

FROM AWARENESS TO APPLICATION: TEN YEARS OF CONSUMER-FACING ATES IN THE UNITED STATES

Andy Sovick^{1,2*}

¹ onX Maps, Missoula, MT, USA

² Beacon Guidebooks, Gunnison, CO, USA

ABSTRACT: The Avalanche Terrain Exposure Scale (ATES) was designed as a communication tool to convey terrain complexity to backcountry recreationists through consumer channels such as guidebooks and mobile apps. Despite two decades of research into ATES mapping methodology, few empirical studies have examined how the general public receives and acts on ATES ratings delivered through US private sector products. In 2016, Beacon Guidebooks introduced the first significant consumer-facing ATES implementation in the United States, and for the following seven years it remained the only one. Three surveys conducted between 2018 and 2023 documented a shift in comprehension among this engaged, guidebook-buying audience: the share reporting low awareness of ATES dropped from 50% to 10%, and active use of ATES in trip planning rose from 15% to 48%. When onX Maps introduced ATES to a much larger and less self-selected backcountry audience in fall 2023, a different picture emerged. Across three winters of behavioral data, users consistently engaged with the simpler slope angle layer at a higher rate than ATES, and the gap widened even after accounting for a below-average snowpack year that suppressed engagement with all terrain layers. A survey of onX users conducted in August 2026 helps explain why. Self-reported comprehension of ATES trails slope angle by a wide margin, but the gap narrows steadily with years of backcountry experience, and use of both layers is concentrated in trip planning rather than in-field decision making. These findings suggest that understanding ATES as a classification and applying it dynamically in the field are separate challenges, and that slope angle's advantage may owe as much to its decades of pre-digital use with a hand-held inclinometer as to its simplicity. Together, this decade of US consumer ATES delivery offers the first empirical account of how the general public receives a terrain communication tool, with direct implications for how such tools are designed, taught, and evaluated.

KEYWORDS: avalanche terrain exposure scale, autoATES, risk communication, terrain visualization, consumer behavior, backcountry recreation

1. INTRODUCTION

The Avalanche Terrain Exposure Scale (ATES) was developed as a communication tool. It is meant to translate the technical work of terrain classification into a rating that a recreational backcountry traveler can use without a background in avalanche science (Statham and Campbell, 2023). For twenty years, most of the published work on ATES has focused on the classification side of that equation: how to define terrain classes, how to map them consistently, and how to update the scale as understanding of avalanche terrain improves. Comparatively little published research has looked in the USA at the other side of the communication model, the receiver: whether the general public who encounter ATES ratings in a guidebook or an app actually understand them, and whether that understanding changes how they travel in the backcountry.

This paper looks at that question using a decade of US private sector data. Beacon Guidebooks introduced the first significant consumer-facing ATES implementation in the United States in 2016. onX Maps added ATES to its Backcountry product in fall 2023, exposing the rating to a much larger and less self-selected audience. Together these two platforms offer a unique long-running record of how ATES has been received by consumers rather than professionals. This paper combines survey data collected across that decade with three winters of behavioral engagement data from onX, and draws a comparison to the adoption history of a simpler, older terrain tool: slope angle.

2. BACKGROUND: TWO ERAS OF CONSUMER ATES DELIVERY

From 2016 to 2023, Beacon Guidebooks was the only company distributing ATES-rated zone and route information directly to backcountry recreationists in the United States. Three surveys of

* Corresponding author address:
Andy Sovick¹
OnX Maps
Missoula, MT
email: andy.sovick@onxmaps.com

this audience, conducted between 2018 and 2023, tracked a steady rise in reported comprehension. The share of respondents reporting low awareness or understanding of ATES fell from 50% to 10% over that period, and the share who said they actively used ATES ratings in trip planning rose from 15% to 48%.

In fall 2023, onX Maps launched an ATES layer inside its Backcountry app, built on an automated terrain classification pipeline rather than route-by-route guidebook authoring. This exposed ATES ratings to a much larger and substantially less self-selected population, most of whom had never encountered the scale before. This was accomplished using AutoATES, an automated terrain classification model developed by Hans Toft and John Sykes (Toft et al., 2024), which onX localized to US terrain and forest conditions in collaboration with regional avalanche centers (von Avis et al., 2023), applied as a toggled layer in both mobile and desktop applications. onX's Backcountry user base grew significantly year over year through this period, and coverage of ATES-rated terrain expanded from an initial set of regions to a much larger footprint across the western United States by the 2025-26 season. This shift, from a small engaged audience to a large general one, is the pivot point of this paper. Comprehension gains measured in a self-selected guidebook audience are not necessarily evidence that the wider public understands or uses ATES the same way.

2.1 *The Slope Angle Precedent*

Slope angle has been the primary heuristic that practitioners use to recognize avalanche terrain for generations, long before it could be shaded on a digital map. Avalanche courses teach the same rule of thumb everywhere: most avalanches release on slopes between 30 and 45 degrees, and travel below or beside them carries risk even on flatter ground. That rule has been repeated in avalanche education for decades, independent of any app or map.

What digital tools added to slope angle was a way to see it before you go, by shading a map according to steepness. That visualization layer is comparatively recent, but the underlying concept it displays is not. ATES does not have the same history. It is a composite rating that combines slope angle with starting zone characteristics, runout potential, forest density, and historical avalanche frequency into a single class. It was formalized as a professional standard in 2004 and has been available to consumers in the United States for a decade, only three winters of that at a large scale. An individual cannot verify an ATES rating with a simple tool the way they can check a slope angle with an inclinometer. They have to trust a synthesis produced by someone else.

Slope angle's comprehension advantage over ATES is not simply that it has had longer to be taught. It also had a decades-long head start as a directly measurable, personally verifiable concept before any visualization tool existed for it, and it survives on a single memorable rule that avalanche education repeats constantly. ATES asks more of both the educator and the learner. That does not mean ATES cannot close the gap. It means the comparison should be made honestly, rather than treated as a guarantee that time alone will fix it.

3. RESULTS: COMPREHENSION AND CONFUSION

To look at how a general, unfiltered audience understands these tools today, onX Backcountry surveyed its US snow mode users in August 2026. Respondents rated their understanding and confusion of ATES, slope angle shading, and the avalanche runout layer on a five-point scale, where 5 indicated strong understanding or high confusion, respectively.

Self-reported understanding of slope angle shading was high across the sample, with a mean score of 4.12 out of 5, and 81% of respondents rating their understanding a 4 or 5. ATES trailed at a mean of 3.49, with 54% rating their understanding a 4 or 5. The avalanche runout layer trailed both, with a mean of 2.82 and only 33% rating their understanding a 4 or 5. Confusion ratings followed the same pattern in reverse: slope angle was rated not confusing, a 1 or 2, by 76% of respondents, ATES by 58%, and runout by only 42%. Runout, not ATES, was the layer respondents understood least well and found most confusing, and several open-ended responses specifically asked that runout not be bundled with ATES in how onX presents the two.

The clearest single result in the survey is a direct comparison of the two layers. Only 2% of respondents rated their understanding of ATES higher than their understanding of slope angle shading. Forty-nine percent rated slope angle higher, and the remainder rated the two equally. This is a near one-sided result, and it lines up with the behavioral engagement data described in Section 5.

One pattern in the data speaks directly to the argument made in the Background section. When responses are grouped by years of backcountry travel experience, the gap between slope angle and ATES understanding narrows as experience increases. Respondents with one to four years of experience rated ATES 1.14 points lower than slope angle on average. That gap fell to 0.79 points among respondents with five to nine years of experience, and to 0.44 points among those with ten or more years. ATES understanding itself rose steadily with experience, from a mean of 3.14 among the least experienced group to 3.72 among the most experienced. Slope angle understanding, by contrast, was already close to its ceiling at every experience level, between 4.0 and 4.3. Confusion with ATES also fell with experience, from a mean of 2.57 to 2.18. This is consistent with the idea that time and repeated exposure narrow the gap, even within a single cross-sectional survey rather than a longitudinal one.

This survey has a real limitation worth stating directly. Fifty-nine percent of respondents reported ten or more years of backcountry experience, a much more experienced group than onX's snow mode user base as a whole. The results describe a population that already skews toward veteran travelers, and even within that population slope angle is understood better than ATES. A more representative sample would likely show a wider gap, not a narrower one.

4. RESULTS: FROM UNDERSTANDING TO APPLICATION

Understanding a rating and using it to make a decision in changing conditions are not the same skill, and the survey data separates the two clearly. Fifty-four percent of respondents said they mostly consult terrain layers during trip planning, before they leave the trailhead. Only 2% said they mostly consult them in the field. When asked directly whether they had ever changed a route or turned around in the field specifically because of ATES or the runout layer, 45% said no, 34% said yes, and the remainder were not sure.

This does not mean the layers are seen as low value. Sixty-seven percent of respondents said the ATES and runout layers help them make better decisions in the backcountry, and among that group, the overwhelming majority said they would be very or somewhat disappointed if the layers were removed from the app, with almost no one indifferent. Respondents value these tools. They mostly use them before the trip starts, not while conditions are changing around them.

Taken together, these results support a distinction raised earlier in this paper: understanding ATES as a static classification and applying it dynamically alongside a forecast and current conditions appear to be separate cognitive tasks. Most respondents have made progress on the first task. Fewer have made the second one part of their in-field routine.

5. RESULTS: BEHAVIOURAL ENGAGEMENT ACROSS THREE WINTERS

Survey responses describe how people say they understand and use these layers. Behavioral data from onX's product analytics describes what a much larger population of users actually does with them. This paper reports engagement as a percentage of active snow mode users rather than as raw counts, both to avoid disclosing business-sensitive figures and because it is the more meaningful metric for comparing two layers used by the same population.

Across three winters, from a mid-season snapshot each January, ATES engagement ran at 66% of slope angle engagement in the 2023-24 season, 54% in 2024-25, and 41% in 2025-26. The gap between the two layers has widened every season onX has offered ATES at scale.

The 2025-26 season complicates a simple reading of that trend. Snowpack across the western United States was well below average that winter, and engagement with every snow layer, not just ATES, fell as a result. A single-season drop in ATES usage on its own would not be strong evidence of declining interest; it could simply mean fewer people were touring. The behavioral data, however, shows that the two layers were not affected equally. Slope angle engagement fell by roughly 16% from the prior season, while ATES engagement fell by roughly 36%, more than twice as much. A uniform effect from a bad snow year should have hit both layers by a similar proportion. It did not. The gap widened for reasons beyond snowpack alone.

6. DISCUSSION

Three lines of evidence in this paper point in the same direction. The historical precedent of slope angle suggests that a terrain communication tool can start out unfamiliar to most of the public and become intuitive over time, given enough reinforcement across education, guidebooks, forecasts, and apps. The

survey's experience-tier results show that same mechanism working in miniature: more years in the backcountry correspond to a smaller gap between ATES and slope angle comprehension, even within one snapshot in time. The behavioral data shows ATES engagement, while still trailing slope angle, growing in absolute terms even as the gap between the two widens in relative terms, which is consistent with a slow but real adoption curve rather than a rejection of the tool.

None of this proves that presentation refinement and continued adoption by educators will fully close the gap. The comparison to slope angle in Section 2 is deliberately not a clean analogy. Slope angle carries a structural advantage that time alone did not create for it: it is a single variable that a person can measure themselves with an inclinometer, and it is reinforced by the single most repeated rule in avalanche education. ATES asks a user to trust a synthesis of several inputs that they cannot check in the field on their own. Some portion of the remaining gap between the two layers may be durable rather than temporary, tied to that structural difference rather than to a shortage of time or teaching.

The practical implications for the industry are more actionable than the theoretical ones. First, the data here suggests ATES and runout should not be treated as a single concept in either product design or education. Respondents understood them differently, were confused by them at different rates, and asked directly that they not be bundled together. Second, the strong planning-versus-field split in how these layers are used suggests that improving in-field decision support, rather than only improving the static rating itself, may do more to close the application gap than further refining the classification alone. Third, forecast language that already describes terrain in indirect, hedged terms, such as advising travelers to avoid slopes of a given angle or greater and the terrain adjacent to them, is effectively describing exposure the way ATES already names it directly. There may be more room than currently used to state that plainly, rather than reconstructing it in a sentence each time.

7. FUTURE WORK

Broader geographic application of AutoATES at onX, and inclusion of the 0 - Non-Avalanche Terrain rating, will allow for more data in coming years. Measuring USA user comprehension would benefit from comparisons to Canadian user comprehension. Additionally, measuring comprehension in future years will provide granularity to the matter (e.g., users claim they understand ATES, but to what level do they actually understand it?).

8. CONCLUSION

Ten years of consumer ATES delivery in the United States, first through a small guidebook audience and then through a much larger general one, gives a more complete picture of how the public receives a terrain communication tool than either dataset alone. Comprehension has genuinely improved over that decade, but a wide gap remains between how well people understand ATES and how well they understand slope angle, and that gap has persisted through a season that should have narrowed it if time were the only variable at work. The gap narrows with individual experience, which argues for patience and continued investment in education and presentation. It also reflects a real structural difference between a rating a person can check themselves in the field and one they have to trust secondhand, which argues against expecting the gap to close on its own. Both of those things can be true, and a terrain communication tool built for the general public should be designed with both in mind.

ACKNOWLEDGEMENTS

Thank you to the onX Backcountry users who took the time to complete the August 2026 survey, and to the Beacon Guidebooks community whose survey responses since 2018 made the longitudinal comparison in this paper possible. Thank you also to John Sykes and Hans Toft for developing and validating the AutoATES model that made ATES mapping at this scale possible in the United States. Thank you to Charlie von Avis for bringing autoATES to a consumer facing product. Thank you to onX Maps for supporting the efforts to advance knowledge in decision making tools and systems. Thank you to Grant Statham for continued peer review, support, and wisdom throughout the timespan outlined in this paper.

REFERENCES

- Horton, S., Haegeli, P., Statham, G., Shandro, B., Clark, T., Nowak, S., Towell, M., Hordowick, H., Herla, F., 2023. Is it a problem? Takeaways from research into the use and effectiveness of avalanche problems, in: Proceedings of the International Snow Science Workshop, Bend, OR, 1-6 October 2023.
- McClung, D., Schaerer, P., 2006. The Avalanche Handbook, 3rd ed. The Mountaineers, Seattle, WA.

- Statham, G., Campbell, C., 2023. The avalanche terrain exposure scale v.2, in: Proceedings of the International Snow Science Workshop, Bend, OR, 1-6 October 2023.
- Toft, H.B., Sykes, J., Schauer, A., Hendrikx, J., Hetland, A., 2024. AutoATES v2.0: Automated Avalanche Terrain Exposure Scale mapping. *Nat. Hazards Earth Syst. Sci.*, 24, 1779-1793. <https://doi.org/10.5194/nhess-24-1779-2024>.
- von Avis, C.D., Sykes, J.M., Tutt, B., 2023. Development of large scale automated Avalanche Terrain Exposure Scale (ATES) ratings in collaboration with local avalanche experts, in: Proceedings of the International Snow Science Workshop, Bend, OR, 1-6 October 2023, 982-988.