



Winter 2024

NWAC Snow School Intern

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Recommended Citation

Zobrist, Cayla A., "NWAC Snow School Intern" (2024). *College of the Environment Internship Reports*. 201.
https://cedar.wwu.edu/cenv_internship/201

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COLLEGE OF THE ENVIRONMENT



Internship Title: Mt. Baker Snow School

Organization Worked For: Northwest Avalanche Center

Student Name: Cayla Zobrist

Internship Dates: 2/22/24-3/29/24

Faculty Advisor Name Kate Darby

Department ENVS

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STUDENT SIGNATURE Cayla Zobrist

DATE: 3/26/24

NWAC x WWU

Snow School Internship

Cayla Zobrist
Quarter: Winter 2024

Internship Organizations

The Northwest Avalanche Center

The Northwest Avalanche Center (NWAC) is a non-profit organization that is dedicated to elevating avalanche awareness, reducing avalanche impacts, and providing important services such as mountain weather and avalanche forecasts, education programs, and data resources to the community. NWAC envisions a Pacific Northwest backcountry user community that is well-informed about avalanche risks and capable of making informed decisions for safe outdoor activities. NWAC holds a 3-year plan that outlines five major goals aimed at meeting the needs of the backcountry community across Washington State as well as Oregon. These goals include various aspects such as improving forecasting capabilities, expanding education programs, improving data collection and visualization, and ensuring organizational sustainability. Over the years, NWAC has changed for the good significantly, transitioning to become part of the US Forest Service (USFS). This merge marked a period of growth and innovation for NWAC, leading to the development of a strong forecasting program staffed by avalanche meteorologists and specialists purposely located in key satellite locations across the region.

NWAC's forecasting program runs once a sufficient amount of snow allows for consistent on-snow travel, which typically starts around Thanksgiving and will continue through mid to late April. The forecasts are carefully made by a committed team of forecasters who utilize weather models, remote weather stations, snowpack data, field observations, and insights from avalanche professionals and the public. This collaborative approach ensures the accuracy and reliability of NWAC's daily forecasts, which is crucial for backcountry lovers and professionals. NWAC's data collection efforts are outstanding, maintaining one of the most comprehensive mountain weather data networks in the United States. The network comprises about 50 remote WeatherStation owned as well as maintained by NWAC, the WSDOT avalanche program, and ski area operations. The data collected is documented and projected on NWAC's website, providing field time weather and snowpack information which is crucial for informed decision-making.

Education is part of the foundation of NWAC's initiatives, with a strong program offering free avalanche awareness classes, workshops, and resources for both youth and adults. These educational efforts are led by a committed program director and trained instructors, which are all aimed to equip outdoor enthusiasts with the knowledge and skills needed for safe backcountry travel. NWAC's non-profit administration is based in North Bend and oversees education, outreach, fundraising, website management, and technological projects. Funding for NWAC is gained from partnerships with the following stakeholders, including the US Forest Service, Washington State Parks and Recreation Commission, Washington State Department of Transportations, National Park Service, Pacific Northwest Ski Areas Association, and the NW Winter Sports Foundation.

The United States Forest Service

The United States Forest Service focuses their attention on the mission of preserving the health, diversity, and productivity of national forests and grasslands to benefit the current and future generations. They operate under the US Department of Agriculture and are tasked with managing the nation's forests as well as public lands. The US Forest Service tends to have diverse sets of land that are spread across more than 193 million acres in the United States. The diverse landscapes include national forests and grasslands that utilize scientific research, conservation strategies, and community engagement. Managing the forests is one of the main focuses of the US Forest Service, as it includes activities such as sustainable

timber collecting, wildlife habitat restoration, watershed protection, and reforestation efforts. The efforts being accomplished maintain the ecological balance between the forest ecosystem which also supports beneficial utilization of forest resources.

The USFS is also heavily involved in wildlife management and prevention. They use various strategies, including controlled burns and fire suppression techniques, to reduce fuel amounts, and safeguard forested areas. The Forest Service places a strong emphasis on educating the public about fire safety measures and collaborates with other agencies and organizations to enhance firefighting capabilities. The US Forest Service makes it a point to hold a strong emphasis on educating the public about wildlife management and prevention. Various strategies including controlled burns, reducing fuel amounts, as well as practicing fire suppression techniques help manage the environment. Education and outreach programs are an important component of the US Forest Service's mission. The service provides educational programs, workshops, and resources to schools, communities, and individuals, aiming to raise awareness about the importance of forests. By forming a deeper understanding of environmental-issued resources, the USFS seeks to instill a sense of responsibility and care for America's forests and public lands.

Mt. Baker Heather Meadows Ski Area

The Heather Meadows Ski Area is located at Mt. Baker in Deming Washington, where the NWAC x WWU Snow School internship took place, seen in Figure 1. The mountain offers a variety of options to those who may love outdoor recreation, natural beauty, and adventure for nature lovers, outdoor enthusiasts, and anyone seeking a memorable wilderness experience. Mt. Baker is a perfect place for students to learn about snow science as it receives the most snowfall in the world for each given year. With so much snow falling there are always new layers of snow, making it easy to show the students each snowpack layer along with how snowpack plays a role on Mt. Baker. Students were provided snow shoes from the Mt. Baker Rental shop. Here they learned how to put them on as well as how to move around in them efficiently. The ski area provided great station areas in which the students gained valuable knowledge. Thanks to Mt. Baker, the Snow School internship can exist as well as provide an incredible experience to the interns and students.

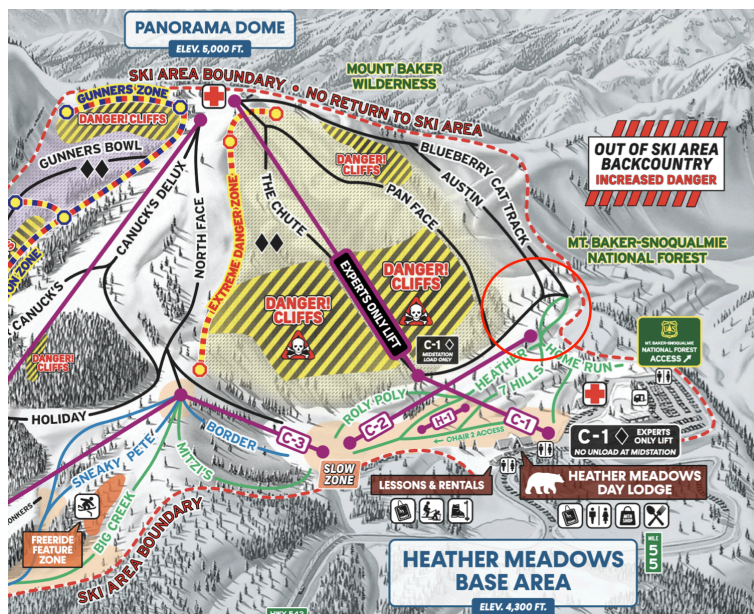


Figure 1. Heather Meadows Ski Area is located on Mt. Baker. The red circle indicates where the four learning stations took place, teaching students about the science behind snow (source: [Mt Baker Ski Area](#))

Internship Responsibilities

As a snow school intern working with the Mt. Baker Ski area, the Northwest Avalanche Center, and the US Forest Service we are expected to attend all Mt. Baker Snow School trainings, sessions, and events. We are required to be up to date on the teaching materials, encouraged to ask questions, as well as be engaged! We were expected to be cooperative, flexible, and willing to work with team members.

On teaching days of Snow School instructors are required to be at Mt. Baker at 8 am with the day ending around 3 pm. At the beginning of the day before any students arrive instructors rent out a radio, which is used in order to keep track of time/listen to orders given by the coordinator. While waiting for students to arrive instructors organize gear and clothing for the incoming students, preparing to hand out gear to those who need better warmth. After the gear is laid out instructors are to check their personal gear making sure all tools are present as well as easily accessible, during this time is when snowshoes are laid out as well. Once everything is prepared the bus typically arrives with the set group of middle school students coming from Whatcom and Skagit County districts. Instructors then teach each student the purpose of snowshoes and how to put them on. Once snowshoes are on all students the instructors then lead the students to where their stations are in the snow. Here is when the NWAC specialist takes over and as they are teaching students we as instructors are expected to stay engaged as well as add on to what the specialist is teaching, you can see an example of this in Figure 2. The four stations specialists/instructors are expected to teach is snow depth measurement, snow pit profiles, snow-water equivalent, snow crystals, and snow algae. Following teaching the students are then led back to the lodge by instructors where lunch is eaten and any borrowed gear is returned. Once the students finish lunch they are then loaded back onto the bus. Instructors are then expected to clean up everything used during a day at the Snow School. When Snow School is cleaned up instructors, coordinators, and specialists group together to debrief and dismiss.

There are additional tasks included in a day of Snow School entailing alphabetizing release forms, fixing gear, organizing instructor kits, escorting students to lodge with chaperones if sick or otherwise pulled from the program, as well as subbing for instructors as necessary. Each instructor is required to carry a first aid kit, radio, extra clothing for students, extra water, a bag for waste, a watch, and a cell phone in case MNSA dispatch needs to be called.

Internship Reflection

Public Speaking

The NWAC x WWU Internship at Mt. Baker has supported my professional as well as personal goals in a few of many ways. A personal goal that this internship helped me with substantially, is my fear of public speaking. I gained valuable experience in preparing and delivering information on a wide range of topics related to snow science, avalanche safety, backcountry travel, and outdoor recreation. Presenting this information is not just about conveying the information but also about engaging the students, creating memorable experiences, and inspiring action. With the help of this internship, I was able to practice techniques for handling questions, managing time, and maintaining the student's interest throughout the lessons. I found it easier to work on public speaking as my targeted audience varied around 6th-8th grade students.

Within the internship communication is a key requirement, as we are always to stay in touch with one another. Effective communication is important when it comes to the NWAC x WWU internship as we interns interact with students, Mt. Baker ski staff, NWAC specialists, as well as the community. Interacting with one another requires communicating key safety messages, sharing relevant information, and advocating for responsible outdoor practices. We learned to navigate challenging conversations that might have resulted in concerns or even an important issue. I found communication to be most important when working with students as we are who they are looking up to. During the internship, the students referred to us interns as "guides". Having this title held responsibility as we were leading and engaging the students through each informational station. When the students first stepped off the bus they seemed

timid and nervous. I made it a goal to have conversations about what they liked and or what they were comfortable with. This opened them up and eased their nerves. They found this extremely impactful when getting to know the students as well as listening to their needs and helping them if needed.

Networking opportunities are something I got to take away from the internship. It provided valuable networking opportunities for me to connect with professional experts, and organizations in the snow science, avalanche safety, and outdoor education fields. This networking opportunity offered me platforms for myself to engage in meaningful conversations with the experts. I believe that this opportunity is going to help expand my professional network as well as access new opportunities in these given topics. I can enhance my ability to communicate effectively, collect useful information, as well as relay that information, which is essential for successful public speaking engagements. All of the NWAC specialists opened my eyes to the possible careers being done in and with the snow. Talking with them and getting insights about the industries provided me with so much knowledge on a possible future career in the snow. I was able to spend a good amount of time talking to NWAC specialist Graham Clark, discussing his role within NWAC and how what he does impacts the environment. I enjoyed our conversation as it gave me a glimpse of what it's like to be in his shoes. In Figure 2 you can see Graham teaching the students how to measure the amount of water that is in the snow.



Figure 2. NWAC specialist Graham Clark is asking students whether they think the snowpack is over or under 200 inches. He takes the measuring stick and pushes it down into the snow until it reaches the dirt.

Exploration of Career Path

The NWAC x WWU Snow School internship provided an experience that greatly benefited me as it opened the opportunity to explore various career paths. Throughout this internship, I was able to engage in hands-on activities and gain practical experience in the fields of snow science, avalanche forecasting, and outdoor education. This learning experience allowed me to immerse myself in day to day tasks and responsibilities of the specialists present at the internship. Learning from the specialists allowed me to gain invaluable insights as well as get my foot in the door into potential career paths. Jeff Hambelton, featured in Figure 4, is a specialist at the Northwest Avalanche Center. His focus is on avalanche prevention as well as assessing avalanche risk by analyzing snowpack. In the back of the image, you can see how he tests the snowpack, seeing if the area is in danger of an avalanche. Simple hand tests were conducted in the snow wall behind Jeff, done by himself as well as the students.

Along with the networking opportunities came skill development across various domains. As an intern, I was able to develop some critical skills to use in risk management, decision-making under pressure, effective communication, teamwork, as well as leadership skills. These skills are highly transferable and apply to a wide range of careers we were introduced to during the internship. The hands-on nature of the internship allowed me to apply hypothetical knowledge in real-world settings, tuning in my skills and enhancing my readiness for future career opportunities. Exploring different career paths throughout this internship fulfilled my professional goal of taking a step into the NWAC specialist's and Mt. Baker coordinator's shoes and seeking what a day-to-day life is for them.

Being a part of the NWAC x WWU internship has benefitted my possible future profession as I have gained more knowledge in the specific industry of snow science. The internship offered a hands-on experience learning about the snow and what it is capable of. For example, if I were to pursue a future career in avalanche safety, this internship provided me with the practical experience to demonstrate in teaching avalanche safety and risk management. Having this experience intrigues future employers seeking candidates with real-world knowledge and skills specific to the industry.

Although I didn't earn any official certifications I was able to be trained in avalanche safety, outdoor leadership, wilderness medicine, as well as other related areas. Ways I was able to demonstrate this during the internship was by doing compression tests with the snow. In Figure 3 you can see an NWAC specialist conducting a compression test on the snow. This test is done in the snow and involves checking the stability and strength of the snowpack by applying pressure to the top of the snowpack and observing how it responds. You can see Jeff Hambelton carrying a snow block which was a result of the compression test. Being trained in these areas not only enhanced my skills and knowledge but also created me to present as a more experienced candidate for future jobs requiring these specific qualifications. It can be extremely helpful to already have prior information under your belt. Being certified and having training from reputable organizations such as NWAC adds credibility to my qualifications. Completing the NWAC x WWU internship allows me to add it to my resume, as that will enhance and add significance to it. Adding the internship to my resume showcases my hands-on experience, technical expertise, commitment to safety, and passion for outdoor education and adventure sports. I can catch the eye of future employers as I may decide to pursue a career in the realm of snow science.

I come to believe that participating in the NWAC x WWU Snow School internship demonstrated my passion for snow science and outdoor education. During the internship, I was motivated and committed to what was being accomplished. I feel as though showing motivation, dedication, and commitment can tell a lot about a person, and showing that in yourself can make a difference. During the Snow School internship, I had the opportunity to expand my leadership role by serving as a guide for the students. Accepting this responsibility was not only fulfilling but also had a significant impact on the student's learning experience. I enjoyed the sense of responsibility that came with guiding them, as it influenced how they absorbed and retained the information. Being in a leadership position allowed me to

make a meaningful contribution to the program and positively influence the student's understanding and appreciation of snow science and avalanche safety.

Improved and Gained Skills

Although I did not create any charts of my time at the NWAC x WWU Snow School internship, I was able to gain some valuable skills along with improving personal skills that will benefit me for a possible future career. Something I am proud of improving on is my confidence. Out of all 24 interns, I was the youngest one, which was a little unsettling at first but once I had become more comfortable with the program and my peers, it was amazing! Meeting new people and starting conversations have always been a struggle for me. I am grateful to have been accepted into this internship as it pushed me outside of my comfort zone and boosted my confidence. I found that working with a younger audience made it easier, as if I did make a little mistake there wouldn't be a huge reaction since the students were 6th graders. At times I don't give myself enough credit when it comes to my own personal confidence but as I near the end of the internship I can say that a huge improvement has been made. The NWAC specialists made a big impact on me during this time as I was able to ask any question with ease. The valuable feedback the specialists provided me, especially when it was positive, strongly contributed to boosting my self-confidence. Hearing those positive remarks about my performance played a big role in my growth during the program. One of my favorite things was also hearing good feedback from the students. It was rewarding to hear each one of them thank me as well as say I was a great guide for them!

Another skill I am proud to say has improved is my teamwork as well as collaboration with others. The Snow School internship relies on the use of communication heavily as it was important for safety reasons, instruction, learning, using a walkie-talkie, and even problem-solving. I'm typically a shy person so due to the use of communication also pushed me out of my comfort zone for the good. Once I had down my jobs and duties I became more comfortable collaborating with my team. All of the interns were so nice and willing to help anyone at any given time. Although we were role models for the students and had to be on professional behavior we were still able to have a little fun with each other when working as a team. Towards the start of the internship, I felt a little disconnected from some of the interns as a lot of their personalities were very outgoing. Zoe, one of the interns, introduced herself to me and helped me ease my way into being comfortable with everyone, which thankfully didn't take a lot of time. Having Zoe as a peer gave this little push opened me up and allowed me to have an exceptional experience working with my fellow interns. I built relationships with not only my peers but the students as well. I enjoyed working and collaborating with the students as it was interesting to hear their thought process behind learning about snow science.

During my time as an intern at Snow School, I was particularly excited about developing the skills of gaining deeper insights into the industries associated with Mt. Baker. I am not entirely confident in knowing what my future career would be but because of this internship, I am now interested in a job related to snow science! Snow water equivalent was a station that the students participated in and excited me the most. The students learned how to measure the amount of water in a given snow sample, 'the recipe' for an avalanche, as well as how the density of snow impacts the watershed. The NWAC specialist teaching this station was Graham Clark. Graham works with the NW Avalanche Center and is a wilderness first responder, and avalanche course instructor, is snowmobile certified, as well as graduated from WWU with a degree in environmental geology! At his station, he went in-depth talking about how the surrounding mountains all provide snowmelt that then goes into the Nooksack River. The snow fields as well as glaciers on the mountains how we have water during the summer. The students were taught that the water is used for the salmon in the ocean, farming and agriculture, household use, etc. I found the process of measuring the water in the snow and how it impacts everything around us so interesting. Hearing what Graham does within his job and how he applies it to the mountain was so interesting to me. This internship most definitely made me want to pursue a future career working with the snow, and how it can affect the environment around us.

Images of NWAC Specialists



Figure 3. NWAC specialist Jeff Hamblen is holding a snow block, in result of doing a compression test on the snowpack.



Figure 4. NWAC specialist Jeff Hamblen is demonstrating to students his results from the hand test that was done behind him.

In Figures 3 and 4 Jeff is teaching the students how to deploy equipment correctly and how to identify layers within a snowpack. What the students are learning about at this station is what tests are used to determine characteristics of layers in the snow, how layers are formed and the role they play in avalanches, as well as learning about the science dedicated to understanding snow and avalanches.



Figure 5. NWAC specialist Patrick Beebe is teaching the students what albedo is and how snow algae is formed.



Figure 6. A bucket of 'snow algae' placed out to give the students an idea of what it looks like.

In Figures 5 and 6 Patrick is demonstrating to students the concept of albedo as well as how algae can grow from it. He teaches the students how to understand the snow as an ecosystem with life. While at his station the students ask a question, form a hypothesis, design an experiment, analyze data, as well as then communicate the results to one another.

Appendix: Internship Time Log

Internship: Mt. Baker Snow School is a cooperative program between Mt. Baker Ski Area, the Northwest Avalanche Center, Western Washington University, and the US Forest Service

Quarter and Year: Winter 2024

Start time/		Number of hours		
Date	End time	worked in day	Activity	
2/22/2024	6am-4pm	10 hours	Training day: Commute to Mt. Baker, arrive, lesson plan overview, facility tour, learn to gear up, learn stations: - Algae Station - NWAC Snowpit Profiles - NWAC Water Equivalent - Snow Crystal Station Learn instructor kit tools, collaborative talk throughout day, learn of risk management, commute to Bellingham	
3/1/2024	6am-4pm	10 hours	Commute to Mt. Baker, arrive, daily chores, prep myself as well materials for affective teaching, discuss any concerns or challenges, greet bus, follow risk management policies, assist during stations, engage with students, attend to radio calls, clean up, end with a team discussion, commute to Bellingham	
3/8/2024	6am-4pm	10 hours	Commute to Mt. Baker, arrive, daily chores, prep myself as well materials for affective teaching, discuss any concerns or challenges, greet bus, follow risk management policies, assist during stations, engage with students, attend to radio calls, clean up, end with a team discussion, commute to Bellingham	
3/15/2024	6am-4pm	10 hours	Commute to Mt. Baker, arrive, daily chores, prep myself as well materials for affective teaching, discuss any concerns or challenges, greet bus, follow risk management policies, assist during stations, engage with students, attend to radio calls, clean up, end with a team discussion, commute to Bellingham	
3/22/2024	6am-4pm	10 hours	Commute to Mt. Baker, arrive, daily chores, prep myself as well materials for affective teaching, discuss any concerns or challenges, greet bus, follow risk management policies, assist during stations, engage with students, attend to radio calls, clean up, end with a team discussion, commute to Bellingham	
3/29/2024	6am-4pm	10 hours	Commute to Mt. Baker, arrive, daily chores, prep myself as well materials for affective teaching, discuss any concerns or challenges, greet bus, follow risk management policies, assist during stations, engage with students, attend to radio calls, clean up, end with a team discussion, commute to Bellingham	
3/14/24- 3/27/24	Time varied across days spent on	12 hours	Time spent working on internship report	