

A HISTORY OF AVALANCHE HAZARD IN  
SAN JUAN AND OURAY COUNTIES, COLORADO

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Introduction

In 1974, two adjoining counties in southwestern Colorado, Ouray and San Juan, authorized (under Colorado House Bill 1041) historical studies to compile and map avalanche incidents involving life and property. This paper summarizes portions of these studies (Armstrong, 1976; Armstrong, 1977) which the interested reader may consult for further details.

The method of study included a search through about a century of winter issues (October through May) of weekly newspapers from each county. Periodicals and books were also examined. Residents and former residents, including miners, road maintenance personnel, and people generally familiar with the area, were interviewed and extensive field checking was carried out to ascertain the location of avalanche disaster sites. Sites were mapped on U.S.G.S. 1:24,000 scale maps. The following photographic collections were utilized: San Juan County Historical Society, Denver Public Library Western History Department, the Colorado State Historical Society, and the collections of Jim Bell of Silverton and Ruth and Marvin Gregory of Ouray.

This study does not claim to have recorded all avalanche events, all people caught and property damaged, but only those incidents reported in the newspapers and obtained during interviews. Nearly continuous newspaper records start in San Juan County with the publication of the La Plata Miner in 1875, and in Ouray County with the Ouray Times in 1877, and later the Solid Muldoon and Ouray Herald. Avalanche events were newsworthy and received considerable coverage, as is shown in these headlines in the Solid Muldoon of 22 January, 1886:

DIRE DISASTERS!

MOUNT SNEFFLES AND RED MOUNTAIN

THE SCENES OF FEARFUL SNOW-SLIDES

Ruby Trust Mine, in the Former District,  
Furnishes Four Victims,

While the Genessee and Dutton add to the Horror  
Five More.

SITUATIONS AND INCIDENTS GRAPHICALLY DESCRIBED BY  
MULDOON REPORTERS SENT TO THE VERY FRONT.

## Historical Overview of San Juan and Ouray Counties

Until prospectors and miners invaded the San Juan Mountains in the 1860's, human activity was limited to summer visits by the Ute Indians (Fig. 1). In 1873, with the signing of the Brunot Treaty, the Utes ceded the San Juan Mountains to the United States government for a cash payment and mining and settlement officially began.

By the mid-1880's, both counties were booming with an economy dependent primarily on the production of silver. In 1890, Ouray County reached its peak population with 6,510 inhabitants (Cummins, 1951) and its peak in mineral production producing \$3,578,494 in gold, silver, copper, lead and zinc, the highest output from 1878 to 1924 (Henderson, 1926). San Juan County reached its peak population of 4,500 in 1900.<sup>1</sup> When the gold standard was adopted by the U.S. Government in 1893, and the price of silver fell drastically, both mining areas, after an initial slump, poured their energy into the production of gold, with the Camp Bird Mine producing approximately one-third to two-thirds of the total yearly mineral production in Ouray County from 1900 to 1916 (Armstrong, 1977).

Both San Juan and Ouray counties' early development was hampered by the same problems: lack of efficient transportation, and long winter seasons when many mines were unable to operate due to a lack of supplies. San Juan County responded to the problem with an extensive system of trails, roads, railroads, and aerial tramways. In July, 1882, the Denver and Rio Grande Railroad reached Silverton from Durango and, the following year, Otto Mears built a toll road from Silverton to Ouray. By 1904, railroads from Silverton reached Animas Forks, Gladstone and Ironton. In 1910, 14 aerial tramways were operating in San Juan County, a total of 177,600 linear feet. With this increased activity, came an increase in avalanche hazard. Of the 14 tramways, eleven were damaged by avalanches.

Ouray County's transportation network consisted of trails, roads, and at least six aerial tramways, two of which were damaged by avalanches. Two railroads entered the county but neither traversed its entire distance. Railroad traffic was frequently blocked by avalanche debris for periods of a few hours to a maximum of three months. The Silverton Railroad, which ran from Silverton to Ironton, was blocked repeatedly.

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<sup>1</sup>See San Juan County in the 1890's published in 1969 by the Silverton Standard and San Juan County Book Co., Silverton, Colo. (no author listed).

Dave Day, editor of the Solid Muldoon in Ouray, called the line the "Silverton-Red Mountain-Rainbow Slide and Drift trunk line" (Solid Muldoon, 6 March, 1891). Packers and teamsters were constantly exposed to avalanche hazard, as were miners, mail carriers, railroad and road workers, telephone and power company employees and anyone else travelling during the winter months or working in hazardous locations.

Figures 2 and 3 show the numbers of avalanche deaths by year for San Juan and Ouray County, respectively. Population statistics and mineral production studies show a correlation between population-mining activity and reported destructive avalanche events. The climatic influence was not a factor as no significant changes in climatic conditions were observed during this period (Bradley and Barry, 1973). How each county responded to the avalanche hazard is discussed next.

### San Juan County

San Juan County is predominantly mountainous with elevations ranging from 2600 to nearly 4300 m on some of the mountain summits (average elevation, 2900 m). The county seat, Silverton, lies in a park surrounded by peaks, and the entire county can lay claim to having not one acre of tillable soil. Travelling from Silverton to nearly any destination requires travelling through avalanche terrain. Silverton residents can observe numerous active avalanche paths, three of which have runout zones within the town limits. Perhaps these factors influenced the population's awareness of the avalanche hazard. Newspaper editors in Silverton published warnings:

"There has been a number of narrow escapes from snow slides already this winter. Nearly every day we hear of them, miners who are compelled to travel in the mountains should be very careful." (Silverton Standard, 22 December, 1894.)

Some of the warnings included a basic knowledge of snow properties:

"The bottom layer of snow is granulated and the top layer is soft and heavy. This will cause slides. Even the most expert snowshoer should be wary of climbing the mountains until the slides have run." (Silverton Standard, 16 January, 1897.)

The county depended on the mines for its prosperity and anything that interfered with production, such as excessive snowfall and avalanches, was viewed negatively. Only enough snow to keep the streets snowpacked in winter was thought necessary. "The snow this week came as a blessing. The main street was bare and it was impossible to get a sleigh up town." (Silverton Standard, 20 December, 1890.)

Statistics of people caught by avalanches from 1875 to the present in San Juan County are listed in Table 1. A total of 98 persons were killed and an additional 159 were caught but survived. Of the 98 deaths, 68 occurred when people were in fixed locations, either inside a building or working at or near a mine. During this period, over one hundred properties were reported damaged by avalanches, including 15 sites where death or burial from avalanche occurred. The remaining 30 avalanche deaths occurred when the victims were travelling.

Breaking these numbers down by time shows that, from 1875 through 1938, the majority of avalanche accidents occurred when people were in fixed locations; while during the modern period, 1939 to the present, almost all of the accidents occurred on highways. This reflects the decrease in mining activity, and the increasing concentration of the hazard along the traffic routes, U.S. Highway 550 and Colorado Highway 110.

San Juan County newspaper editors made several statements with regard to avalanche hazard zoning. The first statement appeared in the La Plata Miner of 15 March, 1884, after the Sampson Mine buildings were totally demolished (two men caught, one fatality):

"The mine was equipped with the most costly and complete plant of machinery ever placed on property in San Juan, and the destruction of life and property thro' careless location, should be obviated hereafter by the employment of men familiar with the country, and whose experience should point the way to proper location." (La Plata Miner, 15 March, 1884.)

The second mention was in the January 1887 issue of the San Juan newspaper after a thirteen-year old building at the Highland Mary property was destroyed:

"Again, buildings should not be put up where there is the least danger of slides, and we believe that the Colorado Legislature should pass a law making it a penal offense for

mining superintendents who have buildings put up in dangerous places or where there is a possibility of a slide sweeping them away. Until such a law is passed, there will be lots of chances taken in the erection of buildings." (San Juan, 27 January, 1887.)

The last and most explicit call for legislation appeared in the Silverton Standard of 7 April, 1906, after the most destructive storm in county records. Thirty-six people were caught, 18 killed and six injured, and 22 sites damaged by avalanches. The editorial asked for a state law whereby mining counties would appoint a commission to gather avalanche statistics so that an official record of avalanche location and frequency could be started. The commission would have additional powers as well:

"Were a commission given plenary powers in the location of (mining and milling) plants, both capital and lives would be guarded by the wisdom of experience. . . . Upon such a commission should the power be bestowed to decide whether sites for such buildings are safe or unsafe, and their licenses issued accordingly." (Silverton Standard, 7 April, 1906.)

Unfortunately, no legislation was enacted.

The written word was one response to the hazard; avalanche defense structures were another. Several aerial tramways were protected by wedges that were placed immediately upslope from the tram tower in order to divert the main force of the avalanche to either side of the structure. The wedges were most often constructed of log cribbings filled with stone, but one example found was built entirely of stone. The structure was constructed in 1938 under the supervision of a Tyrolean stone mason and the tower it protects still stands today.

### Ouray County

Southern Ouray County, where the majority of the principal mines were located, is similar in geographical features to San Juan County:

"With the exception of a small portion in the north end, the topography of the county is that of rugged mountains, a number of which reach an altitude of 13,000 to over 14,000 feet above sea level. The various streams head, generally, in large open basins, or glacial cirques, well up above timber line,

and near the top of the culminating ridges connecting the most prominent mountain peaks. Below the basins, these streams occupy eroded valleys or gulches, gradually deepening into somewhat narrow canons, and finally uniting with the Uncompahgre river, and making exit through the north county boundary line at an altitude of 6,500 feet. ..." (Ouray Herald, 20 March, 1903.)

The area north of the town of Ouray to the county line is predominately grazing land with little mining development and little avalanche hazard. The town of Ouray is the northern entrance into the San Juan Mountains. It sits in an amphitheatre at an elevation of 2530 m with surrounding mountains rising 1,140 m higher. The citizens of Ouray County had mixed feelings about winter precipitation. The agricultural portion of the county depended on a good winter snowpack for its summer water supply, while the mining interests needed only enough snow for good sleighing to transport supplies and ore:

"Hence, the farmer watches the winter's storm with joy, while the miner, fearing the snowslide and the precipice, dreads its approach." (Gibbons, 1972.)

Residents of Ouray can see avalanches on the steep slopes surrounding the town but no avalanche has been observed to come into the town. Thus, only people directly involved in mining experienced the hazard. To the rest of the population, the hazard was one they read about in the newspapers, heard stories about, but rarely experienced themselves.

To the workers and their families living and travelling in the mining districts, the hazard was real and obvious. Of a total of 62 deaths from 1877 to the present, 31 occurred when people were in fixed locations with the same number of people killed by avalanches when travelling (Table 1). Of the 192 people caught in avalanches and surviving, 69 were in fixed locations and 123 were travelling.

Although newspaper articles in San Juan County were concerned with the placement of buildings in locations safe from avalanches, no such specific mention was ever found in the Ouray County newspapers, perhaps because Ouray County had proportionately fewer incidents at fixed locations (33 fixed sites in Ouray County compared to 100 fixed sites in San Juan). On several occasions, when a building was damaged or destroyed in Ouray County, the newspaper editor reported the property owner's intention to rebuild immediately, and in the same location:

"A slide came down Friday at the Commodore Foote in the Horseshoe, destroying the ore house. It will be replaced at once by the lessees." (Ouray Herald, 18 February, 1897.)

The U.S. slide, in March 1906, released and destroyed the Camp Bird Mill and boarding house and a portion of the aerial tramway; ten men were caught, with one killed. Following this event, rather than relocate the mill, the mine management ordered the construction of a dirt mound above the mill (Trujillo, 1976). Continuous growth of coniferous trees followed the 1906 event and a mature forest stood, when, on January 9, 1974, the U.S. Slide released and tore out great quantities of trees. A number of mature trees contained in the moving avalanche were deposited on the upslope side of the mound, indicating some reduction in the amount of debris reaching the run-out zone. The mill was undamaged, although the debris stopped only three feet upslope from the buildings and damaged the flume (Trujillo, 1976).

Although Ouray County never published any statements proposing avalanche hazard zoning, several articles recognized the avalanche problem and proposed protection.

"It is during the latter part of February that the biggest avalanches usually run, carrying death and destruction to everything in their path. All should bear this in mind and not venture into hazardous portions of the mountains until the danger period has passed." (Ouray Herald, 30 January, 1972.)

The editor of the Ouray Herald was correct in the above statement. Figure 4 shows Ouray County avalanche deaths by month with February taking the highest toll. (For comparison, Fig. 5 shows the distribution of avalanche deaths by month for San Juan County, with the highest number in March.)

It appears from the newspapers that Ouray County's chief concern was with safe travel on the roads and trails. In November 1908, the Ouray Herald published an article endorsing the use of what is now known as an avalanche cord:

"'Snowslide ribbons' are long, narrow coloured ribbons used by the Alpine climbers whenever there is any danger of snowslides. Though the climber may be covered up by an avalanche of snow, part of the ribbons will show on the surface of the snow indicating where the victim may be dug for. It has been suggested that

miners of the San Juan might adopt this simple safeguard against the loss of life in travelling over the hills to and from the mines in winter." (Ouray Herald, 13 November, 1908.)

The following winter, the same newspaper reported that a Mr. Walker had introduced House Bill 500 to the State General Assembly. The bill was:

"...for the purpose of improving and protecting from snowslides a state wagon road, from a point above seven miles south of Ouray, near what is known as the Riverside, on the Uncompahgre River and running south from there along the river. The bill carries a \$10,000 appropriation clause." (Ouray Herald, 26 March, 1909.)

Unfortunately for travellers on U.S. Highway 550, and the four persons who have been killed underneath the Riverside Slide since 1909, this unspecified protection structure, most probably a tunnel, was never built.

In 1909, the Ouray Herald published a report entitled "Shooting of Snow Slides". The article described a plan to "... arrange a series of bombs connected with wires so that they might be set off after a heavy fall of snow and made to run when there was no danger to human life" (Ouray Herald, 26 February, 1909). Another avalanche control plan was suggested:

"... the shooting of shells from a canon into the combs which overhang the precipices at the top of the run where the slides come down. For instance, the U.S. slide near the Camp Bird is precipitated by the breaking of the heavy comb of snow formed at the top of the range. To shoot into this with an explosive shell from a cannon would break off this comb and start the slide, as it is the theory that the breaking of this comb is what starts it any way." (Ouray Herald, 26 February, 1909.)

#### Present Trends in San Juan and Ouray Counties

By the 1920's, both San Juan and Ouray Counties had suffered a demise in mining activity and population and concurrently a reduction in avalanche hazard. The hazard became concentrated along the main traffic routes and the few remaining active mines. In San Juan County, from 1939 to the present, only one avalanche death has been reported. During the New Year's storm in 1952, the watchman and sole

occupant at the Highland Mary Mill in Cunningham Gulch was killed when an avalanche totally buried the mill. During the same storm, another watchman at the Pride of the West Mine, also in Cunningham Gulch, was caught when his cabin was buried but he was rescued several hours later. During the Christmas 1971 storm, the Standard Metals Mine, located at the terminus of Colorado 110, evacuated one of its buildings located in the runout zone of a small avalanche path. The avalanche ran during the storm but, with the exception of the structure itself, no property was damaged. During the summer of 1975, an avalanche protection structure was constructed in this path which so far has proven effective. The Standard Metals Mill is adjacent to a large avalanche path which, during the same 1971 storm, released and tore out the flume which provided the mill with its water supply. This mill was forced to close until the flume could be repaired.

All other reported avalanche encounters have occurred on the roads, with predominately highway maintenance personnel being involved, up to the winter of 1975-76. During a February 9th storm, the bus from the Idarado Mine, located on the north side of Red Mountain Pass, was carrying the day shift home to Silverton; close by was the Continental-Trailways bus and six private cars, all travelling underneath the Brooklyns avalanche paths. When an avalanche ran in front of one of the buses, traffic stopped and, a few moments later, another avalanche released, pushing both buses and the vehicles off the highway (Fig. 6). Fortunately, no one was injured, although, if the avalanche had run a few moments earlier when many of the Idarado passengers were outside the bus, the consequences would certainly have been more severe. A total of 32 people were involved, with only one person injured.

The pattern is basically the same in Ouray County where only one incident has affected a fixed location since 1940. During a March 1944 storm, an avalanche at the Revenue Mine removed the new snowshed connecting the portal to the mill, followed soon by a second avalanche which swept away the old snowsheds. All other incidents reported from 1940 to the present in the county have occurred on the Camp Bird Mine road and U.S. Highway 550. Both these roads provide the access to the only working mines in the county, the Camp Bird and Revenue (sporadically until the 1950's), and the Idarado, respectively. Eight deaths have been recorded during this period, four on each road, and 11 additional people have been caught by avalanches and survived. All of the people caught were travelling on the two roads, either in cars or on foot. As a tragic example, on Valentine's Day, 1958, two Camp Bird employees, Harry Peck and Ted Mason, unable to drive their vehicle to the mine because of heavy snow, were walking to work. When they were under the West Waterhole Slide, it

released, killing Mason and partially burying Peck. Four rescuers en route to the site were caught and three were killed when the East Schoolhouse Slide released.

Thus, since about 1940, the avalanche hazard in both San Juan and Ouray Counties has appeared mainly on the highways and not at specific sites, with the exception of the town of Silverton and the Camp Bird and Standard Metals mines and mills. However, this situation is changing with the beginning of recreational and mineral development. A new interest in ski-touring and winter mountaineering is bringing more people into the mountains during the winter months. People are considering the San Juan Mountains as a site for their vacation homes. During the past few summers, considerable mineral exploration has been undertaken and the potential for increased mining activity continues to exist.

### History and the Future

San Juan and Ouray Counties, in authorizing these historical studies, began a data bank to use in future land-use planning. The studies have been expanded in conjunction with further University of Colorado Institute of Arctic and Alpine Research (INSTAAR) research, including the identification and mapping of avalanche and geologic hazards in the four adjoining counties in the San Juan Mountains: San Juan, Ouray, San Miguel and Hinsdale (Bovis, 1976a, 1976b, and 1976c).

The recommendation of those who lived in the San Juan Mountains at the turn of the century has been fulfilled:

"There are certain defined places where snow-slides run. Statistics, old and new, should be gathered in order that the danger points may be known and avoided as far as possible. It is said conditions change and that slides came down last month where never before. The more reason that an official record should be kept of them, for memory is treacherous."  
(Silverton Standard, 7 April, 1906.)

### ACKNOWLEDGEMENTS

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Newspapers: San Juan County: San Juan  
La Plata Miner  
Silverton Standard.

Ouray County: Solid Muldoon  
Ouray Herald.

Discussion

TESCHE: How would you characterize the attitude of the present residents of San Juan County toward avalanches?

ARMSTRONG: The old-timers are very interested. The new mountain settlers - mostly young people - are also very interested. However, there is a certain faction of miners that have been around the area for a few years who resent any form of law or ordinance including the Avalanche ordinance for San Juan County. So far, the Ordinance has not been tested.

GEISLER: Does the community of Silverton make any provision for educating the school children in avalanche lore and snow safety?

ARMSTRONG: Members of the San Juan Avalanche Project have visited the school, and made presentations to the students. We have also taken the students on field trips to our snow and avalanche study areas. It has been very rewarding to see their wholehearted participation in these programmes.

GALLAGHER: You mentioned that there were historical attempts to pass avalanche zoning laws - did any pass?

ARMSTRONG: No. After the major avalanche disasters at the turn of the century, mining started to fall off, and there was a loss of interest in passing zoning as population moved out of the area.

LACHAPELLE: What was the earliest skiing fatality in the area due to avalanches?

ARMSTRONG: The earliest fatality on skis was in 1905 when two miners skied across the starting zone of the "Irene Avalanche".

LACHAPELLE: In your historical studies, did you find any suggestion to control avalanches with explosives?

ARMSTRONG: Yes, the use of "dynamite" and "cannons" was suggested in a 1908 article in the Ouray newspaper. In

1879, during an avalanche rescue, "giant powder" was used to control an avalanche slope before the rescuers crossed.

MCMEEKIN: Apparently some of the early miners understood avalanche lore. What were their backgrounds? Did they come from the Alps?

ARMSTRONG: It was a mixed population. People from Great Britain, Cornishmen, people from the Southern Alps. The idea of using "snow ribbons", or, as we would say today, "avalanche cords", was mentioned in an early newspaper article, and could have been an outgrowth of experience from the Alps. Another article quoted an avalanche forecast based on the fact that the snowpack was weak and granular.

BECK: Are you planning to expand your study to include mapping of hazards?

ARMSTRONG: We have completed an Avalanche Atlas for San Juan County, and we are working on an Avalanche Atlas for Ouray County. In cooperation with other groups at INSTAAR, we are working on mapping avalanches and other geophysical hazards in adjacent counties.

LANG: I would like to comment that, in our studies of runout distances of avalanches, we found the historical records collected by Betsy Armstrong to be very useful.

TABLE 1

Circumstances of Avalanche Encounters Ouray and San Juan Counties, Colorado

County	Fixed Location		Travelling		Category Totals		Total Encounters By County
	Deaths	Survivors	Deaths	Survivors	Deaths	Survivors	
Ouray							
1877-1940	31	69	23	111	54	180	234
1941-1976	0	0	8	12	8	12	20
TOTAL	<u>31</u>	<u>69</u>	<u>31</u>	<u>123</u>	<u>62</u>	<u>192</u>	<u>254</u>
San Juan							
1875-1938	67	72	30	37	97	109	206
1939-1976	1	1	0	49	1	50	51
TOTAL	<u>68</u>	<u>73</u>	<u>30</u>	<u>86</u>	<u>98</u>	<u>159</u>	<u>257</u>

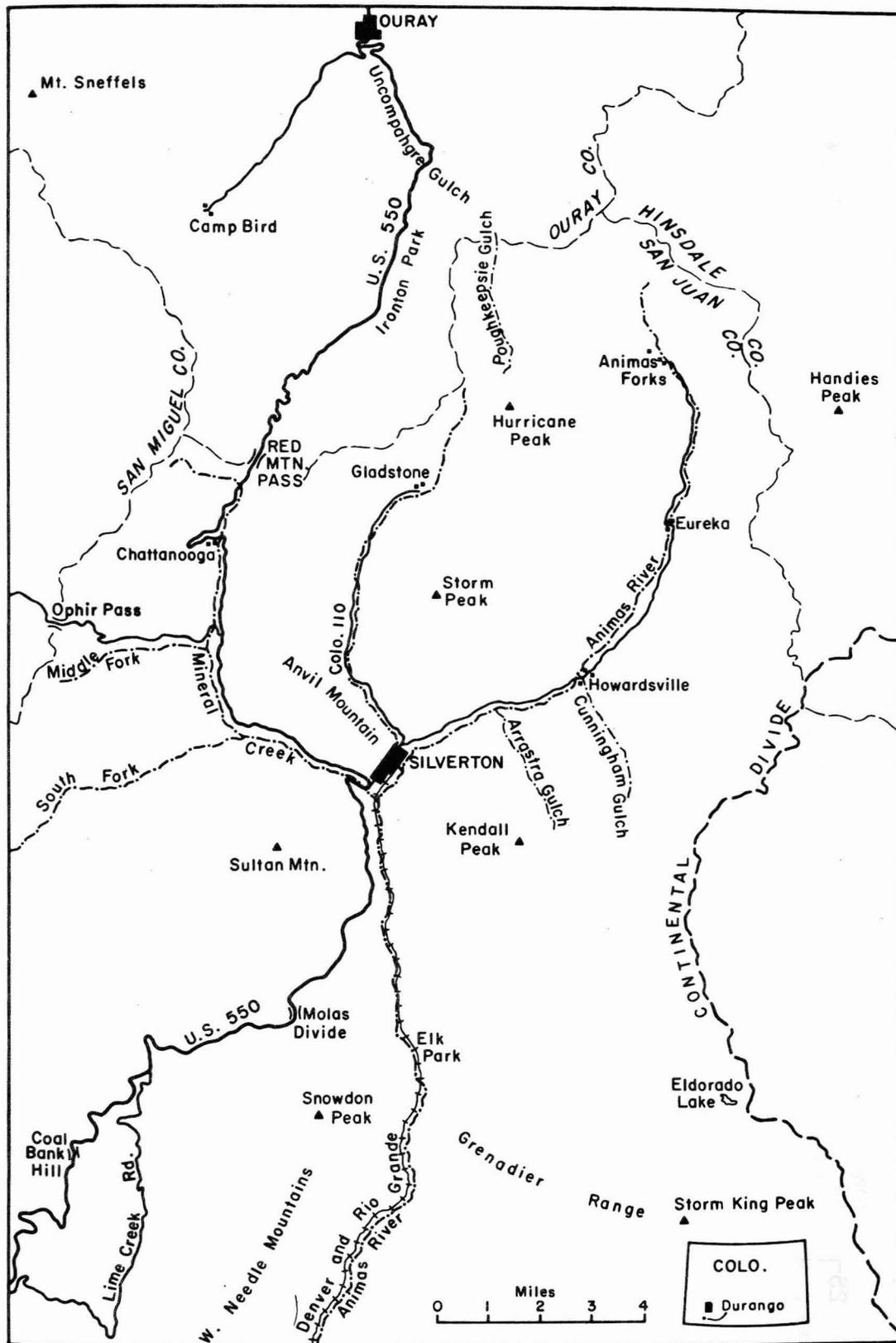


FIGURE 1 SAN JUAN AND OURAY COUNTIES, COLORADO

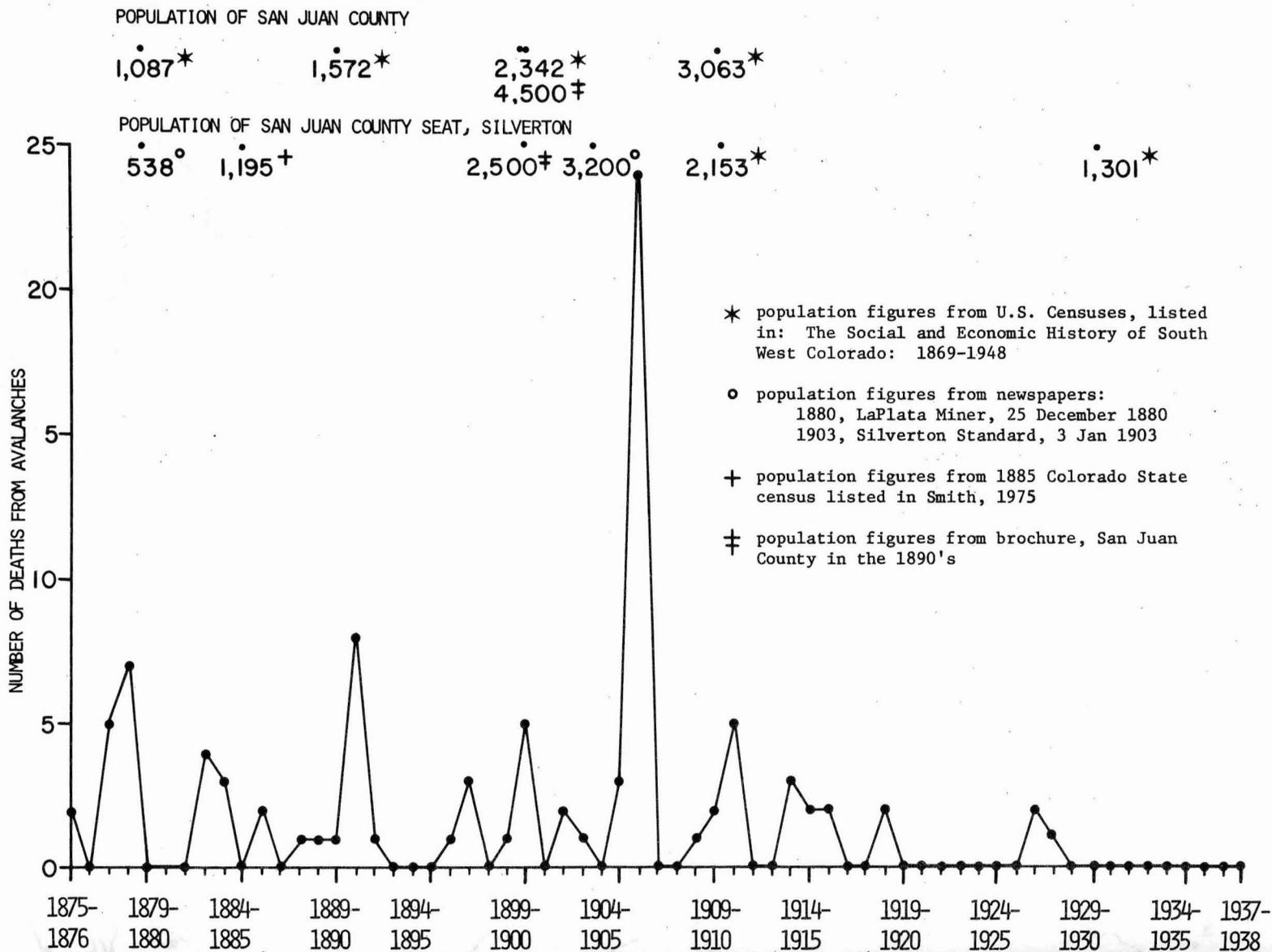


FIGURE 2 NUMBER OF AVALANCHE DEATHS BY YEAR, 1875-1938, OURAY COUNTY, COLORADO, AND COUNTY AND COUNTY SEAT POPULATION FIGURES. SINCE 1938, ONLY ONE AVALANCHE DEATH HAS BEEN RECORDED, JANUARY 1951, IN THE COUNTY

# POPULATION OF OURAY COUNTY

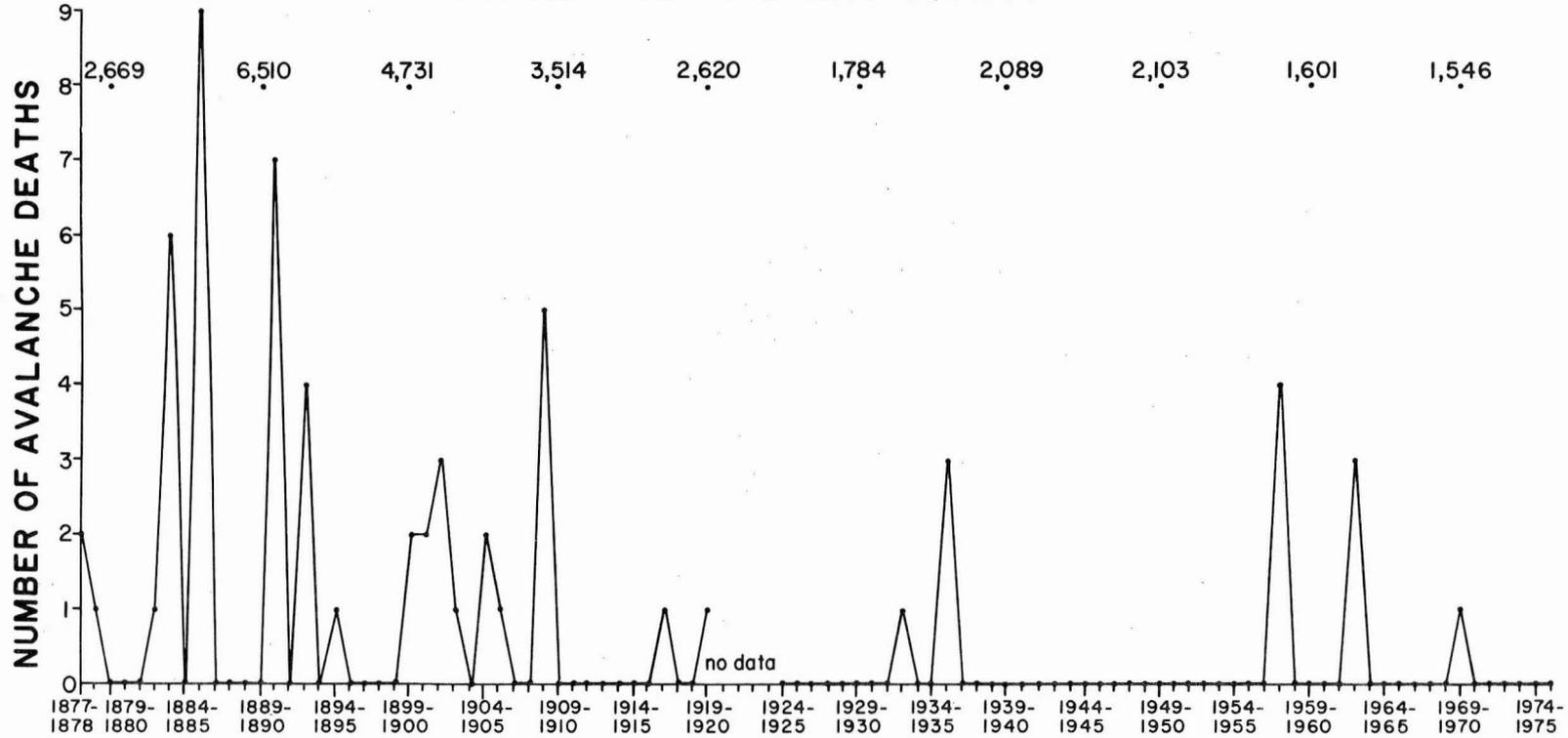


FIGURE 3 NUMBER OF AVALANCHE DEATHS PER YEAR, 1877-1976, OURAY COUNTY, COLORADO, AND 10 YEAR COUNTY POPULATION FIGURES (CUMMINS, 1951)

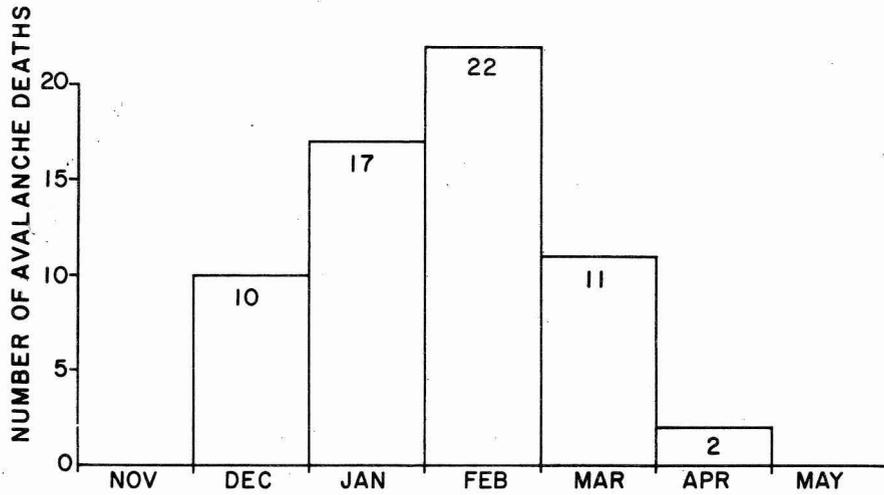


FIGURE 4 AVALANCHE DEATHS BY MONTH,  
1877-1976, OURAY COUNTY,  
COLORADO

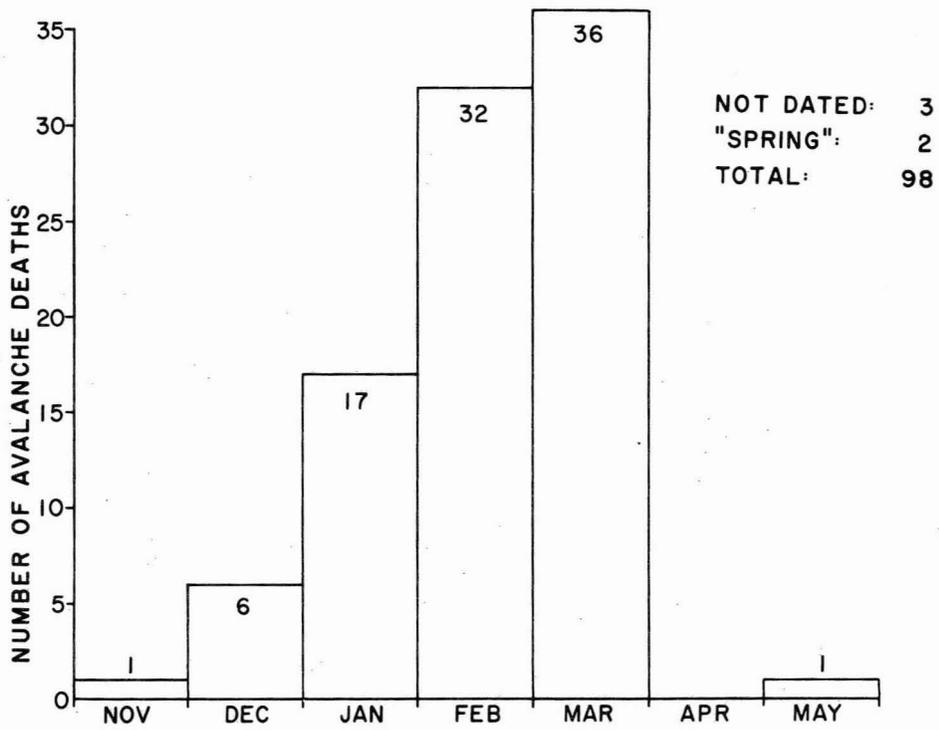


FIGURE 5 AVALANCHE DEATHS BY MONTH,  
1875-1976, SAN JUAN COUNTY,  
COLORADO



FIGURE 6 THE BUS FROM THE IDARADO MINE, RED MOUNTAIN PASS, AFTER ONE OF THE BROOKLYNS AVALANCHE PATHS RELEASED, PUSHING THE BUS AND ITS OCCUPANTS OFF U.S. HIGHWAY 550, FEBRUARY 9, 1976. (INSTAAR PHOTO)