A. Environmental Science, Colby College

Sylvia manages the Doug Walker Challenge Course. Originally from Connecticut, she moved to Jackson to work at Teton Science Schools in 2012, and her experiences ignited a passion for place-based education and a love for Jackson Hole. For her Master's project, she developed a stream science and stewardship program in collaboration with a Missoula high school and the Watershed Education Network, designed to bring science learning outside, link science with stewardship, and introduce students to their local government. Since then, she has practiced place-based education at the Jackson Hole Children's Museum, at NatureBridge in Yosemite, and at the employee childcare center in Yosemite. She believes in the power of outdoor experiences to connect and empower children of all ages. In her spare time she runs in the mountains, skis, and likes to climb the prettiest rocks she can find.

Lena Goss

Field Education Faculty

Lena grew up in the Pacific Northwest exploring the tidepools, beaches, and forests of Puget Sound. At college in eastern Washington Lena studied geology and biology and got the chance to study the Greater Yellowstone Ecosystem through field courses in the summers. Lena first joined TSS as a Summer Instructor in 2019 and is enjoying a new role as Field Education Faculty. When not engaging with students in the outdoors Lena can be found riding her bike, hiking, and enjoying the mountain lakes of the Tetons.

Alex Sivitskis

Professional Learning Coach

Alex is originally from the small town and glaciated landscapes of Princeton, Massachusetts. After completing his undergraduate studies in Earth sciences, he began a career in environmental education through an AmeriCorps position in Casper, Wyoming. Alex first joined Teton Science Schools in 2018 as a participant in the graduate program. He went on to complete Master's degree in Natural Science Education from University of Wyoming. For the past two years he was teaching place-based education, GIS, and remote sensing at The Royal University of Bhutan and other nonprofit organizations through a fellowship with TSS.

Alex joined the TSS Field Education department as a lead instructor for the 2022 season. Now returning to the Greater Yellowstone Ecosystem, he is excited to respectfully engage with the land alongside students. His educational philosophy is centered around the implementation of a critical pedagogy of place and inquiry-based learning.