



SNOW AVALANCHE AVOIDANCE POLICY 2011

**BC Public Service Natural Resource Sector
For General Wilderness Activities**



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Natural Resource Sector (NRS)

Snow Avalanche Avoidance Policy

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1.0 Application and Scope:

This policy applies to all Natural Resource Sector (NRS) staff activities and operations and provides guidance for contractual activities being discharged by NRS.

2.0 Purpose and Intent:

The purpose of this policy is to ensure that NRS staff consider and assess snow avalanche risk prior to committing to field activities. The intent is to ensure NRS staff exposure to avalanche hazard in the discharge of NRS duties will manage risk to acceptable levels. **Adherence to this policy and making the expected daily decisions as part of routine field planning will minimize exposure of NRS staff to avalanche hazard.**

Curtailement or deferral of field activities to periods when risk is acceptable is a founding principal of this policy, as it is a preferred hazard management approach. This avoidance approach however is not always feasible or practical, however in some geographical areas of the province and for some activities avoidance is practical and a preferred manner to manage the potential risk of avalanche. Practicing avoidance as prescribed in this policy is the starting point for planning all NRS operations. Where local management deems avoidance of at risk circumstance to be impractical given the nature of the work then activities must be governed by an avalanche safety plan. The NRS offers a provincial level avalanche safety plan (ASP) for general wilderness activities which must be followed as minimum expectation for all NRS activities where avoidance of risk is impractical. This ASP also integrates principals of avoidance to identify unacceptable levels of risk and to alter activities, routes and approaches in order to reduce exposure to risk.

3.0 Background:

Identifying snow avalanche hazard and determining avalanche risk is complex. Many variables must be considered including:

- Terrain characteristics – slope angle, slope orientation (wind, sun), forest cover, ground roughness, , slope configuration (terrain features - gullies, ridges, bowls), elevation;
- Potential snow instability identified by -
 - Seasonal and current patterns of avalanche activity;
 - Snowpack – depth, structure, distribution;
 - Weather- historic, current, and anticipated conditions - precipitation (type, amount, duration, intensity), temperature, wind, solar radiation;
 - Potential avalanche triggers – skier, snowmobile, snowfall, wind, rain, rising temperatures;

- Human factors - knowledge (level of training, experience), motivation, mode of travel, equipment, impacts of others' activities (historic, current and anticipated);

Many of these factors are dynamic and vary spatially and temporally such that even during the course of a day the avalanche hazard can vary from low to high depending on time and location. Training, planning, and experience become critical elements to increase margins of safety when working in avalanche terrain. The complexity and variability in conjunction with the potential consequences of an incident dictate caution.

In occupational safety, the preferred management strategy for hazards is to eliminate or avoid them if practical and feasible. This is the premise behind this provincial level policy. **The NRS primary approach will be to minimize and avoid at risk circumstances via implementation of this policy.**

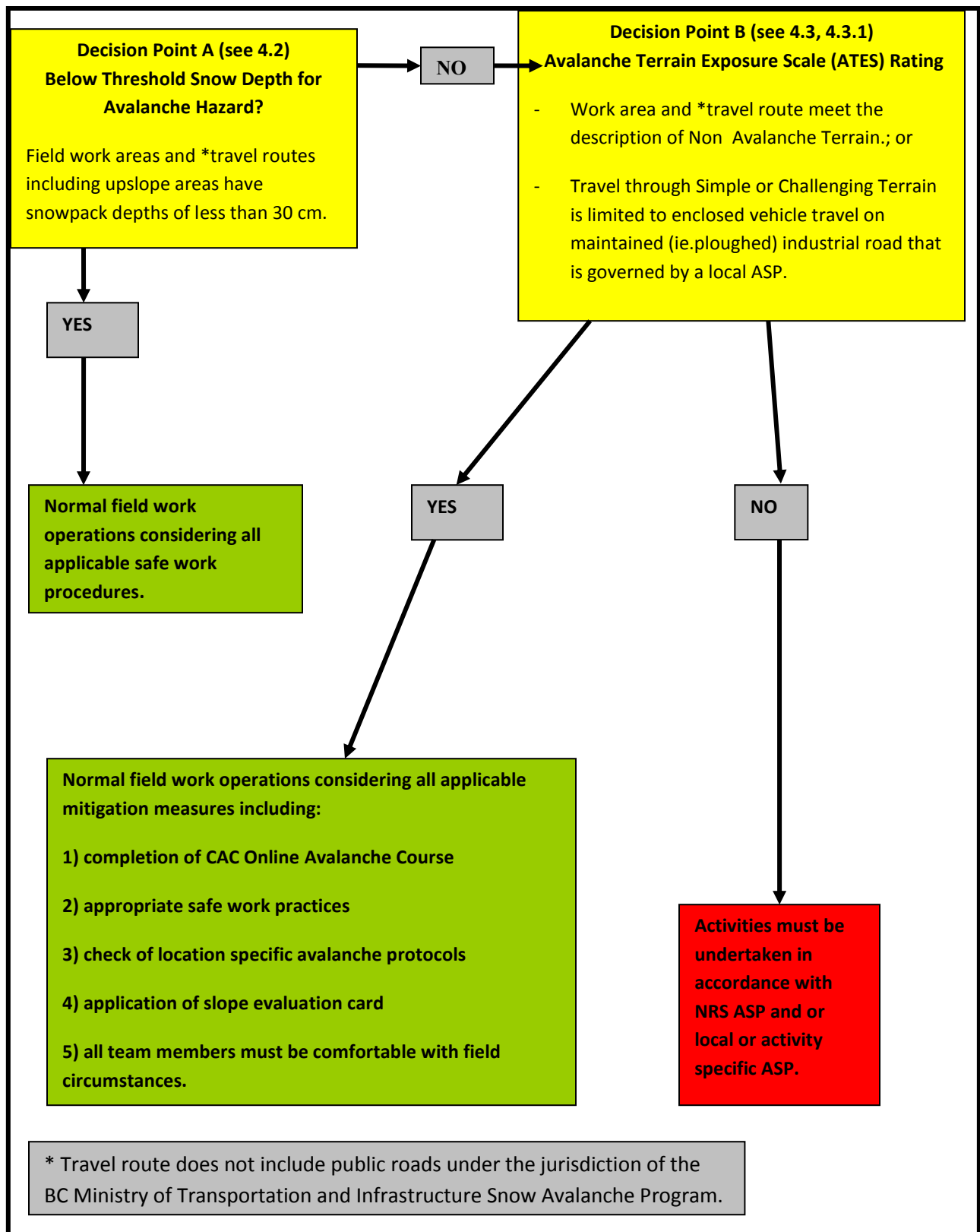
NRS shall avoid exposing its staff or contractors to avalanche hazards and where this is not operationally practical then wilderness activities must be undertaken in accordance with the NRS ASP as well as any local, activity specific or contractor protocols developed to address specific situations. This policy provides guidance to the development of NRS sector ASP in those cases where avoidance is not practical.

4.0 Field Operations

4.1 NRS Avalanche Avoidance Decision Guide

A decision guide is established to provide guidance for field operations during the avalanche season. Figure 1 illustrates the decision-making process which must be undertaken prior to field work commencing. If the decision guide determines that operations may proceed without an ASP, these operations are considered to be "not at risk". Regardless, use of the Avaluator Slope Evaluation Card (Appendix 1) is required when snowpack's are present. It is expected that field activities will be suspended during periods when the probability of an avalanche occurring and reaching the work site and/or travel route is considered unacceptable. The decision guide centers on broad landscape level information. Local and site specific information may be used to rationalize curtailing field activities, but cannot be used to justify proceeding with field activities except as determined by the NRS ASP or locally established ASP. A local, site specific or activity specific avalanche safety plan may include active or passive mitigation measures, on site monitoring programs implemented by licensees or contractors, or information provided by avalanche professionals. Where the decision guide indicates the need for an ASP this can be addressed for routine wilderness activities via adherence to the NRS provincial ASP.

Figure 1 Natural Resource Sector (NRS) Avalanche Avoidance Decision Guide



4.2 Snowpack (Decisions Point A)

The determination of a threshold snowpack depth is critical in determining the onset of seasonal avalanche hazards. The snowpack evaluation must include upslope areas which have the potential to create avalanches which may extend down to the worksite or travel route. In the absence of snowpack's greater than 30 cm, field operations can proceed regardless of the ATES rating.

4.3 Terrain Risk Assessment (Decision Point B)

An ATES rating must be applied to worksites/ travel routes if a snowpack greater than 30 cm exists. Guidance on the ATES scale is provided in Section 4.31 of this policy. Generally activities including field travel should be restricted to Non-Avalanche Terrain. Non-avalanche terrain is defined as terrain which does not meet the criteria established under the ATES scale (Table 1). The exception to this is enclosed vehicle traffic on a maintained industrial road with a Simple or Challenging exposure terrain rating. In this case, it is the responsibility of field personnel to contact the organization responsible for maintenance of the road to determine applicable avalanche safety procedures and factor this into travel consideration. Field personnel are expected that if the information regarding the road maintainer is unknown then they should contact the appropriate government agency responsible.

Travel on *public highways is not affected by this plan* as the Ministry of Transportation and Infrastructure (MoT) conducts a comprehensive avalanche safety program for all public travel corridors. The MoT should be contacted for clarification if there is uncertainty as to whether or not a particular section of public road falls under their jurisdiction.

Table 1. Non-Avalanche Terrain Characteristics

Terrain characteristic	Non-Avalanche
Forest Density and Slope Angle	Slopes greater than 25 ° have more than 1000 stems per hectare exceeding the height of the snowpack with no avalanche hazards directly upslope. Slopes less than 25° with fewer than 1000 stems per hectare have no avalanche hazards directly upslope.
Interaction with avalanche paths	None
Avalanche frequency (events: years)	N/A
Route options	Route selection avoids avalanche terrain.

4.31 Avalanche Terrain Exposure Scale Rating Guide:

Prior to staff or NRS contractors being exposed to potential snow avalanche hazard, an assessment of the potential risk shall be carried out using available information associated with the specific area and activity. The risk assessment should utilize the provided Avalanche Terrain Exposure Scale (ATES) and rate the terrain based on the identified terrain characteristics. Table 2 identifies the ATES Scale and the key terrain characteristics to be used when determining the appropriate avalanche terrain exposure

level. The ATES was developed by Parks Canada. Information on the Parks Canada ATES can be found at: <http://www.pc.gc.ca/eng/pn-np/ab/banff/visit/visit7a7.aspx> or in the NRS ASP.

Table 2. Avalanche Terrain Exposure Scale

Terrain characteristic	Simple	Challenging	Complex
Slope angle	Angles generally < 30 ⁰	<i>Mostly low angle, isolated slopes >35°</i>	<i>Variable with large % >35°</i>
Slope shape	Uniform	Some convexities	Convoluted
Forest density	Primarily treed with some forest openings	Mixed trees and open terrain	Large expanses of open terrain. Isolated tree bands
Terrain traps	Minimal, some creek slopes or cutbanks	Some depressions, gullies and/or overhead avalanche terrain	<i>Many depressions, gullies, cliffs, hidden slopes above gullies, cornices</i>
Avalanche frequency (events: years)	1:30 ≥ size 2	1:1 for < size 2 <i>1:3 for ≥ size 2</i>	1:1 < size 3 <i>1:1 ≥ size 3</i>
Start zone density	Limited open terrain	Some open terrain. Isolated avalanche paths leading to valley bottom.	Large expanses of open terrain. Multiple avalanche paths leading to valley bottom.
Runout zone characteristics	Solitary, well defined areas, smooth transitions, spread deposits	Abrupt transitions or depressions with deep deposits	Multiple converging runout zones, confined deposition area, steep tracks overhead.
Interaction with avalanche paths	Runout zones only	Single path or paths with separation	<i>Numerous and overlapping paths</i>
Route options	Numerous, terrain allows multiple choices	A selection of choices of varying exposure, options to avoid avalanche paths.	<i>Limited chances to reduce exposure, avoidance not possible.</i>
Exposure time	None, or limited exposure crossing runouts only	<i>Isolated exposure to start zones and tracks</i>	<i>Frequent exposure to start zones and tracks</i>
Glaciation	None	<i>Generally smooth with isolated bands of crevasses</i>	<i>Broken or steep sections of crevasses, icefalls or serac exposure</i>

* Recently harvested cutblocks are included in the definition of open terrain.

** Terrain that qualified under an italicized bold descriptor automatically defaults to that terrain class or a higher terrain class.

5.0 Training and Considerations:

Training requirements are dependent on the applicable Avalanche Terrain Exposure Scale (ATES) rating. Training and protocols required increase with increased risk of exposure. Training requirements for work in avalanche terrain are detailed in the NRS ASP.

The minimum level of training required to work in areas with snowpack's greater than 30 cm (Decision Point A) is completion of the [CAC Online Avalanche Course](#) or equivalent and familiarity with the Evaluator Slope Evaluation Card. The intent is to provide staff with the knowledge to have a basic awareness of avalanche risk in the workplace and to recognize and assess snow avalanche hazard and risk (prior to venturing into the field and continually as they carry out their field work). This basic level is the minimum for working in terrain that does not qualify as avalanche terrain under the ATES scale. The exception to this level of risk is exposure to Simple or Challenging exposure terrain within an enclosed vehicle on a maintained (ie. ploughed) industrial road. In this circumstance, the CAA Online course or equivalent is sufficient.

The CAC Online Avalanche Course can be found at: <http://www.avalanche.ca/cac/training/online-course>

5.1 Work Advisory:

It is important to note that field work or travel in potential avalanche terrain will require a minimum team size of two. The exceptions to this would be:

- Travel in an enclosed vehicle on a maintained road. In this circumstance, an appropriate check in procedure must be in place to monitor the travel in relation to the avalanche hazards.
- Other workers at the location where our field work is conducted are an appropriate resource with the proper training and equipment to provide emergency response.

It is important to be aware that small slopes can have deadly consequences. Crews should be aware that short, steep slopes within harvested areas or open areas and road cuts present avalanche hazards that could be easily overlooked. Field teams must be aware of the hazards these terrain features present and be diligent in avoiding exposure.

6.0 Local or Activity Specific Protocols (operating in at risk conditions)

6.1 General

Where the local manager concludes that adherence to this policy will not provide for critical operational activities, they may establish local protocols in a manner that will be consistent with all other similar NRS activities in the specified area. It is expected that some areas of agency business may demand more complex risk management via local or activity specific protocols. These activities may include: weather observation, snow surveys, research activities, RCMP associated compliance activities, radio repeater maintenance and other operations that by their nature require work or travel in avalanche terrain during at risk periods.

If more specific protocols are warranted to ensure safe operations, these protocols must be documented in writing and must be approved by the applicable local manager. They must be included in a local or activity specific Avalanche Safety Plan. Managers will ensure their approach and protocols are consistent with other NRS managers that undertake similar works in similar areas to ensure staff are able to support and assist one another in a consistent and complimentary manner. General wilderness activities associated with routine operational business may proceed typically under the NRS ASP.

6.2 Avalanche Safety Plan

The NRS has a Provincial ASP that can be used to address at risk activities within a wilderness setting. Local risk assessments may indicate more specific information and protocols and maybe used to amend or replace provincial guidance as warranted. A local avalanche safety plan is required when working or travelling in avalanche terrain as defined in the decision guide. The requirement and content of the avalanche safety plan should be guided by WorkSafe BC regulation, policy, guideline and the engaged QAP. In addition, other agencies and or licensees should be solicited for information which may assist in the development of appropriate protocols.

An avalanche safety plan will identify passive measures to mitigate or reduce the avalanche risk and/or any active avalanche program measures that are necessary to monitor and manage the avalanche risk. Avalanche safety plans must prescribe the required personal avalanche safety equipment to work in avalanche terrain. They must include specified levels of training for all staff undertaking field activities. Training must include emergency response education and competency practice, avalanche hazard awareness, decision making and group decision making as well as use and practice with avalanche safety equipment and the applicable expectations of the protocols. In addition, these protocols should provide staff guidance on pre-trip planning and other mitigation tactics including person check onsite and for the entire team. These local

protocols do not supersede this provincial level policy, but rather augment and provide for field activities in circumstances or terrain not available if operating solely under this policy.

The principal of empowering all members of a field team to suspend or curtail field activities if and when they become uncomfortable with the level of risk must be reiterated in any specific protocol and respected by all field team members. This principal must be supported in training and must be communicated and supported by senior and supervisory staff routinely.

7.0 Avalanche Terrain Analysis

Wilderness activities that cover a broad spectrum of land may not be well informed by detailed terrain analysis or assessment due to the variability of circumstance and risk from one day to the next. Landscape level hazard mapping may help define lower risk travel corridors in some instances. It is more likely that focus on the operating procedures and training will have greater impact on the safety of personnel. The conditions staff will encounter will be highly variable and thus difficult to assess by an office review of large areas. Terrain hazard mapping however may inform forest development and help reduce the implications of avalanche risk on harvesting or avalanche risk on forest resources (Land Management Handbook 55). Prior to investing significant resources in hazard mapping, local managers should be clear as to the value expected for forest management or staff safety and should prioritize their resources for the greatest impact.

The assessments referenced in WorkSafe BC regulation could be broadly interpreted as assessment of the nature of work to identify suitable protocols with minimal or strategically focused assessment of the land base itself. All employers will need to do some preliminary determination of what areas will need to be assessed in order to inform protocols and manage risk, the broader the land base and more variable the timing of work becomes the less valuable any static assessment is in mitigating risk. We must focus our resources on mitigating the risk to our staff and not become side tracked by interpretations which detract from this objective!

8.0 Contractors and Licensees

The avoidance parameters associated with this policy apply to staff planning contracts. Contracts should be planned to support the same avoidance strategy and deployment of contractors should not occur unless consistent with the avoidance principals described in this document. Tree planters, road builders, forestry consultants, and others should curtail field activities when the conditions warrant as specified in the NRS avalanche avoidance decision guide, unless these activities are governed by contractor's protocols that increase the contractor's readiness to deal with avalanche hazards. Contractors may choose to adopt NRS ASP protocols where the nature of work and activity makes their application

appropriate. Staff administering contracts should take into account the season and term of the contract to allow for curtailment of activity. If the term of the contract does not provide adequate time for completion then extensions to the timeline should be granted. Where contractors must be deployed during at-risk circumstances, these contracts should clearly expect the contractors to manage the avalanche risk accordingly and as guided by WorkSafe BC requirements. In addition, information sharing and communication protocols must be established with the contractors to ensure all workers (NRS staff included) are kept well informed as to hazards and mitigation strategies, including emergency response. NRS staff may have to come to the aid of contractors or vice versa and each will need to understand the expected protocol. NRS staff must be made aware of hazards and risks identified by the contractors and all information that the NRS has developed in regard to avalanche risk, including hazard mapping, must be shared with the contractor. These expectations are supported by the Workers Compensation Act, thus cooperation is required by all employers to ensure the safety of other workers on their worksite.

In regard to tenure or other authorizations of the Crown, the NRS must ensure they share any information with the licensees that may identify hazards associated with avalanche and should remind these parties of their obligations to manage these risks relative to their operations. Communication and information sharing protocols should be established between the NRS and tenure holders as well as other parties. Road activity management should be addressed through road safety committees or other suitable communication forums to ensure adequate measures are in place where roads cross avalanche paths, this generally involves signage, no stopping, leaving pullouts unploughed, and it may also include appropriate protocols to time ploughing or hauling to mitigate the hazard.

References and further information available through:

Snow Avalanche Management in Forested Terrain Land Management Handbook 55 Ministry of Forest –Forest Science Program

Land Managers Guide to Snow Avalanche Hazards in Canada 2002 Canadian Avalanche Association

Guidelines for Snow avalanche Risk Determination and Mapping in Canada 2002 Canadian Avalanche Association

http://www.pc.gc.ca/eng/rech-srch/clic-click.aspx?/cgi-bin/MsmGo.exe?grab_id=0&page_id=38799&query=Avalanche%20Terrain%20Exposure%20Scale&hiword=AVALANCH%20AVALANCHES%20Avalanche%20EXP%20EXPOSURES%20Exposure%20SCALEABLE%20SCALED%20SCALES%20SCALING%20SCALY%20Scale%20TERRA%20TERRAINS%20Terrain%20

<http://www.avalanche.ca/cac/>

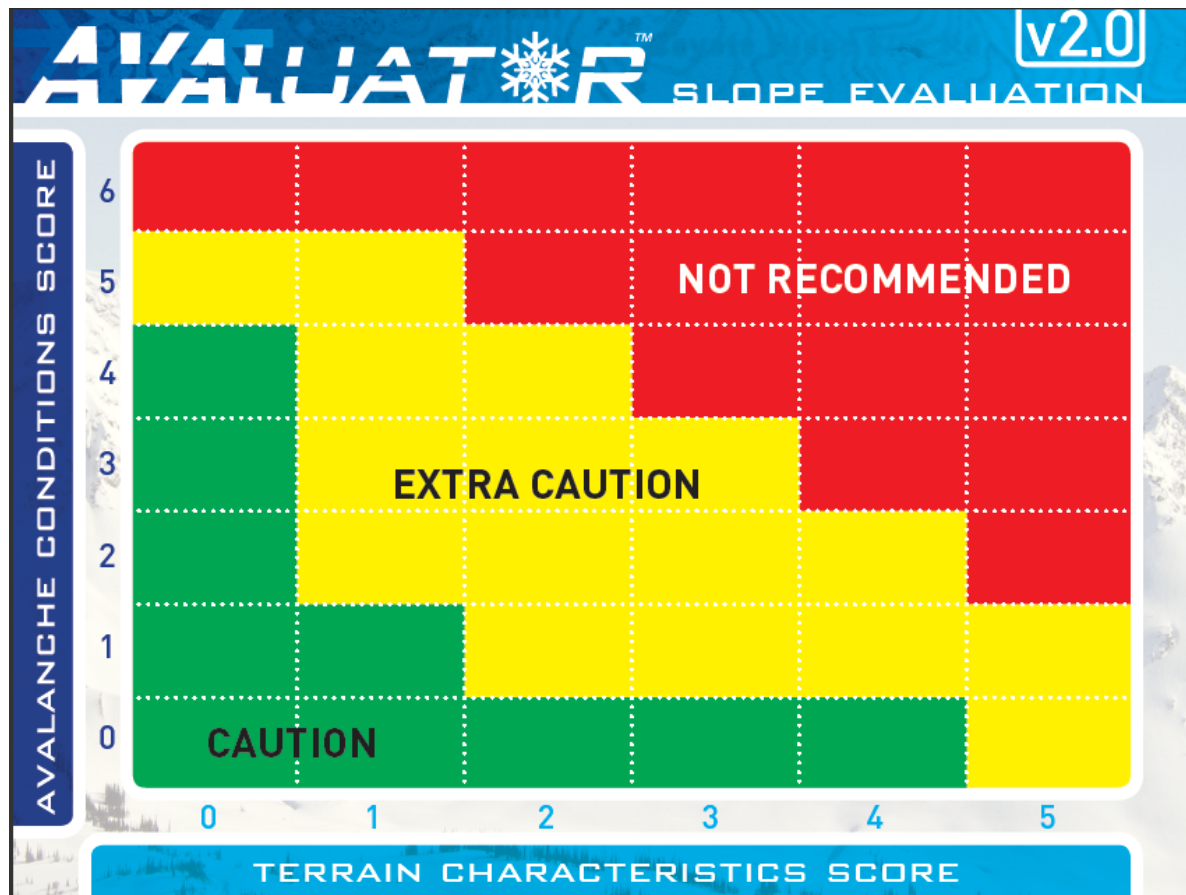
APPENDIX 1: AVALUATOR SLOPE EVALUATION

The Avaluator Slope Evaluation tool is designed to be used while in the field to help with continual on-site assessment of local conditions and terrain – before committing to avalanche slopes.

On-slope ratings are independent of the original NRS Trip Planner rating. Discrepancies are likely, so the Slope Evaluation score could override original rating. Factors include: local, small scale variations in terrain; rapid changes in conditions; and variations in conditions over the terrain.

Accurate slope evaluation relies on your ability to see the terrain and conditions around you. Remember your ability to gather accurate info may be limited by: distance; blocking terrain features; and poor weather

- Be prepared to downgrade a rating based on the results of a slope evaluation (i.e. from Green to Yellow)
- Upgrading a rating (i.e. from Yellow to Green) is discouraged



AVALUATORTM SLOPE EVALUATION v2.0

AVAILANCHE CONDITIONS

Regional Danger Rating: Is the avalanche danger rating "Considerable" or higher?	+1
Persistent Avalanche Problem: Is there a persistent or deep persistent slab problem in the snowpack?	+1
Slab Avalanches: Are there signs of slab avalanches from today or yesterday?	+1
Signs of Instability: Are there signs of snowpack instability including <i>whumpfs</i> , shooting cracks or drum-like sounds?	+1
Recent Loading: Has there been loading within the past 48 hours including roughly 30 cm of new snow or more, significant wind transport or rain?	+1
Critical Warming: Has there been a recent rapid rise in temperature to near 0 C, or is the upper snowpack wet due to strong sun, above-freezing air temperatures or rain?	+1
Avalanche Conditions Score:	<input type="text"/>

TERRAIN CHARACTERISTICS

Slope Steepness: Is the slope steepness between 30 and 35 degrees?	+1
Or Is the slope steeper than 35 degrees?	+2
Terrain Traps: Are there gullies, trees or cliffs that increase the consequences of being caught in an avalanche?	+1
Slope Shape: Is the slope convex or unsupported?	+1
Forest Density: Is the slope in the alpine, in a sparsely treed area or in open forest (cut-block, burn, wide-spaced glades)?	+1
Terrain Characteristics Score:	<input type="text"/>

Visit www.avalanche.ca for more information.



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Anomalies in terrain and avalanche conditions may exist.
Users of the AVALUATORTM assume their own risk.

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