

THE NORTH ROCKIES MOUNTAIN SNOWMOBILERS IN THE ABSENCE OF A DAILY
PUBLIC AVALANCHE BULLETIN
INTERNATIONAL SNOW SCIENCE WORKSHOP 2016 IN BRECKENRIDGE, CO

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ABSTRACT: British Columbia's mountainous topography and weather makes it a rewarding region for winter backcountry travel. Studies acknowledge that less is known about snowmobilers as a user group, or of their attitudes toward avalanche safety compared to skiers. A particular challenge in BC's north is a lack of frequent, spatially explicit public avalanche forecasting. The purpose of this research is to describe the attitudes and safety habits of mountain snowmobilers in Northern British Columbia (BC), and to determine their backcountry travel habits, decision strategies and use of the current forecasting service when compared to other data rich regions within BC. Survey data was collected in 2016 from 282 active snowmobile users across the North Rockies. Participants were asked information regarding their level of avalanche training, use of safety equipment and use of the public forecasting service. These results were compared to similar data previously published for the Pacific Northwest.

KEYWORDS: (Avalanche bulletins, North Rockies, snowmobilers, avalanche risk culture, public safety)

1. INTRODUCTION

Avalanche Canada's (AC) North Rockies region is one of the few mountainous Canadian geographical areas that do not receive a daily avalanche bulletin. In lieu of a daily avalanche bulletin, this region receives a weekly avalanche synopsis. The weekly report is uploaded online on Thursdays and covers information on weather, weather forecasts, suspected avalanche conditions and avalanche occurrences to the best of AC's ability.

The North Rockies region, as per Strom and Helgeson (2014), is 45,164 km²; this mountainous territory is greater than the landmass of Switzerland. The majority of recreationalists in the North Rockies are snowmobilers, although there is an avid backcountry ski touring population and

increasingly popular backcountry snowshoe user group as well. The view of Storm and Helgeson (2014), of Avalanche Canada, was "If this region was provided with an avalanche forecast, a significant proportion of the users do not have the training or knowledge to use it [an avalanche bulletin] effectively." This claim although based on the lack of avalanche forecasting, public outreach and the handful of avalanche educators available in the North Rockies region may be somewhat ingenuous.

A quick review of the literature will showcase that relatively little is known of mountain snowmobilers, or their attitudes towards avalanche safety, with Hägeli et al (2012), Baker (2013) and Strong-Cvetich (2014) doing some of the preliminary mountain snowmobiler and snowmobiler avalanche related research in Canada. Strong-Cvetich's dissertation entitled 'Mountain Snowmobilers and Avalanches: An Examination of Precautionary Behavior' (2014) is, to date, the only empirical avalanche data set with regards to snowmobilers in BC; notably it excludes the North Rockies.

Mountain snowmobilers in the North Rockies were an excellent group to study in terms of avalanche awareness and education. On a typical weekend, there were 20-150 snowmobilers at the more popular staging

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areas. For the most part, these recreationalists were willing to talk and take time to fill out surveys to aid their snowmobiling community whilst gearing up for the day. This cavalier attitude may have been aided by the fact that I was similarly dressed had my snowmobile unloaded and ready to go for gathering field data.

The North Rockies represent a ‘conundrum wrapped in an enigma’ to the avalanche forecasting community. The North Rockies is a data-sparse region with vast distances, few backcountry commercial operations, limited recreational backcountry populations and budgetary constraints that all non-governmental organizations (NGO) face. Scientifically, however, the North Rockies offer a fantastic real-world opportunity to study the effectiveness of avalanche bulletins. The daily avalanche bulletin then acts as a dependent variable in which to test the efficacy of daily avalanche bulletins towards avalanche education, awareness and avalanche risk culture. Information gathered from this region can be compared to Strong-Cvetich (2014) data taken from ‘southerly’ backcountry recreational areas in BC that are currently offered a daily avalanche forecast. The hope is that this study can give suggestions that will better aid avalanche awareness outreach in avalanche bulletins, thus fostering a safer backcountry community.

2. RESEARCH APPROACH

A survey tool was used to collect information from mountain snowmobilers. The survey was based upon Strong-Cvetich's (2014) ‘Intercept Survey’ because it was important to be able to compare results. Several additional questions were included in the survey tool.

The surveys were administered in snowmobiler staging areas and parking lots. Participants of this study were English speaking snowmobilers, over the age of 19, who were actively snowmobiling in the area that day. Several areas were identified as ‘hot-spots’ (Fig. 1) within the North Rockies to conduct survey sampling (Strom and Helgeson, 2014). Every person who fit the criteria at the given location was asked to participate within the study. To aid randomness of the study, each location was assigned a number and placed into a random number generator, which was used to determine the date to visit the location. This method was

followed as close as possible, given weather factors, driving conditions and snowmobile maintenance.

Finally, field notes were taken to supplement survey data. These field notes included photos, riding behaviors of snowmobilers and snowpack observations.

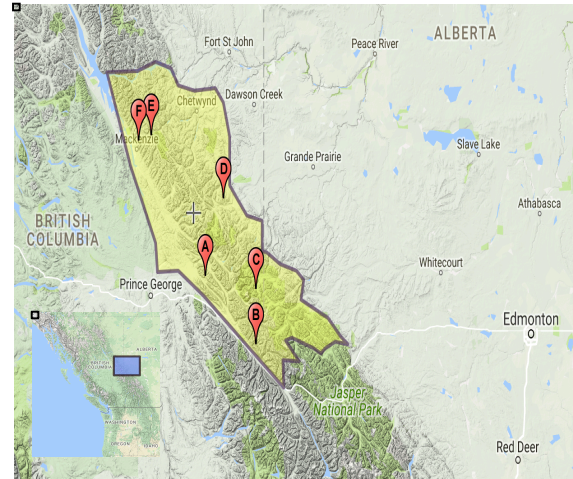


Figure 1. Avalanche Canada’s North Rockies. The localized ‘hot spots’ being: A) Torpy Mountain: B) Renshaw Snowmobile Area: C) Kakwa Park: D) Tumbler Ridge: E) The Pine Pass: F) Mount Morfee

3. RESULTS

Survey data was tabulated so that results from the North Rockies information could be compared to Strong-Cvetich's (2014) data. A Z-test was used to determine whether the two sample populations differed statistically, given a standard error and a 95% confidence interval.

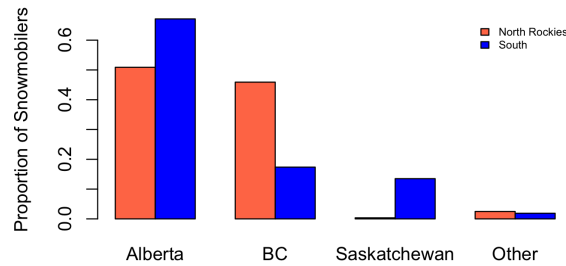
3.1 *Demographics*

The mean age of surveyed participants of the North Rockies was 37 (n=167, SD =12.83) and 94% were male. Both results are statistically significant when compared to Strong-Cvetich (2014) ‘southerly’ regions with daily avalanche bulletins. Respectively Strong-Cvetich (2014) found a mean age of a 34 (n=1002, SD =10.33) and 88% ridership being male.

Of North Rockies snowmobilers, the majority hailed from Alberta at 51%, followed by BC 45.5%, Saskatchewan with 3% and 0.35% from other locations (Quebec) (n= 282). When compared to Strong-Cvetich (2014), Albertans

accounting for 67%, BC 17%, Saskatchewan 13% and others (from the USA) at 2% (n=1007). This represented a statistically significant difference between the proportion of snowmobilers and where they come from in terms of North Rockies and 'southerly' snowmobile locations and can be seen in table 1.

Table 1: Proportion of Snowmobilers originating locations. Comparing North Rockies to Strong-Cvetich (2014).



3.2 Riding Experience

The North Rockies median riding experience was 6 to 9 years and 42% of snowmobilers were riding 5 to 15 days in the mountains snowmobiling per year. Of mountain snowmobilers surveyed 13% were members of a snowmobiling club.

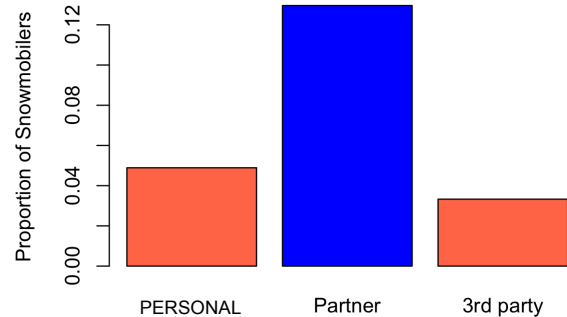
In comparison to Strong-Cvetich's data from 2014, the median riding experience was 3 to 5 years. The median riding experience was not statically significant and thus the median riding experience between the two groups is assumed to be the same. Both North Rockies and 'southern' mountain snowmobilers are getting out equally at 5-15 days per season. Snowmobile club membership is 33% and was also found to be similar to Strong-Cvetich's data as it was not statistically significant.

Of survey respondents in the North Rockies 19% had either witnessed or been caught in an avalanche. As per Strong-Cvetich (2014) 26% of 'southern' snowmobilers that have witnessed or been buried in an avalanche. The result was not statistically significant and again assumed that these two sample groups were similar.

Further avalanche involvement in the North Rockies breaks into three categories (Table 2). 4.5% of snowmobilers had been caught in an avalanche, 11.5% had a riding partner that had

been caught in an avalanche and 3% of snowmobilers had witnessed a third party caught in an avalanche.

Table 2: Proportion of respondents who have either personally been caught, witnessed a riding partner caught, or come across a third party involved in an avalanche.



3.3 Avalanche Education and Awareness

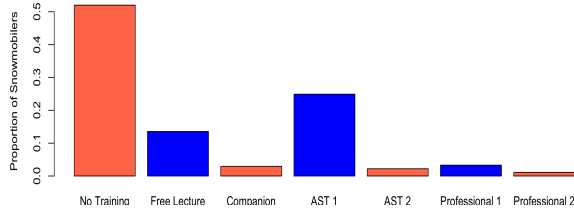
Avalanche education, or those snowmobilers who had at least taken an avalanche skills training (AST) course level 1, were found to be 34.4% in the North Rockies. Strong-Cvetich (2014) found that 40% of 'southern' snowmobilers had at least their AST 1. Here the results are not statistically significant, thus suggesting that the two sample populations are similarly trained.

In the North Rockies, the level of avalanche education breaks down in the following (Table 3). Snowmobilers without avalanche training 52.5%, snowmobilers who had gone to a free evening lecture 13.5%, AST1 was 24.5%, with 3% attending a companion rescue course, 2% have completed the AST 2, 3% have completed a professional avalanche operations course (ITP) level 1 and 1% of snowmobilers had their professional avalanche operational (ITP) level 2 course.

3.4 Avalanche equipment

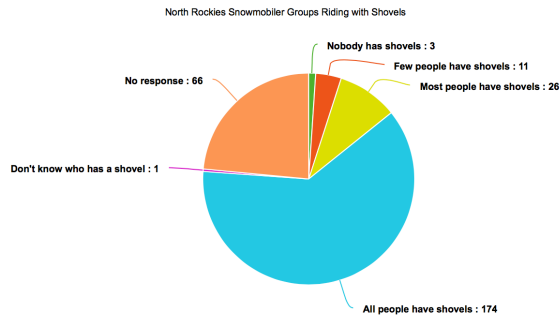
90% of participants carried avalanche shovels. When compared to Strong-Cvetich (2014) result of 96% the two groups are found to be statistically different.

Table 3: Break down of North Rockies Snowmobiler's Avalanche education



Further investigation into the use of avalanche shovels will show that of all North Rockies mountain snowmobiler groups (Table 4), 1% rode without shovels, 4% of groups only have a few avalanche shovels between them, in 9% of groups the majority of riders rode with shovels, in only 62% of groups did everyone ride with an avalanche shovel and when asked, 0.5% of respondents did not know whether their riding partners had an avalanche shovel or not. A total of 25.5% of survey respondents did not answer the question.

Table 4: Use of avalanche shovels in the North Rockies

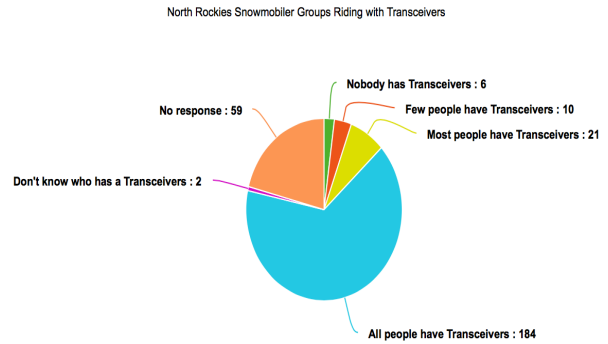


Avalanche transceiver usage in the North Rockies was found to be 87%. This number was identical to the finding of Strong-Cvetich (2014) result. There was no statistical difference between these two sample populations.

The following (Table 5) can better break down the understanding of transceiver usage in North Rockies snowmobilers. Although 20% of respondents did not answer the question, 2% of respondents rode in groups that did not carry avalanche transceivers, 3.5% had a few avalanche transceivers within the group, in 7.5% of respondents rode in groups where the majority of riders wore an avalanche transceiver, in 65% of respondents rode in groups where everyone wore an avalanche transceiver and

0.7% of respondents did not know whether their riding partners had an avalanche transceiver or not.

Table 5: Avalanche transceiver usage in the North Rockies.



The use of avalanche probes in the North Rockies 76% (215 of 282) was significantly lower than Strong-Cvetich (2014) results of 86% (879 of 1,019). Of North Rockies snowmobiler groups surveyed, 29.5% had no response, 9% of groups had no probes, there were 7% of respondents where few people had a probe, 10% where the majority of respondents had a probe, 53.5% where everyone had a probe and 3% of respondents surveyed did not know if their group members had an avalanche probe.

Statistically, the overall picture for snowmobile groups in the North Rockies carrying all three-avalanche essentials (a shovel, probe and transceiver) is 21.5%.

Balloon packs or air bags are another safety tool that have been increasing in popularity. The rate of air bag adoption in the North Rockies was found to be 46%. This represents a 130% increase in the number of air bags when compared to Strong-Cvetich (2014). Strong-Cvetich (2014) found the use of balloon pack to be 35% among snowmobilers. These results were found to be statistically significantly.

The use of air bags among North Rockies snowmobilers respondents was found to be the following: 32% of snowmobilers did not respond to the question, 14% of respondent did not have an air bag or balloon pack, 21% had a few air bag users within there responding group, in 14% of respondents said that the majority of riders in their group had a balloon packs, 16% of respondents and their groups all riders wore an air bags and 1% of responding riders did not know if their partners had an airbag.

The use of GPS devices was similar between both the North Rockies and 'southern' snowmobile groups. Here a North Rockies user was found to ride a GPS 31% of the time compared to Strong-Cvetich (2014) 33%. This result was not found to be statistically different.

3.5 *Avalanche Awareness and culture*

A Likert based questionnaire was used to determine avalanche behaviors, Heuristics and Biases (H&B), Naturalistic Decision Making (NDM) and safety practices in the North Rockies. A tabulated scale of the results can be seen in table 1.

The following Likert scale was devised to determine if North Rockies snowmobilers are taking basic safety practices into mind when heading out in the backcountry.

4. DISCUSSION

4.1 *Avalanche bulletins and Education*

AC made an assumption based upon the lack of avalanche educators, and other data sparse variables, that North Rockies mountain snowmobilers would “not have the training or knowledge to use [an avalanche bulletin] effectively.” However, North Rockies snowmobilers appear to be just as educated in terms of avalanche course work as the rest of their provincial counterparts. The avalanche bulletin as a dependent variable then seems to have little effect on the amount of avalanche education or training. (Although there maybe some increase in avalanche education from 2014 to 2016, as there may be some yearly increase in avalanche education. Unfortunately there is no information to this effect at present). This leads to questions in regards to the efficacy and effects of AC's daily avalanche bulletin. A bulletin that is simple to use, graphic, relatively intuitive and as per Furman (2010) is one of the most important factors influencing people when they decide to ski a slope. To quote Bruce Temper (2013, p.96) about avalanche bulletins:

Table 6. North Rockies Snowmobiler Likert Scale. Scaled from 0% being an event that rarely happens, to 100% where the event occurs every time the surveyed individual goes snowmobiling. Table 1A): Deals with safety issues, groupthink and common safety habits typically taught in a AST1 course.

<i>I have a 'tailgate' meeting prior to riding with my riding partners</i>	57.5%
<i>I ride with people who have no avalanche training</i>	63%
<i>I have cancelled trips when the avalanche danger was to high</i>	69.5%
<i>My riding group checks each others avalanche transceivers and batteries before leaving the parking lot</i>	69%
<i>I dig a snow pit to understand the snowpack when I am out riding</i>	51%

Table 1B): Avalanche Education

<i>I wear an avalanche transceiver</i>	73%
<i>I would be willing to pay for a daily avalanche bulletin</i>	72%
<i>I ride with a collapsible avalanche probe</i>	82%
<i>I am confident that I could find my riding partner buried in an avalanche in 15 minute or less</i>	64%

Table 1C): Avalanche risk Culture.

<i>I enjoy getting into the mountains and having a few beers with friends while sledding</i>	60%
<i>I compete with my riding partner high marking to see who can make it the furthest</i>	55%
<i>I typically just follow someone in the group who knows what they are doing</i>	56%
<i>I generally don't think about avalanches where I ride</i>	42%

Table 1D): Heuristic and Biases and Naturalistic Decision Making

<i>I try and ride after a big snowfall (30cm+)</i>	64%
<i>I will help a friend out who is stuck on a slope</i>	74.5%
<i>It is just the luck of the draw who gets buried in an avalanche. It does not matter how much avalanche education I have, avalanches are something I have no control over</i>	40%
<i>I am confident I could out run an avalanche on my snowmobile</i>	34%

<i>In poor avalanche conditions the riding in tree is a safe alternative, because avalanche do not occur in the trees</i>	47%
<i>A slope that has track in it means it safe and not going to slide or avalanche</i>	31%

4. DISCUSSION

“A well-crafted avalanche advisory from an experienced forecaster is a thing of beauty...an easily understandable summary of the critical information you need to stay alive in avalanche terrain. It’s one of the best deals in town – and it’s free. It’s an essential, daily newspaper for the backcountry.”

This begs the question of how an avalanche bulletin impacts the snowmobile communities’ avalanche education and awareness?

Snowmobilers have been an outlier, subgroup of the avalanche community until recently. As such, an avalanche forecast would likely not have as great an effect, just like the AC thought. Before the avalanche bulletin can have the same effect as it does with skiers the AC, like all other NGOs must have the social capital and buy-in from the snowmobiler community.

As McCammon (2004) discussed, climate change and anti-drug NGOs have typically faced similar issues. The way in which these problems have been dealt with by NGOs has typically been through information and education. NGOs hope to sway public opinion by simply delivering greater amounts and more scientifically accurate information. Unfortunately this method has yet to change the majority of public sentiment in regards to climate change and drugs. NGOs face a bifurcate problem. Firstly supplying more information to better educate their public base, and secondly, gaining social capital and public buy in to see the validity in the data (McCammon, 2004).

In short NGOs must win over hearts before they can change people’s minds. As peer-to-peer, social groups and spheres have the greatest influence on individuals (Kruse et. al, 2014).

AC’s newly released Mountain Information Network (MIN) has the potential to reach this wider social sphere. The MIN is a product, which may produce greater community buy-in, as seen with respect to the North Rockies Info Share Facebook page and further afield with the South Coast Backcountry Touring Facebook page.

Recreationalists can feel empowered by sharing their trip reports, pictures and knowledge of a region (Ditton, Loomis, & Choi, 1992). A possible key difference being that these Facebook pages allow for two-way discussions. The ability to communicate is of great importance when social spheres influence everything from our gear purchases and backcountry terrain choices, to our decisions to further our avalanche education (Kruse et. al, 2014).

Another factor that may have contributed to the equality of avalanche education between the North Rockies and ‘southern’ snowmobiler are the avalanche educators themselves. There are only a handful of avalanche educators in the North Rockies; however, these educators are engaged in their communities, their local snowmobile clubs and local search and rescue organizations. These avalanche educators likely have high social capital within their communities and therefore may have a large influence with respect to increasing avalanche education and awareness. Avalanche educators are the boots on the ground and therefore may be seen as the face of AC. The effect of avalanche educators is a topic that warrants further study.

4.2 Heuristics and Bias and Naturalistic Decision Making

Heuristics and Bias (H&B) are typically used to describe rules-of-thumb that people follow when decision-making. These mental short cuts allow for efficient judgments and decision to be made (Kahneman & Klein, 2009). NDM alternatively looks at how people react when faced with tough decisions under difficult real-world circumstances; typically responding based on the recognition of subtle clues (Kahneman & Klein, 2009).

A snapshot of the North Rockies’ snowmobiling community was generated using a Likert scale to take a baseline set of data. The idea was to make note of any glaring outliers in recreationalist behavior, as one may have assumed given the limited amount of forecasting and avalanche outreach.

From the Likert scale, 69.5% of snowmobilers had cancelled trips because of the avalanche forecast. The other 30% are simply making do with poor conditions. These snowmobilers know the avalanche conditions are not favorable, but hope to produce a non-fatal ‘good’ enough day.

The backcountry has been termed a 'wicked' learning environment with few feedback loops (Einhorn & Hogarth, 1978). If the decision to go snowmobiling in poor avalanche conditions results in a non-event, it will foster the development of poor pattern recognition (Klein, 1998, Stewart-Patterson, 2014).

Once the decision has been made to go out snowmobiling in less safe conditions, the next decision becomes is how to make it work. Nearly a half (57%) of North Rockies snowmobilers have a safety tailgate meeting, however only two thirds (69%) check their transceivers prior to heading out and riding for the day.

Once riding, half (51%) of all snowmobile parties are digging a snow profile to better understand the snow stability. However, I only saw one profile during my sample observation days. Additionally, if I dug a snow profile near where snowmobilers were recreating, I was frequently asked questions like "what are you doing?" and "can I watch?" I think that people are simply not digging snow profiles.

This raises two points, the first discussed in Kruse et. al (2014), that nobody wants to 'be that guy' that slows the group down, so nobody suggest to dig a snow profile (2014).

Unfortunately this likely leads to some group-think occurring since just over half (52%) interviewees have no avalanche training and 63% of groups allow people without avalanche training to join them in snowmobiling for the day.

The second issue seen in the Likert responses was the highly positive response rate to whether they could; recover a buried friend in 15 minutes or less¹, and a few others. I feel the issue is that people are not faced with real-world problems when completing the survey and as such the survey presents an unrealistic expectation of their skill. The respondents had time, comfort and low risk environments to complete the paper work. This safe environment quickly changes as soon as the snowmobiler leaves the trailhead into the mountains. Suddenly time and consequences of their decisions are taxed. Likely the Likert scale represents the optimum conditions of decision response for these respondents

¹ It seems unlikely that two thirds of respondents would be able find their riding partner buried in an avalanche in 15 minutes when 29% of respondents either have old analog transceivers or do not even know what transceiver they are using.

The idea that the Likert scale represents a snapshot of the North Rockies snowmobilers at their best is a worrisome notion when it comes to table D. In table D one third of North Rockies snowmobilers feel confident that they could outrun an avalanche on their snowmobile (34%) and another third (31%) believe that if a slope has a track on it, that it means the slope is safe and will not slide or avalanche. These two beliefs likely stem from the backcountry being a 'wicked' learning environment, with little to no feedback loops (Hogarth, Gibbs, McKenzie, & Marquis, 1991) contributing to poor pattern recognition. The outrunning an avalanche may also be rooted in snowmobile films and personal YouTube videos. These snowmobiling videos, however, also likely lead to a higher usage of airbags and balloon packs (Kruse et. al, 2014) that 50% of the North Rockies snowmobilers are wearing. Unfortunately half of all North Rockies Snowmobilers still believe that riding in the trees is safe when avalanche danger is high because avalanches do not occur in the trees. Simply put there is room to grow.

5. CONCLUSION

The North Rockies is one of few areas in BC that does not receive a daily avalanche bulletin and therefore it is one of the most easily accessible mountain environments to study the effects of AC's avalanche bulletin. The mountain snowmobilers in the North Rockies are a large and active user group that would benefit tremendously from increased avalanche education and access to a daily avalanche bulletin. Further study in the North Rockies would allow for a lithium test in regards to the efficacy of the AC's avalanche bulletin and the prospect of increased social capital of for the AC.

This study showed that there was little difference between the North Rockies and BC 'southern' snowmobiling communities and therefore questions the efficacy of the AC's daily avalanche bulletins.

I believe, the snowmobiling community as a whole counters the North Rockies deficiency of not receiving a daily avalanche bulletin. 2016 may have been a watershed moment in the snowmobiling community in BC. The year saw both large multi-fatality avalanches in the North Rockies and a further consolidation in the avalanche community uniting to educate, warn, tell-off, and showcase avalanche problems.

This outreach was seen in videos posted on the North Rockies Info share, where a few videos of stability tests were seen approximately 1,500 within 48hrs. Articles written by respected snowmobile avalanche educators and a general trend on social media calling out to snowmobilers to do better change their snowmobile culture and get the PPE (Personal Protective Education). Increased usage of the AC's MIN, however, this increased social engagement with the snowmobiling community and its effects should be studied further.

There is stillroom to improve upon the avalanche education, awareness and preparedness of the North Rockies snowmobiling community. As

only 21.5% of respondent groups surveyed are carrying all avalanche essentials (transceiver, probe and shovel). It behooves AC to understand the efficacy and outreach their avalanche bulletin imparts and to continue to increase their social engagement, new product development like the MIN and generate public awareness.

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