

**Should the proposed scale focus on the risk-based interpretation of avalanche size (less specific to terrain features in the deposit)? Should interpretation guidance (e.g. footnotes) state whether or not the terrain features of a specific avalanche be considered? An example would be: Relatively harmless to a person, where no terrain traps or fall hazards exist.**

Open-Ended Responses:

- Yes, I like the way the example is worded. I often teach "A size one avalanche can still kill or bury a person in a terrain trap, similar to drowning in a few inches of water if lying down"
- I like the example. Footnote stating whether or not terrain features are considered. I would need to see an example of risk-based interpretation of avalanche size to have an opinion.
- Yes, I think this will clarify classification.
- No interpretation guidance
- Yes
- No, too prescribed of a rating scheme will make it less effective for edge cases. It should be hazard-based and not risk-based, as the element at risk is not always humans.
- Yes, a focus on risk. Gullies/cliffs/glades do not change the size of the avalanche. Footnotes should accompany if there is potential for size 2 consequences (traps/falls/trauma) from a size <2 slide.
- I think the scale should be relative to the size and mass only, e.g you are expected to see only size 1, and people should make their own judgment call before crossing above a cliff. An small size one avalanche could be triggered in a path without anyone in it and it remains a sz 1, but then you put a person and they get push over a cliff and died and now it become a sz 2?????. If the cliff wasn't there it would remain a sz 1 but if they died going over the cliff the size of the avalanche become a sz 2????? This makes no sense to me, the terrain is the main factor not the avalanche size in this. If someone tell me it was a sz 2 I will picture a much bigger avalanche..
- I support this reasoning. Adding footnotes helps with clarity.
- Scale should be focused on volume.
- I think size of avalanche and terrain feature should be separate categories. This would make standardization easier.
- I like the approach of avalanche size remaining independent from terrain features. I think specific footnotes could help people separate hazard and risk.
- It would seem to me that the consideration of terrain traps or fall hazards is inherent when considering avalanche size. In most basic avalanche courses I have taught we always emphasize that while a size 1 avalanche does not by definition state that it will

bury or kill a person, if there is a terrain trap or cliff feature that you may be pushed into or carried over, then even a small avalanche could be extremely hazardous. I think the defined size of an avalanche should be kept separate from the terrain and you manage the risk based on combining the two.

- Yes
- Yes, keep it risk based. I think that the whole scale should be "where no terrain traps or fall hazards exists". I would prefer to see the scale remain as simple as possible / am not sure this needs to be included
- No
- Yes
- No. I don't think this would be helpful. Any risk-based interpretation would add more personal subjectivity to the assessment (and there is already a lot of subjectivity now)
- Yes, I prefer the scale does not consider terrain features in the deposit. And yes, the footnote would help.
- Yes
- Footnotes - especially for recreational users as they can underestimate the severity of a size 1 or size 2. Putting emphasis that the destructive potential is correlated to terrain will hopefully prompt them to identify terrain traps more regularly.
- Re Table1, Perla 1980, size could depend on three or four variables.
- I like the example when using the scale to communicate risk. I feel the key word in the subjective description of a D1 is "relatively harmless"
- This should already be taught. I have always taught destructive potential.
- Yes, as the example above.
- No to both questions. In my view, the only way to generate consistency is to remove the subject fields of rating avalanches. Stick to easily measurable parameters. Length, width, depth etc.
- Terrain features should be considered.
- Yes in theory, though it may be hard to apply consistently. Once again, descriptive comments and preferably photos are much more illustrative than just a size classification alone.
- Perhaps differentiating scales according to purpose: 1) hazard assessment (less terrain specific); 2) risk management decision making (more terrain specific)

- Avalanche size can be less specific to terrain features if interpretation guidance is stated. It's probably the best way to go. When teaching we can separate terrain traps/fall hazards from avalanche sizing.
- Yes, the proposed destructive size scale of avalanches should be independent of terrain features. When reading avalanche observations, practitioners should immediately know the order of magnitude dimensions (length, mass) of an avalanche, based solely on the destructive size listed. This is a key feature for practitioners who often need to scan hundreds of avalanche observations in a short period of time, identifying those which are relevant to their own workflow at a glance.
- No
- Since destructive potential is not necessarily correlative to burial, injury, or morality, I think it should be standardized regardless of the terrain in any part of the path that might affect any of those outcomes. Burial is one kind of mechanism for injury in an avalanche but not the only one. So, yes, I like the given example with the footnote, but not sure it would work well to qualify when terrain traps or fall hazards do exist.
- Yes

**Are there any scenarios from your experience where terrain features have influenced your size rating?**

#### **Open-Ended Responses**

- Sometimes I feel the scale and size of the path influences size ratings of avalanche. For example a smaller ski hill might report a size 3 on a feature that goes larger than normal and full path while another bigger ski hill may look at the avalanche and see it as a 2 or 2.5 because they are often seeing avalanches of that size regularly on slopes not going full feature. It seems when there is an anomaly things seem to get bumped up the size scale.
- Forecasting for ice climbers, I frequently have terrain features influencing danger ratings. It doesn't typically influence size rating but requires warning in the text about terrain traps.
- Yes, a very small avalanche failed on a suncrust down about 20 cm resulting in a skier injury increased the avalanche rating from a size 1 to a size 2.
- Likely, though I try to just use the size of the avalanche.
- No
- Not to my knowledge -- I attempt to rate as I was taught, based on the most destructive area of the avalanche (e.g., confined track).

- We discuss those scenarios as "size 1 avalanches with size 2 consequences."
- Somewhat, when the debris get completely spread out thin on a wide planar slope (run out). As a result the destruction potential was really low, it could have not really push a person or do much damage.
- There are lots of places where a very small (size 1) avalanche that is able to move thru treed terrain may kill you by pushing you into a tree, or tree well, but was a relatively small mass of snow moving, and would be harmless if it wasn't in treed terrain.
- No.
- No
- While I try not to let terrain influence my size ratings, I know it happens. I can think of one avalanche where I had a close call and the debris piled deeply in a gully and I called it a 2.5, while my coworkers who were not involved in the close call called it a 2.
- I would say we have a harder time estimating size of large avalanches especially from a distance as we don't see them as often and so often size 3 avalanche may actually be classified as 4s. Conversely when snow pours over cliff features etc. it can look much larger than it actually is if you are considering sheer volume of snow.
- Only in the respect that large features can produce more destructive avalanches. For example, a 20cm thick slab on a small slope may only result in a size 1 avalanche, but on a very large slope may result in perhaps a size 2.5.
- They almost always do. It requires practice, open discussion (when possible), and experience to avoid having this influence.
- Yes, I think the root of the problem is the definition for size 1 avalanches being harmless to humans. This is incorrect, all avalanches are a potential hazard to humans other than a 0.5. I think 1.5 is used commonly to indicate the avalanche won't have a big volume but can be potentially dangerous.
- they used to be part of my determination of size, but I have since moved to a more volume based estimation, and then add notes for specific human risk potential, ie terrain traps.
- initially I thought no. But I guess a terrain feature altering the runout and making a deposit look "larger" (=more volume) vs a thin, widespread deposit.
- Likely yes, but I try not to. I try to think about the mass and speed of the snow.

- No
- Yes, I personally size up when I see an avalanche with a deep deposit in a terrain trap. It is challenging to imagine the size of it without the terrain trap and how deep the debris would be.
- Re Table 1, Perla 1980, e.g. vertical descent is a "terrain" variable.
- Not consciously, though I've initially rated an avalanche one size larger until I was able to determine the amount of existing debris in the runout (from a recent, previous event).
- Plunging avalanches onto a road where a size 1 most certain has potential to bury/injure or kill a person and damage a vehicle. Therefore an avalanche with a mass of size 1 may have size 2 or larger consequences based on the terrain and location within the terrain. In my opinion however it is still a size 1 avalanche as the mass can be measured or estimated whereas consequences maybe more ambiguous or difficult to quantify.
- No. I separate terrain from snow. Terrain doesn't change. Snow does. Destructive force should be the only factors. What increases force?  $F=ma$  .. increase mass (density of snow or amount of snow) increase acceleration (speed of the snow movement).
- Not that I can think of, but it has probably happened..
- No. I tend to focus on the quantifiable elements of the avalanche. length, width, volume, mass, density etc.
- Yes
- I find avalanches that pile up in a terrain trap, such as a highway, appear much bigger than those that fan out in the runout with a thinner deposit covering a wider area. In a sense, the same volume of debris can look much more impressive if piled meters deep on a highway.
- Datasets from research from SFU may suggest that activity type influences perceptions of vulnerability to size ratings.
- Yes, mostly where terrain traps increase deposit depth.
- Yes. My initial reaction to avalanches in terrain with consequence (including simple gladed forest) is often more visceral than my initial reaction to an avalanche of similar dimensions on a planar alpine slope. I personally lean heavily on the dimensional guidance for avalanche size, and this often helps me recalibrate my gut reaction into a quantifiably defensible size.

- Yes of course.
- Yes, if typical path length is considered a terrain feature. Also, path geometry/configuration may have influenced size rating.
- Yes, with a glide slab avalanche where the road cut through previous debris made the deposit deeper.

**In many regions, backcountry users share observations, including avalanche observations, with other backcountry users and public forecasters (e.g. Mountain Information Network in Canada) Should greater destructive potential due to terrain features that are typical of the regional mountain environment (e.g. gullies and chokes) be considered when sharing observed avalanche size?**

#### **Open-Ended Response**

- No, but pictures are worth a thousand words.
- Again, I'm having a hard time visualizing what this would look like. I would need to see an example to have an opinion on it.
- Yes
- I don't think so.
- No
- Perhaps in comments but not in size ratings.
- Terrain features that may increase destructive potential should be considered and discussed, but it should not change the size of the slide.
- Yes, because funneling the debris will increase its size at a certain spot and destruction potential.
- I think this is a difficult thing to manage. At the 'intermediate' level of recreational avalanche education we spend a LOT of time talking about terrain and my experience teaching AST2 tells me that many people leave \*just\* starting to integrate that into their thinking, so then asking them to make or interpret specific terrain modifiers is likely beyond most recreationalists.

- No. Scale should be focused on volume.
- No, terrain should be shared separately.
- Maybe we could encourage MIN users to rate size independently of terrain features, but have a check box or something stating that risk is or would be higher due to terrain features.
- No. I think the potential avalanche size should remain consistent with the current definition and we should continue to educate people to consider the hazard within the terrain they are travelling in such that a size 1 avalanche could bury or kill someone in an area where there are lots of gullies/chokes/cliffs etc.
- I think it should be relative to destructive potential without the influence of terrain traps or specific features, unless we are talking about large features that typically result in larger, more destructive avalanches.
- No, avalanches should be classed regardless of the terrain.
- No
- No
- No. But the terrain features could be noted as separate variable for observations. But they should not be linked to interpreting avalanche size.
- No, including more contextual information in ratings can hamper consistent communication. I prefer the rating focus on the amount/speed of snow. The reader can then apply that amount of snow to whatever terrain feature is relevant to them. Any contextual terrain characteristics are better placed as a comment rather than in the rating.
- No
- Yes, would be good to have checkboxes when reporting an avalanche so we are able to gain more information from observations.
- "gully" is not a size, but is important to know.
- Observed size estimates should focus on the volume of the avalanche, independent of the local terrain features. BC users should be aware of their local terrain and how it applies to certain sized avalanches.

- It is important to emphasise that smaller avalanches may have greater consequences as a result of terrain features or lower snow cover but the size should not change based on regional differences.
- Terrain features are important because they play a role in consequence. A size 1 can have more destructive potential when more destructive terrain. Backcountry users will not recognize this and put themselves at risk. A baby can drown in a bathtub.. does this mean the water was dangerous? No.. but it was to the baby. Just like small avalanches are not dangerous with trained backcountry user... they know how to manage risk.
- No
- No
- Yes
- I think the MIN report submissions should strive for a good description of size and consequence, with photos where possible. This will carry much more weight for the AvCAN forecasters than a size rating from a backcountry user with no supporting information.
- If a hazard assessment specific and risk management decision-making specific scale were to be developed, I would suggest that public forecasts, MIN reports, and AST courses educate users to adopt the risk management/terrain-based scale.
- I think we can start trending towards everyone including terrain trap comments, and indicating when the seriousness of a particular avalanche is increased, when reporting.
- No. In fact, the MIN reporting system should be improved to give contributors adequate tools to assist in their avalanche size determination. A web-based calculator with variables of the avalanche slab width, length, depth, and hand hardness for example, would help produce more accurate avalanche sizes in MIN reports. A prominent note should explain that terrain-specific consequences are to be excluded from the size determination.
- No
- Ideally no.
- If the greater destructive potential was added into supporting comments, the size should be consistent.



**Since avalanche mass or volume is more consistent over terrain than destructive potential, should the proposed scale indicate weighting (or state a preference for using) mass or volume more than the other descriptors (columns) like destructive potential or avalanche length?**

### **Open-Ended Responses**

- I think mass and volume are harder to estimate and picture, especially consistently across practitioners and recreationalists alike. Using the destructive potential I think makes people more consistent in reporting sizes. Example, picturing a cabin in the path of the avalanche- would this get destroyed? I think is more accurate for people to guess at then is that 400m or 600m run length? I would bet that if you asked 100 avalanche technicians to ski 30m down hill most of them would all stop at different spots. In my experience ski patrolling and guiding some ones "20m across" is different the the next persons. Its rare that we actually pull a tape measure out and calibrate our estimates. Additionally if it is a close call and like a surprising ski cut and it gets called in right away I think it often gets reported larger then if you see a small avalanche on a slope that has released 12 hrs ago. The scare or surprise factor can also make people estimate larger.
- Yes. Mass or Volume is more consistent. The issue is how to get a accurate mass or volume. It is relatively easy if you have access to the deposit or can get an idea from the area drawn on google earth. But is difficult when estimating avalanche D size from a distance-especially if you can't see the deposit.
- I think it should be considered but weighted lower in influence of size than destructive potential. Consider a 50 cm deep failure 1 Km wide running for 10 m. Huge but small.
- Yes
- YES
- Perhaps. Mass is inherently difficult to assess with unknown densities. Volume can be difficult if the underlying terrain is unknown. Practitioners/Professionals will need time and practice to improve estimation, particularly when only a subset of the path can be observed.
- Yes, I think mass is more objective and consistent in determining avalanche size.
- I think mass and volume should remain the main criteria with the suggested destruction potential.
- I support this reasoning. Length is not a great indicator; I have seen LD slides run for 100's of meters.

- Scale should be focused on volume.
- Yes
- I think we should emphasize using volume/mass. The problem is that it is so hard to visualize deposit volume/mass. Maybe the typical length for each size category could have a range of lengths that overlap between categories to help give guidance but encourage users not to rely too heavily on length as a metric.
- I think it is quite difficult for practitioners to estimate mass of volume of avalanches. I prefer the idea of looking at avalanche length, crown width and depth etc. to help estimate size of avalanche.
- I think that would be very difficult and misleading for non-professionals, and somewhat difficult and time-consuming to be accurate for professional. So no.
- Yes! Keep destructive potential too. Avalanche/run length is almost useless and should be eliminated.
- Yes
- Yes
- Personally, I tried comparing deposition volume with truck loads that would be needed to move the deposit. I found this helpful as a guidance (especially moving between size 2,3 and 4).
- I suppose that could help, but not sure how. It would be nice to communicate the weight of columns in our definitions because I think this causes a fair bit of inconsistency. A classic example is people getting caught up with the snowpack part of the avalanche problems rather than weighting the risk treatment part of the definition. So I'm not sure how you can communicate weights in a rating definition?
- Yes
- I think this would work well for professionals, but it would be extremely challenging for recreational users to guess the appropriate size when reporting on the MIN.
- Same answer as to 1.
- I opt for the mass/volume approach, with an emphasis on volume.

- Yes. Mass or volume can be easily measured or estimated to give a definitive size classification independent of terrain. Whereas both destructive potential and avalanche length can be heavily influenced by terrain and are therefore less consistent.
- Confusing question.
- Yes
- Yes
- No
- Volume is a good one and, as stated, a good calibrator for the size allocated to an avalanche. That said, while it is relatively straightforward to estimate the volume of the slab that released, it is really hard to account for entrainment at a glance, without decent measurements on the ground. Entrainment can be a big determinant of the overall mass, volume and destructive potential, so it is important to account for. I think this is why we default to a "guestimation" of destructive potential.
- I don't feel qualified to weigh in on this one. (Ha! Get it?)
- Calculating mass or volume is based on facts, destructive potential is more open to interpretation. But training on how to calculate mass and volume needs to take place before we can go this route. And even then observer's biases will come into play. Destructive potential still needs to be part of the scale, calculating volume will help determine destructive potential though.
- Perhaps, but I would question whether mass is indeed a better predictor of destructive potential than for example, run length. I personally find that the divergence of avalanche mass and run length for a given destructive size is more pronounced at larger avalanche sizes. In such cases, I perceive that the avalanche run length is a significant indicator of an avalanche's destructive potential. For example, if one were to compare two avalanches of similar mass, with one travelling twice the distance, I imagine an element at risk being more severely damaged by travelling the longer distance (or being impacted by the avalanche which had the energy to travel the longer distance). I do not think that many practitioners have the ability to judge at a glance whether an avalanche could destroy a pickup truck or a rail car, and hence, it is my view that these destructive descriptors should be for reference only and not for use in determining the destructive size of an avalanche, unless such an element at risk is indeed damaged in that avalanche.
- Yes. Let's go with volume as a quantitative measurement.
- I think yes for consistency, but no for more practical reasons.

- Yes, with focus on volume.

**Should the proposed scale use deposit mass or deposit volume or both? Deposit mass is more related to destructive potential than deposit volume. However, deposit volume is easier to visualize and does not require that deposit density be estimated. (The scale developed by the European Avalanche Warning Services (EAWS), which is based on the Canadian Scale, uses volume. The US avalanche encyclopedia now includes a visual aid for estimating volume.)**

### **Open-Ended Response**

- I think both would be helpful as well as still keeping in destructive potential.
- Volume is easier to visualize and requires less math and estimation of deposit density.
- I think that if mass and volume are easily integrated into the classification, that would be best. Otherwise just deposit volume.
- Volume
- Volume prioritized, but include mass also (ie wet avalanches)
- I believe mass is difficult to assess for most practitioners. We attempt to teach it in ITP L2 but I feel uptake is low. Volume is likely better. Mass is still not necessarily related to destructive potential, depending on path setup. Velocity is just as important, which is not part of our estimation (although included in overall impact pressure).
- Yes, both mass and volume.
- no opinion
- This might be one of the places where the practice of professionals differs slightly from the practice of recreationalists. Pros should be able to use mass, where recreationalists are likely going to need to work in volume. The Euro idea of talking about runout vs. slope steepness might be helpful to incorporate.
- Scale should be focused on volume.
- Both
- I think mass is more important than volume, but mass is so difficult to estimate in the field, which is where ratings are usually made. I think its so difficult to visualize density in the field, that people probably think of these two terms interchangeably. So I'm not sure

using one or the other would make a huge difference. The only main issue I can think of is that a wet deposit of smaller volume could be the same size as a dry deposit of larger volume. I don't have a great solution or idea for this, but its worth thinking about.

- See previous questions response. Based on above I would suggest volume is easiest for a practitioner to estimate.
- Perhaps incorporating deposit mass, which might be reasonably measure with aids like Google Earth. I feel measuring mass would be too time consuming and difficult.
- Keep it simple. Are there some easy metrics (like estimated moisture content) that could be used to calculate mass? If not, maybe just stick with volume.
- deposit volume
- deposit volume
- Volume
- Don't have a strong opinion here. I suppose visual training aids could help me calibrate and consider volume in my assessments more than I do currently.
- use both mass and volume
- Volume
- mass is hard to estimate.
- Again, I opt for volume. Mass influence the destructive potential, but so does speed (dry v. wet avalanches).
- Density can be estimated from hand hardness to calculate mass and thus differentiate hard slab or wind slab from fresh storm slab.
- $F=ma$ . If the volume is large the Mass is large. If the density is high the mass is high. If both are high then the mass is very high. Stick with Force equation to determine destructive potential.
- Include a visual aid and find a common definition with EAWS.
- I think mass is the more accurate way to measure an avalanche, however if volume is easier for everyone the community will generate more consistency therefore that would be the more reliable option.

- Volume
- As a practitioner, I am often using thought experiments to assess destruction potential and determine risk recommendations.
- I think it's good to have both mass and volume in the table, but ultimately volume is much more practical for standard observations as its easier to roughly calculate with some measurements on Google Earth.
- Same as above.
- Volume
- I find the calculation of avalanche mass to be sufficiently simple that it should continue to be used. A simple spreadsheet or other calculator can be used to estimate the avalanche mass based on the density of the snowpack layers involved in the avalanche (or approximated through hand hardness of those layers).
- Volume not mass for deposits
- Maybe both.
- I like both systems. Volume is easier to visualize.

**Should the proposed scale be primarily for use by avalanche practitioners and professionals? Should the proposed scale offer guidance on how people who have not seen many large avalanches in motion (e.g. backcountry recreationists, foresters) rate avalanche size? Should these users focus more on mass or volume?**

#### **Open-Ended Response**

- I think the scale should be the same across the board, not different. Size is and will always be an estimation that gets better with experience. The more guidance the better through use of photos and videos and examples. I have found teaching beginners the easiest way is to picture the thing at risk - trees, person, train car in the path.
- Might need to test a new way to rate avalanche size with volume with some focus groups of laypeople and see which is more accurate.
- It should (and will likely) be used primarily by practitioners and professionals. The scale should definitely offer guidance (for consistency). The scale should focus more on mass, but include volume.

- Used by all. Guidance should be available.
- Same. Focus on Volume
- Any scale should be applicable to any person, recreating or working. Having different scales will increase confusion and uncertainty. Volume over mass, particularly since density is always an estimation anyways and is otherwise dependent on volume.
- Practitioners and professionals already have divided opinions on size ratings. I think focusing on having professionals all speaking the same language is most important.
- Consider both.
- Can we build more or less the same scale, and pros access it from the mass end and recreationalists access it from the volume end?
- All users should focus on volume.
- Primarily practitioners and professionals. It should be simple to understand and clear.
- I think the same scale should be used for practitioners and recreationists in order to facilitate communication and information sharing. Perhaps there could be two different sets of qualifying statements for each group. The one for recreationists could provide extra guidance for people who don't often see large avalanches.
- I think volume is still easier for people with less training to use to help calculate size. If some kind of rough dimensions (such as those proposed by McClung) reflective average crown depth, width and avalanche length be included as guidance for estimating avalanche size that would be beneficial instead of just providing volume estimates.
- I question how often professional would take the time to calculate mass or volume. Consider a Xh mission with 20 shots and more than 15 results - I certainly would not spend the time to calculate mass or volume for the results. I believe that public submissions (MIN reports) are typically weighted less than professional observations due to inconsistencies in recreationalists' observations.
- I think we need one scale that can be used for both recreational and professional users. It may not be necessary to communicate anything other than destructive potential with recreational users. I would suspect that trying to get recreational users to use math would result in way less reporting. Recreational users need to be encouraged to include photos.
- Should be used by all.

- Introduce & modify scale thru professional avenues - then bring into recreational venues. Proposed scale can be supported with educational tactics to help with rating (and separately describing the destructive potential) - don't build the guidance into the scale itself. Users to focus on volume estimation. In addition, focus on volume when estimating size may (hopefully) help users estimate potential avalanche size when reviewing terrain features & depths of weak/trigger layers. It can be quite surprising how small a slope will produce a size 2 avalanche (volume definition) with a weak layer down 30cm.
- Yes, guidance helps (comparing to other "measurable" things like trucks). Volume.
- I wonder about also improving the public definitions. For example, in Canada our problems use "small", "large" and "very large", then we use numbers in the avalanche summary as well as the option to report numeric sizes in the MIN. Perhaps there's value in creating a combined professional and public scale, or at least guidance on how to apply the professional scale to non-professionals.
- For use by both, offer guidance. For these user focused more on volume.
- I think offering footnotes for recreationalists would be helpful for them to understand the importance of terrain identification.
- Mass is hard to estimate.
- The scale is far more useful and accurate for professional use. Less experienced users should use a volume and runout estimate.
- Practitioners should focus on mass given their higher level of expertise and ability to differentiate between avalanche types whereas other users with less experience should focus on volume using guidance on how to estimate this.
- A professional with lots of experience will always report more accurately. Make sure you give more weight to professional observations and treat non-professional observations with a degree of error.
- Primarily focus on practitioners and professionals. Should not include guidance towards the general public.
- Yes. Yes. Volume.
- No, yes, volume.



- I think we all have to use the same scale, but maybe, similar to the ATES scale, we have a public model and a more detailed technical model that share common language and sizes.
- I recommend that empirical evidence from a study of how lay people most commonly understand avalanche size (mass vs. volume vs. vulnerability) inform this decision. It's a great research question!
- One scale for all. The more guidance the better. Volume.
- The propose scale should be primarily for use by avalanche professionals. Sufficient tools (smartphone calculator app, for example) should be made available for lay people to estimate an avalanche's size, such that they "get close" to the correct size when reporting.
- Professionals needs to focus more on volume. Recreational users should remain focused on the D scale.
- Scale should be for pros primarily. Recreational public already gets a layperson's version from forecast centers.
- The scale should be the same throughout all user groups. Following the Euro model with photos and videos would be helpful. Many practitioners and professionals have not seen large avalanches in motion.

**Should visualizing potential damage to a person (on foot), a passenger car, a wood frame house, a rail car, a few trees, forests, or a village be part of the proposed scale? Should visualizing the potential burial of a person, a passenger car, or a rail car be part of the proposed scale?**

#### **Open-Ended Response**

- Both and yes for visualizing.
- I think it is an intuitive way to describe most avalanches. It is just the terrain trap part which is tricky.
- Yes, I think the visualisation is helpful.
- Burial not damage.
- Yes, but right now this has more "weight" than something that is measurable like volume and mass. This should be reversed. "Can it bury a car without a terrain trap?"

- If destructive potential is the main classifier then yes, visualizations are good. But the wording of them should be modified to include various types of elements at risk for each scale.
- I think the visualization of destructive potential is helpful. Potential burial may also be helpful.
- Yes, as a second visualization aid.
- I think for recreationalists this is very helpful, especially when I'm teaching AST2. What kind of thing would this avalanche wreck is a helpful tool for folks who don't think about things like mass and density.
- Visualization can stay but the primary focus should be volume.
- It should be separately from the size.
- I think so because I remember that being really helpful for me when I was new to the industry. It would be good to somehow de-emphasize these metrics though. I don't have great suggestions for this because I know this is the column that people's eyes are drawn to when they look at the chart of avalanche size.
- Yes, I would say this is applicable, especially for recreational users. This is where it could get tricky with a terrain trap and the definition of burry or damage - but the volume of the avalanche shouldn't change.
- Good question. Perhaps a mix of both? I feel I typically visualize the potential for burial of a person for smaller avalanches, and visualize the potential damage to cars, houses, etc. with larger avalanches.
- Yes, and yes.
- Potential damage.
- No - this would be part of a descriptor, or foot note, addition to the scale.
- It can be part of it as a help to differentiate the size classes but I would not consider it on the object side (=keep hazard and risk separated as long as possible). Mainly because risk is (qualitatively and quantitatively) subjective to the object.
- It's been a helpful way for me to rate sizes in the field, but not sure if it's the best way. Don't know...

- Yes, to both.
- Yes, I think it is helpful to have some sort of visualization of destructive potential.
- Yes, one of the important variable.
- The visualization of potential damage is a tricky one. Could bury an person or car is easier to visualize (volume-based) than "damage a wood-framed house". How many wood-framed houses have you seen get smoked by an avalanche? Likely not enough to maintain a good scale of reference.
- It can sometimes be difficult to estimate the extent and depth of debris deposits especially from a distance or for larger avalanches. Preference should be given to estimating the area and depth of the slab that released. This can be added by using measuring tools such as google earth to give a more consistent size rating.
- The size of an avalanche is important because it will determine the potential for loss. Using examples if a good way to teach. Keep them in. But emphasize the potential for loss as the real reason.
- Yes and yes.
- No. No.
- Yes, yes.
- I think the existing graduation of destructive potential is good.
- Same as above.
- Yes.
- Ha! I mentioned this above, but I perceive that most practitioners are quite lousy at estimating whether a pile of snow could destroy a given element at risk. It is my stance that these descriptors should be for reference only, unless the specific elements at risk are indeed involved in the avalanche (for example, an avalanche destroys a swath of mature timber of known area)
- No
- I think it is good to use them as examples to visualize, but not to define the scale.
- Keeping the scale to easily pictured items is useful. in North America, a village is not as common as Europe. Cars, rail and passenger are more easily visualized.

**The current definition of size 5 is “Largest snow avalanches known; could destroy a forest of 40 ha.” For avalanches that could destroy about 40 ha and have the typical mass and run length of size 5 avalanches, some practitioners classify the avalanches as Size 4 or 4.5 because the avalanche was not one of the “largest snow avalanches known”. Should this phrase be deleted from the proposed scale?**

### **Open-Ended Response**

- I like this phrase. A size 5 should not be thrown down lightly. I think it's rare we actually see these sized avalanches in Canada on our mountain scale. My parting words would be just a reminder that its always an estimate and no matter what the wording or classification there will always be disagreements and people classifying things different based on experience, I think this should be accepted but also its good to give more examples and guidance to help get people closer to the same page. It's snow science but its also snow art in my opinion and not everything fits perfectly into a box when dealing with nature as much as we would like it to.
- It should be deleted.
- Yes, the statement is too subjective.
- Yes.
- Yes. Delete. Also, consider adding a size 6, as there are avalanches of a magnitude larger than the current definition of mass and volume for a size 5. 5.
- YES!
- Yes.
- No, it is representative of the most extreme events in the world.
- The US encyclopedia visual aids did a good job of putting scope/relative size to size 5. Largest known is hard to quantify, and implies you need experience beyond your current avalanche region (i.e. someone working in the US NE versus someone working in the Himalaya). This might be a bit like the river rapid classification system where they said the top end rapids were "unsurvivable" and then some pros pushing the envelope when and paddled them, needing the creation of "class 6 rapids".
- Either or. Once again volume based is key!
- Yes

- I think it could be helpful to remove this phrase if we want people to actually use size 5. I like the phrase, because it sounds cool and imposing, but I do think it also sounds a bit like a historical relic.
- Yes that is a vague statement - is this referring to climax avalanche for that path, or largest avalanche ever. It's definitely a very subjective phrase and could be removed.
- Probably. Might be best to keep it to wording on destructive potential, run length, etc.
- Yes. If it's a size 5 it should be reported as such. If we can't have size 5s in Canada because of the terrain, we should either eliminate this from the scale, or change the scale so that we can have size 5s. As it stands it is under utilized and not helping us as practitioners as a result.
- Yes
- Yes - scale needs to be open ended & reflect the exponential nature of the volume. The presentation by B Jamieson (CAA Penticton meetings in early 2000's, I think) of the large avalanches observed off Tumbledown (?) at Selkirk Mountain Experience are an excellent example that the current scale is limiting in capturing the magnitude of potential avalanche events. Add that & the rapid changes in environmental (weather) events & we need tools that can be adaptable to describe the unexpected. The black swans are here - if the reviewers know those concepts.
- Yes. Because "largest avalanche known" is subjective. With the goal to push any standardized towards objectivity as much as possible. I personally found that just this phrase biased many avalanches to be downgraded to the 4.5 but in fact there are size 5 avalanches when looking at the objective criterias (volume, length, etc.).
- Yes, I agree this is a deterrent to using size 5.
- Yes
- Yes, I feel size 5's are very often underreported due to this statement.
- Re Perla 1980, table 1, size 5 is extreme, order of magnitude bigger than 4.
- Delete the phrase and stick to volume.
- Yes delete. Offers little in the way of guidance, too subjective.

- Yes. I would also like to mention that MANY professionals call small avalanches size 0.5 . Maybe there should be a yearly reminder that there is no such thing as a 0.5 and the scale starts with 1 and goes to 5. You can use a 1.5 or 2.5 when you are communicating the it was a large 1 or a larger than normal 2.. this gives a buffer for the observer to account for any error in destructive potential measurement.
- Yes
- Yes. I think the definitions of the avalanche sizes need to be specific and quantifiable numbers. Past that there could be examples that help visualize the debris, but I do not think these visualizations should be part of the formal definition.
- Yes
- Yes.
- Yes please.
- "Largest known" does seem too subjective for the purpose of the scale.
- Yes
- No, that descriptor is accurate. This is a cultural problem. Reporting of these large avalanches should be encouraged, provided that sufficient backup information/calculations are available to verify the size reported.
- Delete the phrase.
- I'm fine with that.
- Yes