REVIEWING THE PRESCOTT COLLEGE AVALANCHE FORECASTING COURSE:  
PAST, PRESENT, AND FUTURE

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ABSTRACT: Prescott College’s Avalanche Forecasting course is a three-week, 4 credit-hour field course focusing on snow science and avalanche forecasting for backcountry travellers. Since its inception in 1983, Avalanche Forecasting has marked the beginning of successful careers in snow science, avalanche forecasting, ski guiding, avalanche education, and serious recreational backcountry pursuits. American Avalanche Association Level 2 curriculum is used as a foundation for the course, and a Level 2 certificate is awarded to students who successfully complete the curriculum. Students learn operational and site-specific forecasting methods and demonstrate their competence by writing and reviewing weather and avalanche forecasts, learning and implementing ski-guiding techniques, and applying industry standard language and notations. Students engage in course instruction through several presentations and complete independent research projects on advanced topics in snow and avalanche science. Many participants have given anecdotal evidence for the value of Avalanche Forecasting through praise, testimony and pursuit of professional careers in avalanche safety following completion of the class. However, the effectiveness of Avalanche Forecasting has not yet been examined outside of standard college distributed course assessment forms, and the course has never been assessed for its persisting value as alumni become professionals in the snow science world. A survey of Avalanche Forecasting alumni and teachers has been used to investigate alumni outcomes and to inform recommendations for future Avalanche Forecasting courses. This paper will discuss the history and format of Avalanche Forecasting, analyze alumni outcomes, and present recommendations for future Avalanche Forecasting courses and additional research.

KEYWORDS: Avalanche Forecasting, avalanche education, AAA Level 2, Prescott College.

1. INTRODUCTION
Prescott College’s Avalanche Forecasting class provides education in advanced topics in snow science, winter leadership and recreation. Many graduates of the course have gone on to become respected avalanche professionals, and many others remain active backcountry winter recreationalists (D. W. Lovejoy 2015, personal communication). To evaluate the role of Avalanche Forecasting in the development of graduates in both professional and personal realms, a survey was employed targeting both students and instructors. Basic questions about individuals’ rolls in and evaluation of the course were answered by the participants, generating both quantitative data and individualized qualitative responses. The results of this survey are discussed here, along with analyses of trends and recommendations for future iterations of this course.

2. BACKGROUND
2.1 Course History
Prescott College’s Avalanche Forecasting course began in the early 1980s. Prescott College faculty member David Lovejoy designed the pilot course in collaboration with Colorado Department of Transportation (CDOT) forecasters and observers Tim Lane and Jerry Roberts and proposed the course to the college, and it was offered shortly thereafter. The college had been providing courses in winter mountaineering, backcountry skiing, alpine climbing, and search and rescue since soon after the college’s inception in 1966. Avalanche Forecasting was proposed as a course that would provide students with a more advanced skill set which would be valuable in the pursuit of careers as backcountry professionals and
receronalists. Eventually compliance with AAA Level 2 curricular standards was adopted and certificates were awarded to students who successfully completed the rigorous three-week field and classroom integration (Lovejoy 2015). The course remains grounded in its original objectives to provide students with a “solid background in snow science, the mechanical properties of snow and forecast methodologies, along with a large doses of decision-making and risk management to prepare them for occupational opportunities with ski patrols, snowcat and heli-ski outfits, highway and backcountry-forecasting programs, guide services, or as avalanche educators” (Roberts 2002).

Avalanche Forecasting was initially run in the San Juan Mountains in Southwestern Colorado, infamous for its fragile snowpack. In 2000 Lynne Wolfe added a second section of the course in the Tetons Mountain Range, which was offered every other year when enrollment was high enough to support concurrent avalanche forecasting courses (Roberts 2002). Currently, a single section of the course currently alternates between the Tetons and the San Juans.

Tim Lane was the first Avalanche Forecasting instructor, followed by Jerry Roberts. Roberts and Wolfe were the primary instructors for the course for over two decades, and have co-taught with and been proceeded by many instructors with diverse snow-related experience and backgrounds. Avalanche Forecasting instructors include Ann Mellick, Trevor Deighton, Sue Miller, David Lovejoy, Ian McAmmon, John Farmer, Ben Traxler, Chris Marshall, Andrew Kiefer, and Philip Straub. Lovejoy has developed and promoted Prescott College’s snow studies curriculum since the beginning, and has taught a variety of winter field courses and mentored many related independent studies and senior projects (D. W. Lovejoy 2015, personal communication).

2.2 Curriculum

Avalanche Forecasting is a three-week long field course that operates during Prescott College’s winter block session, which is mid-January through mid-February. Level 2 curriculum as recommended by the AAA and CAIC provides curriculum guidelines for Avalanche Forecasting with topics covered in much more depth than a standard Level 2 course (Lovejoy 2015). This is made possible by the long-format structure of the course, as well as the amount of field experience and diversity of experiences provided for students. Outcomes, content, prerequisites, and performance measures parallel those presented in the Level 2 course guidelines created in 2010, shown in the American Avalanche Association Recommendations for U.S Avalanche Education table (AAA 2010). The course is “recommended for serious and qualified backcountry skiers or snowboarders, aspiring ski guides, and students wishing to further their knowledge of snow and avalanche dynamics in preparation for advanced recreational use, graduate studies or professional work” (Lovejoy 2015). Students are required to have prior backcountry experience and to have completed AAA or AIARE Level 1 training. Student qualifications are assessed through an application process and pre-course examination (Lovejoy 2015). These prerequisites allow the course to move quickly into field operations and advanced topics.

Avalanche Forecasting curriculum extends beyond AAA recommended content. Additional topics include deeper investigations of mountain meteorology, synoptic- and meso-scale weather forecasting, operational and site-specific forecasting, advanced metamorphism, human factor and psychology of risk, slab formation and fracture mechanics, tour planning and ski guiding techniques, field observations and stability testing, field safety and decision-making, use of telemetry and weather models, use of snow pit mapping software, and the roles of avalanche professionals (Lovejoy 2015). The course schedule and curriculum vary slightly by location, environmental conditions, and field trips, but there is typically a rotation between classroom days and field days, in which students apply and expand upon knowledge gained in classroom sessions, collect observations, and implement ski guiding technique. The course is enriched by guest presentations and visits to regional forecasting centers. Interaction with the Colorado Avalanche Information Center (CAIC), Colorado Department of Transportation (CDOT), Center for Snow and Avalanche Studies (CSAS), various ski area snow safety directors, guides, and other professionals continues to be one of the most beneficial components of the course and exposes students to various aspect of working in the field (Roberts 2002). Many Avalanche Forecasting alumni who have careers in snow science and snow safety meet with the class to discuss their professions.

In addition to being the only long-format avalanche education courses provided in the U.S., Avalanche Forecasting is unique in that curriculum is modeled after the two generalized tracks available
for avalanche professionals: a forecaster track and a guide track. The forecaster track prepares students for the work of avalanche forecasters by teaching students how to use and interpret weather telemetry, archived snowpack observations, and recent avalanche activity in order to write Operational Avalanche Advisories using industry standard language, format, and notations. Operational Avalanche Advisories include an avalanche danger rating, summary of avalanche problems, weather synopsis, and weather forecast and are modeled after forecasts produced by regional backcountry and highway forecasters. The guide track prepares students to work within the mountain guiding field. On designated “Guide Days” students create tour plans, lead a morning meeting in which they brief the group on travel plans and present the detailed custom operational hazard and risk assessment form they have completed, lead small groups on backcountry tours, and facilitate an end-of-day debrief. These “AM forms” include a weather synopsis and forecast, avalanche danger rating, hazard factors, objectives, and terrain evaluation and anticipated hazards, and are akin to what a ski guide would complete before taking clients into the backcountry. Inclusion of this curriculum provides students working towards careers as guides with the valuable skillset of assessing snowpack, avalanche problems, and terrain before they venture into the backcountry and provide them with the skillset needed to create accurate hazard assessment of terrain not covered by published avalanche bulletins. Students rotate between writing operational avalanche advisories and AM operational hazard and risk assessment Forms and presenting them to the class in morning meetings for review and peer and instructor critique (Lovejoy 2015).

3. METHODS

To assess student outcomes and perspectives from participants in the Prescott College Avalanche Forecasting class, a survey was distributed to all available Avalanche Forecasting graduates and instructors from the full history of the course. The survey gathered both quantitative and qualitative data. Participants provided general data about the timing and nature (student, teaching assistant, instructor) of their participation in the course, as well as information about their roles, if applicable, as snow and avalanche professionals. Long answer questions prompting participants to evaluate the function of avalanche forecasting in both their professional and personal pursuits in the winter backcountry were a source of qualitative data. Quantitative data were processed and analyzed using the R statistical programming package. These data were examined for trends in student outcomes. Qualitative data were manually processed and examined for trends in participant opinions on the value of and personal experience with the Avalanche Forecasting class.

The survey was distributed to 97 course graduates and instructors, of whom 39 responded (40.2% return). This sample was not entirely representative of course participants. Prescott College was unable to provide a list of participants and general course information to the project. Many instructors and alumni, especially those involved in courses prior to 2012, were missed during survey distribution. The total number of participants who were not included in the distribution is unknown. The list of survey recipients was generated through the memory of several available instructors. More resources were present to develop a complete list of course participants from 2012 through the present, and all course participants since 2012 were contacted. Contact information was gathered using the American Avalanche Association professional directory, the Prescott College email server, and social media.

4. RESULTS

Of the 34 Avalanche Forecasting alumni that responded to the survey, 58.8% were students in Silverton, CO, and 33.3% were students in Driggs, ID. More recent courses were better represented in survey responses. 2016, 2015 were the most well represented years, followed by 2011 and 2010. 1985 is the earliest course represented in the survey (Fig. 1).

![Student Responses by Year](image-url)
After taking Avalanche Forecasting, 21.3% of students completed Level 3 courses, 3.0% completed AvPro and 6.0% reported completion of other avalanche courses. 69.7% have not pursued avalanche training higher than a Level 2 course, though many have completed other Level 2 courses outside of the Prescott College Avalanche Forecasting course (survey results here were ambiguous).

Many alumni who have made their careers in the snow science field cite Avalanche Forecasting as being the course that “started it all”, was their “first practical application of snow science in the field”, and “provided a solid foundation for launching [their] career[s]”. One student stated “Avalanche Forecasting opened my eyes to the complexities of snow and gave me an idea of the broad array of career tracts possible for avalanche professionals”. 42.4% of Avalanche Forecasting alumni are currently working as avalanche professionals, 12.1% have worked previously as avalanche professionals and 45.5% have not worked as avalanche professionals (Fig. 2).

Among alumni who reported working or having worked as avalanche professionals, the highest percentage have gone on to work as avalanche educators (74.1%), ski guides (66.7%), or other mountain guides (66.7%). Many have worked in multiple capacities. Alumni have also worked as backcountry avalanche forecasters (25.9%), highway avalanche forecasters (14.8%), and other operational avalanche forecasters (25.9%). 33.3% have been ski patrollers, 18.5% have worked as ski area snow safety personnel, and 14.8% have reported working in other realms as avalanche professionals (Fig. 3). One alumnus, who has worked in a many capacities within the field, said that the internships and jobs they held the season after taking Avalanche Forecasting “were gained through Prescott College and Avalanche Forecasting connections, and were a direct result of having taken the course.”

Students and instructors identified the duration of the course as the primary factor that separates it from standard Level 2 courses. Many survey respondents stated that the sheer quantity of time spent in the field and classroom is what elevated their skill sets. One instructor said that after having taught standard Level 2 courses and Avalanche Forecasting, they know that “students came out of Avalanche Forecasting…with a much higher degree of proficiency and greater learning outcomes than students in a typical 4-5 day Level 2 course.” A past Avalanche Forecasting student and current backcountry avalanche forecaster also stated that the long-format of Avalanche Forecasting allows students to track the snowpack over time and make “daily decisions on where to ski” based on personal experience and observations in addition to published observations. Developing the skill of monitoring snowpack throughout the season was noted as essential for aspiring ski guides, forecasters, and recreationalists.
Most Avalanche Forecasting alumni have an acknowledged lack of experience with standard format Level 2 courses and base their comparison off of interactions with peers who have completed standard Level 2 courses. Alumni who have pursued high levels of avalanche training after Avalanche Forecasting consistently report feeling better prepared for advanced coursework than they perceive their peers to be, and that they "feel more competent when out in the field with friends and that [they] have a better understanding of information and can make safe well thought-out decisions." Another alum stated that the skills of Avalanche Forecasting "students consistently exceed those with alternative [Level 2] educations in knowledge of snow science, snowpack and risk assessment and backcountry etiquette and behavior," and that "alums of this course seem to consistently understand mountain meteorology and more complex snow topics such as fracture mechanics and snow metamorphism at a higher level than most other people I backcountry ski with, including other snow professionals."

The intensive, experiential nature of the course was also credited as contributing to positive outcomes. A student reported "Avalanche Forecasting expanded my knowledge base by combining extended classroom learning with field experience and application" and that this combination makes alumni "more capable in both a recreational and work setting[s]."

The theme of enduring mentorship was common among survey respondents. Many Avalanche Forecasting alumni reported that the course provided them with "connection to lifelong mentors" and led to opportunities for professional development. One respondent said, "the mentorship I received from the instructors is unparalleled and they both remain some of the most influential mentors in my avalanche profession." Responses regarding the value of mentorship were most commonly from alumni who have worked or do work as avalanche professionals. Multiple alumni also cited the lasting positive influence of early exposure to instructors that set a high standard.

Many recent alumni stated that learning how to collect observations and analyze snowpack in the field using industry standards tests, methods, and notations was highly valuable, and that these skills were refined and reinforced by extensive time in backcountry applying this knowledge. One student reported that the course "taught [them] the skills necessary to mitigate avalanche danger while traveling in the backcountry to perform scientific work." There was a recurring emphasis placed on the courses' value as teaching about the reasons behind various observation methods, which gives students the "ability to understand the science behind why the snowpack behaves like it does so [that] decisions weren't made solely on given procedures." An alumnus responded that Avalanche Forecasting "went beyond how to be safe in the back country and dove into how to understand and relate to a snowpack through a greater understanding of the storm systems, snowpack history, daily forecasting changes of stability within the snowpack."

Survey respondents also noted the transference of skills gained in Avalanche Forecasting to other areas of their work or education. Students and instructors both said that the course provided opportunities to improve teaching and guiding techniques. One Avalanche Forecasting teacher said that teaching has "kept me current with changes [in the field] and better enabled me to perform duties and advise students." A student noted that, "beyond its practicality, the course

![Professions Among Graduates](image-url)

**Figure 3: Professions Among Graduates**
offered rigorous intellectual [and] technical material: it was a significant contribution to my education at Prescott College.” Similar feedback has been given colloquially outside of the survey. As early as 2002, Wolfe reported “many of the students on this first Tetons section commented that this was the ‘best course they had at Prescott College’” (Wolfe 2002).

Shortcomings of the course were also gathered in written survey responses. No published works reporting on the effectiveness of standard Level 2 courses were found, and many of the survey respondents have not participated in Level 2 courses outside of Prescott College so comparisons to short-format Level 2 courses may be weak. Multiple survey respondents now working professionally stated that Avalanche Forecasting was an effective introduction that led to further professional and educational opportunities, and consider it a step towards competence.

5. CONCLUSION AND RECOMMENDATIONS

Prescott College’s Avalanche Forecasting course has been influential in the careers of many avalanche professionals and serious backcountry recreationalists. Survey results yielded that many alumni regard the course as a significant step in their education and careers, and that many valuable connections have been made as a result of participation in Avalanche Forecasting.

This study would have been more complete if a list of alumni contact information had been made available by Prescott College. It would also be valuable to analyze the standard college distributed course assessment forms completed by students at the end of each course.

In the future it would be valuable to compare the effectiveness of Avalanche Forecasting to Level 2 courses provided by other institutions. This could inform the development of other long-format avalanche education courses.

Future iterations of the course should further investigate the limitations of avalanche education and continue to evaluate alumni outcomes.

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REFERENCES


