

IS IT SAFE: AN EDUCATIONAL POSTER DEVELOPED BY GRADE  
SCHOOL STUDENTS FOR THEIR PEERS

2007/2008 Fifth Grade Class  
Ophir School, Big Sky, MT

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Ophir School, Big Sky, MT

**ABSTRACT:** A poster developed by the students of Mr. Neal's 5th grade class was specifically designed to educate their fellow schoolmates regarding snow and avalanche safety. The following is an overview of the poster, which was primarily written by the students. For an avalanche to occur there needs to be a bed surface, a weak-layer, and a slab. The slab must be a solid piece of snow and rest on top of a weak-layer. Humans are usually the trigger that causes the slab to break away and slide down the hill. Before traveling in an avalanche area you need to consider the snowpack, weather, and terrain. The snowpack is made of layers of different snow types, like facets or rounds, and the correct layering can cause an avalanche. Avalanches usually occur on 30 to 45 degree slopes, and other factors such as trees and rocks could make them more deadly. The weather is also important because wind and heavy snow can lead to unsafe conditions. When traveling in avalanche terrain be sure to travel one-at-a-time so that many people do not become buried. But, if someone does get buried you can rescue them using an avalanche beacon, shovel, and probe—which you should always carry with you.

**KEYWORDS:** Avalanche, Safety, Primary Education

## PREFACE

Snow and avalanche science lessons were implemented in Mr. Neal's 2007/2008 fifth grade class at Ophir School in Big Sky, MT (Slaughter et al., 2008). These lessons were developed and delivered by an engineering PhD student at Montana State University through the National Science Foundation Graduate Teaching Fellows in K–12 Education (GK–12) Program. The entire curriculum included 15 lessons, a field trip, and a final project, which is the poster presented at this conference—the 2008 International Snow Science Workshop (ISSW).

The poster was presented by two students: Isabella Sarmiento and Micah Robin. These two students were chosen to represent their class at ISSW after winning an essay contest: *Why should I go to ISSW?*

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The following is a text-only copy of the student-presented poster shown in Figure 1, which was designed and written by the students. The poster was edited for grammar and digitalized by the co-authors.

## 1. INTRODUCTION

For an avalanche to occur there needs to be a slab, a bed-surface, a weak-layer, and a trigger. A weak-layer is an unstable layer of snow. The slab is a dense layer of snow that piles up on top of the weak-layer. The trigger is the last bit of weight that causes the weak layer to collapse. For example, if a skier/snowboarder skis over it, the weak-layer will collapse and the slab will slide down on the bed-surface creating an avalanche.

## 2. DECISION MAKING

There are three factors that you need to consider when traveling into the backcountry: weather, terrain, and snowpack. Each factor can be separated into green, yellow, and red light conditions. Green means that it is safe, yellow means to be cautious, and red means conditions are dangerous.

### 3. TERRAIN

When traveling in avalanche terrain you should be aware of the following features.

- **SLOPE ANGLE:** If the slope is between 30 and 45 degrees there is a high chance of an avalanche.
- **TERRAIN TRAPS:** Terrain traps are ditches that can easily fill up with deep snow if an avalanche occurs.
- **CONSEQUENCES:** Trees, rocks, and cliffs can be deadly when you hit them if you are caught in an avalanche.

### 4. SNOWPACK

There are six basic types of snow, and the different types make up the layering that causes slabs, weak-layers, and bed-surfaces to develop. The type of snow can change when the snow temperature gets warmer and colder. This is called the temperature gradient, which is the difference in temperature across the layer divided by the layer's thickness. Facets form when the temperature gradient is greater than 10 °C/m, and rounded snow forms when the temperature gradient is less than 10 °C/m.

### 5. WEATHER

The weather is important to consider when traveling in the backcountry. There are three major weather events to consider.

- High winds can create wind slabs, which are dangerous because they build up fast and form extremely strong slabs and cornices.
- Blizzards are dangerous because you cannot see signs of avalanches or dangerous terrain and a lot of snow can trigger an avalanche because of the additional weight added to the snowpack.
- Cold and clear nights often form surface hoar, which is a common weak-layer.

### 6. RESCUE

Most avalanches that hurt people are caused by that person or someone that they are with. When traveling in the backcountry always carry a shovel, probe, and beacon, never travel alone, and cross avalanche terrain

one at a time. If someone is caught in an avalanche, first turn on your beacon to "receive" and then follow the arrows. When you find the smallest possible number use your probe to locate the buried person and then shovel to find them.

### 7. STABILITY TESTING

A compression test is one method to test the strength of the snow. This test is completed by following these steps. If the column breaks during steps 4–6, the test is stopped and given a score. For example, if you hit the snow 7 times the score would be CT7. Low scores mean that snow is unstable.

1. Dig a snow pit to the ground.
2. Cut out a rectangle that is 30x30 cm.
3. Place a shovel on top of the column.
4. Tap the shovel 10 times from your wrist.
5. Hit the shovel 10 times from your elbow.
6. Hit the shovel 10 times from your shoulder.

### 8. ACKNOWLEDGMENTS

Thank you to the National Science Foundation Graduate Teaching Fellows in K–12 Education (GK–12) Program, who gave funding to the program at Ophir school, and for the support received from the Big Sky Institute, Ophir School, Big Sky Resort, Big Sky Ski Patrol, and Elizabeth Absire.

Thank you to the students of the 2007/2008 fifth grade class of Ophir School, who participated in the program and wrote the content of this poster: Alyssa Adams, Cody Ballantyne, Jake Belleisle, Tehya Braun, Tanner Burton, Harry Child, Alecia Drum, Haven Fry, Samantha Furgeson, Andrew Garcia, Gabrielle Gasser, Simeon Goode, Griffin House, Quinn House, Trevor House, Justin McKillop, Ben Michel, Gabby Michel, Karlie Perry, Micah Robin, Skylar Rogers, Zoe Ross, Isabella Sarmiento, Rachid Schultz, and Cooper Shea.

### REFERENCES

Slaughter, A., D. T. Neal, and Ophir School 2007/2008 Fifth Grade, 2008: Snow science as curriculum in a fifth grade classroom. *In Proceedings: 2008 International Snow Science Workshop, Whistler, B.C.*

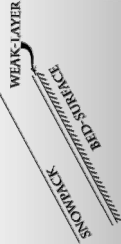


# IS IT SAFE?

2007-2008 Ophir School 5th Grade, Andrew E. Slaughter, and David T. Neal



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## INTRODUCTION



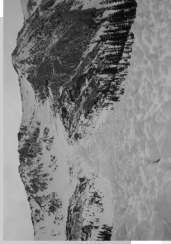
### TERRAIN

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### RESCUE

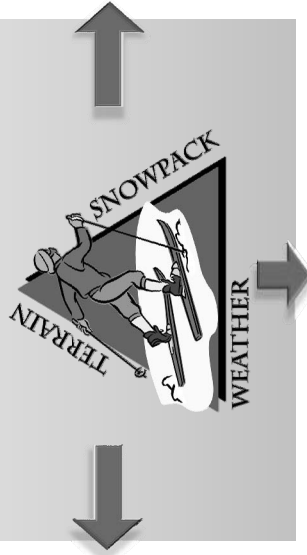
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### DECISION MAKING

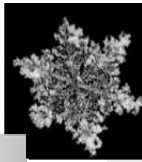
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	TERRAIN	WEATHER	SNOWPACK
RED LIGHT	Flagged Trees Cliffs and Terrain Traps Steep Slopes (35-45°)	Low Visibility Heavy Winds Coronics	Weak-Layers and Slabs Crowlines Surface Depth Hoar
YELLOW LIGHT	Small rocks and cliffs Moderate Slopes (25-35°)	Fall Light Snow Light Winds Weather	Signs of Faceted Snow
GREEN LIGHT	Dense Trees Low-angle Terrain (<25°)	Sustained Clear Weather Calm Winds	Rounded Snow Non-layered Snowpack



### WEATHER

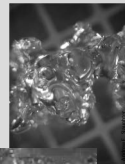
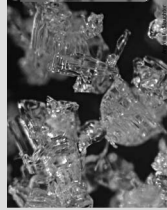
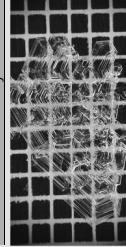
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### SNOWPACK

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SNOW	TYPE OF LAYER
New	Weak-layer or Slab
Facets	Weak-layer
Surface hoar	Weak-layer
Rounds	Slab
Crust	Weak-layer or Slab
Wet	Weak-layer or Slab



### STABILITY TESTING

A compression test is one method to test the strength of the snow. This test is completed by following these steps. If the column breaks during steps 4-6, the test is stopped and given a score. For example, if you hit the snow 7 times the score would be C77. Low scores mean that snow is unstable.

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Figure 1: Image of the final project created by the student of Mr. Neal's 2007/2008 fifth grade class at Ophir School in Big Sky, MT during the 2007/2008 academic year.