In 1996 and 1997, Freda Carley Peterson published the two volume set, The Story of Hillside Cemetery, documenting, with mini-biographies, the lives of over 3300 individuals interred at the small cemetery in Silverton, Colorado. In 2003, Peterson published a selection from her original work that highlighted those killed in snowslides, a common occurrence for the miners working in the high mountains surrounding this isolated southwest Colorado mining town.

The book is a fascinating read. "The two exhausted, nearly frozen men and their animals stopped at the Highland Mary Mine that evening and waited for Joe Sellers, the mail carrier whose route was from Silverton to Brewster's, a way station on the Stony Pass route. They knew Sellers was familiar with the trail and could safely guide them over perilous Stony Pass." For someone not familiar with the Silverton area, though, these descriptions do not paint the kind of picture that they do for someone familiar with the area. The book needed an accompanying set of maps.

used ArcGIS and a combination of Peterson's documentation, published mining histories of the area, historic photos, historic and contemporary maps, and GPS data of mine locations in the Silverton Caldera complex to produce detailed 3D maps showing the possible routes traveled, snowslide locations and rescue/recovery attempts of some of the 108 documented fatal events associated with snowslides between 1875 and 1952 in the Silverton, Colorado area. I also digitized maps from Miller and Armstrong's 1976 Avalanche Atlas, and these overlays clearly show the relationship between some historic events and recurring avalanche activity in the area.

# Silverton & Avalanch



Silverton and the surrounding San Juan Mountains have a long history of grappling with snow and its mysteries. • Mineral extraction drove the first significant wave of settlement in the late 19th century. Challenges of the "now-world-famous" San Juan snowpack became apparent. Living and travelling in the mountains taxed the ingenuity and endurance of those settlers.



Avalanches killed them, while working in the mines, in their housing and travelling the trails and routes to the mines and town. http://www.snowstudies.org/history1.htm

<u>Introduction</u>



The mineralized high mountains surrounding Silverton, a high mountain town at 9,318 feet, drew the first permanent white settlers to the area in the early 1870's. As more people "struck it rich" more people came, including many Europeans. Men from Austria, Denmark, England, France, Germany, Ireland, Italy, Norway, Russia, Scotland, Sweden and Yugoslavia came to work the mines. (Peterson 1996)

Mining is dangerous work and many were killed in mining related accidents as related in Peterson's voluminous work *The Story of Hillside Cemetery*. As with all natural hazards, avalanches are not a hazard when people are not around. The only routes into and out of Silverton, covered long distances, crossed difficult terrain and high mountain passes. With the increased population traveling these routes throughout the year, avalanche deaths rapidly increased. Peterson's Death in the Snow, documents over 100 avalanche deaths between 1875 and 1952 with information gleaned from newspapers published in San Juan County, Colorado. Silverton was difficult to access from the outside. The first auto into Silverton arrived in 1910 traveling over a wagon road and assisted by a horse team to crest Stony Pass. (Wyman 1

Avalanches continue to be a hazard in the Silverton area. The only year-round road into and out of Silverton is occasionally closed for multiple days due to avalanche activity. Both southbound to Durango and northbound to Ouray the road crosses numerous active avalanche paths. The Durango & Silverton Narrow Gauge tourist steam train does not operate during the winter season due to the number of avalanche paths that cross the route through the Animas Canyon.

One of the countries premier avalanche schools is based in Silverton. They have trained over 4,000 students to recognize avalanche hazards, determine snow stability and handle avalanche emergencies. (http://avyschool.com/) Additionally, the Silverton based, Center for Snow and Avalanche Studies is building on snow and avalanche research begun in the early 1970's, with a goal to investigate snow system's behavior and it's impact on humans and the environment. (www.snowstudies.org)



# The Account That Got This All Started

Fred Gardiner and Hiram Morrison left Silverton on horseback on January 29th 1879 planning to head east to spend time with relatives. The weather was cold and snow was deep. "The two exhausted, nearly frozen men and their animals stopped at the Highland Mary Mine that evening and waited for Joe Sellers, the mail carrier whose route was from Silverton to Brewster's, a way station on the Stony Pass route. They knew Sellers was familiar with the trail and could safely guide them over perilous Stony Pass."

Being familiar with the area this text confused me and this project grew from work to resolve my confusion.

A traveller would not travel all the way to the Highland Mary Mine at the head of Cunningham Gulch to then go over Stony Pass, the trail for which leaves much closer to the mouth of Cunningham Gulch. Petersen's compelling mini-biography derived from historical sources had me hooked however, and with additional sources I was able to resolve the Stony Pass issue as well as illustrate the location of the events unfolding and, with historic photographs, get a sense of conditions in 1879.



Joe Sellers, the mail carrier between Silverton and Brewster's Park, a postal station on the east side of the Continental Divide, arrived with horse and mule at the Highland Mary Mine on Thursday after having been caught in an avalanche while traveling up Cunningham Gulch towards the mine. At 1 PM on Thursday, January 30th the three men and animals headed up the trail from the Highland Mary Mine towards the pass at the top of Cunningham Gulch (Cunningham Pass) which, at the time, was grouped with Stony Pass by the locals (Kindquist 1987).

Four days later on February 3rd, another traveller, Tom Higgins, came into Silverton with word that the mail carrier, Joe Sellers, had been found under avalanche debris along Deep Creek on Sunday February 2nd. Sellers had been expected at the Grassy Hill Postal Station and when he did not arrive by Saturday William Watson, who ran the station, and others went searching for him. After crossing avalanche debris they found a lone mule with no pack standing in the trail and intuition told them Joe Sellers was probably buried in the slide. On Sunday, Watson along with others who had been called up from Brewster's Park Postal Station, using shovel handles as avalanche probes, located the body of Joe Sellers under four feet of snow. Neither a horse or mail sacks were found. As Sellers usually traveled the route alone, no additional searching was done once his body was located.

In Silverton, alerted by the news from Tom Higgins, it was realized that two of it's citizens were probably also lost in the avalanche and a search party was formed. On Tuesday February 4th in a raging snowstorm 14 men headed out of Silverton to head to the avalanche site on Deep Creek close to 12 miles from town. Three more men joined the group en route and one dropped out at Howardsville. Arriving at the Highland Mary Mine they had a substantial meal provided by the mining crew, two additional men dropped out, and at two in the afternoon the party headed up the trail towards Cunningham Pass. As the party crossed the Divide the fierce storm hit them with it's full force. Remarkably, without losing a single man, the entire party made it to the Grassy Hill Postal Station in the dark.

The following morning, Wednesday February 5th, the searchers retraced their path back towards the Divide and probing the avalanche debris along Deep Creek found the bodies of Gardner and Morrison under six feet of snow. Two of the bodies, Morrison and Sellers, were dragged back to Silverton on a sled by Ben Harwood. 12 days earlier, Harwood had used his sled to drag the body of Sam Greene, who had frozen to death attempting to cross the Divide, back to Silverton for internment at Hillside Cemetery.



The "White House" at the Highland Mary was commissioned as a post office in March 1878. It was a popular stop with mail carriers and travelers on the Cunningham Pass route, which can be seen directly below the white latticework. (Nossaman 1993)



Thomas Hine's June 1873 photo on the west side of Cunningham Pass. Spencer Basin (left) and Royal Tiger Basin (right) lie on the west side of Cunningham Gulch hidden behind the foreground ridge. (Nossaman 1993)



Allen Nossaman's photo of remnants of Grassy Hill Postal Station. View is looking southeast with the Rio Grande headwaters in the valley on the right side of the photo. (Nossaman 1993)



William Henry Jackson's 1874 photograph of the Rio Grande near Los Trail Creek flowing through Brewster's Park. View is looking west southwest. Grassy Hill, Deep Creek, Cunningham and Stony Passes are up the valley that curves out of the scene to the right in the background. (USGS Photographic Library Image file: /htmllib/btch110/btch110j/btch110z/jwh00398.jpg)







# Avalanches Are Not Random Events

- They frequently occur in defined areas or paths
- Research has identified snowpack conditions that enhance the likelihood of avalanches
- Slope angles and aspects most susceptible to avalanche have been recognized
- Warning signs and triggers of snow/slope instability have been recognized



On December 5th 1913 Harry Castle and George Legg left the Buffalo Boy Mine headed for Silverton. The first heavy snowfall of the season had occured earlier and Harry was traveling on "Norwegian (long) skis". About 3/4 of a mile from the Buffalo Boy Mine a "heavy snowslide came crashing down the mountain, passing Lugg, about thirty feet behind Castel, but engulfing Harry. He was swept to his death in the bottom of the gulch". George headed to the Gary Owen Mine where the night shift was sleeping. They responded and spent all afternoon searching for George. The night shift was relieved by the day shift, who, after working all day in the mine, worked all night searching for Harry. The night shift relieved them the next morning and around noon found the body of Harry Castle "near the bottom of the gulch". Three quarters of a mile from the Buffalo Boy Mine is the junction of Rein Gulch and Rocky Gulch. About two years after Harry Castle's death, Dollie and Harvey Bennett were killed in a slide running in the same path.

Dollie and Harvey Bennett, along with two other men, were returning to their workings near the head of Rein Gulch. It had been snowing heavily in Silve ton for a number of days and they waited in town to allow plenty of time for slides to run. On Wednesday January 5th 1916 they headed from Silverton to the Gary Owen boarding house through deep snow (assumption is made that the boarding house is near the mine). Following dinner at the boarding house they continued their journey towards head of Rein Gulch. Near where Rein Gulch joins Rocky Gulch, Patterson reports " they all crossed the path of the big slide safely, with the exception of Dollie" clearly indicating that slide paths were recognized (oval on map). "..the slide broke with a mighty roar and the great mass of snow came tearing down the mountain toward Dollie. Her terrified husband dashed back into the path of the slide in a frantic effort to save her, but was too late, and in another second, both were swept 1500 feet down the mountainside to the bottom of the gulch". The two survivors moved down the slide debris to search for the victims. Harvey Bennett's leg was seen protruding from the snow. No trace of Dollie was found. Due to "a mountain of snow still hanging above the path", the search was abandoned. Harvey's body was extricated the next day(?), but search for Dollie's body was discontinued due to another severe snow storm that hit the area. Days later 15-25 men worked with 15 foot poles for several days in an attempt to find Dollie. The slide debris was so deep that the 15 foot poles did not reach the full depth of the slide. Dollie's muff and the kitten she had been carrying were found, but not Dollie. She was eventually located on July 26th, almost 7 months after the slide, following extensive digging and blasting in slide debris that was still over 30 feet

Clearly avalanche paths were recognized. What is unclear is exactly what "the bottom of the gulch" refers to. The distance in the Bennett description of 1500 feet is a puzzle. 1500 linear feet from the starting point is near where the topography flattens above where the road to the Gary Owen Mine crosses the drainage from Rocky Gulch. 1500 vertical feet is almost to the floor of Cunningham Gulch. The other possibility is the junction of Rocky and Sterling Gulches, but this is over 2600 linear feet from the starting zone.

> cultural features from Silverton USGS 7.5 minute DRG Slide path outline digitized from Miller et al, 1976

On February 11th, 1905 the first fatal slide in two years was recorded. Three Austrian miners living in a cabin near the Irene Mine had built skis from long boards and were trying them out when the slide released. Pete Casagranda and Ridolfo Sarchleti were swept up by the slide. Dan Casagranda, standing near the cabin was also caught and the cabin was destroyed. When the slide stopped, Dan Casagranda was buried up to his shoulders in tightly packed snow, "as if in a vise". With time he was able to extricate himself from the snow. When news of the slide reached Silverton a force of men responded but all that was found was one man's coat "under tons of snow, timber, rocks and ice". The search was abandoned with plans to wait for spring to melt the snow. One searcher, John Dalla, refused to give up and with a second search party discovered the bodies of the two men on the third day of searching. They were found about 30 feet from where they were struck under "twenty-five feet of snow".

Miller et al's 1976 Avalanche Atlas lists these avalanche deaths as the first documented ski fatalities by an avalanche in San Juan County. The Atlas, a significant work documenting avalanche paths that impact Colorado Highway 550 which connects Silverton to Durango and Ouray and those paths that impact the Cement Creek drainage. No longer in print it is available as a PDF. Digitizing the 1970's Irene path, shows the Irene mine centrally located in the large basin that heads part of this complex path.



shows the Irene slide running the full length of it's path. The Irene mine is located in the high basin near the skyline in the upper the photograph.

Preacher George Darley and James Herring (right) "snowshoeing" on Norwegian snowshoes (skis) on the route between Silverton and Ouray. View is looking north from near Red Mountain towards Mt. Abrams. Skis were 4 inches wide and 10 feet long. A ngle long sturdy pole was used for balance, braking or pushing while going up a grade. "Young men thought nothing of traveling long distances through rugged terrain on their snowshoes". (Nossaman 1998)



(Nossaman 1993)

Ishade derived from NED 1/3 arc second DEM

# <u>Could information from some of Peterson's narratives be correlated with today's understanding of avalanche dynamics?</u>



Carl Brunn died January 2nd 1910 when his cabin was destroyed by an avalanche. Carl had just gone off shift at the lowa Mill and was in his cabin when the slide struck. Carl's body was recovered within the debris of his cabin under eight feet of snow. In the report is the following description c the storm that preceded this incident. "A severe storm had been raging two days, with a heavy fall of very wet snow. The next day it grew colder with high winds and soon developed into a howling blizzard which lasted another four days as the temperature fell to 34 degrees below zero. The peculiar conditions soon convinced those familiar with the area that it not only meant a serious blockade, but also the running of snow slides". Locals recognized the dangers associated with this storm, probably based more on the amount of snow than the weaknesses that were developing within the snowpack itself.

A warm, wet, dense snow, overlain by dry cold snow compressed and compacted by strong winds and extremely cold air temperatures makes a sno pack that is highly susceptible to avalanche.

• Temperature difference between the warm, wet snow and the -34 degree air makes a strong temperature gradient in the snowpack. Temperature gradient is how much the temperature changes over a certain distance within the snowpack. • A strong temperature gradient in the snowpack allows water vapor to diffuse from high concentration areas (warm) to low concentration areas (cold). • Water vapor diffusion changes rounded snow crystals into faceted ones, changing strong snow bonds to weak snow bonds. This lower snow layer may have also developed an ice crust as the relatively warm, wet snow was exposed to the rapidly cooling air mass. The four day blizzard accompanied by "howling" winds would have developed a dense compacted slab layer overlying the possible ice crust and developing weak snow layer(s) within the underlying unit.





Saint Patrick's Day 1906 was one of the deadliest days in the San Juans. A week of unbroken storms preceded clearing on Monday March 19th. With the clearing weather reports started flowing into Silverton of numerous avalanches and deaths. Cunningham Gulch was reported to have "four miles of unbroken slide debris with snow, in places, up to 150 feet deep". Slides were reported on Green Mountain, the Shenandoa Mine, Highland Mary, Unity Tunnel, the Last Chance, Bonner, Silver Wing and Sunlight mines.

The Shenandoa Boarding House was perched on the hillslope next to the mine itself, 200 feet below the crest of the ridge. It is reported that "snow hung heavy above the mine...with overhanging drifts". Twenty one men were finishing supper in the boarding house when the slide occurred, breaking loose at the ridgecrest, possibly due to a cornice collapse. Survivor S.F. Nelson describes the slide "the slide struck at 6:30 pm, flipping Nelson. It then lifted the bunkhouse, smashed it to kindling and everyone was thrown out into the slide. The slide had a kind of rolling motion, all were swept along, first on top, then underneath." When the slide stopped Nelson was on top with his head and arms free of the cement like snow. Once he had dug himself out he found a hand sticking out of the snow and dug out a second survivor. Directly below this person was a third man who was also dug out alive. One of the survivors of this slide was Harvey Bennett who would die in an avalanche with his wife ten years later near the Gary Owen Mine (see column 2 Nelson and four others brought the news of the slide to Silverton on Monday March 19th and led the rescue crews back up to the site. Dominic Ferra glio was the last victim found. He was dug out from under nine feet of snow on May 10th almost 2 months after the slide.

Right, upper and lower photographs, show the Old Hundred Number 2 mine and boarding House. These structures sit on the southwest face of Galena Mountain 650 vertical feet above the valley floor and provide a good example of the setting of some boarding houses associated with these mines. This structure still stands today although it has been damaged by avalanches and weather. These structures are probably much larger than the structures at the Shenandoa mine, but in a similar setting. Note the 38 degree reference line in the lower photo.

# MAPPING HISTORY: MAPS AND GIS ANALYSIS OF EVENTS RELATED TO AVALANCHE VICTIMS INTERRED AT HILLSIDE CEMETERY, SILVERTON, COLORADO

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# Avalanche Triggers

Snow on a slope is stable as long as the strength of the snow, either bonds within the snowpack itself, or bonds with the underlying ground surface and surrounding snow are greater than the stress on the snowpack. Increase the stress or weaken the bonds within the snowpack and the snow will slide. Neither the stress nor the strength are uniformly distributed across a snowy slope or vertically within the snowpack itself. Layers of snow with different characteristics can either strongly support overlying snow, or be a hidden weakness that simply needs an increase in stress acting on the layer to fail completely. With avalanche fatalities, these stress increases frequently occur in the form of a human trigger.

# Avalanche Warning Signs

- A typical slab avalanche in the United States i
- 60 centimeters deep
- 60 meters wide
- 2 feet deep and two-thirds the size of a football field reaches speeds of 20 mph in the first 3 seconds
- accelerates to 80 mph after the first 6 seconds bonds holding the slab together fracture at 220 mph
- slab appears to shatter like glass







prone setting.

"Men were scattered all over the mountains during the 1875-76 winter to a greater degree than any previous winter, and it was only a matter of time before the undeniable odds would place an unfortunate human bein in the path of one of the hundreds of avalanches that thundered down from countless summits of the San Juan Mountains for centuries". (Nossaman 1989)

D.B Carson and John Paxton were killed in an avalanche they triggered while chasing a porcupine through snow in the woods near their cabin. These were the first recorded avalanche deaths in what was to become San Juan County. They occurred on Wood Mountain northeast of Animas Forks on December 9th 1875.



It had been snowing heavily in Silverton and the surrounding mountains. In fourty-eight hours it measured five feet. "Old timers could not remember so much snow in such a short period of time." In order to keep the trail to Red Mountain open five men, some on horseback, and eighteen mules left Silverton headed for Red Mountain. Near the Gold Bug Cabin about a guarter mile past Burro Bridge, just as the lead men passed out of the woods and onto an old slide track (oval), they heard the avalanche breaking loose. Instead of running in the old path, "the entire side of the mountain was sliding down through the timber". Those in the lead were out of the slide, but Robert Roberts, the mail carrier, and eighteen mules were swept down towards the valley floor. Men at the Gold Bug cabin heard the survivors calls for help and responded with shovels. The slide occurred at 10:30 am and Roberts was located under three feet of snow at three in the afternoon. Six of the eighteen mules were dug out alive. Robert McNicholas, one of the survivors thought the slide was triggered by snow falling from trees. Trees and branches up to 12 inches in diameter were being snapped by the heavy snow and "at the time of the avalanche trees had been cracking and breaking all over the mountain". Rapid accumulation of large amounts of snow creates internal stresses within the snowpack which is unable to adjust to the rapidly increasing weight of the accumulating snow.

At the Little Charlie Mine near Burro Bridge, Martin Hubner was killed while working outside the mine. Blasting within the tunnel triggered an avalanche that swept him into the stream valley. Gullies are considered terrain traps that result in deep snow accumulations even with a small slide. The slide occurred on February 2nd. His body was not recovered until May. Deep burials have almost no chance of survival.(Tremper 2008)

William Wilson and Jim Burnett with eight mules were hired to haul ore from the North Star Mine on King Solomon Mountain. The snow was deep on the trail with about six inches of new snow over older snow. They hauled ore from the mine to the junction with the pack trail coming from Silver Lake, returning to the mine for additional loads. Once all the ore was at the junction they loaded the mules for the first of a number of trips down Arrastra Gulch to Silverton. They headed down the pack trail late in the afternoon with Burnett leading with two mules and Willson following with eight. One of Wilson's mules slipped from the trail as did one of Burnett's. Burnett's mule struggled to extricate itself from the snow, "giving three or four mighty plunges". Wilson heard the snow collapse and jumped to a nearby rock outcrop. The snow covered hillside began to slide, eventually forming a slide a quarter of a mile long, fifty to a hundred feet wide with debris twenty to fifty feet deep at the toe. Ten men from Silverton probed the slide for Wilson's body and one missing mule with no success. Wilson's body was recovered four months later when Rev. Father Pickl, returning to Silverton from the North Star Mine saw Wilson's head sticking out of the melting snow mass. Six men from Silverton dug the body out the next day.

Two things are significant in this account. The collapsing snow, described in numerous avalanche text books as having a WHOOMPH sound. In fact whoomph has been accepted as a technical term to describe collapsing snow. (Tremper 2008) Jill Fredston, Alaska avalanche expert, says whoomphing is the sound of Mother Nature screaming in your ear that if a slope is steep enough to slide it wouldn't hesitate to do so. (Tremper 2008) The sound is generated by the collapsing of an internal weak layer within the snowpack in response to added stress.

Secondly, the significant depth of avalanche debris at the toe can make locating and recovering an avalanche victim almost impossible. This is particularly true with terrain traps or where the slide ends on a flat or gently sloping surface.

William Henry Jackson photograph of the trail to the North Star Mine shows the upper section of the trail in the switchback section (left). Right photograph from the San Juan Historical Society shows the wagon trail, (now Highway 550), crossing the East Riverside slide path via a tunnel dug through the snow of the avalanche fan.



![](_page_0_Picture_104.jpeg)

# features from Howardsville USGS 7.5 minute DRG Mine tra

The HIghland Mary Mine number 4 level cabin was located directly over the mine tunnel at 11,480 feet, over 1000 feet above the valley floor. A shelf had been blasted on the side of the mountain to build the cabin, and a trap door in the floor opened into a shaft leading to the tunnel. Access to the cabin was either by trail crossing Royal Tiger Gulch or via the numerous tunnels of the Highland Mary Mine complex. On February 12th 1879, nine men were in the cabin when they heard the cabin being cracked and crushed by the avalanche. "Legendary Big Dave Olsen" kicked open the trap door and jumped into the shaft, followed by seven other men. Anselmo Giovanni and Stephen Toy were caught in the collapsing building and carried to the valley floor below. Olsen and another miner named MItchell dug the snow out of the shaft and on reaching the su face called for help to men at the bottom of the mountain. The normal trail was impassible because of the slide so nine rescuers responded by climbing the steep mountainside. The party was able to reach a point about 500 feet above and 1000 feet to the side of the number 4 mine. To reach the mine the men would have to cross 1000 feet of steep, deep snow that was cracked by the initial slide. Phillip Uhl followed by John Klusman and G.T. Beall headed across this dangerous slope, "having gone only a short distance when it happened". The slope failed carrying two of the men, Uhl and Klusman, 1500 vertical feet to the valley below. Beall was able to grab some bushes and saved himself. Once the slide had run, Beall crossed the slope to help Olsen and Mitchell dig out the remaining survivors of the initial slide from the tunnel. The bodies of Phillip Uhl and John Klusman were recovered and taken to Silverton for internment at Hillside Cemetery. Stephen Toy's body was not found until April when it was revealed by the melting snow. There is no mention of when Anselmo Giovanni's body was found.

and Mary Number 4 was in a hazardous position and only quick thinking by "Legendary Big Dave Olsen", (who w legendary because he had survived two blasting accidents, falling 30 feet down a mine shaft and landing on a drilling machine, exposure in blizzard and sub-zero temperatures, being kicked by mules and numerous "minor" accidents), prevented the deaths of all the miners in

The fact that an avalanche and just run and the steep snow slope that Uhl, Klusman and Beall headed across also had cracks from the initial avalanche, is a clear warning that the slope(s) were not stable. Secondly, slopes that end in cliffs or trees, lower the chances of survival Finally, according to Bruce Tremper's third rule for staying alive in avalanche terrain, Never Go First. In the current setting this refers to skiers, snowboarders and snowmobilers but holds true for everyone. According to Swiss statistics, 90 percent of avalanche accidents are gaered by the first person on a slope.

William Henry Jackson's photograph taken from what is known as the Highland Mary Number 7 level looking northwest towards where Highland Mary Number 4 level would be established on the cliffs above the talus, possibly on the cliffy ridge with sparse trees in the middle distance. The light ridge behind it is the north side of Royal Tiger Basin.

This project grew out of an attempt to resolve a geographical question arising from a single sentence in Freda Peterson's Death in the Snow and grew to a significant project combining history, geomorphology, and snow dynamics.

During the late 1800's into the early 1900's avalanche victims were mainly miners and mail carriers working on, in, and crossing the San Juan mountains that surround Silverton. Mineralization of the mountains attracted the original settlers to the area. Rapid development of mines and mining claims throughout the avalanche prone terrain is evident when Whitman Cross's 1900 Economic Geology map of the Silverton Quad is hillshaded and overlain with a shapefile from a recent USGS paper showing all mines and prospects in the area (near right).

Peterson's remarkable efforts have given faces and names to many of the settlers who would otherwise have been forgotten. Combining 3D views of the landscape, maps and historic photos with her documentation creates a whole picture of these narratives. Almost as a bonus, some of the events she docu ments contain details that allows the event to be put into context using current understanding of snowpack structure, weather patterns, terrain influences and the influence of people on this dynamic system.

Today's avalanche victims tend to be backcountry skiers, boarders or snowmobilers. Modern avalanche forecasting, control (far right), training and safety equipment has improved the odds for those traveling and recreating in avalanche terrain but, just as in the past, an avalanche victim is completely dependent on others in their group for rescue if there is to be a positive outcome.

![](_page_0_Picture_117.jpeg)

![](_page_0_Picture_118.jpeg)

Riley Boy slide crosses Highway 550 north of Silverton, following control work

Juan County: University of Colorado, Institute of Arctic and Alpine Research, Occasional Paper 17, 235 p.

n avalanche terrain, 2nd edition: The Mountaineers Books, 318 p. Library, Jackson, W.H. 1875: http://libraryphoto.cr.usgs.gov/cgi-bin/search.cgi?search\_mode=noPunct;selection=Jackson%2C%20W.H.%201875\Jackson%2C%20W.H.%201875;start=0