

CRH SSD  
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## CENTRAL REGION TECHNICAL ATTACHMENT 92-14

A REVIEW OF FLEXZONE APPLICATION  
IN THE WINTER STORM OF MARCH 8-9, 1992By Craig Sanders  
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## 1. Introduction

Wyoming began a risk reduction effort on October 1, 1991. The state set aside the 17-zone format which had been used for many years in favor of a new 58-zone format which closely accounted for unique terrain and climate features. The goal was to design zones where terrain differences could be removed in a mountainous state of the western U.S.

The significant winter storm of March 8 and 9, 1992, brought up to 13 inches of snow to parts of southeast Wyoming. Blizzard conditions developed late in the storm as well. This review is not a summary of performance by the Cheyenne Forecast Office and WSO's in Wyoming. It is intended to review the way in which Flexzones were grouped during the storm and to identify opportunities for optimum service as compared to the former 17-zone format. All times are Mountain Standard Time.

## 2. Synoptic Overview

The storm elements became fairly well identifiable on Friday, March 6, 1992. A split flow was analyzed along the West Coast. The northern portion, which was zonal, was progged to sag south out of Canada into Montana. A series of short waves was forecast to move through Montana and northern Wyoming in the subsequent 24-48 hours.

The other portion of the flow dived south and entered the U.S. at the southern tip of California. Two rather strong short waves were noted at the base and west side of this trough. These were to be the features which would enhance the weather over Wyoming. The main trough moved east-northeast through the Great Basin and passed through Colorado.

By 500 A.M. Sunday, March 8th, a Canadian cold front was near the northern border of Wyoming. Short waves moving east in the northerly branch of the upper flow were producing snow along the front. At the same time, the main surface low was in Utah with a warm front running east through southern Wyoming. The systems

merged over southern Wyoming on Sunday the 9th. An overrunning situation, combined with short waves moving northeast into the frontal area, strengthened the circulation in the central and southern parts of Wyoming. The circulation which developed had a north to northeast component which is very favorable for upslope enhancement of precipitation in Wyoming.

Blizzard conditions and heavy snow developed during Sunday afternoon, March 9th. Temperatures were in the 40s. The precipitation began as rain and changed over to snow by evening. Thunder was even noted at Cheyenne late in the afternoon. Winds finally exceeded 35 mph during the evening, and blizzard conditions materialized in the southeast. Most major roads and highways were closed. This included I-25 and I-80 through Cheyenne. Two people died and 75 others were injured. All were traffic-related.

### 3. Sequence of Forecasts and Zone Groupings

The summary which follows will use the attached maps. There are composite maps with the 58 Flexzones depicted by thin lines. The old 17-zone format is overlaid, and these zones are drawn with thick lines. In this way, one can readily see how the two zone formats would compare in dealing with this storm.

The first highlights were issued with the 340 P.M. zone package on Saturday, March 7th. Figure 1 shows the state divided into thirds. A Snow and Blowing Snow Advisory was issued for the north for Sunday. As the polar front came south, snow was forecast to develop with the aid of transient short waves and dynamics from the emerging trough in the Great Basin.

As the front moved into central Wyoming Sunday afternoon, snow was expected to be enhanced due to northeasterly upslope flow. Winds also were forecast to increase. A Winter Storm Watch was issued for Sunday afternoon and Sunday night. The forecaster chose to put only the eastern slopes of the Wind River mountains and foothills (zones 11-13) in the Watch. In the old 17-zone format, there was no east-west split in mountain zones. Zone 15 was included because it is a range of low mountains, while zones 31-34 are flatter and to the west of where the short waves were expected to intensify the system. Note also that timing of events was accomplished better by being able to group zones 68-70 with those of the southeast. The southeast also was given a Winter Storm Watch for Sunday but for a later time of day. At 910 P.M. Saturday, no changes were made to the highlights (Figure 2).

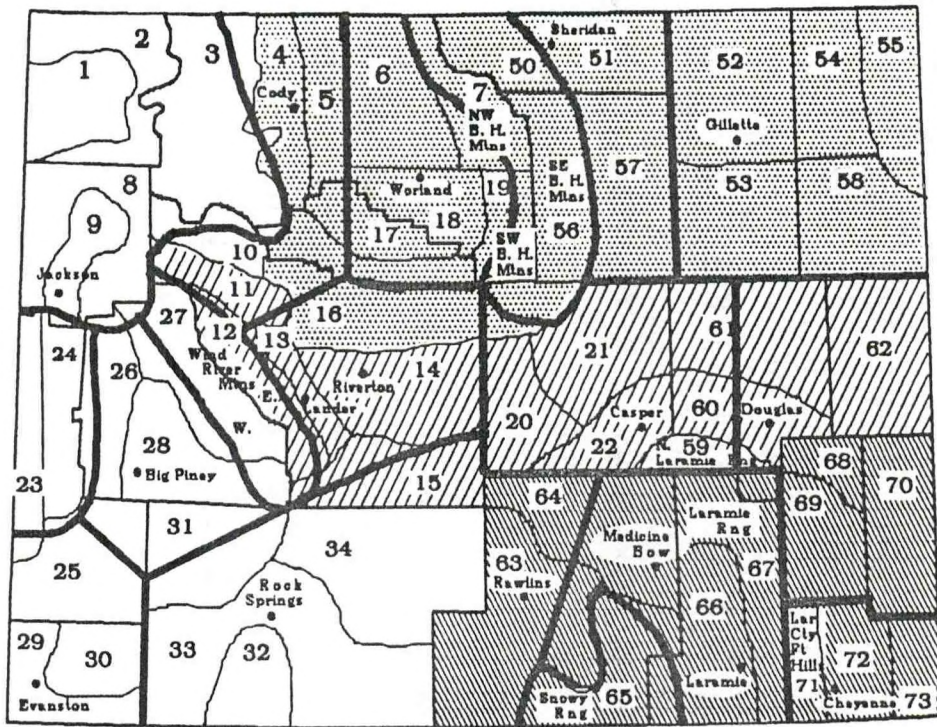





Figure 1.

First highlight issuance - 3:40 PM Saturday, March 7, 1992

-  Snow and Blowing Snow Advisory for Sunday
-  Winter Storm Watch Sunday afternoon and Sunday night.
-  Winter Storm Watch *late* Sunday and Sunday night

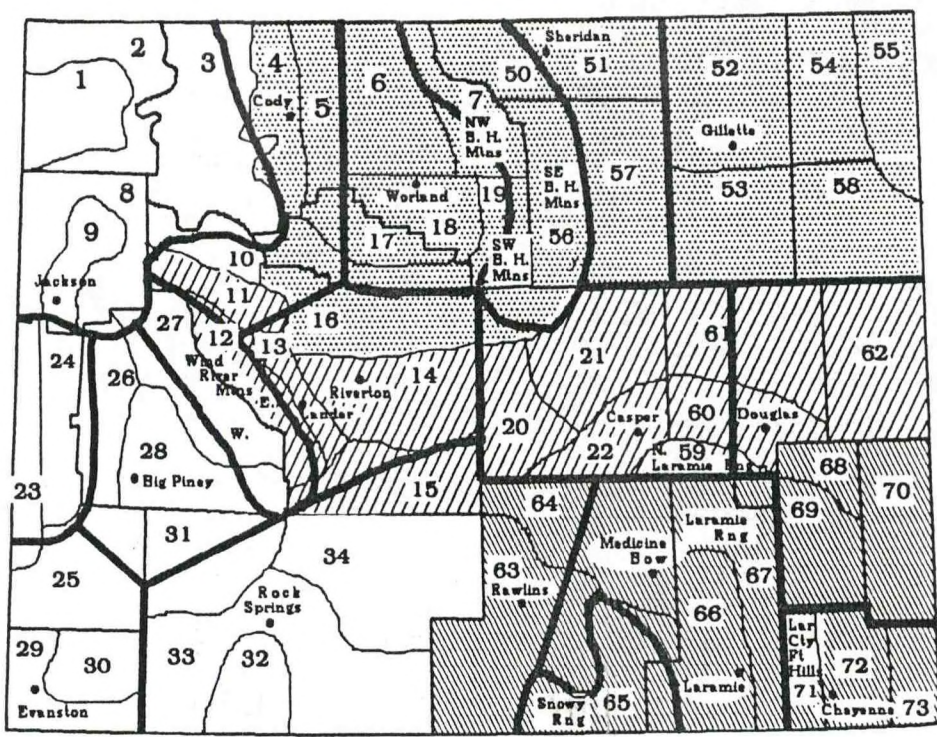





Figure 2.

Same highlights continued - 9:10 PM Saturday, March 7, 1992

-  Snow and Blowing Snow Advisory for Sunday
-  Winter Storm Watch Sunday afternoon and Sunday night.
-  Winter Storm Watch *late* Sunday and Sunday night

At 410 A.M. on Sunday, March 8, the Watch for the central portion of Wyoming was upgraded to a Winter Storm Warning (Figure 3). The southeast was still mild. Rain was forecast to change over to snow after 200 P.M. so the Winter Storm Watch was not due to take effect until late that afternoon or early evening, after the precipitation had changed over to snow.

At the 10 A.M. issuance, the Snow and Blowing Snow Advisory for northern Wyoming was trimmed in its west portion (Figure 4). However, the eastern slopes of the Big Horn Mountains and the northeast were still receiving snow. The west slopes of the mountains and the Big Horn basin to the west reported very little snow.

Through the day Sunday, the 700 mb low and the surface low were nearly vertical as they drifted east through Colorado. By evening they were in eastern Colorado, and cold air began to spill into southern Wyoming behind the cold front. Rain began changing into snow. It was at this time that thunder was briefly heard in the Cheyenne area.

By 340 P.M., when the next set of zones was issued, the southeast was upgraded to a Winter Storm Warning (Figure 5). A Snow and Blowing Snow Advisory was added to southwest Wyoming where wrap-around was forecast to bring snow into that area. Flexzones allowed this Advisory to be issued close to the border and better localize the threat. The front was well south in Wyoming. This allowed the Snow and Blowing Snow Advisory in the north to be trimmed further in the northeast.

The circulation increased in the southeast between 600 P.M. and 800 P.M. Visibilities dropped to a quarter mile as winds exceeded 35 miles an hour. By 910 P.M. (Figure 6) the Winter Storm Warning was upgraded to a Blizzard Warning. Flexzones allowed the forecasters to focus on the higher terrain zones (65 and 67) where the wind was stronger and snow was heavy. The southeast corner (68-73) was well exposed to the northeast flow of the Colorado systems. The terrain is all uphill from Nebraska which obviously led to upslope enhancement.

From about midnight on, the storm moved into Kansas. The circulation weakened and the snowfall lessened. By 410 A.M. Monday, all warnings and advisories were dropped except for a Blowing Snow Advisory in the southeast corner (Figure 7). The area covered included the Laramie Range and open areas to the east. By 650 A.M. even these Advisories were terminated. The final snow amounts are shown in Figure 8.

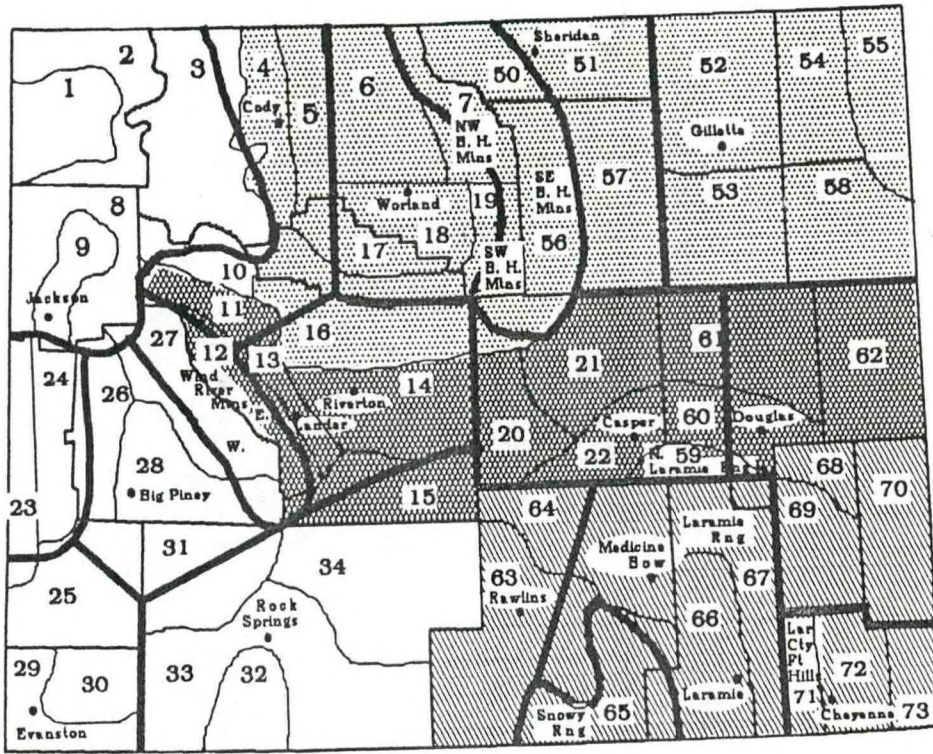


Figure 3.

Highlights issued at 410 AM Sunday, March 8, 1992

- Snow and Blowing Snow Advisory continued for for today (Sunday) and extended into the evening.
- Winter Storm Watch upgraded to a Warning for this afternoon and tonight.
- Winter Storm Watch continued, but backed off to tonight.

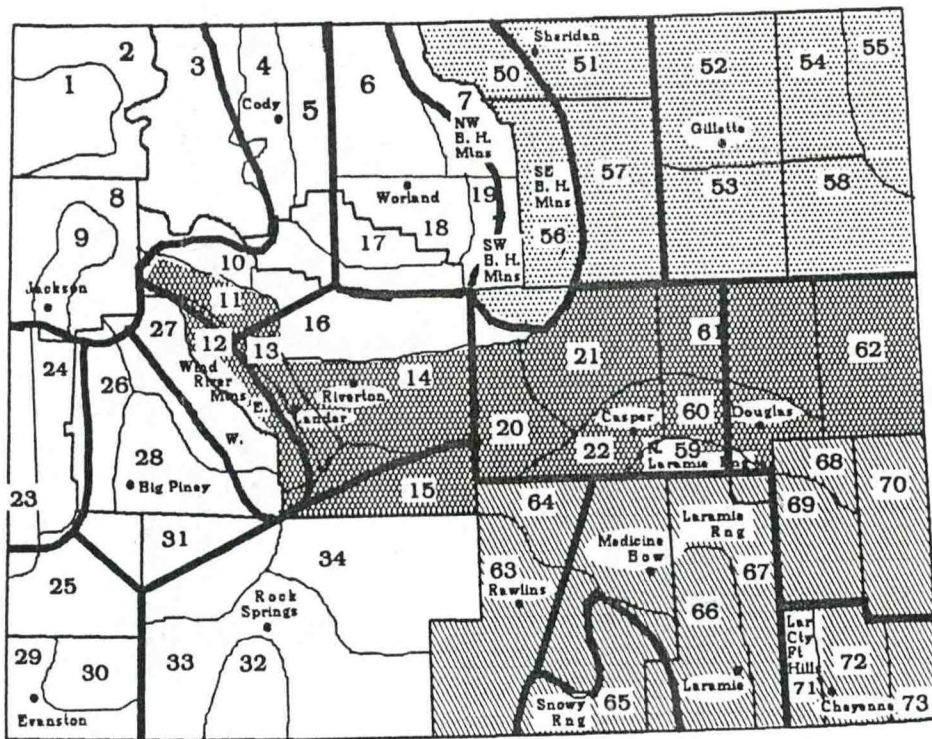


Figure 4..

Highlights continued at 1010 AM Sunday, March 8, 1992.  
 Generally the same except the SBS was dropped for zones 4-7  
 and 17-19.

- Snow and Blowing Snow Advisory continued for today (Sunday) and this evening.
- Winter Storm Warning for this afternoon and tonight.
- Winter Storm Watch continued for tonight.

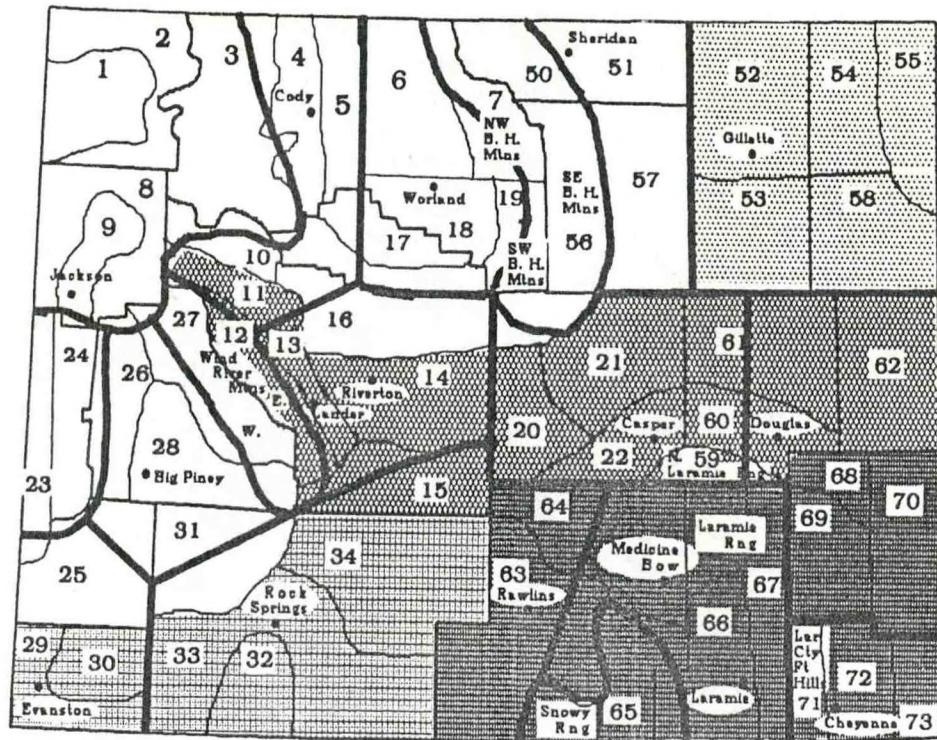


Figure 5..  
 The zones issued at 340 PM Sunday, March 8, 1992.  
 Some trimming of the SBS in the north. Upgrading and  
 expansion of highlights in the south.

- Snow and Blowing Snow Advisory continued for tonight.
- Winter Storm Warning continued for tonight.
- Winter Storm Watch *upgraded to a Warning* for tonight.
- Snow and Blowing Snow Advisory added for tonight.

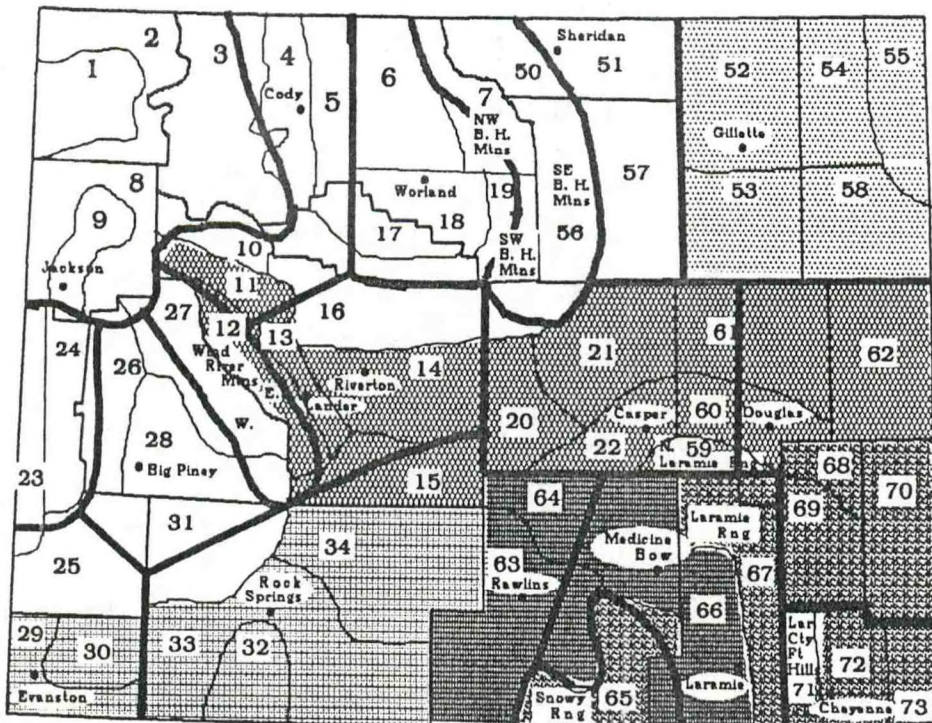


Figure 6..  
 Some significant changes were needed at 910 PM Sunday, March 8, 1992.  
 A portion of the Winter Storm Warning area in the southeast was upgraded  
 to a Blizzard Warning for the remainder of the night.

- Snow and Blowing Snow Advisory continued for tonight.
- Winter Storm Warning continued for tonight.
- Winter Storm *Warning* continued for tonight.
- Snow and Blowing Snow Advisory continued for tonight.
- Blizzard Warning issued as an upgrade from the  
 Winter Storm Warning

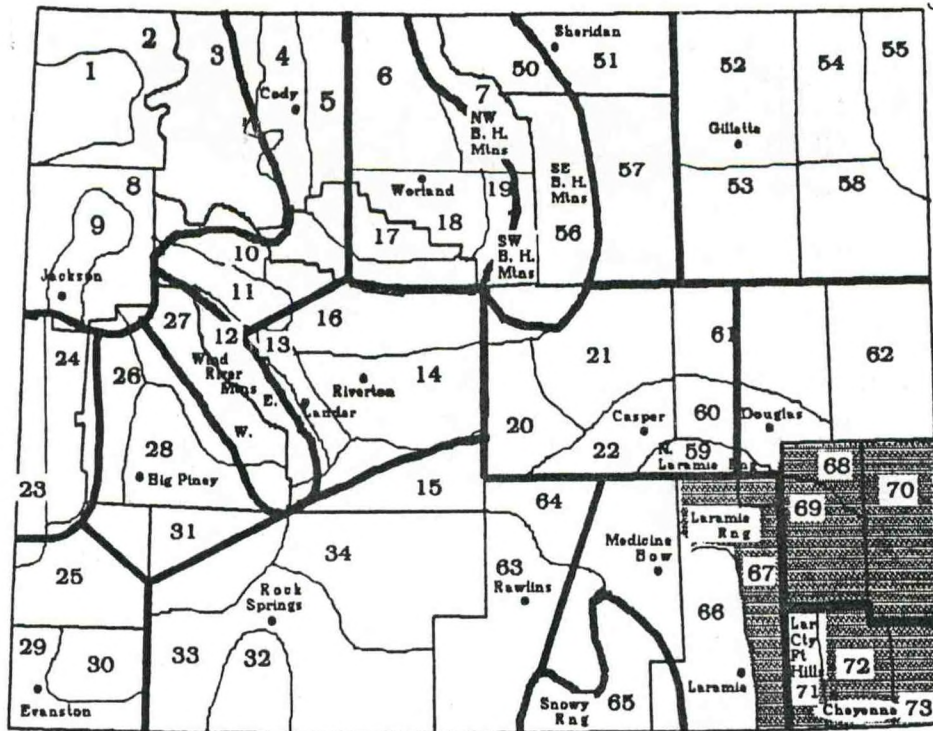



Figure 7..  
 Most highlights were dropped at 410 AM Monday, March 9, 1992.  
 A Blowing Snow Advisory was retained in a portion of the area  
 where the Blizzard Warning had been.

 Blowing Snow Advisory.

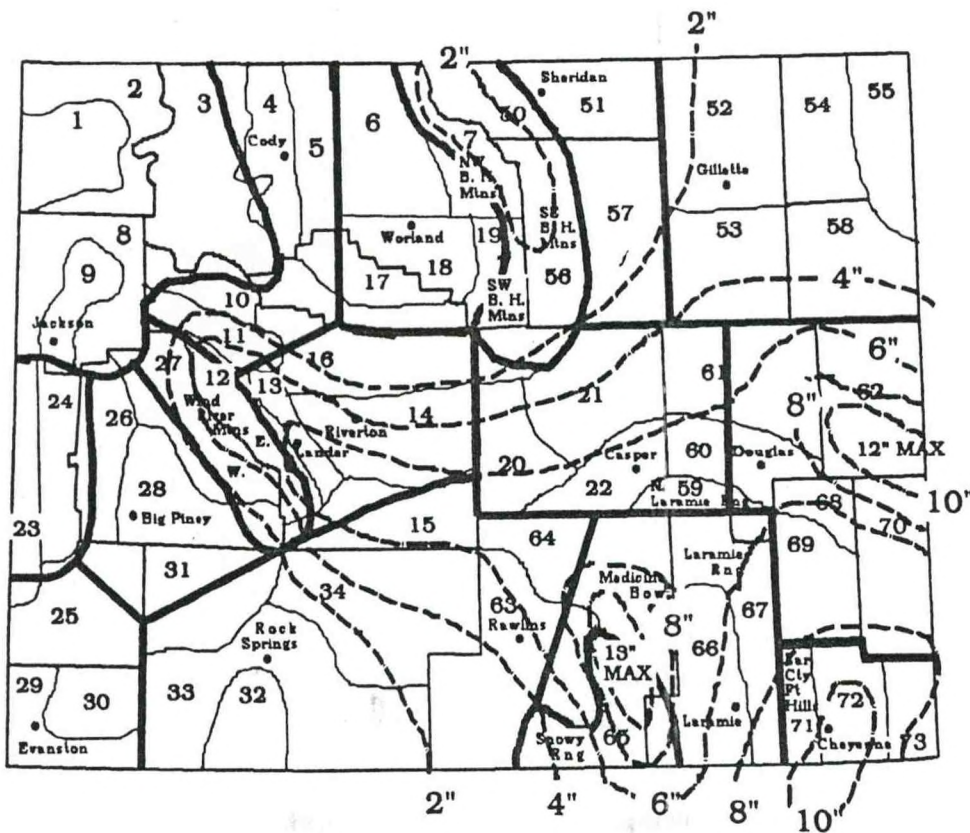


Figure 8..  
 Snowfall totals from Sunday March 8th through Monday March 9th.

#### 4. Conclusions

The Flexzones allowed forecasters to more accurately address upslope enhancement of precipitation and terrain exposure to wind. They could better time the onset of events as well as the changeover and intensity of precipitation as they progressed south or enhanced in certain areas. The forecasters did not have to mention variations in parameters near terrain. The forecast text was simpler and more explicit, allowing the media to glean the bare specifics for each zone or group.