PILOTING A BACKCOUNTRY AVALANCHE ADVISORY PROGRAM FOR ALASKA'S MOST READILY ACCESSIBLE AVALANCHE TERRAIN: THE FRONT RANGE AND EAGLE RIVER AREA CHUGACH

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ABSTRACT: Despite heavy wintertime use (increasing exponentially in recent years) and a history riddled with recreational casualties and fatalities, Anchorage's backyard mountain playground lacked a program to provide organized information on snow and avalanche conditions until March 2013. This report covers a Master's thesis project that piloted a grassroots, minimalist model advisory program for the most popular and easily accessible avalanche terrain of Chugach State Park. Through the experience of this project, what's involved in starting and developing a *backcountry avalanche advisory program* and in becoming an *Avalanche Specialist* is explored. Components of the multifaceted project covered here include: the extensive planning and preparation required for making this project a reality, working with potential stakeholders capable of helping sustain this project and provide for its continued development, working with students and volunteers, risk management, field work and advisory production, and partnerships that eventually allowed for the project to be made available to the public as the Anchorage Avalanche Center. This report also discusses project challenges, such as navigating Alaskan avalanche politics and land management implications for Alaska's vast avalanche terrain. It concludes with a section on viability and sustainability.

KEYWORDS: Anchorage, forecasting, specialist, safety, awareness

1. OVERVIEW

What's involved in starting and developing a *backcountry avalanche advisory program* and in becoming an *Avalanche Specialist*? This question framed an Alaska Pacific University (APU) Master of Science in Outdoor & Environmental Education (MSOEE) thesis project that began, formally, in January 2012. However, the idea was conceived years earlier.

The grassroots and volunteer Anchorage Avalanche Center (AAC) is the most concrete result. Since March 2013, during the avalanche season, it has provided at least a once weekly advisory (issued Saturday mornings by 7am) for avalanche terrain accessed from Chugach State Park's most frequented winter trailheads. Creating and developing a website (www.anchorageavalanchecenter.org) to provide information (weather resources, webcams, advisories, professional quality field observations, a forum for hosting public field observations, etc) to the public was another facet of this project.

The following report explores the development of the AAC, including a discussion on viability and sustainability for future seasons. It discusses the extensive preparation undertaken and other elements involved in making this project a reality: risk management, working with stakeholders, negotiating project-related politics, and gaining the experience and knowledge necessary for providing the best possible local avalanche information for enhancing recreational decision making.

2. LITERATURE REVIEW

A brief overview of the literature that informed this project explores *becoming an Avalanche Specialist*, mountain meteorology, snow science research, key documents providing the closest semblance to industry standards for undertaking such an effort, and prior work conducted towards this project's goal: developing a sustainable advisory program for public recreation in Chugach State Park (CSP).

Journal articles and government documents provided insight into what it takes to become an Avalanche Specialist, but the most relevant insight came from an extensive conversation with National Avalanche Specialist, Simon Trautman of the Forest Service (USFS) National Avalanche Center (NAC). Two traditional, or common, tracks for entering the profession were identified. The first, through prior experience ski-patrolling in a snow-safety capacity. Exposure to avalanches in this occupation is regular, which allows for an expedited means of understanding avalanche dynamics from a firsthand perspective. A typical

patroller working control routes is exposed to the number of avalanches in a few months that a relatively avid backcountry skier may be exposed to over the course of several seasons.

While ski-patrolling is often a common path en route to becoming an Avalanche Specialist, it's not mandatory and its relevancy varies. Avalanches in the backcountry are, in many ways, different from those within ski area boundaries (a controlled environment). Avalanche expert Bruce Tremper (2008), has related inbounds avalanche phenomena to the controlled thrills of an amusement park...versus the savagery of backcountry avalanche phenomena.

The other common track into the Avalanche Specialist occupation is the academic route; specifically, graduate education and research at one of the few universities in the country that offer snow science programs. Research projects typically undertaken focus on a question relating to avalanche formation or dynamics and involve some degree of scientific field work. However, although not as prevalent, the future of the academic track may have more opportunities for social science research in order to further inform an understanding of the human factors.

These two common tracks into the occupation are not exclusive of one another. Perhaps the most successful approach is through a combination of these tracks, and/or other means of acquiring relevant experience. The NAC *business plan* provides further insight into qualifications:

> Avalanche Specialists typically obtain training at the National Avalanche School, the International Snow Science Workshop, and on the job training at ski areas, avalanche centers and winter ski and mountaineering concessions. Avalanche Specialists may also have applicable degrees from universities and colleges. Currently, there are no clear guidelines for becoming an Avalanche Specialist; rather it is a combination of on the job training, master-apprentice training, and academic training. (USDA, 2001)

Meteorological literacy is an essential qualification of an Avalanche Specialist; developing it to an appropriate level was a critical task for undertaking this project effectively. Multiple routes were taken including textual study, workshops (AK winter weather forecasting with Jim Woodmencey), and a graduate level mountain weather course.

Numerous snow science studies were reviewed as part of project preparation and developing the requisite literacy of an Avalanche Specialist. Articles from *Cold Regions Science and Technology* were a primary source in regard to the physical dimension of snow science; studies reviewed focused on avalanche formation and dynamics, snow stability evaluation, snow-avalanche climatology, and forecasting practice.

How do people make decisions in backcountry avalanche terrain, what are the risk factors involved, what can be learned from survival patterns, and are there rule-based decision-making tools that can enhance safety and mitigate risk? These are some questions explored in the social science research that informed this project.

McClung's (2002) two part treatise on “the elements of applied avalanche forecasting” was a foundational source for the literature review. Prior to this work, forecasting had formally been framed as “a geophysical problem with respect to the state of stability of the snow cover.” McClung broadened this framework and described forecasting as a complex process with interconnected elements that must all be mastered for optimal forecasting. He framed forecasting as a dynamic problem involving variations and interactions between a human and natural system; it's pointed out that “since most avalanche accidents result from human errors, no description of avalanche forecasting is complete unless the human component is addressed.”

Three important documents provide the closest semblance to industry standards for backcountry avalanche advisory programs in the United States: *Snow, Weather, and Avalanches: Observation guidelines for avalanche programs in the United States,* commonly referred to as *SWAG* (Greene et al., 2010), the *USDA Forest Service National Avalanche Center Backcountry Avalanche Program Business Plan* (USDA, 2001), and the *USDA Forest Service National Avalanche Center Backcountry Avalanche Center Operational Guidelines* (USDA, 2012). These documents were referenced intensively; *SWAG* for field work documentation and advisory production; the NAC business plan and operational guidelines provided structural ideas and a starting point for developing a grassroots program.

Important findings from a CSP avalanche center feasibility study included “determining visitor use,

public support, and what infrastructure would be needed to start and continue operations" (Gellings, 2010). The study surveyed 272 people. It was found that "an overwhelming majority think that there is a need for an avalanche information advisory program, and want/would use the service if it was provided." Four areas receiving frequent recreational use were identified, which informed selection of the core advisory area for this project. The survey further suggested that the majority (72%) of respondents would be willing to make a donation of between $1-50 per year to provide for an advisory program that they felt should be provided by a partnership between the state (Alaska State Parks – CSP) and a non-profit group. Gellings' study envisioned a program that would start with one full-time employee issuing advisories two or three days a week; a program that would initially be feasible according to the NAC model for a Type 3 center "with room to expand in the future." The seasonal budget would be ~$30,000.

3. METHODS

Project development is explored here. Initially, this project was a non-public pilot program and the information it provided access-restricted (to local professionals, advanced recreationists, and organizational stakeholders) for quality control and development purposes.

3.1 The Need for a Grassroots, Minimalist Approach

Gellings' feasibility study primarily relied on the NAC business plan for structuring a Type 3 CSP advisory program. Adhering to this model of development would require significant initial funding, infrastructure, and resources; it seemed too cumbersome. CSP deals with a very tight budget. The lack of an advisory program is not a priority problem for which CSP is actively seeking a solution. Additionally, there would be no existing infrastructure or resources to lean on for initial support (as there is for USFS centers). It was clear something minimalist and grassroots was required. As an example, a non-government avalanche center was taking off for the popular Hatcher Pass area that is about an hour to the north of Anchorage.

3.2 Primary Stakeholders & the Need for a Consortium

The first, more formal efforts towards making this project a reality were identifying and then meeting with community stakeholders. This project's primary stakeholder is the recreating public but, in order to develop this project into a viable and sustainable institution, the focus here is on developing a stakeholder consortium of local government agencies, organizations, businesses, etc. capable of helping to support, sustain, and develop this project. These stakeholders would have ties to recreation in avalanche terrain or be interested in increasing awareness, public safety, and outdoor recreation opportunities in the greater Anchorage area. Considering the circumstances, a consortium may (at least initially) be the only way to address the viability and sustainability of a CSP advisory program. The idea is that, by working together, these varied stakeholder organizations could pool together enough resources to help support and sustainably fund the program and its future development.

As all of the avalanche terrain under consideration by this project is managed by CSP, the state park was an obvious primary stakeholder. As the CSP Citizen's Advisory Board plays a key role in decision-making, they were introduced to the project early on as well. Finally, Friends of the Chugach National Forest Avalanche Information Center (F-CNFAIC) was an initial contact as they're partnered with the USFS to provide sustenance for the only well-funded backcountry avalanche center in the state and have had as a stated goal addressing the lack of avalanche information for CSP.

3.3 Working with Undergraduates & Risk Management

Working with APU students was another component of this project, initially planned as a directed study course (*OS380: Field Work in Snow Science*) for the Outdoor Studies snow science curriculum track. This would provide additional partners for field work in order to gather sufficient snow and weather observations for producing a reliable and accurate advisory. Undergraduates would get hands-on experience collecting snowpack data, taking field observations, synthesizing this information, and integrating it into a written avalanche advisory. They would learn how field data is collected and documented according to national standards, how this information is applied to avalanche forecasting, and improve their winter backcountry travel skills.

The experience would also be a valuable opportunity for the project designer to gain outdoor, avalanche, and higher education teaching experience.

An extensive risk management process took place before any project field work could formally begin. This included submitting a comprehensive Risk Management Plan (RMP) to APU for approval. The process involved some back-and-forth, editing and answering questions, and was then approved.

3.4 Field Work Strategy & Writing the Advisory

Field work for this project consisted of several full days each week collecting observations and conducting snowpack analysis with volunteer partners and/or an APU undergraduate. Two full days was the minimum deemed necessary for producing a reliable and accurate weekly advisory with danger rating and was fitting for a model that employed one full time staff. Each week, the best efforts were made to spread field time evenly throughout the core advisory area and were conducted so as to provide the best possible information for the Saturday morning advisory.

For primarily two reasons, field work emphasized *quick assessment on the move* (pole probing, hand pits, assessing low consequence test slopes, ski-cutting, cornice dropping, digging quick pits with standardized stability tests, and taking more in-depth looks with snowpack layer analysis as warranted) rather than in-depth snow science. First, most partners were volunteering during their time off work. They wanted to ski, not dig more than necessary. A partner was mandatory for risk management, so field days had to be structured so as to be appealing and satisfying for qualified volunteers. Nonetheless, in order to ski safely, the snowpack had to be assessed adequately; this provided very useful information for observations and advisories. Second, a lot of ground needed to be covered each week in order to assess an extensive snowpack; there were five access points for two zones comprising the core advisory area, each of which are separated by a 15-45 minute drive and some of which require at least a fifteen minute approach to reach avalanche terrain.

Friday evenings and early Saturday mornings were spent preparing the weekly advisory. Integrating everything observed and documented during field days in addition to examining snotel and mountain weather station data, weather (past, current, and forecast), and observations from others was the first step. The advisory was structured with both avalanche laymen and more advanced users in mind. The most important, basic information and communication of dangers was presented first, followed by increasingly detailed and specific information that would be of interest to more advanced users.

3.5 Partnership with the Alaska Avalanche Information Center (AAIC) & Going Public as the Anchorage Avalanche Center

The Alaska Avalanche Information Center became involved in this project, inadvertently, when information was solicited from the Valdez Avalanche Center (VAC) and this project was mentioned. The VAC founder-director Peter Carter, also founder-director of the AAIC, was very interested and supportive. It was discovered that the AAIC was providing the non-profit status and liability insurance coverage to the aforementioned grassroots avalanche center for the Hatcher Pass area that, in part, inspired this project.

Mr. Carter was impressed with efforts on this project in its early stages and offered non-profit status and liability insurance coverage through the AAIC, in order that the project be made available to the public as the Anchorage Avalanche Center. It would be part of the AAIC network of non-government avalanche centers (Valdez, Hatcher Pass, Cordova, and Haines). In March 2013 the Anchorage Avalanche Center was born.

4. DISCUSSION – CHALLENGES & VIABILITY

4.1 Land Management Implications for Alaska's Avalanche Terrain

Perhaps the majority of all avalanche terrain in the contiguous 48 states, and definitely the avalanche terrain where most accidents occur, is on land managed by the USFS. This includes the avalanche terrain of most US ski resorts (with longstanding avalanche mitigation programs required for their operations). Thus, the USFS has a long history of involvement with avalanche terrain and, through the NAC, seems to be the primary force behind the development of protocols for backcountry avalanche advisory programs in the US. Avalanche programs developed for USFS managed land are supported by and able to lean on existing USFS infrastructure, resources, budgetary funding, buildings, communications technology, vehicles, equipment, and the diverse staff expertise of their respective ranger districts.

While the exact figures aren't available for Alaska, the majority of avalanche terrain popular with

recreationists is on non-USFS managed land. Alaska's vast public lands (managed by a host of different municipal, state, and federal government agencies) make for a unique situation in regard to providing backcountry avalanche information. For example, extensive acreage of avalanche terrain that is very popular with wintertime recreationists in Southcentral Alaska is managed by Alaska State Parks (ASP), such as that under consideration by this project. Vast swaths of avalanche terrain in the Alaska range are managed by the National Park Service (NPS) and Bureau of Land Management (BLM). These agencies generally lack the protocol and experience necessary for providing recreational avalanche advisory programs. While there is considerable NPS avalanche terrain in the contiguous 48 states, most of it is in close proximity to USFS avalanche centers or, at least, avalanche centers closely associated with the NAC. For example, the Bridger-Teton Avalanche Center, Northwest Avalanche Center, and Colorado Avalanche Information Center work with the NPS to provide avalanche information for NPS avalanche terrain in their vicinities.

For much of Alaska's avalanche terrain, the need for backcountry avalanche information isn't dire due to remoteness, lack of accessibility, and little recreational traffic. However, this isn't the case for ASP avalanche terrain in Southcentral Alaska; there has long been an identified and dire need. The demand for such programs is increasing, as both human-powered and motorized winter sports are growing rapidly in popularity in Southcentral AK.

4.2 USFS Avalanche Center Structure

Before further discussion, it's necessary to provide a rudimentary understanding of how USFS centers function, in regard to the interesting interface between their nonprofit Friends groups and the federal government that makes these centers possible. As mentioned, USFS avalanche centers rely heavily on federal government infrastructure, staffing, resources, and funding. However, this typically provides for only about 50% of their needs. This is why USFS avalanche centers have nonprofit Friends groups, which negotiate a contract with the USFS for these avalanche centers operations and provide for the rest of their needs through fundraising. For example, the Chugach National Forest Avalanche Information Center (CNFAIC) is ~$150,000/season (six months from November-April) operation with about half of the resources coming from the USFS and the other half being fundraised by the F-CNFAIC (sourced from CNFAIC website and 2012-13 annual report).

4.3 AAIC Structure

While the AAIC has operating standards and bylaw documents in place, they aren't widely regarded as alternatives to the NAC business plan and guidelines (likely due to most avalanche centers in the US being USFS or NAC-associated and thus not in need of a grassroots alternative). However, this is the only operational alternative for providing information for Alaska's vast avalanche terrain outside of that very small fraction provided for by the CNFAIC.

The struggle of non-government avalanche centers in the state has been developing sustainable funding for their efforts. The AAIC network is very minimalist and grassroots. As mentioned, the umbrella AAIC provides its five satellite centers with liability insurance coverage and nonprofit status. However, since there's no centralized, well-funded government agency to lean on and individuals involved with the AAIC and its satellite centers do this work pro bono, time and energy is limited. Because of these limitations, AAIC centers have a very different operational capacity when compared to well-developed USFS centers that are supported, in part, by the federal government and have decades of collective history and associated experience in avalanche programming. AAIC centers' informational products are, therefore, different than those provided by well-funded and staffed USFS avalanche centers.

4.4 Unfair Scrutiny of AAIC Efforts?

Differences in operational capacity and quality of avalanche information products has been a source of scrutiny of the AAIC in some circles. However, it's important to consider that well-paid USFS avalanche professionals are in a much different situation than pro bono AAIC professionals that lack government infrastructure, resources, and support. AAIC products are criticized because they don't measure up to that of some very well-funded USFS centers, but this is an unrealistic expectation considering the differences in circumstance.

This overview of USFS and AAIC avalanche center differences is intended to serve as an introduction to the two primary players involved in providing backcountry avalanche information for Alaska. It's also meant to provide a basic

understanding of their different operational capacities and how this has created some controversy between the two parties.

4.5 Alaskan Avalanche Politics

One source of conflict between the CNFAIC and AAIC is in regard to the AAIC's willingness to expedite solutions to a lack of avalanche information. As mentioned, the F-CNFAIC has long been interested in addressing the lack of organized avalanche information for CSP. However, they've not been able to answer questions which they view as prerequisites for implementing some sort of solution. As the F-CNFAIC is associated with the USFS, they're committed to following the NAC business plan and guidelines. As discussed, providing for a CSP avalanche information program is burdensome, especially to stay in accordance with NAC guidelines.

On the other hand, the AAIC (being a grassroots operation) has less constraints in regard to taking immediate action. The AAIC can seemingly start a new avalanche center simply by paying for additional liability insurance coverage and having a qualified individual willing to provide information. While the F-CNFAIC's approach is to have funding in place and sustainability addressed before it will take action, the AAIC (in grassroots fashion) will implement programs without having all the details of funding and sustainability lined up. After all, if everything has to be in place beforehand, and with good prospects for sustainability, efforts such as the AAC and HPAC would likely have never taken off (and this may be why they never did before getting connected with the AAIC).

4.6 Claiming to be an Avalanche Center?

Another source of conflict between the AAIC and CNFAIC is in regard to naming. That is, calling an avalanche information program an *avalanche center*. The CNFAIC has expressed concern that by calling AAIC advisory programs avalanche centers the public will be confused as to what constitutes an avalanche center (CNFAIC staff, personal communications, multiple occasions). For example, the operational capacity of the Anchorage Avalanche Center and CNFAIC is very different: a new program with volunteer staff of one and no government infrastructure versus a well-funded program that has been in existence for over a decade, with a well paid staff of four, and the infrastructure of the federal government. It should be noted that AAIC websites make it clear that they are volunteer and grassroots efforts; they do not equate themselves with well-funded, infrastructure-intensive government avalanche centers. Additionally, this criticism and scrutiny is characterized by inconsistencies and double standards. For instance, in regard to naming, the two Type 4 centers in the US that are officially endorsed and sanctioned by both the NAC and American Avalanche Association call themselves *avalanche centers* (Kachina Peaks Avalanche Center and Wallowa Avalanche Center); they have similar or less operational capacity than AAIC centers.

4.7 Danger Rating Controversy

Further conflict centers around the use of the *North American Public Avalanche Danger Scale* in advisories provided by AAIC centers. According to the NAC model, avalanche centers should start at the Type 4 level and operate at this level until the sustainable funding and resources are available for developing into a Type 3 center. As Type 4 centers aren't supposed to provide advisories, they definitely shouldn't provide advisories with danger ratings (according to the NAC). However, the USFS doesn't have ownership or copyright of the danger scale; it was developed cooperatively by snow-avalanche professionals and organizations from throughout the US and Canada as a tool to easily and effectively convey avalanche conditions to the general public.

The CNFAIC pressured the AAC not to issue advisories with danger ratings when it went public. The CNFAIC argued that AAC staff wasn't qualified and danger ratings weren't appropriate for the AAC's level of development. However, primary AAC staff meet the qualifications for Avalanche Specialist as outlined in the NAC business plan and operational guidelines. The primary AAC staff is also more qualified than former CNFAIC staff that issued advisories with danger ratings. Eliminating danger ratings from advisories was not a method the AAC was interested in changing as long as it had the equivalent of one full time staff, thus providing it with the operational capacity characteristic of a Type 3 center for which, according to the NAC, it's appropriate to issue advisories with danger ratings.

The CNFAIC suggested a discussion of snow-avalanche conditions only, without providing a danger rating and the explanatory icon that was developed to quickly and easily convey associated conditions. The AAC persisted in using danger ratings and associated icons, as these were

developed to be effective communication tools, along with a discussion of snow-avalanche conditions as mentioned in section 3.4. To the AAIC, relying on more cumbersome text than would be necessary if a danger rating was used results in an “incomprehensible wall of print” (Peter Carter, personal communications, multiple occasions). Danger ratings lend advisories tone, structure, and comprehensibility that would be absent without them.

4.8 Field Work Challenges

Overall, the field work strategy of *quick assessment on the move* has been effective and successful so as to produce timely, accurate, and reliable weekly avalanche advisories. However, there are limitations to the grassroots, minimalist approach. More time and manpower would allow for more in-depth snow science (snow study plots, digging full pit profiles to track layers and snow metamorphism over the course of a season, more thoroughly assessing the snowpack and spatial variability from one advisory area to the next and at different elevation bands, etc.) to increase the professionalism of the AAC product and enhance the advisory program's reliability and accuracy.

However, as relatively well-funded USFS avalanche centers often have difficulty committing to in-depth, advanced snow science tasks in a structured way, it is a long term goal for the AAC. Additionally, as more time and manpower is acquired for the AAC effort, how to appropriate these resources will be a serious consideration. Should initial acquisitions of more time and energy be allocated to developing volunteer, student, and intern assets, to more in-depth and advanced snow science, or to a combination of such options?

4.9 Outline for the Future

During the 2012-13 season the avalanche advisory program conducted as part of this project functioned characteristic of the guidelines for a NAC Type 3 avalanche center. Continuing to provide the same quality of information at as regular intervals as was done during the 2012-13 season has been deemed to require one full time staff.

In line with industry-standard wages for an entry-level Avalanche Specialist working full time for the six month season through which most avalanche centers operate, it would cost ~$20,000/season for the AAC to provide the same product it offered during the spring of 2013 indefinitely. This includes professional quality observations two to three times per week, at least a weekly avalanche advisory, and management of a website and forum for public submission of field observations.

While ~$20,000/season would provide for the minimalist model, basically just paying the salary for one full time staff, additional expenses would be required for the center to develop into a more viable entity. In line with what is suggested for a Type 3 center as outlined in the NAC business plan and operational guidelines, ~$30,000/season would provide the AAC with one full time staff, transportation expenses, one significant professional development opportunity per season, gear for field work, communications technology, and a small budget to offer incentives for volunteers.

Initially, funds towards reaching the goal of continuing to provide for a minimalist program could be provided by donations to the AAC from individuals, local businesses and organizations, and industry sponsors. These donations would be tax deductible via the AAC's 501(c)3 status provided through its partnership with the Alaska Avalanche Information Center. Another approach may be for the land manager to contract the AAC to provide for a Chugach State Park Avalanche Information Center. This contract could include part of, all of, or more than what is needed for the ~$20,000/season minimalist model. The AAC could then continue to raise additional funds, which would allow the program to develop into a solid Type 3 center with a budget of ~$30,000/season. The relationship between CSP and the AAC could function similar to the NAC model for avalanche centers in which a contract is made between the government entity and a nonprofit group to implement the program. This framework would provide for the most appropriate way to convey this program to the public, as all the avalanche terrain under consideration by this project is part of CSP and providing for such a program seems within reasonable expectations of the land manager.

After the budget for a sustainable Type 3 center is met, the program could focus on developing into a Type 2 center with additional staff, infrastructure, and resources. With more staff and a bigger budget the AAC could expand its core advisory area and provide avalanche information for more of CSP, which would also likely make the program increasingly popular with the motorized (snowmobile) community (avalanche terrain

outside of the initial core advisory area is more regularly open to motorized use).

4.10 Making the Minimalist Model Work in the Meantime

While the ~$20,000/season budget for the AAC to continue providing the products it did during the 2012-13 season may not be immediately available, the AAC is committed to continuing to provide some sort of organized avalanche information for the Front Range and Eagle River area Chugach in the interim. As the time constraints of a 100% volunteer effort in which all individuals involved have other priorities (jobs) in order to meet the expenses of day to day life, this may simply be continuing to manage a forum for the submission of public observations and providing professional quality observations as often as possible.

As the details for how the AAC will function in the short term come together, there will be a continued need for volunteer assistance. Such needs to keep the center functioning at a very grassroots level will be able to be met by recreationists submitting their field observations as often as possible, local snow-avalanche professionals and organizations providing whatever assistance they can, and more involvement from the APU Outdoor Studies snow science program. Local snow-avalanche organizations have a lot to offer when it comes to the community outreach necessary for letting people know about this project in order to raise funds and increase the submission of observations that make a reliable and accurate advisory program possible.

These organizations have a lot to gain from the AAC effort as well. As the goal of Alaska Avalanche School (AAS) education "is to increase backcountry users' awareness and reduce exposure to avalanche conditions" (found on AAS website homepage), AAC efforts are a huge step towards AAS' goal. Likewise for the F-CNFAIC's longstanding goal of establishing an advisory program for CSP. As an initial intention of this project was to provide further snow science opportunities for the Alaska Pacific University Outdoor Studies curriculum, specifically an experiential learning laboratory exclusive to APU, the AAC has a lot to offer in exchange for student volunteers and interns to help bolster field work. Finally, local businesses and industry sponsors will be able to show the community their investment in public safety and healthy wintertime recreation opportunities by supporting the AAC and having their contributions publicized via the AAC website.

5. CONCLUSION

Coming back to the framing question for this thesis project is an appropriate conclusion: what's involved in starting and developing a backcountry avalanche advisory program and in becoming an Avalanche Specialist? Suffice to say that A LOT is involved in starting an advisory program; much more is required to develop it into something sustainable. While Avalanche Specialists range from prior ski patrollers to PhD scientists, years of experience in avalanche terrain and seeking specialized learning opportunities is prerequisite. Both becoming an Avalanche Specialist and starting an advisory program require commitment, dedication, perseverance, attention to detail, creativity, positivity, and patience in the slow process of building credentials and qualifications or developing a program from startup to viability and sustainability.

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