

# NEW OBSERVATION GUIDELINES FOR AVALANCHE PROGRAMS IN THE UNITED STATES

E. M. Greene<sup>1,2,4</sup>, K. W. Birkeland<sup>3</sup>, K. Elder<sup>4</sup>, G. Johnson<sup>5</sup>, C. Landry<sup>6</sup>, I. McCammon<sup>7,8</sup>,  
M. Moore<sup>9</sup>, D. Sharaf<sup>1,8,10</sup>, C. Sterbenz<sup>1,11</sup>, B. Tremper<sup>1,12</sup>, and K. Williams<sup>13</sup>

American Avalanche Association, Pagosa Springs, Colorado, USA.<sup>1</sup>  
Department of Geosciences, Colorado State University, Fort Collins, Colorado, USA.<sup>2</sup>  
USDA Forest Service National Avalanche Center, Bozeman, Montana, USA.<sup>3</sup>  
USDA Forest Service Rocky Mountain Research Station, Fort Collins, Colorado, USA.<sup>4</sup>  
USDA Forest Service Sawtooth Avalanche Center, Ketchum, Idaho, USA.<sup>5</sup>  
Center for Snow and Avalanche Studies, Silverton, Colorado, USA.<sup>6</sup>  
Snowpit Technologies, Salt Lake City, Utah, USA.<sup>7</sup>  
National Outdoor Leadership School, Lander, Wyoming, USA.<sup>8</sup>  
USDA Forest Service Northwest Avalanche Center, Seattle, Washington, USA.<sup>9</sup>  
Valdez Heli-Ski Guides, Valdez, Alaska, USA.<sup>10</sup>  
Telluride Ski Company, Telluride, Colorado, USA.<sup>11</sup>  
USDA Forest Service Utah Avalanche Center, Salt Lake City, Utah, USA.<sup>12</sup>  
Colorado Avalanche Information Center, Boulder, Colorado, USA.<sup>13</sup>

**ABSTRACT:** For over 35 years avalanche workers in the United States used observations described on “the blue and green sheets” published by the USDA Forest Service for standard snow, weather and avalanche observations. Those observation outlines served the U.S. avalanche community well and produced a valuable long-term data set. However, a new and updated set of guidelines are now needed since the blue and green sheets are out of print, and the number, types and needs of avalanche programs in the U.S. have changed.

The American Avalanche Association and the USDA Forest Service National Avalanche Center joined forces to research, write and publish a new set of observational guidelines to support avalanche programs in the United States. This effort began by licensing the Canadian Avalanche Association’s *Observational Guidelines and Recording Standards for Weather, Snowpack, and Avalanches*. This well-established document along with the blue and green sheets formed a solid foundation for the new guidelines, which were specifically developed to fit the diverse needs of avalanche programs in the U.S. The resulting document, *Snow, Weather, and Avalanches: Observational Guidelines for Avalanche Programs in the United States*, was published by the American Avalanche Association in the fall of 2004.

**KEYWORDS:** avalanche, meteorology, measurement, observation, education

## 1. INTRODUCTION

Since the late 1960’s data record sheets distributed by the United States Department of Agriculture (USDA) Forest Service listed daily standard observations for snow, weather (blue sheet) and avalanches (green sheet) (Figure 1). Observers throughout the U.S. recorded data on these sheets and sent them to the USDA Forest Service Rocky Mountain Research Station in Fort Collins, Colorado. This network of reporting stations and the central archive comprised the Westwide Avalanche Network (Judson, 1970; Williams, 1976; Williams, 1994). In the mid

1990’s the Forest Service stopped funding the program and management of the archive and data network was turned over to a private group (Tremper et al., 1996).

The parameters recorded during the standard observation and the methods used to collect these data have not been updated in over three decades. During that time the number, type and needs of avalanche operations in the U.S. have expanded. In order to preserve and increase the quality of mountain weather, snow and avalanche data collected in the U.S. and to generate a professional resource for the avalanche community; the American Avalanche Association (AAA) and the USDA Forest Service National Avalanche Center (NAC) joined forces in 2003 to compile and publish a set of observational guidelines for avalanche programs in the United States.

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\*Corresponding Author’s Address: Ethan M. Greene, USDA Forest Service Rocky Mountain Research Station, 240 W. Prospect Rd., Fort Collins, CO 80524, 970-498-1273 voice, 970-498-1212 fax, [greenec@cnr.colostate.edu](mailto:greenec@cnr.colostate.edu)

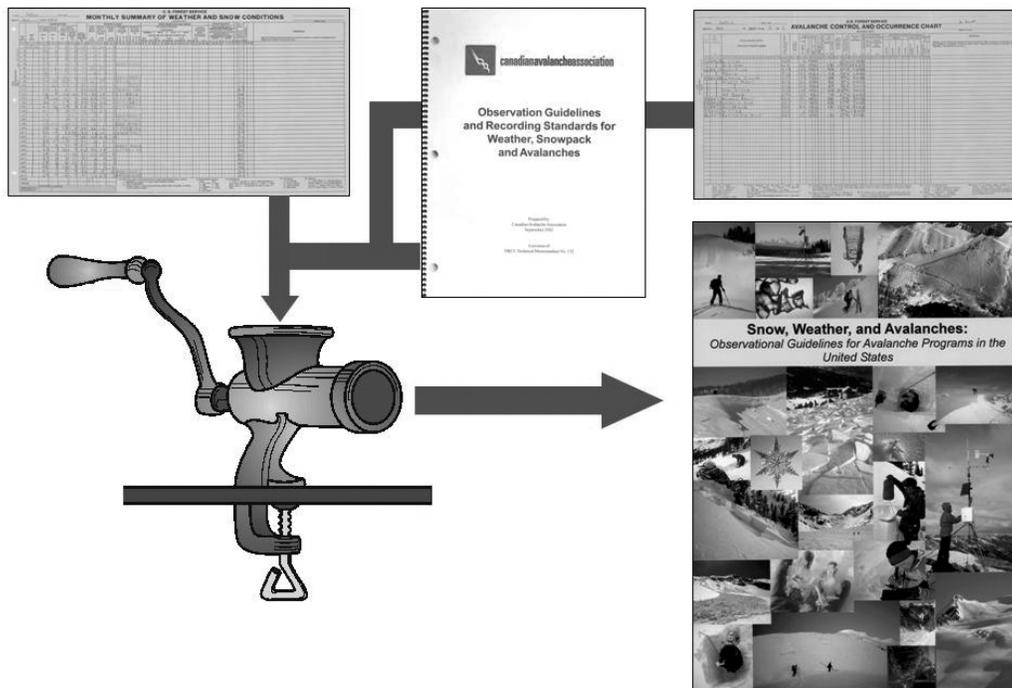


Figure 1: Schematic of the creation process. Foundation documents from left to right: Monthly Summary of Weather and Snowpack Conditions (blue sheet—USDA Forest Service Westwide Avalanche Network), Observation Guidelines and Recording Standards for Weather, Snowpack and Avalanches (Canadian Avalanche Association) and Avalanche Control and Occurrence Chart (green sheet—USDA Forest Service Westwide Avalanche Network).

## 2. CREATION PROCESS

The Westwide Avalanche Network established a set of standard observations for avalanche programs in the United States. However, due to time and funding constraints an observations manual was never compiled (Judson, personal communication). An observation manual for avalanche programs was later developed by the National Research Council of Canada (ARC, 1981), and that manual has been maintained and updated by the Canadian Avalanche Association (CAA) (CAA, 2002). The current version of the CAA document (*Observational Guidelines and Recording Standards for Weather, Snowpack and Avalanches* or OGRS) (Figure 1) has been well accepted in Canada and is currently being used by avalanche programs in several other countries. Through a licensing agreement with the CAA, we were able to use the current version of OGRS and the blue and green sheets from the Westwide Avalanche Network as a foundation for

a new set of observational guidelines (Figure 1).

The American Avalanche Association and USDA Forest Service National Avalanche Center formed the Working Group on Observational Guidelines (referred to as the working group throughout this document) from individuals that are active in avalanche forecasting, education and research. The working group took the contents of OGRS and the Westwide blue and green sheets, and produced a draft of the new observations guide. This draft was distributed to a group of 25 technical reviewers for comment. In addition, the document was available to any member of AAA or the general public upon request. The comment period was advertised in *The Avalanche Review* and on the AAA's web site. Comments on the draft were accepted for a three month period (January through March of 2004).

After collecting and organizing comments from the review period, the working group selected issues raised during the review that

would be addressed in the final version of the document. Three post-review drafts were composed and circulated amongst the working group. During this period the working group also contacted several experts in avalanche field work and science to clarify specific discussion points.

### 3. PHILOSOPHY

The avalanche community in the United States encompasses a diverse group of individuals and operations. They include, but are not limited to, regional forecast centers, ski area operations, backcountry guiding services, highway forecasters, educators and recreationalists. All of these groups operate in the three major snow climates and transitional zones that exist within the continental U.S. and Alaska. During the creation process it became obvious that any document striving to serve this diverse group would need to cover a broad array of topics and techniques. This document would also have to remain a work in progress with periodic updates to account for new methods and techniques that develop.

The working group adopted the philosophy that certain field tests and observations should be conducted using standardized methods. A base set of observations would be valuable for most operations and maintain the Westwide Avalanche Network data set. However, parameters being observed in snowpits should vary based on the

type of avalanche operation and the type of avalanche problem being investigated. In addition, field workers should be encouraged to adopt and develop non-standardized methods that yield information needed for their particular organization or application. These non-standardized methods should augment but not replace data collected by standard methods.

### 4. CONTENTS OF THE NEW GUIDELINES

The new publication, entitled *Snow, Weather, and Avalanches: Observational Guidelines for Avalanche Programs in the United States* (SWAG), contains three main chapters and nine appendices (Table 1). The chapters discuss weather, snowpack and avalanche observations. While the appendices present additional information related to but not covered in the main chapters. Each chapter presents a *standard observation* (a set of parameters to be observed each day, after a weather or avalanche event, or field or hazard mitigation mission), followed by a description of a recommended method for observing each parameter in the standard observation. Other useful parameters not included in the standard observation, and methods for observing them, are also discussed in the appropriate chapter.

### 5. DISTRIBUTION

Bound hard copies of *Snow, Weather, and Avalanches* will be available at the virtual

Table 1: Contents of *Snow, Weather, and Avalanches: Observational Guidelines for Avalanche Programs in the United States*

Section	Title or Contents
Chapter 1	Manual Snow and Weather Observations
Chapter 2	Snowpack Observations
Chapter 3	Avalanche Observations
Glossary	100+ snow, weather, avalanche, and physical science terms
Appendix A	References
Appendix B	Units
Appendix C	Metadata
Appendix D	Observations Sites for Meteorological Measurements
Appendix E	Automated Weather Stations
Appendix F	ICSI Classification for Seasonal Snow Cover on the Ground
Appendix G	Avalanche Danger, Hazard, and Snow Stability Scales
Appendix H	Reporting Avalanche Involvements
Appendix I	Symbols and Abbreviations
Forms and Tables	Snow profile forms, temperature and speed conversion charts

store on the American Avalanche Association's website ([www.americanavalancheassociation.org](http://www.americanavalancheassociation.org)). In addition, the AAA is devolving a companion web page that will reside on the same web site. This web page will contain resources for groups using SWAG. Currently, there is a list of snow science equipment vendors and an electronic nonprintable version of the document. The electronic version of the document is supplied to facilitate key word searches and easy reference of the text. Printable versions of the accident forms, snow profile forms, coding cheat-sheets and conversion charts will also be available. Electronic versions of the document and forms will also be available on the Technology Transfer section of the NAC's web site ([www.fsavalanche.org](http://www.fsavalanche.org)).

## 6. SUMMARY

The American Avalanche Association and the USDA Forest Service National Avalanche Center partnered to create a new set of observational guidelines for avalanche programs in the United States. The result is a document that we hope will become a valuable reference for anyone interested in observing snow properties or avalanche forecasting. The document will be most useful to people who have had some type of formal field training (such as a professional level avalanche course), but may also be useful to entry level avalanche workers or enthusiastic recreationalists. We hope this document will become part of the curriculum for any professional level avalanche courses in the United States. The document will remain a work in progress, with revisions occurring every five to ten years.

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## REFERENCES

Avalanche Research Centre, 1981: *Guidelines for Weather, Snowpack, and Avalanche Observations*. Technical Memorandum No. 132. National Research Council of Canada, Ottawa, pp. 60.

- Canadian Avalanche Association, 2002: *Observational Guidelines and Recording Standards for Weather, Snowpack and Avalanches*. Canadian Avalanche Association, Revelstoke, British Columbia, pp. 78.
- Judson, A., 1970: A pilot study of weather, snow, and avalanche reporting for western United States. In: *Ice Engineering and Avalanche Forecasting and Control*, National Research Council of Canada, Technical Memorandum No. 98. 123-134.
- Tremper, B., D. Judd, D. Howlett, R. Trover, M. Moore, D. Atkins, and K. Heineken, 1996: The New Westwide Avalanche Network. *Proceedings of the International Snow Science Workshop*, Banff, Alberta, Canada, 41-43.
- Williams, K., 1976: The Colorado avalanche warning programme. In: *Avalanche Control, Forecasting, and Safety Workshop*, National Research Council of Canada, Technical Memorandum No. 120, 116-131.
- Williams, K., 1994: The U.S. Forest Service Westwide Avalanche Network. *Proceedings of the International Snow Science Workshop*, Snowbird, Utah, 644.