

Chad Hahn: Chad Hahn. C-H-A-D H-A-H-N.

Tom Manning: Sure. Weather forecasting has changed a lot in the ensuing years and just talk about the state of weather forecasting back at '49 and just a brief synopsis on how it's changed.

Chad Hahn: How's it evolved. Yeah, 1949 weather forecasting was very simple in comparison to what we do today. They would likely have a staff of about four to six people that were taking observations, weather observations at specific sites across the country and they were using those observations to get some sort of an idea of what the prediction and what the weather would be going forward. The simple ways of doing that is a persistence forecast which is essentially what's happening now will continue to happen. That's good for the next few hours but it's really poor when you go out too far in time. The other method of forecasting back then was likely the steady state forecasting which is basically what's happening upstream at observations, say at Cody or Sheridan or Casper, would move at the same rate of speed through and effect the eastern, southern part of the state. They didn't have the luxury of things like satellite and radar that we have today and that certainly inhibits the way that they would be able to make those forecasts.

Tom Manning: You were talking earlier about whether the forecast came through here in Cheyenne that you didn't have fax and they probably did not receive a weather map.

Chad Hahn: Yeah, that's right. Yeah, they were probably just getting observations, teletype to the central office which is the Weather Bureau Airport Service office here in Cheyenne and so they would have no use of facsimile. That was probably installed in Cheyenne here in like 1953 and so they weren't looking at the weather maps, they were probably just reliant on what they were looking out the window or reports that they were getting upstream and they were trying to make a determination of what was going to happen in the coming days from now.

Chad Hahn: Basically, we're starting here on the night of the 1st which would be Saturday evening of the event of 1949 and you can see at this point, broad weather map gives you an idea of where the low pressures and high pressures are. Any sort of trough is indicating a low pressure, any sort of mountain or hump or ridge would indicate high pressure, low pressure is associated with poor weather or precipitation, high pressures are typically with quiet weather and warm weather. You can see here on the 1st, you start to see this deep trough of low pressure developing across the northern rocky mountain states. We weren't seeing snow, at least here locally in Cheyenne at this point but when you go forward in time into Sunday morning at about 5:00 in the morning, you could see this area of low

pressure has deepened across the Intermountain West and it was about at this point, about midday on Sunday that Cheyenne began to see some snow and you could see at this point, you got this really big area of low pressure developing across the western US.

We'll go forward in time and you'll see this area of low pressure start to form across the four corners and this would be Sunday night on the 3rd. We'll continue forward in time and you can see it really take shape and deepens across the four corners into the day on Monday and this would be about when the conditions were the worst. The one thing of note as we go through this is just how long this storm system remained across the area. Here we go into Monday afternoon and evening, low pressure is still to our south so we're still seeing the influence of the strong winds and the snowfall across much of southeast Wyoming and the whole eastern part of Wyoming through this time.

Move forward into Tuesday, you see this big low pressure still really close to the area even 48 and 60 hours later into the day on Tuesday, January 4th. It moves up into the central plains by late on the 4th and that's when we start to see conditions improve in eastern and southeast Wyoming at that time. By this point on the 5th, in the morning of January 5th, the low pressure has moved out of the area.

Tom Manning: Okay, now explain that this next map that you just pulled up is the official weather service map from 1949. I want you to talk about that.

Chad Hahn: This is the official weather map from 1949 and this one was actually from early on the 1st so early Saturday morning on New Year's Eve or New Year's Day and you can see that the shaded areas on this particular map show areas where precipitation is falling, where snow is falling. At least in this case, you can see that on Saturday morning, there wasn't a lot of observing stations upstream across Montana or Idaho showing snowfall with the exception of Yellowstone, West Yellowstone here and you can see some areas up in Western Montana and Idaho showing some snow as well. Really at this point, looking at the numbers, you know, you have 23 degrees up here in southern Alberta, nothing that indicates that it's going to be a deep cold system at this point.

We'll fast forward a day and this is the next official weather map and this would be on the morning of January 2nd which would be Sunday. You could see the area of precipitation and shading has expanded and you could see the area up here across Alberta and down into northern Montana. Even starting to see some snow fall in Billings at 29 degrees early on on Sunday but still at this point, there's really little in the way of indication that we would see what would end up being a benchmark type system. We have -1 in southern Alberta, -3, I guess, that's some indication that there's a strong cold front that's in there but at this

point, you know, we probably can expect maybe a chance for snowfall mainly because the observing areas upstream are starting to see it but nothing that would indicate what we would see the next day.

This is on January the 3rd which would be Monday morning. You can see the area of snow has expanded across the high plains, expanded across Wyoming and Nebraska. You can see at this point, the cold front is through Cheyenne or -1 degrees, north winds at about 50 gusting to about 65 miles per hour. Certainly conditions were deteriorating rapidly on the 3rd which ended up being the most critical day as far as temperatures and snow and blowing snow are concerned. You could see this area expanded across Nebraska and much of the central plains as well and back here you see some really cold temperatures kind of setting up, -24 up there at Alberta, 2 at Billings and you can see that cold there really beginning to stream south along through the high plains.

Go forward another day, snow's continuing, the low pressure again is out to the east, out towards northeast Nebraska or southeast ... South Dakota. You see we're -5 on Tuesday morning. That's what we wake up to. Northwest wind's 35 knots so that's about 40 miles per hour gusting to about 55 still at that day so certainly conditions on the 4th continued to deteriorate and remain pretty poor with a combination of snow and blowing snow.

Then we go one day further into the 5th which would be Wednesday morning. You could see at this point, the precipitation generally was winding down across the area with the bulk of it across the plains where northwest winds at about 40 to 45 miles per hour gusting still to about 60, still creating significant blowing and drifting snow across our area and certainly, the combination of wind and the temperatures were creating some really, really poor wind chills, really cold wind chills. That was ...

Chad Hahn: Okay. Basically, this is just a snapshot of what the low pressure did during this event and it has dates here which is basically on the 2nd so on Sunday morning at 6:00 AM, the surface low pressure took a track of this down through the southern plains and then actually retrograded in Nebraska. It was during this time that was ... What's the abnormality of this storm system was the fact that the low pressure actually over the course of about 24 hours remained basically stationary across eastern and central Nebraska. What that did is a prolonged snowfall and the winds blowing snow, impacts across eastern and southeast Wyoming to the likes of 60 hours, 60, 70 hours or so. That's unlike normal weather patterns for us that time of year. Generally, 24 to 36 hours are what our typical duration of events are. In this case, that was very different. It was a much longer event encompassing probably 24 to 36 hours longer than what we would typically see in winter time in this part of the country.

This one's pretty interesting. This is a wind speed map basically and visibility is down here at the bottom. Here we start on the January 2nd at 6:00 AM and you can see that the wind speed really starts to pick up during the morning hours. I remember snow began to fall around mid-morning Sunday on the 2nd. Wind speeds increase to about 40 miles per hour there and continued at 40 miles per hour or above through January 4th, through the entire day. Early in the morning on January 4th, recorded wind speed was around 53, 54 miles per hour. At that time, there was a gust report here in Cheyenne of 66 miles per hour so you can just imagine what the magnitude of snow fall, the 30 to 40 inches that we're seeing across the area combined with the 66 miles per hour winds, just the magnitude of blowing and drifting snow.

Visibility during this time is on this map and you can see the line basically comes down to 20 miles of visibility initially, decreases to a quarter mile or less by the afternoon on the 2nd which is Sunday and it was about at this point in time where basically all traffic was stopped across Cheyenne. We remained at or below a quarter mile of visibility through January 5th so that's a long duration event certainly than what we typically would see. This is interesting too, this shows the wind chill temperature which, obviously, with the combination of cold temperatures and the strong winds, our wind chills were going to be very, very low and very dangerous during this event.

On January 2nd here around midday, you can see the wind chill basically decreases as you go up so you start off at about -25 degree wind chill. During the peak of the event on January 3rd, we were probably getting wind chills that were somewhere in the vicinity of -60 to -70 degrees Fahrenheit during the event, a combination of wind speed and subzero temperatures. That was decreased as worked in through January 4th and you could see down here on the bottom, this is basically the air temperature so 20 degrees on the 2nd and we basically cooled down below freezing from 9:00 AM on January 2nd through 6:00 AM or 9:00 AM on January 5th so about three full days where the air temperature was below degrees that is. We bottomed out down here around -8 or so during the peak of the event.

The important part of this is that the air temperature combined with falling snow can magnify the snowfall totals and generally speaking at 32 degrees Fahrenheit, we generally get a 10 to one liquid to snow ratio. For every one inch of liquid, we get 10 inches of snow. As the temperatures cool, typically that ratio increases so it can be something on the order of maybe 20 to 30 to one in really, really frigid, cold temperatures and that was the case here and we look at the snowfall reports that we received across the area with the 30 to 40 inches observed around Cheyenne and across the southern Laramie range. You go up across Goshen and Platt Counties a little bit less with around 10 to 12 but you see this other bullseye up here in the northern Nebraska panhandle extended along the

Pine Ridge, 31 inches recorded at Lusk, 17 at Douglas and certainly that area expanded to the north up through Gillette as well with the significant snow falling in those areas.

Tom Manning: Can we back up for a second?

Chad Hahn: We can.

Tom Manning: These are current estimates?

Chad Hahn: Yes.

Tom Manning: Okay, so just back up and just talk about that just a little bit.

Chad Hahn: Okay. This is the three day totals from January 2nd to January 4th of '49 and these were from observers that were in those specific locations that we went back and added up those three day totals. The estimate for Cheyenne, we only received officially 12.6 inches on the books with 2.6 inches of liquid being reported that number as far as too low and so, we had to increase that. Likely, it's somewhere between 30 and 40 inches of snow fell. Certainly looking at some of the record keeping, some of the observations, some of the pictures that we've seen. It was more than 12.6 inches of snow. These other ones out here were all actual observed values and so, these would be completely accurate. Ours, in Cheyenne locally and Cheyenne probably, they certainly needed to be increased based on observations.

Tom Manning: What about the other counties in eastern Wyoming? Are those observational or those are necessarily been more to ... I know Lusk really got slammed.

Chad Hahn: They did and that number would suggest that, 31 degrees.

Tom Manning: The land forms up there in Lusk essentially. They do tend to get an increase up there. There's a little ridge that formed up there.

Chad Hahn: Basically down in this area, kind of the extension of the Pine Ridge.

Tom Manning: Can you start over with Lusk?

Chad Hahn: Yeah, I can. Basically, you have an area across maybe Goshen and Platt Counties where we did have a little bit of a minimum. Not unusual for lower elevations along the north Platt River Valley, they can tend to see a little bit less snowfall but up areas around Lusk and in east central Wyoming with the 31 inches reported there, that was actual observe by the observer up there at the time and they tend to see a little bit increase, a little big magnification in snowfall totals

based on some of the topography across the southern part of that county. That even extended back over to Douglas and Converse County where they saw about a foot and a half.

Tom Manning: What you're saying that from this map around the Platt River Valley that Casper, I had heard that Casper wasn't hit as bad?

Chad Hahn: Yeah, I believe that because ...

Tom Manning: Can you start off with ... Talk or just say Casper.

Chad Hahn: Yeah. In Casper, right along the north Platt River Valley, you're a little bit lower in elevations. I mean, it's still fairly high but it definitely is influenced by the river drainage and there's probably a likelihood certainly along the north Platt river where there was a decrease in snowfall totals across Casper.

Tom Manning: Can you also explain about these totals? That this is basically on the level and then you factor in winds and what happens.

Chad Hahn: That's what makes it incredibly difficult because even today, when we're seeing snowfall and 60 mile per hour winds, it's incredibly difficult for even us to get a really accurate measurement. We're relying a lot on what falls in with the can, the liquid that falls within the precipitation can and then melting that down and then trying to make a determination based on what the snowfall measurement is on level.

Tom Manning: Okay. What I was getting at though is the winds and drifting and because I've got photographs of, at least, 20 foot if not more at the south side of Lusk.

Chad Hahn: Absolutely. With the 60 mile per hour winds that we saw with almost three foot of snow, it would create 10 to 20 feet drifts certainly.

Tom Manning: Or more.

Chad Hahn: Or more easily, absolutely. Yeah, for sure. This one's kind of interesting. The maximum three day snowfall total for Cheyenne. Basically, these are our record three day snowfall totals. We have some events in 1979 that had about 25 inches of snow and it basically decreases from there. What made the 1949 blizzard different was that in the estimates of 30 to 40 inches of snow that fell, it would definitely be a benchmark for what we use here at the office. It's definitely the largest since we've been keeping accurate observations, the largest snowfall that we would have seen, at least, locally in Cheyenne. I would imagine that would be the same case in places like Lusk and Sheridan and those places too. You want me to go through that or you think ...

Tom Manning: You know what? I'm going to ... I'd like to ... Go ahead, go ahead.

Chad Hahn: Okay. Essentially, this was just a post evaluation from the official in charge during this time which was [A.R. Laurie] and this was typed up on January 11th of '49. He talks about that with so many elements to take into consideration, it is difficult to make a comparison between this and previous storms. For instance, many storms on record were ... Was where the snow depths was greater but the duration of the wind were less and the temperatures were milder. This is particularly true in the spring storms prevalent in this region. On the other hand, we have had storms where the temperatures was more severe but the wind duration and snow depth was less. Taking all elements into consideration, it is safe to say that this was the most severe storm in recent years and although some information such as visibility is not available on blizzards prior to 1930, this storm in most respect was the most severe on record for the Cheyenne area. It kind of puts it into perspective and he would have been the person that would have the best perspective of an event like this and working it.

Tom Manning: The recording is going back to the 1870s.

Chad Hahn: Exactly. Yeah and I was looking back through some of the Nebraska things and 1888 was, I guess, a big blizzard as well. The thing about it that's changed over the years when you think about 1888 to where we are today, just the quality of records that we see now is so much better than what we saw even in 1949 and certainly when we go back to 1888, it's much, much better. This was also taken out of the weather bureau topics report that they basically created for Congress every year. It talks about weathermen carrying on despite storms so during January, the west experienced some of the worst blizzard weather in history but weathermen in most cases trudge to work as usual. Wind pack drifts, gale driven snow which cut and froze exposed flesh long hours with relief on a minimum of food and sleep and frigid nights and days and offices which could not be kept above freezing despite stoves were some of the difficulties they faced in carrying out their duties.

At Cheyenne, Wyoming during the storm of January 2nd through the 4th, drifts stopped all traffic and the only possible way to commute between the office and employee's residences was to walk. It is fortunate, reports OIC A.R. Laurie, that the Weather Bureau Office at Cheyenne is not several miles from the city like a number of other airport stations. With the visibility zero or near zero along with the snow, low temperatures and wind, walking a mile is an enormous task. All employees spent long hours at the office and forecaster William J. Denny stayed at the airport two days after his car stalled in the snow. It's kind of interesting.

Then, just a letter of appreciation that was sent to actually Congressional folks for how the office did during the event but it talks about whatever hardships our

weathermen underwent and carrying on with their jobs, they were at least partially compensated by appreciation such as that expressed by a Wyoming rancher in a letter to the OIC of Cheyenne. I am writing this personal letter to thank you for your assistance, not only in reporting the last one but for all the other times you had given storm warnings. This is indeed a great help to me in operating my ranch and I certainly appreciate it. When you called me Sunday morning, I took my sheep to the north since you reported a northwest wind and when the storm struck, the sheep came right for the ranch. The only loss I had was two heads of two lambs.

Tom Manning: Fantastic.

Chad Hahn: Okay, good.