

# Quick Response Report #100

## A MAJOR SNOW-AVALANCHE EPISODE IN NORTHWEST MONTANA, FEBRUARY, 1996

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### Introduction

During the evening and early-morning hours of February 8-9, 1996, numerous snow avalanches (associated with heavy rains in the Pacific Northwest of the United States) were triggered along the southern boundary of Glacier National Park, Montana. These avalanches buried a portion of U.S. Highway 2 (US2) approximately four miles east of the village of Essex, Montana, as well as the mainline tracks of the Burlington Northern and Sante Fe Railroad (BNRR). US2 is the only east-west link across the Rockies in northern Montana; when closed, a 180-mile detour from East Glacier Park to West Glacier is required. US2 was closed during the evening of February 8 and into the morning of February 9 by snow avalanches blocking traffic. Additionally, approximately 75 yards of track of the BNRR were blocked for about eight hours, shutting down all freight traffic as well as the eastbound Amtrak passenger train from Seattle to Chicago.

Upon learning of the highway and railroad closures, a graduate student and I traveled to Essex, MT, with authorization and funds from the Natural Hazard Center's Quick Response Program. Our purposes were:

- to interview local residents concerning their reactions to the recent avalanche activity, and how they were affected by it;
  - to find how local residents gather information necessary for decision-making during times of high avalanche danger;
  - to determine how driving habits and views toward driving through avalanche-prone areas are affected by avalanche activity;
  - to discern what actions (if any) residents feel should be taken by governments to increase avalanche awareness;
  - to collect standard demographic data of interview respondents;
  - to compare data collected on-site with data collected by a postal survey of local residents conducted in the mid-1980s (Butler, 1987).
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## Background

The postal survey reported in Butler (1987) utilized a questionnaire to discern local residents' knowledge of, and reaction to, snow-avalanche hazards along US2. That survey had an excellent return rate for such postal surveys, but illustrated an educational bias, in that approximately 90% of respondents had some form of college education. That survey included residents of the US2 corridor between Essex and East Glacier Park; however, some residents of East Glacier Park never drive west to utilize the US2 corridor in winter, instead traveling to the east to Browning and Cut Bank, MT. Some of these individuals may have responded to the postal survey, and thus adversely affected its representativeness of residents of the avalanche-prone region. For these reasons, I believed that an on-site data collection effort, immediately following a major avalanche episode, would provide more accurate data concerning local residents' knowledge of, and reaction to, the avalanche hazard, as well as providing a more representative cross-section of local residents in terms of educational and employment backgrounds.

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## Methods and Sample Size

Personal interviews were conducted by graduate student Forrest Wilkerson and me with over 60 local residents of the Essex community. We spoke with residents concerning their experiences with the recent snow-avalanche closure of US2 and the BNRR, and took notes during these interviews. Of the people interviewed, 38 were willing to be formally interviewed using a pre-established questionnaire essentially the same as the postal survey form reported by Butler (1987). The remaining individuals were in some cases interested but too busy to have interview forms filled out (primarily workers of the BNRR at the Essex staging yard, but also including a busy local fry cook at a small restaurant), or simply did not wish to have their opinions formally recorded. The individuals willing to be formally interviewed with the questionnaire included most of the employees of the Izaak Walton Inn in Essex; several employees of the BNRR yard in Essex, including the local roadmaster responsible for maintaining traffic flow through the avalanche zone and who described the snow-clearing actions needed to re-open the railroad line; and local residents of Essex encountered in the area, including several individuals interviewed at the Snow Slip Inn (an excellent place-name for the region!) approximately eight miles east of Essex and on the opposite side of the location of the highway closure.

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## Sample Group Characteristics

Of the 38 formal interviewees, 63% were male and 37% were female, down from the 94% male-respondent number reported in Butler (1987). Caucasians comprised the vast majority of the group (87%, with 11% Native Americans and 3% Hispanic). Mean age of respondents was 40.51 years (standard deviation [SD] 13.74 years), and average length of residence was 13.5 years (SD 16.6 years). As in the postal survey (Butler, 1987), respondents generally had either lived in the area a very short time (typically less than three years, and usually in association with employment at the Izaak Walton Inn, which thrives on winter tourism associated with cross-country skiing) or for well over 15 years (essentially had lived there most of their lives). The education level illustrated in the sample group was much more representative

than that shown in the postal survey (Butler, 1987): 5% of respondents had post-graduate college education, 21% were college graduates, 50% attended college or a vo-tech school for less than 4 years, 13% were high school graduates, and 11% had not completed high school. Occupational categories included 61% associated with tourism in some form (hotel worker, ski instructor, restaurant waitress, etc.), 13% who were laborers for the BNR, 13% who were retired, 5% involved in teaching, and 8% "other" (including a locomotive engineer, an emergency medical technician, and a manager of the rail yard).

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## Knowledge of the Snow-Avalanche Hazard

Self-reported personal "level of experience" with snow avalanches was comparable to that reported by Butler (1987), but with fewer people reporting a "considerable level" of experience. In the current survey, 26% reported having considerable levels of experience with snow avalanches, 18% moderate levels, 39% very little experience, and 16% described themselves as having "no experience" with snow avalanche hazards (due to rounding, some values reported here do not add exactly to 100%).

When asked about the frequency of snow-avalanche hazards in the area (a question designed to discern the accuracy with which individuals perceive the hazard), a wide range of responses was recorded. Nearly equivalent numbers (29%, 29%, and 34% respectively) responded that avalanche-hazard frequency occurred "several times per winter", "once per winter", and "once every 2-5 years." Only 6% felt that the hazard occurred less than once every five years, and one person said the hazard never occurred, in spite of the road and railroad having just been closed by avalanching! The accuracy of the response (road closures occurring on average about once every 3-5 years; Butler and Malanson, 1985) has increased since the postal survey (Butler, 1987), in which over half of the respondents answered that the frequency was several times per winter. The increase in accuracy assessment may be a function of the great expansion in winter tourism-related activities in the area since the mid-1980s, at which time virtually no one in the area had heard of cross-country ski/lodging packages. By 1996, such packages were advertised in national publications, and snowshoeing had also become a popular winter activity (when I visited the Izaak Walton Inn in 1993, and brought snowshoes, people were intrigued and commented on what a good idea it was; when I visited the Inn again in February, 1995, snowshoes were available for rental).

One question assessed the feelings experienced by respondents during times of avalanche hazard and road closure. Individuals could choose from more than one category, so values reported below exceed 100%. During periods of high hazard and road closure, 71% of the respondents reported feeling "cautious," 50% described themselves as "alert but not fearful," and 29% described themselves as feeling either "fearful" or "apprehensive." More individuals described themselves as "helpless" rather than "in control" (5% vs. 3%), and no individual chose the "no fear" category.

Individuals were asked to describe the nature of the impact of the avalanche hazard upon themselves. Again, multiple responses were allowed. A full 50% reported that avalanche hazards and closures impacted their business or work, 44% described an impact of inconvenience (typically because of travel disruption), 13% felt impacted because the avalanches were obstacles to receiving medical care, and 6% felt impacted because they had witnessed deaths in the past during prior avalanche episodes elsewhere.

One question was designed to simply assess knowledge of the recent closure. Respondents were asked if US2 had ever experienced a major avalanche. Definition of "a major avalanche" was left up to each person. Seventy-four percent responded yes, but 26% replied no, even though the road had been closed by avalanching less than two weeks previously. Of note also is the fact that in February 1979, a major snow avalanche indeed ripped out a bridge along US2 and caused a month-long period in which the detour of 180 miles was in effect! Either the 26% responding "no" were completely oblivious, or had an extraordinarily stringent personal definition of what constitutes a "major avalanche".

A final question in the group of questions assessing local knowledge focused on the perception of individuals as to the seriousness of the present and future hazard. Nearly two-thirds of the respondents replied that the present and future avalanche hazard was "somewhat serious," 16% replied "very serious," and 11% replied it was not serious at all (and 11% "did not know"). These results contrast with those from the earlier postal survey (Butler, 1987), in which only 7%

felt the threat was very serious, 56% reported somewhat serious, and a significantly higher 35% replied that the hazard was not serious. These shifts are at least partially a function, in my view, of the reorientation of the local economy to a winter tourism and recreation-based one.

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## Reactions to the Snow-Avalanche Hazard

Respondents were asked several questions concerning their individual adjustments to the avalanche hazard. When asked the frequency of their winter driving through the avalanche-prone area, 38% responded "several times per week" (many of these were laborers for the BNRD whose daily journey from home to work took them through the area in question), 14% said "once a week," 35% said only "once or twice a month," and a surprisingly high 14% responded that they never travel through the area in winter. That value was up from a mere 4% in the postal survey (Butler, 1987). Those individuals were, however, among the group of retirees in the Essex area, or people whose jobs at the Izaak Walton Inn effectively precluded them from travel during "high season."

Individuals were asked if they travel at night through the avalanche-prone zone. Sixty-eight percent said that they do (compared to 83% in the postal survey; Butler, 1987), and 32% do not, again illustrating some adjustment and/or awareness of the difficulty of seeing/reacting to snow avalanches in the dark.

Finally, individuals were asked if they travel when avalanche warning signs are posted or avalanche warnings are issued. Although 49% of the respondents said that they travel both at day and night when warnings are up, that value is down from 68% in the postal survey (Butler, 1987), and a full 49% said that they do not travel at all when warnings are posted. The current population seems to have a much greater respect for the danger of traveling during periods of warnings, as compared to the group from the 1980s.

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## Information Gathering and Awareness in the Hazard Zone

Individuals were asked a set of questions concerning their sources of information concerning avalanche hazards, and one question regarding suggestions for the future. When questions concerning the primary source of information utilized in gathering knowledge of snow avalanches, 52% replied that they use "locals/co-workers" as their primary source. This is significantly down from the 95% reported from the postal survey (Butler, 1987), and seems to represent a broadening of the information sources utilized, as well as a greater cognizance of the hazard in the area, which could in turn be interpreted as resulting from the shift into a winter tourism-based economy. Other sources of information included past personal experiences with avalanches (28%), newspapers (8%), radio (12%), old photos (8%), reading avalanche literature (4%), and formal avalanche training (4%).

Respondents were also specifically asked how they learned that the US2 area was prone to avalanches. Multiple sources were allowed, and 28% learned from locals, an additional 28% learned from personal experience (presumably knew what avalanche terrain looked like, having lived elsewhere in avalanche-prone country), 10% had had direct personal experiences with avalanches, 14% observed the conspicuous snow-avalanche paths and snow sheds in the area, 10% had undertaken avalanche training, 10% learned of the local situation through the newspaper, 10% learned through the radio, 3% learned through local pamphlet literature, and only 3% learned through consulting the Glacier Country Avalanche Center (GCAC). The GCAC is responsible for assessing avalanche danger in the US2 region, and for disseminating warnings and watches. In a separate question, 19% of respondents said they consulted the avalanche forecasts from the GCAC "at least once a week," 27% consulted the forecasts "only during times of high hazard," and a depressingly high 54% of local respondents never consulted the avalanche forecasts of the very agency designed to offer information and warnings. When asked if they were aware of the high level of avalanche danger prior to the recently concluded road and railroad closure, 41% of the individuals said they were "very aware," 35% replied "somewhat aware," and a rather high 24% were "unaware," further illustrating that the local warning distribution system still has some major work to do in the area.

A final question asked individuals to offer suggestions for increasing awareness of avalanche hazards during future

periods of high hazard. Multiple responses were allowed. Only 27% said that "government is doing all that it can," 45% wanted more road signs and/or road closures during high-hazard periods, and a very high value of 86% wanted "more information or reports through various means." And this from a group in which 54% never consult the forecasts of the GCAC!

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## Conclusions

It is apparent that a more representative cross-section of individuals can be garnered by on-site surveying rather than through application of a postal survey. More significantly, attitudes toward the snow-avalanche hazard in the Essex area seem to have changed since the utilization of the postal survey in the 1980s. Residents in general have a greater knowledge of, and respect for, the snow-avalanche hazard in the region, but still may be shockingly unaware of impending danger at a given time. Little improvement in reaching the public via avalanche warning issuance has occurred.

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