STATE OF COLORADO
2008 FLOOD DOCUMENTATION REPORTS

Flooding in Downtown Greeley (Photo Courtesy of the Rocky Mountain News)

Elk River at Routt County Road 42

COLORADO DEPARTMENT OF NATURAL RESOURCES

Prepared for:
Colorado Water Conservation Board
1313 Sherman St. Room 721
Denver, CO 80203

Prepared by:
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April 27, 2009

ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

EXECUTIVE SUMMARY

Flooding during 2008 was characterized primarily by snowmelt events, with only one documented rainfall-based flood event occurring in Weld County on August 6, 2008. On that evening, a band of heavy rainfall passed through the cities of Greeley and Evans, impacting these communities as well as adjacent areas of unincorporated Weld County. In both Greeley and Evans, several businesses (including Greeley's City Hall) received moderate flood damage with floodwater entering their first floors. Numerous single family homes in the central and downtown areas of Greeley experienced flood damage, primarily to basements and garages. Fortunately, no injuries or deaths were reported. Several roads in Greeley and Weld County were closed due to erosional damage that made them impassable. Electrical service was interrupted until early the next day for roughly 2,700 customers.

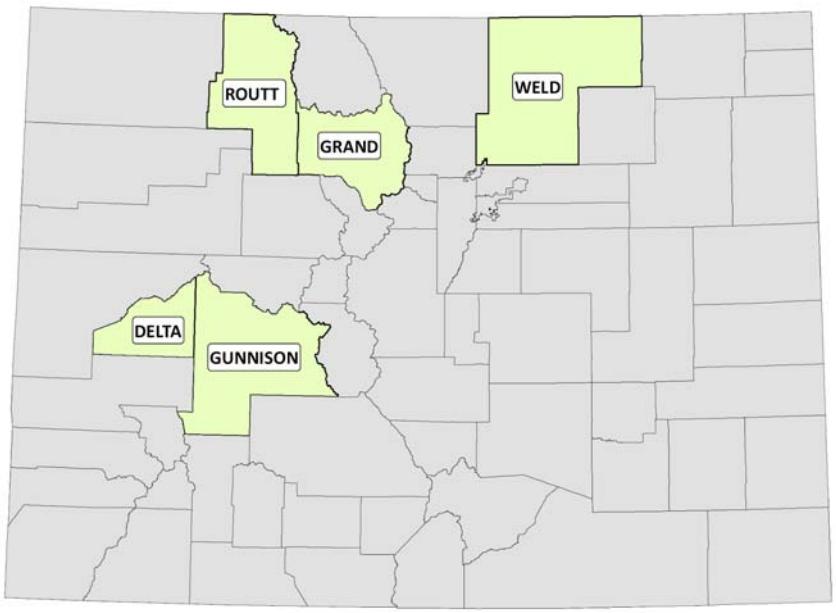

Figure 1. Location Map for the Documented 2008 Flood Events

Table 1. Summary of Documented Flood Events for 2008

Date	Location/Water Course	County
May 22, 2008	Gunnison River	Delta County
May 18-24, 2008	Eight-Mile Creek	Grand County
May 18-24, 2008	Fraser River	Grand County
May 18-24, 2008	Muddy Creek	Grand County
May 18-24, 2008	Ten-Mile Creek	Grand County
May 18-24, 2008	Troublesome Creek	Grand County
May 18-24, 2008	East River	Gunnison County
May 18-24, 2008	Elk River	Routt County
August 6, 2007	Cities of Evans and Greeley	Weld County

The threat of serious snowmelt flooding for numerous mountain communities and adjacent downstream communities continued through most of the month of May 2008. Communities were on high alert: testing reverse 911 systems, updating flood preparedness

information, issuing press releases concerning flooding potential and appropriate citizen preparation and response, making sandbags available, closely monitoring weather, and scrutinizing the operation of upstream water systems, including dams and flow diversion systems.

As it turned out, the 2008 snowmelt season resulted in less flooding than anticipated due to several factors, including the following: (a) a cooler than average spring, which lead to snowpack in lower elevations melting without the contribution of runoff from higher elevations; (b) no substantial precipitation during the snowmelt runoff period; and (c) no prolonged period of consecutive days with above average temperatures. However, record flow peaks were measured on the Fraser River (near Tabernash) and Muddy Creek (near Kremmling) in Grand County, as well as the Elk River (near Milner) in Routt County.

Snowmelt flooding was documented for Grand County, Gunnison County, Routt County and the City of Delta, all during the week of May 18-24, 2008. Flooding in Delta may have been exacerbated by flow releases during this period from the Aspinall Unit (Blue Mesa Dam, Morrow Point Dam, and Crystal Dam). Fortunately, flooding in all four areas was primarily limited to inundation of roadways, trails and open land, with one walkway reportedly damaged due to erosion, including the loss of a footbridge. Floodwater was reported to have entered the crawl space and garage of one home in Gunnison County, along with several barns in both Grand County and Routt County.

This report summarizes key factors associated with each flood event, such as: storm location and characteristics, rainfall data, hydrologic and hydraulic investigations, descriptions of flooded areas and flood damages, flood damage estimates, and flood mitigation efforts. Additional documentation for these events, including contact information, photographs, and hydrologic/hydraulic computations, is provided in each chapter.

INTRODUCTION

The following chapters discuss the one documented rainfall flood event that occurred in 2008, along with the numerous areas that experienced relatively minor snowmelt flooding across the State of Colorado. Each chapter follows a specific format for presenting data and information. The amount and type of information that is provided for each event varies due to the type of flooding experienced in each case, as well as the amount of information gathered by local, state and federal agencies. The general trend implies that the more severe the event, the more information and data are available. However, the availability of data is also influenced to a substantial degree by the technical and financial wherewithal of the local community.

PURPOSE OF STUDY

The intended purpose of this study is to gather information on specific flood events throughout the State of Colorado and present that information to all interested parties in a uniform, organized format. This study was commissioned by the Colorado Water Conservation Board in order to inform state and local government officials, as well as private citizens, on the location, effects and damage of flooding events throughout the State. An additional objective of this study is to help government officials and citizens prepare for future flood events. Each chapter includes a section that identifies flood mitigation efforts that assisted in minimizing flood impacts and damages to the community for the subject event.

AUTHORITY

It is the responsibility of the Colorado Water Conservation Board (CWCB) to devise and formulate methods, means and plans for bringing about the greater utilization of the waters of the State, while also preventing or minimizing flood damages to public infrastructure and private property. By this authorization, work on this project was sanctioned and funded by the CWCB through a contract with Anderson Consulting Engineers, Inc., dated October 9, 2007. In consultation with the CWCB staff, and a number of federal, state and local agencies, Anderson Consulting Engineers compiled this year-end report, which provides flood documentation for events across Colorado for the 2008 calendar year.

Anderson Consulting Engineers would like to specifically acknowledge the coordination efforts of Mr. Kevin Houck of the CWCB, and the funding provided through the CWCB Flood Response Program.

FLOOD DOCUMENTATION REPORT – CHAPTER 1

SNOWMELT RUNOFF FLOOD WARNINGS FOR GRAND, GUNNISON, AND ROUTT COUNTIES DURING THE WEEK OF MAY 18-24 2008

During the week of May 18-24, 2008 numerous flood warnings were issued within the Counties of Grand, Gunnison and Routt. These warnings were the result of rapid snowmelt of a higher than average snowpack in the contributing watershed (estimated by the Intermountain West Climate Summary as being 110-129 percent of average for the month of May). During this time frame, several creeks and rivers reached or exceeded flood stage resulting in roadway overtopping and/or damage, debris accumulation, land erosion, and isolated cases of structure inundation.

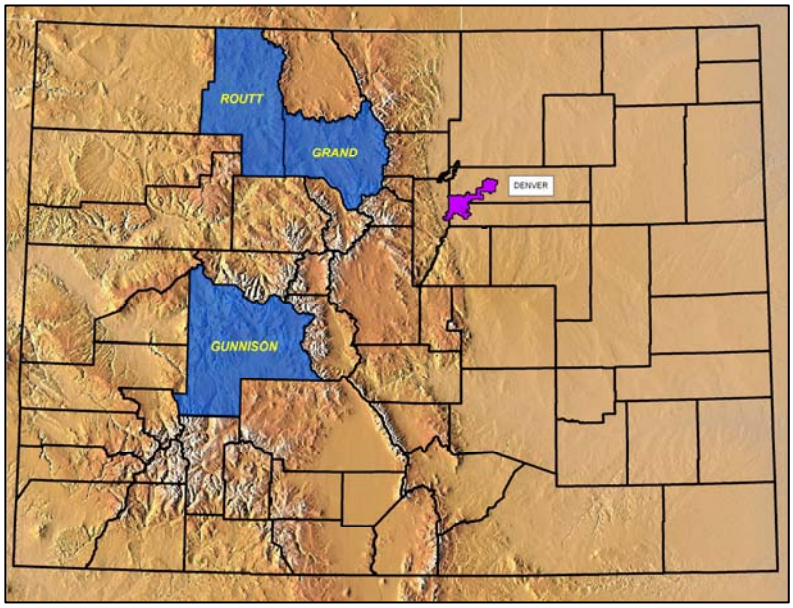

Figure 1. Location Map

For Grand County, local news agencies indicated that there was minor flooding (fields and barns) through a couple of ranches along Eight-Mile, Ten-Mile and Troublesome Creeks. Two creeks were reported to be flowing at historic levels during this time frame including Muddy Creek near Kremmling (902 cfs on May 21, with a previous record of 822 cfs) and the Fraser River near Tabernash (890 cfs, with a previous record of 720 cfs). As of May 25, 2008 Mr. Ray Jennings, Grand County Emergency Manager, indicated that he was unaware of any structural damage but did indicate that he believed a property on the Fraser River in Granby required sandbags to prevent flooding.

On the morning of May 20th in Gunnison County, the National Weather Service elevated the standing flood watch to a warning for the East River at Almont. By Wednesday afternoon (May 21st) the National Weather Service lowered its projections of peak discharges along the East River from 3,400 cfs to 3,100 cfs with flood stage occurring at 3,120 cfs. According to the USGS, the East River at Almont peaked on the morning of May 22nd with a stage of 7.14 feet and a discharge of 3,040 cfs. On May 22nd, Scott Morrill, Gunnison County Emergency Manager, reported to a local newspaper that “most of the homes in the Almont area are

relatively high and only a couple of homes are at risk during the high waters expected this week." Ultimately, only isolated cases of structural damage were reported in Gunnison County. One such example was a residential structure along Tomichi Creek (5469 County Road 43 near Parlin Colorado), which reportedly experienced a flooded crawlspace and garage.

Figure 2. Elk River Flooding

In Routt County, the National Weather Service flood warnings focused on the Elk River near Milner and the Yampa River at Deerlodge Park and Steamboat Springs. According to the USGS, the Elk River near Milner peaked on the morning of May 22nd with a stage of 7.8 feet and a discharge of 6,230 cfs (flood stage occurs at 7.0 feet). According to the USGS, the Yampa River at Steamboat Springs peaked Thursday afternoon (May 22nd) with a stage of 5.8 feet and a discharge of 3,250 cfs (flood stage occurs at 7.0 feet). Contrary to what appears to be flooding impacts to structures shown in the enclosed photographs, on May 23rd Chuck Vale, Routt County Emergency Management Director, was quoted in a local newspaper as saying that no significant property damage had been reported due to high water in Routt County, and that water had not entered any structures.

Figure 3. Elk River Flooding

Figure 4. Elk River Flooding

APPENDIX A

COORDINATION

Aaron Hansen

From: Ray Jennings [rjennings@co.grand.co.us] **Sent:** Sunday, May 25, 2008 11:47 PM **To:** Aaron Hansen **Subject:** RE: Flood Response for the Colorado Water Conservation Board

Aaron Hansen,

At this time I do not know of any structural damage that has occurred. I do believe there is a property on the Fraser River in Granby that has required sandbags to prevent flooding. Rivers are running high and it would appear that the runoff season will be longer than normal. Ray Jennings

From: Aaron Hansen [mailto:amhansen@acewater.com] **Sent:** Thursday, May 22, 2008 1:35 PM **To:** rjennings@co.grand.co.us
Subject: Flood Response for the Colorado Water Conservation Board

Mr. Jennings,

My name is Aaron Hansen with Anderson Consulting Engineers, Inc. and we are under contract with the Colorado Water Conservation Board (CWCB) to track any flood related damages to structures resulting from the increased snow melt runoff that we've experienced this last week. Consequently, I was wondering if you could tell me if there has been any structure flooding in Grand County and to what extent. Based on your information, and the direction of the CWCB, we might be sent out to do some field reconnaissance to document any structure damage. If this information is not available to you and you happen to know of someone else I could contact, I would greatly appreciate it if you could forward that information to me.

Thank you for all your help!
Sincerely, Aaron Hansen

Aaron M. Hansen, P.E., CFM
Senior Engineer

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APPENDIX B

CONTACTS

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cvale@co.routt.co.us

APPENDIX C

NEWS ARTICLES

Intermountain West Snowpack data through 05/01/08

Below average precipitation across most of the IMW region in April, coupled with the beginning of snowmelt, led to a decrease in overall snowpack in some areas. The percent of average snowpack also decreased in parts of **Utah** and **Colorado** for the second month in a row (Figure 6).

In **Colorado**, snowpack as a percent of average decreased significantly across southern basins, but the Gunnison and Upper Arkansas River basins are still above 130% of average. Northern basins remained close to last month's percentages, according to the NRCS. Due to the above average precipitation during December 2007-February 2008, snowpack percentages remain above average in all basins on May 1.

Southwest **Utah** received the lowest precipitation in the region in April (see page 8). Snowpack in that area went from the near average range last month (90-109%) to below average ranges this month (25-89%). However, southern Utah has 305% to 2654% more snow this year than last year, according to the NRCS. The central and northern mountains remain in the 90-129% of average range with the exception of the Bear River basin at <25% of average.

Snowpack in **Wyoming** is near or above average in most basins, according to the NRCS. The highest SWE is in the Belle Fouche River basin in the northeast (150-180% of average). The lowest SWE is in the South Platte River basin in the southeast (50-69% of average. While SWE in Utah and Colorado decreased in April, the SWE in several **Wyoming** basins increased: the Lower North Platte, Green, and Bear River basins.

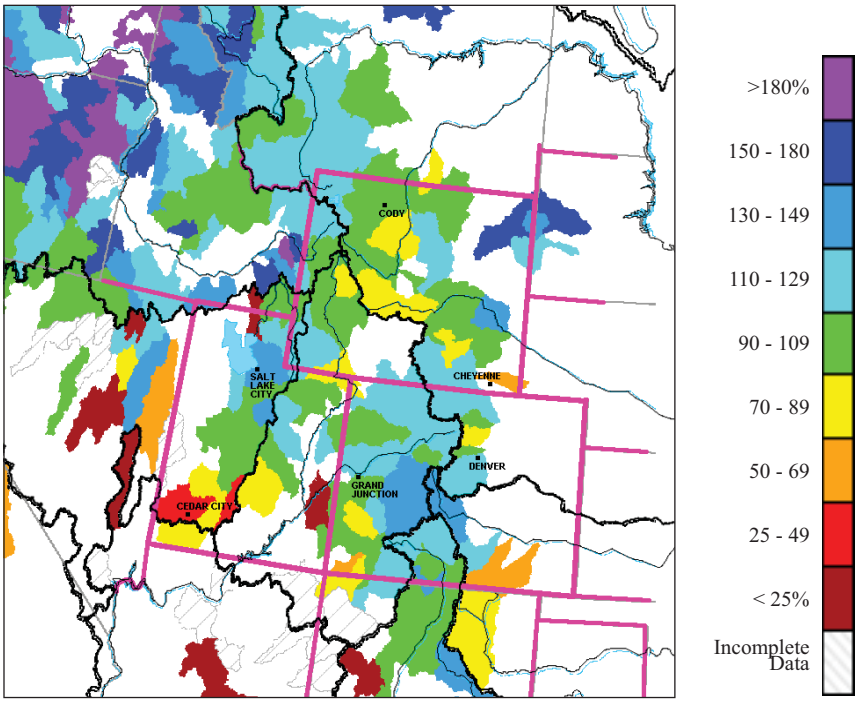

Figure 6. Snow water equivalent (SWE) as a percent of average for available monitoring sites in the Intermountain West as of May 1, 2008 (NRCS).

Notes

Snow water equivalent (SWE) or snow water content (SWC) refers to the depth of water that would result by melting the snowpack at the measurement site. Snowpack telemetry (SNOTEL) sites are automated stations operated by NRCS that measure snowpack. In addition, SWE is measured manually at other locations called snow courses. SWE is determined by measuring the weight of snow on a "pillow" (like a very large bathroom scale) at the SNOTEL site. Knowing the size of the pillow and the density of water, SWE is then calculated from the weight measurement. Given two snow samples of the same depth, heavy, wet snow will yield a greater SWE than light, powdery snow. SWE is important in predicting runoff and streamflow.

Figure 6 shows the SWE based on SNOTEL and snow course sites in the Intermountain West states, compared to the 1971-2000 average values. The number of SNOTEL or snow course sites varies by basin. Basins with no SNOTEL sites or incomplete data are designated in white on the map. To see the locations of individual SNOTEL sites, see each state's water availability page.

On the Web

- For graphs like this and snowpack graphs of other parts of the western U.S., visit: http://www.wcc.nrcs.usda.gov/snowcourse/snow_map.html.
- For snow course and SNOTEL data updated daily, please visit one of the following sites: River basin data of SWE and precipitation: http://www.wrcc.dri.edu/snotelanom/snotelbasin.
- Individual station data of SWE and precipitation for SNOTEL and snow course sites: http://www.wcc.nrcs.usda.gov/snowcourse/snow_rpt.html or http://www.wcc.nrcs.usda.gov/snotel/.
- Graphic representations of SWE and precipitation at individual SNOTEL sites: http://www.wcc.nrcs.usda.gov/snow/snotel-data.html.

APPENDIX C.1

GRAND COUNTY

9NEWS.com **Printer-Friendly Story**

Rivers and creeks overflowing as spring runoff surges

posted by: **Jeffrey Wolf** , Web Producer
written by: **Matt Renoux** , 9NEWS Mountain Reporter

created: 5/21/2008 6:12:47 PM
Last updated: 5/21/2008 9:18:33 PM

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VIEW SLIDESHOW

GRAND COUNTY - After 80 years on a ranch outside Granby, Bud Linke knows a thing or two about runoff and springtime flooding.

"Every year there is flooding but not like this," said Linke.

With two creeks, the 10-mile and 8-mile, now running right through his ranch, flooding the fence and an old barn in the low areas, Linke says this is proving to be a big water year.

"This year is unusual. I mean this is more than I have seen in years," said Linke.

Just down the road near Kremmling, Ryan Eastin stopped by one ranch to see the Troublesome Creek live up to its name as it flowed over the banks and washed out the road to his neighbor's ranch.

"I've never seen water run like this on the Troublesome. This is totally insane," said Eastin.

That same creek also tried to take out a county bridge, so Grand County Road and Bridge Supervisor Ken Haynes led a team to pull the tree out and release the backed up water.

"We have trouble with trees clogging our bridges once all those trees get against the bridge the debris will start collecting and it will wash out around the bridge," said Haynes.

The issue for many rivers has been several days of warm weather which is melting the above average snowpack in a hurry.

Most waterways in Grand County are flowing above their normal levels for this year; two are at historic highs. The Muddy Creek near Kremmling has a record flow of 822 cubic feet per second (CFS). As of May 21, it was flowing at 902 CFS. The Fraser River near Tabernash has a record flow of 720 CFS, but is flowing at 890 CFS.

With water levels that high, road crews will be keeping an eye out for more flooding as more snow melts.

"All the foremen will be getting up at midnight or 3 a.m., depending on how tired they are because 2 in the morning is typically high-water time," said Haynes.

Back at Linke's ranch, he's got water standing where his barn and cows stand.

"You have to go through water to get to the feed barn," said Linke.

Still this rancher says it's always better to have a big water year than a no water year.

"It's good to see this kind of water. Of course, you would like to see it stay in the hills a little longer," he said.

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APPENDIX C.2

GUNNISON COUNTY

May 22, 2008

Residents brace for rising water in low-lying areas

Written by Seth Mensing
Wednesday, 21 May 2008

Record flows have some people stacking sandbags

On Monday morning, May 19, Dorothy Falco chose a rock on the bank of the East River, opposite from her home on Lower Allen Road near Crested Butte South, which would serve to gauge the rising water. By mid-afternoon her rock was submerged.

Community Links

Town of Crested Butte

Town of Mt. Crested Butte

Gunnison County

Road Conditions - CDOT

Tourism Association

Snow Report -CBMR

CB Nordic Center

CB Avalanche Center

KBUT - Local Radio

Gunnison Valley Hospital

Visit Crested Butte

Mountain Kids Magazine

Falco and her husband had already mobilized against the rising torrent. Pallets piled with 60 sandbags each sat in the driveway and a clear plastic skirt covered the bottom layers of logs on their home. They had moved nearly all the first-floor furniture to the upper level and had made preparations in case evacuation was necessary.

"We've been in this house for 30 years and I don't ever remember it coming up like this so early," says Falco. "The last time we flooded, it was a surprise. We were doing well with the runoff and then all of a sudden it rained. Now I look at [the weather forecast] and they're predicting rain for the end of the week, so we're getting ready."

Warm temperatures and a record snowpack in the high country have combined to make many people nervous, especially those living near the valley's rivers, and has the Town of Crested Butte and Gunnison County making plans for its response to an emergency.

"Last week we met with the National Weather Service (NWS), so we kind of knew that we would get a rise coming our way. We've been preparing since February, making the flood plan and organizing all the different people we'll need in an emergency," says Crested Butte town manager Susan Parker.

Then Monday morning the NWS issued a river flood watch "because our forecast model showed that the East River at Almont was ripe for going over its banks in the middle of the week," says Jim Daniels, a meteorologist with the NWS in Grand Junction.

Just after midnight Tuesday morning, May 20, the river level at the USGS gauging station on the East River, just below Cement Creek, rose to 2,530 cubic feet per second, breaking the old record of 2,470 cfs set during the runoff of 1996. The overnight conditions on Coal Creek, which cuts through the heart of Crested Butte, saw a similar rise.

By Tuesday morning, the East River flood watch that had been issued for Almont was elevated to a river flood warning for a large portion of the East River corridor, says Gunnison County emergency manager Scott Morrill.

"A watch means that [a flood] could happen and a warning means that it's going to happen," Morrill says.

The escalation prompted the use of the "reverse 911" warning system at approximately 5

p.m. for people living in the area, the second use of the system this spring. The first one was the previous Friday for those living in, or near, Almont.

According to the Flood Plan laid out by the town, there are three major events brought on by swollen rivers: flooding due to an excessive amount of water in the river, flooding that is caused by debris that blocks the river channel, and major erosion that can occur along the river's banks.

For Dorothy Falco, it is the erosion that has removed a wide swathe of her yard and stripped the soil from under trees that once grew at the barrier between her house and the year's run-off. Now those trees are in the water.

"Over the years, I've lost probably six feet from my property because of erosion, and this year it's already almost cutting under the berm," she says, pointing at a rampart-like mound that has surrounded the property since she covered an old line of sandbags with dirt and grass.

Not everyone living on Lower Allen is scrambling for sandbags, however. Dan Ewert, who worked as the snow safety director at Crested Butte Mountain Resort for 15 years and has lived on the East River not far from Falco's home for the past 30 years, isn't convinced that all the preparation is warranted.

"The melt is occurring really well right now. The more we can get melted right now the better," says Ewert. "Of course anything can happen and we've got a hell of a lot of snowpack. But how it melts is more important than how much is up there."

While Falco's home is built on a concrete slab in a low-lying area of Lower Allen Road, Ewert's house is built on a raised foundation of stone and sits high enough to be out of reach of a moderate rise in the river level.

Instead of flooding to his house, Ewert is concerned that the river could grow beyond the capacity of the channel and reroute itself through the neighborhood.

"I'm not worried about standing water near, or even on, the foundation. The problem is going to be if the East River reaches a level above Allen Homesites where it could possibly try to get out of its course and create a new course," says Ewert. "Anybody who says that it can't happen isn't being very smart."

During the day Tuesday, Morrill had the opportunity to fly over much of the valley looking for trouble spots and obstructions in the waterways and was "pleasantly surprised not to find many."

In the town of Crested Butte, the focus has been on preparing a response and taking preventive measures against a potential breach of the bank, like filling sandbags and staging them in the parking lot at the corner of Elk Avenue and First Street and other places where a breach is possible.

These areas are marked on a map of the 100-year flood plain that hangs on the wall in the town's Emergency Operations Center at Town Hall, along with four highlighted areas that could flood and seven areas at risk of erosion, mostly near bends in the river's route. Because Coal Creek is unregulated above Crested Butte, there is no way to dampen the effects of what comes down the mountain.

"The creek above town runs wild and free and there is really nothing we can do to slow it down if it comes in a hurry. We're happy to have it rise in inches this time of year, not feet," says Parker. "If a log jam lets loose or a beaver dam breaks up there we could be in a lot of trouble, so we need to be prepared."

Parker says some of the measures the town has taken are training local law enforcement in swift water rescue, filling a vehicle with all of the equipment needed to take action in an emergency, formulating a flood plan and compiling lists of people to coordinate necessary services like communications, emergency shelters and food.

"The local government's first priority is life safety issues," says Morrill, outlining the county's responsibilities. "Second to that is public infrastructure like roads and bridges, and third is if there is a situation that might affect an entire subdivision or neighborhood. But we just don't have the resources to help with every property that might be threatened."

Speaking for the town of Crested Butte, Parker says, "There are only four Public Works guys… It's just not enough [to protect private property] and we want to be ready."

"For the balance of this week, the [National] Weather Service tells me it will be pretty warm again (Wednesday) and then in the fifties on Thursday with lows getting down close to freezing, and that's perfect," says Morrill. "But I guess that's the cycle that's going to be around for a few weeks, where it gets warm for a few days and then it cools off again."

There is money, up to $1,000, available from the county for reimbursement to homeowners who have flood insurance and took measures to protect their property from an imminent threat of flooding by purchasing sandbags or other means of mitigating the damage.

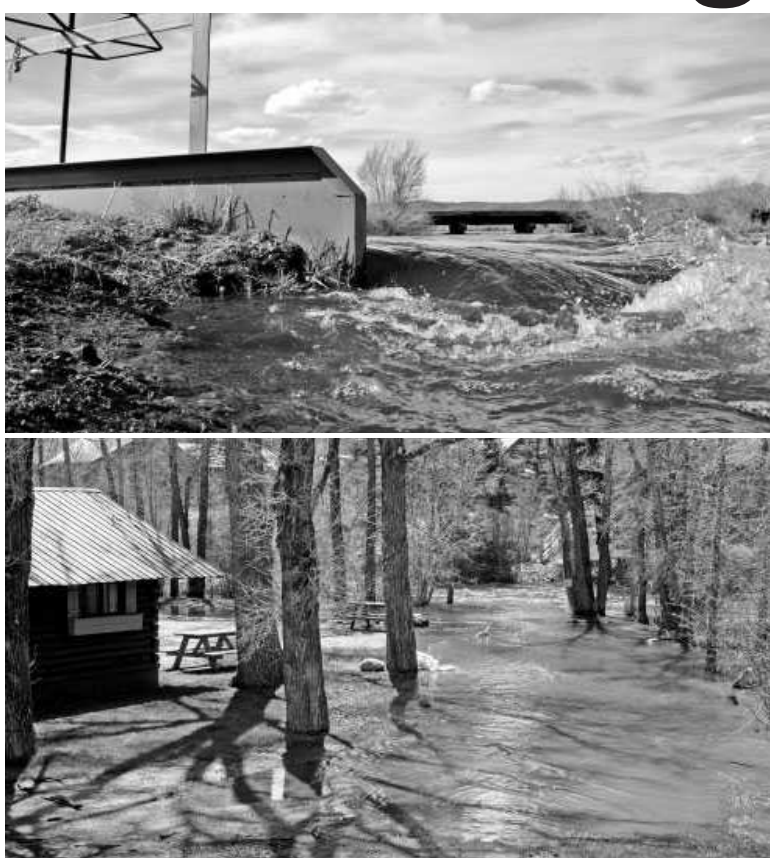
"But a flood event has to happen and the local government must declare flood conditions for the area, and the house has to be threatened to get that money," says Morrill.

For more information on that reimbursement program, people can contact the county office at 641-0248.

[Back]

Crested Butte News, P.O. Box 369, Crested Butte, CO 81224
Phone: (970) 349-0500 - FAX: (970) 349-9876:

Flood warning



Water levels are reaching their limits around the Gunnison Valley, as warmer weather has opened up the proverbial flood gates. Above, water is nearly overflowing at this headgate located on Tomichi Creek just east of the Gunnison Airport. Seen on the bottom, water invades grounds of the Almont Resort cabins.

Photos by Matt Smith and Chris Rourke

Larger peak expected in late June

Michelle Burkhart
Times Staff Writer

A sudden shift towards warmer temperatures last weekend resulted in the National Weather Service placing a flood warning on the East River near Almont, as of Tuesday.

Gunnison County Emergency Manager Scott Morrill said the county realized late last week that flooding was likely on the horizon and went into action.

"We knew this was coming Friday afternoon, so we did a reverse 911 call at that point telling people to be aware," he explained Tuesday afternoon.

By Wednesday afternoon, Morrill said the National Weather Service had lowered its projections for flooding. While it still had a flood warning in effect for the East River, it decreased its predictions for peak flow from 3,400 cubic feet per second (cfs) to around 3,100 cfs. However, he noted that some forecasting centers were still saying that 3,400 cfs was possible.

According to Upper Gunnison River Water Conservancy District Manager Frank Kugel, flood stage at Almont occurs at 3,120 cfs.

For comparison's sake, Kugel also noted that the East River peaked at nearly 3,700 cfs in 1984 and approximately 3,500 cfs in 1957.

Water watchers, however, warn that this peak on the East River is likely to be the first — and the smaller — of two peaks on the river.

Kugel explained that the real peak is likely to happen in late June, when the snow at higher elevations is anticipated to come off.

According to Morrill, most of the homes in the Almont area are relatively high and only a couple of homes are at risk during the high waters expected this week.

He believes the roads and the East River bridge in the Almont area are also high enough to be in the safe zone, but that driveways in the area may be inundated with water.

During a fly-over Tuesday morning, he said some ranch driveways were already becoming swamped.

Morrill cautioned that boaters should take extreme caution with the high waters, because there is lots of debris in the water and dangerous snags could quickly develop with trees falling into the river.

Bridges could also be difficult to maneuver, he said, noting that as of Monday, boaters would need to lie down to make it under the bridge on the Gunnison River, directly south of the Lost Canyon Resort.

He cautioned boaters to "pay attention, listen and be aware."

"The water is running quicker than it has for a long time and it's pretty easy to get caught off guard on this stuff," he said.

The Gunnison River and Tomichi Creek may soon lead to flooding issues at Dos Rios Golf Course, as well.

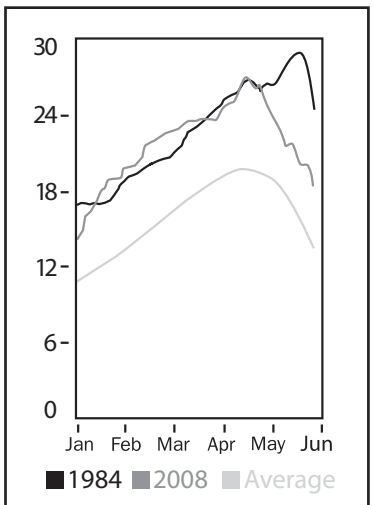
High waters may eventually lead to portions of the golf course being closed, according to golf course general manager Tom Carricato.

While Carricato is concerned, he is also thankful he spent $10,000 on flood insurance.

On Wednesday, the Bureau of Reclamation (BOR) started "ramping releases up from all reservoirs in the Aspinall Unit," according to Dan Crabtree with the BOR.

That morning, he also noted that the Crystal Reservoir was at a level that it would start to spill sometime that day.

(Michelle Burkhart can be contacted at 970-641-1414 or michelle@gunnisontimes.com)



Snow tracker

Since this could result in a record breaking year for snowpack, the *Gunnison Country Times* is running a weekly graph to track how 2008 stacks up against the average snowpack in the basin and other record years. The snow water equivalent is expressed in inches on the vertical axis of the graph.

Water board seeks new reps

Michelle Burkhart
Times Staff Writer

The Upper Gunnison River Water Conservancy District (UGRWCD) is on the hunt for two new board members for the organization, which acts as a watchdog in protecting water of the Upper Gunnison Basin.

At the district's board meeting Monday night, board members Diane Lothamer and Bob Drexel noted that that would be their last meeting.

Drexel has served on the board for 12 years, including a four-year term as board president from 2003 to 2007, and is currently serving as the board secretary. Lothamer, is currently serving as the treasurer, and has been on the board for 14 years.

The two will continue to serve as board members until the board's annual meeting next month.

In the meantime, the UGRWCD hopes to find new board members who are knowledgeable in water matters. The new board members must also be residents of the City of Gunnison for at least one year and own real property in the district.

Interested citizens must send a letter of interest by this Friday, May 23, to the attention of District Judge Steven Patrick at 200 E. Virginia Ave., Gunnison CO 81230. The letter should specify the applicant's knowledge in water matters and residency eligibility.

(Michelle Burkhart can be contacted at 970.641.1414 or michelle@gunnisontimes.com)

APPENDIX C.3

ROUTT COUNTY

U.S. Geological Survey crews check their measuring equipment on the Elk River Wednesday morning on Routt County Road 42. The Elk River was measured at an all-time high flood level Wednesday. Enlarge photo Steamboat Springs Civil Air Patrol/Courtesy

Elk River at record level

Vale: Runoff higher than all of the locals have ever seen

By Melinda Dudley (Contact)

Overflow from the Elk River near U.S. Highway 40 and Routt County Road 44 overtakes fields at Saddle Mountain Ranch, top, and neighboring residences Wednesday. Members of the Steamboat Springs Civil Air Patrol surveyed the area Wednesday. (Steamboat Springs Civil Air Patrol/Courtesy)

STEAMBOAT SPRINGS — High water continued to encroach upon houses near the confluence of the Elk and Yampa rivers Wednesday, as the Elk River reached its highest level ever recorded.

"We're at a flood of record," Routt County Emergency Management Director Chuck Vale said. "You're seeing river and creek runoff higher than all of the locals have ever seen."

The Elk River was measured at 7.8 feet at 7:15 a.m. Wednesday, well above flood stage, which begins at 7 feet. This current crest of high water, which began Monday, has bested by more than a foot the previous record of 6.7 feet recorded May 20, 2000, according to the National Weather Service.

The river not only is running higher than any other recorded level since record keeping began in the early 20th century, its flow was measured at 7,100 cubic feet per second Thursday morning, which Vale called "incredibly fast."

Water stands in the yard of a home Wednesday morning along the Elk River near Mad Creek. During the early morning hours this week, water from the river has flowed over the banks and flooded the yards of numerous homes. Photo by Matt Stensland

The numbers were so staggering that the U.S. Geological Survey sent officials to Routt County on Thursday morning to ensure its measuring equipment was functioning properly and that nothing was amiss with its gauges near Milner.

"Of course, it was right," Vale said of the measuring equipment. "It's the heavy snowpack you have on the upper part of the Elk River, which we've known about all winter."

A National Weather Service flood warning remains in effect until tonight for the Elk River, though the river is expected to fall below flood stage this afternoon.

Sandbag parties are happening up and down the river, with neighbors helping neighbors to move furniture and fill sandbags, Vale said. About 7,000 sandbags had been distributed as of Tuesday, with more being filled Wednesday and additional deliveries planned for the Seedhouse Road area in northern Routt County.

Rapid snowmelt damaged Seedhouse Road on Monday night, causing the road to slough off in several places between Elk River Guest Ranch and Vista Verde Guest Ranch.

Seedhouse Road remains passable, though 10.2 miles of Routt County Road 129 was closed to all through and commercial traffic Wednesday from Columbine north to 3 Forks Ranch, because of poor road conditions. Local and emergency traffic still will be permitted

on the affected stretch of C.R. 129.

About 20 homes and parcels of property in Routt County have been affected by this most recent bout of high water.

“Again, we don’t have any water in houses, but people are being proactive and protecting themselves,” Vale said. “Everybody’s doing OK. We had only one family that we were worried about, and they’ve chosen to stay put — and that’s their choice.”

Cooler temperatures this weekend will hopefully allow the snowpack to “settle” a bit, Vale said.

Although the National Weather Service predicted a 50 percent chance of thunderstorms this afternoon, daytime highs are expected to be no higher than the mid-60s for the next week.

“Then, we’re going to enter another warming trend, and we’ll be back at high water again,” he said.

Railroad officials and the Colorado Department of Transportation have been checking their infrastructure constantly, especially the U.S. Highway 40 bridge that crosses the east fork of the Elk River just above its confluence with the Yampa River.

“The problem we’ll have is debris. If a tree gets in the way, we’ve got a huge issue,” Vale said.

From May 15 to June 15 each year, CDOT crews are required to check all bridges daily and remove any debris that impedes water flow or threatens structures, spokesman Bob Wilson said.

No problems have been reported on U.S. 40 in Routt County, Wilson said Wednesday.

Community comments

Note: The Steamboat Pilot & Today doesn't necessarily condone the comments here, nor does it review every post. Read our full policy.

(Requires free registration) Post a comment

Username:

Password:

(Forgotten your password?)

Comment:

Preview comment

Steamboat Springs Assistant Fire Chief Bob Struble drives his truck Thursday morning through a water-covered section of Routt County Road 44 where it intersects U.S. Highway 40 west of Steamboat Springs. Enlarge photo — Photo by Matt Stensland

Swollen Elk River receding

Yampa up next; melt-off also causing rural road problems

By Melinda Dudley (Contact)

Water flows across a driveway Thursday morning leading to a ranch along Routt County Road 44. Photo by Matt Stensland

WEST ROUTT — Although still above flood stage, the swollen waters of the Elk River are expected to recede this weekend along with temperatures, bringing relief to residents near the Elk's confluence with the Yampa River. The area of the confluence has been flooded to varying degrees since Monday because of the record flows.

But local officials warn that Routt County isn't out of trouble yet. Even as the Elk recedes, the Yampa River could overflow its banks as early as Monday, Routt County Emergency Management Director Chuck Vale said.

Because of Thursday's rain and melting snow, a National Weather Service flood advisory is in effect for Routt County until 8:45 a.m. today. Small creeks and streams across the county are running at or above their banks, and flooding of adjacent land is likely, according to the advisory. A flood warning for the Elk River near Milner was due to expire late Thursday.

The Elk River was measured at 7.8 feet at 7:15 a.m. Wednesday, well above flood stage, which begins at 7 feet. The Elk River measured at 7.78 feet about 6 a.m. Thursday but had dropped to 7.32 feet by the afternoon. The river was flowing at 5,690 cubic feet per second at 3:15 p.m. Thursday, down from 7,100 cfs the previous day.

"This is what good skiing turns into, apparently," Vale said.

Similar conditions are causing concern in Baggs, Wyo., which serves as the drainage for the other side of the snowpack.

Railroad officials and the Colorado Department of Transportation have been monitoring their respective bridges over the Elk River, Vale said. The railroad's bridge, which has multiple abutments, is a particular concern because large debris can easily be caught underneath it, he said.

As the Elk River drops out of immediate concern due to cooler weather this weekend, the Yampa River seems primed to take its place.

"Now it's starting to grow all across the county. The Yampa was up this morning, and it's been gradually increasing day by day," Vale said Thursday. Vale expects Steamboat Springs to begin experiencing high water conditions at low-lying areas along the Yampa

River early next week, including the area near Walton Creek Road and Dream Island Mobile Home Park.

Some riverside residents of Dream Island had preemptively sandbagged the banks of the Yampa on Thursday. The Yampa River Core Trail was closed under the 13th Street Bridge, as its pathway already was underwater with the river expected to continue rising.

Discharge for the Yampa River measured at 3,130 cfs at 9:15 a.m. Thursday, well above May 22's historical average of 2,060 cfs, but also significantly below the fastest recorded flow of 4,300 cfs on May 22, 1984. The Yampa's flow was hovering near 1,000 cfs only a week ago, according to the USGS.

No significant property damage has been reported because of high water in Routt County, and water has not entered any structures, Vale said.

High water on the Yampa in Steamboat likely will continue on to West Routt County.

"If (the Elk River) stays high next week, since the Yampa will come up more, we're going to have bigger problems," Vale said.

Road damage

Routt County Road 129 remains closed to through and commercial traffic for 10.2 miles in North Routt County. Local traffic still is permitted on the affected stretch of road from Columbine north to 3 Forks Ranch.

Water flowing over C.R. 129 in four or five places left gullies "big enough to swallow your Subaru," Routt County Road and Bridge Director Paul Draper said. Traffic will be restricted on C.R. 129 at least through the weekend, Draper said.

When the county experienced high water in 1997, there was 20 inches of water on C.R. 42 adjacent to the Elk River, Vale said. Although the river was well out of its banks Thursday, C.R. 42 remained dry.

Six to 8 inches of water, however, was flowing across C.R. 44 just north of its intersection with U.S. Highway 40. C.R. 44 remains navigable — cars were cautiously fording the roadway Thursday morning.

Some repairs were done Thursday to C.R. 76, known as Cog Road, which slides each spring and has been crumbling more significantly than usual since early May.

"As of this morning, there was still one solid lane," Draper said Thursday.

Road and Bridge crews also are closely watching slide areas on C.R. 25 just outside Oak Creek and monitoring a bridge on C.R. 67 south of Hayden, which may have weight restrictions placed on it today, Draper said.

"I think it's just getting started," Draper said.

Community comments

Note: The Steamboat Pilot & Today doesn't necessarily condone the comments here, nor does it review every post. Read our full policy.

mtnspring (anonymous)
May 23, 2008 at 5:42 a.m. (Suggest removal)

My family which also consists of two pregnant young ladies in a small convertible, are coming to Steamboat for the weekend from Grand Junction. Needless to say I am worried about the flooding conditions. I've called State Patrol and they said they should be ok. I would like to know from the residents of Steamboat of what you think about their travels. I worked at Gofers and the Iron Horse Inn there, on and off for 5 years so I know how the Yampa can get in the spring seasons. . Please tell me what you think..
A concerned Mom

lovemysteamboat (anonymous)
May 23, 2008 at 6:12 a.m. (Suggest removal)

Dear Mtnspring:
Come on up an enjoy how green and beautiful it is right now. You would not be able to walk the whole core trail along the river due to a few spots of high water but all of the other activities I can imagine your family doing is safe and on high ground. If you haven't booked lodging yet, you could always pick a ski area property or a motel which you know isn't along the river for your piece of mind. The convertable and the experience will be fun.

weststmbtres (anonymous)
May 23, 2008 at 9:25 a.m. (Suggest removal)

I wouldn't worry mtnspring. Unless they are trying to go north to Steamboat Lake they shouldn't have a bit of trouble. Hwy 131 and US 40 are both clear and dry and wouldn't pose any danger. High water won't affect their activities in downtown Steamboat other than a few spots on the core trail.

katrinkakelly (anonymous)
May 23, 2008 at 10:15 a.m. (Suggest removal)

Oh Wilton get you oars out on 44! You be swimmin!

SPARKY!

(Requires free registration) Post a comment

Username:

Password:

(Forgotten your password?)

Comment:

Preview comment

9NEWS.com **Printer-Friendly Story**

Waters recede after rivers overflow banks near Steamboat

posted by: **Jeffrey Wolf** , Web Producer

created: 5/22/2008 2:38:03 PM
Last updated: 5/22/2008 2:40:36 PM

VIEW SLIDESHOW

STEAMBOAT SPRINGS – Water levels were dropping in Routt County on Thursday, but residents were still putting sandbags around their homes due to flooding from two rivers there.

On Wednesday, the Elk and Yampa Rivers reached their highest water levels ever recorded due to warm weather melting the above average snowpack.

Flying overhead, the Civil Air Patrol took several picture that showed rivers causing minor flooding in many yards, forcing homeowners to sandbag around their houses.

Routt County Emergency Manager Chuck Vale says cooler weather has dropped water levels for now, but says they could see more flooding next week when warm weather returns.

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FLOOD DOCUMENTATION REPORT – CHAPTER 2

FLOODING ALONG THE GUNNISON RIVER IN DELTA, CO
MAY 22, 2008

I. INTRODUCTION/SUMMARY

On May 22, 2008 minor flooding occurred along the Gunnison River in Delta, Colorado. This flooding was the result of rapid snowmelt of a higher than average snowpack in the contributing watershed (estimated by the Intermountain West Climate Summary as being 130-149 percent of average for the month of May) in combination with flows being released through the Black Canyon by the operation of the Aspinall Unit (Blue Mesa Dam, Morrow Point Dam, and Crystal Dam).

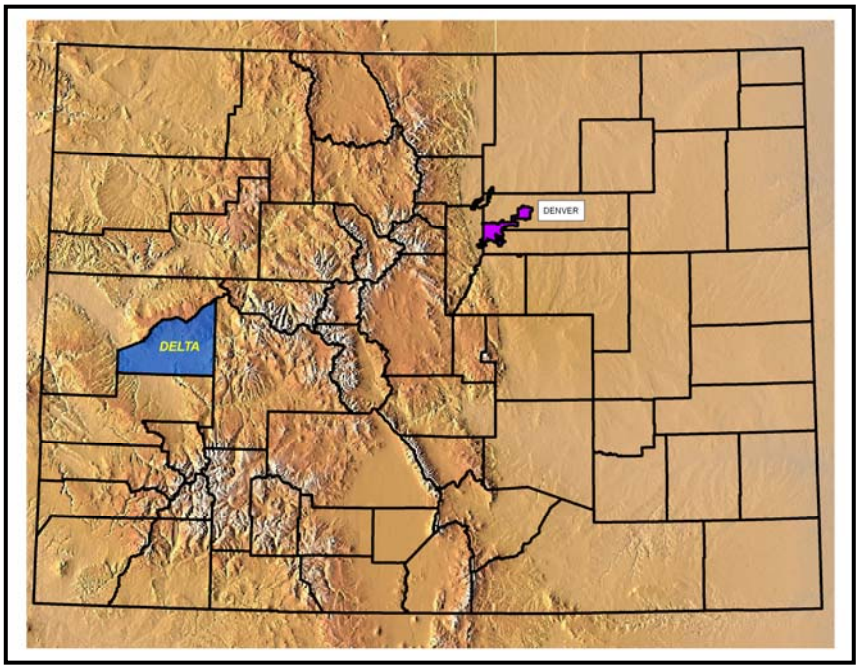

Figure 1. Location Map

According to a letter prepared by representatives of the City of Delta, flows within the Gunnison River in Delta exceeded 12,000 cfs during the flooding event. The letter further explains that during the time frame of the flooding event, between 6,500 and 7,500 cfs was being released through the Black Canyon by the operation of the Aspinall Unit.

Damages in and around the City of Delta were limited to land erosion, trail inundation and a walkway that was washed out. No injuries or deaths were reported from this flooding event and there were no reports of interruption in utility services. However, representatives of Delta indicated that things could have been worse had there been a spike in temperatures (additional snowmelt runoff) or if large trees had been swept into either the Highway 50 Bridge or the County Road Bridge, west of the City.

II. LOCATION AND WATERSHED DESCRIPTION

The City of Delta is located in western Colorado, between Grand Junction and Montrose at the confluence of the Uncompahgre River and Gunnison River. The Gunnison River gage at Delta (USGS Station 09144250) is located in Confluence Park on the left bank, 0.7 miles downstream from the Highway 50 Bridge at the edge of Delta. This gage is located upstream of the Gunnison River/Uncompahgre River confluence.

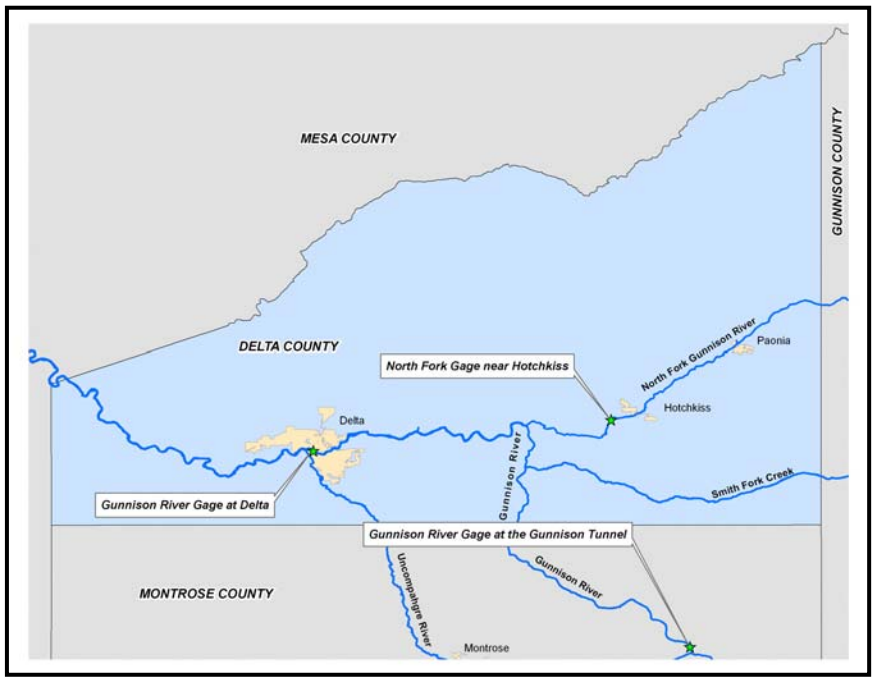

Figure 2. Gage Location Map, Gunnison River

The drainage area for the Gunnison River gage at Delta is 5,628 square miles. Flows tributary to the Gunnison River in Delta originate primarily from the North Fork of the Gunnison River and from the Aspinall Unit. Flows are also contributed from Smith Fork, which confluences with the Gunnison River upstream of the Gunnison River/North Fork confluence.

Two other gages located further up in the watershed were also queried as part of this study in order to identify the magnitude of flow from the major contributing sources. The first of these USGS gages is located on the Gunnison River below the Gunnison Tunnel (Station 09128000). Specifically, this gage is located 0.4 miles downstream of the east portal of the Gunnison Tunnel, 4.7 miles downstream of Crystal Creek and 12 miles northeast of Montrose. This gage has a drainage area of 3,965 square miles and primarily represents releases from the Aspinall Unit. The second gage is located on the North Fork Gunnison River below Leroux Creek, near Hotchkiss (Station 09135950). Specifically, this gage is located 0.7 miles downstream of Leroux Creek, 1 mile southwest of Hotchkiss and has a drainage area of 922 square miles. This gage represents the majority of the North Fork watershed that contributes runoff to the Gunnison River.

III. FLOODING EVENT HYDRAULIC INFORMATION

On the morning of May 22, 2008 the USGS Gage on the Gunnison River in Delta (Station 09144250) recorded a peak discharge of 14,000 cfs, which corresponds to a gage height of 9.42 feet. At this same time, the Gunnison River gage at the Gunnison Tunnel indicated a release of approximately 6,000 cfs from the Aspinall Unit; while the North Fork Gunnison River gage near Hotchkiss indicated a range of discharges from 5,600-5,700 cfs. It is assumed that the remaining discharge of approximately 2,300-2,400 cfs was contributed by a combination of the Smith Fork (no gage information) and the downstream drainage areas along the two major watercourses not covered by either the Gunnison River Gage at the Gunnison Tunnel, or the North Fork Gage near Hotchkiss.

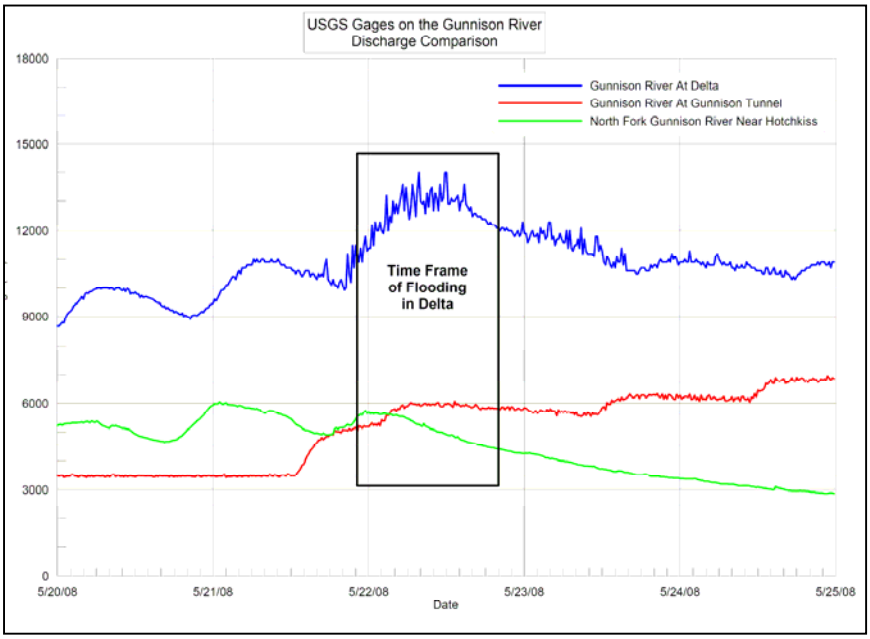

Figure 3. Gunnison River Discharges for May 20-May 24, 2008

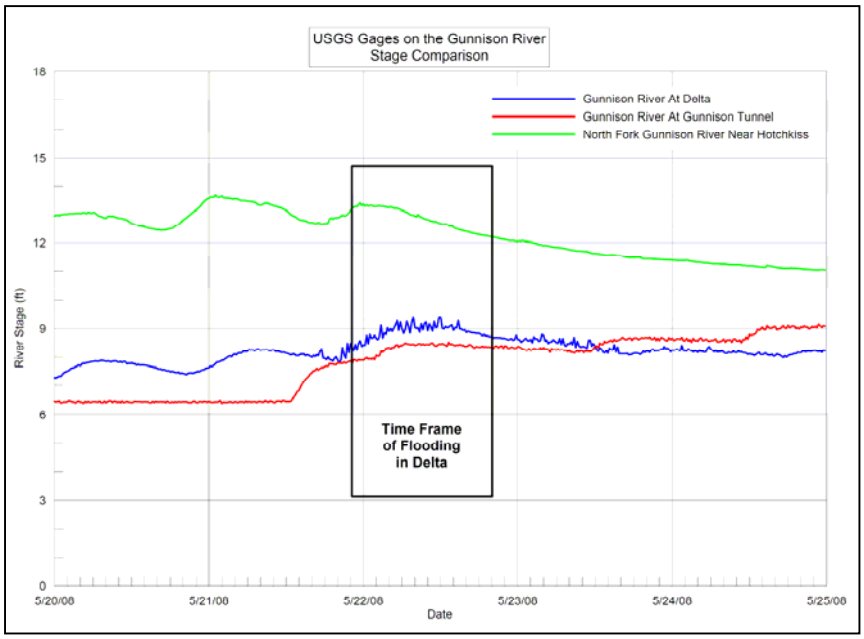

Figure 4. Gunnison River Stages for May 20-May 24, 2008

IV. FLOODED AREA DESCRIPTION/AREAS OF INUNDATION

Damages from this flooding event in and around the City of Delta included: (a) erosion to a berm on the south side of the river; (b) inundation of a private lake east of the Highway 50 Bridge; (c) inundation of trails in the northwesterly part of Confluence Park; and (d) inundation of portions of the Four Seasons property, including the washout of a walkway. The Gunnison River also came close to overtopping the bank at Delta Hardware, and threatened a farm implement dealer east of the Highway 50 Bridge.

V. ESTIMATED FLOOD DAMAGES

According to correspondence from the Delta County Emergency Manager, as of June 13 the water levels were still high enough such that the remedial and repair work had not taken place. Consequently, no damage estimates have been prepared for the City of Delta for the May 22nd flooding event.

VI. FLOOD HAZARD MITIGATION

According to the USGS, flood stage at the Gunnison River gage in Delta occurs at 12 feet, which corresponds to 17,000 cfs. Representatives for the City of Delta indicate that this may be flood stage at the gage itself, but other low lying areas within the City would be inundated at a lower stage. The City of Delta has indicated that the true flood risk for this particular gage should be lowered to 9.0 feet, which corresponds to 12,900 cfs. This is in reasonably close agreement with the condition experienced in Delta on May 22nd, which occurred at a peak discharge of 14,000 cfs, and corresponds to a gage height of 9.42 feet.

APPENDIX A

COORDINATION

Aaron Hansen

From: Rob Fiedler [rfiedler@deltacounty.com]
Sent: Friday, June 13, 2008 2:58 PM
To: Aaron Hansen
Subject: RE: Flooding along the Gunnison River in Delta

Aaron,

What you say is essentially true, however, I'm not aware of any costs associated with clean up or repair. In most cases water levels are still high enough that remedial and repair work has not taken place.

You might want to contact Jim Hatheway director of public works for the city Delta as they had some trail closures' that might have incurred some costs.

jim.hatheway@delta-co.gov.

Rob

Becareful what you pray for, your prayers may be answered.

From: Aaron Hansen [mailto:amhansen@acewater.com]
Sent: Friday, June 13, 2008 8:57 AM
To: Rob Fiedler
Subject: Flooding along the Gunnison River in Delta

Mr. Fiedler,

My name is Aaron Hansen with Anderson Consulting Engineers, Inc. and we are under contract with the Colorado Water Conservation Board (CWCB) to track any flood related damages to structures for the State of Colorado. We got word from the CWCB that back in the week of May 19th there was some damage along the Gunnison River, in and around Delta. The reports that we got indicated that no inhabited structures were damaged but there were some land erosion, trail inundation, and debris accumulation (please correct me if I'm wrong). It appears that the flooding was a combination of increased snowmelt runoff in combination with flows being released from Blue Mesa Reservoir. Consequently, the CWCB and the Bureau of Reclamation would like to document this event in hopes that this situation may be avoided in the future. Therefore I was wondering if you could provide us with any additional information/documentation associated with the flooding along the Gunnison River during this time frame, especially any damage related costs for cleanup and repair. With this information we will prepare a report documenting the flooding event and the resulting costs.

If this information is not available to you and you happen to know of someone else I could contact, I would greatly appreciate it if you could forward that information to me. Also, if you have any questions please feel free to contact me directly.

Thank you for all your help!
Sincerely,
Aaron Hansen

Aaron M. Hansen, P.E., CFM
Senior Engineer

Anderson Consulting Engineers, Inc.
772 Whalers Way, Suite 200

Fort Collins, Colorado

(970) 226-0120 Work, (970) 226-0121 Fax
amhansen@acewater.com www.acewater.com

Aaron Hansen

From: Steve Glammeyer [steve.glammeyer@delta-co.gov]
Sent: Monday, June 16, 2008 9:31 AM
To: Aaron Hansen
Cc: Hatheway, Jim
Subject: Flooding issues with Delta

Aaron,

Jim Hatheway forwarded your email to him about the flooding experienced in Delta this spring. Most of your answers can be found in a letter written to Randy Seaholm at the CWCB by our special counsel Jim Brown. That letter was dated 6/11/08 and was sent to him via email.

I hope this helps.

Steve Glammeyer, P.E.
Assistant City Manager
City of Delta
360 Main St.
Delta, CO 81416
(970) 874-7566 x229
(970) 874-8776 fax

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James D. Brown
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A. Allen Brown (1904-1983)

Marc Stimpert †
(brownlawmarc@acsol.net)

Telephone 970-874-4451
Fax 970-874-7433

†*Admitted in Wyoming and Oklahoma*

June 11, 2008

Dan Crabtree
Bureau of Reclamation
2764 Compass Dr.
Grand Junction, CO 81506

Re: City of Delta - 2008 flood report

Dear Dan:

This responds to your email message of May 30, 2008, regarding the flood damage at Delta. First, let me indicate that the City very much appreciates the cooperation it continues to receive in communicating with the Bureau of Reclamation in times of high water. On May 22, 2008, the Delta City Manager, Lanny Sloan, reported to you that some citizens of Delta were experiencing problems as a result of high flows in the River after flows briefly exceeded 12,000 c.f.s. at Delta. Thereafter, flows stabilized for a period of about 10 days fluctuating in a range between 10,000 and 12,000 c.f.s. at Delta. Accordingly, we appreciate the Bureau's efforts in protecting the City.

Your message indicated that flows between 6,500 to 7,500 c.f.s. were sent through the Black Canyon during the several days preceding your message with "no major property damage ... reported from the Delta area." It is correct that we did not experience damage to buildings this year. However, flood flows did enter and exit a small private lake east of the Highway 50 bridge over the night of May 21 and morning of the 22nd, just as flows from the Aspinall Unit were ramping up in the expectation that the North Fork flows were declining. The water also damaged a berm on the south side of the river east of the bridge. Water inundated trails in the northwesterly part of Confluence Park owned by the City of Delta. Water rose above the parking lot drain near Delta Hardware and Big O Tire requiring the closing of a back-flow prevention valve. Still, the river came close to overtopping the bank at Delta Hardware. Lands of a farm implement dealer east of the Highway 50 bridge were threatened, but not flooded this year. Improvements on commercial properties north of the river (Riverwood Inn and Four Seasons River Inn and RV Park) were not injured, although some portions of the Four Seasons property were inundated briefly and a walkway was washed out.

While it may be true that no buildings were affected, the City believes that flows of 12,000 c.f.s. at Delta are the maximum flows which should be intentionally created by the operation of the Aspinall Unit, whether for Black Canyon peak flows, endangered species flows at Whitewater, or any other Federal purpose. During the recent event in which the Bureau pursued a goal of creating flows at Whitewater of 14,000 c.f.s., the river at Delta was certainly bank full and spilling in some low lying areas as noted above. We were fortunate in the recent runoff that temperatures varied and there were no significant new precipitation events. A spike in temperatures or a heavy rain on top of the Aspinall Unit flows would definitely have caused substantial damage in the City. We are also fortunate that no large trees were swept into the Highway 50 bridge or the County road bridge west of the City.

We think it should be pointed out that the U.S.G.S. gage is located at one of the higher spots on the river bank within the Delta City limits. It may be true that flood stage <u>at the gage</u> may be 12 feet on the staff or as much as 17,000 c.f.s.; but water will definitely leave the river in lower lying areas flooding commercial properties as occurred in 1984 and 1995 well before reaching 12 feet at the gage. I have confirmed with Joe Sullivan of USGS that the gage is placed on higher ground precisely so that it will measure flood waters. We wish to be clear that the City does not accept the U.S.G.S. flood stage number of 12 feet as anything other than the point at which water would leave the river at the gage and it must be appropriately discounted to 9.0 feet in order to measure the true flood risk for the City of Delta at lower lying places both upstream and downstream from the gage.

The City feels that the Bureau's releases from the Aspinall Unit this year made a good test of the river's capacity at Delta, at least in its current configuration. The City intends to maintain its vigilance in the exercise of any Federal water rights and the operation of the Aspinall Unit in order to protect its citizens and their property from man-made flood damage. We appreciate the efforts of the Bureau to avoid flood damage in our City having been assured that flood control remains the Bureau's primary goal after maintaining the safety of the dams in the Aspinall Unit. However, the City also sees increasing risk of man-made flooding from the proposed peak flows for the Black Canyon and ESA flows at Whitewater. With these developments, we hope that the Bureau will remain objective and cautious in its operation of the Aspinall Unit in pursuit of the overriding purpose of flood control.

If you have any questions concerning the City's concerns in this matter, please feel free to contact me.

Very truly yours,

By:_____
James D. Brown, Special Counsel for
the City of Delta

JDB:j
cc: Lanny Sloan, Delta City Manager
Steve Glammeyer, Assistant Delta City Manager
Randy Seaholm, CWCB
Delta County Commissioners

APPENDIX B

CONTACTS

Rob Fiedler
Director/Coordinator Delta Co Emergency Preparedness
P.O. Box 172
Delta, CO 81416
(970) 874-2004
rfiedler@deltacounty.com

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Assistant City Manager
City of Delta
360 Main Street
Delta, CO 81416
(970) 874-7566 x229
Steve.glammeyer@delta-co.gov

APPENDIX C

NEWS ARTICLES

Colorado River Storage Project

Water and Power - Yesterday, Today, Tomorrow...

Wayne N. Aspinall Unit

Three dams comprise the Wayne N. Aspinall Unit on Gunnison River in western Colorado: Blue Mesa Dam, Morrow Point Dam, and Crystal Dam. These three dams and the reservoirs they impound are located within a 40-mile stretch of the river below Gunnison, Colorado. Originally named the Curecanti Unit, the name of this Colorado River Storage Project unit was changed in 1980 to honor Colorado Congressman Wayne N. Aspinall, a strong proponent of water resource development in Colorado and the western states.

Inside CRSP

- Brief History
- Benefits
- Hydropower
- Glen Canyon Unit
- Flaming Gorge Unit
- Wayne N. Aspinall Unit
- Navajo Unit
- Glen Canyon Dam Video
- CRSP 50th Home


Blue Mesa Dam


Morrow Point Dam


Crystal Dam

Facts

Blue Mesa Dam	
Location	Uppermost of the three dams
Completion date	1965
Dam type	zoned earthfill embankment
Height	390 feet
Powerplant capacity	2 units - 86 megawatts
Morrow Point Dam	
Location	12 miles downstream of Blue Mesa
Completion date	1968
Dam type	concrete thin-arch, double curvature
Height	465 feet
Powerplant capacity	2 units - 173 megawatts
Crystal Dam	
Location	6 miles downstream of Morrow Point
Completion date	1976
Dam type	concrete thin-arch, double curvature
Height	323 feet
Powerplant capacity	1 unit - 32 megawatts


Blue Mesa Dam Construction


Morrow Point Dam construction


Surveyor at Crystal Dam -1975


Highscaler at Blue Mesa - 1966

Last bucket of concrete - Morrow Point


Crystal Dam construction

Last updated: December 6, 2006

APPENDIX D

HYDRAULIC DATA

STATION.--09135950 NORTH FORK GUNNISON RIVER BELOW LEROUX CREEK, NEAR HOTCHKISS, CO

LOCATION.--Lat 38°47'18", long 107°44'21", in SW¼SW¼ sec.36, T.14 S., R.93 W., Delta County, Hydrologic Unit 14020004, on left bank 0.7 mi downstream from Leroux Creek, and 1 mi southwest of Hotchkiss.

DRAINAGE AREA.--922 mi^2.

PERIOD OF RECORD.--July 1997 to current year (seasonal records only).

GAGE.--Water-stage recorder with satellite telemetry. Elevation of gage is 5,240 ft above NGVD of 1929, from topographic map.

REMARKS.-- Natural flow of stream affected by diversions for irrigation of about 44,000 acres upstream from station. Storage in Overland Reservoir (capacity, 6,280 acre-ft) and storage in Paonia Reservoir (capacity, 18,300 acre-ft).

STATION.--09128000 GUNNISON RIVER BELOW GUNNISON TUNNEL, CO

LOCATION.--Lat 38°31'45", long 107°38'54", in NE¼NW¼ sec.10, T.49 N., R.7 W., Montrose County, Hydrologic Unit 14020002, on left bank 0.4 mi downstream from east portal of Gunnison tunnel, 4.7 mi downstream from Crystal Creek, and 12 mi northeast of Montrose.

DRAINAGE AREA.--3,965 mi^2.

PERIOD OF RECORD.--October 1903 to current year. Published as "at east portal of Gunnison tunnel" 1905-6 and as "at River portal" 1907-11. Statistical summary computed for 1911 to current year. For a complete listing of historical data available for this site, see http://waterdata.usgs.gov/co/nwis/inventory/? site_no=09128000

REVISED RECORDS.--WSP 1313: 1906(M). WSP 1733: 1918-19, 1948. WSP 2124: Drainage area. WDR CO-77-2: 1926, 1941.

GAGE.--Water-stage recorder with satellite telemetry. Datum of gage is 6,526.06 ft above NGVD of 1929. Apr. 9, 1905 to Aug. 20, 1915, nonrecording gage at site 300 ft upstream from diversion dam at east portal of Gunnison Tunnel, at different datum. Aug. 21, 1915 to Jan. 19, 1943, nonrecording gage at site 500 ft downstream from diversion dam at east portal of Gunnison Tunnel, at different datum. Jan. 20, 1943 to Sept. 30, 1956, water-stage recorder at present site at datum 1.0 ft, higher.

REMARKS.-- Natural flow of stream affected by transmountain diversions, transbasin diversion through Gunnison Tunnel for irrigation of about 75,000 acres in Uncompahgre Valley, Taylor Park Reservoir (station 09108500), Blue Mesa Reservoir (station 09124600), Morrow Point Reservoir (station 09125400), Crystal Reservoir (station 09127600), diversions for irrigation of about 63,000 acres, and return flow from irrigated areas.

STATION.--09144250 GUNNISON RIVER AT DELTA, CO

LOCATION.--Lat 38°45'11", long 108°04'40", in NW¼NW¼ sec.13, T.15 S., R.96 W., Delta County, Hydrologic Unit 14020005, in Confluence Park on left bank, 0.7 mi downstream from U.S. Highway 50 bridge at north edge of Delta.

DRAINAGE AREA.--5,628 mi^2.

PERIOD OF RECORD.--May 1976 to current year. For a complete listing of historical data available for this site, see http://waterdata.usgs.gov/co/nwis/inventory/?site_no=09144250

GAGE.--Water-stage recorder with satellite telemetry and crest-stage gage. Elevation of gage is 4,910 ft above NGVD of 1929, from topographic map. Prior to May 1976 nonrecording gage at site 0.7 mi upstream at datum 4.52 ft higher. June 1, 1976 to Mar. 19, 1998 water-stage recorder at site 0.7 mi upstream at datum 4.52 ft higher.

REMARKS.-- Natural flow of stream affected by transmountain and transbasin diversions, storage reservoirs, power developments, and many diversions for irrigation. Auxillary gage established 200 ft downstream from present site to collect streamflow data during bridge construction at principal site then in use, June 27, 1991 to September 30, 1992.

FLOOD DOCUMENTATION REPORT – CHAPTER 3

CITIES OF GREELEY AND EVANS, COLORADO
FLOOD OF AUGUST 6, 2008

I. INTRODUCTION / SUMMARY

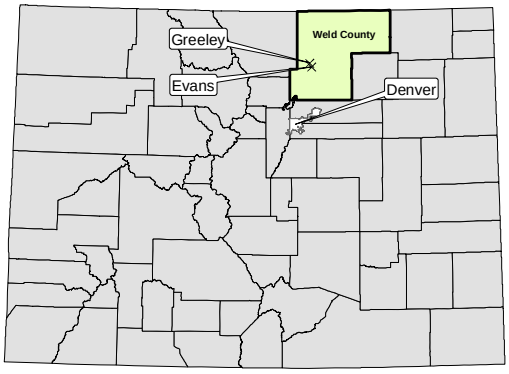


Figure 1. Location Map for the Cities of Greeley and Evans.

On the evening of August 6, 2008, a band of heavy rainfall passed through the cities of Greeley and Evans, Colorado, including adjacent areas of unincorporated Weld County. The storm, depending upon location, started generally between 6:30 p.m. and 7:30 p.m. and moved through the area in a northeast direction with the heaviest rainfall amounts exceeding 3 inches in many locations prior to 9:00 p.m. that same evening. The high intensity rainfall resulted in local flooding of many areas in Greeley and Evans. The heaviest rainfall fell on the Downtown and North Greeley Basin and the 28th Avenue Basin in east and southeast Greeley, with significant rainfall in other areas of Greeley and Evans as well.

Numerous single family homes in the central to downtown portions of the City of Greeley received flood damages primarily to basements and garages. Several businesses (including City Hall) in the downtown area received more moderate damages, with floodwater inundating many first floors. No injuries or deaths were reported, although one woman and her infant had to be rescued from their car. The flooding interrupted power to approximately 2,700 people, but was restored early the next day. Widespread street flooding hampered emergency access, and one road had to be closed due to a street-wide sinkhole. Five roads within Weld County, outside the City of Greeley, also were closed due to washouts.

The City of Evans appeared to have faired slightly better than the City of Greeley, with single-family homes along the eastern side of town receiving minor damages to landscaping and fences. Several businesses were inundated with floodwaters on their first floors. One of the local storm sewers became so overwhelmed with stormwater that a bolted manhole lid blew off.

Figure 2. Vineyard Church at 1015 9th Avenue.

II. LOCATION AND WATERSHED DESCRIPTION

The Cities of Greeley and Evans are located in west-central Weld County in northeastern Colorado, approximately 50 miles north-northeast of Denver via U.S. Highway 85. Both cities are nearly 4,700 feet above sea level and lie east of the Front Range of the Rocky Mountains, with Greeley being the largest city in Weld County. A 2006 Census Bureau estimate put the combined population of both cities at about 105,000 residents with nearly 31,000 households. U.S. Highway 85 is the main north-south transportation corridor through both cities; U.S. Highway 34 is the main east-west thoroughfare. The Cache la Poudre River runs generally from west to east through the north end of Greeley; the South Platte River runs from the southwest to the northeast directly south of Evans.

The highest intensity rainfall fell on the Downtown and North Greeley and 28th Avenue Basins; however, all of the remaining basins in the Greeley and Evans areas received significant precipitation as well. The Downtown and North Greeley Basin encompasses approximately 5 square miles of mostly residential area and significant industrial/commercial areas. The basin contributes flow along the right bank of the Cache la Poudre River. The 28th Avenue Basin lies immediately west of the Downtown and North Greeley Basin. The basin encompasses nearly 4 square miles of mostly residential areas with limited open space and commercial areas. This basin also contributes flow along the right bank of the Poudre River. Figure 3 provides a map depicting all of the drainage basins within and around the cities of Greeley and Evans.

The Cities of Greeley and Evans typically receive approximately 13 inches of precipitation annually, with slightly more than 1.1 inches of rainfall occurring during the month of August. Data obtained from the Western Regional Climate Center indicated that prior to 2008 the maximum rainfall depth on August 6th was 0.80 inches (average taken between the Greeley and Greeley UNC stations associated with the National Weather Service Cooperative Station Network (NWS/COOP); the stations provide a continuous precipitation record from 1893 to the present). The largest single day of rainfall for the month occurred on August 19, 1915 with 2.03 inches of precipitation (recorded at the Greeley NWS/COOP station). ***The Greeley UNC station reported 3.08 inches of precipitation (officially recorded on August 7, 2008), breaking the largest single day of rainfall ever recorded in Greeley for the month of August.*** Mean monthly precipitation values are presented in Figures 4 and 5 for the Greeley and UNC gages, respectively; daily maximum precipitation values are provided in Figures 6 and 7 for the Greeley and UNC gages, respectively.

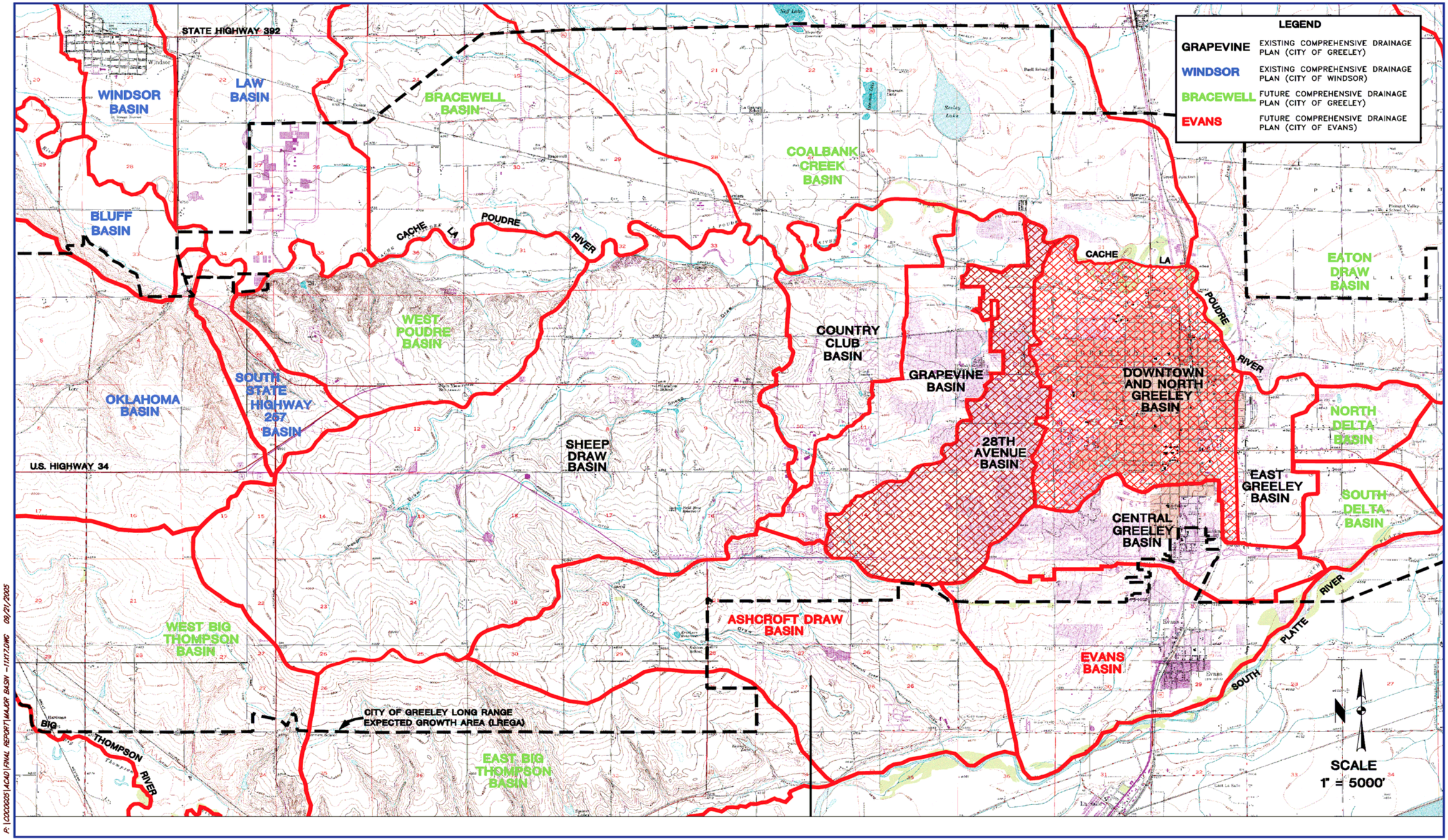


Figure 3. Cities of Greeley and Evans Drainage Basins.

GREELEY, COLORADO

POR - Monthly Average Total Precipitation

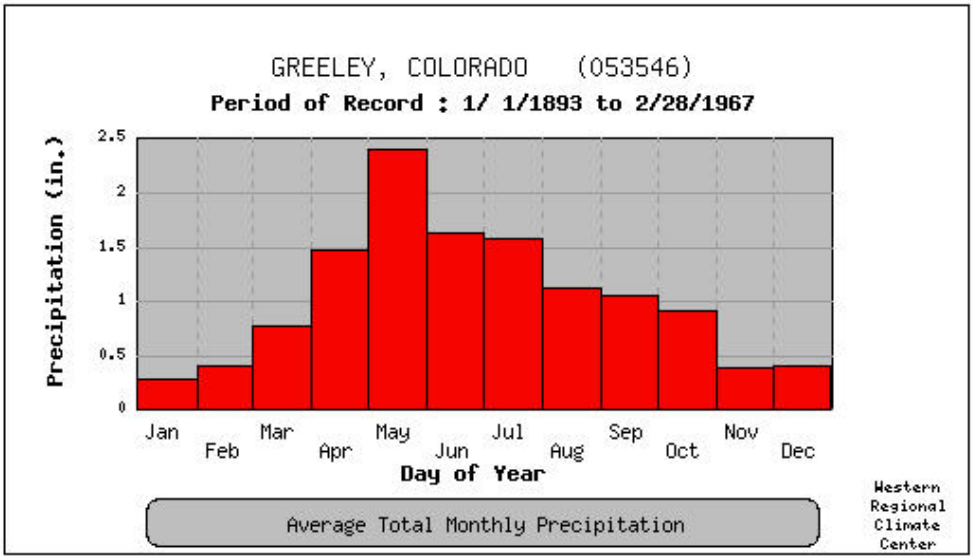


Figure 4. Mean Monthly Precipitation for the City of Greeley (Greeley gage).

GREELEY UNC, COLORADO

POR - Monthly Average Total Precipitation

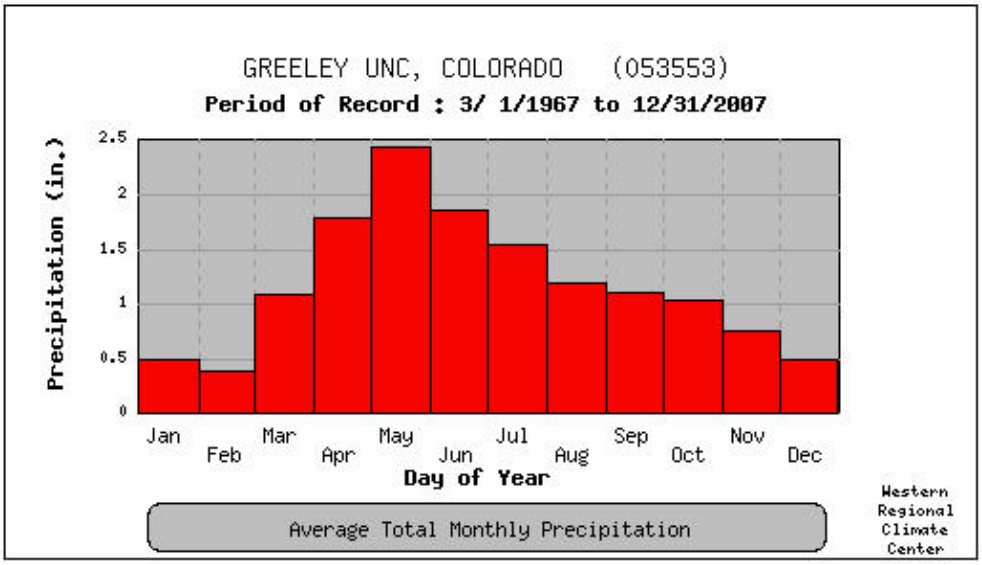


Figure 5. Mean Monthly Precipitation for the City of Greeley (UNC gage).

GREELEY, COLORADO

POR - Daily Precipitation Average and Extreme

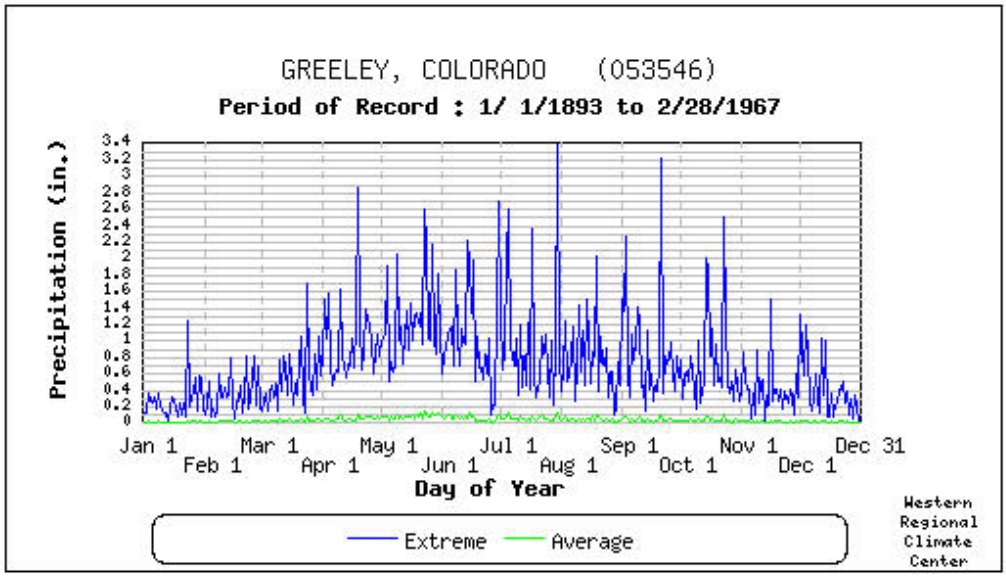


Figure 6. Daily Maximum Precipitation for the City of Greeley (UNC gage).

GREELEY UNC, COLORADO

POR - Daily Precipitation Average and Extreme

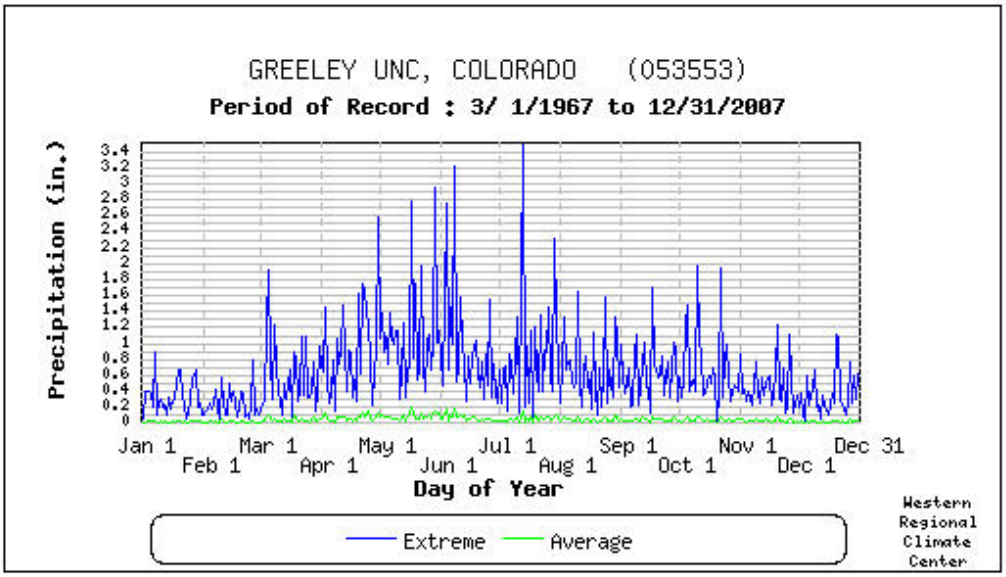


Figure 7. Daily Maximum Precipitation for the City of Greeley (UNC gage).

III. STORM CHARACTERISTICS AND RAINFALL INFORMATION

Detailed temporal rainfall data for the storm of August 6, 2008 is not readily available due to the lack of continuously recording rain gage observations in the area. However, due to a fairly extensive network of gages that supplies precipitation information from volunteers both in and around Greeley and Evans, daily precipitation values provide a reasonably good estimate of rainfall during the storm. Several of the individuals that supplied the precipitation data were carefully observing the storm and its effects immediately after the storm.

The official rain gage at the University of Northern Colorado (UNC) campus, located between downtown Greeley and Evans, is part of the NWS/COOP network of weather reporting stations. Several additional rain gages in Greeley and one in Evans as well as the surrounding area are part of the Community Collaborative Rain, Hail & Snow (CoCoRaHS) Network. The CoCoRaHS Network is a project managed by the Colorado Climate Center at Colorado State University in Fort Collins. Rainfall data for this program is provided by volunteer weather observers located across various states throughout the country.

The 24-hour precipitation recorded at the Greeley UNC station for August 6, 2008 was 3.08 inches (officially recorded on August 7, 2008). The rainfall depth eclipsed the previous averaged record of 0.80 inches and in particular the record of 0.82 inches at the Greeley station. In fact, the rainfall depth on August 6, 2008 exceeded the maximum daily rainfall for the entire month of August for the entire period of record dating back to 1893 at either station.

Several of the CoCoRaHS gages that reported values for August 6, 2008 recorded rainfall depths that were less than that recorded at the Greeley UNC station; however, five gages all located within an approximately 3 mile radius of the UNC station reported 24-hour rainfall depths in excess or equal to the UNC station. A gage approximately 2 miles north of the UNC campus reported the maximum 24-hour precipitation depth in the region of 3.35 inches. All together, seven gages (including the UNC gage) reported 24-hour precipitation depths of over 3.00 inches. Another CoCoRaHS station in the Evans area reported a rainfall depth of 2.52 inches. The downtown Greeley area, however, experienced the greatest amount of precipitation, with rainfall totals between 2.73 and 3.35 inches of rainfall.

Several reports from CoCoRaHS observers indicated that the recorded precipitation amounts at their respective stations were among the highest they had ever recorded in several years with the program. Intense precipitation reports indicated that the majority of heavy rainfall occurred between 6:30 and 8:00 p.m., with some light rain occurring later in the evening and early morning hours. Figure 8 depicts the rainfall amounts from the CoCoRaHS gages in and around the Greeley and Evans areas covering the 24-hour period beginning at 7:00 a.m. on August 6, 2008 and ending at 7:00 a.m. on August 7, 2008. This rainfall pattern is generally reflected in the NEXRAD images for the evening of August 6th. The archival images shown in Figure 9 are generally at 4-5 minute intervals. Based on these radar images, it appears that the storm peak occurred in the downtown areas of Greeley and Evans between 6:45 p.m. and 7:15 p.m. A video clip of the NEXRAD images beginning at 5:02 p.m. and ending at 9:57 p.m. Mountain Daylight time (MDT) on August 6, 2008 is provided on the CD.

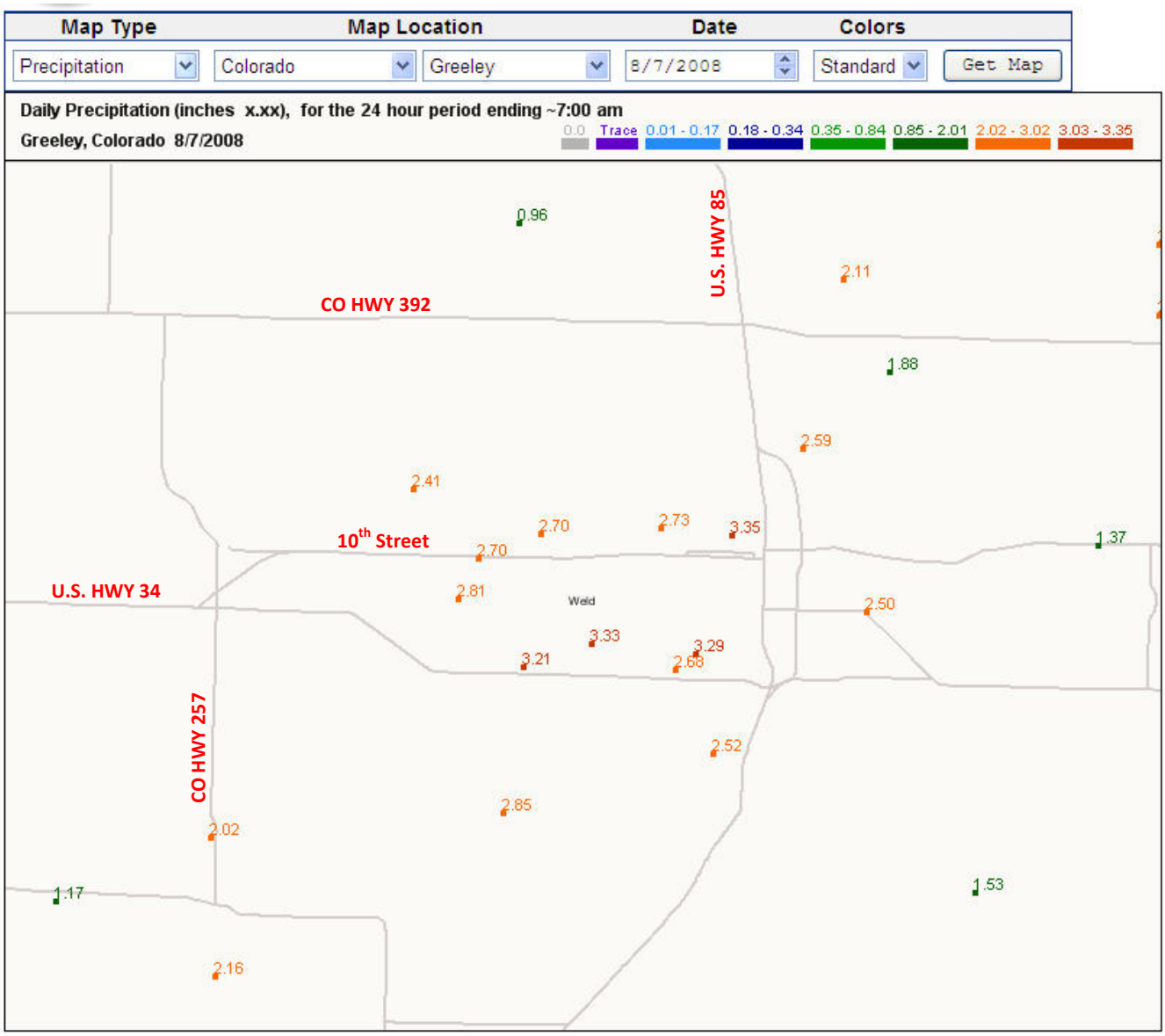
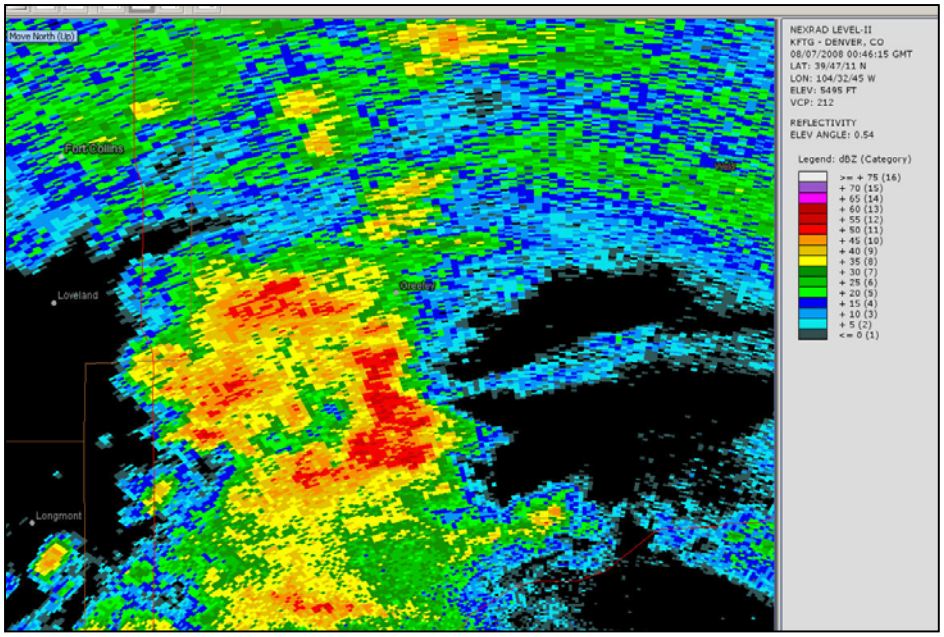


Figure 8. CoCoRaHS 24-Hour Rainfall Depths for August 7, 2008.



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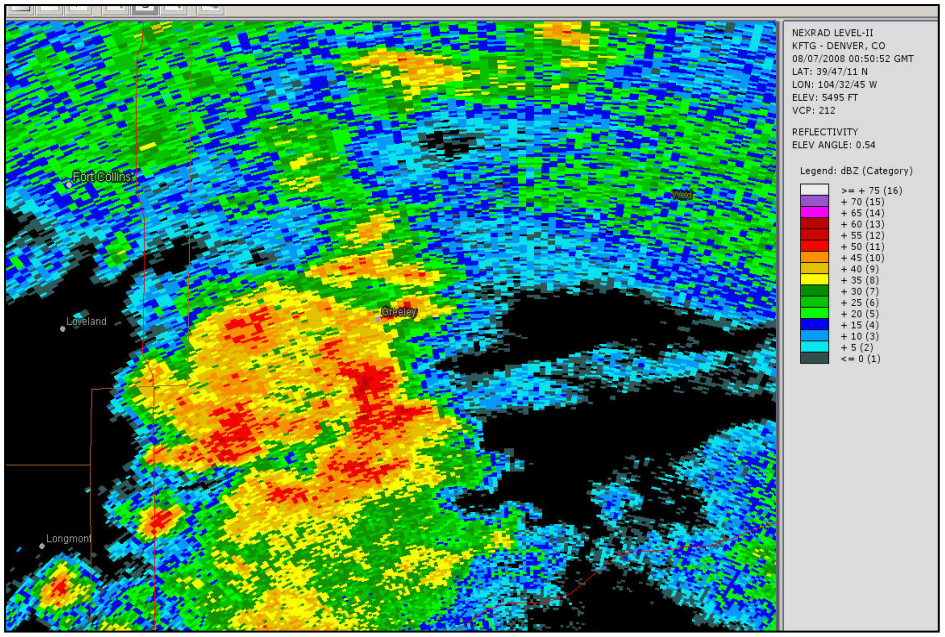

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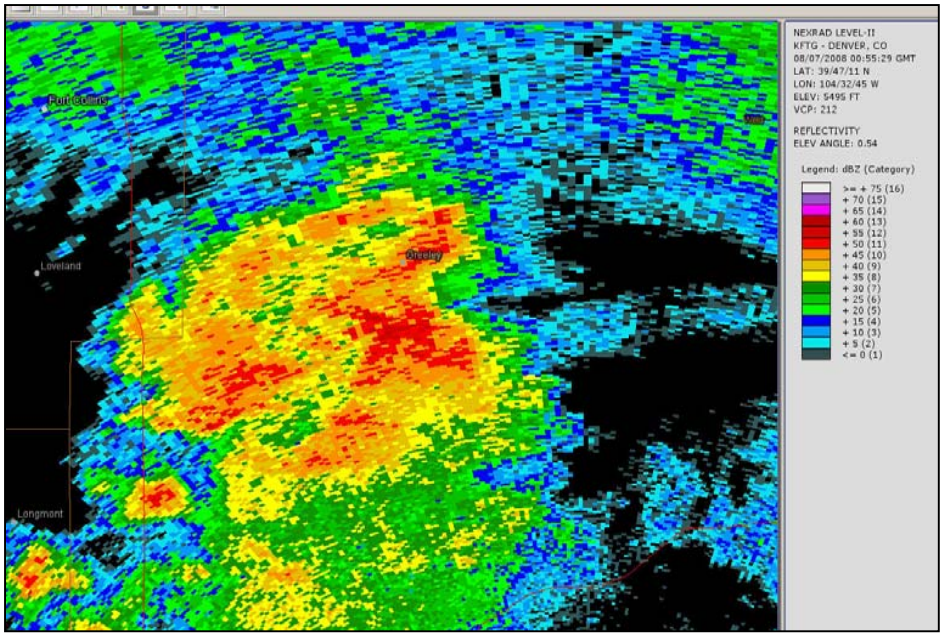
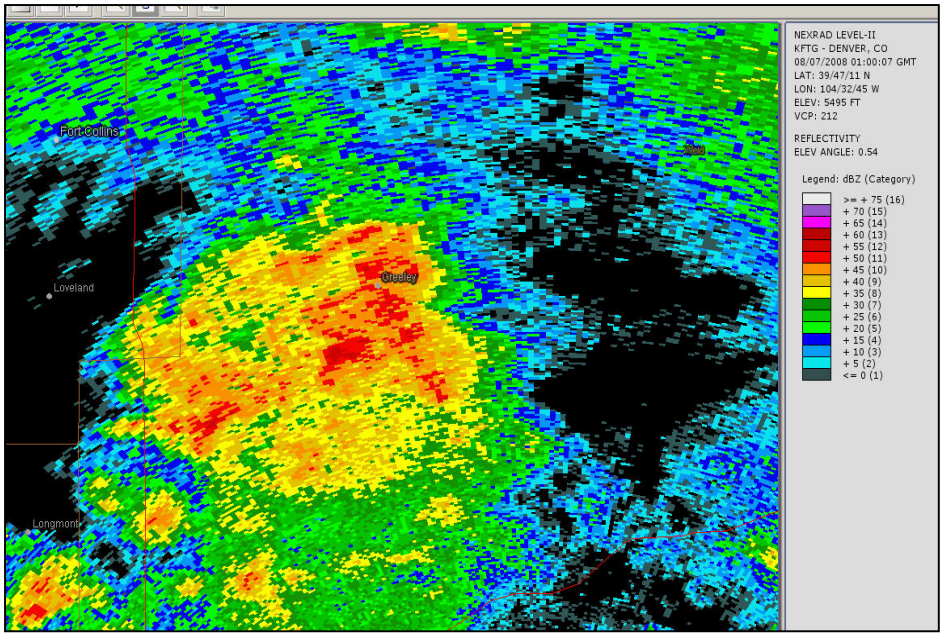


6:55 p.m.



7:00 p.m.

Figure 9. NEXRAD Images for Greeley and Surrounding Areas on the Evening of August 6, 2008

IV. HYDROLOGIC AND HYDRAULIC INVESTIGATIONS

Flooding within the cities of Greeley and Evans on August 6, 2008 was confined mainly to residential and commercial areas and resulted from intense rainfall in a relatively short period of time that overwhelmed existing drainage facilities. Due to the fact that the heaviest precipitation generally fell in areas with little to no stormwater detention, ponding along street corridors and the resulting inundation of many commercial structures within the downtown Greeley and Evans areas was widespread. In areas where drainage facilities have been implemented to handle larger storm events (generally west of the Downtown and North Greeley and 28th Avenue Basins, in the Grapevine and Country Club Basins), flood damages were not as extensive.

The City of Greeley provided several high water mark measurements, gage readings, and other visual observations within four of the five major drainage basins. Comparing these observations with discharges determined for the City's Comprehensive Drainage Plans [Anderson Consulting Engineers, 2005 – 2007], it appears that facilities within the Country Club and Grapevine Basins experienced a storm ranging between a 5-year and a 10-year event. Further east where the rainfall was the heaviest, the 28th Avenue and Downtown and North Greeley Basins experienced a storm ranging between a 10-year and a 50-year event.

Two of the CoCoRaHS stations (one in the Sheep Draw Basin, west of the Country Club Basin, and one immediately south of the Grapevine Basin) supplied intense precipitation reports on the evening of August 6, 2008. Information obtained from the two reports would tend to indicate a rainfall intensity of 1.6 to 2.0 inches per hour, depending upon location. Comparison of these values with one hour point values obtained from the City of Greeley Storm Drainage Criteria Manual indicate an event between a 5-year and 10-year storm to greater than a 10-year storm but less than a 50-year storm. Being as the two stations are located further west of the heaviest rainfall, it would appear that the rainfall intensities reported from the two stations are reasonable for areas in the western portion of Greeley, with higher intensities in east Greeley and Evans.

V. FLOODED AREA DESCRIPTION/AREAS OF INUNDATION

Figure 10 shows the areas where structures sustained flood damage, streets were flooded heavily, and utilities were compromised. Photographs taken of flooded areas both during and after the storm event were obtained from various news sources; these photographs are provided in Appendix D. The captions associated with some of the photographs provide details of flooding conditions at specific locations.

The City of Greeley provided detailed information as to various flood depths, inundation of structures, precipitation depths, and the operation of existing drainage facilities. It appears the area that saw the highest flood damages to structures was along the 10th Street corridor generally between

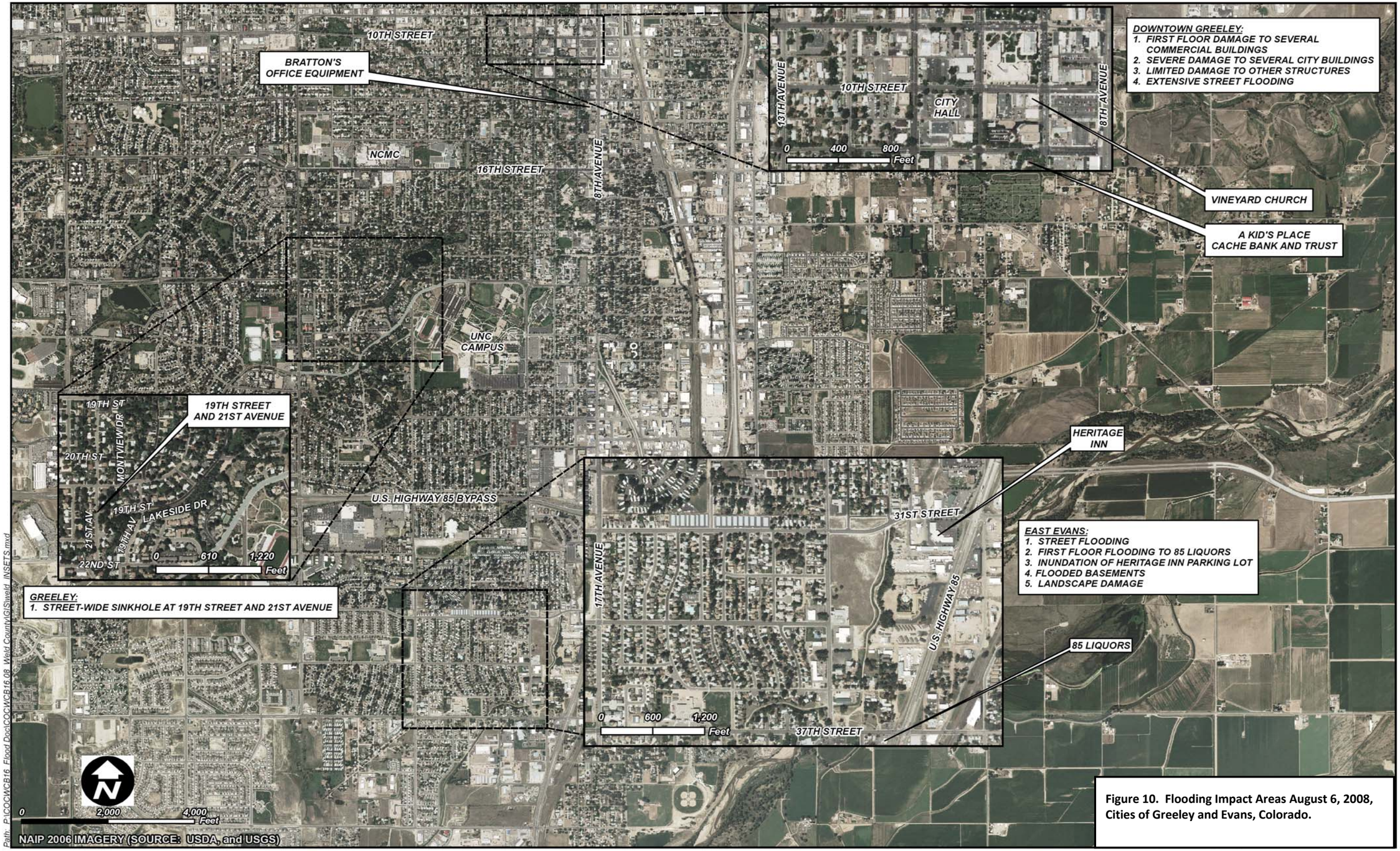


Figure 10. Flooding Impact Areas August 6, 2008, Cities of Greeley and Evans, Colorado.

8th and 13th Avenues, extending up to a block north and south of 10th Street (9th Street and 11th Street, respectively). This area essentially encompasses much of the Central Business District. Flood depths generally ranged from 13 to 24 inches above gutter flowlines, inundating several City of Greeley buildings (including City Hall), as well as other commercial buildings.

Other properties significantly impacted included A Kid's Place child advocacy center and the Cache Bank and Trust at 924 11th Street, Bratton's Office Equipment at 1303 8th Avenue, the Vineyard Church at 1015 9th Avenue, and the North Colorado Medical Center (NCMC) at 1801 16th Street, all in the City of Greeley. Properties significantly impacted in the City of Evans included 85 Liquors at 3705 West Service Road, where flood depths inundated the building to a depth of around 12 inches, and the Heritage Inn at 3301 West Service Road, where the parking lot was heavily inundated with floodwaters.

VI. SPECIAL FACTORS AFFECTING THE FLOOD

The unusually intense rainfall and the resulting flooding in the cities of Greeley and Evans were exacerbated by two separate factors that likely increased flooding. The first is that the downtown area of Greeley has extremely flat topography, including localized sump areas. Stormwater runoff generated here tends to pond locally and move slowly toward the Poudre River creating the potential for frequent flooding of first floors and basements. The second is that both areas in Greeley and Evans lack stormwater conveyance facilities that provide adequate flood protection generally beyond a 2-year event. Western portions of Greeley that also received significant rainfall amounts appeared to have fared better as storm drainage facilities in those areas generally provide relatively higher levels of protection.

VII. ESTIMATED FLOOD DAMAGES

Detailed flood damage values were not available from the cities of Greeley or Evans for the flood of August 6, 2008. A report from the Greeley Tribune indicated Greeley officials estimated that city buildings downtown suffered $15,000 in damages. A street-wide sinkhole at the intersection of 19th Avenue and 21st Street was estimated to take a week to repair; however, cost estimates for repairing those damages were not available.

VIII. FLOOD HAZARD MITIGATION

Flood damages in the western portions of Greeley such as in the Country Club and Grapevine Basins were less severe as existing drainage facilities in those areas have been designed to handle larger

storm events. Flood damages in the eastern portions of Greeley such as in the 28th Avenue and Downtown and North Greeley Basins as well as eastern Evans were more severe as drainage facilities in those areas are less adequate to handle larger storm events. The City of Greeley Comprehensive Drainage Plans prepared for both the 28th Avenue and Downtown and North Greeley Basins addressed existing drainage problems and provided a recommended plan of drainage improvements, which primarily included several large storm sewer systems, as well as the replacement or enlargement of other conveyance facilities.

IX. REFERENCES

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APPENDIX A

TELEPHONE CALL LOGS

ANDERSON CONSULTING ENGINEERS, INC.
Telephone Call Log

Project Name:	CWCB Flood Documentation for the City of Greeley, Colorado Weld County Flood Documentation Report – August 6, 2008	**ACE Project No.:**	COCWCB16.08
Subject:	Discussion of flooding	**Date/Time:**	August 8, 2008 9:00 am

To:	Ron Hoagland, Stormwater Director Department of Public Works 1001 9th Avenue Greeley, CO 80631	**From:**	Brian Van Zanten Anderson Consulting Engineers, Inc. 375 E. Horsetooth Road, Bldg. 5 Fort Collins, CO 80525
Phone:	(970) 336-4031	**Phone:**	(970) 226-0120
Fax:	(970) 336-4019	**Fax:**	(970) 226-0121
Email:	Ron.Hoagland@Greeleygov.com	**Email:**	blvanzanten@acewater.com

Summary:

The nature and extent of flooding was discussed with Mr. Hoagland. He mentioned that one of his co-workers, Mr. Bert Leautaud, was out collecting field observation data to see how stormwater facilities handled the storm. He mentioned that I should contact him in order to collect more detailed information.

He mentioned that the 28th Avenue Basin was hit particularly hard with flooding, as well as the Downtown and North Greeley Basin. He talked about the street-wide sinkhole at the intersection of 19th Avenue and 21st Street and how emergency repairs were being performed as a sanitary sewer was in danger of collapsing. He also mentioned high street discharges along 39th Avenue and 4th Street in the Grapevine Basin.

ANDERSON CONSULTING ENGINEERS, INC.
Telephone Call Log

Project Name:	CWCB Flood Documentation for the City of Greeley, Colorado Weld County Flood Documentation Report – August 6, 2008	**ACE Project No.:**	COCWCB16.08
Subject:	Discussion of flooding	**Date/Time:**	August 27, 2008 11:00 am

To:	David Bran, Public Works Director Town of Platteville 400 Grand Avenue Platteville, CO 80651	**From:**	Brian Van Zanten Anderson Consulting Engineers, Inc. 375 E. Horsetooth Road, Bldg. 5 Fort Collins, CO 80525
Phone:	(970) 785-6415	**Phone:**	(970) 226-0120
Fax:		**Fax:**	(970) 226-0121
Email:		**Email:**	blvanzanten@acewater.com

Summary:

The nature and extent of flooding was discussed with Mr. Bran. He mentioned that there were local reports of up to 3 – 5 inches of rain in approximately 2 hours, but none of these reports were considered official. He said that there are no official rain gages in town.

He also mentioned that many basements in town were flooded, primarily he felt via groundwater issues. He said that himself and others in his department were out that same evening relieving local drainage grates on inlets of trash and other debris to allow them to drain properly. He said the worst damages in and around town came from the microburst associated with the storm, which was mainly wind damage.

APPENDIX B

CONTACTS

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Bert.Leautaud@Greeleygov.com

David Bran
Public Works Director
Town of Platteville
400 Grand Avenue
Platteville, CO 80651
(970) 785-6415

APPENDIX C

NEWS ARTICLES

Weld County cleans up after flooding

written by: Adam Chodak ▪ Date last updated: 8/7/2008 7:50:01 PM

Associated Images

GREELEY ? One to 3 inches of rain fell over a large part of Weld County Wednesday night, leading to localized flooding. Thursday, crews were out and about picking up what was left behind.

Overall, the damage wasn't extensive.

In Greeley, people woke up to streets and sidewalks carrying dirt and debris.

"Everything can be cleaned up," said Greeley City Manager Roy Otto. "It's an inconvenience, but I don't think life and liberty were endangered last night."

For many, the main victim was their basement.

Aside from homes that had to have water pumped up and out, the Vineyard Church and A Kid's Place ? a child advocacy center ? sustained water damage below.

A Kid's Place lost several computers and a server. Most importantly, the water closed down the rooms they use to interview children.

North Colorado Medical Center was also affected by the storm. More than a foot of water covered part of its emergency room parking lot, while water that sneaked in through the roof made several rooms unusable.

The floods also pushed water into the basement of Greeley's City Hall, where the city stores many of its records, including some that date back to the 1800s.

"In my mind they're priceless," said City Clerk Betsy Holder. "Lots of history here."

Fortunately, the records are stacked six inches from the ground placing them out of the water's reach.

Outside Greeley, five Weld County roads washed out by the floods remained closed on Thursday.

Evans dries out from high water

BY BY DAVID YOUNG
DYOUNG@GREELEYTRIBUNE.COM,

EVANS — In the wake of Wednesday's severe flooding, the Evans homeowners, merchants and city employees spent Thursday morning drying out.

Floodwaters that accumulated in the lower-lying areas of the city were pumped out Thursday, said Rick Brandt, Evans chief of police.

Brandt said the worst flooding in Evans occurred along 37th Street around 17th Avenue. East of that location to U.S. 85 there was standing water.

Landscaping and fences at a few homes sustained minor damage as well, he said.
While Brandt wasn't aware of any damage to businesses, Dave Bradley, owner of 85 Liquors, 3705 W. Service Road, watched his storeroom fill with water.

"We are bad," Bradley said. "Our storeroom had 12 inches of standing water. We're not sure damage inside the store."

Bradley said water draining onto his property from the west was just too much.
"It just came through the front door," Bradley said. "The storm drainage isn't big enough."

He expects it will take two weeks to clean up all the mud, debris and soot in the store.
"We just have to bite the bullet and wait until the water recedes and go out there and look at the damage," he said.

For farmers, downpour is reason to rejoice

- SARA LOVEN/gtphoto@greeleytribune.com

BY ANDREW VILLEGAS,

Water that inundated Greeley residents Wednesday night was a Godsend for Frank Eckhardt's corn crop.

Three inches of water fell on his farm near La Salle Wednesday night. There was little runoff, and it drained well, he said.

It turned out to be one of the best rains he's ever seen.

"We were all pretty worried. We were running out of river water," Eckhardt said. "This really helped. It helped us catch up."

Farmers in other parts of Weld County also welcomed the rain, though they got less than farms near Greeley.

"It comes at a good time for us," said Marc Arnusch, who farms near Keenesburg. "It should help moderate temperatures for a while."

Corn and sugar beets, which Arnusch grows, are able to withstand lots of water falling on them as long as wind doesn't accompany it, he said.

Kent Peppler, a farmer near Mead, said the inch of rain that fell on his corn, alfalfa and barley thankfully didn't run off his land.

"As dry as it's been, we're lucky to have what we have," he said.

Indeed, the rains came a day before Gov. Bill Ritter asked the U.S. Department of Agriculture to extend drought disaster help to Weld, which still has much less than normal rainfall for the year.

"We were all ready for the rain," said Harry Strohauer, saying he had heard from others -- including his father-in-law -- that they had been flooded and that he sympathized with them.

Many in Greeley, especially those who had their basements flooded, probably could have done with a lot less rain, no matter how good it was for nearby crops.

Greeley officials who said city buildings downtown suffered an estimated $15,000 of flood damage.

Bill Sterling, Greeley public works director, said it will take about a week for crews to finish cleaning up the rocks, dirt, trash and mulch that remained on streets after the floodwaters subsided.

A street-wide sinkhole that opened up at the intersection of 19th Avenue and 21st Street also will take a week to fix because the city will have to bring in contractors to fix it, Sterling said.

The day after flooding knocked out power for 2,700 customers, all power was back on by 6 a.m. Thursday. Only 13 customers remained powerless Thursday morning, said Mark Stutz, spokesman for Xcel Energy.

The rain even caused minor flooding at the JBS-Swift & Co. meatpacking plant in northeast Greeley. The flooding was minor and didn't stop operations inside the plant, said Tamara Smid, spokeswoman for JBS-Swift.

The rain proved no match for at least one part of Greeley's drainage system.

Greeley Parks Director Ron Williams said the city's parks functioned just as they were supposed to: as collectors and gatherers of runoff water to allow for slower drainage. Parks are designed to take 100-year floods, Williams said, adding that he didn't think Wednesday's storm was quite so big.

Dale Lyman, spokesman for the Union Colony Fire Rescue Authority, said there were 30 calls to 911 in an hour Wednesday night and that officials called in all available firefighters to help with the emergency.

At one point, a woman and her infant had to be rescued from their car when it became waterlogged on Centerplace Drive between 35th and 47th avenues, Lyman said. Both were OK.

"Things are kinda getting back to normal," Lyman said Thursday. "Hopefully we don't get any heavy rain today."

Heavy rainfall creates havoc

BY STAFF AND WIRE REPORTS,

GREELEY, Colo. (AP) _ Heavy rain and wind from thunderstorms tonight have caused extensive flooding through Greeley.

Union Colony firefighters rae reporting several calls for flooded basements. Off-duty firefighters are being called in to help with the basement flooding, and several police are working the flooded street areas. Some difficult areas to pass:

« 37th Avenue and 10th Street. The water is so high there is actually a current.

« 10t Street and 13th Avenue. Cars are stalling at the intersection as the water rises beyond car's tires.

« There has been reports of extensive flooding in Evans along U.S. 85 and south of U.S. 34.

Rains early partially flooded a highway, knocked down trees and a building under construction near Platteville and spawned tornado warnings for Greeley and Fort Collins in northern Colorado.

Weld County sheriff's spokeswoman Margie Martinez says no damage from tornadoes has been reported. Martinez says at least one lane of U.S. 85 to Greeley was flooded by heavy rain, but no major traffic problems were reported.

http://www.greeleytribune.com/apps/pbcs.dll/article?AID=/20080806/NEWS01/660690007&parentprofile=search&template=printart

Heavy rain floods Greeley streets


- BRET HARTMAN/bhartman@greeleytribune.com


- BRET HARTMAN/bhartman@greeleytribune.com


- Wayne Henson

BY DAVID YOUNG,

Standing in more than a foot of dirty water at the door of the Vineyard Church in downtown Greeley, firefighters stared through the glass doors at the water seeping into the entrance.

Flashing lights illuminated the murky waters, while the men, responding to a fire alarm Wednesday night, made it was clear water was more of an issue.

"There's no fire," said fire engineer Greg Holmes as he waded around the side of the building.

Pastor Michael Webb and music director Bob Olivier made it downtown to the church at 1015 9th Ave.

"Wow, that is a lot of water," Olivier said as he arrived.

Firefighters decided not to open the doors to keep the water from flooding the building -- even with the sounding alarm.

Webb said he had never seen the flooding this bad and expects that some expensive audio visual equipment in the basement to be damaged.

"This is worse than I expected," Webb said.

Directly north of the church, Joe Shelor, city of Greeley public works facility manager, and Bill Sterling, city of Greeley public works director, assessed the damage at public works building, 1001 9th Ave.

Water flowed through the front door creating a little pool in the entry way.

"That's the worst for this building," Sterling said. "The City Hall annex across the street has no basement and it is going right through the doors."

Drenched in water, Sterling slogged through the building to ensure water hadn't breached any other entrances.

Through much of the evening Wednesday, heavy rainfall dumped from 1-3 inches of rain throughout Weld County. According to Greeley police spokesman Sgt. Joe Tymkowych, many of Greeley's streets and low-lying areas flooded, and there were two crashes caused by hydroplaning tires actually floating on the water at too high of a speed.

Union Colony Fire spokesman Dale Lyman said the department was getting dozens of calls on flooded basements and water inside power boxes, but no one had been injured.

At the height of the calls, firefighters determined to only respond to life-threatening situations, and the flooded basements would wait until after the rains subsided.

In Weld County, Undersheriff Margie Martinez said there were many flooded roads, and some washed-out roads, according to the deputies reporting Wednesday night.

In Platteville, where a tornado watch was issued, 12 power lines were down and about 1,700 people were expected to be without power from 9 p.m. until about 6 a.m. today, according to Mark Stutz, spokesperson for Xcel Energy. Another 1,000 people were without power in Wellington, he said.

Some embraced the heavy rainfall and flooding.

Sisters Ashley Carter, 21, and Ravini Carter, 20, both of Greeley, splashed and played in knee deep waters at the corner of 6th Street and 9th Avenue.

With a plastic Tweety Bird umbrella, Ashley chased her sister through the middle of the street kicking water into the air.

"We didn't know how deep it was so we thought we would check," Ashley said. "It's fun, except for the severe tornado warnings at first."

The 10th Street corridor heading into downtown turned into a river as smaller cars stalled out with water above their tires.

Employees at the Arby's at 10th Street and 30th Avenue took a break from work to play in the waist-deep waters out front of the restaurant.

Arby's employee Cecilia Cruz, 17, of Greeley, ready to cool off following record high temperatures, nearly submerged herself in the waters on the shoulder of 10th Street.

"We took advantage of the rain, so we thought we would go for a swim," Cruz said.

Cruz's fellow employee Crystal Ramos, 20, also joined in on the rare swim break.

"At first it was scary, but then she pulled me in and it was fun," said Ramos who had never seen such flooding before in Greeley.

-- Reporters Mike Peters and Jakob Rodgers contributed to this report.

http://www.greeleytribune.com/apps/pbcs.dll/article?AID=/20080807/NEWS/922899918/-1/rss01&template=printart

Homes, businesses swamped by floodwater

BY JAKOB RODGERS,

Barbara Moreno walked through her house, water gushing from the carpet with each step, as she gazed at the swamp that was her house and recalled what happened less than an hour earlier.

“The water was just coming (down 37th Street), but then I could see it rising and by the time I could call my son and my daughter, the water was all just coming in,” Moreno said.

A heavy rainstorm that rushed through Evans and Greeley on Wednesday left homeowners and business owners searching for shop vacs and water pumps as 1-3 inches of rain fell throughout Weld County.

Standing in one of the worst-hit areas of Evans at U.S. 85 and 31st Street, Doug Melby, fire marshal for the Evans Fire Department, said flash flooding occurred in Evans from U.S. 85 all the way west to 65th Avenue. The Evans Fire Department was called to assist in draining mostly flooded basements, Melby said.

Some business owners had to fend for themselves — and close up shop — until help could arrive.

“Everything is flooded, it’s past my ankle. In the parking lot, it’s up to past the owners’ knees,” said Jessica Jenkins, an employee of 85 Liquors in a telephone interview.
The store is located where Melby was standing. “I was by the door, and it just started coming in fast, we didn’t open the doors.”

Using multiple shop vacs to try to drain the water, Karla Bradley, owner of 85 Liquors, said her store has flooded at least once a year for the past eight years.

“I just got finished talking to the firemen, who are just wonderful, and he’s going to try to (help),” said Bradley in a telephone interview. “It’s absolutely terrible. We’re just sick of it. We shouldn’t have to put up with this. We lose a lot of products.”

And though she has insurance, Bradley said the flooding is getting tiresome.

“Bottom line is, the city needs to do something about the draining issue. We should not have to suffer as business people like this.”

Soaked and standing in her dining room, Moreno gazed in amazement at her backyard — where nearly 10 inches of water rushed through — and came back inside to her dining room. After her house flooded five years ago, Moreno is reluctant to begin the cleaning process once again.

“This is just overwhelming, but look, again I have to replace everything,” Moreno said. “And then it takes months for it to dry and get cured.”

http://www.greeleytribune.com/apps/pbcs.dll/article?AID=/20080807/NEWS/24308251&parentprofile=search&template=printart

Platteville worst hit of U.S. 85 towns

BY MIKE PETERS,

Of the towns south of Greeley along U.S. 85, Platteville seemed to take the worst of the Wednesday night storm that swept through the area.

In town, Fire Chief Gary Sandau said there were many flooded basements, but no severe property damage or injuries. The town employees spent Thursday helping resident pump out their basements.

Along Weld County Road 31, east of Platteville, several trees and at least 10 power poles were blown down, apparently by a microburst, Sandau said. A microburst is a sudden down burst of wind, which could exceed 100 mph.

Several residents in and around Platteville were without power overnight.

In La Salle, town administrator and Police Chief Carl Harvey said there were a few basements with minor flooding, but no roads were washed out. He said electrical power was out between 11 p.m. Wednesday and about 1:30 a.m. Thursday.

In Gilcrest, police said there was no major damage, but some "gustnados" (small tornados or dust storms) hit various places in town.

In Weld County, there was likely some crop damage, according to sheriff's spokeswoman Margie Martinez. "We had some roads damaged and debris washed out on the roads, and the county is working on them today," Martinez said Thursday.

Rain continues to cause problems

BY STAFF REPORTS,

Heavy rainfall Wednesday night dumped up to 3 inches of rain throughought Weld County, and rain is expected to continue throughout tonight and into tomorrow.

As of now, there is a flash flood warning in effect until 10:30 p.m. in Weld County, reported Chris Dunn, meteorologist with Fox 31. Dunn said he recieved one report of 2.05 inches of rain in Prospect Valley, a report in north, northwest Greeley of 2 inches of rainfall in an hour, as well as 3/4 to 1 inches from Johnstown, northeast of Brighton and in Galeton.

In Weld County, Undersheriff Margie Martinez said there were many flooded roads, and some washed-out roads, according to the deputies reporting Wednesday night.

Martinez, who drove from the Denver area to Greeley during the storm, said in Platteville some trees and power poles were down, but there was no tornado damage as far as her reports indicated.

There was also a fallen tree across U.S. 85 near the port-of-entry south of Platteville.
In front of Big R on 8th Street in Greeley, water reached the headlights of cars.

According to Greeley police spokesman Sgt. Joe Tymkowych, many of Greeley's streets and low-lying areas were flooded, and there were two crashes caused by hydroplaning — tires actually floating on the water at too high of a
speed. Cars have been reported stalling throughout town, as drivers tried to negotiate the waters.

Union Colony Fire spokesman Dale Lyman said the department was getting dozens of calls on flooded basements and water inside power boxes, but no one had been injured.

At the height of the calls, firefighters determined to only respond to life-threatening situations, and the flooded basements would wait until after the rains subsided.

For more on this story, see Thursday's Tribune.

http://www.greeleytribune.com/apps/pbcs.dll/article?AID=/20080806/NEWS01/626005212&parentprofile=search&template=printart

Residents begin to clean up after storm

- SARA LOVEN/gtphoto@greeleytribune.com

Scroll to the bottom of the story to see a video of the damage at "A Kid's Place."

BY JAKOB RODGERS,

For Chris Sarlo-Bergmann, the moment of shock first came not when she stepped into the office of A Kids Place with Gwen Schooley, the organization's executive director. Instead, it came a few moments later.

"We go downstairs and I look and I go to our interview rooms and I start crying, because our interview rooms are gone," said Sarlo-Bergmann, upon seeing the more than 18 inches of standing water in the building's basement.

As the floodwaters receded, residents took stock of the damage caused by Wednesday's rainstorm to their homes and businesses and began the slow and steady process of drying out and cleaning up. The storm on Wednesday night dumped 2-3 inches in Greeley and Evans, according to weather spotters for the Colorado Climate Center at Colorado State University.

Carpet cleaning services were busy with calls for assistance across Weld County. Tom Denovellis, owner of TLC Carpet and Upholstry Cleaning, 6380 W. 10th St. in Greeley, said he already was booked through Monday.

"I got all kinds of calls, but I've had to turn some down," said Benny Trujillo, owner of New Way Sunshine Carpet and Uphostry Cleaning, 313 11th Street in Greeley.

Terry Greenwood spent Thursday ripping out the carpet in the basement of his house on the corner of 6th Avenue and 17th Street Road in Greeley, which was filled with about six iches of sewage-filled water from a nearby sewage plant.

"All day -- fill the dumper full," said Greenwood, who estimated the damage to be $3,000-$4,000. "Just ripping out carpet and cleaning. Cleaning all day long."

Cliff Deibel, owner of Dieble Lawn Service, said his shop about a block away from Greenwood was inundated with more than two feet of water because of what he said was a poorly-placed culvert on U.S. 85 -- something he termed a "man-made dam."

The culvert was installed during construction on U.S. 85 last year to help limit erosion under U.S. 34, according to Corey Stewart, resident engineer from the Colorado Department of Transportation. Stewart said Wednesday's flooding could be contributed to the heavy rains, however engineers were still examining the culvert.

The United Way and the Red Cross also were at work on Thursday to help those displaced and threatened by the flood. The American Red Cross set up a walk-in clinic at the United Way of Weld County, 228 9th Ave. in Greeley, however only a few people required assistance.

Agner Martinez, a specialist with the United Way 2-1-1 network, said the majority of the calls for assistance came from Greeley, Evans and La Salle.

Volunteers from the United Way are slated to help clean up A Kids Place, according to Sarlo-Bergmann, who said the organization, which assists children whose parents are caught in civil cases, is now caught in a tough place as employees will have to juggle cleaning the building with the annual tradition of recruiting advisors for their children.

Yet, looking up to one of the walls hand-outlined pieces of paper of every child interviewed at the organization, Debbie Calvin, board member of A Child's Place, could see a silver lining.

"The hands are still there," Calvin said. "That means something."

How to help

To reach the United Way of Weld County, please dial 2-1-1 from a land-based telephone line and (970) 353-8808 from a cell phone.

To volunteer or donate to A Child's Place, please call (970) 353-5970.

SEE THE DAMAGE AT A KID'S PLACE

Rocky Mountain News
ROCKYMOUNTAINNEWS.COM

Rain floods Greeley City Hall; lightning ignites Pueblo church

Storm damages steeple in Pueblo, washes out roads

By Jeff Kass

Originally published 11:24 p.m., August 6, 2008
Updated 07:23 a.m., August 7, 2008

Severe weather struck the Front Range on Wednesday night as rains flooded Greeley City Hall in the north and lightning set fire to a historic Pueblo church steeple in the south.

Greeley firefighters and the Weld County sheriff were unaware of any injuries - or at least any major ones - as the rain started subsiding at 9 p.m.

Numerous roads were flooded or washed out, said sheriff's spokeswoman Margie Martinez. She described driving through a "blinding rainstorm" amid clouds that were large, ugly and colorful.

A tornado warning was issued, but officials were unaware of any actually touching down.

The main concern at City Hall was preserving records, and pumps were brought in, said Dale Lyman, spokesman for Union Colony Fire/Rescue Authority in Greeley. He described a "deluge" that began at 7:30 p.m. and lasted for more than an hour.

He estimated that 10th Street, a main east-west thoroughfare through Greeley, had a foot of water down the middle and up to three feet on the sides.

"I've never seen anything like it," he said.

There were also reports of flooding in Adams County.

The Cathedral of the Sacred Heart steeple in Pueblo was damaged, but the fire was under control in about 35 minutes, said Pueblo Fire Department spokesman Woody Percival. Officials said lightning blew out power across the city, including police and fire headquarters.

"It was just an amazing thunder and lightning show," Percival added.

The National Weather Service also said the storm spawned funnel clouds and some weak tornadoes in the area north of Denver, but no damage was reported.

The Associated Press contributed to this report.

TheDenverChannel.com

Evans Residents, Business Owners Assess Flood Damage

Downpour Overpowers Drainage System

By Lance Hernandez, 7NEWS Reporter

POSTED: 10:59 pm MDT August 7, 2008
UPDATED: 6:21 am MDT August 8, 2008

EVANS, Colo. -- Evans residents say they needed the rain, just not that much.

The skies opened up over the Weld County community late Wednesday, dumping more than 2 inches of rain in less than two hours.

“It was almost like being in Oklahoma or the Ozarks,” said Thomas DeBrock as he was pumping water out of the Heritage Inn parking lot Thursday morning.

DeBrock said so much rain fell that he knew he “had to move the cars to higher ground or they’d be floating.”

“We’ve got three drains out there in that parking lot and I was up to my chest in water,” he said.

At 85 Liquor, owner Dave Bradley spent most of the day vacuuming water and mopping up.

“You can see the water line right there,” Bradley said pointing to a spot 12 inches above his stock room floor.

This isn’t the first time he’s been flooded.

“It happens every year,” Bradley said. “The worst was in 2001. There was about four feet of water outside the store, and about three feet inside.”

Bradley said the drainage system is inadequate along that stretch of Highway 85, especially with all the new development and pavement on the west side of town.

But Evans City Manager Aden Hogan told 7NEWS it’s not the new developments causing the problems. “Those developments have their own retention ponds,” he said.

Hogan said the floodwaters Wednesday came from South Greeley, and overwhelmed the drainage system along the frontage road.

The City Manger said there was so much water in the system it blew out a manhole lid near the 7-Eleven.

“That manhole lid was actually bolted down,” Hogan said. “The force of the water in the system stripped

the bolts and blew the lid off."

Bradley acknowledges that it was a big storm, but said the drainage system has a tough time handling runoff from smaller storms.

"I shouldn't have to mop up in my store every time it rains," Bradley said. "We pay storm drainage fees (to maintain the system.)"

Hogan said the drainage system can handle a regular rain storm.

He said storm water is a priority and has been for the last three or four years.

Hogan said Evans has upgraded a number of drainage culverts. He adds that some will require the cooperation of the Colorado Department of Transportation.

"We do work with them when we can," Hogan said. "But they've got priorities and sometimes they're not here where we live."

CDOT said it relinquished control of drainage along the frontage road to Evans last year.

A spokesperson for the transportation agency said engineers are willing to meet with city officials to get to the bottom of the problem.

APPENDIX D

PHOTOGRAPHS

APPENDIX D.1

CITY OF GREELEY PHOTOGRAPHS

Photo 1

Street-wide sinkhole at 19th Street and 21st Avenue.
(Courtesy of Greeley Tribune)

Photo 2

Intersection of 11th Street and 11th Avenue at Bank of the West.
(Courtesy of the Rocky Mountain News)

Photo 3

Vinyard Church at 1015 9th Avenue.
(Courtesy of Greeley Tribune)

Photo 4

Vinyard Church at 1015 9th Avenue.
(Courtesy of Greeley Tribune)

Photo 5

Basement of A Kid's place at 92A 11th Street.
(Courtesy of Greeley Tribune)

APPENDIX E

HYDROLOGIC AND HYDRAULIC DATA AND COMPUTATIONS

APPENDIX E.1

FIELD OBSERVATIONS PROVIDED BY THE CITY OF GREELEY

STORM EVENT IN THE CITY OF GREELEY
AUGUST 6, 2008
FIELD MEASUREMENTS TAKEN
AUGUST 7, 2008

DOWNTOWN & NORTH GREELEY BASIN:

- At 9th Ave &10th St – gutter flowline vertical to high water mark (HW) = 16 ½"
- At 10th Ave & 10th St – gutter flowline vertical to HW = 24"
- 10th St & 11th Ave – gutter flowline vertical to HW = 13" – water in cars in the east parking lot at city hall and water in the basement of city hall.
- In the parking lot just west of the Plaza Building, which is at the south west corner of 10th St & 11th Ave – 20" depth of water
- In the parking lot on the south side of city hall at 1000 10th St – 13" depth of water
- 8th Ave @ Salzman's Shoe Shop (between 9th St and 10th St – no water into the front door. Front door sits about 6" above the sidewalk level
- 8th Ave & 13th St @ Bratton's Office Supply – water to the crown of 8th Ave, which is about 16" to 18" above the flowline of the west gutter. Bratton's had water come in all four of their doors. Front door on 8th Ave – they have a flood control plank that they put in, but some water still seeped under the plank. One door on the north side of bldg and two doors on the west side of bldg all had water come in. Owner said that this has only happened twice in 33 years to this degree.
- 4th St & 8th Ave - no water into bldg at 404 N 8th Ave – sits on the south east side of the intersection and the door is maybe a couple inches above the sidewalk level.
- Spillway on the No 3 Ditch at 9th Ave – 10" depth of spill over the crest of the spillway
- Water in many business buildings downtown that have floor levels at or near the sidewalk level
- Cache Bank and Trust at 924 11th Street – water through the front door
- A seasonal employee for the City who lives in east Greeley reported 2" in his rain gage
- A resident near Glenmere Lake on 19th Ave and 20th Street reported 3 ½" in his rain gage and said the first 3" came very fast – within the first hour or so.
- Downtown Greeley reported 3.35" of rain. The source for this measurement came from the Community Collaborative Rain, Hail and Snow Network, a division of the Colorado Climate Center of Colorado State University.

28TH AVENUE BASIN:

- No 3 Ditch ran over its north bank between the 28th Ave outfall and the Clarkson – surface flow over 4th St.
- Water levels below the Clarkson Gate were out of the waste ditch banks and high water line was at least 1.3 feet above the existing ground along fences at 202 25th Ave.
- Culvert crossing at 35th Ave and 22nd Street – 10" of water over the crown of 35th Ave
- Westlake dam – gage reading at high water mark = 4.5', which is at elevation = 4776.5'. This is at about 18" over the invert of the 36" CMP overflow and about 30" below the crest of the surface emergency spillway at the south east corner of the pond. During the storm event about 45.3 acre feet of storage was used from the permanent pool level to the high water mark and a peak flow rate of about 60 CFS was released from the dam outlet pipes.
- Based on the high water marks in Westlake and our hydraulic model of the basin and this detention pond it looks like there was about a 10-year event that occurred in the

28th Avenue Basin, at least in the area of the basin up stream of the Westlake Detention Pond.

- Two residents in the area near Westlake said they measured 3 ½" in their rain gage after the storm event.
- Water flowing over 19th St Rd at 2819 19th St was 1.5 feet deep and 100 feet wide. A car was stalled in this low area.
- At 1771 28th Ave a resident reported water coming from Woodbriar Park as 1.5 feet deep and flooding his garage.
- The high water line along the east fence line of Woodbrior Park shows water was 1.4 feet deep in this drainage.

GRAPEVINE BASIN:

- Franklin Park detention pond high water marks – about 1/3 full. The new twin outfall pipes from this pond north, under 4th Street to the Northview pond and channel seemed to have worked very well to prevent over topping of this detention pond. There was no flooding in the neighborhood. The residences there must be very thankful since they have been flooded in the past when this pond overflowed.
- Franklin Channel – running south to north on the east side of Franklin Middle School – high water marks – full channel, but did not spill out onto the athletic field
- A resident who lives at the north east corner of 38th Ave and 4th St said that during the storm the water came over the top of 4th Street at about 39th Ave and there was about 12" of water depth over the crown. He said that a lot of this water flowed north of 4th Street on 38th Ave, but some may have flowed east as well.

COUNTRY CLUB BASIN:

- 47TH Ave and 10th Street – no visible ponding in the Country Club Golf Coarse that sits at the south east corner of the intersection.
- Bittersweet Detention Pond at 35th Ave and 11th Street – at the foot bridge just upstream of the pond and the presed pond – measured 4'-11" from invert of channel to high water marks – channel held up well – we reinforced it with riprap just two years ago.
- Bittersweet Detention Pond – spillway on the downstream side of the presed pond – water over the spillway – spillway held up good, we have had trouble with this spillway in the past. We reinforced this spillway with grouted riprap two years ago.
- South Eagleview Detention Pond – report from an observer said that the pond was filling at 8:00 pm on 08/07. Water level at about the top of the discharge control box so high water at about 4694.8' and water depth in the pond overflow channel at the entrance of the channel – about 0.8'. The channel was working well. Minimal overflow from the No 3 side channel spillway.
- Report from 8:00 pm on 08/07 said: Just upstream of South Eagleview Detention Pond – at B Street – the inflow from the Larson Ditch was impressive with the surface width that must have been near 40' since it did not constrict much as it entered the 50' throat of the CBC under B St.
- At Epple Park – report said: at about 8:00 pm on 08/07 – there was no overtopping of 4th Street and the new CBC's under 4th Street seem to be handling the flow very well.
- West Greeley reported 2.81" of rain. This measurement came from the Community Collaborative Rain, Hail and Snow Network, a division of the Colorado Climate Center at Colorado State University.

APPENDIX E.2

CITY OF GREELEY ONE-HOUR POINT RAINFALL VALUES

DESIGN CRITERIA
AND
CONSTRUCTION SPECIFICATIONS

STORM DRAINAGE
VOLUME II

City of Greeley Colorado

Great. From the Ground Up.

MARCH 2007

DEPARTMENT OF PUBLIC WORKS

CITY OF GREELEY, COLORADO

TABLE 3.4 - ONE-HOUR POINT RAINFALL (INCHES)				
2-year	5-year	10-year	50-year	100-year
1.04	1.49	1.76	2.51	2.78

The IDF curves were developed by distributing the one-hour point rainfall values using the factors obtained from the NOAA Atlas as presented below.

TABLE 3.4(1) - FACTORS FOR DURATIONS OF LESS THAN ONE HOUR				
Duration (minutes)	5	10	15	30
Ratio to 1-hour Depth	0.29	0.45	0.57	0.79

The point values were then converted to intensities and plotted on Figure 3-1. The data are also presented in Tables 3-1, 3-2, and 3-3.

APPENDIX E.3

NOAA RAINFALL DATA

NOWData - NOAA Online Weather Data

GREELEY UNC (053553)
Observed Daily Data
Month: Aug 2008

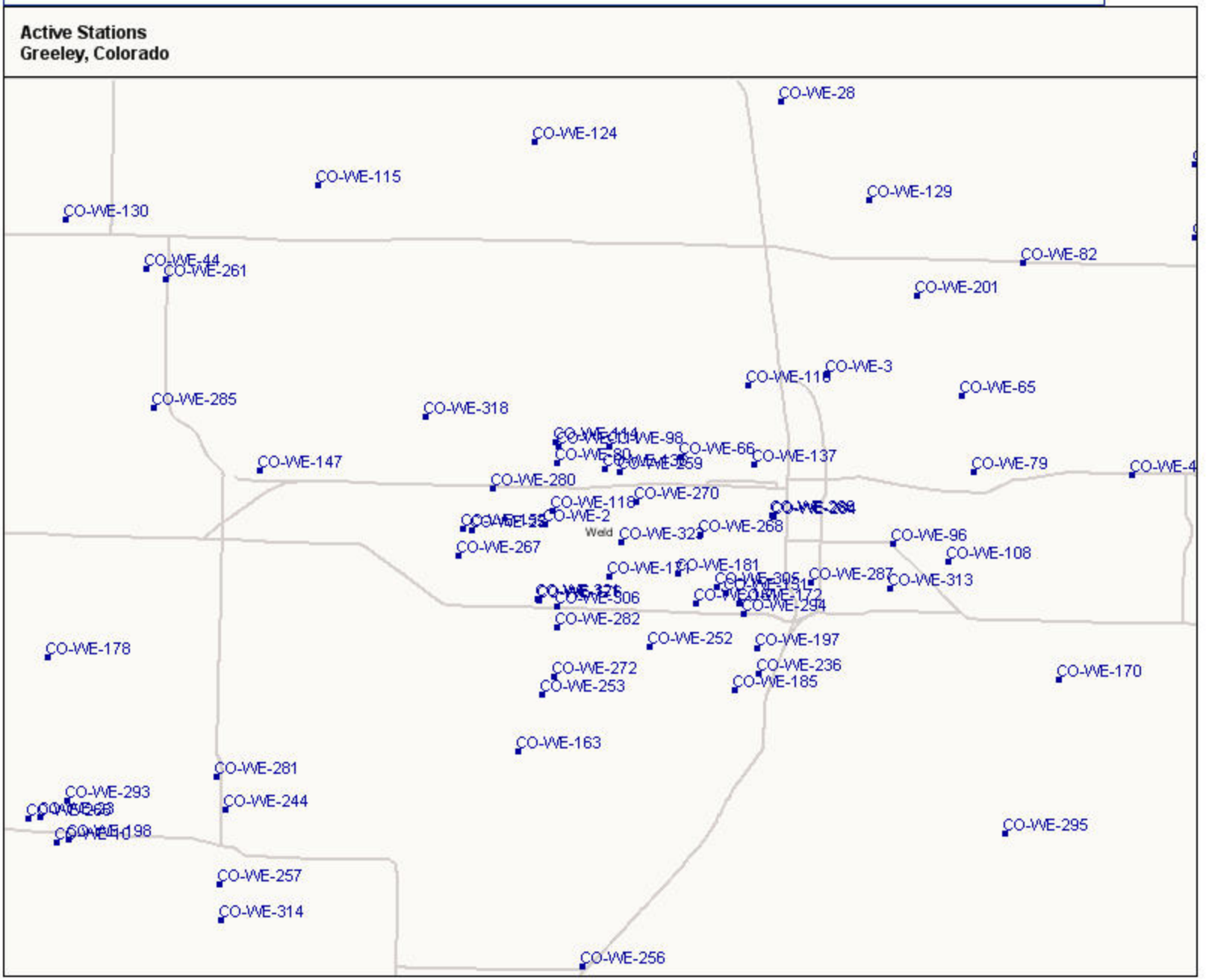
Day	MaxT	MinT	AvgT	HDD	CDD	Pcpn	Snow	Snwg
1	105	62	83.5	0	19	0.00	0.0	0
2	105	62	83.5	0	19	0.00	0.0	0
3	102	66	84.0	0	19	0.03	0.0	0
4	97	59	78.0	0	13	0.00	0.0	0
5	91	62	76.5	0	12	0.00	0.0	0
6	91	61	76.0	0	11	0.00	0.0	0
7	81	62	71.5	0	7	3.08	0.0	0
8	87	60	73.5	0	9	0.00	0.0	0
9	91	61	76.0	0	11	0.01	0.0	0
10	87	64	75.5	0	11	0.07	0.0	0
11	88	58	73.0	0	8	0.00	0.0	0
12	92	55	73.5	0	9	0.00	0.0	0
13	93	59	76.0	0	11	0.00	0.0	0
14	92	57	74.5	0	10	0.00	0.0	0
15	79	50	64.5	0	0	2.12	0.0	0
16	57	50	53.5	11	0	1.45	0.0	0
17	72	52	62.0	3	0	0.22	0.0	0
18	77	51	64.0	1	0	0.00	0.0	0
19	82	54	68.0	0	3	0.00	0.0	0
20	85	55	70.0	0	5	0.00	0.0	0
21	91	56	73.5	0	9	0.00	0.0	0
22	91	57	74.0	0	9	0.00	0.0	0
23	86	56	71.0	0	6	T	0.0	0
24	86	57	71.5	0	7	0.00	0.0	0
25	87	54	70.5	0	6	0.00	0.0	0
26	93	55	74.0	0	9	0.00	0.0	0
27	89	58	73.5	0	9	0.04	0.0	0
28	78	55	66.5	0	2	0.00	0.0	0
29	88	51	69.5	0	5	0.00	0.0	0
30	92	57	74.5	0	10	0.00	0.0	0
31	93	55	74.0	0	9	0.00	0.0	0
Smry	88.0	57.1	72.6	15	258	7.02	0.0	0.0

Official data and data for additional locations and years are available from the Regional Climate Centers and the National Climatic Data Center.

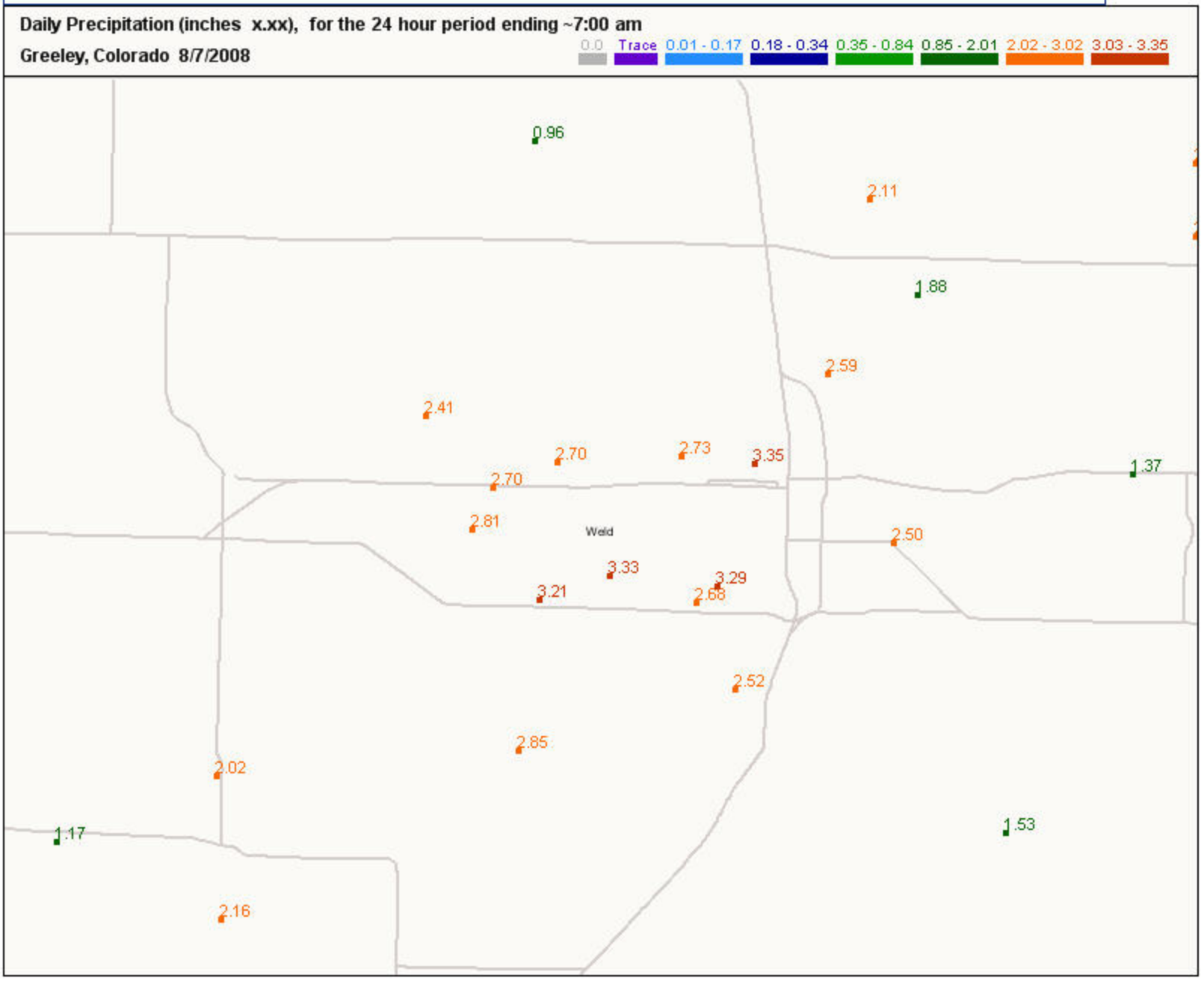
APPENDIX E.4

COCORAHS NETWORK DATA

Map Type	Map Location	Date	Colors	
Stations	Colorado	Greeley	9/19/2008	Standard	Get Map



Map Type	Map Location		Date	Colors	
Precipitation	Colorado	Greeley	8/7/2008	Standard	Get Map



Search Daily Precipitation Reports

Station Fields: ☐ Station Number ☐ Station Name

Location: Colorado | WE - Weld

Date Range:

Start Date: 8/6/2008 **End Date:** 8/7/2008

Precip Value: Total Precip | Operator

Search

Searched: Stations in Weld, Colorado. Report date between 8/6/2008 and 8/7/2008.

Showing 1 - 50 of 88 Records. <Back Page 1 Next>

Date	Time	Station Number	Station Name	Total Precip .in	New Snow .in	Total Snow .in	State	County	View
8/7/2008	7:00 AM	CO-WE-137	Greeley 1.8 N	3.35	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-171	Greeley 2.6 W	3.33	0.0	0.0	CO	Weld	
8/7/2008	7:00 AM	CO-WE-305	Greeley 2.3 SE	3.29	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-199	Eaton 3.9 ENE	3.23	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-176	Greeley 3.8 W	3.21	0.0	NA	CO	Weld	
8/7/2008	4:30 PM	CO-WE-287	Greeley 3.5 ESE	3.08	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-163	Greeley 5.2 SW	2.85	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-25	Greeley 4.4 W	2.81	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-66	Greeley 1.1 ENE	2.73	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-280	Greeley 2.2 W	2.70	0.0	0.0	CO	Weld	
8/7/2008	8:00 AM	CO-WE-80	GLY 4 NW	2.70	0.0	0.0	CO	Weld	
8/7/2008	7:00 AM	CO-WE-161	Greeley 1 SW	2.68	0.0	0.0	CO	Weld	
8/7/2008	7:00 AM	CO-WE-3	Greeley 3.9 ENE	2.59	0.0	NA	CO	Weld	
8/7/2008	8:00 AM	CO-WE-122	Gill 2.4 NW	2.53	0.0	0.0	CO	Weld	
8/7/2008	7:30 AM	CO-WE-185	Evans .8 WSW	2.52	0.0	NA	CO	Weld	
8/7/2008	6:30 AM	CO-WE-96	Greeley 2.8 ESE	2.50	0.0	0.0	CO	Weld	
8/7/2008	7:00 AM	CO-WE-318	Greeley 4.6 WNW	2.41	0.0	NA	CO	Weld	
8/7/2008	8:00 AM	CO-WE-275	Hudson 1.8 SE	2.30	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-187	Hudson 4.8 WSW	2.27	0.0	NA	CO	Weld	
8/7/2008	8:00 AM	CO-WE-314	Milliken 0.8 W	2.16	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-296	Galeton 1.4 SE	2.14	0.0	0.0	CO	Weld	
8/7/2008	7:00 AM	CO-WE-129	Eaton 3.4 SE	2.11	0.0	NA	CO	Weld	
8/7/2008	7:00 AM	CO-WE-43	Greeley 10.5 SSE	2.09	0.0	NA	CO	Weld	
8/6/2008	8:55 PM	CO-WE-287	Greeley 3.5 ESE	2.04	0.0	NA	CO	Weld	

View Data : List Intense Precipitation Reports

Search Intense Precipitation Reports

Station Fields: ☐ Station Number ☐ Station Name

Location: Colorado | WE - Weld

Date Range:

Start Date: 8/6/2008 **End Date:** 8/7/2008

Precip Value: All Precip Values | Operator

Flooding Value: All Flood Values

Search

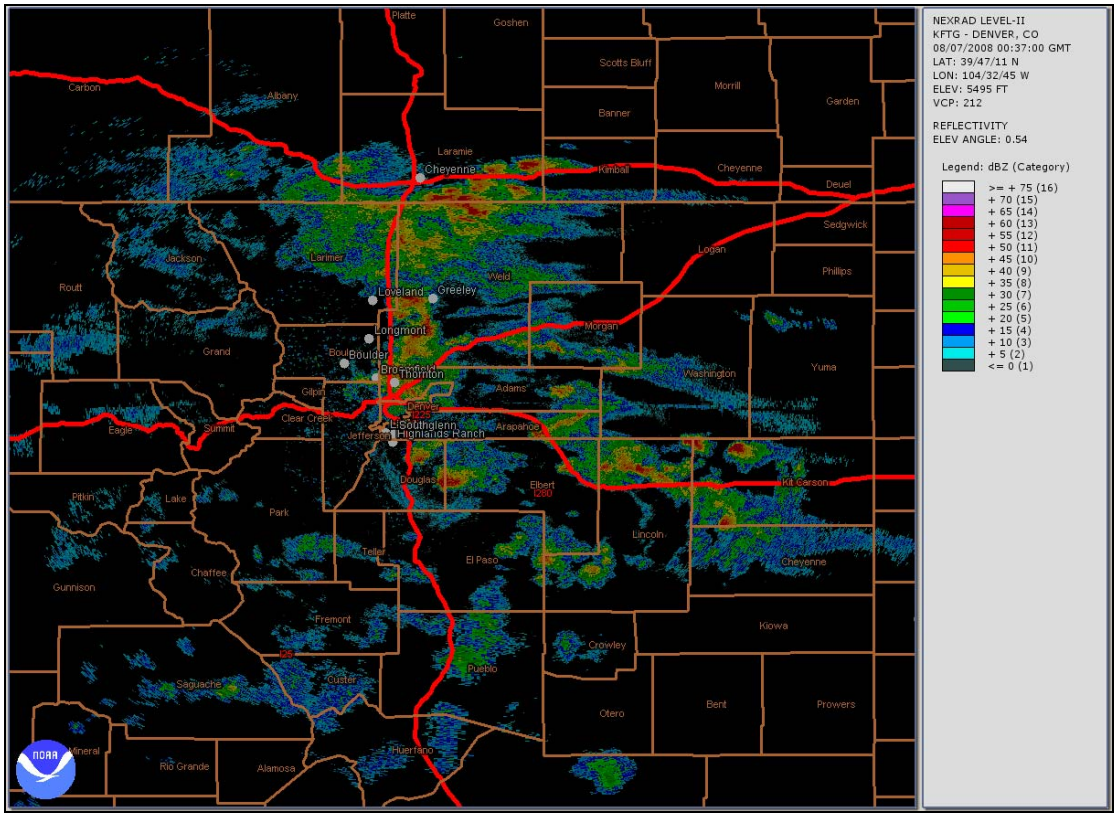
Searched: Stations in Weld, Colorado. Report date between 8/6/2008 and 8/7/2008.

Showing 7 Records.

Date	Time	Station Number	Station Name	Duration Minutes	New Precip .in	Total Precip	New Snow Depth	Total Snow Depth	Flooding	State	County	View
8/6/2008	9:40 AM	CO-WE-176	Greeley 3.8 W	180	3.20	NA	NA	NA	Unusual	CO	Weld	
8/6/2008	6:15 PM	CO-WE-281	Milliken 2.5 NNW	0	NA	NA	NA	NA	Minor	CO	Weld	
8/6/2008	6:25 PM	CO-WE-249	Fort Lupton 5.9 NNW	10	0.30	NA	NA	NA	Unusual	CO	Weld	
8/6/2008	7:30 PM	CO-WE-25	Greeley 4.4 W	60	2.01	2.81	NA	NA	Unusual	CO	Weld	
8/6/2008	7:39 PM	CO-WE-303	Galeton 1.6 E	20	0.45	NA	NA	NA	Minor	CO	Weld	
8/6/2008	7:52 PM	CO-WE-303	Galeton 1.6 E	30	0.85	NA	NA	NA	Minor	CO	Weld	
8/6/2008	9:40 PM	CO-WE-176	Greeley 3.8 W	120	3.20	NA	NA	NA	Unusual	CO	Weld	

APPENDIX E.5

NOAA NEXRAD DATA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VCP: 212
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Legend: dBZ (Category)
>= + 75 (16)
+ 70 (15)
+ 65 (14)
+ 60 (13)
+ 55 (12)
+ 50 (11)
+ 45 (10)
+ 40 (9)
+ 35 (8)
+ 30 (7)
+ 25 (6)
+ 20 (5)
+ 15 (4)
+ 10 (3)
+ 5 (2)
<= 0 (1)
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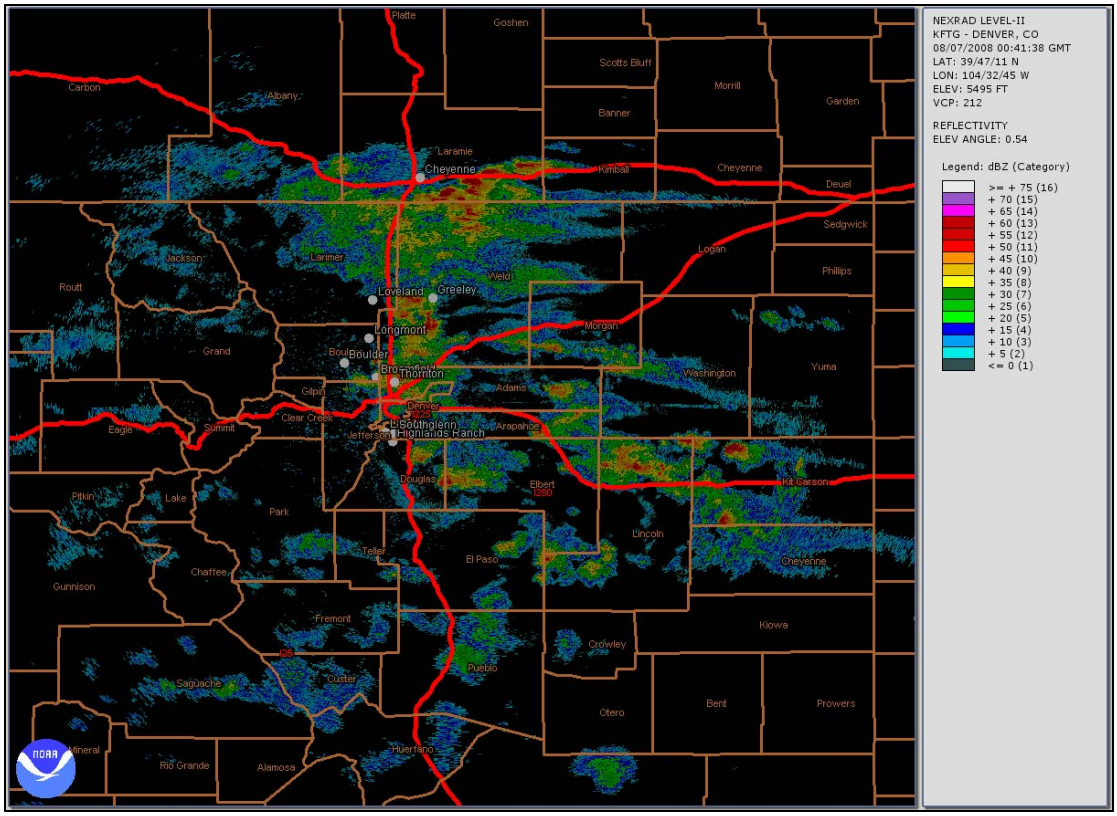
Prowers
Mineral
Rio Grande
Alamosa
Huerfano

6:37 p.m.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VCP: 212
REFLECTIVITY
ELEV ANGLE: 0.54
Legend: dBZ (Category)
>= + 75 (16)
+ 70 (15)
+ 65 (14)
+ 60 (13)
+ 55 (12)
+ 50 (11)
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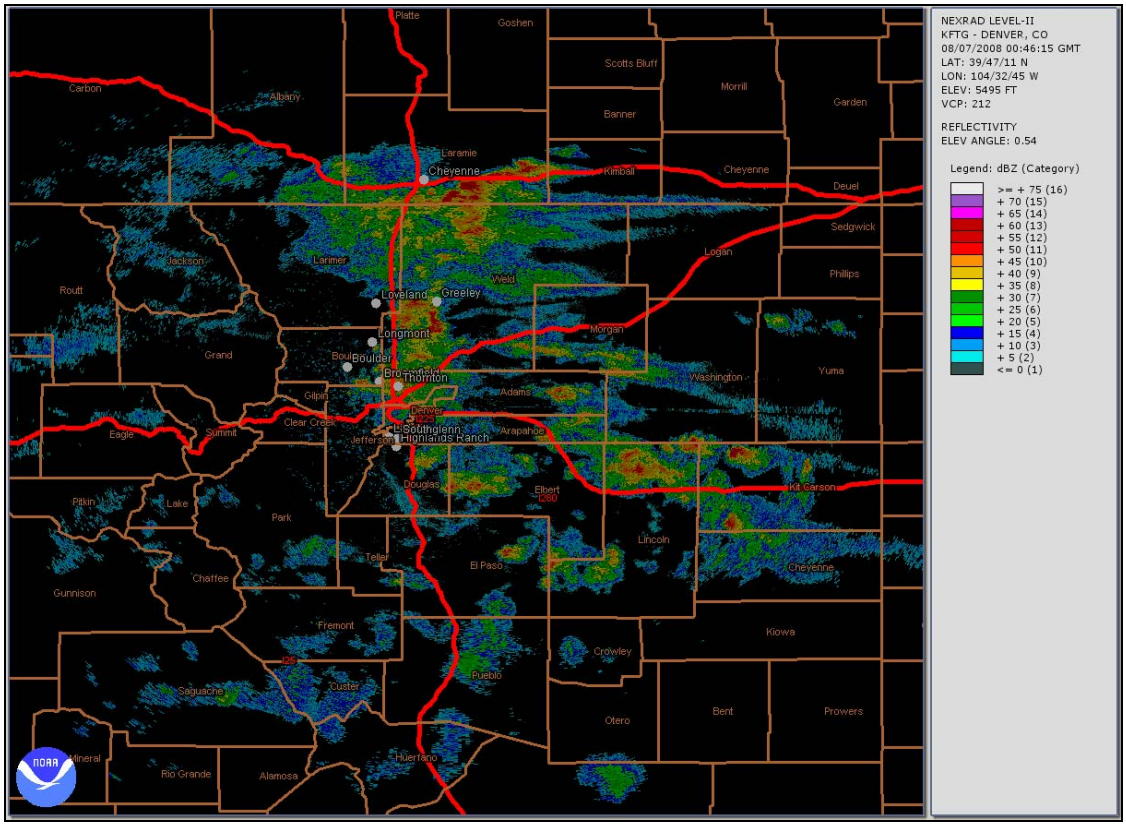
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REFLECTIVITY
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Legend: dBZ (Category)
>= + 75 (16)
+ 70 (15)
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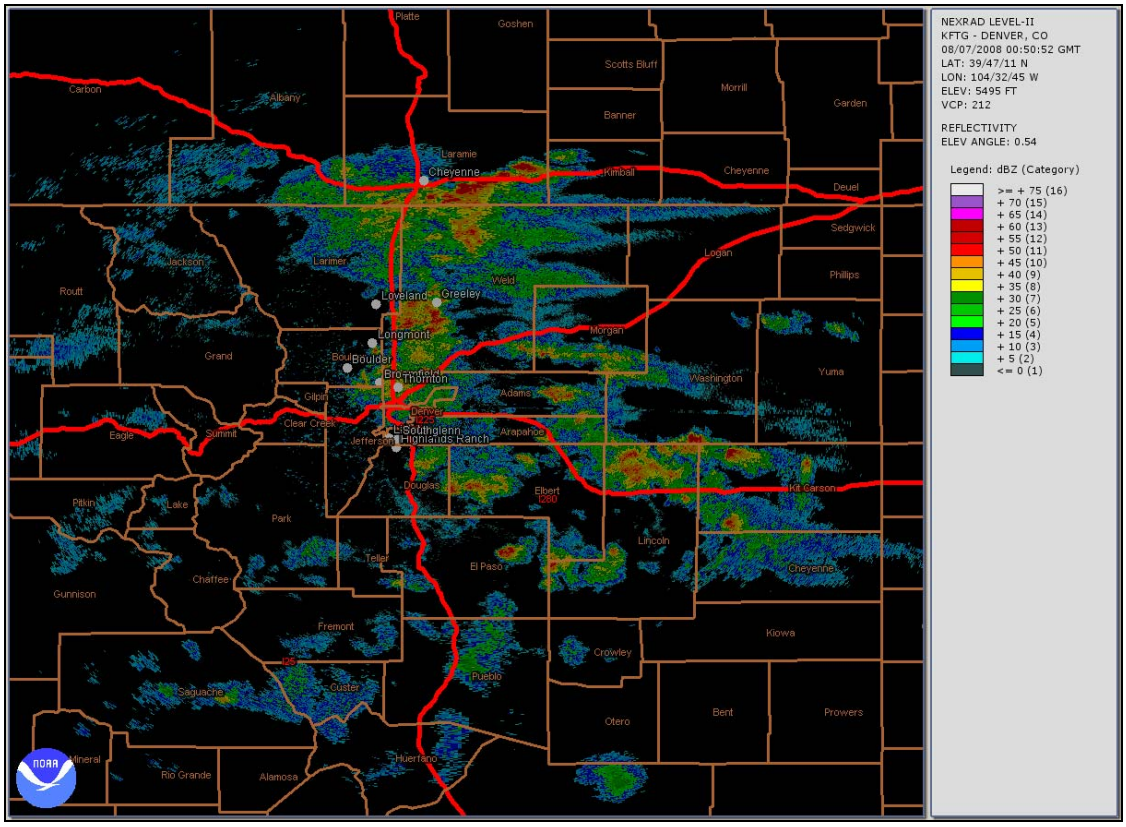
6:46 p.m.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VCP: 212
REFLECTIVITY
ELEV ANGLE: 0.54
Legend: dBZ (Category)
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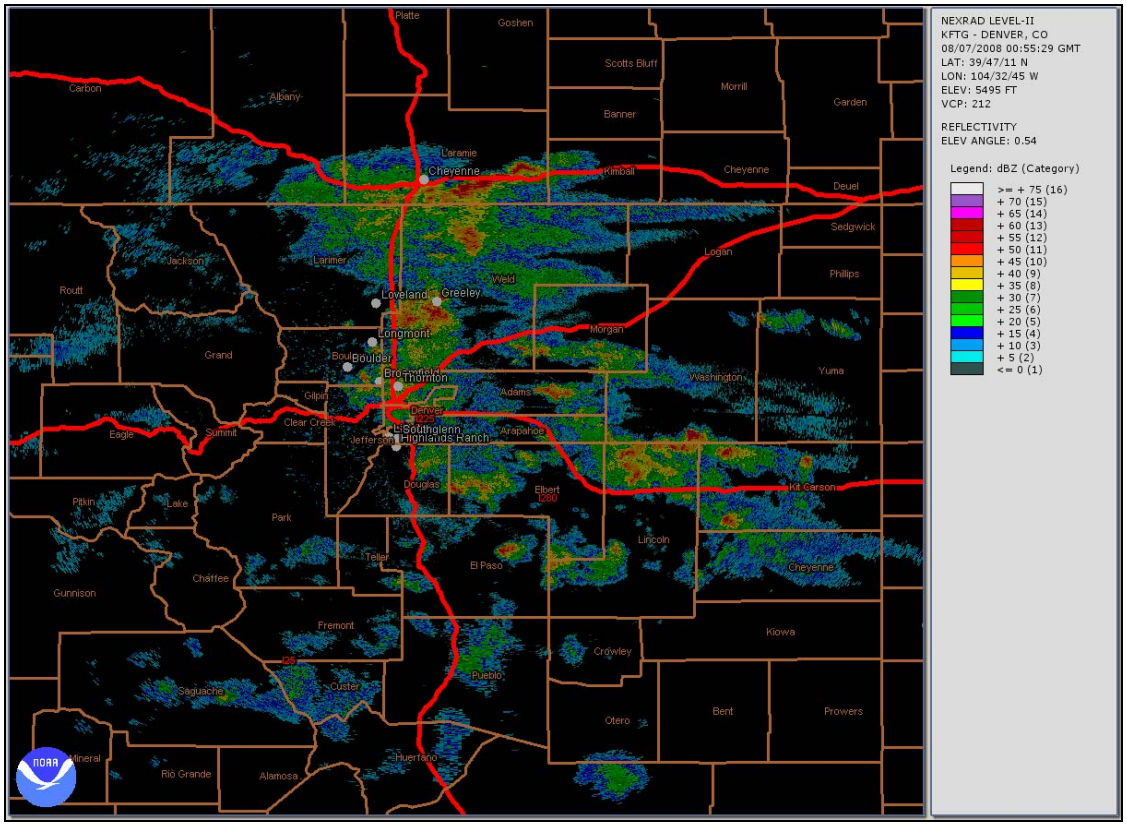
6:51 p.m.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REFLECTIVITY
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Legend: dBZ (Category)
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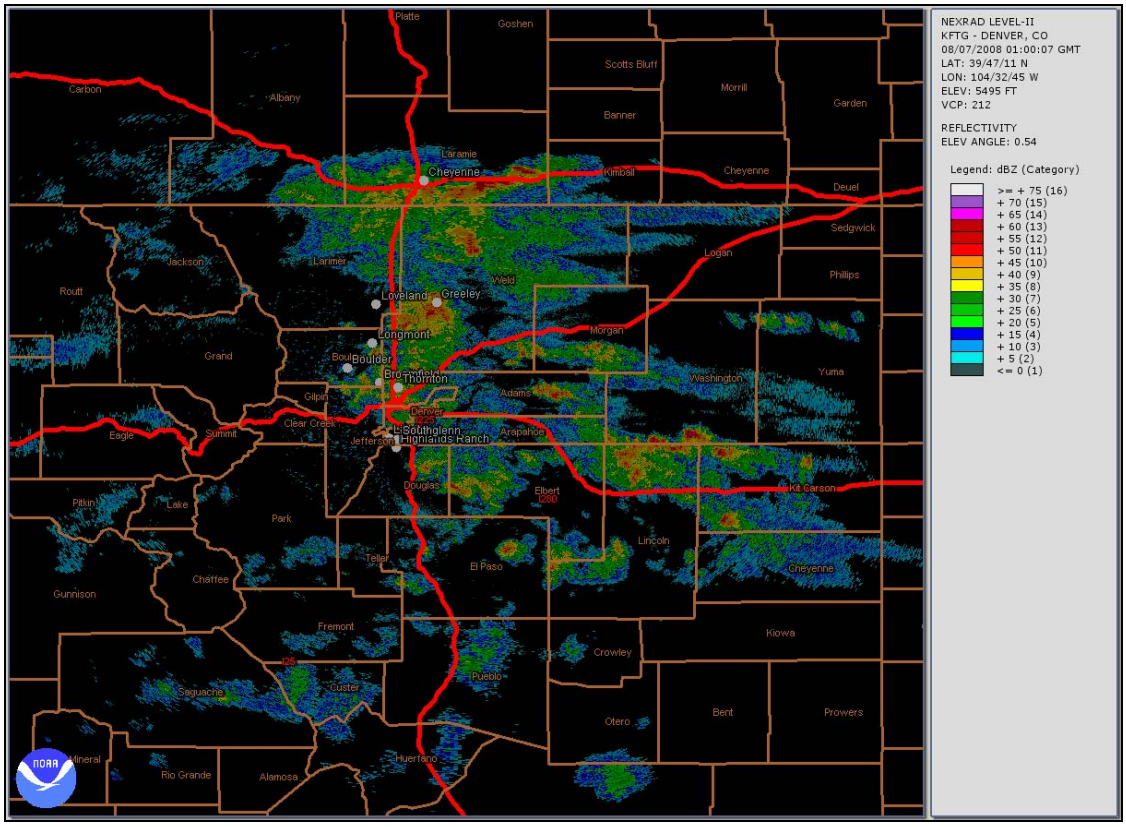
6:55 p.m.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VCP: 212
REFLECTIVITY
ELEV ANGLE: 0.54
Legend: dBZ (Category)
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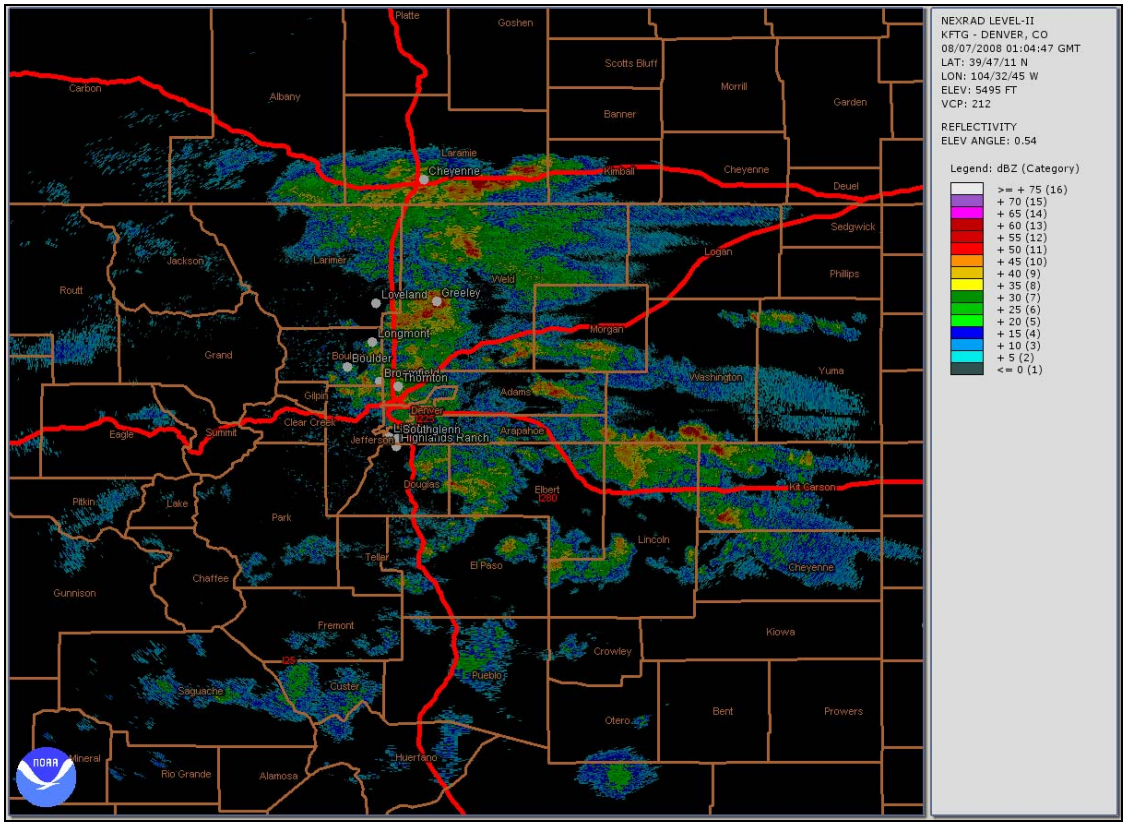
7:00 p.m.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REFLECTIVITY
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Legend: dBZ (Category)
>= + 75 (16)
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+ 65 (14)
+ 60 (13)
+ 55 (12)
+ 50 (11)
+ 45 (10)
+ 40 (9)
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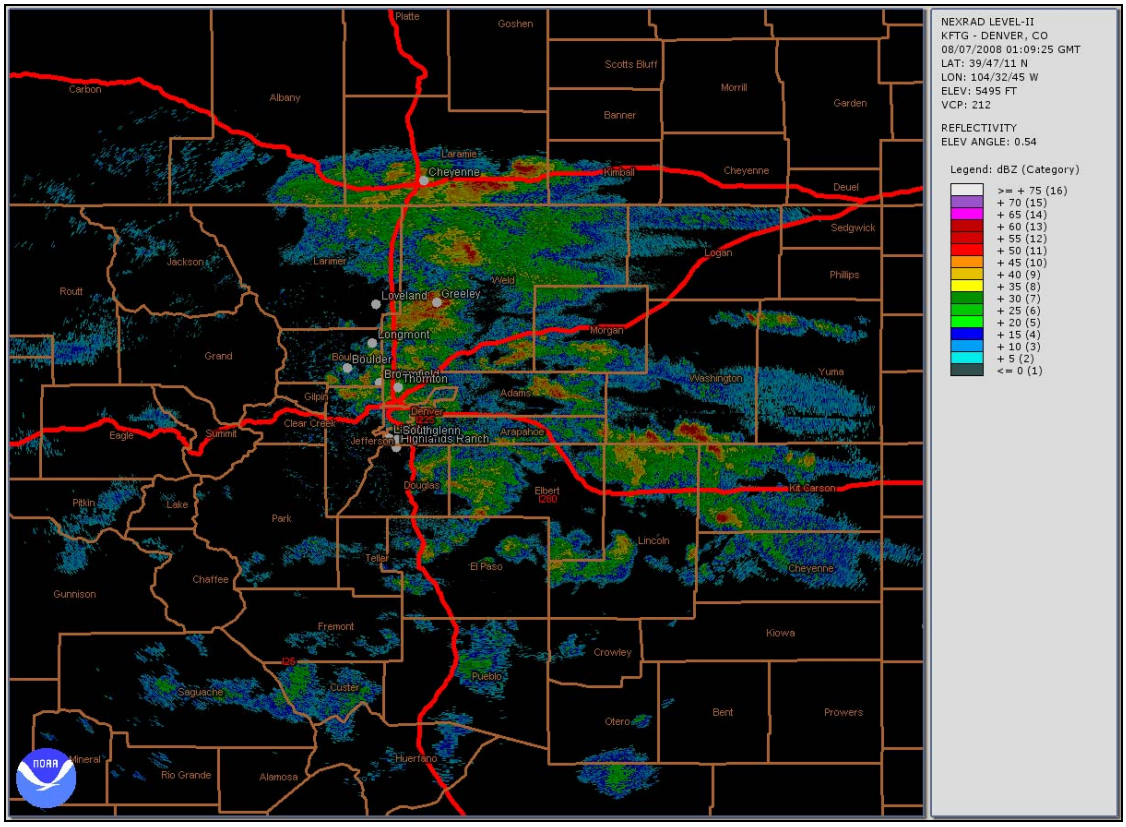
7:05 p.m.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LON: 104/32/45 W
ELEV: 5495 FT
VCP: 212
REFLECTIVITY
ELEV ANGLE: 0.54
Legend: dBZ (Category)
>= + 75 (16)
+ 70 (15)
+ 65 (14)
+ 60 (13)
+ 55 (12)
+ 50 (11)
+ 45 (10)
+ 40 (9)
+ 35 (8)
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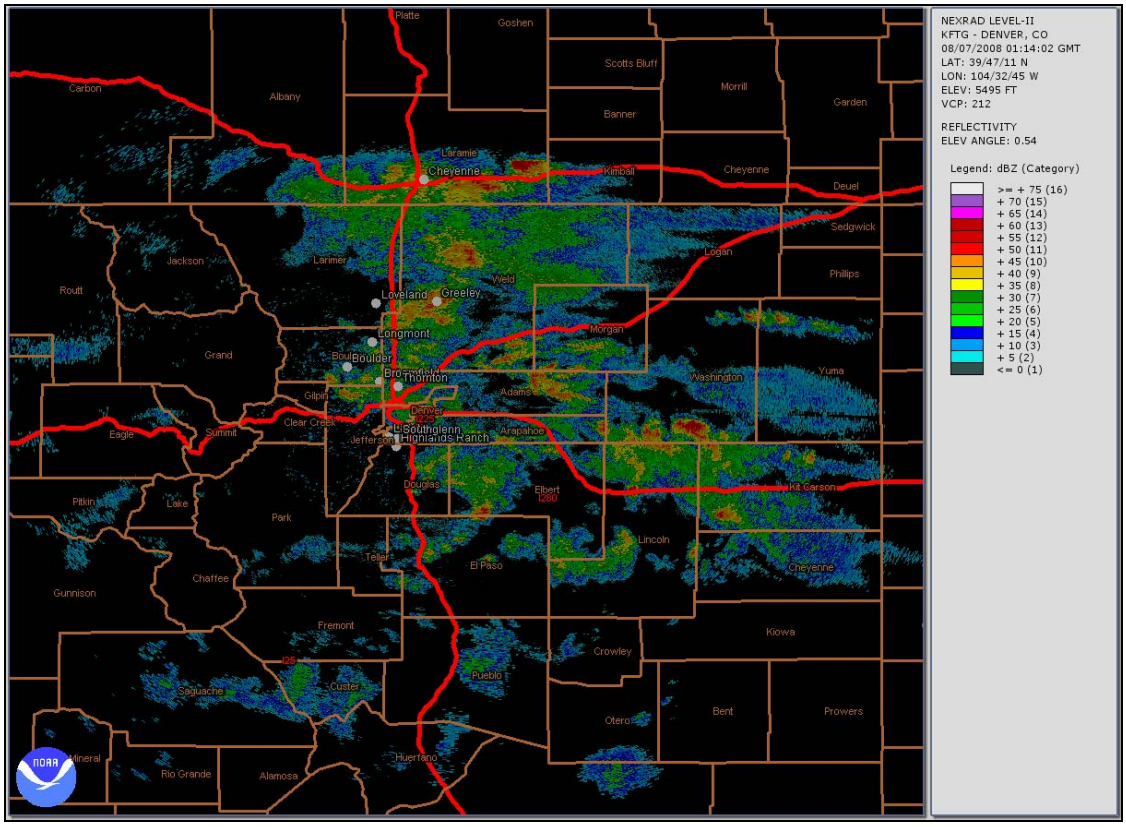
7:09 p.m.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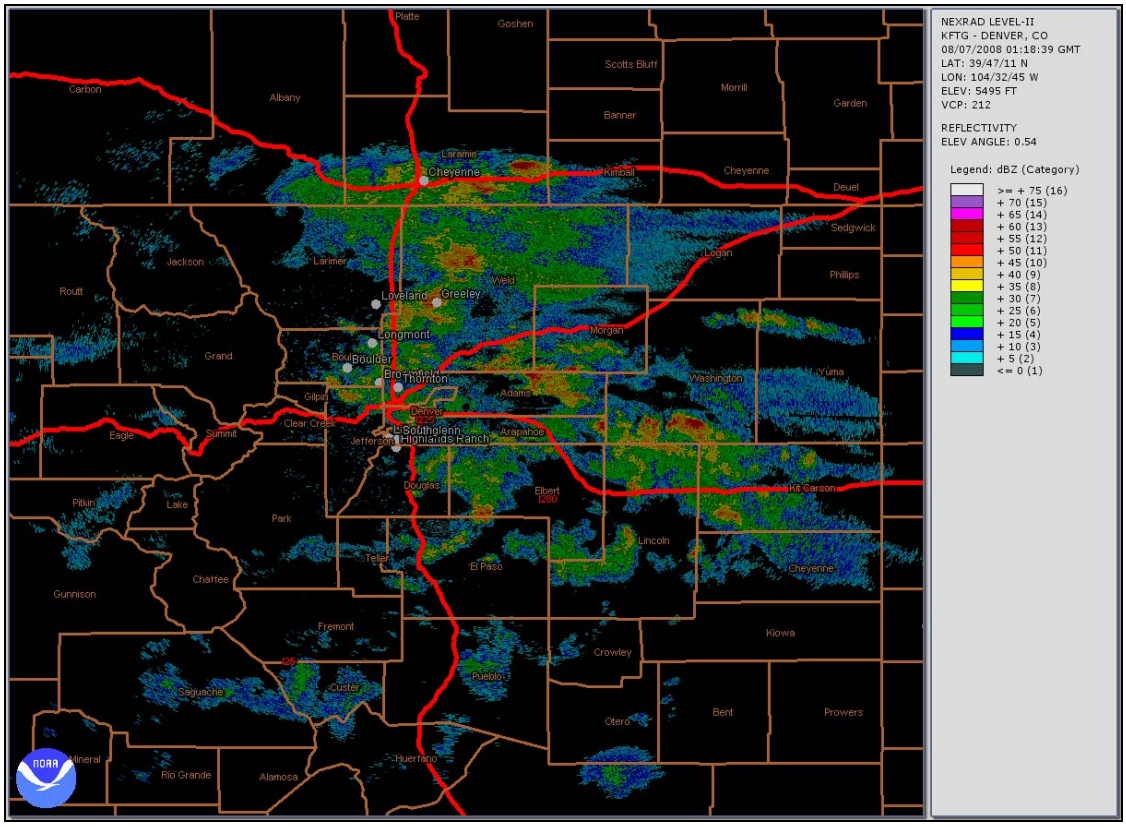
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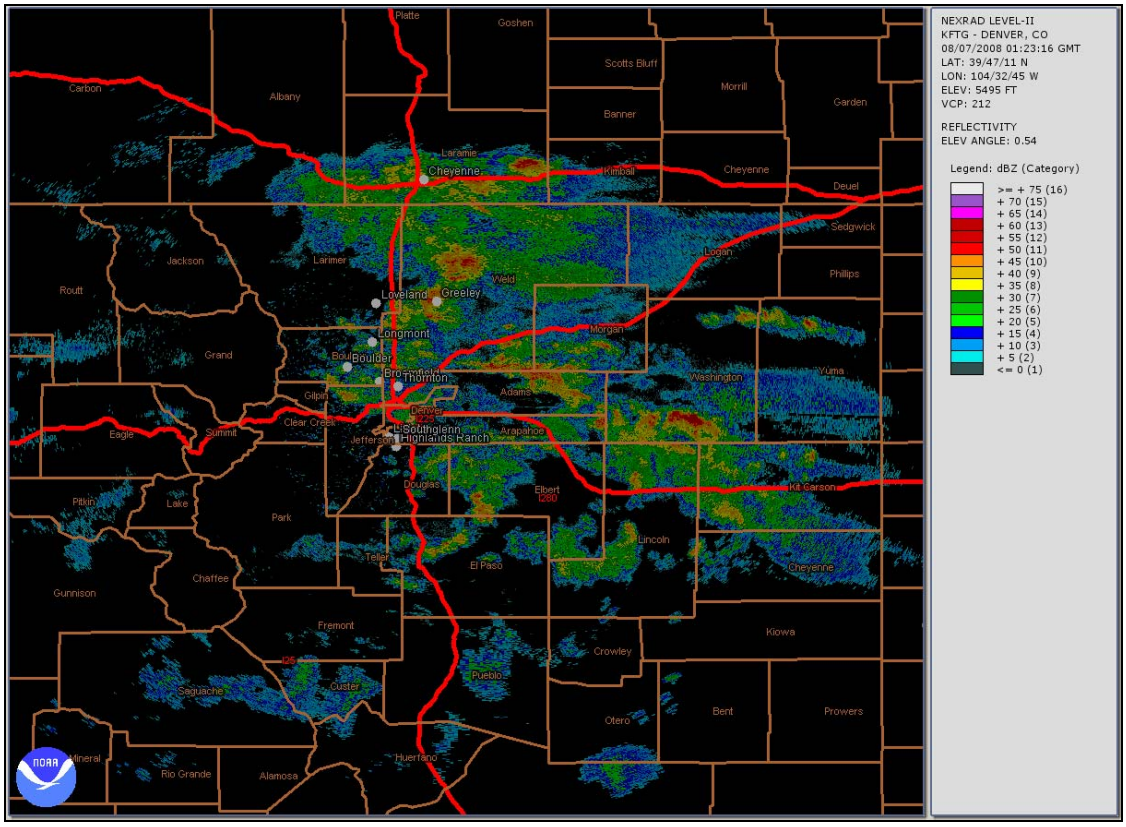
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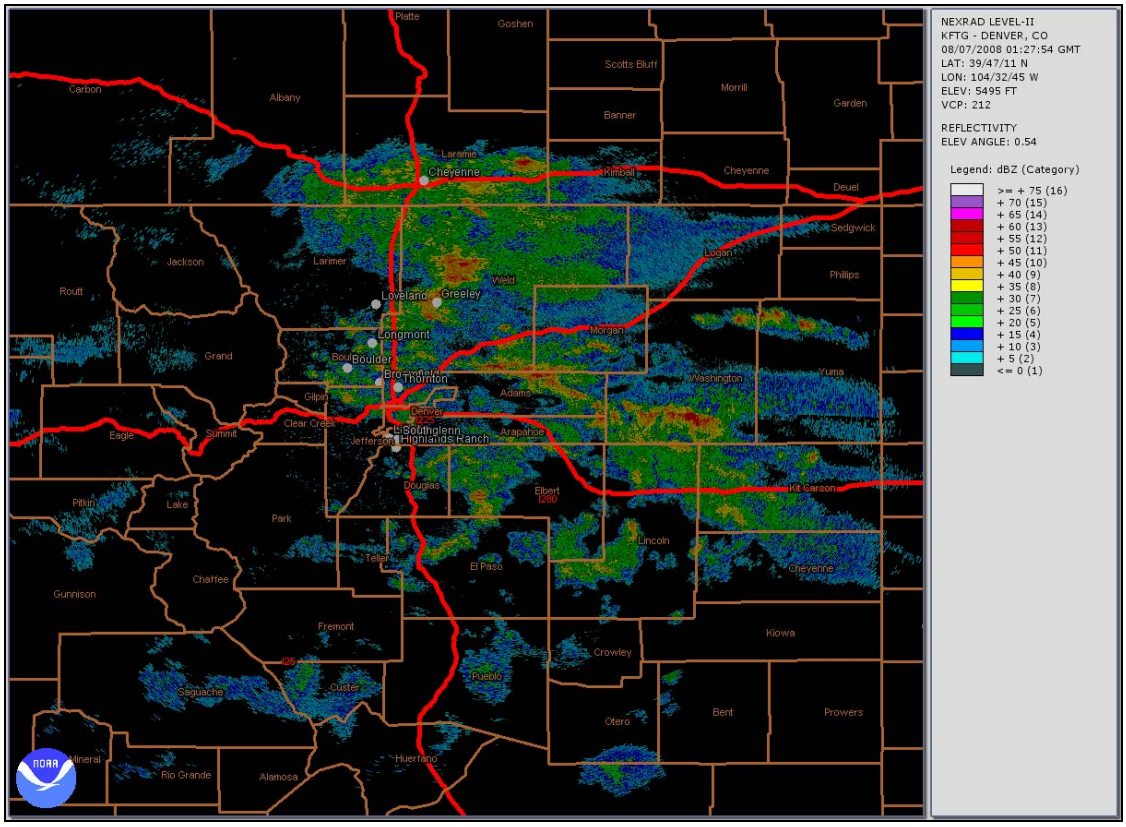
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FLOOD DOCUMENTATION REPORT – CHAPTER 4

2008 SNOWMELT RUNOFF SUMMARY REPORT

Anderson Consulting Engineers, Inc. would like to acknowledge Mr. Nolan Doesken, Colorado State Climatologist and Senior Research Associate at Colorado State University, for his invaluable information utilized in the preparation of this document.

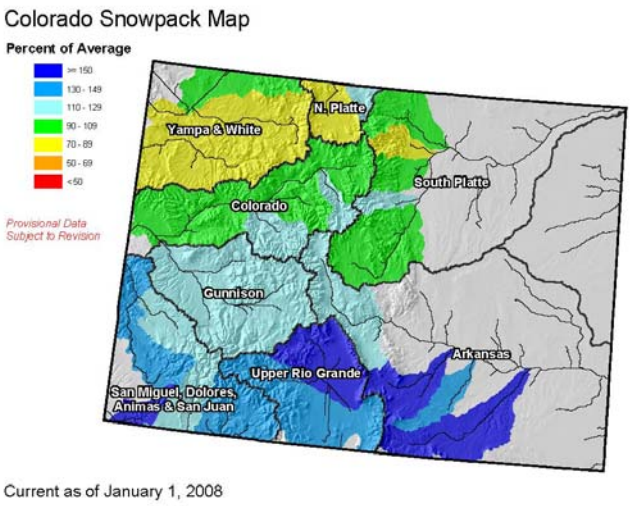
I. COLORADO SNOWPACK SUMMARY FOR 2007-2008

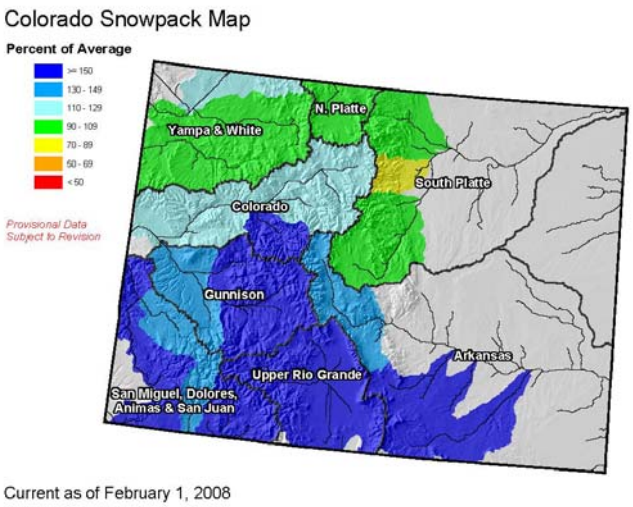
The 2007-2008 snow season started off slowly, with concern of further drought conditions for the State of Colorado through the month of December. Near the end of December, heavy snowfall was experienced in the southern mountains of Colorado with the northern mountains tending to follow normal precipitation patterns. This pattern generally continued through February 2008 resulting in a snowpack for the southern and central mountains of Colorado ranging from 130 to over 150 percent of average. During this same timeframe the northern mountains of Colorado generally observed average, to above average snowpack levels.

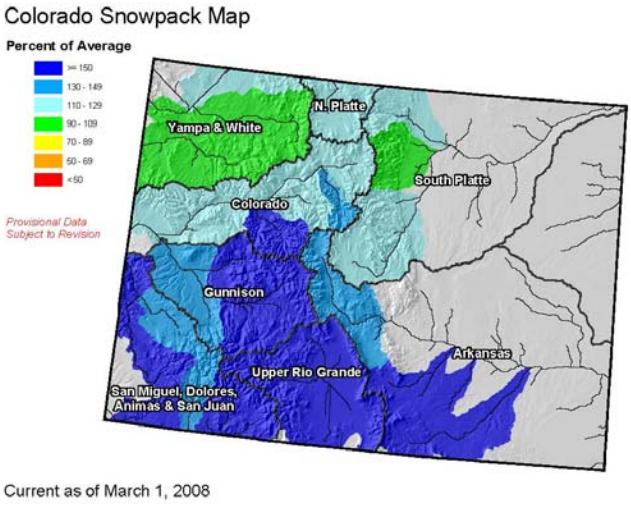
At the beginning of March 2008, concern was growing for the southern mountains with respect to the potential of flooding from the spring runoff associated with the higher than average snowpack levels. However, about this time the precipitation patterns for the State of Colorado began to shift. The months of March and April resulted in very little snowfall for the Southern Mountains, especially south of the Gunnison Basin. The central and northern mountains continued to experience average to slightly above average snowfall.

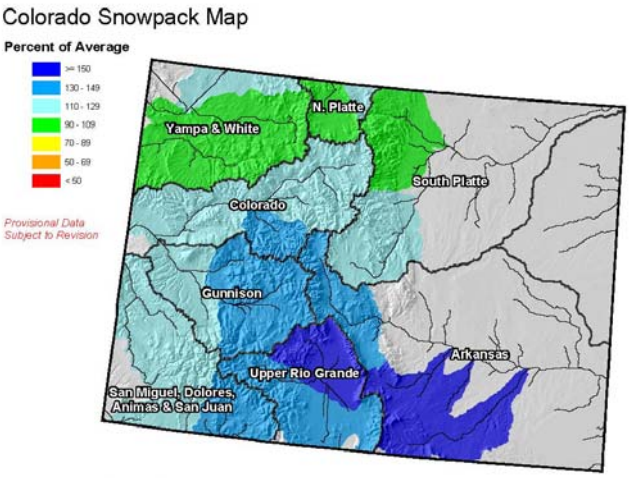
For the majority of the Colorado Mountains, May signaled the end to the accumulating snowfalls and the beginning of the spring snowmelt. However, some additional snow accumulated in the northern mountains during the month of May. Figure 1 provides a graphical presentation of statewide snowpack levels for 2008. Table 1 provides a summary of snowpack statistics across Colorado on May 1st, 2008.

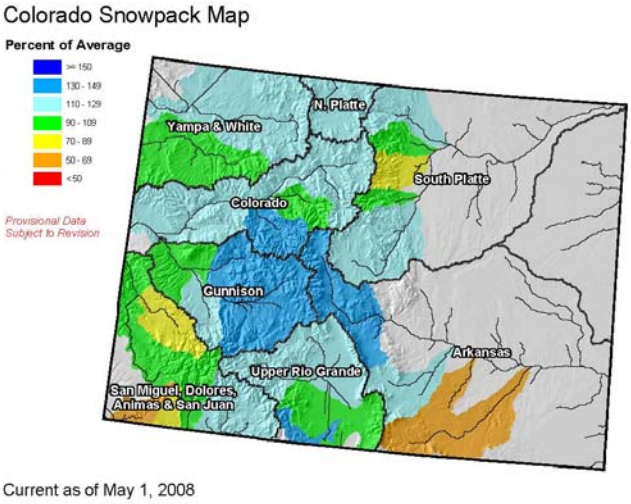
The 2007-2008 snow season resulted in a statewide snowpack peak of 129 percent of average, which occurred around the middle of April 2008. Figure 2 provides the statewide average time series snowpack summary. Figure 3 provides the time series snowpack summary for drainage basins in Colorado. Additional time series data and historical comparisons are provided in Appendix A.











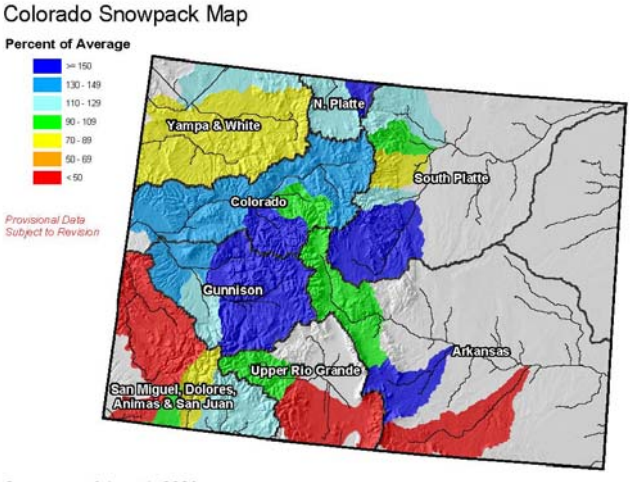


Figure 1. Statewide Snowpack Levels for 2008.

Table 1. Colorado Snowpack Statistics, May 1st, 2008.

Colorado Drainage Basin	Snowpack Levels (Percent of Average)	Notes
South Platte	103	2nd Highest since 1997
Arkansas	131	Highest Since 1997
Rio Grande	117	3rd Highest Since 1997
Southwest Basins*	103	2nd Highest Since 1997
Gunnison	136	Highest Since 1997
Yampa/White/N. Platte	108	Highest Since 1997
Upper Colorado	120	Highest Since 1997

* Includes San Miguel, Dolores, Animas and San Juan Basins

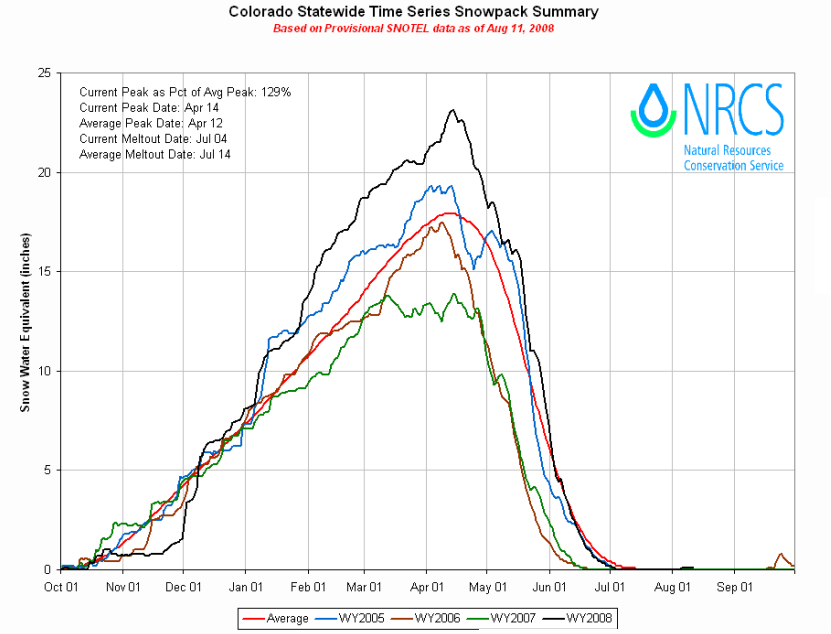


Figure 2. Statewide Average Time Series Snowpack Summary.

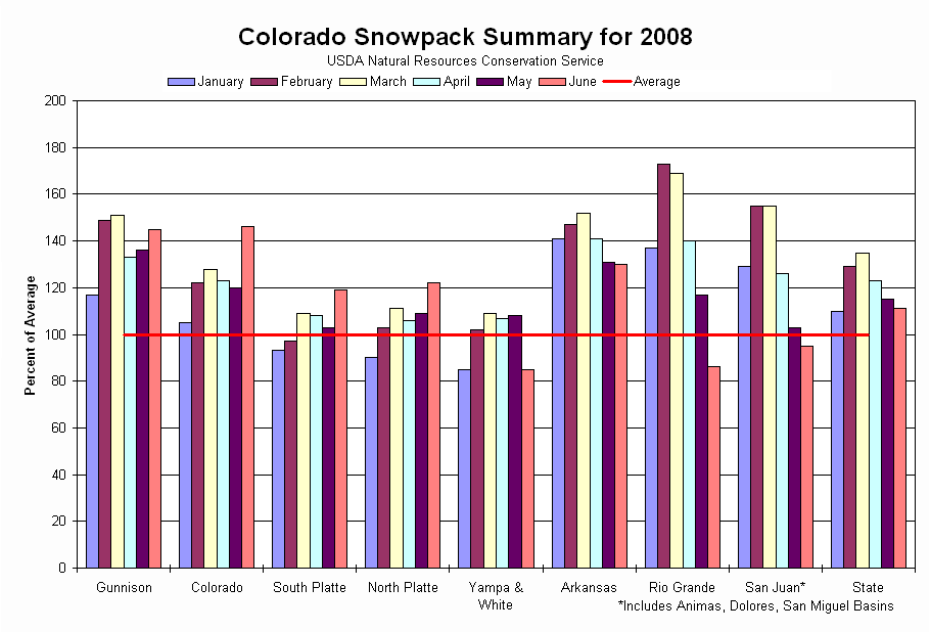


Figure 3. Colorado Drainage Basins Time Series Snowpack Summary.

II. SPRING 2008 SNOWMELT SUMMARY

Snowmelt in Colorado's mountains is highly dependant on temperatures during the months of May and June. Mountain temperatures were generally cooler from December 2007 through mid-May 2008, seeing departures of 1 to 5 degrees below average. With the cooler than average spring, most of the lower elevation snow melted in an uneventful manner without the contribution of higher elevation runoff.

Toward the middle of May the first warming trend was observed for the central and northern mountains. This trend resulted in several flood warnings being issued in Grand, Routt, Delta and Gunnison Counties. Several rivers and streams reached their peak flow stage on or around the 21st of May. Table 2 provides a summary of locations that experienced notably high levels of runoff during this timeframe.

Table 2. Notable Rivers/Streams that Peaked the Week of May 18-24, 2008.

River/Stream Name	Peak Discharge (cfs)	Notes
Gunnison River at Delta	14,000	Highest Flow Since 1995
East River at Almont	3,040	Highest Flow Since 1997
Elk River at Milner	6,230	Record Measured Flow
Muddy Creek near Kremmling	902	Record Measured Flow
Fraser River near Tabernash	890	Record Measured Flow

The 22nd of May brought an end to the five days of above average temperatures for the northern and central mountains. This cool down quickly reduced the amount of runoff and lowered stream discharges. It is the opinion of Mr. Nolan Doesken, that if this above average temperature streak had extended a few more days, there would have been significant flooding and flood related damages.

The second peak of the 2008 spring runoff occurred during the month of June. As June progressed, temperatures began to rise and runoff from snowpack at the highest elevations began to increase. Some of the rivers that exhibited notable runoff peaks during the month of June are identified in Table 3.

Table 3. Notable Rivers that Peaked in the Month of June 2008.

River/Stream Name	Peak Discharge (cfs)	Notes
Colorado River at Glenwood Springs	15,600	2nd Highest Flow Since 1997
Roaring Fort at Glenwood Springs	8,000	Highest Flow Since 1997
Arkansas River at Canon City	4,300	Highest Since 1995

With the higher than average snowpack from the 2007-2008 snow season, snowmelt runoff had the potential to cause significant flooding and flood related damage. However, the 2008 spring

snowmelt was generally uneventful due to the following: (a) a cooler than average spring, which lead to snowpack in lower elevations melting without the contribution of runoff from higher elevations; (b) there was no substantial precipitation during the runoff period; and (c) there was not a prolonged period of consecutive days with above average temperatures (greater than 7 days). It is noted that according to Nolan Doesken, it typically takes 5 days of continuous above average temperatures before significant levels of snowmelt runoff commences. If the warm weather continues for 7 or more days, widespread flooding can be expected.

III. COMMUNITY PREPAREDNESS ACTIVITIES AND IMPACT

Mountain communities took several steps prior to, and during the 2008 spring runoff in order to inform and prepare local citizens for the potential of snowmelt related flooding and to provide aid during the snowmelt period. To determine the steps taken by the various communities, a questionnaire was prepared and submitted to the Emergency Managers in impacted counties. Included in this questionnaire was a request for the following information: (a) a summary of local preparedness activities (i.e., meetings, news media announcements, reverse 911, task forces, etc.); (b) a summary of any operational procedures that were applied (i.e., operation of flow diversions, dams, etc.); (c) a summary of spring runoff conditions (i.e., which streams/rivers were the most impacted, was there any damage, any mitigation efforts, etc.); and (d) any other information that the community feels would be pertinent to include. Responses to the questionnaire are provided in Appendix B.

The following are some of the reported community preparedness activities that were conducted in preparation of, and during, the 2008 snowmelt period:

- Departmental meetings;
- Press releases via several media formats (TV, radio, newspaper, websites, etc.) to inform citizens of potential flood issues and how to prepare/respond;
- Update to the High Water Preparedness Packet (Towns of Breckenridge, Dillon , Frisco, Silverthorne, and the Summit County Government), which provides residents, business owners, and visitors of Summit County a summary of information to help prepare for high water and to provide emergency contact information;
- Making sandbags available to the community;
- Testing of Reverse 911 Emergency Systems;
- Delay of sponsored river activities; and
- Monitoring and/or operation of upstream dams (e.g., releases from the Dillon Dam were increased starting in late February and continued through mid-May in order to have the available storage to reduce the risk of flooding below the dam).

Even though the 2008 snowmelt turned out to be fairly uneventful, considerable preparation were made in anticipation of potential flooding and there were areas that experienced flooding due to snowmelt runoff. However, outside of a few reports of flooded basements, there were no reports of substantial structure inundation and damage. Most of the reports consisted of water exceeding bank capacity and flooding adjacent fields. There were also reports of minor channel/bank erosion and the loss of a footbridge from the high runoff levels and the loss of a footbridge. Two reports were prepared for the Colorado Water Conservation Board, which document the end of May flooding events. The first report, "State of Colorado, 2008 Flood Documentation Report, Snowmelt Flood Warnings for Grand, Gunnison, and Routt Counties During the Week of May 18-24, 2008" [ACE, June 20, 2008], documents the flooding in these three counties. This report focused primarily on the East River at Almont, Elk River at Milner, Muddy Creek near Kremmling, and the Fraser River near Tabernash. The second report, "State of Colorado, 2008 Flood Documentation Report, Flooding Along the Gunnison River in Delta, CO, Flood of May 22, 2008" [ACE, June 25, 2008], documents the flooding along the Gunnison River in Delta in conjunction with the operation with the Aspinall Unit (Blue Mesa Dam, Marrow Point Dam, and Crystal Dam).

IV. GOVERNMENT ACTIVITIES

In response to widespread flooding in 1995, the Governor's Flood Task Force (FTF) was created. The Flood Task Force typically meets from March to June, but may begin as early as February and continue until September, as needed. Meetings are occasionally held in conjunction with the Water Availability Task Force, and are held on a regular basis during the flood season to monitor severe weather conditions, exchange information and coordinate local, state, and federal activities. The FTF also monitors snowpack, precipitation, reservoir storage, streamflow, and weather forecasts, as well as providing a forum for synthesizing and interpreting potential flood hazard information.

In the event of significant flooding in Colorado, members of the FTF provide technical assistance, funding and coordination for flood response, flood recovery, and mitigation efforts. The Colorado Water Conservation Board (CWCB) is the Chair of the FTF and has a flood response program that provides for flood outlooks, aerial photography, post-event floodplain mapping, and mitigation activities. As part of the flood response program, the CWCB also documents the flooding events in Colorado. The two snowmelt flood documentation reports produced in 2008 ("Snowmelt Flood Warnings for Grand, Gunnison, and Routt Counties During the Week of May 18-24, 2008" and "Flooding Along the Gunnison River in Delta, CO, Flood of May 22, 2008") were part of this documentation program. An annual summary of the flood season is also developed by the CWCB, and is presented at conferences, and is made available to the public through their website. The PowerPoint presentation of the 2008 flood summary is provided in Appendix C.

Summary reports for the March 17, 2008 and the May 19, 2008 FTF meetings are provided in Appendix D. Both reports focused on the preparation for the potential of snowmelt related flooding by providing the following: (a) snowpack levels; (b) reservoir levels; and (c) short and long term weather forecasts.

V. REFERENCES AND ACKNOWLEDGEMENTS

1. Meeting on August 21, 2008 with Nolan Doesken, Colorado State Climatologist and Senior Research Associate at Colorado State University, to discuss the 2007-2008 snow season and snowmelt runoff.
2. Natural Resources Conservation Service, Colorado Snow Survey Program http://www.co.nrcs.usda.gov/snow/snow/index.html
3. High Plains Regional Climate Center, http://www.hprcc.unl.edu/
4. Watershed Protection & Flood Mitigation Section of the Colorado Water Conservation Board,

   http://cwcb.state.co.us/WatershedProtectionFloodMitigation/FloodPreparationResponse/FloodTaskForce/
5. The PowerPoint presentation, "CWCB Flood Summary, (2008) Flood Season", [Kevin Houck, P.E., CFM, CWCB, September 11, 2008].
6. "State of Colorado, 2008 Flood Documentation Report, Snowmelt Flood Warnings for Grand, Gunnison, and Routt Counties During the Week of May 18-24, 2008," ACE, June 20, 2008.
7. "State of Colorado, 2008 Flood Documentation Report, Flooding Along the Gunnison River in Delta, CO, Flood of May 22, 2008," ACE, June 25, 2008.

APPENDIX A

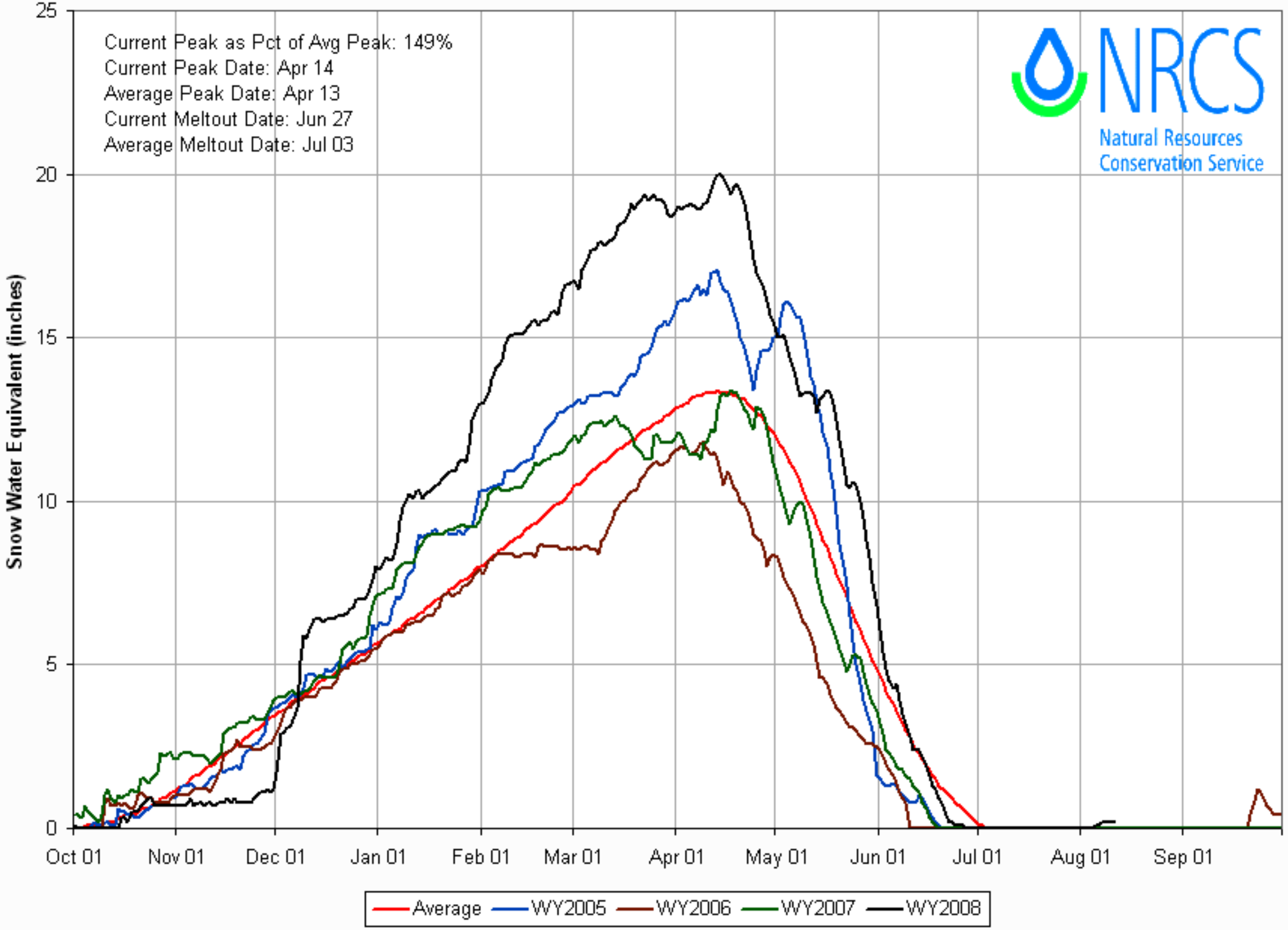
TIME SERIES DATA AND HISTORICAL COMPARISONS

APPENDIX A.1

TIME SERIES SNOWPACK SUMMARY BY BASIN

Arkansas River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008



Gunnison River Basin Time Series Snowpack Summary

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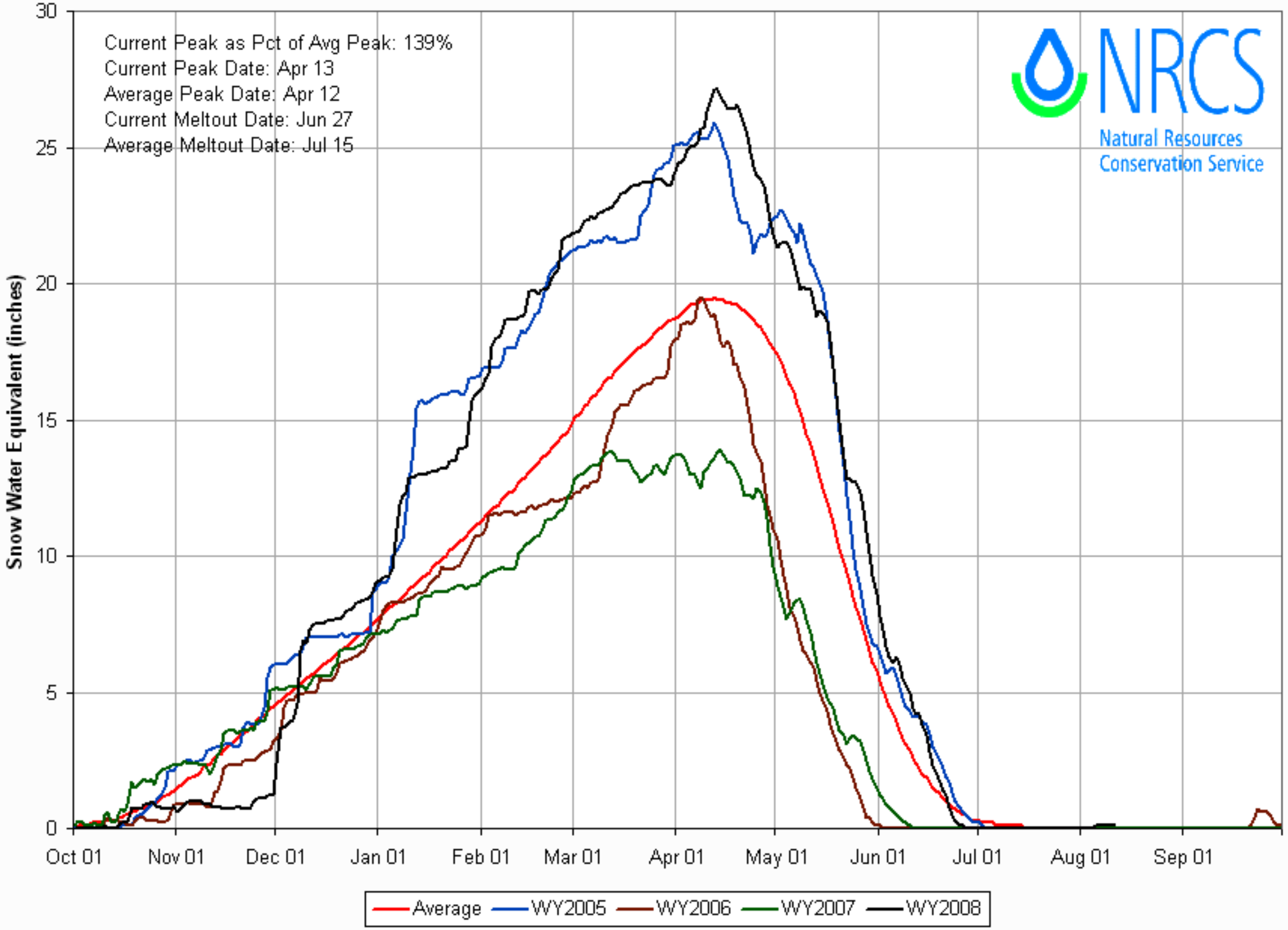


Laramie and North Platte River Basins Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008

Current Peak as Pct of Avg Peak: 113%
Current Peak Date: Apr 19
Average Peak Date: Apr 26
Current Meltout Date: Jul 04
Average Meltout Date: Jul 18

NRCS
Natural Resources Conservation Service

Snow Water Equivalent (inches)

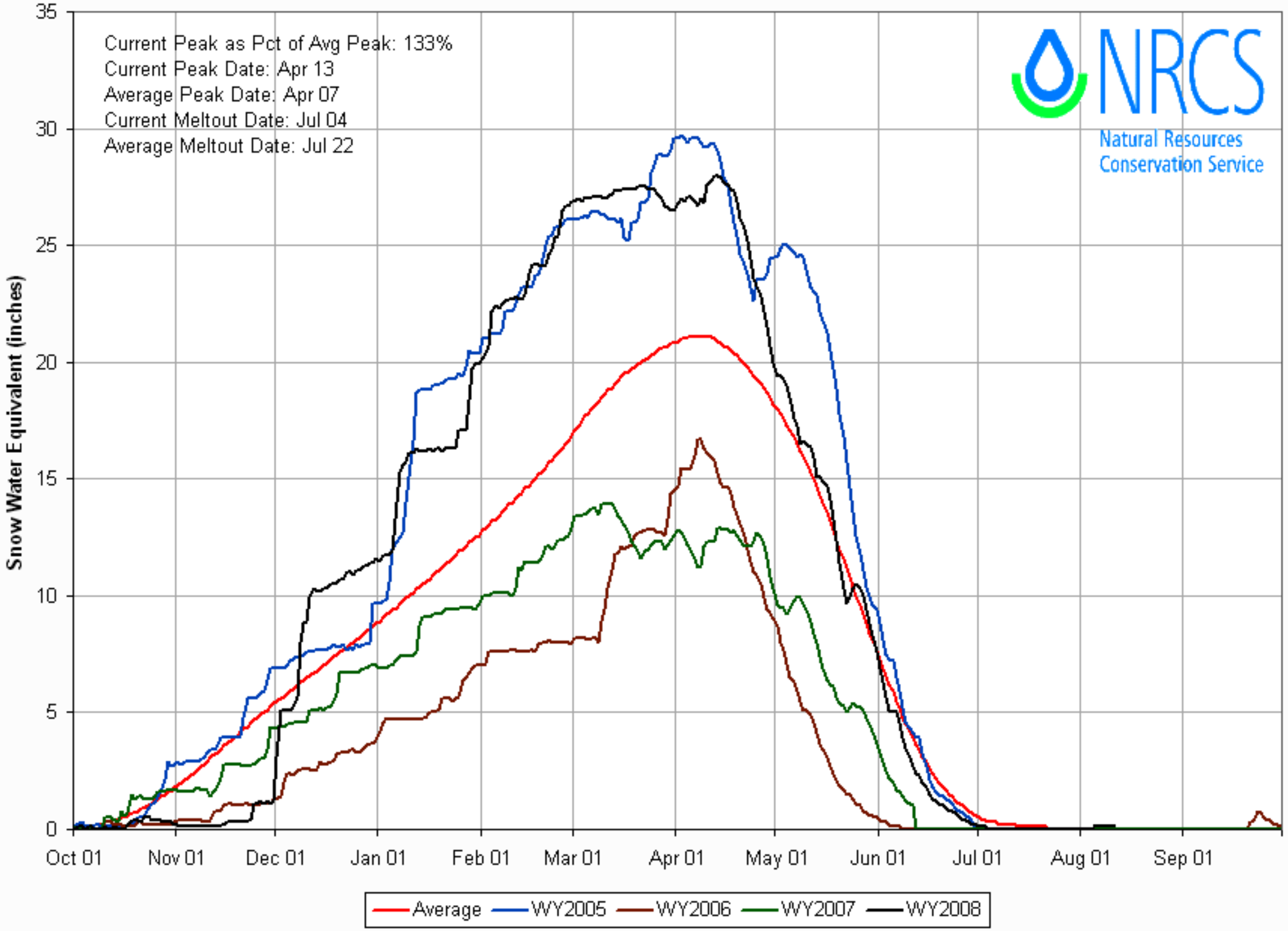
35
30
25
20
15
10
5
0

Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01

Average WY2005 WY2006 WY2007 WY2008

San Miguel, Dolores, Animas & San Juan River Basins Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008



South Platte River Basin Time Series Snowpack Summary

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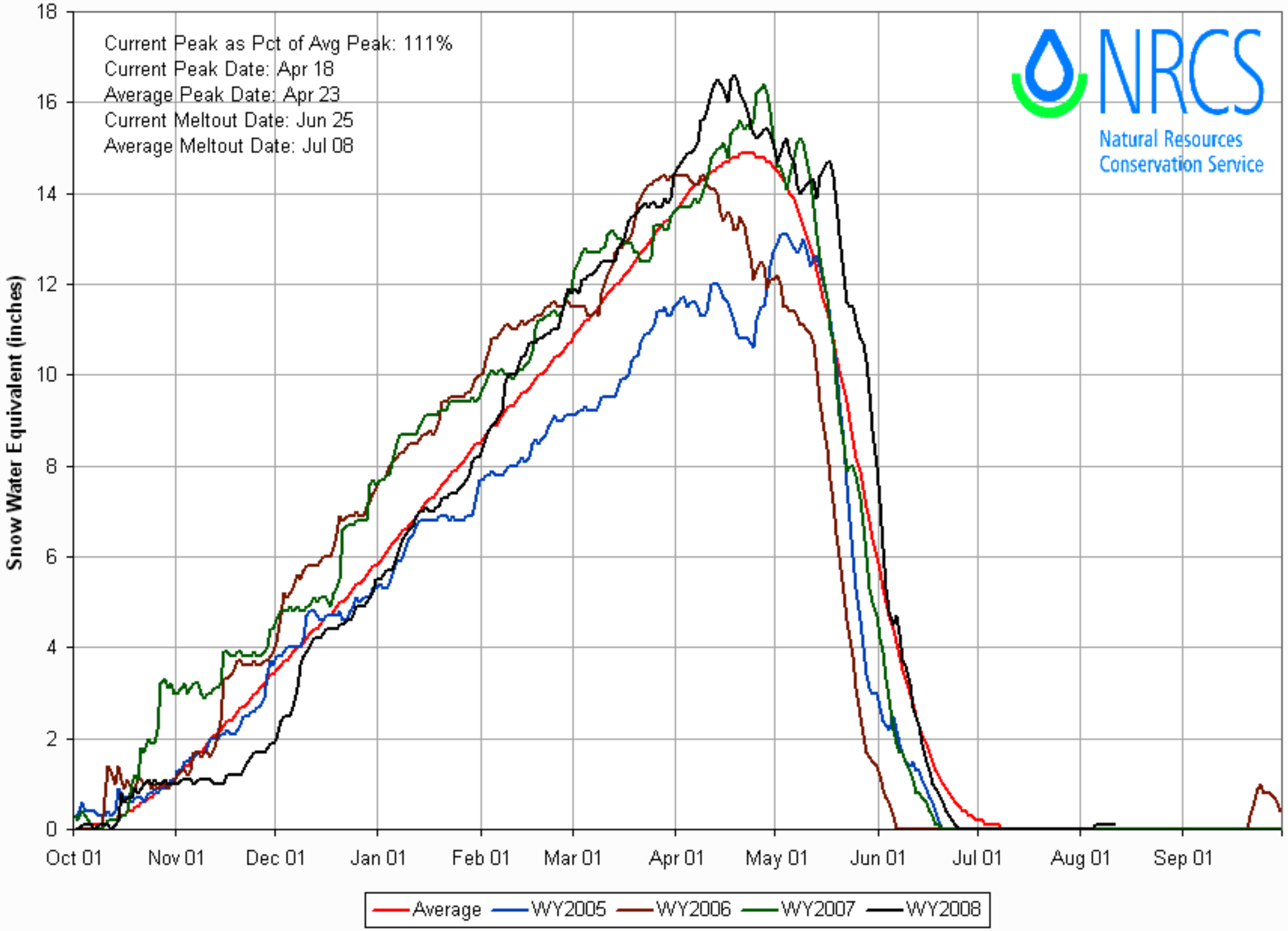


Upper Colorado River Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008

Current Peak as Pct of Avg Peak: 136%
Current Peak Date: Apr 13
Average Peak Date: Apr 14
Current Meltout Date: Jul 06
Average Meltout Date: Jul 12

NRCS
Natural Resources Conservation Service

Snow Water Equivalent (inches)

25
20
15
10
5
0

Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01

Average WY2005 WY2006 WY2007 WY2008

Upper Rio Grande Basin Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008

Current Peak as Pct of Avg Peak: 139%
Current Peak Date: Mar 22
Average Peak Date: Apr 10
Current Meltout Date: Jul 05
Average Meltout Date: Jul 24

NRCS
Natural Resources
Conservation Service

Snow Water Equivalent (inches)

30
25
20
15
10
5
0

Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01

Average WY2005 WY2006 WY2007 WY2008

Yampa and White River Basins Time Series Snowpack Summary

Based on Provisional SNOTEL data as of Aug 11, 2008

Current Peak as Pct of Avg Peak: 121%
Current Peak Date: Apr 14
Average Peak Date: Apr 13
Current Meltout Date: Jul 07
Average Meltout Date: Jul 18

NRCS
Natural Resources
Conservation Service

Snow Water Equivalent (inches)

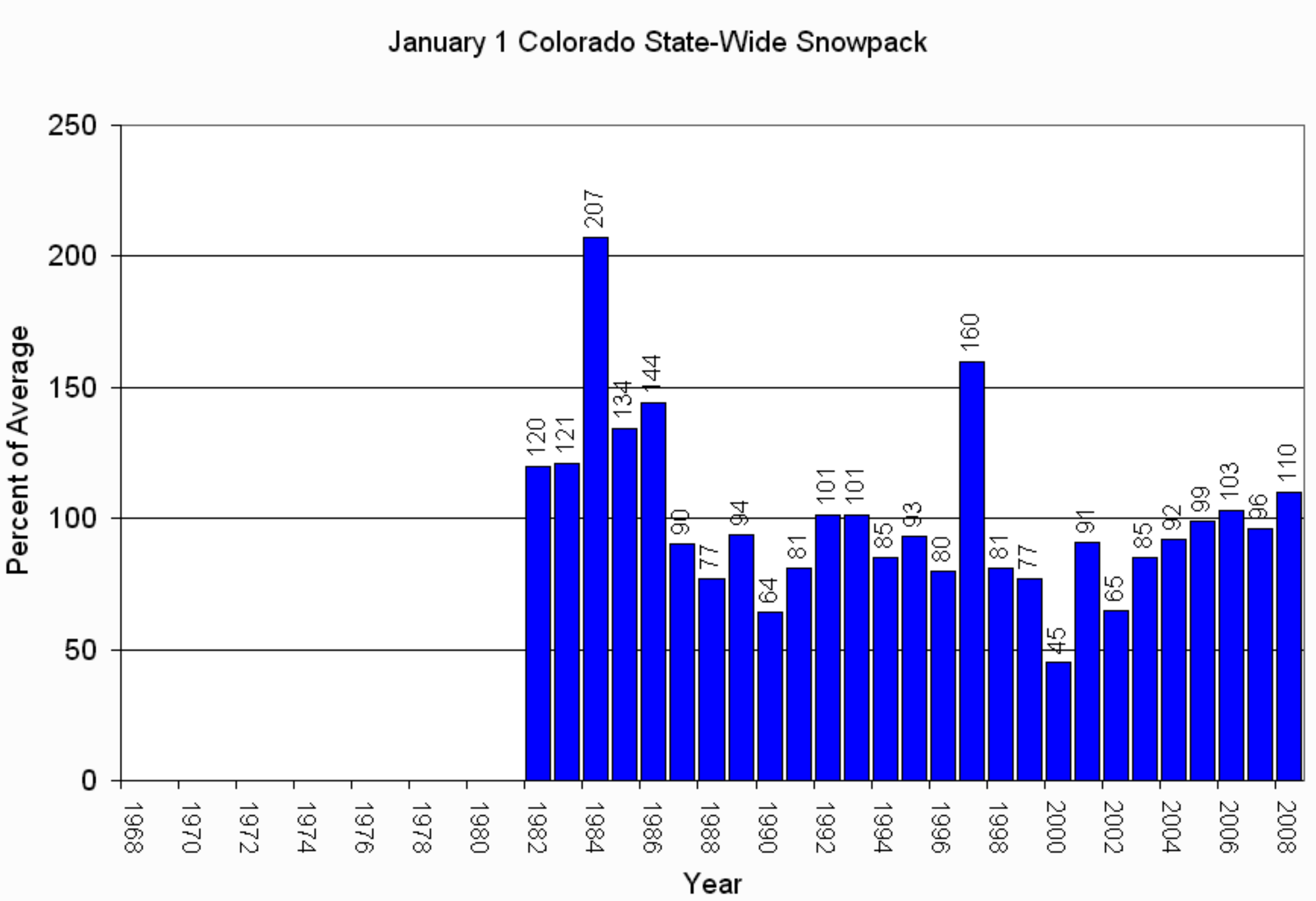
30
25
20
15
10
5
0

Oct 01 Nov 01 Dec 01 Jan 01 Feb 01 Mar 01 Apr 01 May 01 Jun 01 Jul 01 Aug 01 Sep 01

Average WY2005 WY2006 WY2007 WY2008

APPENDIX A.2

HISTORICAL MONTHLY STATEWIDE SNOWPACK


January 1 Colorado State-Wide Snowpack
Percent of Average
250
200
150
100
50
0
120
121
207
134
144
90
77
94
64
81
101
101
85
93
80
160
81
77
45
91
65
85
92
99
103
96
110
1968
1970
1972
1974
1976
1978
1980
1982
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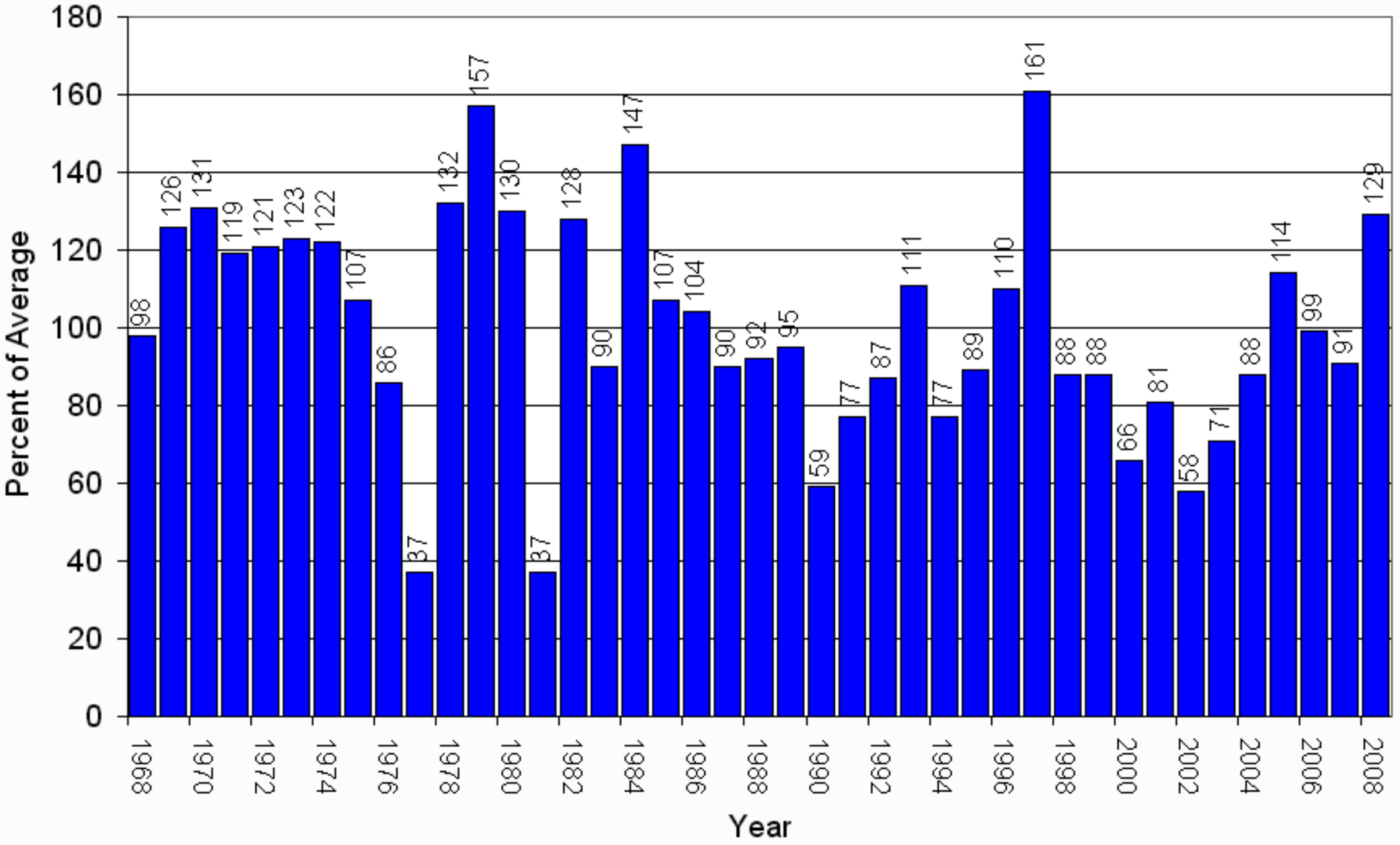
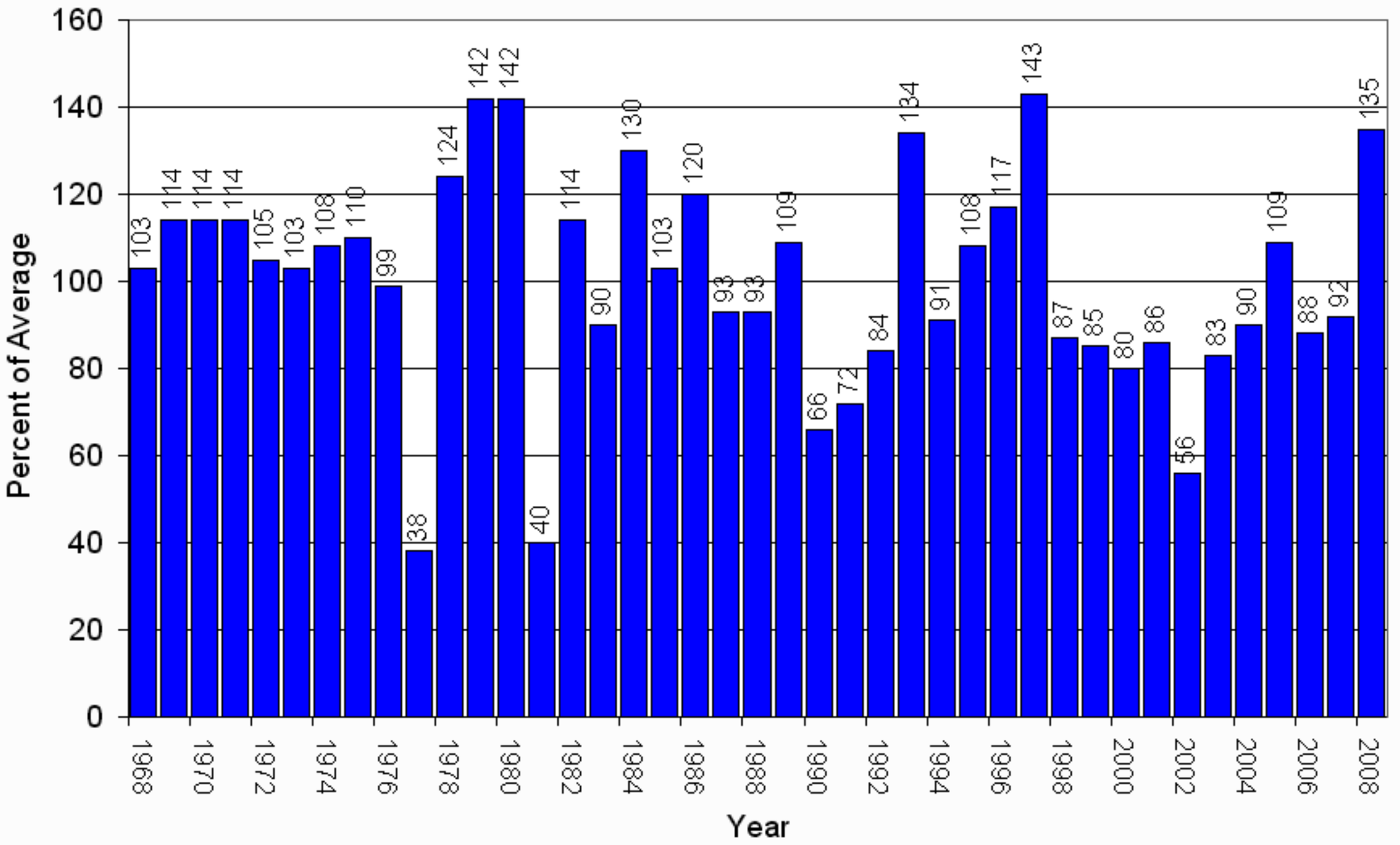
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
Year

February 1 Colorado State-Wide Snowpack




March 1 Colorado State-Wide Snowpack
Percent of Average
Year
0
20
40
60
80
100
120
140
160
1968
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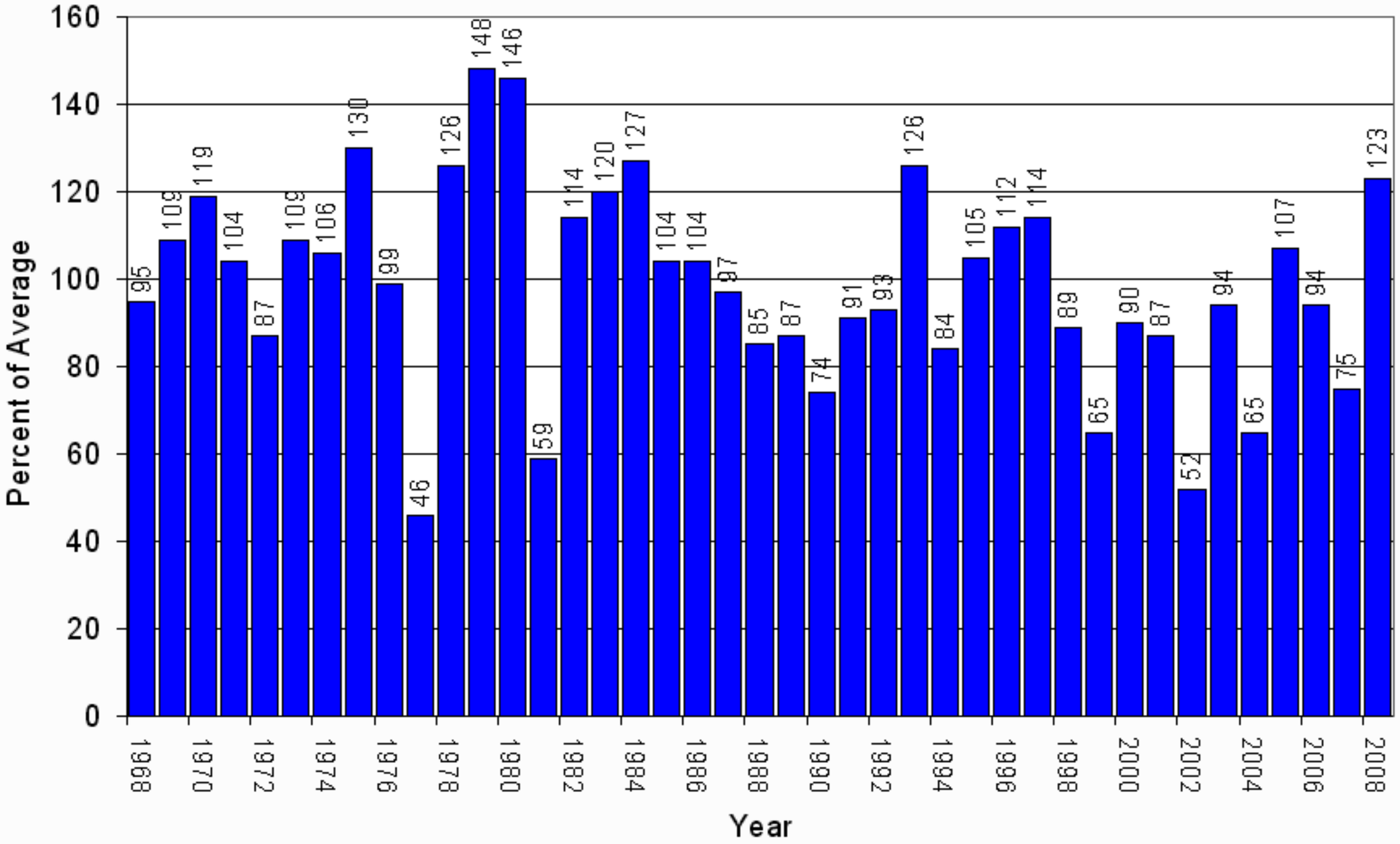
April 1 Colorado State-Wide Snowpack
Percent of Average
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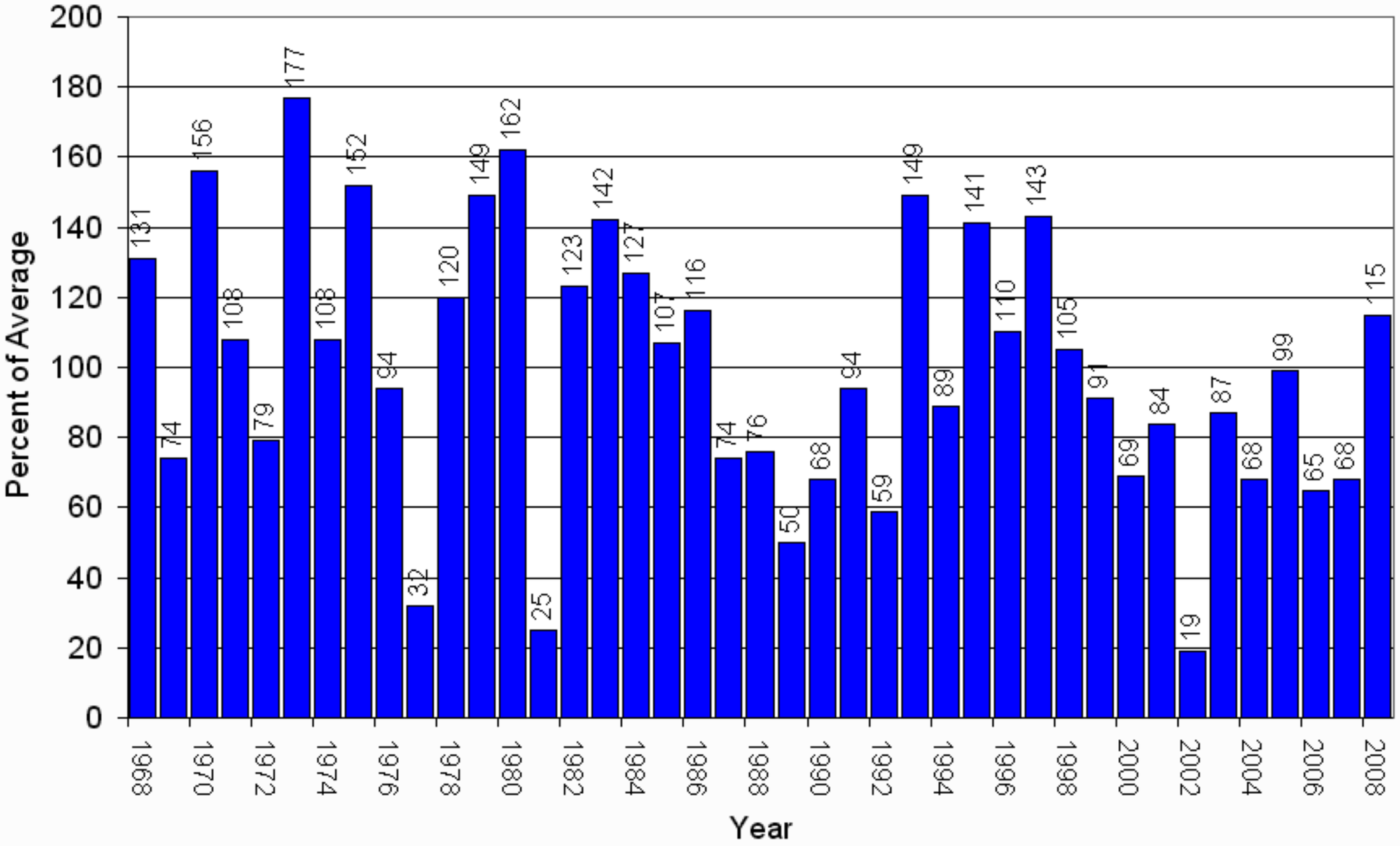
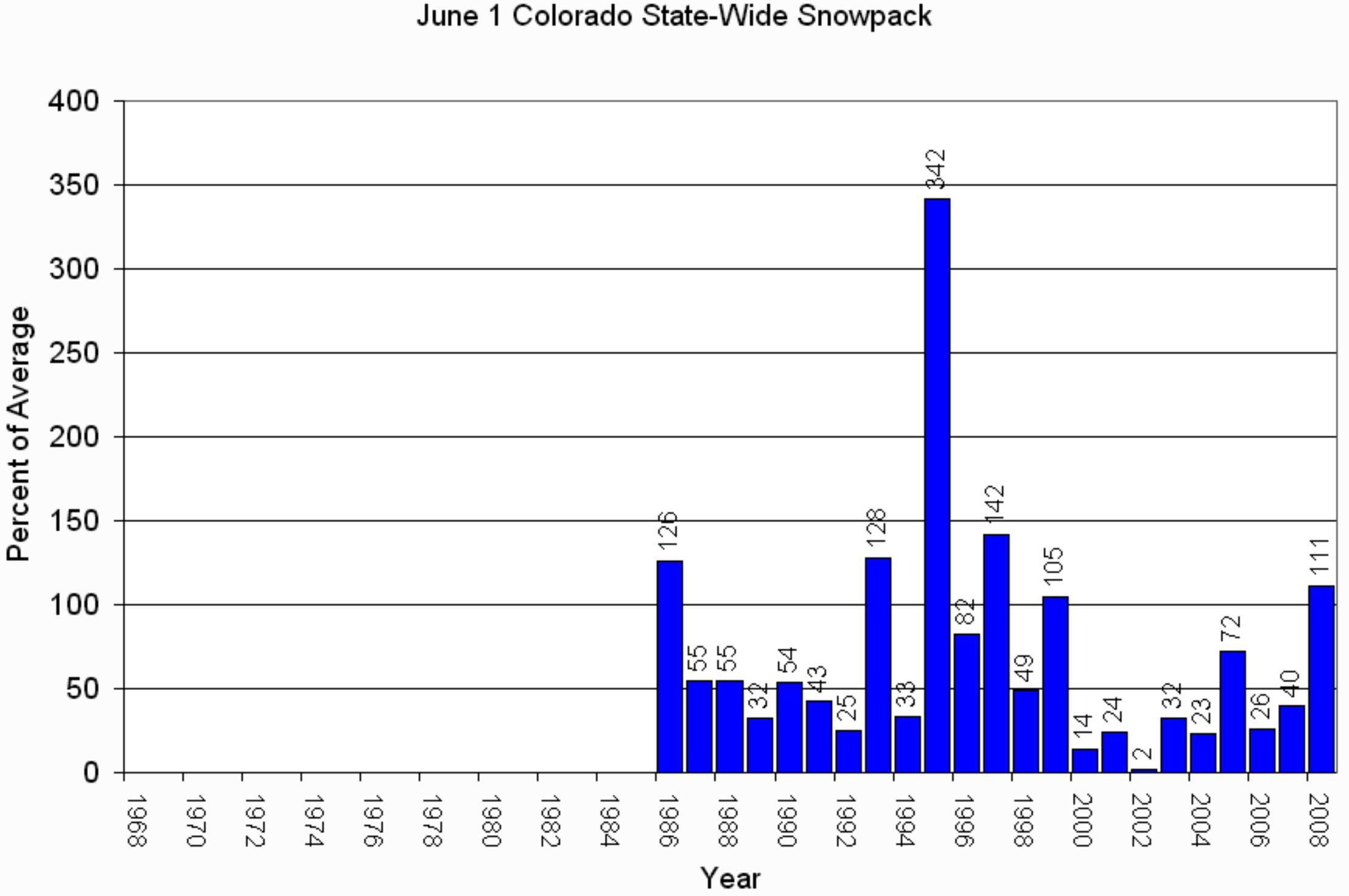
May 1 Colorado State-Wide Snowpack




June 1 Colorado State-Wide Snowpack
Percent of Average
Year
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APPENDIX B

2008 SPRING RUNOFF
QUESTIONNAIRE RESPONSES

Aaron Hansen

From: Steger, Robert G. [Robert.Steger@denverwater.org]
Sent: Wednesday, August 13, 2008 5:21 PM
To: 'JCochran@co.summit.co.us'; Aaron Hansen
Cc: Keefe, Kevin R.; Fernandez, Dave A.; Christensen, Edward R.; Steger, Robert G.
Subject: Spring Snowmelt Dillon Reservoir

Joel and Aaron,

Here is some information about Denver Water's operations on the Blue River for your Spring Snowmelt Summary Report:

The natural inflow to Dillon Reservoir for the April – July period this past year was 193,000 AF. The average is about 167,000 AF, so this year's runoff was about 16% above normal.

Because of the high snowpack, Denver Water operated Dillon Dam so as to reduce the risk of flooding below the dam. We increased the outflow to the Blue River in increments over the course of the snow accumulation season as follows (numbers are rounded off):

Late February: Increased outflow from 50 cfs to 100 cfs
Mid March: Increased outflow from 100 cfs to 180 cfs
Mid April: Increased outflow from 180 cfs to 500 cfs
Mid May: Increased outflow from 500 cfs to 800 cfs

By late May, we determined that the risk of downstream flooding was minimal, and we began decreasing the outflow. (On May 28, we were releasing about 800 cfs. By May 30 we were down to about 500 cfs.)

In June, we dropped the outflow some more and allowed the reservoir to fill and begin spilling.

I hope you find this information useful.

Sincerely,
Bob Steger

Bob Steger
Manager of Raw Water Supply
Denver Water
303/628-6548

Aaron Hansen

From: Steve Morrisey [steve.morrisey@fremontco.com]
Sent: Tuesday, August 12, 2008 9:35 AM
To: Aaron Hansen
Subject: RE: Spring Snowmelt Summary Report

Aaron,

In Fremont County we had several instances of the Arkansas River reaching Flood Stage this year. This all occurred in June and the fluctuations were due to temperature variations in the mountains. There were no heavy rains during that time period which kept things manageable.

The Arkansas River was the only affected water body, although many smaller streams were running fast and high.

The Arkansas, as it travels through Canon City, is confined to a narrower bed than in most places. Embankments placed along the river kept any damage from occurring to homes or infrastructure. Some banks were eroded along the river but never entered lowland area for any appreciable distance. Florence River Park did receive a little damage along the river side, but this area is built out a gravel bar, anyway. It periodically gets inundated at high water during storms.

Our preparedness activities started with the NWS warning early in the year.
Based on this we set up a meeting with all local officials, press State Parks and responders in the County to provide information to and to receive feedback from them.
The outcome from this was;

Department of Corrections offered the use of inmates for sandbag filling and storage.
The purchase of sand bags and provision of fill material for different jurisdictions.
Places where private individuals could receive sand bags and fill material.
Press releases from local radio and paper including daily updates on river flow.
Television interviews describing conditions and dangers of the river.
Website information for river flow on the County website (WWW.Fremontco.com).
Trial runs of reverse 911 to select areas that could be affected.
Meeting with the Army Corps of Engineers for information.
Rafting on the river was limited in areas where danger was increased.
Delay of sponsored river activities.
Monitoring of upriver dams.

Since the weather cooperated with no large rainfall events there was never any action started that affected normal operations.
The river was high but never caused any significant damage.
The highest CFS reading was about 4,500 with 3,700 being Flood Stage
The 30 year average is about 2,400 CFS during that time period
FYI - in July of 2006 the gage at Portland, downstream of Florence, hit about 21,000 CFS during a storm)

If you have more questions please let me know,

Steve Morrisey
Fremont County
Office of Emergency Management
(719) 276-7422

From: Aaron Hansen [mailto:amhansen@acewater.com]
Sent: Tuesday, August 12, 2008 8:44 AM
To: knowltonbk@co.laplata.co.us; dpetersen@archuletacounty.org; rfiedler@deltacounty.com; chadd.searcy@mesacounty.us; smorrill@gunnisoncounty.org; Steve Morrisey; ellena@co.pitkin.co.us; cbornholdt@garfield-county.com; tom.soos@thmcraig.org; barry.smith@eaglecounty.us;

jcochran@co.summit.co.us; cvale@yampa.com
Subject: Spring Snowmelt Summary Report

Hello,

My name is Aaron Hansen with Anderson Consulting Engineers, Inc. and we are under contract with the Colorado Water Conservation Board (CWCB) to document flooding events across the state of Colorado. Due to a higher than normal snow pack accumulated over the 2007-2008 winter, several counties experienced higher than average runoff causing streams and rivers to swell and exceed their respective banks. I've already contacted a few of you earlier this year to gather flood related information relating to your particular county.

Now that the spring runoff is behind us, the CWCB has requested that we compile a summary report documenting the 2007-2008 snow season and spring snowmelt conditions. They have also identified your counties as the ones that were probably the most impacted by this spring runoff. What I'm hoping to get from you, to include in our report, would be the following:

1) A summary of spring runoff conditions (i.e., what streams/rivers were the most impacted, was there any damage, any mitigation efforts, etc.);
2) A summary of local preparedness activities (i.e., meetings, news media announcements, reverse 911, task forces, etc.);
3) A summary of any operational procedures that were applied (i.e., operation of flow diversions, dams, etc.); and
4) Any other information that you feel would be pertinent to include in this summary report.

If you would like to just respond to this e-mail with any of the above information, it will help us greatly in developing this summary report for the CWCB. Once the report is complete, we will be more than happy to provide a PDF copy of the report to all that are interested. I greatly appreciate you taking the time to assist us with this information! If you have any questions, please feel free to contact me directly so we can discuss.

Thank You,
Aaron

Aaron M. Hansen, P.E., CFM
Senior Engineer

Anderson Consulting Engineers, Inc.
375 E. Horsetooth Road, Bldg. 5
Fort Collins, Colorado 80525

(970) 226-0120 Work, (970) 226-0121 Fax
amhansen@acewater.com www.acewater.com

Aaron Hansen

From: JCochran [JCochran@co.summit.co.us]
Sent: Thursday, September 04, 2008 7:41 PM
To: Aaron Hansen
Subject: FW: Spring Snowmelt Summary Report - SUMMIT COUNTY
Attachments: 2008 SC High Water Packet.pdf; High Water - joint press release May 08.pdf

Information from the Town of Breckenridge which includes our High Water packet and joint press release. I have a couple of other emails to forward to you. Sorry about delay in getting these to you.

Joel

From: DiLallo, Kim [mailto:kimd@breckgov.com]
Sent: Wednesday, August 13, 2008 2:30 PM
To: ThadN; JCochran; JohnP; Hummer, Scott; Fernandez, Dave A.; RicP
Subject: RE: Spring Snowmelt Summary Report

I would ditto Thad's input. Specifically for item number 2:
a representative of the Summit County Public Information Officers (SPIO) attended operational planning meetings on March 31 and May 1, 2008, and then coordinated a full SPIO meeting on May 1, 2008; SPIO completed the following:

- joint press release announcing a High Water Preparedness Packet (thanks to Town of Silverthorne)
- updated the High Water Preparedness Packet (thanks to Town of Frisco)
- appearance on SCTV -Channel 10 (Summit County's PEG channel) to promote the packet (Thanks to Summit County)

The release and packet are attached.

Let me know if you need anything further.

Kim DiLallo

Director of Communications

Town of Breckenridge

PO Box 168, Breckenridge, CO 80424

kimd@townofbreckenridge.com

*970/453-3187 *1*

cell: 970/406-0371

From: ThadN [mailto:ThadN@co.summit.co.us]
Sent: Wednesday, August 13, 2008 12:10 PM
To: JCochran; JohnP; Hummer, Scott; Fernandez, Dave A.; DiLallo, Kim; RicP
Subject: RE: Spring Snowmelt Summary Report

We never really experienced anything but minor issues with high water, mainly due to the fortunate weather patterns we had (in my opinion). Several days of hot weather followed by a day or two of cold days and nights slowed melting down a bit and allowed the streams to keep up with runoff. Adding to that, we didn't get the big rains that can have such a big impact on the rate of melting. I think our prep was extremely valuable regardless, and will get us ready for the next time when we may not be so fortunate.

Thad

From: JCochran
Sent: Tuesday, August 12, 2008 11:02 AM
To: ThadN; JohnP; Hummer, Scott; Fernandez, Dave A.; DiLallo, Kim; RicP
Cc: JCochran
Subject: FW: Spring Snowmelt Summary Report

Good Morning,
I plan to respond to this summary report request on behalf of SCG and our community planning team. I know each of you are busy with many projects and am hoping you can take a couple of minutes and provide me a couple of your thoughts regarding the planning work we did this spring in preparedness for High Water Season. Please see the specific questions in the following email. I believe this is a worthwhile project and glad to see CWCB working to capture best practices in a seasonal report. Feel free to forward this email to anyone appropriate.
Thank you and I look forward to your comments by 5pm on August 15, 2008.

Joel

From: Aaron Hansen [mailto:amhansen@acewater.com]
Sent: Tuesday, August 12, 2008 8:44 AM
To: knowltonbk@co.laplata.co.us; dpetersen@archuletacounty.org; rfiedler@deltacounty.com; chadd.searcy@mesacounty.us; smorrill@gunnisoncounty.org; steve.morrisey@fremontco.com; ellena@co.pitkin.co.us; cbornholdt@garfield-county.com; tom.soos@thmcraig.org; barry.smith@eaglecounty.us; JCochran; cvale@yampa.com
Subject: Spring Snowmelt Summary Report

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Now that the spring runoff is behind us, the CWCB has requested that we compile a summary report documenting the 2007-2008 snow season and spring snowmelt conditions. They have also identified your counties as the ones that were probably the most impacted by this spring runoff. What I'm hoping to get from you, to include in our report, would be the following:

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2) A summary of local preparedness activities (i.e., meetings, news media announcements, reverse 911, task forces, etc.);
3) A summary of any operational procedures that were applied (i.e., operation of flow diversions, dams,

etc.); and
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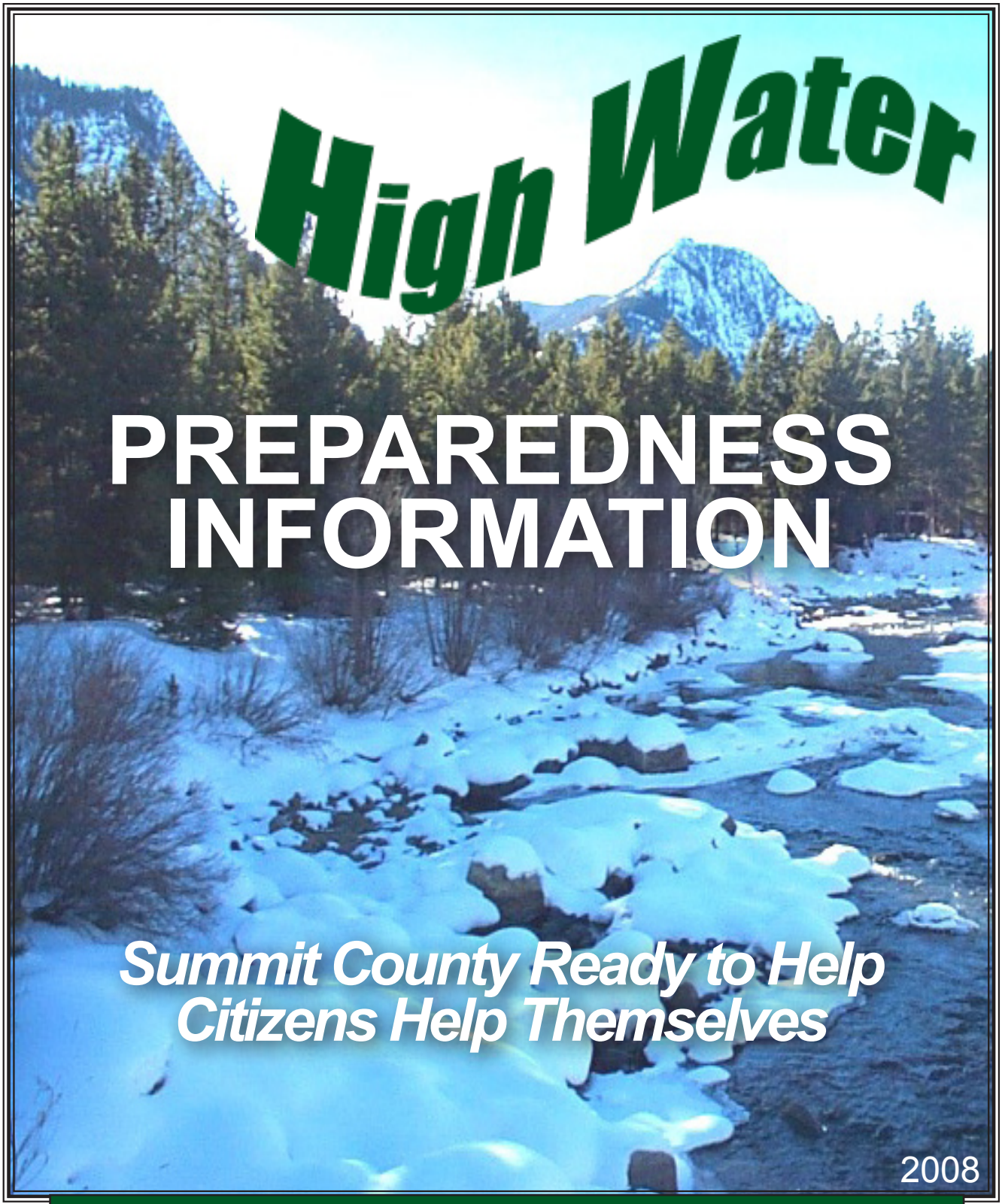
Thank You,
Aaron

Aaron M. Hansen, P.E., CFM
Senior Engineer

Anderson Consulting Engineers, Inc.
375 E. Horsetooth Road, Bldg. 5
Fort Collins, Colorado 80525

(970) 226-0120 Work, (970) 226-0121 Fax
amhansen@acewater.com www.acewater.com



www.TownOfBreckenridge.com www.TownOfDillon.com www.TownOfFrisco.com
www.Silverthorne.org www.co.summit.co.us

May 2008

To Residents, Business Owners, and Visitors of Summit County:

Heavy snowfalls this season could result in a major spring run-off. A packet of information has been assembled to inform the community about the impacts of high water in May and/or June. The Towns and County have prepared a plan of action and are ready for a possible high water event! ***Summit County is prepared to help citizens help themselves.***

Summit County probably won't realize effects of the melt until the end of May or first part of June. However, no one can predict the spring weather, including warm temperatures and precipitation which will determine the rate of flow in the county's creeks. Local and State officials have been monitoring the flows in all the creeks and are prepared to respond to the possibilities of high water situations.

During April, May and June, the Public Works Departments in the county have been removing debris and obstructions in waterways. Sandbags will be available at various locations around the county and more information on sandbags is included in this packet.

On the following pages please find a summary of information, questions and answers assembled for your convenience to prepare for high water. Maps from FIRM (Flood Insurance Rate Map) to assist you in locating your property and evaluating its proximity to the 100-year flood areas are available on-line at www.Fema.gov or you may call the planning department in your town or the county for information on your property.

Another great resource is www.Ready.gov and the USGS site that monitors the flow (CFS- cubic feet per second) in area creeks and rivers and for other information, as the spring melt situation unfolds.

In the case of a significant flooding event anywhere in the county, the County-wide Incident Command Center will be activated and all emergency management agencies in the county will be participating and assisting. The American Red Cross can be contacted at 970 262-0530.

On behalf of the Towns of Breckenridge, Dillon, Frisco and Silverthorne and Summit County Government, thank you for your cooperation and concern.

Town of Breckenridge	970-453-2251
Town of Dillon	970-468-2403
Town of Frisco	970-668-5276
Town of Silverthorne	970-262-7300
Summit County Government	970-453-2561

HISTORY OF HIGH WATER EVENTS IN SUMMIT COUNTY?

Snow Gage Information by Basin through 2004
(measured in CFS -cubic feet per second)

Upper Blue Basin:

Blue River below Goose Pasture Tarn - 20 years of record:
Peak flow MAX, June 18, 1995 = 681 CFS.
other key dates: July 1, 1984 = 506 CFS; June 22, 1997 = 300 CFS.

Blue River below confluence of the Swan River - 46 years of record.
Peak flow MAX, June 18, 1995 = 1390 CFS.
other key dates: June 17, 1965 = 1250 CFS; May 25, 1984 = 1050 CFS.

Lower Blue Basin:

Straight Creek -17 years of record
Peak flow MAX, June 17, 1995 = 416 CFS.
other key dates: June 19, 2003 = 289 CFS; June 22, 1996 = 205 CFS; June 22, 1997 = 205 CFS

Blue River below Dillon Reservoir - 44 years of record
Peak flow MAX, May 25, 1984 = 2010 CFS.
other key dates: July 14, 1995 = 2000 CFS; June 22, 1983 = 1990 CFS; June 11, 1996 = 1800 CFS; June 14, 1997 = 1760 CFS.

Blue River Below Green Mountain Reservoir- 66 years of record
Peak flow MAX, July 12, 1995 = 4040 CFS.
other key dates: June 4, 1938 = 4000 CFS; July 1, 1984 = 3460 CFS; June 24, 1997 = 3190 CFS.

Snake River Basin:

Keystone Gulch - 46 years of record
Peak flow MAX, June 17, 1995 = 311 CFS
other key dates: May 25, 1996 = 130 CFS; June 27, 1983 = 118 CFS; June 4, 1997 = 101 CFS.

Snake River below confluence with North Fork - 61 years of record
Peak flow MAX, June 10, 1952, = 1250 CFS.
other key dates: June 21, 1995 = 1110 CFS; June 4, 1997 = 833 CFS; June 10, 1996 = 739 CFS; May 31, 2003 = 704 CFS.

Ten Mile Creek Basin:

Ten Mile Creek below North Ten Mile - 46 years of record
Peak flow MAX, June 16, 1965 = 1910 CFS.
other key dates: June 17, 1995 = 1760 CFS; June 26, 1983 = 1530 CFS; June 4, 1997 = 1310 CFS; June 30, 1984 = 1220 CFS.

Information provided by:
Scott Hummer
Water Commissioner Dist. 36
Water Division 5
Colorado Division of Water Resources
970-468-2442

HIGH WATER PUBLIC WORKS ACTION PLAN

WHAT CAN YOU EXPECT FROM PUBLIC WORKS?

Primary Responsibilities of Public Works Staff:

- Monitoring rivers and streams in the county.
- Removing debris which might impede the flow of water in creeks and culverts in public right-of-way.
- Evaluating levels of flooding and/or anticipated flood threat and determining needs.
- Providing up-to-date estimates about flooding potential and anticipated areas.
- Establishing priorities for the protection of life safety, essential facilities, access roads, bridge structures and culverts.
- **Providing sandbags and sand to area residents and businesses.**
- Patrolling lakes after floods for floating debris that may be a hazard to boaters.

CONTACT INFORMATION: During Business Hours

Breckenridge	***Police***	***970-453-2941***
	Public Works	***970-453-3170***
Dillon	***Police***	***970-468-6078***
	Public Works	***970-468-2403***
Frisco	***Police***	***970-668-3479***
	Public Works	***970-668-0836***
Silverthorne	***Police***	***970-262-7320***
	Public Works	***970-262-7340***
Summit County Sheriff		***970-453-2232***
Summit County Road and Bridge		***970-668-3590***

AFTER BUSINESS HOURS CALL SUMMIT COUNTY COMMUNICATIONS CENTER 970-668-8600

HIGH WATER LAW ENFORCEMENT ACTION PLAN

WHAT WILL THE LOCAL LAW ENFORCEMENT AND SUMMIT COUNTY SHERIFF'S DEPARTMENTS DO IN THE EVENT OF A HIGH WATER SITUATION ?

Duties of LAW ENFORCEMENT :

- Protect life (health and well-being of the community)
- Minimize the threat to people and property in response to flooding
- Continue to provide essential police services

Priorities:

- Evaluate the threat level
  - **24 Hour stream watch during peak run-off period**
  - Communication with affected agencies
  - Obtain hydrologic information from relevant sources
- Identify actual affected areas
  - Life threatening potential
  - Need to evacuate
    - Shelter
    - Food and water
    - Temporary housing
    - Sanitation facilities
  - Secure affected area
    - Traffic
    - Crowds
  - Establish and secure access to affected area
- Warn and advise the population
  - Media
  - Emergency Preparedness Network 911
- Direct use of personnel and other resources
  - Logistics
  - Command Center
  - Communications system
  - Assistance from local agencies
  - Assistance from state agencies
- Secure property impacted by flooding
  - Public property (local government infrastructure)
  - Private property - prevent looting
- Continue to provide essential police services
  - Prioritize police response to requests for service
  - Additional manpower and other resources from local agencies

SANDBAGS and SAND in SUMMIT COUNTY

BRECKENRIDGE PUBLIC WORKS:

- *Sand and Sandbags will be provided to residents (limit 100/household).*
- *Location of sand and sandbags: Breckenridge Public Works at 1095 Airport Road.*

970-453-3170

DILLON PUBLIC WORKS

- *Sand and sandbags available to residents at Road and Bridge Shop, 640 County Road 51*

970-468-2403

FRISCO PUBLIC WORKS:

- *Sandbags available at the Frisco Public Works facility located at 102 School Road*
- *First 100 bags FREE to Frisco Property owners only.*
- *Then 100-bag bundles will be sold @ $.50 per bag or $50.*
- *Public Works will deliver sand to neighborhoods upon request. 24 hours notice must be given.*

970-668-0836

SILVERTHORNE PUBLIC WORKS:

- *Sandbags available at the Public Works Shop 264 Brian Ave. at no charge to residents.*
- *Sand piles will be located at two locations:*
  - *Hamilton Creek Rd. and Hwy. 9 (North Pond)*
  - *Public Works lot just south of the Joint Sewer Authority facility.*

970-262-7340

SUMMIT COUNTY ROAD AND BRIDGE:

- *Sandbags will be distributed free of charge in 100-bag increments to county residents. Additional bags will also be available for purchase at $.50 per bag.*
- *Sandbags are available at the Road and Bridge Office at 0218 CR 1003 (County Commons Area) in Frisco.*
- *Sand piles will be available at the following locations:*
  - *CR 626 and HWY. 9 in Blue River*
  - *CR 450 at 0187 Road and Bridge Shop in Breckenridge*
  - *0218 CR 1003 Road and Bridge Office in Frisco*
  - *CR 120 by Snake River Sanitation in Summit Cove*
  - *CR 58 Church Parking lot (Straight Creek Drive) in Dillon Valley*
  - *In Keystone across from the west end of Gondola parking log*
  - *In Copper Mountain in the North Alpine parking lot, South of Copper Road*

970-668-3590

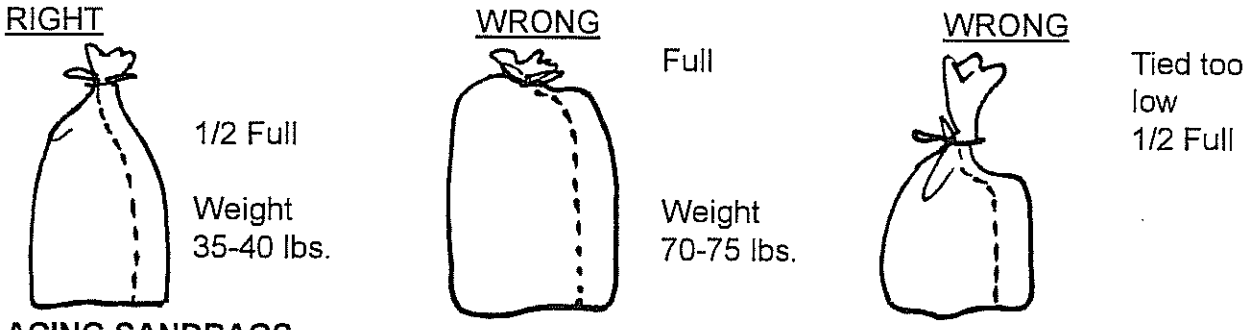
Clean Up Procedures after High Water:

- *Sandbags may be taken to the Summit County Landfill - no charge for dumping*
- *Sand may also be taken back to the areas in each town where it was originally procured.*

HOW TO CONSTRUCT A SANDBAG EMERGENCY LEVEE

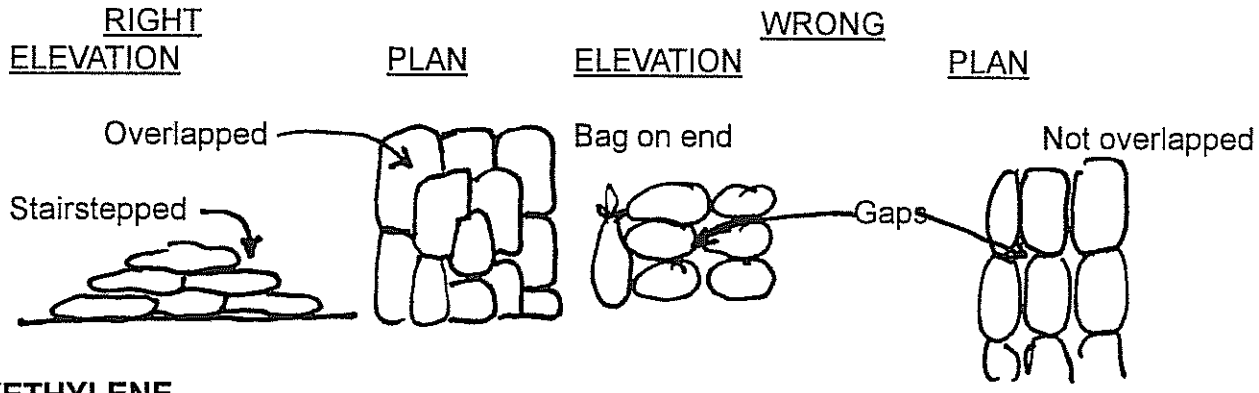
HOW TO FILL SANDBAGS

Fill sandbags 1/2 to 2/3 full, tie at top so bag will lay flat when put in place. (Overfilled bags leave gaps in levee allowing water to seep through.)



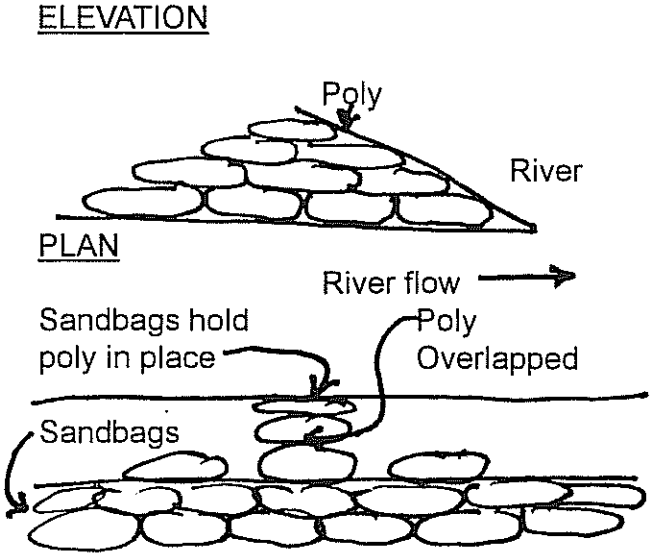
PLACING SANDBAGS

Sandbags should be placed flat on ground, overlapped, tamped into place, and stairstepped.



POLYETHYLENE

Polyethylene (poly) comes in rolls 20 ft. wide and 100 ft. long. It's used to wrap sandbag levees to prevent seepage. Poly should be placed on downstream portion of levee first, then worked upstream with a two to three-foot overlap. Poly is held in place with sandbags.

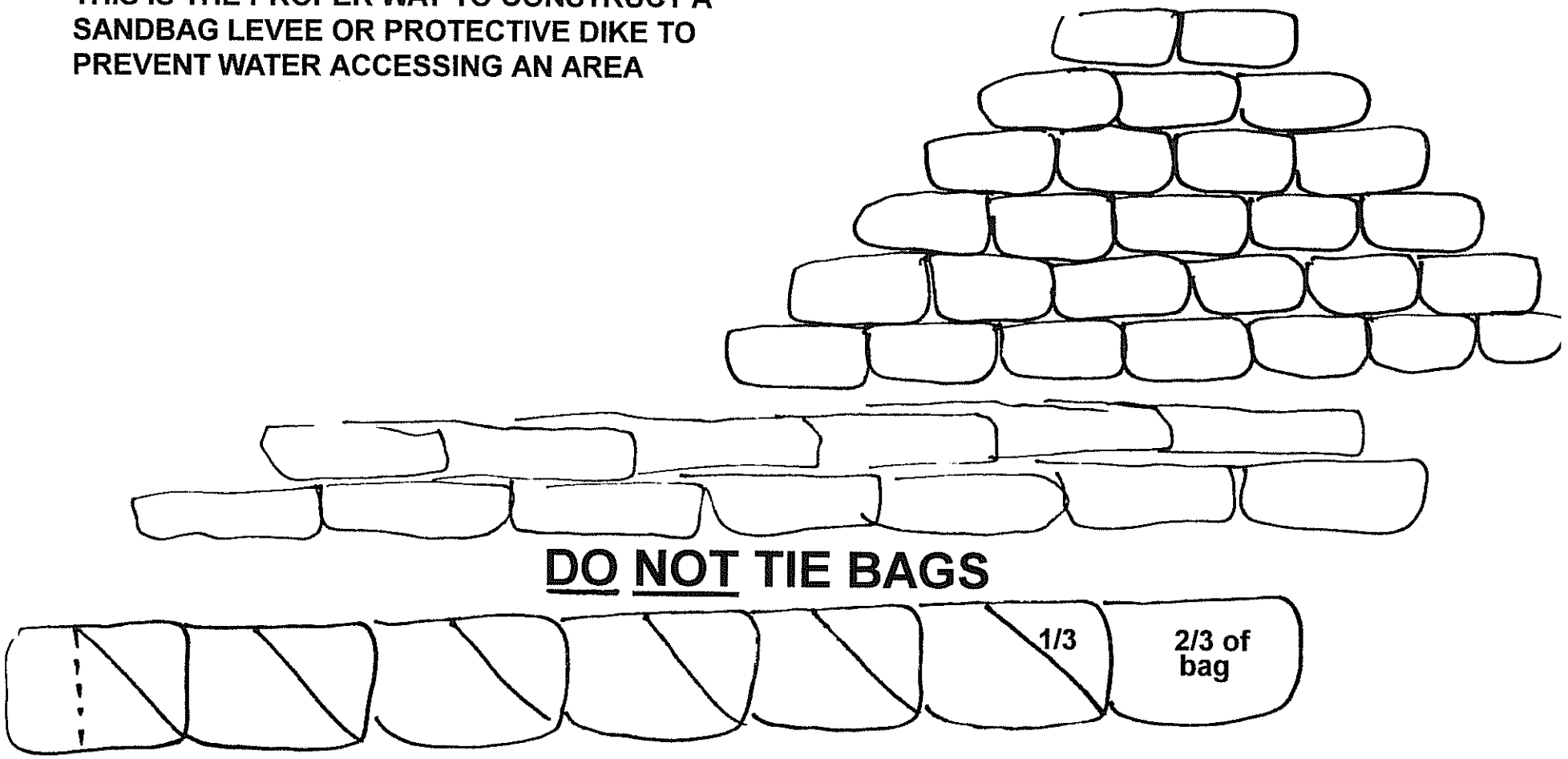


Estimated number of sandbags per linear foot of wall.

Height in Feet	Bags Required
1	5
2	10
3	21
4	36
5	55

Five feet is the practical limit of sandbag levee. If a higher levee is needed, alternate means of construction should be considered. Note: Preferred levee limit is three feet high.

THIS IS THE PROPER WAY TO CONSTRUCT A SANDBAG LEVEE OR PROTECTIVE DIKE TO PREVENT WATER ACCESSING AN AREA



Only fill bags 1/2 to 2/3 full - note the lap made by the excess material - fold it diagonally in half and walk right down the top of the bags to compact. Each additional row ties the lower ones in.

HIGH WATER PREPAREDNESS

WHAT CAN CITIZENS DO TO PREPARE FOR AN EMERGENCY?
visit www.ready.gov

In preparation:

- Prepare an evacuation plan from your home to a safe area.
- PURCHASE FLOOD INSURANCE, IF DESIRED.
- Make a list of personal property to help with insurance claims.
- Choose a relative or close friend out of the area as a contact person for family members and friends.
- Prepare an emergency kit:
    - Flashlight with batteries
    - Non-perishable foods
    - Bottled water
    - First aid kit.
- Determine who will be responsible for important papers, clothing, food, family pets, etc.
- Once you formulate your plan, REHEARSE IT!

During a high water emergency:

- Never attempt to drive through high water. Two feet of water can carry away most cars.
- Organize your homeowners association, neighbors and friends to assist with filling and placing of sandbags.
- Cooperate with Police, Public Works and Emergency personnel
- Volunteer your time and energy to assist in efforts to protect town facilities and private property.

Taryn Gillette
Summit High School
Class of 2006

MORE HIGH WATER TIPS

- Move to higher ground away from rivers, streams, creeks, and storm drains. Do not drive around barricades…..they are there for your safety.
- If your car stalls in rapidly rising waters, abandon it immediately and climb to higher ground.
- Road beds may be washed out under flood waters. Never drive through flooded roadways.
- Keep children and pets away from fast moving streams and high water. Even six inches of water flowing quickly can knock you off your feet.

- Stay away from ground level transformers that are inundated by flood waters.
- If your basement is flooded, try to turn off the electric power to the house at the outside electrical panel. If the electrical panel is in the flooded area do not go near the panel.
- If you have natural gas or propane fired appliances try and turn off the supply to the house at the meter or at the tank.
- If boating on Lake Dillon early in the season, watch out for logs and floating debris dumped into the lake by fast running streams and rivers.
- If flooding occurs, get to higher ground. Stay away from flood-prone areas, including dips, low spots, valleys, ditches, washes, etc.
- Don't allow children to play near high water, storm drains or ditches. Hidden dangers could lie beneath the water.
- Be especially cautious at night when it is harder to recognize flood dangers.
- Do not camp or park your vehicle along streams and washes, particularly when threatening conditions exist.
- Know what the weather is doing. Monitor NOAA Weather Radio or your local media for vital weather related information

HIGH WATER PREPAREDNESS RESOURCES

To watch the flow in area rivers & streams.

Go to:

http://waterdata.usgs.gov/co/nwis/discharge

Visit http://cwcb.state.co.us

303-866-3441

The Colorado Water Conservation Board (CWCB) is the state authority on the administration of flood insurance and information. They are actively engaging in preparatory activities and updating information on their website throughout the flood season.

Website links with Flood Information pertinent to Summit County homeowners:

Certificates of Elevation can be obtained from a licensed PLS (surveyor) in the state of Colorado. Blank certificates and detailed instructions can be found on-line at the FEMA website; www.fema.gov/pdf/nfip/elevcert.pdf

Summit County can provide guidance on the basis of floodway/floodplain information available to them, but cannot verify all of the information provided to them. FEMA's FIRMs (Flood Insurance Rate Maps) are available at the county commons for review by the public. They are also available on-line at the FEMA website; www.fema.gov then click on the 'FEMA flood map store' link (on the left side), then proceed to look for the flood map for your location.

- National Weather Service: http://www.floodsafety.noaa.gov/
- Federal Alliance for Safe Homes: www.flash.org 1-877-221-SAFE
- Flood Insurance: www.floodsmart.gov
- Emergency Preparedness: www.fema.gov or www.redcross.org
- Colorado Water Conservation Board: www.cwcb.state.co.us
- Flood Information: www.floodsafety.com
- Institute for Business and Home safety: www.ibhs.org
- US Army Corp of Engineers: http://www.usace.army.mil/whatwedo/flooding.html
- Flood Recovery and related health issues: http://www.oznet.ksu.edu/library/Flood/

FEMA FLOOD INSURANCE RATE MAPS

Flood Insurance Rate Maps (FIRM) are available as part of the National Flood Insurance Program. The maps for Frisco are attached, as an example.

Summit County can provide guidance on the basis of floodway/floodplain information available to them. FEMA's Flood Plain Insurance Rate Maps are available at the County Commons in Frisco for review by the public. Information on flood maps and flood insurance is available at

http://cwcb.state.co.us/

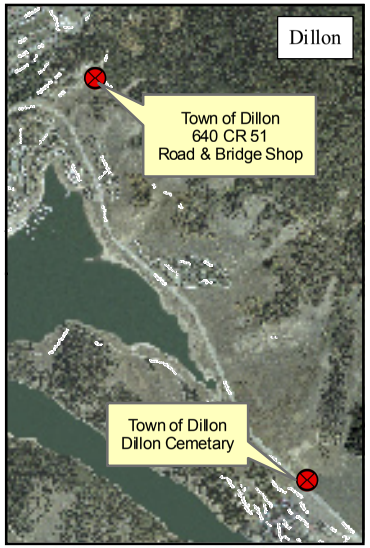
Then click on the "Flood Protection" tab on the left for the following:

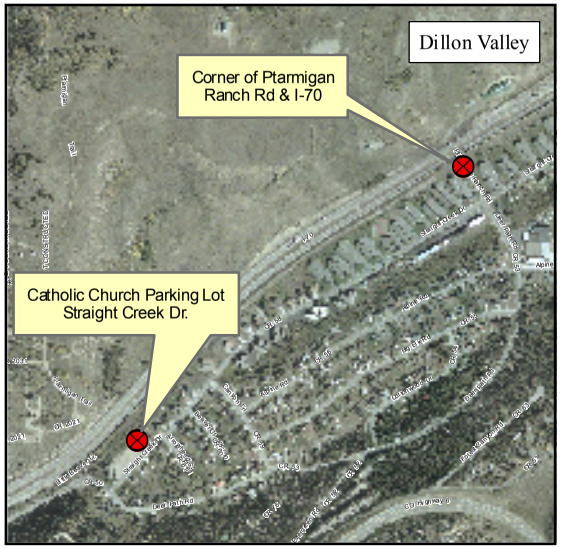
- Colorado Flood and Weather Information
* FEMA Resources (maps, documents, technical guidance)
- Flood Insurance Information and Floodplain Maps
- Floodplain Management Presentations and Reports
- Forms and Documents (flood related downloads)

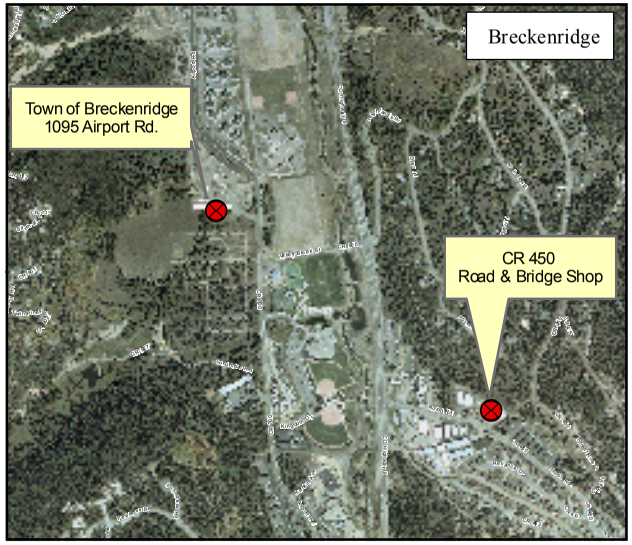
For assistance in determining whether your property is in the 100-year flood area, please contact the Planning Department in your town or the county:
(Please note: Flood Insurance rate maps are available for review and the various towns will answer general questions for the public. However, lending institutions, not the towns, determine whether flood insurance will be required for a property and the related liability potential.)

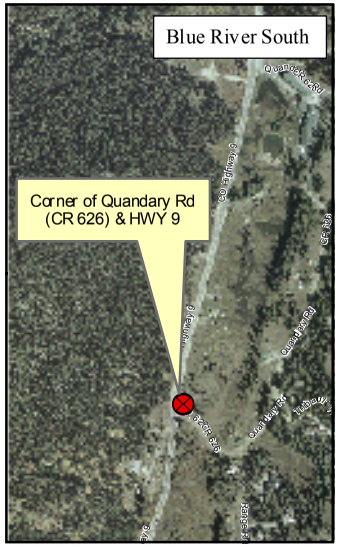
Breckenridge:	**Engineering Department at 970-453-3191 or e-mail ginny@townofbreckenridge.com**
Dillon:	**Melissa Wyatt at 970-468-2403 or e-mail mwyatt@ci.dillon.co.us**
Frisco:	**Mark Gage - Flood Plain Administrator Contact Ryan McGee at 970-668-5276 ext. 3041 or e-mail - ryanm@townoffrisco.com**
Silverthorne:	**Public Works, Dan Gietzen at 970-262-7354 or e-mail dgietzen@silverthorne.org**
Summit County:	**Ric Pocius – 970-6684210 - RicP@co.summit.co.us Robert Jacobs – 970-668-4212 - RobertJ@co.summit.co.us**

Summit County
Sand Pile Locations









SAND BAGS MAY BE PICKED-UP AT:

1) Lake Dillon Fire Stations
2) Snake River Fire Stations
3) Road & Bridge @ County Commons
4) Keystone Road Maintenance
5) Public Works Buildings at Breck, Frisco, Dillon and Silverthorne

TOWN OF BRECKENRIDGE • TOWN OF DILLON • TOWN OF FRISCO • TOWN OF SILVERTHORNE • SUMMIT COUNTY COLORADO

JOINT PRESS RELEASE

For Immediate Release: May 31, 2008
Contact: Ryan Hyland, Assistant to the Town Manager (970) 262-7319

Towns and County Stress High Water Preparedness As Peak Runoff Begins

-Sandbags and Sand Available Now at No Cost-

Heavy snowfalls over the winter are now manifesting into heavy runoff in the rivers, creeks and streams throughout Summit County. With nighttime temperatures getting warmer, we are now entering into what is predicted to be the peak portion of runoff for the season. Over the coming weeks Summit County is likely to experience heavy runoff, some of which may impact properties that are prone to high water. It is important to note that peak flows generally occur between 10:00 p.m. and midnight while low flow is typically around 2:00 p.m. This is a delayed response to warm daytime and cool nighttime temperatures. These fluctuations in flow will be much more obvious in the coming weeks.

The Towns and County continue to monitor flows in the County's waterways, and have prepared a plan of action to respond to possible high water events. It is also important that property owners be prepared to respond to high water events. Sandbags are available at various locations throughout the County, and property owners who feel their property may be affected by high water are encouraged to utilize these materials.

(Please see attached for Sandbag and Sand Locations)

In the case of a significant flooding event anywhere in the county, the County-wide Incident Command Center will be activated and all emergency management agencies in the county will be participating and assisting. On behalf of the Towns of Breckenridge, Dillon, Frisco and Silverthorne and Summit County Government, thank you for your cooperation and concern.

If you are interested in more information on High Water Preparedness, including sandbag levee practices, please visit www.co.summit.co.us to view a preparedness information packet.

###

SANDBAGS and SAND in SUMMIT COUNTY

BRECKENRIDGE PUBLIC WORKS:

- *Sand and Sandbags will be provided to residents (limit 100/household).*
- *Location of sand and sandbags: Breckenridge Public Works at 1095 Airport Road.*

970-453-3170

DILLON PUBLIC WORKS

- *Sand and sandbags available to residents at Road and Bridge Shop, 640 County Road 51*

970-468-2403

FRISCO PUBLIC WORKS:

- *Sandbags available at the Frisco Public Works facility located at 102 School Road*
- *First 100 bags FREE to Frisco Property owners only.*
- *Then 100-bag bundles will be sold @ $.50 per bag or $50.*
- *Public Works will deliver sand to neighborhoods upon request. 24 hours notice must be given.*

970-668-0836

SILVERTHORNE PUBLIC WORKS:

- *Sandbags available at the Public Works Shop 264 Brian Ave. at no charge to residents.*
- *Sand piles will be located at two locations:*
  - *Hamilton Creek Rd. and Hwy. 9 (North Pond)*
  - *Public Works lot just south of the Joint Sewer Authority facility.*

970-262-7340

SUMMIT COUNTY ROAD AND BRIDGE:

- ***Sandbags will be distributed free of charge in 100-bag increments to county residents. Additional bags will also be available for purchase at $.50 per bag.***
- ***Sandbags are available at the Road and Bridge Office at 0218 CR 1003 (County Commons Area) in Frisco.***
- ***Sand piles will be available at the following locations:***
  - ***CR 626 and HWY. 9 in Blue River***
  - ***CR 450 at 0187 Road and Bridge Shop in Breckenridge***
  - ***0218 CR 1003 Road and Bridge Office in Frisco***
  - ***CR 120 by Snake River Sanitation in Summit Cove***
  - ***CR 58 Church Parking lot (Straight Creek Drive) in Dillon Valley***
  - ***In Keystone across from the west end of Gondola parking log***
  - ***In Copper Mountain in the North Alpine parking lot, South of Copper Road***

970-668-3590

Clean Up Procedures after High Water:

- ***Sandbags may be taken to the Summit County Landfill - no charge for dumping***
- ***Sand may also be taken back to the areas in each town where it was originally procured.***

APPENDIX C

CWCB 2008 FLOOD SUMMARY PRESENTATIONS

CWCB Flood Summary

2007 Flood Season

By Kevin Houck, P.E., CFM

Colorado Water Conservation Board

September 11, 2008

In This Presentation…

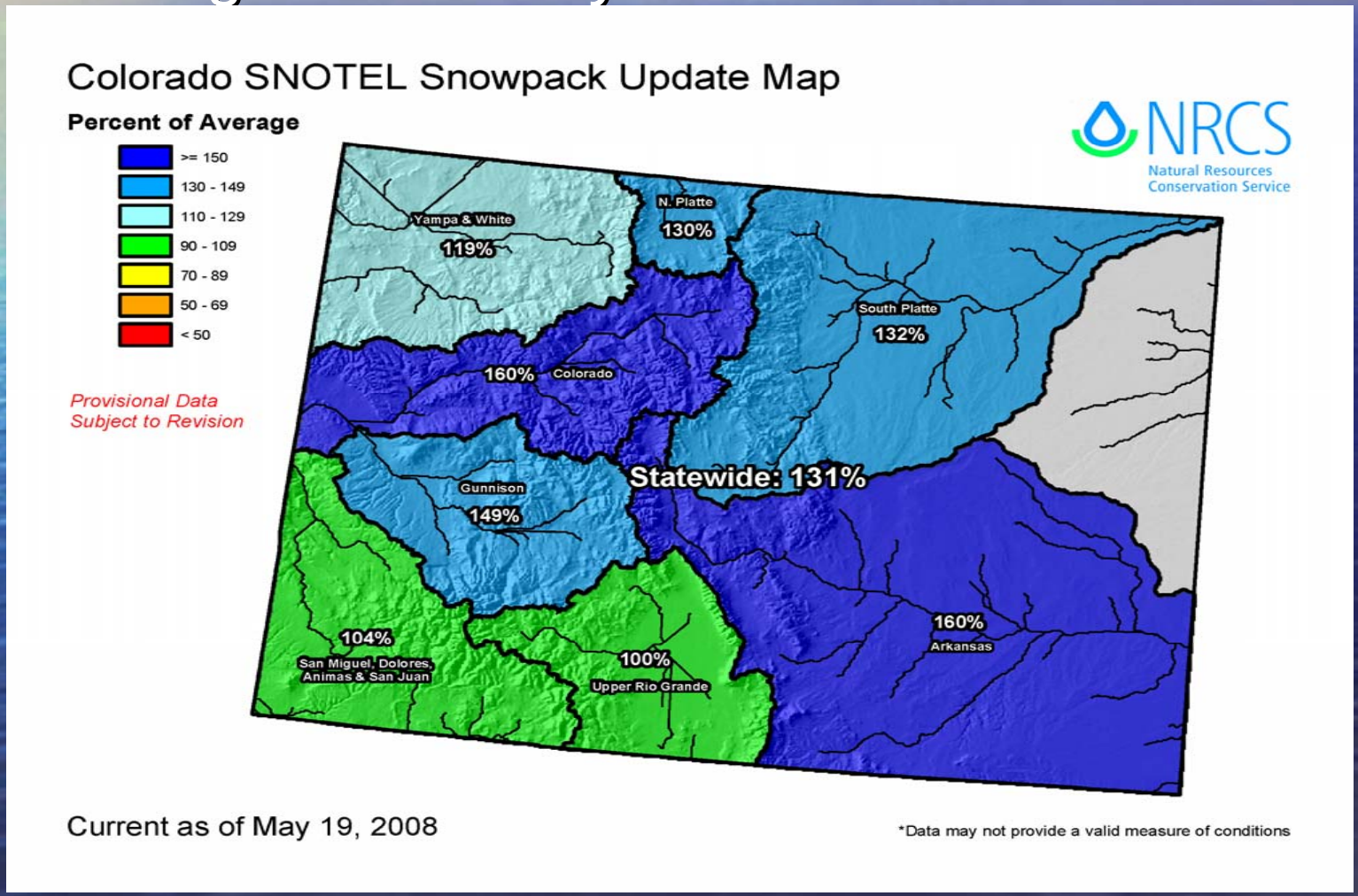
- Runoff Season 2008
- Laymen's Analysis of Recent Denver Climate

What's happened this winter

- Big winter snowstorms in the SW and central mountains.
- Dry spring statewide, except in central and northern mountains.
- Extremely dry on eastern plains

CURRENT SNOWPACK CONDITIONS

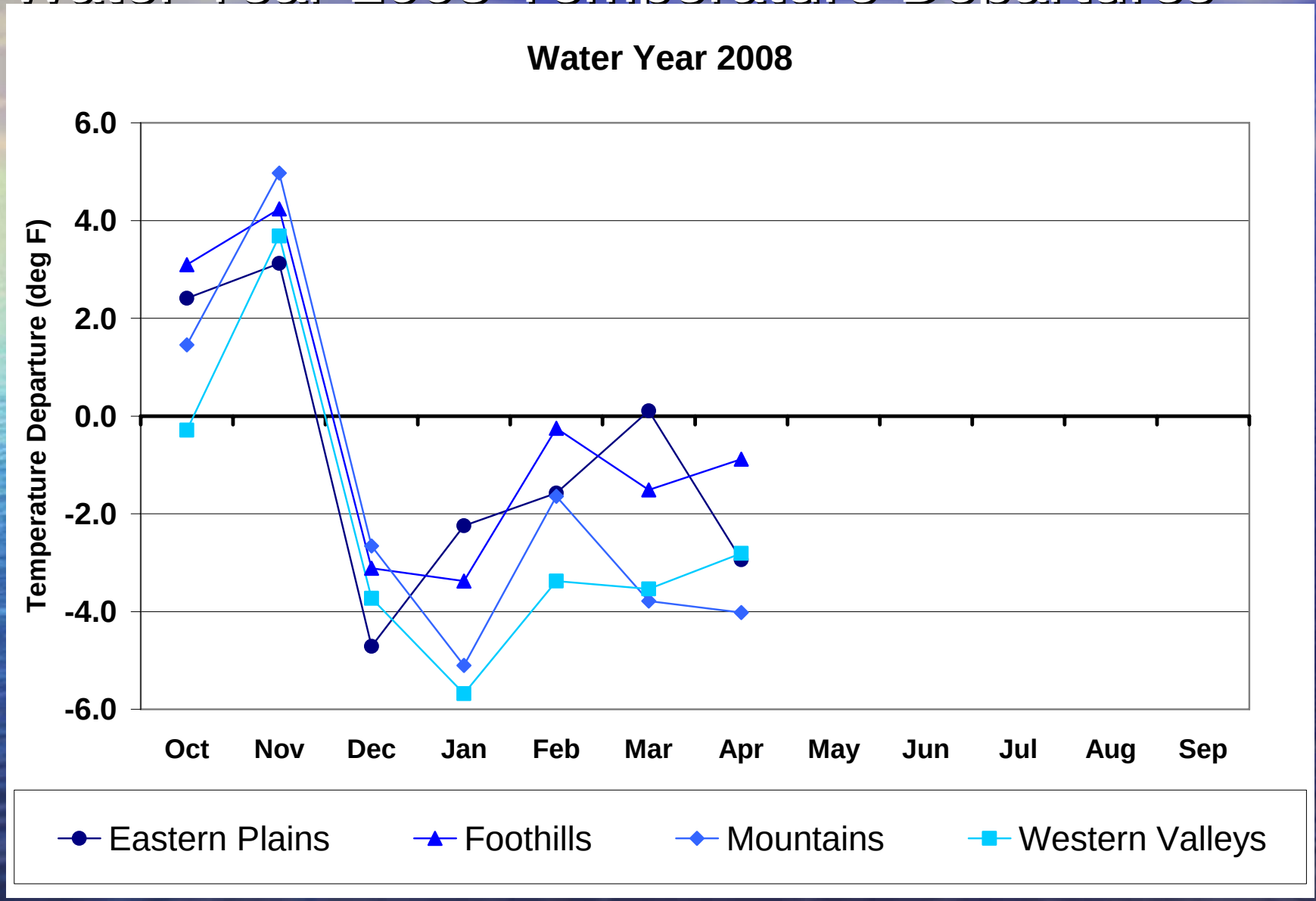
All major river basins were at or above average in mid-May.



Snowpack Statistics – May 1st

- South Platte: 103%, 2nd highest since 1999
- Arkansas: 131%, highest since 1997
- Rio Grande: 117%, 3rd highest since 1997
- SW basins: 103%, 2nd highest since 1997
- Gunnison: 136%, highest since 1997
- Yampa/White/N. Platte: 108%, highest since 1997
- Upper Colorado: 120%, highest since 1997

Water Year 2008 Temperature Departures



May Snowpack vs. Seasonal Precip (May 19)

Basin	Snowpack	Season Precip
South Platte	133%	101%
Arkansas	160%	117%
Rio Grande	105%	117%
SW	104%	108%
Gunnison	151%	121%
Yampa/White	123%	110%
Upper Colorado	156%	119%

Locations Experiencing Runoff High Water

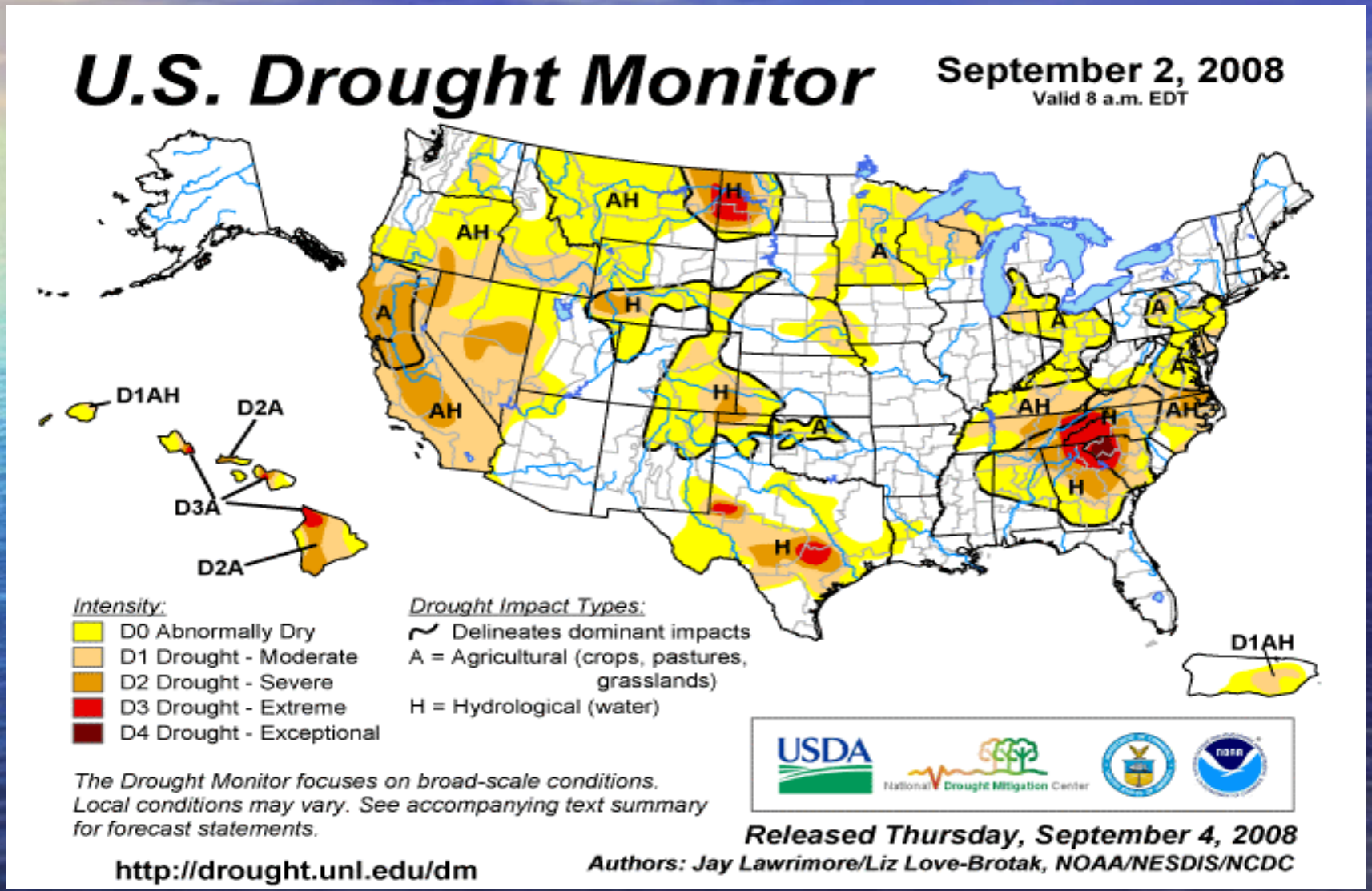
- Gunnison River at Delta – 14,000 cfs (highest flow since 1995)
- East River at Almont – 3,040 cfs (highest since 1997)
- Elk River at Milner – 6,230 cfs (record measured flow)

Elk River – Routt County

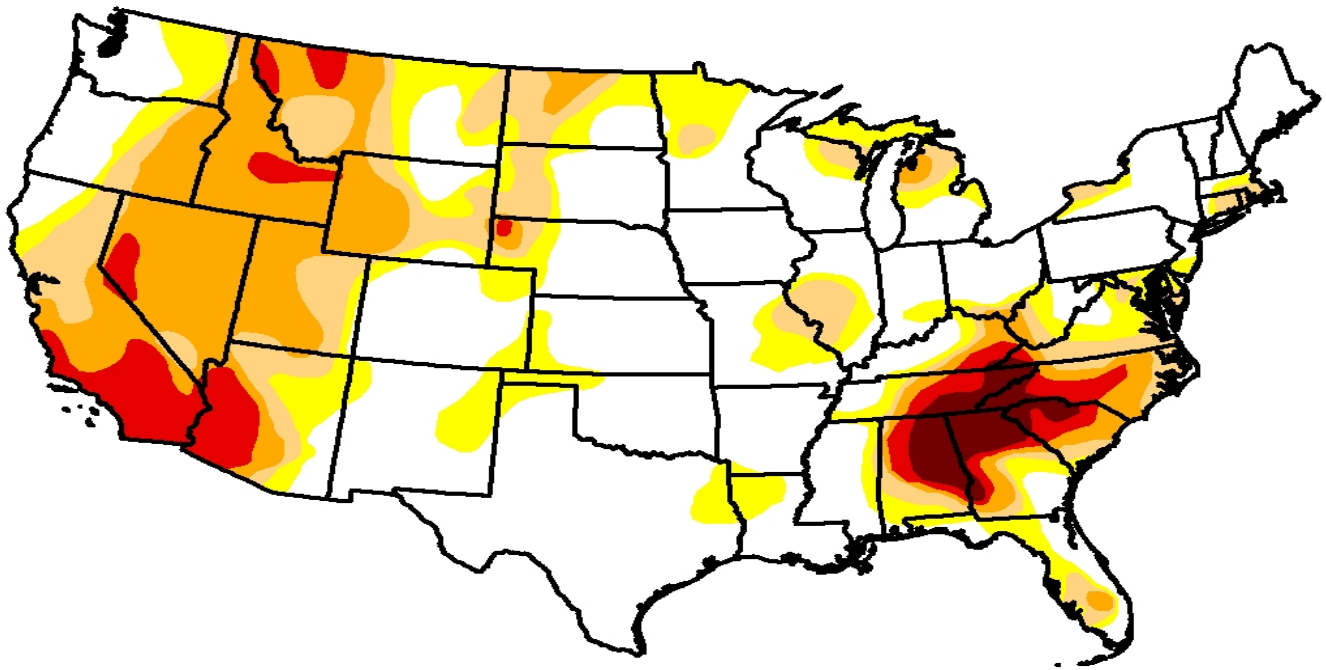
Locations Experiencing Runoff High Water

- Colorado River at Glenwood Springs – 15,600 cfs (2nd highest since 1997)
- Roaring Fork at Glenwood Springs – 8,000 cfs (highest since 1997)
- Arkansas River at Canon City – 4,300 cfs (highest since 1995)

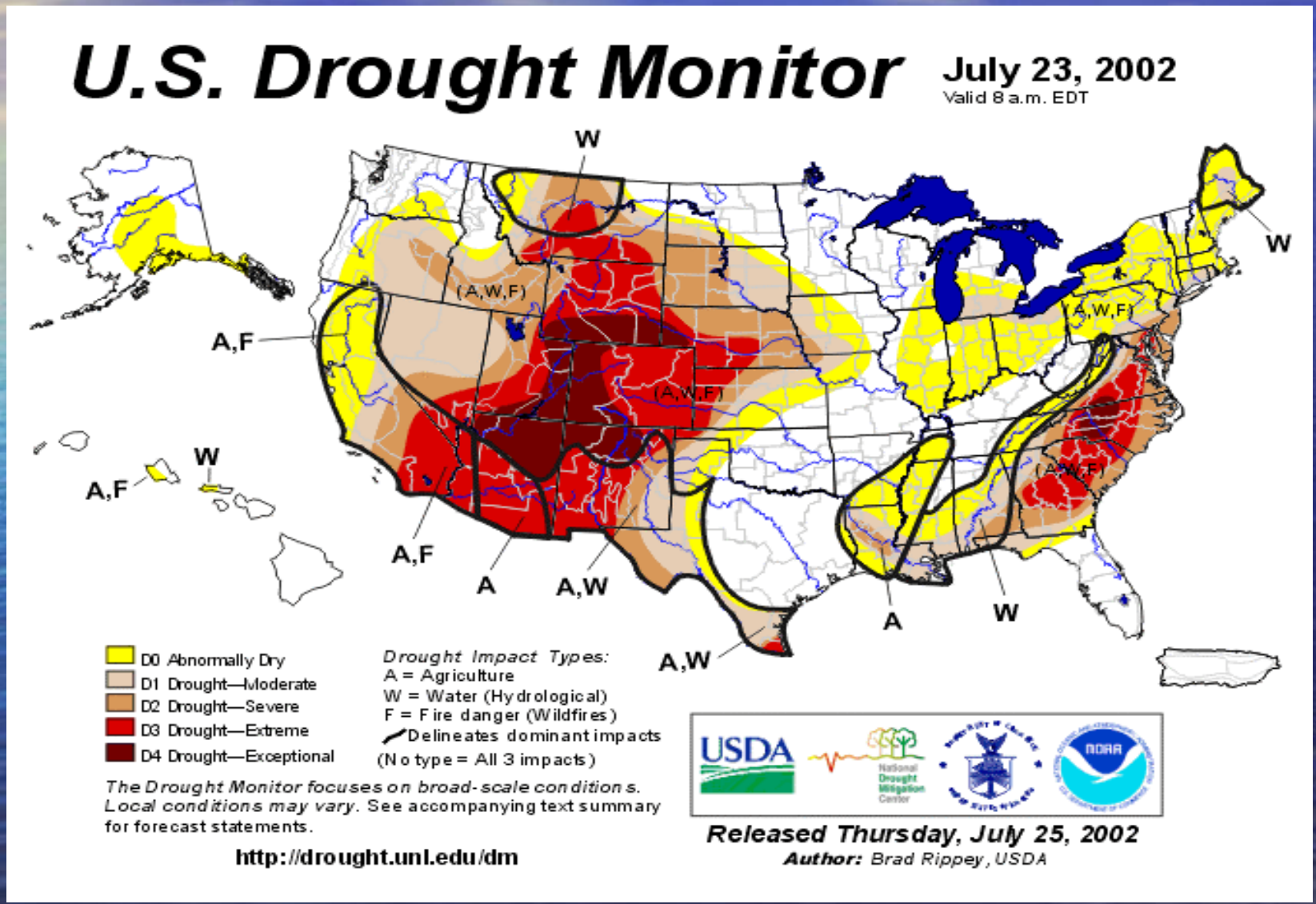
Current Drought Monitor



Drought was at its best in late October, 2007



The drought was at its worst in 2002



APPENDIX D

SUMMARY REPORTS FOR THE SPRING 2008 FLOOD TASK FORCE MEETINGS

STATE OF COLORADO

Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 721
Denver, Colorado 80203
Phone: (303) 866-3441
FAX: (303) 866-4474
www.cwcb.state.co.us

COLORADO WATER AVAILABILITY TASK FORCE
& FLOOD TASK FORCE
DRAFT MEETING SUMMARY FOR MARCH 17, 2008

This summary is from the combined meeting between Colorado's Flood Task Force (FTF) and Water Availability Task Force (WATF) held at the Natural Resources Conservation Services offices in Lakewood, Colorado. Presenters and attendees included local, state, and federal officials, private sector experts, and media interests. The meeting summary and presentations posted on the Colorado Water Conservation Board (CWCB) website at www.cwcb.state.co.us. To inquire about the FTF call Tom Browning, Chair at (303) 866-4804 and for questions about the WATF call Veva McCaig, Co-Chair at (303) 866-3339. To report corrections to the meeting summary please contact Joe Busto at (303) 866-4807.

Report from Governor's Office

- DNR Executive Director Harris Sherman expressed appreciation for the Task Force members and participants, and for their efforts in monitoring and reporting the water supply and potential flooding conditions. Coordination between federal and state agencies in a year with high snowpack presents a challenging situation and we need to be proactive and thoughtful.

CWCB Staff Report

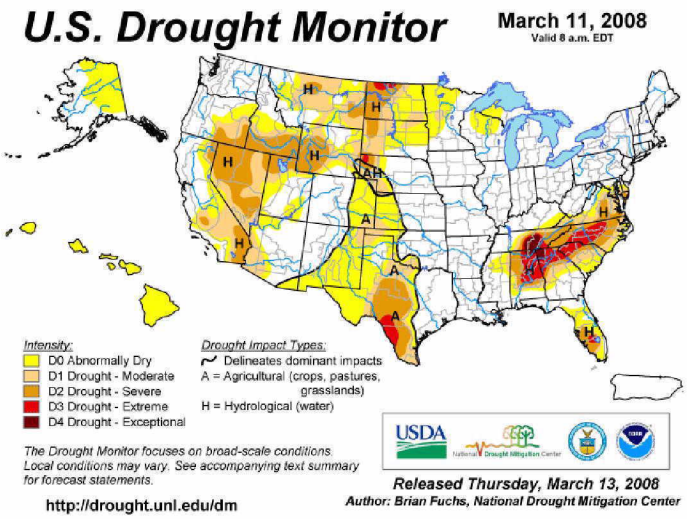
- Tom Browning is the Chair of the FTF and is the Chief of the CWCB's Watershed Protection and Flood Mitigation Section.
- Thuy Patton is the Community Assistance Program coordinator between the locals, state and the Federal Emergency Management Agency (FEMA). She manages the National Flood Insurance Program (NFIP), visits the communities to make sure they are in compliance. This year we sponsored 15 floodplain managers to take the certified floodplain managers exam. We provided flood insurance workshops in the Rio Grande, Gunnison, and San Juan Basins. We will also have an NFIP meeting in Steamboat Springs.
- Joe Busto is the regulatory person for cloud seeding program in Colorado. New tools developed are daily mapping a tapering snowpack snow water equivalent thresholds and avalanche hazard levels determined by the Colorado Avalanche Information Center suspended all wintertime cloud seeding by the last week of January 2008.
- Chris Sturm is the state's river restoration program coordinator and presented spatial snowpack maps for Colorado. The CWCB and the USBR have provided daily mapping of snowpack since 2004. The project uses a NOAA experimental model called the Snow Data Assimilation System (SNODAS).
- Dawn Gladwell manages floodplain mapping working with communities outside of the Denver Metro area to take paper floodplain maps to digital format. There are 15 counties underway, 18 counties with preliminary maps, and 31 counties left to go. Since the program got started in 2003, FEMA has spent

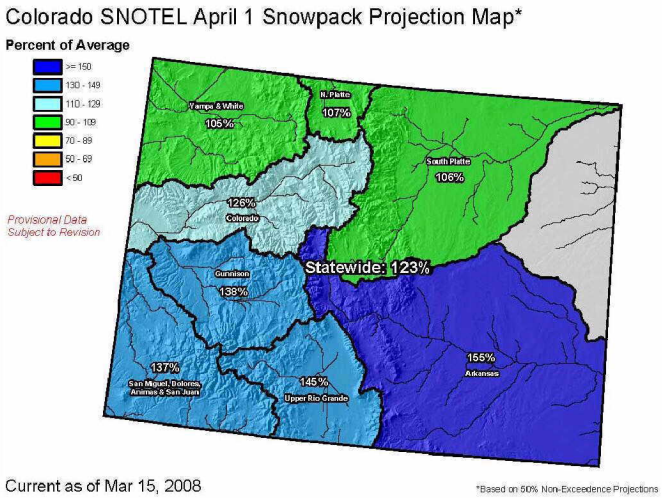
$6.6M, the CWCB $862K, locals $542K for a total of $8.6M million. We are working with FEMA and Corps with levees and will host seminars throughout the state for hazards and risks behind the levees.

- Kevin Houck manages the flood response program for the CWCB. We have provided SNODAS maps for three years. We do briefings and updates every two weeks in high snowpack years that can be found on our website. Snowpack tables are how we monitor watersheds and long term weather forecasts from all sources. We are scheduling meetings with locals and the Division of Emergency Management. (DEM) on May 1st. We also have a daily flood threat bulletin tailored for flood threat statewide in the spring and summer months.
- Veva McCaig manages the CWCB's Office office Water Conservation and Drought Planning and stated that during August 6th through 8th there will be a conference for drought risk and climate change focused for water providers and how to do a better job of planning for and adapting to climate change. .

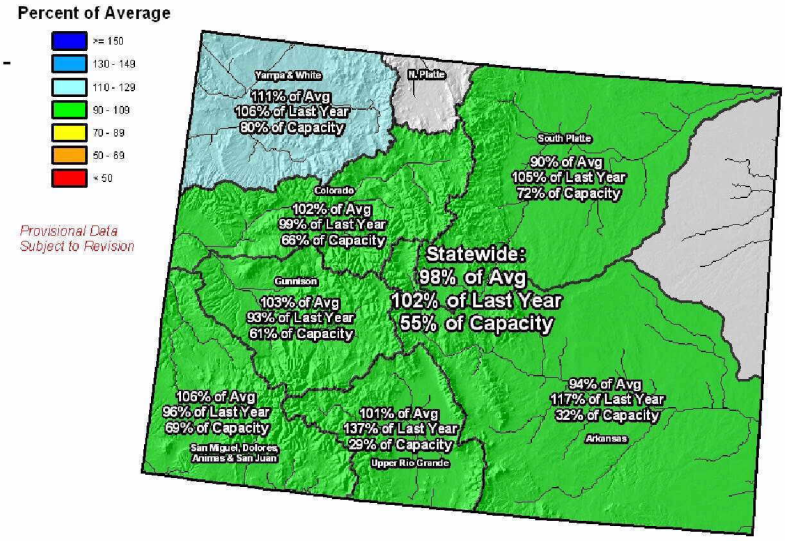
Colorado Climate Center, CSU

- Nolan Doesken presentations are posted at **http://ccc.atmos.colostate.edu**. There have been three consecutive winter months with below average temperatures. A PRISM map of precipitation showed areas of the eastern plains on the dry side and the rest of the state wet.
- The difference between wet and dry in Colorado is often a few storms. The U.S. Drought Monitor shows drought around us from Phoenix to Laramie with drought holding its own around us.
- Every year it takes about two months to melt out snow pack during a predictable window but the peaks are less predictable.
- Colorado's biggest floods are from rains. We are going into heavy rain season in April and may maximum. Really big floods not that uncommon usually once per decade and could not be forecasted even with today's skill. We usually require warm temperatures and widespread late season snowpack including snow on south facing slopes for snowmelt flooding.
- Rain on snow is not often a big problem and is a bigger problem in Washington and Oregon. Intense rains are localized. We can get volume from summer rains that is as much water as snow pack volume that is in the streams.
- We have a higher likelihood of large peaks if it stays cold in the spring. A cold April is a good indicator that we might have snowmelt flooding. After a couple of weeks of hot weather in May and things get interesting.





Colorado Reservoir Storage Map

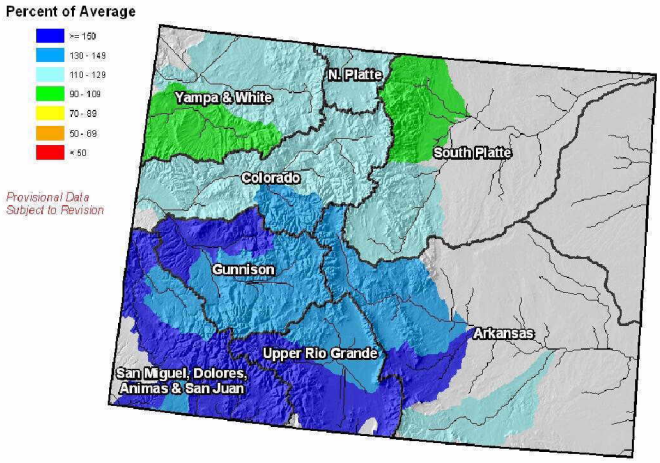


End of February 2008

NRCS Snow Survey Program

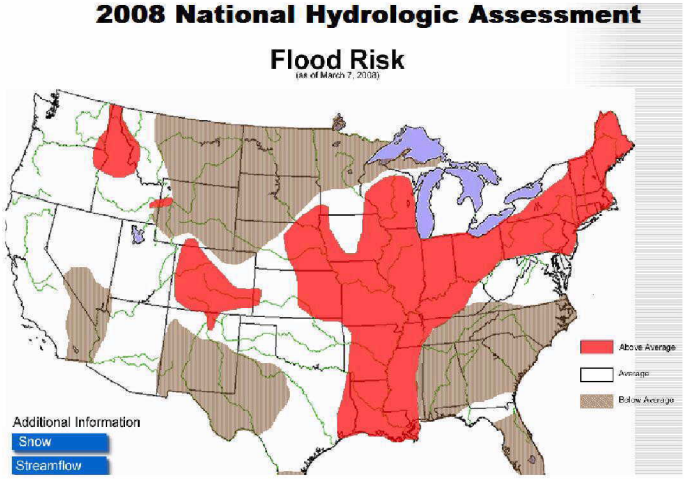
- Mike Gillespie- NRCS report. October was average, November warm and dry, December heavy snow storms in southern mountains January increased snowpack percentages in all basins, February continued above average snowfall.
    - **Yampa/White River Basin -** best snowpacks in Little Snake and North Platte 109% at northwest corner. This basin has only above average twice in a decade. Reservoir storage is 111% of average, 106% of last year and 80% of total capacity.
    - **Colorado River Basin** – The Roaring Fork and blue River Basins are doing. This is the best year since 1997. This basin is not too far from record maximum and six weeks earlier than what we would expect. The reservoir storage is 102% of average, 99% of last year, and 66% of capacity. The runoff forecasts are highest for the Roaring Fork at 147% of average.
    - **South Platte Rive Basin -** the headwaters is above average and near average in Front Range. The Poudre is a little bit above average. The snowpack is 109% of average. Reservoir storage is 90% of average, 105% of last year, and 72% of total capacity.
    - **Gunnison River basin -** Snowpack is 137% of average and 173% of last year. Reservoir storage is 103% of average and 93% of last year and 61% of total capacity. There is ony a 10% chance it won't be average in this basin. Gunnison River near Grand Junction and North Fork of the Gunnison River near Somerset are forecasted for 150% of average streamflows and this is the rule of thumb when to get concerned.
    - **Southwest River Basins** – Snowpack in the Dolores, Mancos, La Plata, and San Juan basins are near 150% of average. Reservoir storage is 106% of average, 96% of last year, and 69% of capacity. McPhee reservoir inflow is forecasted for 155% of average, Animas River at Durango is forecasted for 155% of average, and San Juan River at Carracas is forecasted for 173%.

Colorado Streamflow Forecast Map



Current as of March 1, 2008

- **Rio Grande River Basin** – the snowpack is 169% of average and 186% of last year and you have to go back to 1979 for a year this good. Snowpack exceeded the maximum in late January and we have a really good chance of being well above the maximum of record. An impressive December was four times normal but March has tapered off. Reservoir storage is 101% of average and 137% of last year and 29% of total capacity. This basin has been struggling to get back from the drought. The Rio Grande at Del Norte is forecasted for 167% of average, South Fork Rio Grande at South Fork 166%, and Alamosa Creek above Terrace Reservoir 164%.



- **Arkansas River Basin** – Snowpack is 160% of average and 150% of last year. Reservoir storage is 94% of average, 117% of last year, and 32% of capacity. Grape Creek near Westcliffe is forecasted for 155% of average streamflow as well as the Huerfano River near Redwing.

Division of Water Resources SWSI Report

- Don West explained that the NRCS calculates the Statewide Water Supply Index in the winter and the DWR does it in the summer. The DWR report can is at http://water.state.co.us/pubs/swsi.asp . The range is +4 abudnant water supply to -4 severe drought. The highest is the Gunnison Basin at 3.9 and the lowest is the South Platte at +0.2.
  - **South Platte Basin -** Plains reservoirs are 77% of capacity, flow at kersey gage 751 cfs. Comments form division 1, by end of February eliminated restrictions due to icing. 15-20 days ahead of last year, with positive storage conditions, good water year with adequate water.
  - **Arkansas Basin** - Arkansas basin, SWSI is positive 3.3 flow average is 550 cfs,
  - **Rio Grande Basin** – Rio Grande is plus 3.7, 109% of normal, comments very good chance of all filling, Platoro will be for flood these string, sand bags ordered, runoff levels might easily
  - **Gunnison Basin** – Gunnison is 3.9 is highest in the state, higher than wet year average of 1984, supply will be excellent, the USBR has scheduled maintenance activities and flows will be reduced significantly
  - **Colorado basin** – Colorado basin, has 2.9 value, 1057 cfs at dotsero, cumulative flow is at 1984 flow, storage at three reservoirs are 123% of normal, USBR basin wide run off of 120, 49 feet lake Powell rise, in
  - **Yampa/White Basin** - comments from division engineer, latest runoff forecast and 120%
  - **San Juan/Dolores Basin** - San Juan Dolores basin on page 9 the SWSI is 3.9 flows is 230cfs, and cumulative flow since October is above long-term average. Pine River been releasing form, compact call since river flows
- Jack Byers, Deputy State Engineer at the DWR, stated that they and CWCB work together on a high flow alert system. There is icing conditions still at stream gages. With respect to dam safety the DWR has already flown over some reservoirs in the state. We work with local emergency managers, water commissioners and reservoir owners and to have the spillways open.

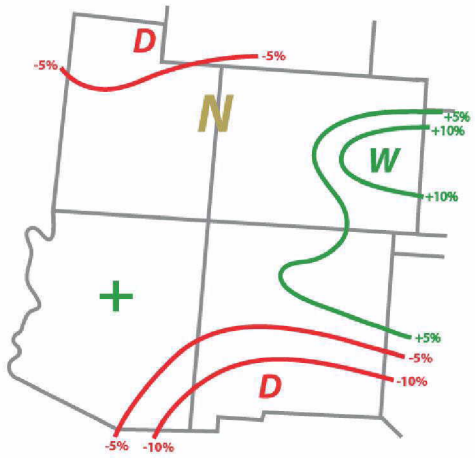
National Weather Service Short Term Forecast

- Bob Glancy showed short term forecasts with the best now in the foothills.
- CPC indicating a better chance of dry conditions and best chance of above normal precipitation in the Pacific North West and cooler than average for eastern 1/3 of the country.
- Treste Huse showed AHPS data (Advanced Hydrologic Prediction Services) that can be found at http://www.weather.gov/ahps/. These graphs plot flood stage and exceedance probabilities. A weekly histogram plots the chance or range of outcomes for flooding potential. These are calculated by 54 simulations and the local climate.
- Flood risk assessment has above average flood risk.for Colorado.
- The NWS also explained the difference between watches and warnings. As we look at a threat a watch is issued, and we are not sure where it is going to be. A warning is issued when occurrence is eminent. Flood warnings looking at gages and rises on the river and rainfall and radar estimates.

NOAA Long Range Forecasts

- Klaus Wolter's executive summary small chance things could change continued weakened la Niña, next two weeks and models are not too hopeful, march was terrible for snowpack and this won't be those years.
- A moderate-to-strong La Niña has been in place since August 2007 and is expected to continue for at least another three months, possibly right through the summer. The last three months have brought above-normal moisture to Colorado's mountains, in excess of La Niña-based expectations.
- The next two weeks do not look too promising for moisture, but so have been many previous two-week periods that ended up wet in the mountains. My experimental forecast guidance for spring is surprisingly optimistic for eastern Colorado, while the rest of our state has not tilt one way or the other.

EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE
APR - JUN 2008 (issued March 13, 2008)



- Based on monthly composites, the lack of a negative tilt despite a pervasive tendency for dry weather during La Niña springs is anchored by the month of April. Essentially Aprils can be wet or dry with La Niña, the 1999 April being the last of example of a very wet La Niña April. If we go thru April and do not get much moisture, the odds for a dry spring go up dramatically.
- Bottomline: After a surprisingly wet winter season, March has still continued wet in the mountains, while the rest of the state has shown the more typical La Niña-related dryness, last night's storm notwithstanding. Once we are through April, the remainder of spring into the summer is more likely to end up drier than normal rather than wetter than normal, unless we get a surprise onset of an El Niño.

Division of Wildlife

DOW is feeding over 9,000 deer and 3,000 elk in the Gunnison Basin to keep the doe mortality rates down.

U.S. Army Corps of Engineers

- The Albuquerque District has set up meetings with the DEM and CWCB and state and county emergency managers in Rio Grande and Arkansas basins. The Sacramento District will meet with Durango. The Corps has recently completed levee inspections in Grand Junction.

- Omaha District has inspected the South Platte flood control channel. The Omaha District is in transitioning the inspection program over to engineering. The Corps also looks at Kelly Road dam, Westerly Creek dam, Eerie, Wiggins, and Fort Collins. The levee inspection has been taken out of emergency realm and put into geo-technical realm. The Arkansas River levees have been let go for a number of years. There are 100,000 sand bags at tri-lakes at Chatfield for flood fighting.

U.S. Geological Survey

- The Colorado Water Science Center's Joe Capesius stated that there is a large run off this year and the USGS is preparing for that and ready to measure high flows. This will give the chance to extend the rating curves at some sites.
- Bob Jarrett stated that the real issue is that the water will be freezing cold and for many months and even with personal flotation device the risk on the river is much higher this year than in normal years.

Colorado Division of Emergency Management

- They have nine field people and have been working with locals on a process for a state and federal disaster declarations if needed. The DEM has a list of companies that have sandbag. The DEM 24 hour emergency number is (303) 279 - 8855 and that has always been the same emergency number. After hours it goes to the state patrol dispatch and then to the DEM duty officer

Next Meeting Dates

- The next joint meeting of the FTF and WATF meeting is April 15th from 9:30 – 12:00PM with the location to be announced. (Location has now been scheduled to be held Denver Water, 3rd Floor, Board Room).

STATE OF COLORADO

Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 721
Denver, Colorado 80203
Phone: (303) 866-3441
FAX: (303) 866-4474
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COLORADO WATER AVAILABILITY TASK FORCE
& FLOOD TASK FORCE
DRAFT MEETING SUMMARY FOR MAY 19, 2008

This summary is from the combined meeting of Colorado's Flood Task Force (FTF) and Water Availability Task Force (WATF) held at the Division of Wildlife in Denver, Colorado. The meeting summary and presentations will be posted on the Colorado Water Conservation Board (CWCB) website at www.cwcb.state.co.us. To inquire about the FTF call Tom Browning, Chair, at (303) 866-4804 and to inquire about the WATF call Veva Deheza, Co-Chair at (303) 866-3339 or Jack Byers, Co-Chair, at 303-866-3581 x 2114. To report corrections to the meeting summary please contact Joe Busto at (303) 866-4807.

Report from Governor's Office

- The Governor's Conference on Managing Drought & Climate Risk will be held October 8-10, 2008 in Denver Colorado. The 2.5 day conference will help water providers, planners, managers, and agency officials assess drought risk, impacts and preparedness in Colorado. Governor Bill Ritter and Harris Sherman, Executive Director of the Department of Natural Resources, and members of the Intergovernmental Panel on Climate Change will be the featured speakers. Online registration starts June 16th and for more information contact the CWCB at (303) 866-3370.

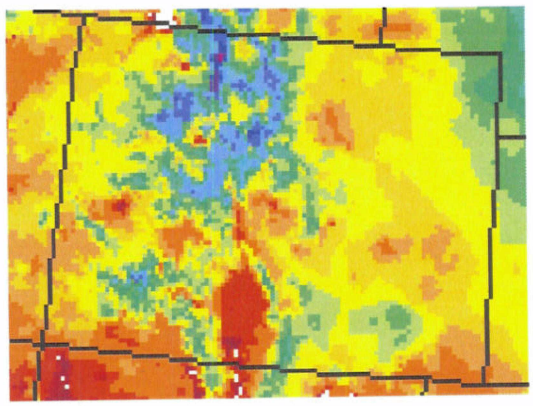
CWCB Staff Report

- Tom Browning, FTF Chair, provided an overview of the meeting and thanked the participants for attending. Self-introductions were made to start the meeting.
- Kevin Houck, CWCB engineer, provided a 2008 Snowmelt Flood Preparation Summary for March through May using SNOTEL data sites. The CWCB continues to monitor snowpack and snowmelt conditions throughout the state. Staff members are looking out for high flows in several key areas (see attachment). Kevin handed out a color SNODAS map for May 13, 2008 for Colorado that shows snow water equivalent (SWE) contained in the snowpack.
- Joe Busto, CWCB staff, provided a brief overview of the SNODAS project that is an adaptation of modeled snowpack data for Colorado. The CWCB, USBR, and Riverside Technologies, inc. are tailoring this NOAA data set for Colorado's watersheds. The 2008 effort will include: stream flow simulations using a distributed hydrologic model coupled with SNODAS for the Colorado River Basin, and providing SNODAS and SNOTEL data and mapping for water managers in the Rio Grande Basin to track snowpack SWE melt out in several sub-basins in the Rio Grande Basin. Daily mapping of

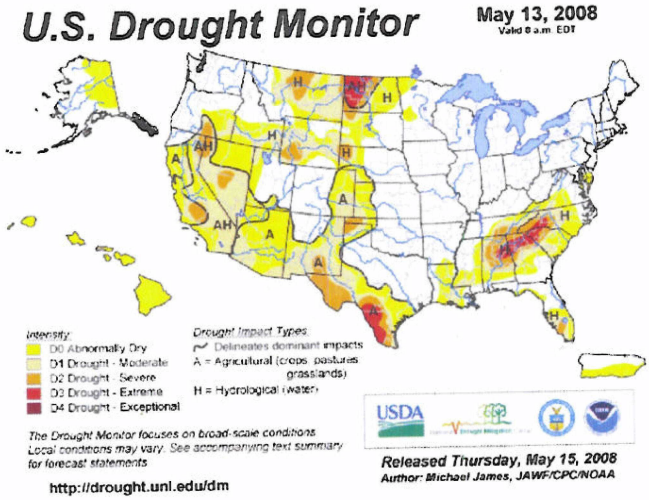
SNODAS model output for Colorado can be found at http://www.usbr.gov/pmts/rivers/awards/SNODAS/index.html

- As part of the Flood Response Program managed by Kevin Houck and Tom Browning the CWCB working through HDR Weather Services provides a May through September seven to fifteen day flood threat and precipitation outlook by county and region that can be found at http://www.hdrweather.com/operational/cwcb/cwcbinformation.htm

Colorado Climate Center, CSU



- Wendy Ryan provided the Climate Center report and provided a PowerPoint presentation including a graph for the western valleys, foothills, plains, and mountains. December through May has been colder than average across Colorado.
- PRISM data showing higher amounts of accumulated precipitation is blue and green and illustrates that Colorado April precipitation was largely a northern central mountains phenomenon.
- A CoCoRaHS map for May 1, through May 15 showed higher spring precipitation totals in north central and north western Colorado.
- Summary: Cooler than average temperatures have continued through mid May (longest string of consecutive cooler than average months in many years); Spring precipitation through mid May has been highly variable; Above average precipitation in much of northern and central mountains; Southwest and south central Colorado very dry since March; Considerably drier than average since March over much of eastern Colorado; Average or better precipitation mid Front Range counties and extreme NE Colorado, Most low elevation snow has melted in its typical uneventful manner; High elevation melt out is now underway; No large spring storms so far this spring; Early summer mountain dry spell usually begins now. Only four weeks remain in eastern Colorado's typical "Wet season." Thereafter, we shift to primarily convective precipitation – storms locally intense but usually not widespread. June – peak tornado season – Watch out for Hail.



NRCS Snow Survey Program

- Mike Gillespie- NRCS report. October was average, November warm and dry, December heavy snow storms in southern mountains January increased snowpack percentages in all basins, February continued above average snowfall.
  - **Yampa/White River Basin** – As of May 1 it is 108% of average snowpack at northwest corner and it hasn't been this good since 1998. Reservoir storage is 92% of average, 81% of last year and 78% of total capacity.
  - **Colorado River Basin** – The total basin snowpack as of May 1 is 120% of average and it hasn't been this good since 1997 when it was 142% of average. Reservoir storage is 97% of average,

91% of last year, and 57% of capacity. Streamflow forecasts are: Green Mountain inflow 120% of average, Reudi inflow 138% of average, and Roaring Fork at Glenwood Springs 141% of average.

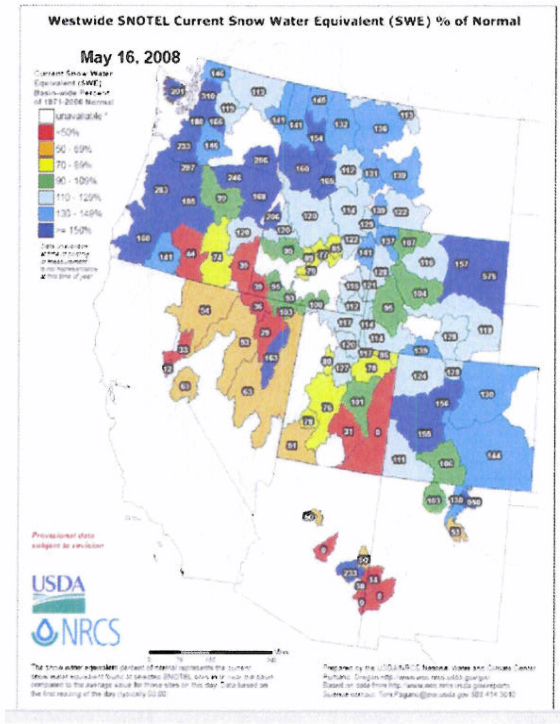
- **South Platte River Basin** - The basin wide snowpack as of May 1 is 103% of average. Reservoir storage is 92% of average, 100% of last year, and 78% of total capacity.
- **Gunnison River Basin** – The total basin snowpack as of May 1 is the 136% of the long term average and the last time it was higher was 1996 when it was 150% on May 1st. Reservoir storage is 99% of average and 79% of last year and 56% of total capacity. Streamflow forecasts are very high in this basin an a few are given: Tomichi Creek at Sargents @ 142%, Blue Mesa inflow @ 147%, north Fork Gunnison River near Somerset @ 141%, and Gunnison River near Grand Junction @ 146%.
- **Southwest River Basins** – (San Juan, San Miguel, Dolores, and Animas Basins) Snowpack in the southwest basins had a good start but a dry spring and is at 103% of average on May 1 as compared to 2005 when it was 135% for a basin wide total. Reservoir storage is 100% of average, 83% of last year, and 73% of capacity.
- **Rio Grande River Basin** – As of May 1 the snowpack is 117% of average and less than the 139% in 2005. Reservoir storage is 100% of average and 114% of last year and 32% of total capacity. The Rio Grande at Del Norte is forecasted for 128% of average, South Fork Rio Grande at South Fork 133%.
- **Arkansas River Basin** – The basin wide snowpack is 131% of average and it has not been better since 1997 when it was 150% of the long term average. Reservoir storage is 90% of average, 96% of last year, and 29% of capacity.

Division of Water Resources SWSI Report

- Don West explained that the NRCS calculates the Statewide Water Supply Index in the winter and the DWR does it in the summer. The DWR report can is at http://water.state.co.us/pubs/swsi.asp . The range is +4 abundant water supply to -4 severe drought. The highest is the Gunnison Basin at 3.0 and the lowest is the South Platte at +0.7.
  - **South Platte Basin** – 0.7, 107% of normal, plains reservoirs are 100% of capacity. With above average snowpack throughout the basin they are hopeful it will meet demand this spring but at lest some spring precipitation will be needed to assure adequate water supplies.
  - **Arkansas Basin** – SWSI value is 2.7 and Turquoise, Twin Lakes, Pueblo and John Martin reservoir storage is 98%. The USBR and Corps of Engineers have held meetings to make room in upper reservoirs (Twin Lakes & Turquoise). These ops have pushed Pueblo Reservoir to near spill conditions. Preliminary compliance models indicated that the well associations in the Basin were successful in providing adequate replacement water to the river and to the Offset Account in John Martin Reservoir.
  - **Rio Grande Basin** – The SWSI value is 2.4 and the flow at the Rio Grande near Del Norte averaged 1008 c.f.s. (153% of normal).
  - **Gunnison Basin** – SWSI 3.0 value and all the Grand Mesa reservoirs are expected to fill. High flows will adversely affect the Gunnison River Gorge annual salmon fly hatch in June but white water enthusiasts should experience a year to remember.
  - **Colorado Basin** – The SWSI value is 2.3 and Lake Powell is forecasted for a 45-50 foot rise.
  - **Yampa/White Basin** – SWSI value is 0.1 value and many of the reservoirs remained frozen through April and are beginning to thaw.
  - **San Juan/Dolores Basin** – SWSI is 1.4 and a dry and windy spring was a theme in April. Vallecito and Navajo reservoirs began ratcheting back releases as the recent decrease in snowpack has led to less spring runoff than expected.

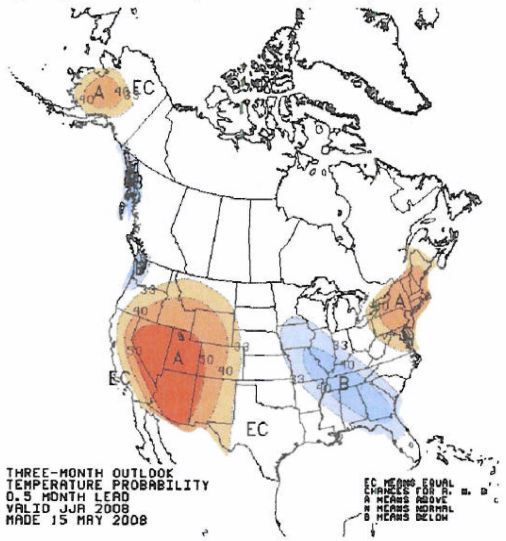
National Weather Service - Short Term Forecast

- Bob Glancy showed west wide SNOTEL readings to show good snowpack in the central Rocky Mountains and Pacific Northwest with pockets of drier conditions in Utah and Nevada.
- Recent flood warnings were issued at Elk River near Milner, Flood watches East River (Gunnison County), Green River (Uintah County), Elk River (Routt County), Yampa River (Moffat County)
- The bottom line was hot and dry until Wednesday with accelerated snowmelt and some fire weather concerns; somewhat cooler the remainder of the week with a chance of showers and thunderstorms.
- For the remainder of May…the upper trough remains to our west with southwest flow. Conditions will be generally dry…but thunderstorms east of the divide will be subject to low level moisture and instability. Snowmelt should accelerate again next week.



NOAA - Long Range Forecasts

- Gary Bates gave the seasonal outlook for NOAA.
- **Snowmelt delayed?** 8-14 day precipitation forecast (26 May-2 Jun) shows ~75% chance of wetter than normal conditions over the Colorado mountains.
- **La Nina has weakened** (below normal sea surface temps in tropical Pacific) and is expected to continue weakening thru summer.
- NOAA's seasonal forecast for JJA is for increased likelihood of **warmer than normal** conditions, based on agreement between multiple forecast tools.
- **Klaus Wolter's experimental forecast guidance (from April)**: July-September precipitation forecast indicates slightly increased odds (+5%) of wetter than normal conditions for eastern Colorado. Little signal over western Colorado.
- The June - August forecast for temperatures from NOAA calls for above average temperatures.



Next Meeting Date

The next meeting date has not been set. It is anticipated to be held after the bulk of the snowmelt peak flows. An email announcement will be sent to all Task Force Members to coordinate an appropriate date/time/location for the next joint meeting.

2008 Snowmelt Flood Preparation
Summary of March-May Snotel Data

May 18, 2008

SNOTEL data for those locations where the March 3, 2008 reading for Snow-Water Equivalent (SWE) was over 120% of average are listed below. Light shading shows SNOTELs where the average is between 140% and 159% of average, while darker shading shows SNOTELs where the average is at or above 160% of average. This is a first cut attempt at focusing attention on those watersheds where we should be most concerned about the possibility of snowmelt flooding.

In the tables below, the first row indicates the SWE readings from March 3, 2008, the second row indicates values from March 18, the third row indicates values from March 31, the fourth row indicates values from April 14, the fifth row indicates values from May 1, and the sixth row indicates values from May 18. These values have been left in the tables for historical information and trend determination. SNOTEL sites have not been deleted from the table unless they have fallen below 100% on May 18, or if average SWE for the date has dropped below 5 inches.

Gunnison River Basin (Basinwide SWE at 151% of Average)

(122% of Average May 1st)
(139% of Average April 14th)
(128% of Average March 31st)
(135% of Average March 18th)
(145% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Butte	Gunnison	East River	10,160	18.8 20.3 21.5 22.5 18.2 12.5	*147* *141* *138* *141* *132* *205*
McClure Pass	Pitkin, Gunnison, Delta	Crystal River, Muddy Creek	9,500	23.3 24.8 26.5 29.7 19.4 9.0	*153* *142* *145* *163* *138* *153*
Mesa Lakes	Mesa, Delta	Plateau Creek, Kannah Creek	10,000	17.7 19.0 19.4 23.0 19.5 15.7	*123* *114* *104* *117* *103* *152*
Park Reservoir	Delta	Surface Creek	9,960	29.4 30.7 31.8 35.2 31.8 33.2	*133* *122* *115* *118* *103* *123*
Porphyry Creek	Gunnison, Chaffee	Tomichi Creek, South Arkansas River	10,760	20.0 21.6 21.8 24.3 17.6 12.1	*155* *149* *138* *147* *120* *127*
Red Mountain Pass	Ouray, San Juan	Animas River, Uncompahgre River	11,200	28.0 29.5 30.0 34.4 30.8 28.3	*143* *129* *118* *126* *114* *123*
Schofield Pass	Pitkin, Gunnison	Crystal River, East River	10,700	42.2 45.5 48.4 55.6 53.0 51.3	*150* *143* *139* *150* *138* *172*
Slumgullion	Hinsdale, Mineral, Saguache	Cebolla Creek, Lake Fork Gunnison, Rio Grande, Saguache Creek	11,440	15.6 16.7 17.3 19.1 16.2 13.8	*141* *135* *128* *132* *113* *147*

Upper Rio Grande Basin (***Basinwide SWE at 105% of Average***)
(109% of Average May 1st)
(131% of Average April 14th)
(136% of Average March 31st)
(150% of Average March 18th)
(164% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Lily Pond	Conejos, Rio Grande	Alamosa River	11,000	24.9 24.8 23.9 23.3 19.2 9.6	***190*** ***169*** ***150*** ***139*** ***137*** ***117***
Wolf Creek Summit	Mineral, Rio Grande, Archuleta	Rio Grande, San Juan River	11,000	44.0 44.5 44.5 45.6 46.0 41.9	***166*** ***146*** ***134*** ***131*** ***125*** ***121***

San Miguel, Dolores, Animas, San Juan River Basins (Basinwide SWE at 104% of Average)
(109% of Average May 1st)
(133% of Average April 14th)
(127% of Average March 31st)
(138% of Average March 18th)
(152% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Columbus Basin	La Plata	La Plata River	10,785	32.0 32.5 32.8 35.1 28.7 21.5	***155*** ***137*** ***127*** ***124*** ***110*** ***105***
Mineral Creek	San Juan	Animas River	10,040	18.7 19.5 19.9 21.8 15.7 8.8	***147*** ***136*** ***130*** ***139*** ***124*** ***129***
Molas Lake	San Juan, La Plata	Animas River	10,500	25.5 26.2 26.9 31.6 24.7 14.3	***148*** ***139*** ***131*** ***143*** ***121*** ***110***
Red Mountain Pass	Ouray, San Juan	Animas River, Uncompahgre River	11,200	28.0 29.5 30.0 34.4 30.8 28.3	***143*** ***129*** ***118*** ***126*** ***114*** ***123***
Upper San Juan	Archuleta	San Juan River	10,200	37.5 37.7 39.1 38.3 37.2 29.1	***144*** ***130*** ***124*** ***116*** ***125*** ***135***
Vallecito	La Plata	Los Pinos River	10,880	24.1 24.5 24.8 26.3 20.5 10.6	***143*** ***131*** ***128*** ***134*** ***127*** ***116***
Wolf Creek Summit	Mineral, Rio Grande, Archuleta	Rio Grande, San Juan River	11,000	44.0 44.5 44.5 45.6 46.0 41.9	***166*** ***146*** ***134*** ***131*** ***125*** ***121***

Upper Colorado River Basin (*Basinwide SWE at 156% of Average*)
(119% of Average May 1st)
(135% of Average April 14th)
(122% of Average March 31st)
(126% of Average March 18th)
(129% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Arrow	Grand	Fraser River	9,680	14.2 16.1 17.6 20.4 17.7 16.8	***126*** ***127*** ***125*** ***132*** ***113*** ***198***
Berthoud Summit	Grand, Clear Creek	Fraser River, Clear Creek	11,300	16.5 19.1 20.3 24.1 22.7 24.0	***113*** ***116*** ***112*** ***120*** ***105*** ***130***
Bison Lake	Garfield, Eagle	Deep Creek	10,880	27.7 29.3 31.3 34.1 32.1 34.3	***122*** ***116*** ***115*** ***116*** ***105*** ***120***
Copper Mountain	Summit	Tenmile Creek, Blue River	10,550	15.3 17.2 17.7 20.0 18.2 18.7	***135*** ***135*** ***126*** ***132*** ***121*** ***199***
Fremont Pass	Summit, Lake	Tenmile Creek, Blue River, Upper Arkansas River	11,400	17.3 19.3 19.8 22.9 23.4 26.0	***132*** ***132*** ***123*** ***129*** ***121*** ***133***
Grizzly Peak	Summit	Snake River	11,100	17.7 19.1 N/A 22.6 18.9 16.9	***127*** ***123*** ***N/A*** ***123*** ***104*** ***139***
Hoosier Pass	Summit, Park	Blue River, Middle Fork South Platte River	11,400	15.1 17.9 18.7 20.7 18.5 17.7	***127*** ***135*** ***128*** ***130*** ***112*** ***154***
Independence Pass	Pitkin	Roaring Fork	10,600	19.4 22.0 23.0 26.3	***145*** ***146*** ***138*** ***150***

				23.5 19.5	*145* *224*
Ivanhoe	Pitkin, Eagle	Fryingpan River	10,400	17.7 20.3 20.7 24.1 22.6 22.6	*153* *151* *142* *158* *149* *224*
Jones Pass	Grand	Williams Fork	10,400	14.6 16.6 17.7 21.9 21.0 21.9	*112* *113* *110* *132* *127* *270*
McClure Pass	Pitkin, Gunnison, Delta	Crystal River, Muddy Creek	9,500	23.3 24.8 26.5 29.7 19.4 9.0	*153* *142* *145* *163* *138* *153*
Mesa Lakes	Mesa, Delta	Plateau Creek, Kannah Creek	10,000	17.7 19.0 19.4 23.0 19.5 15.7	*123* *114* *104* *117* *103* *152*
Schofield Pass	Pitkin, Gunnison	Crystal River, East River	10,700	42.2 45.5 48.4 55.6 53.0 51.3	*150* *143* *135* *150* *138* *172*
Willow Creek Pass	Grand, Jackson	Willow Creek, Illinois River	9,540	13.7 14.4 15.9 19.5 20.0 20.9	*140* *132* *132* *144* *141* *211*

Note the following site has gone above 120% for the first time (average SWE is above 5 inches):
Vail Mountain 130%

South Platte River Basin (*Basinwide SWE at 133% of Average*)

(101% of Average May 1st)
(114% of Average April 14th)
(105% of Average March 31st)
(109% of Average March 18th)
(109% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Hoosier Pass	Summit, Park	Blue River, Middle Fork South Platte River	11,400	15.1 17.9 18.7 20.7 18.5 17.7	**127** **135** **128** **130** **112** **154**
Jackwhacker Gulch	Park	North Fork South Platte River	10,960	10.7 12.2 12.8 14.5 13.3 12.3	**124** **124** **116** **123** **130** **178**
Loveland Basin	Clear Creek	Clear Creek	11,400	17.9 20.0 20.9 24.5 23.0 24.7	**138** **127** **114** **120** **102** **118**

Note: The following sites in the South Platte River have gone above 120% for the first time (all sites have average SWE of 5 – 15 inches):

Bear Lake 125%
Buckskin Joe 164%
Deadman Hill 128%
Joe Wright 126%
Michigan Creek 197%
Niwot 148%
Willow Park 123%

Arkansas River Basin (***Basinwide SWE at 160% of Average***)

(125% of Average May 1st)
(150% of Average April 14th)
(146% of Average March 31st)
(160% of Average March 18th)
(155% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Fremont Pass	Summit, Lake	Tenmile Creek, Blue River, Upper Arkansas River	11,400	17.3 19.3 19.8 22.9 23.4 26.0	***132*** ***132*** ***123*** ***129*** ***121*** ***133***
Porphyry Creek	Gunnison, Chaffee	Tomichi Creek, South Arkansas River	10,760	20.0 21.6 21.8 24.3 17.6 12.1	***155*** ***149*** ***138*** ***147*** ***120*** ***127***

Note: South Colony site has gone over 120%. It is now at 204%.

Laramie/North Platte River Basins (***Basinwide SWE at 129% of Average***)
(107% of Average May 1st)
(115% of Average April 14th)
(104% of Average March 31st)
(105% of Average March 18th)
(111% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Columbine	Jackson, Routt	North Platte River, Yampa River	9,160	21.9 25.2 26.9 29.9 24.9 19.8	***99*** ***105*** ***108*** ***121*** ***119*** ***182***
Rabbit Ears	Jackson, Routt	North Platte River, Yampa River	9,400	26.3 29.4 31.7 38.2 34.3 32.5	***120*** ***119*** ***117*** ***129*** ***115*** ***137***
Whiskey Park	Jackson, Routt	North Platte River, Yampa River	8,950	28.3 28.9 33.0 38.7 38.3 35.3	***116*** ***103*** ***109*** ***126*** ***126*** ***142***
Willow Creek Pass	Grand, Jackson	Willow Creek, Illinois River	9,540	13.7 14.4 15.9 19.5 20.0 20.9	***140*** ***132*** ***132*** ***144*** ***141*** ***211***
Zirkel	Jackson	North Platte River	9,340	28.5 30.9 N/A 35.7 30.1 24.9	***124*** ***125*** ***N/A*** ***140*** ***140*** ***222***

The following sites have gone over 120% for the first time this year (all have average SWE greater than 5 inches):
Deadman Hill 128%
Joe Wright 126%
Never Summer 125%
Roach 169%

Yampa/White Basin (*Basinwide SWE at 123% of Average May 1st*)
(112% of Average May 1st)
(122% of Average April 14th)
(110% of Average March 31st)
(109% of Average March 18th)
(112% of Average March 3rd)

Station Name	Potentially Affected Counties	Potentially Affected Basins	Elevation of SNOTEL (ft)	Current Inches (SWE)	% of Average (SWE)
Bison Lake	Garfield, Eagle, Rio Blanco	Deep Creek, South Fork White River	10,880	27.7 29.3 31.3 34.1 32.1 34.3	***122*** ***116*** ***115*** ***116*** ***105*** ***120***
Columbine	Jackson, Routt	North Platte River, Yampa River	9,160	21.9 25.2 26.9 29.9 24.9 19.8	***99*** ***105*** ***108*** ***121*** ***119*** ***182***
Divide Peak	Moffat	Little Snake River	8,880	20.5 21.0 23.1 26.6 23.3 19.2	***129*** ***116*** ***116*** ***128*** ***121*** ***175***
Elk River	Routt	Elk River	8,700	21.9 24.0 27.0 30.3 20.5 14.5	***134*** ***133*** ***138*** ***153*** ***137*** ***242***
Rabbit Ears	Jackson, Routt	North Platte River, Yampa River	9,400	26.3 29.4 31.7 38.2 34.3 32.5	***120*** ***119*** ***117*** ***129*** ***115*** ***137***
Whiskey Park	Jackson, Routt	North Platte River, Yampa River	8,950	28.3 28.9 33.0 38.7 38.3 35.3	***116*** ***103*** ***109*** ***126*** ***126*** ***142***

Note the following sites have gone above 120% for the first time (average SWE is above 5 inches):
Burro Mountain 135%
Dry Lake 189%



COLORADO
DEPARTMENT OF
NATURAL
RESOURCES

Colorado Flood & Water Availability Task Force Joint Meeting

Division of Wildlife Office – Denver, CO May 19th, 2008 9:30 AM – 12:00 PM

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COLORADO
DEPARTMENT OF
NATURAL
RESOURCES

Colorado Flood & Water Availability Task Force Joint Meeting

Division of Wildlife Office – Denver, CO May 19th, 2008 9:30 AM – 12:00 PM

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