ATES FOR OPERATIONAL TERRAIN MANAGEMENT IN THE USA FOR MOTORIZED AND NON-MOTORIZED GROUPS

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ABSTRACT: The Avalanche Terrain Exposure Scale (ATES) is widely used to classify avalanche terrain for recreational trip planning, yet its role in structured operational decision-making remains underdeveloped in the USA as opposed to Canada. Professional programs—guiding operations, avalanche education providers, and organized recreation groups—must repeatedly select terrain under changing hazard conditions while managing participants with varying experience, led by staff with different qualifications. This paper adapts ATES from a static terrain classification into a practical tool for Operational Terrain Management (OTM) that explicitly incorporates guide and instructor qualification.

We present a structured method and matrices relating ATES class, daily avalanche danger, leader qualification, supervision level, and travel mode to predefined terrain allowances and constraints, with qualification drawn from the American Avalanche Association (A3) pro certifications and membership held by guides, instructors, and supervising staff, on terrain class. It assumes a catalogue of operational terrain units rated using ATES. Limitations for operational use are examined—map-scale resolution, terrain interpretation variability, micro-terrain below regional resolution, and motorized-specific travel—with recommendations for organizations adopting the framework.

KEYWORDS: Avalanche Terrain Exposure Scale (ATES), Operational Terrain Management, Terrain Management, Scales of Travel in Avalanche Terrain, Snowmobiling and Motorized Travel

1. INTRODUCTION

ATES was developed to communicate the severity of avalanche terrain to backcountry recreationists in a format accessible for trip planning (Statham et al. 2006). Statham et al. (2018) define spatial scales for ATES assessment ranging from micro-scale terrain features through meso-scale mountains and drainages to synoptic-scale regions and ranges (Table 1). Non-motorized travel typically occurs at the micro scale (occasionally Meso)—individual slopes and features encountered sequentially. Modern snowmobiles, by contrast, let groups operate at the synoptic scale within a single outing, comparable to helicopter skiing: a motorized group can cross multiple drainages, faces, and aspects in rapid succession, covering terrain at a scale and speed previously achievable only by aircraft. This expanded extent fundamentally changes the terrain management problem and demands a framework addressing rapid transitions across numerous terrain units at a regional scale, and areas with limited forecasts and snow/weather observations.

Professional operations therefore need a structured system accounting for who is leading, who is participating, what current conditions allow, and how scale of travel (determined by travel mode) affects exposure.

Table 1: Spatial scales for ATES assessments (Statham et al. 2018), from largest to smallest and the scales at which each travel mode's scale or travel in 1 day are typically (●) or occasionally (○) made. Snowmobile includes the motorized snowbike.

Scale	Extent	Heli ski	Snowmobile	Sled-ski	Sled ski laps	Cat ski	Ski touring	XC ski	Snowshoe	Ice climbing
Synoptic $>10^4$ km^2	Range	●	○							
	Region	●	●	○						
Meso $>10^2$ km^2	Drainage	●	●	●	○					
	Mountain	●	●	●	●	●				
Micro <1 km^2	Path/run	●	●	●	●	●	●	○		
	Slope	●	●	●	●	●	●	●	○	○
	Terrain feature	●	●	●	●	●	●	●	●	●

Despite this need, no widely adopted U.S. framework integrates ATES classifications into daily operational terrain decisions (Section 2.2).

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This paper proposes an Operational Terrain Management (OTM) framework that adapts ATES from a static classification into an active decision-support tool, integrating ATES ratings with daily hazard assessments, A3-aligned membership levels + qualifications, group characteristics, and travel-mode considerations for both motorized and non-motorized operations—giving operators a structured, repeatable method for terrain allowances that align exposure with both conditions and leadership capacity. The framework's core output is a single matrix resolving ATES class, daily avalanche danger, and leader qualification into one of five terrain allowances, from Allowed through Not Allowed (Table 2).

2. BACKGROUND

2.1. ATES: Development and Current Structure

ATES was introduced by Statham et al. (2006) as a two-part system—a technical model for practitioners and a public model for trip planning. Statham and Campbell (2025) merged the public model with the CAA's ATES Zoning Model into ATES v.2: five classes, adding Class 0 (Non-Avalanche Terrain) and Class 4 (Extreme Terrain). The revision carries forward the spatial-scale hierarchy of Statham et al. (2018) (Table 1).

Automated terrain classification using GIS and runout simulations—including statewide hazard-indication mapping (Bühler et al. 2022) and AutoATES v2.0 (Toft et al. 2024)—has improved catalogue consistency and coverage.

2.2. Adoption in the United States compared to else where

ATES has been substantially institutionalized in Canada, and other nations. The CAA's Guidelines for Instruction in Avalanche Terrain (GIAT) tie terrain access to membership category: Avalanche Practitioners and Basic Avalanche Educators may instruct in Class 0–1 terrain only, unless supervised under an avalanche safety plan that mitigates Class 2, while Avalanche Professionals may use Class 3 terrain for brief access and egress and only where the path-scale hazard rating is 1 or 2 (CAA 2025, §§2.4–2.5). Those allowances rest on the CAA's competency profiles and proficiency scale (CAA 2025, §3.1), and companion guidance specifies how the underlying terrain catalogue is built and maintained (CAA n.d.). ATES is in turn embedded in Canadian land-use planning and professional practice through the CAA's Technical Aspects of Snow Avalanche Risk Management (Campbell et al. 2016) and its ATES zoning model (Campbell and Gould 2014). TASARM also publishes the matrix itself: a Parks Canada example crossing four training levels against ATES class and avalanche danger, each cell reading Allowed, Requires Forecaster Consult, or Not Allowed (Campbell et al. 2016, Fig. 7.1, p. 55). Parks Canada's Bow-Yoho-Kootenay (BYK) avalanche safety plan carries the pattern furthest, resolving ATES class against the daily danger rating in a single matrix that defines what terrain a given employee may take a group into (Statham 2019). The framework proposed here adapts that pattern to U.S. conditions, substituting A3 tiers for Parks Canada staff certifications and ATES v.2 for the ATES! v.1 three-class scale.

In the U.S., ATES is taught by most avalanche education providers but not broadly adopted as an operational decision-support system tied to guide or instructor qualification. A3 maintains membership levels and pro certifications, and in 2026 adopted TASARM and ISO 31000 as the framework for evaluating applicant experience (A3 2026)—the same document that carries the Parks Canada matrix. The vocabulary is shared; the terrain axis is not, and no widely used U.S. framework connects membership levels to ATES terrain allowances.

2.3. Professional Certification in the U.S.

The same gap runs through the guiding associations—AMGA, US Heli Ski, US Cat Ski—none of which we found pairing its levels with a standardized terrain-qualification matrix. We define an operational qualification tier structure (Table 3) combining A3 category, certification, and documented supervised experience: Support Staff / Affiliate, Pro 1 (Affiliate and Pro A3), Pro 1+, and Pro 2. This tier structure is the qualification axis of Table 2—a starting point for standardizing how U.S. operators connect A3 credentials to terrain access.

Support Staff / Rookie Patrollers / Tail Guides are the entry points for mentees in a structured mentorship program, where their first supervised days accrue which the USA may or may not be after any qualifications. Tier progression assumes candidates can accumulate those days under a qualified mentor—an assumption that holds unevenly across travel modes. Coulter (2023) documents a severe mentor and pathway shortage in motorized avalanche operations: few snowmobilers hold professional designations, and most operations lack the staff depth to supervise candidates in-person.

Table 2: Combined terrain allowance matrix by A3 membership, qualification, and experience tier (Table 3), ATES class, and danger band. Pro 1 Sup. = Pro 1 Supervision Required; Pro 2 Consult = Pro 2 Level Supervisor Consult Required; Peer Pro = Peer Pro Consult Required. LM = Low/Moderate danger; CHE = Considerable/High/Extreme danger. Superscripts give the communication type required (Table 4): [1] in person, [2] radio, [3] remote.

		Non-Avalanche		Simple		Challenging		Complex		Extreme	
A3	**Tier**	**LM**	**CHE**	**LM**	**CHE**	**LM**	**CHE**	**LM**	**CHE**	**LM**	**CHE**
Affiliate	0	Allowed	Allowed	Pro 1 Sup.[1]	Pro 1 Sup.[1]	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
	1	Allowed	Allowed	Allowed	Pro 2 Consult[2]	Pro 2 Consult[2]	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Pro	2	Allowed	Allowed	Allowed	Allowed	Pro 2 Consult[3]	Pro 2 Consult[2]	Pro 2 Consult[3]	Not Allowed	Not Allowed	Not Allowed
	3	Allowed	Allowed	Allowed	Allowed	Allowed	Pro 2 Consult[2]	Pro 2 Consult[3]	Pro 2 Consult[2]	Not Allowed	Not Allowed
	4	Allowed	Allowed	Allowed	Allowed	Allowed	Peer Pro[3]	Allowed	Peer Pro[2]	Peer Pro[2]	Not Allowed

Table 3: Operational qualification tiers, numbered 0–4 by increasing terrain autonomy. The left band is A3 membership with its minimum documented experience. Tier 0 accepts General or Affiliate membership; tier 1 requires Affiliate.

A3	Tier	Cert. / experience
Affiliate 2 year min.	0	Rec L1+Rescue minimum
	1	Pro 1
Pro 4 year min.	2	Pro 1
	3	Pro 1, 6 season min.
	4	Pro 2

3. OPERATIONAL TERRAIN MANAGEMENT FRAMEWORK

3.1. *Terrain Matrix Structure*

The framework assumes a catalogue of terrain units, each carrying one ATES class; Sections 5 and 6 develop that catalogue and the scale and coverage problems they run into. This section defines what the framework does with a rating once it has one.

The core deliverable is a matrix resolving three inputs—ATES class, daily avalanche danger, and A3 operational tier—into one output: **Allowed**, **Pro 1 Supervision Required**, **Pro 2 Level Supervisor Consult Required**, **Peer Pro Consult Required**, or **Not Allowed** (Table 2). It serves the same function as the published Parks Canada matrix (Section 2.2) (Campbell et al. 2016, Fig. 7.1), extending it to ATES v.2's five classes and five A3 tiers, with consult outputs naming a qualification tier rather than a single in-house forecaster. It was built independently rather than adapted from the Canadian model. The matrix output defines the envelope within which a leader's daily terrain choice must fall; "Not Allowed" cells are never authorized, and consult/supervision cells must be satisfied before departure. TASARM pairs an envelope of this kind with *terrain coding*: a daily office pass that marks each run or zone open, closed, or conditionally open against the operational risk band (Campbell et al. 2016, p. 51). Operations adopting this matrix should code their catalogue the same way; detailing that pass is out of scope here. Supervision from more qualified staff is common just not standardized, repeatable and defensible in the USA. The communication type required in each cell is superscripted in Table 2.

Pro 1 Supervision (Support Staff / Affiliate tier at Class 0–1) is ongoing field presence, not a predeparture check: a Pro 1-tier or higher individual must accompany the group. These tiers may not lead independently; the supervisor holds terrain decision authority.

A **Pro 2 Level Supervisor Consult** requires the leader to review conditions, hazard, and intended terrain with a Pro 2-tier supervisor before departure, documented (location, objectives, group, terrain plan); the supervisor may modify, restrict, or deny access.

A **Peer Pro Consult** applies where the leader is already Pro 2 and no higher tier exists to escalate to (Class 4 Low/Moderate; Class 2–3 Considerable/High/Extreme). It follows the same procedure but with a second Pro 2 not on the trip—a documented second opinion rather than an approval by higher authority.

3.2. *Supervision Level and Communication Type*

Terrain qualification alone does not determine autonomy in a given zone; available supervision/peer consulting also constrains travel options. This paper adopts the three-level communication type scale in Table 4, ordered most to least restrictive, to complement the supervision levels. Lower-tier staff are generally restricted to Level 1; Pro 2-level supervisors may operate under Level 3. Every level needs an explicit loss-of-contact protocol; the motorized version (Hanke and Stewart-Patterson 2023) has a rider who loses sight of the one behind stop at the next safe location, radio, and turn back to investigate if there is no response.

Table 4: Communication types complementing supervision levels, most to least restrictive. Every level requires an explicit loss-of-contact protocol.

Level	Contact	Supervisor
1	In person: line of sight and vocal range	With the group
2	Radio	In the area, can help in person
3	Remote: satellite or end-of-day check-in	Off site

3.3. *Input Variables*

ATES class: base rating per catalogue unit (Section 5.1), Class 0–4. **Avalanche Danger**: daily danger rating for the relevant elevation band, collapsed into two operational bands—Low/Moderate and Considerable/High/Extreme. Where the unit is unforecast or thinly observed, this input is set under the constraints in Section 6.2 before the matrix is read. **Qualification tier**: the five-tier structure (Table 3), each with an autonomous range and a supervised range. **Supervision and communication**: the three-level communication type scale (Section 3.2), which determines whether supervised access is actually available on a given day.

3.4. *Terrain Allowances and Constraints*

Table 2 applies the tiers of Table 3 to ATES classes across both hazard bands, in the format of BYK's Table 12. Cells reflect each tier's autonomous range; a supervised extension appears as a consult requirement rather than "Allowed," since it depends on a supervisor being reachable. Even Pro 2 lacks unconditional access at the upper classes, and Class 4 under elevated danger is closed to all tiers.

3.5. *Party Sizes*

Party size is suggested capped at six guests and two staff, eight total, on three operational grounds: manageability, sequential exposure, and the rescue capacity left when part of the group is caught. This will match with current A3 education guidelines, and accommodate mentees or tail guides.

4. Examples

Forecast: Considerable for all examples. The Examples in 4.1 and 4.2 use terrain map in Figure 1. For the motorized groups the moto zone rating governs: where a zone holds more than one class, the highest class present sets the requirement, to have margin of error. The example in 4.3 has no example map since ski run and skin track concept lists are not a new concept, and this paper has limited space.

4.1. *Motorized Group, Pro 2 Leader, A3 Pro*

Zone HP 8: Peer consult required since part of the Zone is complex. Zone HP 5: Mix of Challenging and Simple terrain, Peer consult required since part of the Zone is challenging.

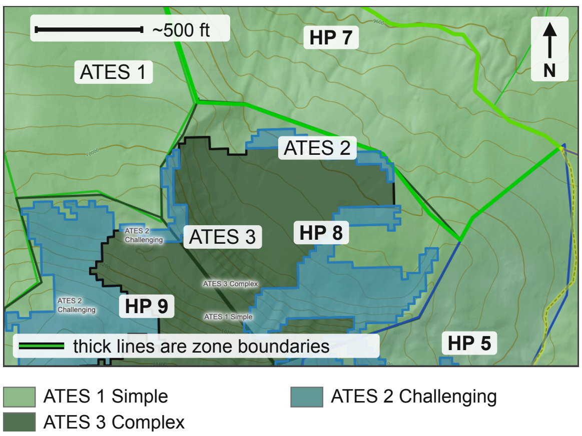

Figure 1: Motorized zone units over the operator's ATES layer, part of Hahns Peak, Colorado; labels, legend and north arrow set in type over an unaltered catalogue view. Solid Colored Lines are zone boundaries. Example: at roughly 1500ft wide HP 8 alone spans Classes 1–3: would be a complex zone (Section 6.4).

4.2. Motorized Group, Pro 1 Leader, A3 Affiliate

Zone HP 8: Not allowed since part of the Zone is complex. Zone HP 5: Mix of Challenging and Simple terrain, Pro 2 consult required since part of the Zone is challenging.

4.3. Ski Group, Pro 1, A3 Pro

This group would be allowed to use ski runs and skinning routes rated simple, or areas rated simple from operations catalogue. For Runs, routes, areas Challenging they need a Pro 2 consult.

5. TERRAIN CATALOGUES

5.1. Terrain Cataloging

Operational Terrain Management (OTM), as used here, means pre-defining a catalogue of terrain units (zones, runs, routes, stationary points) with fixed ATES classifications and constraining daily access based on current hazard, group composition, and leadership qualification—conceptually similar to "run lists" used in heli- and cat-skiing, but extended to motorized + non-motorized programs, avalanche courses, and organized recreation. The catalogue is an operational asset filtered daily rather than a fixed route rated once for trip planning: at Hahns Peak a unit is a single bowl or path—micro scale, under 1 km^2 (Table 1)—carrying one ATES class and one set of daily access rules. A snowmobile operation on the same ground sets its units an order of magnitude larger (Section 6.1). Either way the operating area's full footprint is covered as contiguous or overlapping units with stable identifiers, boundaries, and known hazards.

Building a usable catalogue requires (1) sufficient map-scale resolution to capture micro-terrain features invisible at meso/synoptic scale, and (2) a travel-mode-aware unit structure (Section 6.1).

Each unit should record: a base ATES v.2 class (0–4) (Statham and Campbell 2025); the spatial scale at which it was assessed (Statham et al. 2018); practitioner-authored notes on micro-terrain hazards below mapped resolution, reviewed seasonally; and travel-mode flags. Zone units for motorized users may need mixed ratings to accommodate for scale and recognition of zone boundaries at speed (ex: simple+challenging zones).

6. MOTORIZED AND OTHER MESO/SYNOPTIC-SCALE OPERATIONS

6.1. Scale: Motorized vs Non-Motorized Units

Non-motorized groups travel sequentially at the micro scale, so a terrain unit can correspond to a single slope or path, decided once per unit. Motorized groups operate at the meso-to-synoptic scale established in Section 1 and Table 1. We propose motorized units be defined at the **zone level**—a bounded area(polygon in catalogue) within which travel mode, group capability, and hazard are assumed reasonably uniform—while reserving finer path/slope subdivision for specific high-consequence features (steep glades, corniced ridgelines, confined gullies) warranting separate treatment regardless of overall zone rating. The same ground may need to be one zone unit for a motorized group and several smaller line units for non-motorized travel; combined snowmobile-access ski operations should carry both a zone-level rating and a path/slope breakdown for the same footprint.

Winter operations span a wider set of travel modes than a motorized/non-motorized split implies, and those modes do not partition cleanly by scale. Table 1 maps nine of them onto the scale hierarchy. Human-powered modes concentrate at the micro scale and can be catalogued unit by unit. Motorized and mechanized modes reach meso and synoptic scale within a single outing. Sled-access skiing does both—micro-scale decisions taken inside a synoptic-scale day—which is precisely the case a single-scale catalogue cannot serve. A multi-day hut to hut ski tour could be considered Meso-Scale, but for the proposes of this paper we confining to travel achievable in a day.

6.2. Forecast Coverage and Observation Density in Motorized Terrain

Table 2 treats the daily danger rating as equally reliable everywhere. In motorized terrain it is not, and the shortfall is a property of the terrain unit rather than of the day.

Observations thin out with distance from access. They cluster near plowed roads and trailheads while motorized terrain runs well beyond them (Section 6.1). Over the 2025–26 season no part of the 5 km non-motorized envelope lay more than 5 km from a field observation, against 72% of the 40 km motorized envelope (Figure 2); those ratings rest on interpolation rather than observed structure.

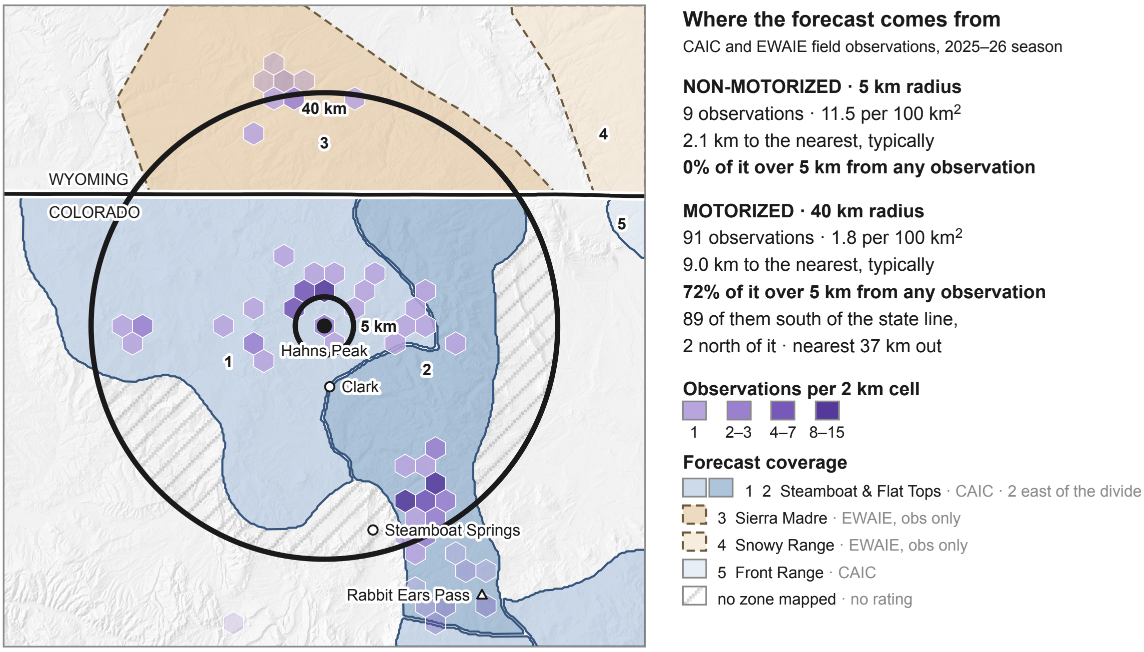

Figure 2: Forecast coverage and observation density: generalized single-day travel envelopes at Hahns Peak, Colorado, over forecast zone boundaries and 2025–26 field observations (CAIC and EWAIE). The envelopes are the ground a party may cover in a day, not the scale at which terrain decisions are made (Table 1). The 40 km motorized envelope is 64 times the area of the 5 km one at 5,026 km^2, crosses a state line and an agency boundary, and 20% of it (1,007 km^2) lies outside any mapped zone. Observations concentrate near roads and trailheads; the panel gives the counts, densities and distances, which Section 6.2 reads.

Forecast coverage may be partial, intermittent, or absent. The same envelope leaves 20% of its area between mapped forecast zones; the Eastern Wyoming Avalanche Information Exchange shares observations but issues no rating (EWAIE 2026), and Seeley Lake, a heavily used snowmobile destination, is advised a few times weekly rather than daily (WCMAC 2026). Only 64% of the envelope carries a rating at all, and one in hand may predate the weather that matters.

Each catalogue unit (Section 5.1) should therefore record its product state and a coarse observation-density class. For **unforecast units**—including any whose rating predates the last significant loading or warming—the danger input to Table 2 must come from the operation: a documented local assessment by a Pro 2 tier. For **thin-observation units**, carry the more conservative rating where adjacent zones disagree, and treat the first party in on a cycle as an observing party (Atkins 2014) until observations confirm the rating.

6.3. Motorized-Specific Zone Lists

A ski program’s ”run” list does not transfer to motorized zones: the travel patterns differ in kind, not degree. Snowmobile travel is multidirectional and iterative: riders climb, sidehill, descend and re-climb the same slope, cross a drainage and return, changing aspect and elevation band repeatedly. A boundary that bounds a ski tour once may be crossed and recrossed dozens of times in a motorized day. A motorized ”zone”s(polygon) boundaries doesn’t need to exactly match ATES class boundaries to account for the multidirectional high velocity travel of snowmobiles.

Motorized zone boundaries must therefore be recognizable on the ground at speed (Figure 1). A polygon whose edges follow contour lines, section lines, or map coordinates is functionally invisible to a rider: consulting a map or GPS while moving is impractical, and a boundary that has to be checked is a boundary that will be crossed unnoticed. Motorized zones should be bounded by features legible from the saddle—roads and marked trails, ridgelines, drainage bottoms, treeline, distinct timber edges—so a rider knows which zone they are in without stopping. Where no such feature exists, the boundary should be pulled back to the nearest one that does, accepting a larger zone over an unenforceable one.

Speed also argues for wider margins than a non-motorized zone list carries. A rider covers in seconds the ground a skinning party covers in minutes, leaving correspondingly less time to recognize a terrain trap, an unexpected slope angle, or a wind-loaded roll and to react to it. Hanke and Stewart-Patterson (2023) put numbers on the trade: a skier needs about thirty minutes to ascend a 350 m slope where a rider needs three, so the rider carries a tenth of the exposure time per slope—but ten climbs erase that advantage while crossing ten times the terrain, raising the chance of finding a weak zone. Motorized zone definitions should absorb this by rating conservatively and by setting boundaries with buffer, rather than relying on in-the-moment reassessment.

6.4. Motorized-Specific Considerations

Table 2 applies at the terrain-unit level (Section 5.1). For motorized groups operating at the zone level (Section 6.1), two adjustments apply.

Zone rating basis. A zone's input level into Table 2 should be the *highest* ATES class of any unit reachable without a deliberate, briefed exclusion decision, not an average—motorized travel can reach a higher-consequence feature within seconds. Or limited cases of zones noting terrain traps.

Zone Sizes. Can be widely variable to accommodate terrain. Areas with more variations could be broken down in to small catalogue zone units. Huge flat valleys with little to no avalanche exposure or terrain traps would be larger units and not broken down into smaller zones.

Consult validity across multi-zone outings. A consult for one route is not automatically valid for an outing crossing several zones; every zone the group may reasonably reach that day should be identified and any consult resolved before departure. The 2016 Renshaw accident shows the cost of unresolved convergence: eighteen riders from four groups met at one crux decision point, two riding in and two riding out, and the size-3 avalanche that released killed five (Hanke and Stewart-Patterson 2023).

7. LIMITATIONS

Map-scale resolution. Catalogue ratings assessed at meso or synoptic scale average over within-unit variability (Section 5.1): a Class 2 drainage may contain unresolved pockets of Class 3 terrain, or lower-class terrain pulled up by a few features. Automated tools (Bühler et al. 2022; Toft et al. 2024) inherit this limitation from underlying elevation models and can miss recent terrain changes; catalogues built primarily from remote sources should be treated as a starting hypothesis requiring field confirmation.

Terrain interpretation variability. ATES classification involves practitioner judgment at unit boundaries, terrain-trap weighting, and threshold terrain; two raters can reasonably disagree. Because Table 2 treats each class as a hard boundary triggering specific requirements, disagreement has sharper operational consequences than in recreational use. Organizations should calibrate raters against a sample of units before treating a catalogue as final.

Gaps not captured by regional classification. Even careful field-based classification cannot capture transient hazards—an overnight wind slab, a growing cornice, wind-scoured rock. ATES describes terrain's potential for involvement, not the hazard on a specific day; Table 2 addresses this only partly via the daily danger input, which is itself typically issued at regional scale.

Uneven forecast quality. The observation-density classes of Section 6.2 are coarse and operator-assigned; no standard exists for how far from an observation a rating should be discounted, or by how much. Those constraints are conservative defaults, not calibrated adjustments, and an operation with better information about its own zones should refine them.

8. RECOMMENDATIONS

For organizations implementing ATES-based OTM. Build the catalogue before the season it will govern, with a defined completion date. **Calibrate raters** with an independent-classification exercise before trusting it operationally. **Adopt the tier structure** (Table 3) as a starting point, documenting any local adjustments. **Formalize consult and supervision procedures** with a concrete pre-trip form and a designated list of eligible supervisors and peer consultants. **Treat microterrain notes as a living document**, reviewed each season and after any terrain-altering event. **Build a deliberate mentorship pathway** rather than assuming supervised days accrue on their own, using remote hazard-assessment and trip-planning participation to supplement the field days a candidate can reach (Coulter 2023).

9. CONCLUSION

9.1. What this proposes.

Operational Terrain Management translates ATES classification into daily operational terrain decisions through three pieces: a catalogue extending ATES v.2 into a standing inventory of terrain units (Sections 5–6), a five-tier qualification structure connecting A3 membership and certifications to terrain autonomy (Table 3), and a matrix resolving ATES class, daily hazard, and leader qualification into a defined operational envelope (Table 2).

9.2. What distinguishes it.

Designed from an existing multi-travel mode and scale operator's experience, built on A3's existing credential and membership structure simultaneously being agnostic of Guiding Associations, and franchise provider networks. Terrain identification being the common thread regardless, while group management within a terrain unit, travel modes skills, trip objectives and trip option catalogs being the variations. It treats motorized travel as a first-order design consideration—zone-level rating and multi-zone consult sequencing (Sections 6.1, 6.4). Section 7 is explicit about where map resolution, rater variability, and qualification thresholds still depend on organizational calibration rather than settled numbers.

9.3. What comes next.

Review and endorsement of the standardized tier-to-terrain matrix, as TASARM and GIAT already provide in Canada (Campbell et al. 2016; CAA 2025); empirical support for the qualification thresholds, with A3 or CAIC incident data; finer-resolution zone subdivision from GPS track density and automated classification (Bühler et al. 2022; Toft et al. 2024); and a shared catalogue clearinghouse to cut duplicated effort across operators in overlapping terrain. Continuing and amplifying outreach to snowmobilers to contribute more observations to help with the uneven forecast quality at their scale.

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