

History of Floods and Flood Control in Boulder, Colorado

by Phyllis Smith

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Colorado



Spring runoff on Boulder Creek. Martha Maxwell, early local taxidermist, lived in house across the stream, site of the present Eben Fine Park. photo, A. A. Paddock Collection

I am very grateful to those who graciously spent time with me, assisting with the interpretation of material for this report.

Gilbert F. White, world-renowned authority on natural hazards, and professor emeritus, Institute of Behavioral Science, University of Colorado at Boulder, was extremely helpful, as was Janet Roberts, Boulder community leader, who has sat on both Council and Planning Board and has worked with a number of civic groups. Former councilmember A. Gayle Waldrop assisted me as did local water expert William DeOreo.

Bob Wheeler, Dan Birch, Debbie Broome, Terry Kenyon, Alan Taylor, and Ned Williams, all of the Public Works Department, gave thoughtful criticism of the draft of this paper.

City Attorney Joseph de Raismes critiqued the work.* Lynn Macy and Bill Hutson, also with the City of Boulder, who assisted with the implementation of the flood control utility in the 1970s, were most informative. Marcelee Gralapp, Director of the Boulder Public Library, gave me additional material.

Public Works Analyst Ellyn Axelrod was meticulous in her editing of this paper.

Good librarians have made my job easier: Virginia Braddock, Municipal Government Reference Center; Imy Easton, Central Files; Lois Anderton, Carnegie Branch Library for Local Research; Charlotte Smokler, Boulder Daily Camera.

The cover drawing by B. Tilsley was first used in July 1977 by Leonard Rice Consulting Water Engineers, Inc. as the cover for "Early Flood Warning Planning: Boulder Creek," a study for the City of Boulder, Boulder County, and the Urban Drainage and Flood Control District.

Finally, I am grateful to all who have written on the subject of floods and flood control before me -- engineers, advanced degree candidates, newspaper reporters, landscape architects, natural hazards experts -- their work is detailed in the bibliography at the end of this report.

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* Mr. de Raismes also made available his flood control files.

Floods are "acts of God" but flood losses are largely
acts of man.

Gilbert F. White¹
Professor of Geography, emeritus
Institute of Behavioral Science
University of Colorado at Boulder

If the people of Boulder only have the sense to take warning by the experience of other towns they will deal with it now, while it can be dealt with cheaply and easily instead of waiting til a catastrophe forces them to remedy their neglect under conditions that will make a solution far more costly and less satisfactory.²

Frederick Law Olmsted, Jr.
landscape architect, 1910

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The snow-fed creeks that tumble down the foothills to broad plains along Colorado's Front Range, the eastern face of the central Rockies, do not bring to mind raging, out-of-control floodwaters filled with debris -- a potential for death and destruction to property.

From the month of May through September of any year, however, warm air masses from the Gulf of Mexico may circle upslope toward the Front Range, bringing with them storm cells that can produce intense rainfall. The resulting cloudbursts may quickly fill the channels of these small creeks which then take on a vastly different character.

After a series of late afternoon thunderstorms along the foothills,* the creeks may turn into "wild overflowing rivers" by late evening. These floodwaters may tear away mature trees, wash down huge boulders, gouge out new stream beds, and break apart such man-made structures as bridges,

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* Even though Boulder itself has an annual precipitation of thirteen to eighteen inches, to the immediate west at 9,000 feet, the yearly precipitation is twenty-six inches. Near the Continental Divide, the annual precipitation is forty inches. Seldom do these storms described above occur above 8,000 to 9,000 feet.

railroad ties, and buildings that have been constructed in the floodway* and on the flood plain.** By dawn, the damage is apparent. Lives may have been lost in the deluge.

Should stationary storm cells continue to soak the mountain terrain, its watershed already swollen from last winter's snow pack,*** flooding may continue for several days.

Of the world's natural disasters, fifteen percent can be attributed to drought, another fifteen percent to earthquake, twenty percent to tropical cyclone, and forty percent to flood. "Floods are the most frequent and do the greatest damage."³

"Flooding is significant in about 50 percent of the U.S. communities. About 7 percent of the total land area in the U.S. is flood prone."⁴

The purpose of this paper is to examine periodic flooding in the Boulder, Colorado area and the steps, or lack of steps, the community has taken, since its settlement in 1858, to combat the potential for harm when these deluges have occurred.

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* A floodway is an area contiguous to a stream which acts as an area of major conveyance for floodwaters of significant depth and velocity. (Through the years, Boulder has periodically and significantly changed its definition of a regulatory floodway.)

** A flood plain is the relatively flat area or low lands adjoining the channel of a stream or river which has been or may be covered by floodwaters that are either slow-moving or standing and are relatively shallow.

*** Flooding along the Front Range may occur with or without the additional pressure of a heavy snow pack.

The community's first settlers camped on Boulder Creek near its confluence with Sunshine Creek. At first, they did not mean to stay but came for gold nuggets and instant wealth.

As the would-be gold magnates climbed into the foothills, following those streams that showed a touch of color, the settlement at Boulder City took on a deserted look. For a number of years, almost everyone was at Gold Hill, Sunshine, Wallstreet, or Caribou, looking for "the ultimate strike."

The town was dusty in the summer, with flies buzzing around horse, pig, and cattle droppings. In the winter, Pearl Street was a muddy expanse, a challenge to cross in high button shoes and long trailing skirts.

British traveler Isabella Bird characterized Boulder as a "hideous collection of frame houses on the burning plain,"⁵ when she came through on horseback in 1873.

Like a number of western towns, Boulder City was slow to adopt a variety of civic improvement measures. It appeared that the community enjoyed discussing local issues, even formed special political parties around them from time to time, but a facility for making timely decisions was not apparent.

From the very first years, Boulder gained the reputation for giving an argument to almost any proposal. A feisty civic attitude prevailed during the discussion of such topics as religious observance in the schools, licenses for saloons, and home rule. But the town's water was of poor quality for many years until just before the turn of the century when Council finally decided to spend the re-

quisite funds to improve the system adequately. Boulder citizens regularly voted down sewer bond issues until 1895.

Many of the lots along Boulder Creek were priced so high that no one would buy them. The community's first streetcars went out of business almost immediately because no one would pay the five-cent fee.

The paving of streets, normally regarded in most towns as a sign of progress and prosperity, was vigorously fought in Boulder, even taken to court. (For a map showing Boulder in 1874, see page 5.)

The drainage for Boulder Creek and its tributaries covers 440 square miles, 136 square miles of which are upstream in the mountains above Boulder and 137 square miles of which are downstream through the city.

Boulder Creek has its sources in the high reaches of the Continental Divide at 13,500 feet, twenty-two miles up Boulder Canyon from the Boulder community. (See map on page 6.)

The source waters, which form in rough terrain, drain into the North Boulder and the Middle Boulder; these two creeks meet at Boulder Falls and continue as the main Boulder down to Orodell where a third stream, Fourmile Creek, flows down from the north to join the waterway.

"Slopes on Boulder Creek in the mountains are on the order of 200 feet per mile. Below the mouth of the canyon, slopes are still deep, averaging about 50 feet per mile throughout the city of Boulder."⁶



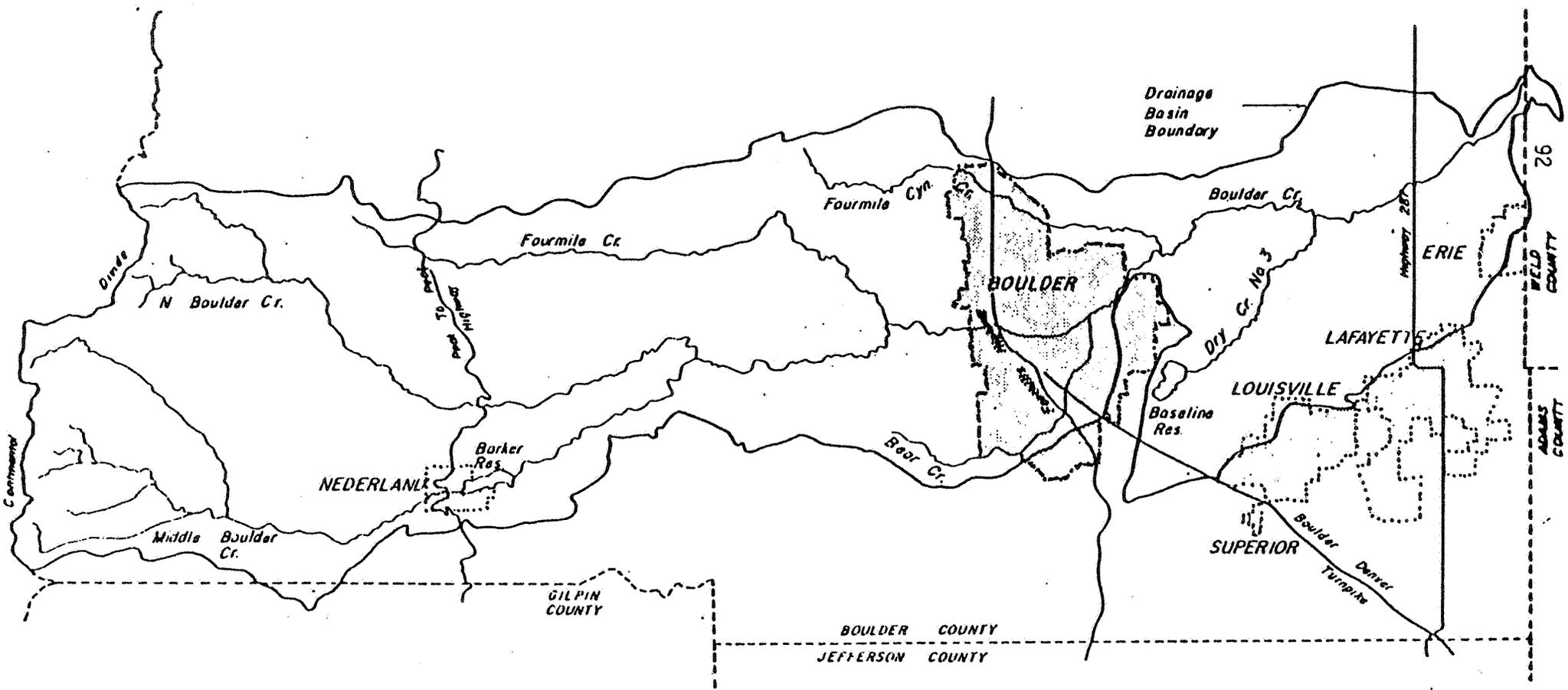
WEEKS CO. LITH. CORP. N.Y.C.

- No. 1.—Union School.
- " 2.—Methodist Church.
- " 3.—Congregational Church.
- " 4.—Baptist Church.

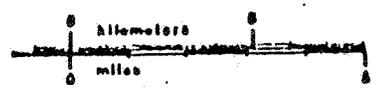
BIRD'S-EYE VIEW OF
BOULDER CITY,
 COLORADO, 1877.
 BOULDER CO.

- No. 5.—Flouring Mills.
- " 6.—Saw Mill.
- " 7.—Planing Mill.
- " 8.—Post Office.
- " 9.—Bear M. 7800 Feet.

Shows 2128



LEGEND



-  TOWNS AND CITIES
-  DRAINAGE BASIN BOUNDARY
-  BOULDER COUNTY LINE
-  STREAMS

BOULDER CREEK BASIN

from Sherry D. Oaks, "Floods in Boulder County: A Historical Investigation," Boulder County: November 1984

The channel for Boulder Creek averages five feet in depth; it averages forty-five feet in width at the bottom of the bed and ninety feet in width at the top.

Twelve miles upstream from the mouth of the canyon, Barker Dam and Reservoir were built in 1908 and were in full operation by 1910.

Two stream gauges* operated along the creek in earlier days. One, located at Orodell, three miles west of the courthouse, operated intermittently from 1887 to 1916; at that point, the gauge was used continuously. The other, located two and one-half miles upstream from Orodell, operated intermittently from 1886 through 1908.

Fourmile Canyon Creek is the most northern stream in the Boulder Creek basin. South of Fourmile Canyon Creek are situated Wonderland Creek, Twomile Creek, Elmer's Twomile Creek, and Goose Creek. Further to the south, Sunshine Creek flows down a gulch and turns south at Mapleton Avenue, moving toward its confluence with Boulder Creek.

From the first draw south of Boulder Canyon, Gregory Canyon Creek runs along Baseline Road, then wanders through the University Hill neighborhood to merge with Boulder Creek at Ninth Street. South of Gregory Canyon Creek lie Fern Creek, King's Gulch, Skunk Creek, and Bluebell Canyon Creek.

Further south, Bear Canyon Creek flows out of the

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* The spelling for "gauge" in the earlier literature is "gage."

foothills, travels along Table Mesa Boulevard, then turns north to join Boulder Creek. A man-made channel from Viele Lake is next; David's Draw is farther south.

Finally, South Boulder Creek, with a drainage of 132 miles,* rushes down a steep Eldorado Canyon and eventually wanders northward for 9.3 miles to join the main Boulder two miles east of the foothills, in east Boulder. (See map, page 9.)

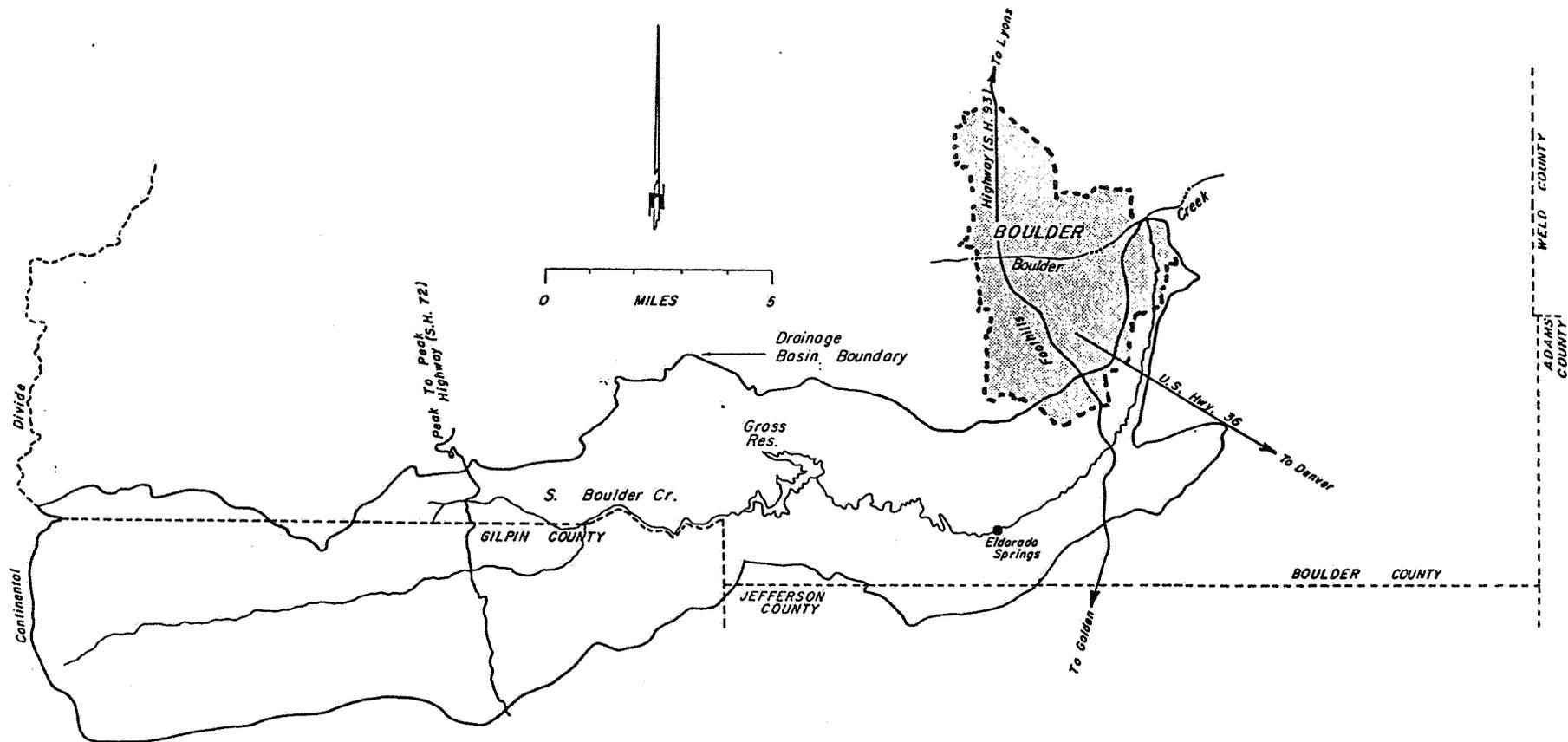
South Boulder Creek's average depth is five feet. Its average width is twenty-five feet at the bottom of the channel and sixty feet at the top.

Gross Reservoir, which was built on the South Boulder in 1955, is seven miles upstream from the town of Eldorado Springs. A stream gauge operated intermittently on the South Boulder, one mile east of Eldorado Springs from 1888 to 1904; at that point the gauge operated continuously. (For a map of both drainages, see page 10.)

Boulder Creek and its tributaries are not the only drainages along the Front Range with a potential for flood hazard. To the north lies St. Vrain Creek -- its tributaries, Jim Creek and Left Hand Creek (with a seventy-two-square-mile drainage), form in the mountains above north Boulder -- which flows through the Longmont area and has caused flood damage along its course from cloudburst activity.

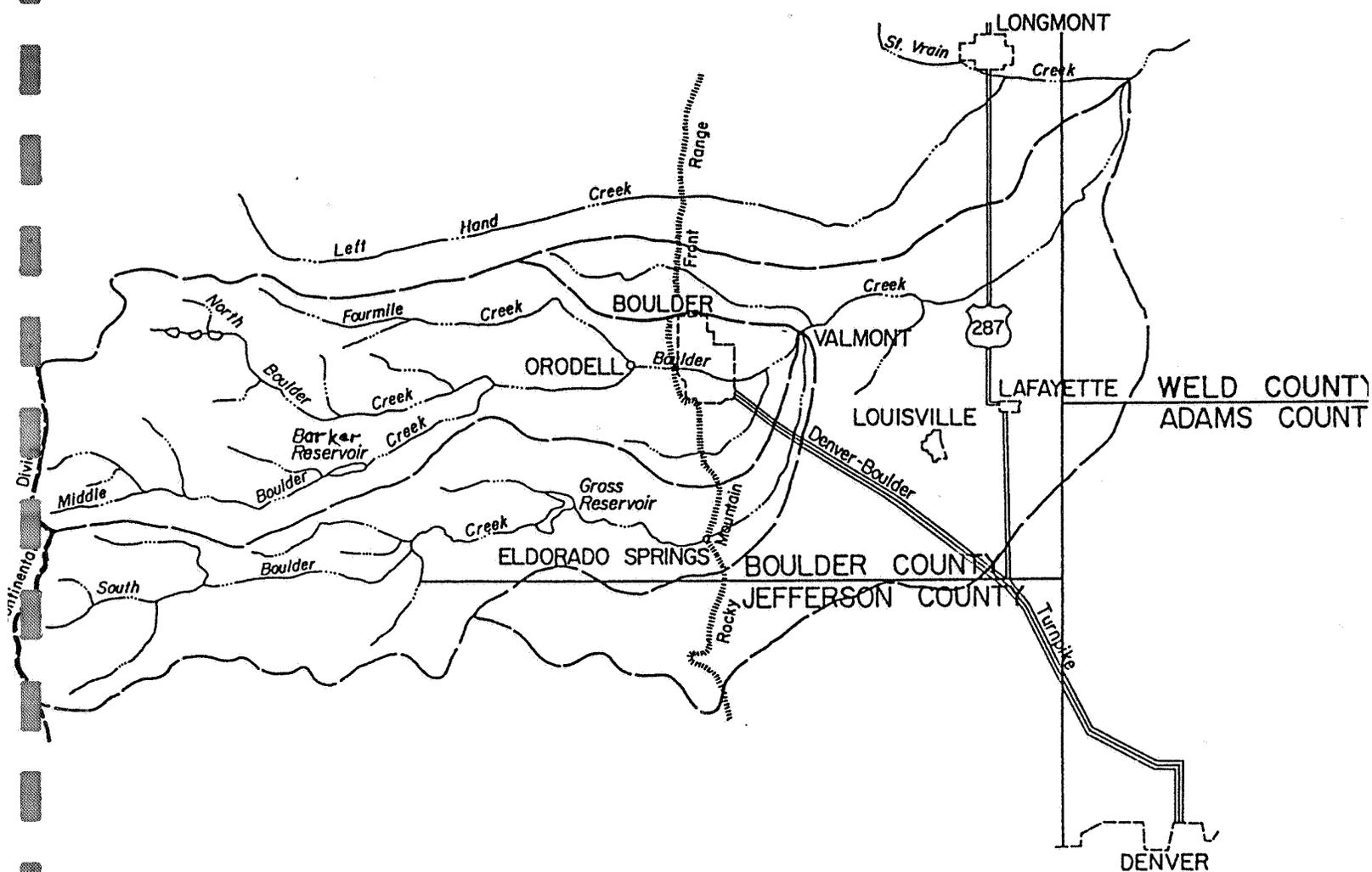
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* Part of the total Boulder Creek drainage of 440 square miles.



South Boulder Creek Basin

from Greenhorne and O'Mara, Inc.,
 "Flood Hazard Area Delineation: South
 Boulder Creek," July 1986



Boulder Creek and South
Boulder Creek Basins

from Muller Engineering Company,
Inc., "Boulder Creek Floodplain
Map Amendment," 1981.

To the south of the Boulder Creek drainage run Coal Creek and Rock Creek which swing to the north into broad flood plains near Superior, Louisville, and Erie. (For an areal drainage map, see page 12.)

All of these Front Range creeks eventually flow into the South Platte River east of Longmont, eighteen miles east of the mountains, which, in turn, joins the North Platte River in Nebraska.

When the first gold-seeking party camped along Boulder Creek in October 1858, the men learned about the possibility of flooding along local mountain streams from an Indian's dream. Bear Head, a minor Arapaho chief, told the white men from the States about a dream he experienced after he realized he could not convince the would-be gold miners to leave his tribe's favorite winter hunting ground.

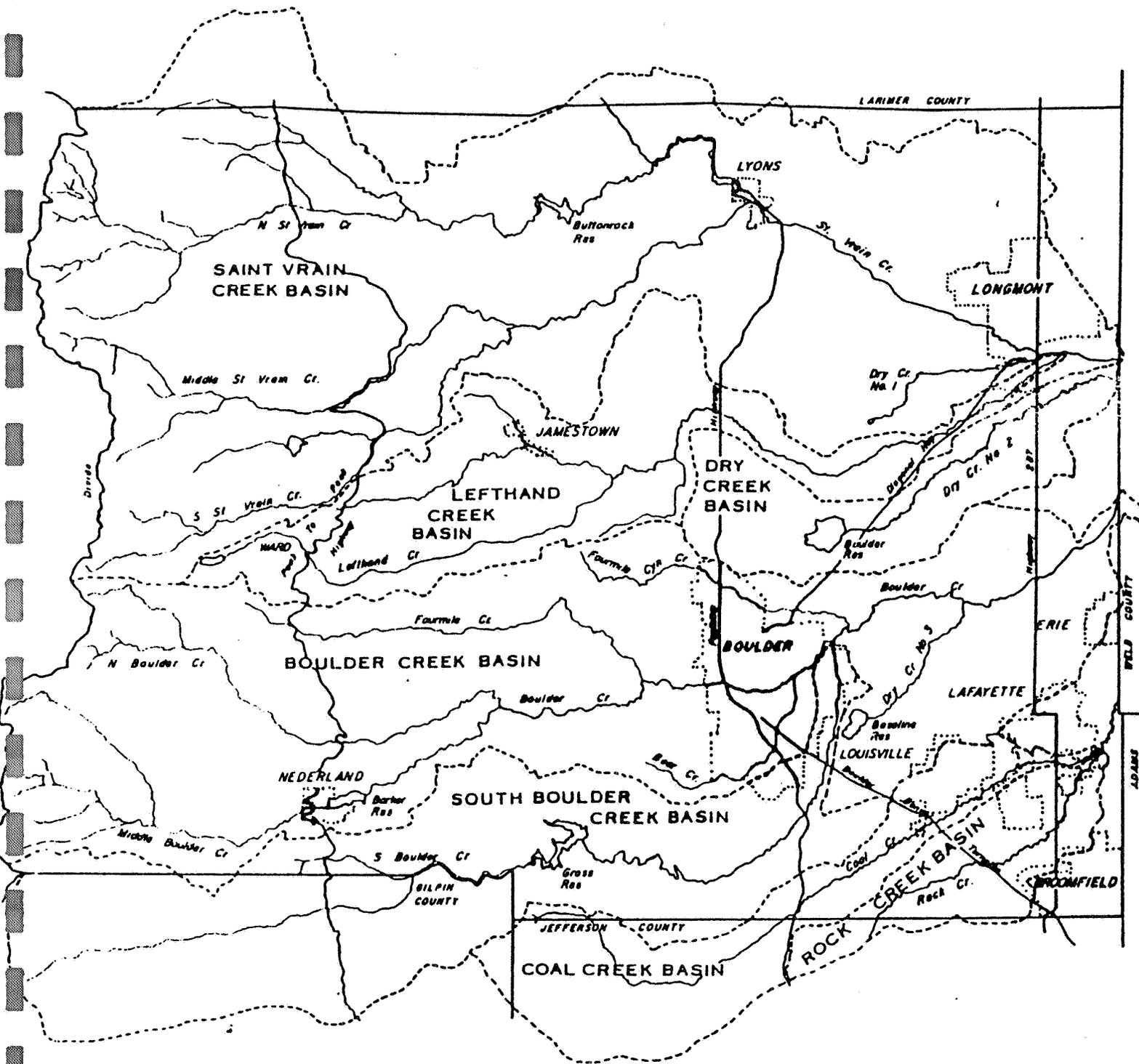
In his dream, Bear Head saw a terrible flood coming down Boulder Canyon; the white men survived the deluge, he said, but his Indian brothers were trapped in the floodwaters and died.*

The earliest flood known in the South Platte River basin, which may have affected the Boulder Creek area as well, occurred in 1844 but was not reported until 1864 in an unsigned reminiscence in an early Denver newspaper:

In the summer of 1861, we were one of Lieutenant Berthoud's exploring party to and from Salt Lake City. Major James Bridger, one of the most thoroughly practical

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* The Southern Arapaho had been regular visitors to the Boulder area for only two hundred years.



Boulder Creek and Neighboring Basins

LEGEND



-  TOWNS AND CITIES
-  DRAINAGE BASIN BOUNDARY
-  BOULDER COUNTY LINE
-  STREAMS

from Sherry D. Oaks, "Floods in Boulder County:
 A Historical Investigation," Boulder County:
 November 1984

explorers in the west, was guide on that trip...he proceeded to tell us that many years ago while on a journey from Ft. Laramie to some other point, he found the bottoms between Cherry Creek and [South] Platte River covered between bluffs of the two, which compelled him to remain on the opposite bank from (the present site of) this city (Denver). It was 9 days before he was able to effect a crossing.⁷

From the descriptions of this flood, the United States Army Corps of Engineers later estimated the peak discharge on the South Platte at 100,000 cfs,*the highest recorded discharge for the South Platte until the mid-1960s.

Shortly after settlement along the Front Range, three floods occurred in May and June 1864, centering again in the Cherry Creek area near young Denver. The May 19 cloud-burst and flood were particularly devastating to the newly-built town. Water rushed through Cherry Creek "like the roaring of Niagara, or, the rumbling of an enraged Etna."⁸

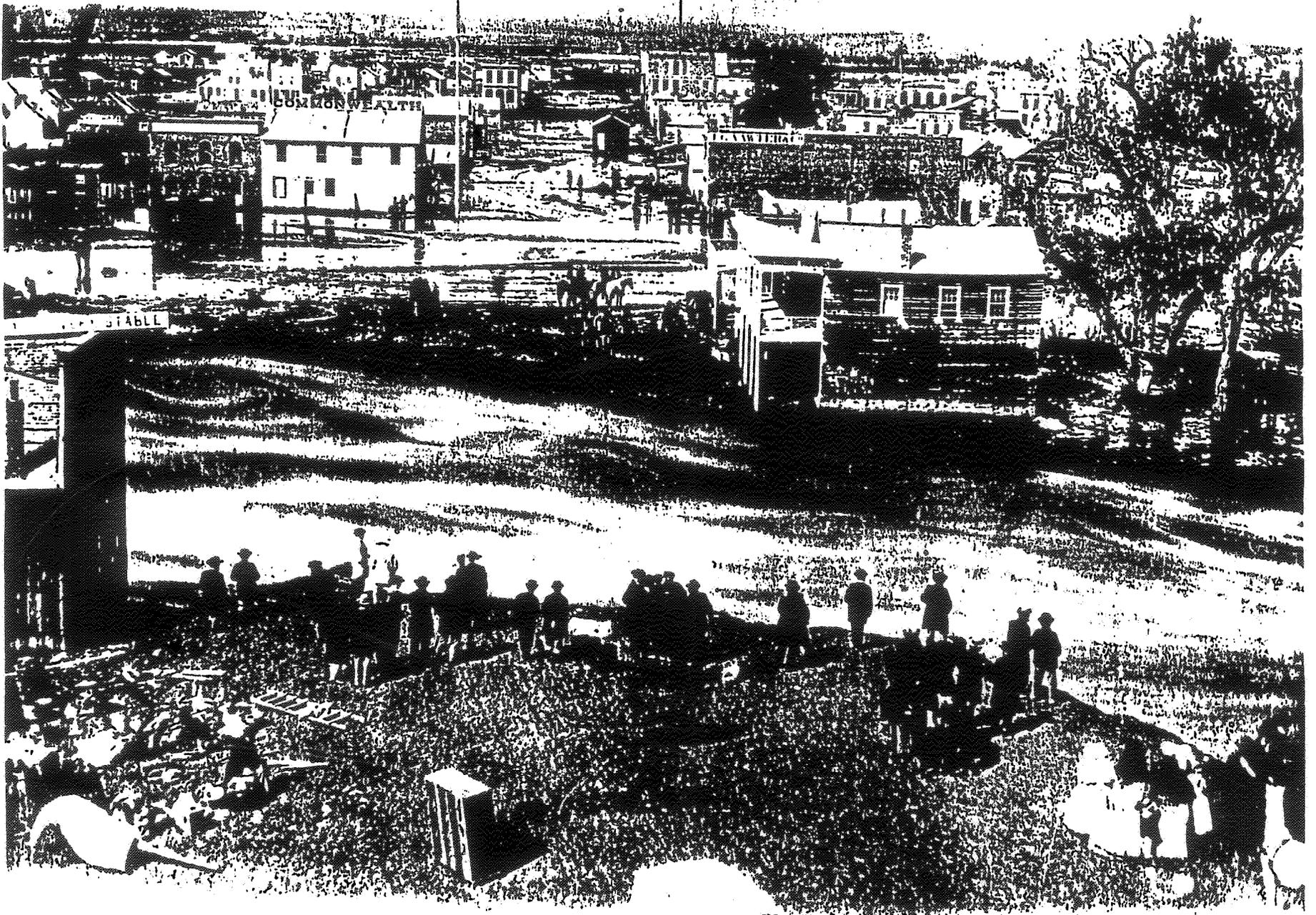
Down the Platte went the new city hall, the Trinity Methodist Church, and the offices of the Rocky Mountain News.

The June 1864 rains lasted about fifty hours and surely affected the Boulder area. The flood ravaged the Superior homestead of William Hake. The waters uncovered a vast bank of coal on his land which lay undeveloped until 1895 when farmer Hake contracted with James Hood to sink the first shaft of the Industrial mine, a major coal producer in the Boulder area.

Flooding occurred again in May of 1867, 1876, and 1885. Damage to the Boulder community itself was relatively minor;

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* Cubic feet per second.



Denver's Cherry Creek in flood, 1864. photo, Western Historical Collections, University of Colorado at Boulder.

downstream, however, the creek was described as, "Swollen into a great river, in many places fully a mile and a half wide, inundated the land and farms and meadows and swept away fences and bridges."⁹

During the 1876 flood, the coal towns to the east of Boulder suffered considerable damage from the floodwaters rushing down Coal Creek. The event was reported in the Greeley Sun:

Coal Creek inspired terror on Monday last, if never before. About noon the streets of Erie began to fill with water, and before an hour had elapsed, houses were flooded and the whole flat on which the town is located was swept by a muddy, roaring flood, over a quarter of a mile in width.

People waded through the boiling flood with children on their shoulders, when the current threatened every moment to dash their feet from beneath them and to hurl them helpless and drowning down the roaring tide.¹⁰

Boulder's winter of 1894 was long, cold, and snowy. The mountains held a heavy snow pack. By the 29th of May, humid winds from the Gulf of Mexico brought warm spring rain that melted the snow pack far too rapidly. It rained for sixty hours. The Denver Republican summed up the situation afterward. "Waterspout after waterspout seemed to break on the hillsides and added to the fearfully swollen streams."

Boulder Creek began flooding in the early morning darkness of May 31. (Many years later, ninety-nine-year-old Elizabeth Ricketts remembered that morning, standing with her family in front of their home on Arapahoe Avenue, watching the flood go past. Miss Ricketts never forgot

the noise of crashing debris swinging downstream.)

One by one, mountain roads, bridges, roominghouses, even mines, broke apart. The narrow-gauge Greeley, Salt Lake City and Pacific Railroad, built up Boulder Canyon to Sunset in 1883, washed out. Fourmile Creek was flooding also; its waters rushed into Boulder Creek at Orodell. (To the north, the St. Vrain drainage boiled over, too.)

For five days, Boulder was cut off from the world; neither news nor mail came in from the outside. Editor Fred Lockwood of the Daily Camera headlined his first story:

FLOOD IN BOULDER

The Windows of Heaven Opened
and Boulder Was Submerged.

MANY LIVES ARE IN DANGER!

And Thousands of Dollars Worth of Property Completely Destroyed.

BOULDER CREEK ON A RAMPAGE

And Boulder Receives the Full Effects of it—The Lower Part of the City One Vast Lake
of Water—Residents Rescued by Means of Horses and Ropes—
The Narrow Gauge Road Destroyed—Marius
G. Smith in Danger of Being
Drowned.

Nobody in town had time to read Lockwood's stories, however, but later, on June 1, the Boulder Tribune reprinted the Camera articles.

First reports spoke of six buildings gone at Camp Crisman, eight down at Sunset, and extensive damage at Jamestown and Ballarat. Parts of Sugar Loaf and Salina were gone; the two-year-old boom town of Copper Rock was wiped out.

At Ward, 8.9 inches of rain had fallen; normally placid Left Hand Creek had turned into a "howling river," measuring three hundred yards across. Jamestown's church floated downstream with its bell tolling. The lower section of Lyons was destroyed and the Estes Park toll road was no more.

At Sunnyside, the new bowling alley broke up in the floodwaters and sailed downstream to Niwot, on the plains. At Glendale, "the entire creek bed, from one side of the canyon to the other, was one seething mass of black water, boulders [sic] and crushed buildings. Nearly every tree has been torn out by the roots and the road bed is entirely destroyed."¹¹

In Boulder itself, the first to go was the long Fourth Street railroad bridge; its tracks were twisted into a semi-circle. Then, one by one, the bridges at Sixth Street, Ninth Street, Twelfth Street (now Broadway), and Seventeenth Street collapsed, piling up along the way. The swiftly-moving debris, including large rocks from the canyon, added to the danger.

It rained for two more days. That first morning of the

flood, Harriet Roosa was walking to high school,

which was located that year in Highland School building. [Ninth Street and Arapahoe Avenue]. I reached Sixth Street before eight o'clock to find the bridge out, so, instead of taking a Greek examination -- I walked up and down Boulder Creek to see what I could.

At the depot, water all around it and it spread out over the ground north of the south bank of the creek which was higher. The waters looked like a river -- more than a block wide.¹²

Mrs. Roosa then described, in a somewhat fanciful manner, the debris flowing down Flagstaff mountain:

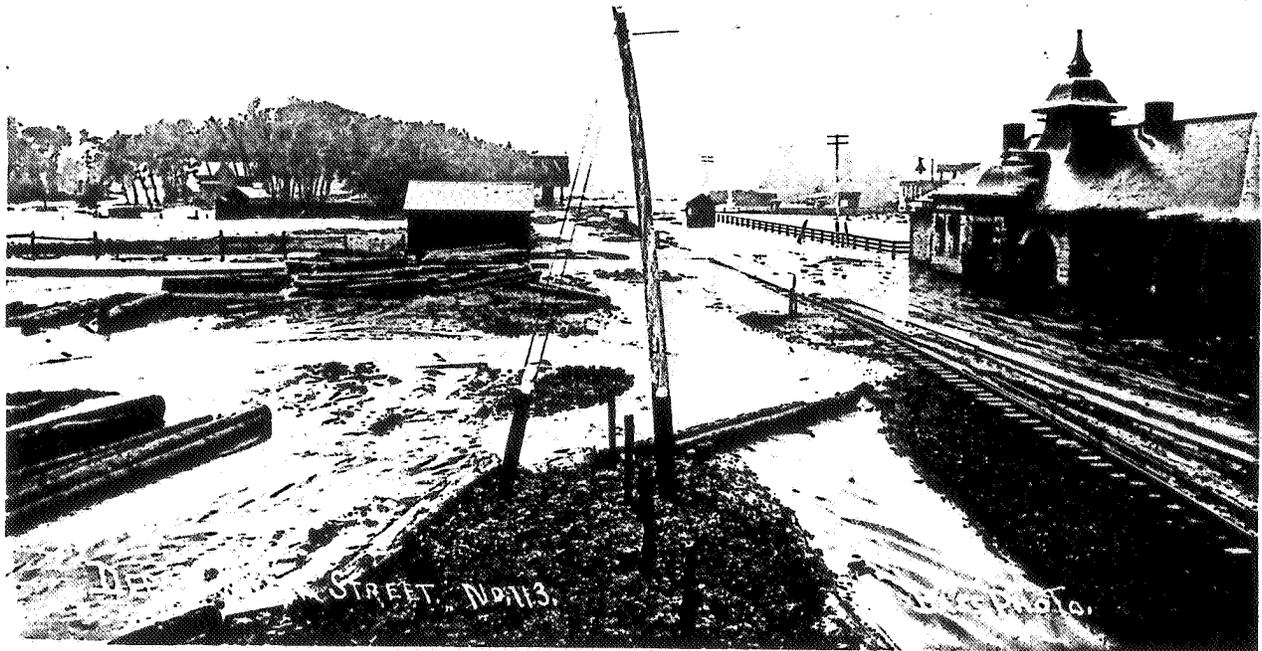
I walked west to the point close to the mouth of the cañon where the road turned to the right as I turned into the cañon. While I stood there, a huge "cloud burst" came down the northeast side of Flagstaff. It was huge -- looked as big as about a five room house rolling over and over -- carrying huge rocks and trees as it rushed along.¹³

For several days, there continued to be no way to cross Boulder Creek; south Boulder was separated from north Boulder. Photographer "Rocky Mountain Joe" Sturtevant had been out for the evening and got caught on the wrong side of the stream from his camera. Marshal Lawrence P. Bass, however, was out taking pictures of the flood scene. As the Camera later stated, "From the Boulder Hotel* to the University Hill was one vast lake with here and there a small patch of an island."¹⁴ In some spots, the water measured eight to ten feet deep.

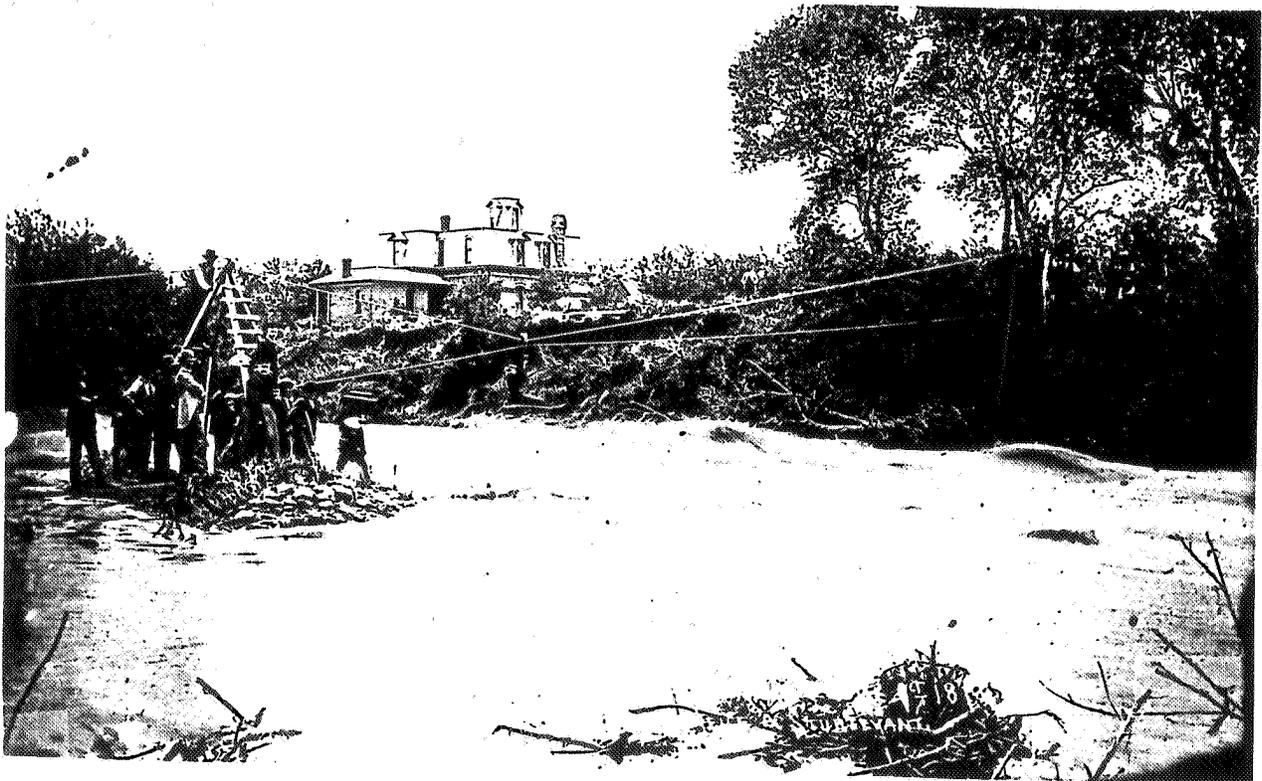
Newspapers, in the journalistic style of the day, ran such one-liners as "Good Baptist weather," or "The more rain, the fewer strawberries," or "Was the Populist Party responsible for the flood?" "Poor Dan McAllister! His best

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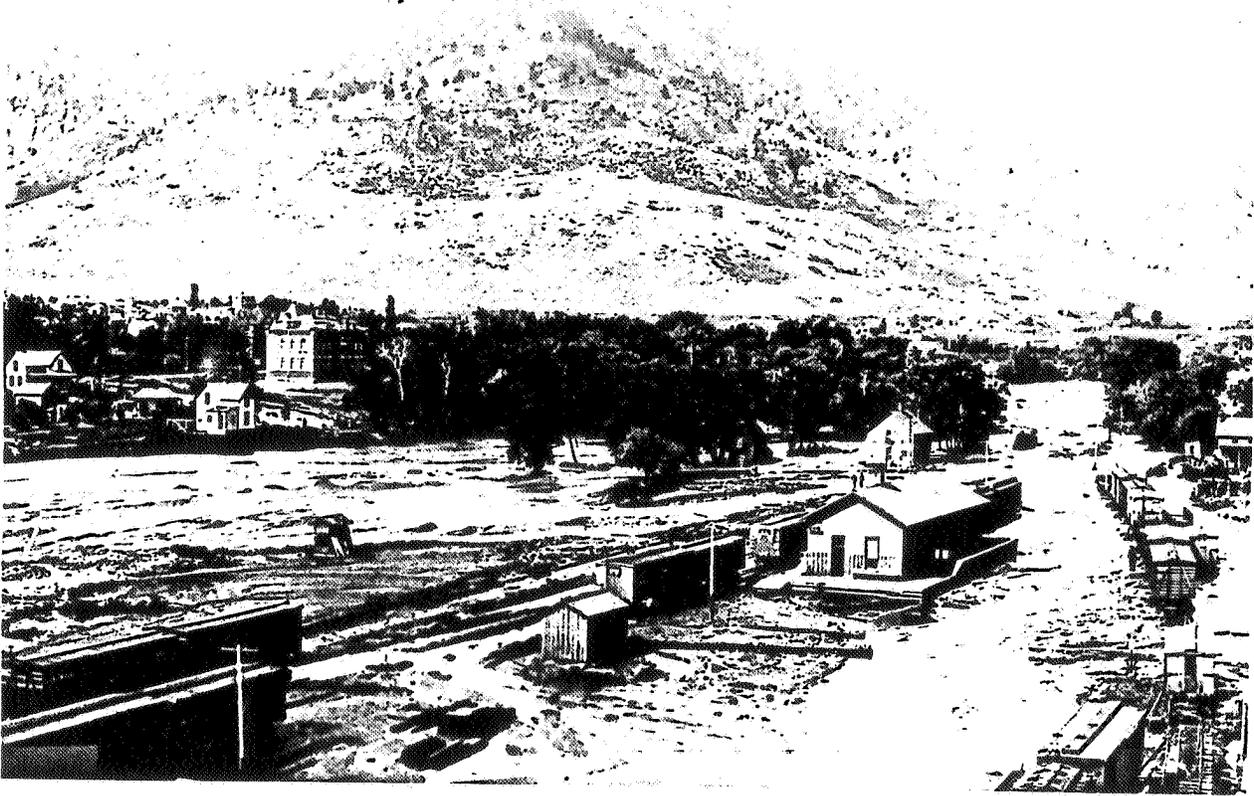
* Not to be confused with the Hotel Boulderado.



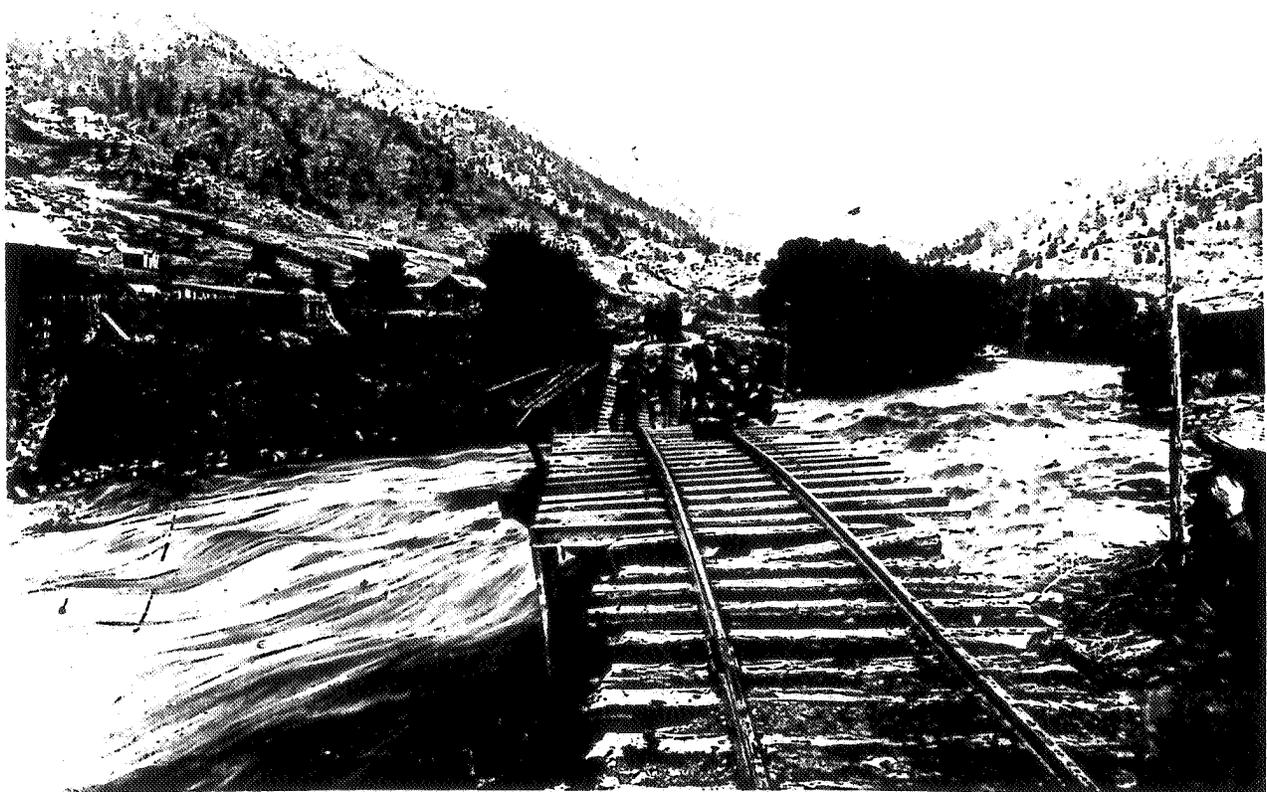
The flood of 1894. It is still raining. Passenger depot at right, Fourteenth and Water (Canyon Boulevard) Streets. Bass photo, A. A. Paddock Collection.



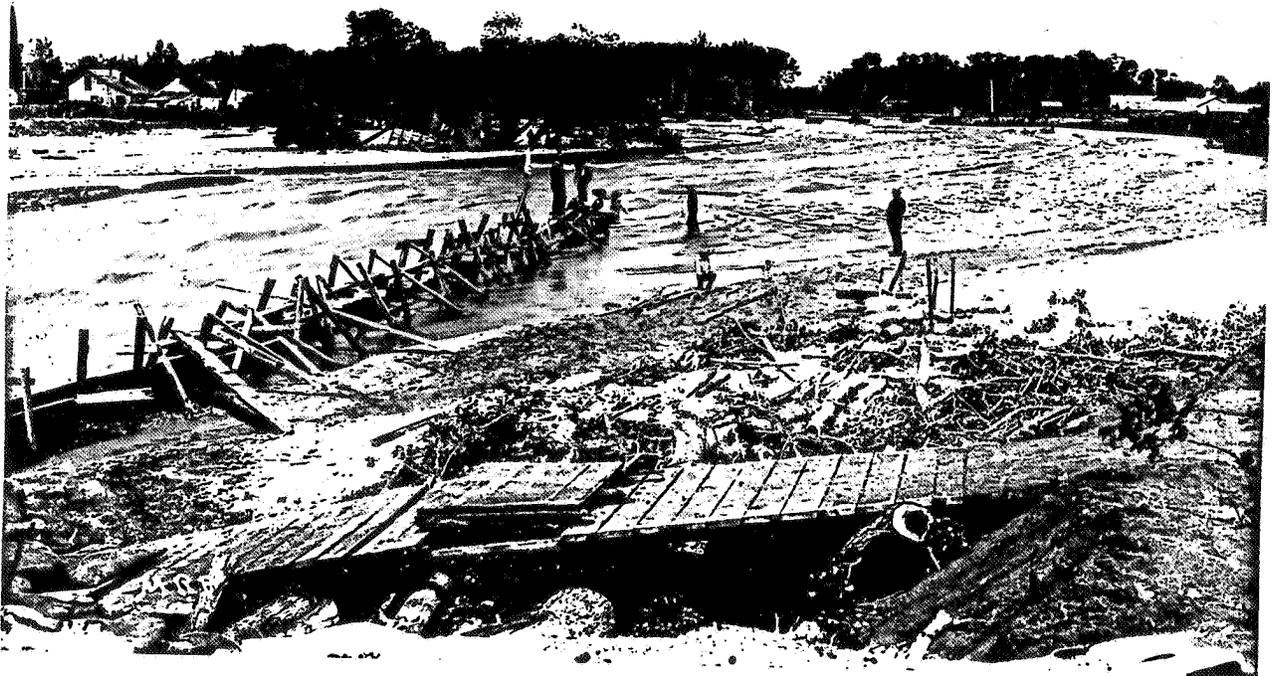
The bridge is gone at Sixth Street. Citizens are setting up a pulley across the creek. Meile photo, A. A. Paddock Collection.



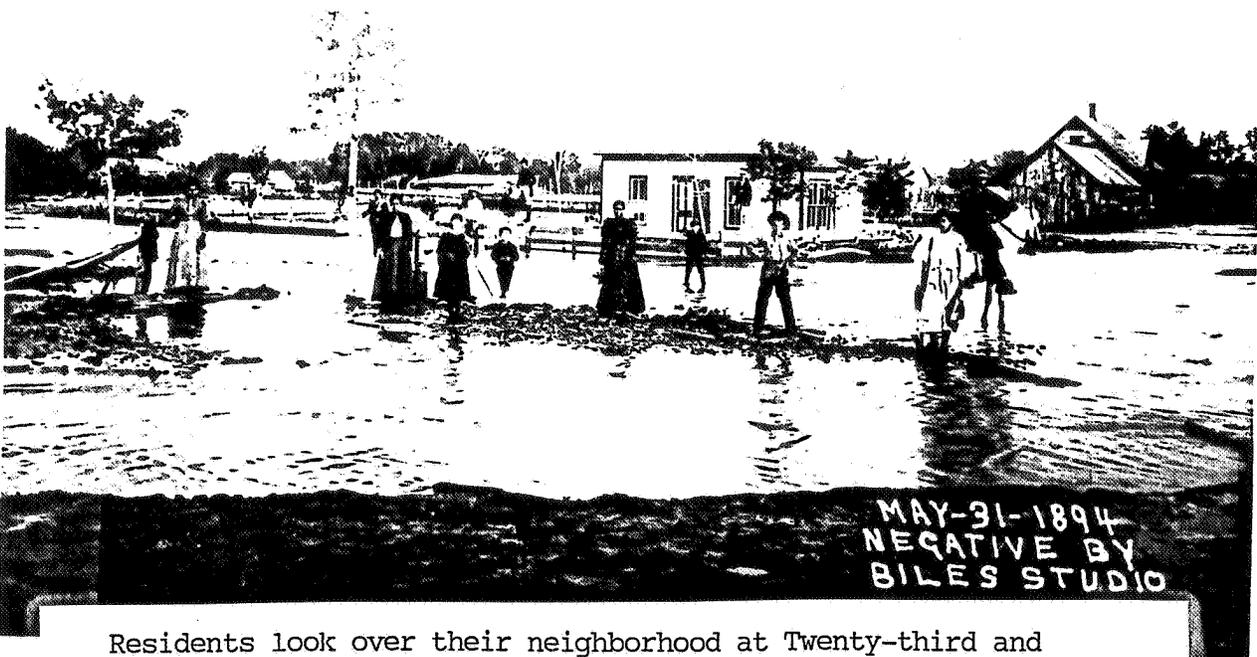
Panoramic view of the flood of 1894. Highland School is in left background. Bass photo, Boulder Historical Society.



What is left of the railroad trestle at Fourth Street is about to go during the flood of 1894. Tangen photo, Western Historical Collections, University of Colorado at Boulder.



A few citizens survey the scene, June 1, 1894. photo, Boulder Historical Society.



Residents look over their neighborhood at Twenty-third and Water (Canyon Boulevard) Streets. photo, Biles Studio, A. A. Paddock Collection.



The view to the west from Ninth Street, 1894. Bass photo, A. A. Paddock Collection.



What the flood of 1894 left behind at Twentieth and Goss Streets. Meile photo, A. A. Paddock Collection.

girl lived on the other side."¹⁵

The northern half of town experienced a temporary beer famine until the brewery*employees, by means of ropes, hoisted kegs of beer across the creek. The ropeways were perilous as the creek bed kept changing.

The unflappable Dr. Jay put on his hip boots and went fishing on Water Street. He caught a seven-inch trout. A certain Madame Kingsley, a pug dog on each arm, was carried to safety in the vicinity of the red-light district, with "misery depicted on her countenance."¹⁶

To the east, Culver Flats**was completely under water. Nearby, engine 155 from the narrow-gauge railroad was sunk in the mud and debris. A bawling cow, tethered near the stream, could not escape the rising waters. Several "humanitarians" shot at the tether rope with their rifles and eventually hit the cow, for the animal went down.

Towards noon of May 31, blacksmith Jacob Faus and his family scrambled out of their creekside home on Twelfth Street (Broadway) between Water Street and Arapahoe Avenue. They joined a crowd to watch their residence sail rather grandly downstream.

The neighbors of Mr. Mallinckrodt helped him move his factory equipment to higher ground; Mr. Mallinckrodt manufactured anti-nicotine pipes.

In the first excitement, the rumor spread that the reservoir***was damaged. George Whitney is said to have

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* Near the present site of the Boulder Public Library.

** Culvert Flats was the area bounded by Seventeenth to Twenty-third Streets, Walnut to Water Streets, and was inhabited by Boulder's poor families, which included all of the community's small black population.

*** Sunshine Reservoir, Boulder's second water storage area, was built in 1891 near the base of Sunshine Canyon.

rushed through the streets crying, "Get to the hills, the reservoir is busted!" Mayor James Cowie was worried about it, too, for he spent the first flood day hiking up the canyon in the rain to assess the damage. Some seventy-five Boulder citizens camped on top of Lovers' Hill (now Sunset Hill) until they were assured by the mayor that the reservoir was intact.

At 3:00 a.m., on the morning of June 2, the rains stopped and the sun shone for the first time in days. Townspeople came out to assess the damage. "There will have to be some changes in the Assessor's Office," editor Lockwood wrote thoughtfully, "Some citizens of Boulder who owned real estate, now find they have none. Farmers in the valleys, whose land has been added to, should not, however, be assessed to this gift of an all wise, but inscrutable Providence."¹⁷

Moreover, the soil that was dumped on the plains was of very poor quality. Farmers had to bring in new topsoil before their farms produced to their previous standard.

Some worried that the destruction to the Beasley Ditch (now the Boulder and Whiterock Ditch) headgate would make it no longer possible to irrigate farms in the area. The Downer family, who farmed just east of the city limits (now the site of the Crossroads Shopping Center), found that their main crop now was the many rocks and bits of debris that had been brought out of the canyon by the floodwaters.

Most of the miners in the mountains above Boulder were out of work for a time, because some of the mine shafts

had filled with water from the extensive rains. They put their dynamite to good use, however, by exploding it to free dangerous debris caught along the creek.

The most outstanding outcome of the flood of 1894 is that apparently no one died because of it. For a while, it was feared that Mr. Tunnel, the milkman, was drowned because someone had seen his empty milk wagon overturned. But Mr. Tunnel was found alive in the vicinity.

Jce Monroe, a fireman on the narrow-gauge railroad, fell into Boulder Creek while trying to save his chickens, but he rose from the swirling waters undamaged. He had managed to climb onto a submerged log and came out safely, minus his hat and the chickens. Others fell into either Left Hand Creek or Boulder Creek, but they were rescued or rescued themselves.

In the area of Eagle Rock, Mr. and Mrs. John Merryman and their two children were buried temporarily by a mudslide. All were saved. Mrs. Merryman was found waist-deep in mud, holding one of her children aloft. Others were presumed dead, but eventually, everyone was accounted for.

No crimes were reported with the exception of the arrest of "Bug Town" Birge and R. M. Randall, who were caught ransacking someone's trunk. There had been a concert just before the flood, and its principals, Signor Sobrino and soprano Signora Sobrino -- forced to stay in Boulder until the waters receded -- gave an additional benefit concert for flood relief; it raised \$33.25.

The Sisters of Charity, who ran the girls' school at

Mount St. Gertrude, provided a program at Feeney's Hall to benefit the needy. Sternberg's flour company gave away fifty sacks of flour to those who were certified as "needy" with a note from Mayor Cowie.

Commencement was postponed, and the new graduates of the university had to wait a few days to receive their diplomas. A newsitem, lost in the reports of flood developments but which came to light later, was that Mrs. Jeanette B. Durham, a faculty wife, had received the first law degree ever granted a woman in Colorado.

By June 4, 1894, five days after the flood, life was returning to normal in Boulder. The first mail arrived, as well as news from the outside. Boulderites discovered that flooding was extensive up and down the Front Range. Colorado's coal strike had not been settled. Boulder also learned that, during its flood ordeal, Alferd Packer, celebrated eater of Democrats, had been denied a pardon and continued to serve his forty-year prison term.

All available men started to work on the roads. The miners started to pump the water out of shafts. Newspaper articles were entitled, "And now to rebuild." A committee of eleven was chosen to coordinate clean up and rebuilding activities. "One touch of Nature makes the world kin," reminded Fred Lockwood, who wrote, "Cheer up those despondent ones, remembering that their calamity is ours and all who are not stricken will comfort those who are."¹⁸

An undated, unsigned report of the flood period which gives an excellent account of the events is included below in its entirety:

①

Flood of 1894.

The Flood of 1894 was caused by a warm rain that fell on the heavy accumulations of snow at the head waters of Four Mile, North Boulder, Middle Boulder and South Boulder Creeks. Three of these streams are tributary to Boulder Creek west of the City of Boulder.

The stream bed was insufficient to accommodate the flood waters, and bridges (broken), trees, houses, saw logs, drift wood and a deal of debris were carried through the town by the force of the stream.

The late Harvey Poole and myself were standing on the 6th Street bridge watching the flood, suddenly we heard a loud crash and tearing sound and scampered off to the north side of the creek, as the bridge broke in two and departed down the stream.

The Flood waters from sixth street through the city did immense damage, carrying away bridges, some houses, many out buildings, besides pouring mud and sand into basements and ^{the} first floors of many houses.

The head-gate at 12th & Broadway was destroyed by the water, and much of the flood followed the Bersley ditch for 6 1/2 blocks through the residential section, then veered South East through another residential section.

The waters covered almost the entire territory from Walnut Street to beyond arapahoe, and from Ninth Street to the city limits with the exception of some high ground east of Highland School, and a portion of land on Walnut Street east of 15 street.

② The South East ^{Flood 1894} part of Boulder from 15th St. East and South of Water Street was formerly known as "Load Hollow" and many places in this section were benefitted by the flood because the ground level was raised from a few inches to several feet by sand and mud that washed in filling and leveling the many depressions.

This aided greatly in future street and sidewalk construction - formerly some of these walks were built on tressels 3 feet above the ground level, as on 17th Street and 18th St North of Grove Street.

The Maple and Box Elder trees in this section put out a new root growth just beneath the surface of the new made soil at 16²²-18 Street - in fact on both sides of this street.

The late Judge Harry P. Gamble, then a U of C Student and others rode horse back through the flooded area rescuing victims of the flood and taking them to places of safety. Mr. Marinus Smith was rescued from the top of his chicken house where he had sought safety from the flood.

Many people living on the South side of the creek were unable to cross the stream to secure provisions.

A steel cable was thrown accross the creek at 5th Street and made fast to trees on either side, from this a platform ^{bridge} 5 feet square was suspended from a pulley and this was used to ~~convay~~ convey people accross the stream.

At ^{the} Broadway Bridge (12st) heroic efforts were made to confine all the waters to the main

③ channel of Boulder Creek, and after several days the creek water subsided sufficiently so that this object was accomplished, by means of logs filled with sand and by the use of timber, a few days later foot bridges were made available for pedestrian use.

The little lake East of 13 Street on Arapahoe was filled with sand and rubble — thus our skating pond disappeared.

The flood water was several hundred feet wide on level ground between Boulder and Valmont.

Access to the mountain towns was only by the Gregory Canyon and Sunshine Canyon roads. New roads had to be built.

Boulder Canyon and the tributary ^{mountain} canyons have never regained their original wonderful beauty since this flood.

Lover's Leap, the most scenic attraction in Boulder Canyon, was blasted down ^{in 1906} to make room for the new canyon wagon road. 19

Council met the following June 12 to discuss the repairs and materials to "put in place"²⁰ the Arapahoe Avenue bridge near Highland School. One month later, the governing body was concerned with a number of bids which involved "removing the 9th, 12th, 17th and Arapahoe bridges and all parts belonging thereto, for the creek to the banks where needed."^{21*} Council then allowed \$145.43 to be spent for flood expenses. By the next meeting, however, more money had to be expended

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* These bridges were replaced again in 1906.

for labor, hauling of timber, and buying "sax."

By October 1894, Council got down to business and declared "the necessity of certain improvements by reason of a casualty in the City of Boulder and making an appropriation therefore."²² Ordinance 259 provided \$10,000 for seven new bridges and the "general repair of streets."²³

Jacob Faus, the man who watched his home float down the Boulder, appeared before Council in November and asked reimbursement for his lot which had washed away that past May. His claim was referred to the judiciary committee for study.²⁴ (What happened to Faus' claim is not recorded but the family moved to new quarters; the second Jacob Faus home is now a landmarked building on the northwest corner of Spruce and Fifteenth Streets.)

One year later, Council took what might have been the first recorded step in local flood control and considered a plan to "build a barrier along the banks of the creek because of the 'danger of another overflow.'"²⁵

Four years after the flood, the narrow-gauge railroad was rebuilt, this time on higher ground; and was capitalized as the Colorado and Northwest Railroad.

In later years, the Corps of Engineers estimated that the peak discharge for the 1894 flood on Boulder Creek was 7,400 cfs.* The Orodell stream gauge was not working at the time of the flood.

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* Since then, estimates have varied from 7,400 cfs to 13,200 cfs.

Working with what little scientific information that was available on the 1894 flood, the Corps of Engineers referred to the deluge as a ninety-five-year or one-hundred-year flood. Such an event has a one percent chance of occurring in any given year. The following gives the percentages of probable occurrence of a variety of flood types:²⁶

<u>% Probability of Occurrence in any given year</u>	<u>Type of Flood</u>
50%	Two-year flood
25%	Four-year flood
10%	Ten-year flood
4%	Twenty-five-year flood
2%	Fifty-year flood
1%	One-hundred-year flood
.2%	Five-hundred-year flood

The Corps of Engineers, in later years, also studied and compared property values of the period and determined that Boulder's 1894 flood probably caused about \$725,000 in damages.

Council was somewhat prepared for a flood in 1897; sandbags were purchased and placed at strategic locations along the creek on May 31. On June 10, flooding did occur after a cloudburst; Boulder Creek's peak discharge was 1,000 cfs. The sandbag "barricade" remained in place until June 19.

During the years before the turn of the century, a private group of Boulder citizens formed the Boulder City Improvement Association; local businessman Charles Dabney was its first president. Association members were concerned with the general appearance of their community and discussed the advantages and disadvantages of subdivision, annexation, growth, park acquisition, planning,

as well as what to do about future flooding along Boulder Creek.

During a May 12, 1904 cloudburst, which was centered in the foothills north of Boulder in Bummer Gulch, two persons died in the resulting floodwaters. Most of the damage to property occurred in the Sugar Loaf area. Doubtless, this tragedy strengthened the resolve of the improvement association to bring about some changes in attitude toward flood control.

Heavy rains fell again on July 5, 1909; on the following July 24, however, a more serious cloudburst occurred; the Daily Camera headlined an unsettling story for its readers:

AFTER THE FLOOD COMES SADNESS

TWO IN THE HOSPITAL AND TWO
IN THE MORGUE OF THE
HAPPY PICNIC PARTY
WHICH LEFT BOUL-
DER YESTERDAY.

During a family outing to Mt. Sanitas near Twomile Canyon Creek, north of Boulder, the rains and flooding caught nine-year-old Vivian Carlisle and Greeley clerk, Arthur Dickerman, who were swept away in the deluge. The Camera suggested editorially that Council consider doing something about Twomile Canyon Creek, "which is very nearly a dry creek bed,"²⁷ but has "filled north Twelfth Street several times this season..."²⁸ Heavy rain occurred again on August 18.

By 1910, Barker Dam was completed high in the mountains, just east of Nederland. Many Boulder citizens felt safe from

future floods now. Barker Reservoir would contain any floodwaters, they reasoned. No matter that most cloudburst activity occurred at elevations below the Nederland area. Many residents were certain the prospects of another flood down Boulder Creek were remote.

By 1908, members of the Boulder City Improvement Association had contacted Harvard-trained landscape architect Frederick Law Olmsted, Jr.* and had invited him to visit Boulder, survey the community, and make recommendations as to its future direction. Olmsted came west, looked over the Boulder community, and published his findings in March 1910. In his report, he "lectured" in a kindly and literate manner about floods and flood control on Boulder Creek:

The principal waterway in Boulder is Boulder Creek, and its principal function, from which there is no escaping, is to carry off the storm-water which runs into it from the territory which it drains. If, lulled by the security of a few seasons of small storms, the community permits the channel to be encroached upon, it will inevitably pay the price in destructive floods. So with the channel of Sunshine Canyon and others of less importance.²⁹

The town's first responsibility, Olmsted said, was to keep good records in order to understand future flood possibilities. Just as a woman, he said,

...looks at the bowl into which she is about to turn a can of peaches and makes up her mind whether it will hold what is in the can. Either it will or it won't, and she is a foolish woman if she gives no heed to the probabilities until the peaches slop over on the table.³⁰

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* Olmsted's father designed New York City's Central Park.

Olmsted outlined for his Boulder readers possible structural changes to the Boulder Creek channel, but he dismissed most of them as unrealistic and expensive solutions to the problem. He did recommend, however, the construction of low walls at the edge of the floodway below Twelfth Street.

Since the area in question would hold floodwaters only on rare occasions, Olmsted suggested the development of a Boulder Creek "Park," but not something "highly polished and exquisite with costly flowers and other decorations of a kind that would be ruined by flooding."³¹ That, he said, would be "foolishness."³²

But the plan of keeping open for public use near the heart of the city a simple piece of pretty bottom-land of the very sort that Boulder Creek has been flooding over for countless centuries, of growing a few tough old trees on it and a few bushes, and of keeping the main part of the ground as a simple, open common, where the children can play and over which the wonderful views of the foothills can be obtained at their best from the shaded paths and roads along the embankment edge -- this would give a piece of recreation ground worth a great deal to the people. And at the same time, it is probably the cheapest way of handling the flood problem of Boulder Creek.³³

Act now to restrict construction in the broad flood plain, he counseled, so that such building will not cause a more dangerous flood in the community:

Again and again, this little piece of history has repeated itself on stream after stream, in town after town; and after the damage from exceptional floods has come to be enormous, the community has gone to work at further great expense to widen and otherwise increase the capacity of the storm channel, often condemning buildings and building land of much value to secure the necessary relief.³⁴

Frederick Olmsted, Jr. went back east to concern him-

self with other matters, feeling confident, no doubt, that he had expressed to Boulder citizens a most sensible approach to the treatment of Boulder Creek's flood plain. And, in turn, the Boulder community, having established in earlier years a reputation for lengthy discussion, cantankerous argument, and taking simple remedies and turning them into complex ones, or, the reverse as well, doing nothing, studied the Olmsted report, but saw to it that Council did not adopt it.

Instead, it was placed "on the shelf." Thus began a sixty-five year search for other solutions to the control of area flooding.

In 1912, the Boston firm of Metcalf and Eddy, the first of many consulting engineers to visit Boulder, was hired by the Boulder City Improvement Association to consider "The Improvement of Boulder Creek, and the Sewerage, Drainage and Disposal of Sewage of Boulder, Colorado."

Metcalf and Eddy recommended the construction of a depressed channel along Boulder Creek -- four feet deep and eight feet wide -- at the center of the natural waterway.

The channel should be made of "concrete or rubble masonry laid in Portland cement mortar on concrete, protected on its margins by a 4 foot strip of heavy stone riprap or paving; that the rest of the channel and its embankments be built in final form as far as practicable and that it be seeded with alfalfa, to protect the earthwork until such time as the rest of the channel bottom and its side slopes may be paved."³⁵

The creek presented special problems at Twelfth Street, reported Metcalf and Eddy. First, "The sharp angle in the river at this point is objectionable and should be modified..."³⁶ Also, the new channel at that site would have to be one of a more expensive masonry construction.

The problem of Sunshine Creek also received the firm's attention with the recommendation that its channel be "revetted" and paved just before it entered Boulder Creek.

"Further straightening, deepening, and widening"³⁷ of Boulder Creek at certain points were also suggested by Metcalf and Eddy.

Throughout its report, the Boston firm noted that Council appeared to have little money to spend on such projects. That being the true case, Metcalf and Eddy departed. Council looked over the report, quite different from the previous study, and placed it on the shelf next to Olmsted.

Flooding on Boulder Creek occurred again in 1914 with a reported peak discharge of 5,000 cfs on June 2. (Such a peak discharge qualified the flood to be characterized as a forty-year deluge; one wonders why this event was not featured in stories about old Boulder. Or is the reported peak discharge inaccurate?)

The 1914 floodwaters did break the community's new water lines built up the canyon. Some south Boulder residents had to be served with water supplies from the city

sprinkler. Wells on the Chautauqua grounds and on the Sanitarium (Boulder Memorial Hospital) property were also used as a course for water while the lines were being repaired.

During the late afternoon of July 31, 1919, a cloudburst opened up with heavy rains falling between 8:00 and 9:00 p.m. This was a storm which involved the whole Front Range down to New Mexico. The storm knocked out bridges across the lower Boulder, destroyed roads, and broke the town's water lines for the second time.

Portions of the narrow-gauge railroad line were destroyed again. This second washout of the famous line, the Switzerland Trail, which had served as a popular tourist attraction for many years, was the final blow to the railroad's already shaky financial operations; the railroad ceased service after that time.*

The following day, Boulder citizens learned that the "entire new Sugar Loaf road fell into Boulder Canyon."³⁸ Four days later, Council approved the expenditure of \$5,000 for a variety of flood-related repairs in town, including the repair of the water lines.

During the spring of 1921, storm cells again clustered in the Boulder area; this time the center of cloudburst activity was just south of the main Boulder Creek drainage. Additional storm cells grouped over the St. Vrain drainage to the north; the city of Longmont was seriously affected.

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* The stone from some of the railroad bridges was used to face the present Boulder County Courthouse when it was built to replace the first courthouse structure which burned in 1932.

It rained heavily from April 14 to 16 and again from June 3 to 7. A peak discharge on Boulder Creek on June 6 was recorded as 3,000 cfs. One observer reported that hail had drifted into six-foot piles on that occasion.

The little town of Erie east of Boulder suffered its second major flood on June 4 of that year. (The Corps of Engineers later determined that the deluge was a twenty-five-year flood for Coal Creek.)

Erie was put almost completely under four feet of water, the flood poured through the streets like a mill race, carrying away houses, buildings, livestock and every moveable article.

One man reported the loss of 26 head of cattle and several hogs and chickens. Another man had just purchased a brand new piano and moved it into his home. After the flood not a trace of the house or the piano could be found anywhere.³⁹

In Boulder, damage was minimal except to the water lines up the canyon; repairs were again necessary.

That same year, 1921, Council hired the engineering firm of Burns and McDonnell to survey the Boulder Creek area and report back its findings. First, the consulting team decried the lack of accurate local records as to rainfall, storm activity, and drainage statistics. Evidently, Frederick Olmsted, Jr.'s recommendation that good records be kept had not been heeded.

Burns and McDonnell recommended that all trees, brush, and plantings be removed along both banks of Boulder Creek as it coursed through town. Boulder's bridges, the firm said, were not adequate to handle the debris that would rush downstream during a flood.

The paving of the Boulder Creek channel with concrete was viewed as unrealistic by Burns and McDonnell. It would be too costly; moreover, the concrete would crack with alternate periods of freezing and thawing. Construction of retaining walls at creekside was the answer to Boulder's periodic flooding.

The stream bed along Sunshine Creek is a serious danger, reported the engineers. Its banks should be cleared by the removal of trees, brush, and shrubs. The eastern bank of this small creek should be riprapped to prevent flooding.

Council received this study, looked it over, and the report joined the others on the shelf.

The financial hard times of the depression surely prevented city funds to be expended for flood control in any form during the 1920s and 1930s. At the federal level, however, the first national interest in funding flood control projects was codified in the Flood Control Act of 1928. No doubt, Boulder recognized that federal monies were becoming available for local flood control; however, the principal factor in the town's lack of attention to improvements along Boulder Creek was an apparent lack of interest.

A late summer storm on September 8, 1933 caused serious flooding along Twomile Canyon Creek's course, upsetting the notion that cloudbursts do not occur along the Front Range after August of any year.

In 1934, Boulder voters were asked to approve a bond issue to build a new high school. The old State Preparatory school was now considered unsafe. The bond issue lost. One of the reasons advanced by some negative-minded voters was that the proposed site for the new school building along Boulder Creek was not a safe one in the event of a flood.

Even so, the next year the bond issue passed; the building was under construction by 1936 at the same creek site, despite further objections by Boulder parents. A more violent argument was under way about the art work placed above the school's front doors. The bas-relief figures were called "Minnie and Jake" by some, "chewed-over bubble gum" by others.

Flood control, or the lack of it, became a temporary campaign issue in May 1937 among those citizens who aspired for a seat on Council. A few Boulder oldtimers were interviewed by the papers as to their memories of the flood of 1894.

Mrs. S. S. Downer recalled the damage to her family's farms by the floodwaters. R. E. Arnett spoke of the damage downtown. Some residents, he said, still think that the presence of Barker Reservoir will keep the community safe from major flooding. Nonsense, he said. "The fact that the Nederland Dam is now in existence is not safety value or flood protection because most of the water came from below the dam at that time..."⁴⁰

With the passage of a number of federal flood control

acts during the 1930s, the U.S. Congress had vested the responsibilities for flood control with the Army Corps of Engineers. The men were studying the South Platte River drainages by 1938, considering the possibilities of navigation, power development, and flood control, adding to their 1928 "308" report.

In 1938, nature again went on a rampage. On September 3, late afternoon storm cells centered over South Boulder Creek and dropped intense rain for seven hours. By 10:30 p.m., a number of local streams were in flood. Boulder itself was "drenched, but not damaged,"⁴¹ with a peak discharge on Boulder Creek of 4,410 cfs. Coal Creek boiled over as well, leaving one person dead in the floodwaters at Louisville.

When the storm water roared down South Boulder Creek through Eldorado Canyon -- a peak discharge of 7,390 cfs was recorded at the mouth of the canyon -- it took with it one of the remaining dance halls and a number of cabins at the resort at Eldorado Springs. The aging spa, which had once been a vacation spot for the rich and famous -- Walter Winchell, Jack Dempsey, Mary Pickford and Douglas Fairbanks, Sr., Dwight and Mamie Eisenhower -- Glenn Miller played there -- had already suffered disastrous fires in previous years to its swimming pools, hotels, pavilions, and residences. The following year, the South Boulder flooded again.



After the flood on South Boulder Creek, 1938. The resort at Eldorado Springs is damaged. photo, Boulder Historical Society.



Another view of the damage to the resort at Eldorado Springs, 1938. photo, Boulder Historical Society.

In May 1944, parks specialist S. R. DeBoer submitted a report to Council outlining his flood control recommendations. There was money available at the federal level, he said, and Boulder should take advantage of this opportunity to get some flood control work done at a relatively inexpensive local cost.

Acquire all rights to Boulder Creek bottomland, channel areas, and flood plains, he said. Put into park land all flood plain property. As Boulder Creek flows through the town area, DeBoer said, an eight-foot wall should be built on the north side of the waterway's flood plain and diked in such a manner that a parkway could be constructed on top for auto traffic along the creek.

DeBoer warned Council that Boulder Creek's bridges were too low; they were debris catchers. Further, he suggested, a reservoir upstream should be constructed to catch a major portion of the debris when flooding occurs.

The following year, under federal legislative mandate, the Corps of Engineers completed the first of a series of comprehensive studies of the South Platte River basin and its tributaries.

In this report, the Corps included an inventory of what was now built in Boulder Creek's flood plain: "The flood plain through Boulder includes nearly all of the business district, the new high school, several lumber yards, the railroad yards, numerous residences, the city park, an athletic field, several miles of paved and unpaved city

streets, various public utilities, and several irrigation diversion structures."⁴²

Said the Corps, the lack of serious flooding since 1894 has given Boulder residents a "false sense of security."⁴³ Moreover, the Corps was taken aback by what it felt was a cavalier attitude toward flood hazard in general on the part of most Boulder citizens.

The Corps of Engineers had specific recommendations for flood control along Boulder Creek. First, the creek should be straightened, particularly that "crooked" place at Broadway. The banks should be revetted, the waterway should be edged with concrete walls, and a dike should be constructed along the north bank with a boulevard-parkway on top of the diked land. The suggestion was very like that of DeBoer. The development would be placed in such a way that it would act as a levee in time of flood.

About fifty residences and a few businesses should be removed from the flood plain, said the Corps. The banks of Sunshine Creek should be revetted as well and its channel excavated and paved.

When the Corps of Engineers presented a formal report to Council in August 1945, the federal men suggested that here was a fine opportunity for Boulder stream improvement. Take advantage, they said.

But Boulder was not in the mood for federally-sponsored stream enhancement. Council never specifically responded to the Corps report but added it to the growing collection of flood control studies. When additional federal money be-

came available with passage of the Flood Control Act of 1950, Boulder was still not interested.

A new municipal building had been discussed among city officials since 1946. Although the governmental offices on Fourteenth Street (site of the Colorado Building) were grossly inadequate, Council felt it was inappropriate to spend public funds for such a building until the nation had recovered from the expenses of world war.

Even so, plans for the new building included space for a new public library and a museum. The present site along Boulder Creek was tentatively selected. A. Gayle Waldrop, who served on Council during this period, says that questions about building close to Boulder Creek did not come up, at least not in public forums.

By 1948, the proposed city building had been "whittled down" to exclude both a new library and a museum.* The greatest controversies connected with the project apparently centered around what price to pay for three land parcels along the creek site.

A proposed park along the banks of Boulder Creek was discussed in Council chambers at this time to honor Boulder men who had died in both world wars but the matter was dropped because of lack of support from the community.

* A proposed basement for the building was also dropped from the plans in an effort to reduce construction costs.

The "scaled-down" municipal building was completed and dedicated by 1952.

The little cohesive college town was changing and a majority of its citizens did not like what they feared was coming. A turnpike was completed from Denver to Boulder in 1952. Now a number of large businesses and institutions were looking over the community for possible sites.

A new world of commuters, traffic signals, zoning changes, annexations, and other signs of future growth were evident; many residents were uneasy about what they foresaw. They stubbornly clung to their vision of a small, unchanging community. Thus, instead of addressing themselves to growing civic problems -- flood control included -- they often elected to do nothing at all.

In February 1955, Boulder resident and chemist Edgar Emerson began to mount a campaign for the establishment of the Boulder Mountain Valley Flood Control Conservancy District. Such a body, Emerson reasoned, could begin long-delayed improvements along Boulder Creek and its tributaries, particularly those located in north Boulder.

Emerson gave speeches, prepared pamphlets, and wrote articles on previous flooding in the area for the newspapers. When his group came before Council, they spoke of the benefit of receiving federal money under Public Law 566, the Watershed Protection and Flood Prevention Act. Council was favorably convinced and voted on April 18, 1956,

and again the following May, to seek a hearing in district court to form a flood control district.

One wonders if Emerson was prepared for the kind of civic fighting that Boulder specialized in, had fine-tuned since the first days of settlement.

When the proposal went to district court in July 1956, Judge Donald A. Carpenter presiding, an array of seventeen objectors were on hand, represented by attorney Frank F. Dolan. Dolan took the view that the Boulder City Council had acted illegally by its vote for the district, that the state statutes on the subject were also illegal, that the proposed taxation for the district was unfair, and that the matter went against the due process clause of the United States Constitution.

The proposed flood control district, Dolan said, with its three appointive commissioners, would take to itself powers that had been reserved for the citizens of Boulder. Furthermore, Dolan concluded, "this thing is a Frankenstein monster."⁴⁴

Supporters of the flood control district told Judge Carpenter that time was important if Boulder were to benefit from federal funding. Said the judge, "I'm not going to rush this thing," and set a court date for November 1956, which was later moved to July 1957.

On December 1, 1957, Judge Carpenter threw the flood control district proposal out of court, saying that he regarded the project as improperly drawn, full of imperfec-

tions, and legal loopholes. City Attorney John R. Mack wearily recommended to Council that it not appeal Judge Carpenter's decision but start the process over again.

In November 1958, geographer Gilbert F. White and a number of his University of Chicago colleagues published a study entitled "Changes in Urban Occupance of Flood Plains in the United States." Seventeen cities across the nation were included in the study; one section was devoted to Boulder, Colorado.*

The Chicago group noted the change in population in the college town -- from 1930 to 1950, a seventy-eight percent increase in the number of residents, with a predicted rise to 30,000 people in 1957 -- and of the resulting additional construction, "a major invasion of the flood plain by institutions and apartments."⁴⁵ (See chart, page 49.)

The potential for flood damage in Boulder had increased by at least thirty percent since 1938, the geographers concluded, due to increased building in the flood plain.

When community attitudes in Boulder toward the prospect of adopting flood control measures were surveyed by the Chicago group, they found that a majority of citizens believed that a flood hazard existed at one time but that it was no longer so. Most new residents in the area had never heard of the flood of 1894. Others still felt that the presence of the reservoir at Barker Dam in the mountains served to limit such flood danger.

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* The White family had summered in the mountains west of Boulder for a number of years and knew the area well.

TABLE 19
 CHANGES IN OCCUPANCY OF BOULDER FLOOD PLAN
 1938-1957

OCCUPANCE CLASS	Structural Units ^a				Per cent added since 1938
	1938	1957	Removals	Net change	
Residential -					
- A	269	309	3	40	13
- B	0	17	0	17	100
- C	0	11	0	11	100
Quonsets	0	54	0	54	100
Temporary	0	18	0	18	100
Commercial -	57	72	3	15	21
Industrial -					
Buildings	0	0	0	0	0
Industrial - Open	0	0	0	0	0
Transport -					
Buildings	2	2	0	0	0
Transport - Open	1	1	0	0	0
Public	3	12	0	9	75

^a Structural units are defined as follows:

- Residential
 - A. Single or double-family dwelling.
 - B. Apartment building for 3-6 families.
 - C. Apartment building for more than 6 families.
- Commercial
 - Separate store, office or warehouse building, with one unit for each 10,000 square feet of ground space.
- Industrial
 - Buildings. Separate building, with one unit for each 10,000 square feet of ground space.
 - Open. Non-structural uses, including storage yards and small auxiliary structures, with one unit for each 25,000 square feet of ground space.

from White, Gilbert F., Wesley C. Calef, James W. Hudson, Harold M. Mayer, John R. Sheaffer, Donald J. Volk, "Changes in Urban Occupance of Flood Plains in the United States," research paper 57, Chicago (University of Chicago Press, November 1958), p. 19.

A number of property owners and developers confidently expressed the attitude that the risk of building on the flood plain or floodway was well worth taking. "These people will take their chances,"⁴⁶ and feel that floods in the area are so rare that the threat to human life is negligible.

As to the prospect of extensive property damage, the businessmen felt that they could quickly pass that possible liability on to new owners and move on to the next project.

I asked a man building a new apartment building on the Boulder flood plain if he thought there any risk of flood. He replied he had no risk at all. I asked him if he knew about the flood of 1894.

He said, of course, he knew about it, the flood of 1894 had come up chest-high where he was standing. How then, I said, could there be no risk. Well, he said, there will be no risk, because he would sell the building within six months.⁴⁷

White and company reviewed Boulder's decision not to participate in the plans put forward by the Corps of Engineers in the 1940s, concluding that, certainly, cost was a determining factor. Moreover, when the municipal building (proposed in 1946) was completed in 1952, no longer could the Corps' "levee project" be effected because the new civic structure was built in its proposed path. (In 1962, an additional to the municipal building placed the structure in the floodway.)

"The city has not used any of its legal powers to curb further encroachment upon the flood plain. The zoning ordinances take no account of flood hazard..."⁴⁸ "The Corps of Engineers' levee-boulevard plan of 1945 was not known to the city planning office in 1957."⁴⁹

The geographers did take positive note, however, of

the local Civil Defense groups and their plans to prepare a flood emergency plan.

When Gilbert White delivered a paper at a Fort Collins hydraulic engineers' conference that year, his remarks on flood control were received with some skepticism; they were backed up, however, by a second paper delivered by General Herbert D. Vogel, chairman of the Tennessee Valley Authority. Vogel stated that the "only solution for floods is to keep the people away from the water, not go on attempting at great expense to keep the water away from the people."⁵⁰

During the early 1960s, as various Boulder governmental bodies discussed and re-discussed flood control possibilities, it seemed as if the town were devoting itself to the "re-invention of the wheel." A proposed revision of the zoning ordinance, which passed in 1928, to include flood control provisions was considered most controversial and caused spirited discussions in Planning Board and Council sessions.

Council finally decided to "divide the question" and "temporarily" dropped the proposed flood control regulations from the hearings agenda until such time that the public had reviewed the main body of ordinance changes. A special public hearing on the flood control regulations would be scheduled at a later time, said Council, but the matter never did come up for public review.

Apparently, Council did not regard the threat of a one-percent flood as an inhibiting factor when it considered possible sites for a new public library in the mid-1950s. The first proposed site was creekside in Central Park. Objections were raised by members of the newly-formed Plan Boulder who felt that Central Park should remain untouched; the group did not take a stand at that time, however, regarding construction of a city building near Boulder Creek. The present site, then a tennis court, was considered by Council despite citizen objections.

Harriet Roosa, the young girl who watched the flood of 1894 instead of taking her Greek examination, wrote to Council regarding her concerns with the new proposed library site. In addition to flood threat, wrote Mrs. Roosa, the land at that spot was unstable because it was fill brought down by the earlier flood when the channel changed. (Mrs. Roosa and her husband had been in the construction business in Boulder for many years; hence, she felt she was informed about such matters.)

Despite complaints from others about the site, construction went forward with Council's blessing and an elevated Boulder Public Library was built with stabilizing construction into the river fill.

The United States Geological Survey published a series of reports on the South Platte River tributaries in the early 1960s with specific flood frequency information for the Boulder Creek area, upstream from Twenty-eighth Street, and downstream to Valmont Road.

This work was used by successive consulting engineers and planners since that time ⁵¹ although parts of the document became obsolete almost overnight due to extensive building on the flood plain below Twenty-fourth Street (now Folsom Street).

In the late 1950s, Boulder financier Allen Lefferdink secured Boulder Creek land near the mouth of the canyon and announced his plans to build an elegant Park Allen Hotel. With much official hoopla, Lefferdink built the foundation for the creekside complex. At that point, however, Lefferdink's financial affairs fell under intense scrutiny and he was forced to depart Colorado rather quickly. The Park Allen foundation remained in place -- citizens called it "The Ruins" -- until the 1970s when Boulder County surveyed the site as a possibility for a new jail and judicial offices.

On a June weekend in 1965, Denver and surrounding area governmental officials were enjoying a pleasant meeting of the Municipal League at the Stanley Hotel in Estes Park.

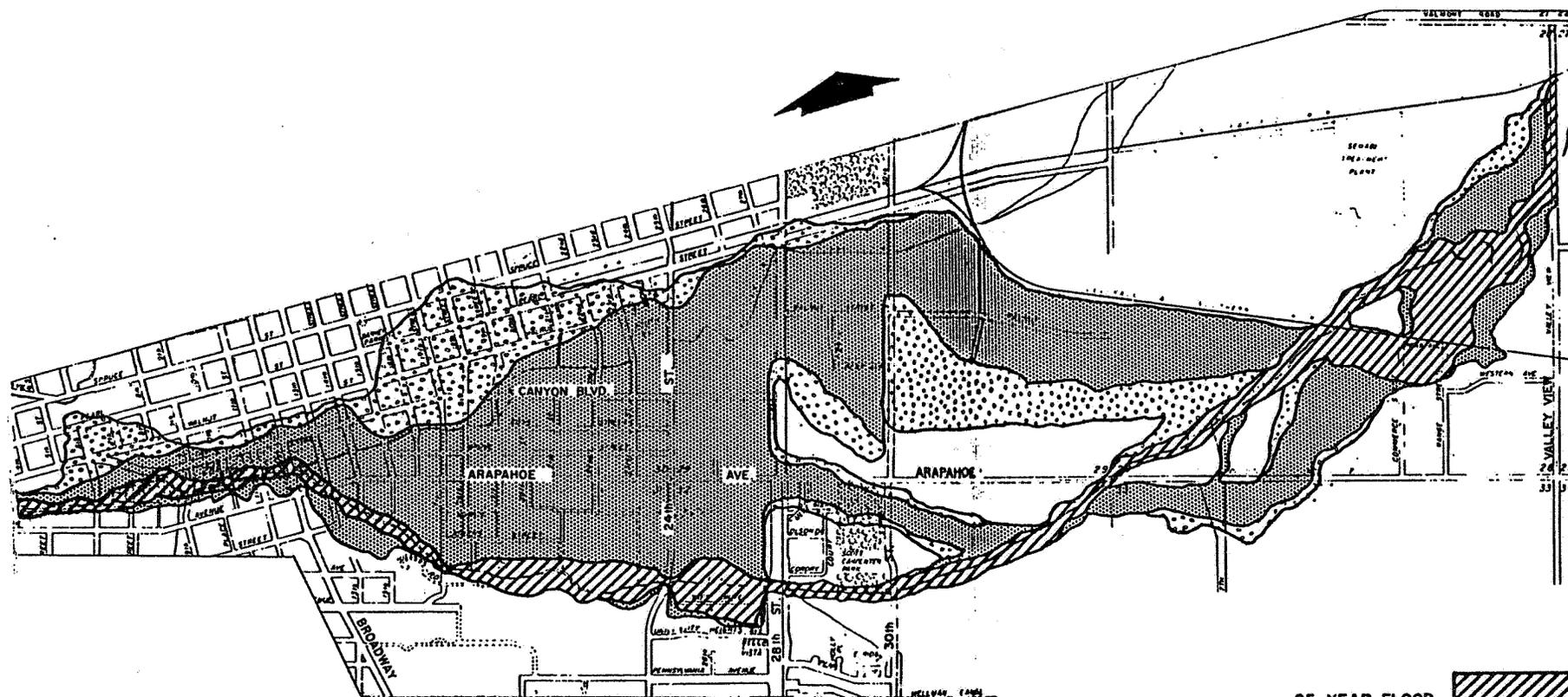
During the meeting, on June 16, warm air masses carrying storm cells formed in the Denver area, heavy rains resulted, and the South Platte River boiled over its banks with more serious flooding than had occurred in the 1864 flood. Those participating in the Estes Park meetings found it difficult to get back to their home bases to direct flood recovery operations.⁵²

Denver itself lost around 2,500 homes and 750 businesses, amounting to an estimated \$325,000,000 loss from property damage. This time, Boulder and the surrounding area were spared. But the storm was violent enough to "awaken" a few more Boulder residents to greater concern about the possibility of a similar deluge down Boulder Creek. The small group of flood control supporters was growing.

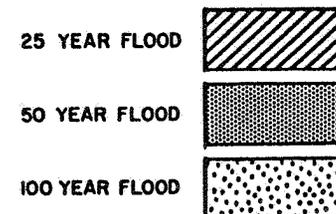
Despite an increasing awareness of the problem, however, a proposed amendment to the zoning ordinance on flood control regulations was voted down by Council in January 1966. (See map, page 54

During the year, Council did consider, however a progress report on floods and flood protection; councilmembers were moved to hire Gilbert White to study land use regulation and flood hazard. By the end of the year White had completed his work, "Flood Hazard Reduction and Flood Plain Regulations in Boulder City and County, Colorado," and came before Council in January 1967.

First of all, White reviewed the information sources available to local governments. Next, he referred to the "Barker Dam myth," saying that "it is a mistake for citizens



BOULDER CREEK — potential flood inundation



from "Flood Report Survey," City of Boulder, 1965.

of Boulder to assume that either because of new works since 1894, such as the construction of Barker Reservoir, or of recent developments in the mountain area, the flood hazard is less severe than it was in earlier years."⁵³ On the contrary, White reported to Council, "The hazard has grown."⁵⁴

With the rapid increase of construction in the flood plain, "When another flood the size of 1894 or even greater does roar out of the canyon at Boulder it will cause far greater damage than its predecessor and the hazard to life will be larger."⁵⁵

White made recommendations for changes in the city's zoning and building codes, among them the designation of a floodway zone in which no further construction would be permitted. He further suggested that buildings constructed near the floodway be proofed according to the standards of the National Building Code. A flood warning system should be adopted, he said.

The following year, another progress report on proposed flood plain regulation was drafted by the planning department staff, passed by the Planning Board, then brought to Council for its consideration. It was evidently read and discussed, but was shelved to join growing archives on floods and flood control.

Community concern with regard to flood control may have been strengthened after the events of early May 1969. It started to rain on May 4. The storm peaked on May 7 but continued for another day. The resulting twenty-five-year

flood centered in south Boulder; Bear Canyon Creek overflowed with intensity, sending floodwaters down Table Mesa Boulevard which then broadened out on the wide flood plain to the east.

In the mountains, Jamestown was hit again, as were the settlements along Fourmile Canyon, near Sugar Loaf. In north Boulder, Twomile Creek overflowed as well.

University officials were worried about the computer center located near Boulder Creek at Thirtieth Street and moved valuable equipment to higher ground, "a move that had been planned -- but not yet."⁵⁶

As this storm was centered to the south of the city, the peak discharge on Boulder Creek was a "low" 3,000 cfs. When the rains stopped, Boulder had received 7.6 inches; at Betasso, water treatment employees measured a 9.3-inch rainfall.

Council moved into action. By August, it had completed its review of flood plain regulations and adopted zoning change amendments in Ordinance 3505. Floodway and flood storage areas were defined. Regulations included any land parcel that would be covered with water from a one percent flood. Any area that might receive two or more feet of floodwater was subject to mandatory flood-proofing requirements. Residences, however, were still "permitted" in the floodway area because proper flood plain delineations or maps had not yet been adopted.*

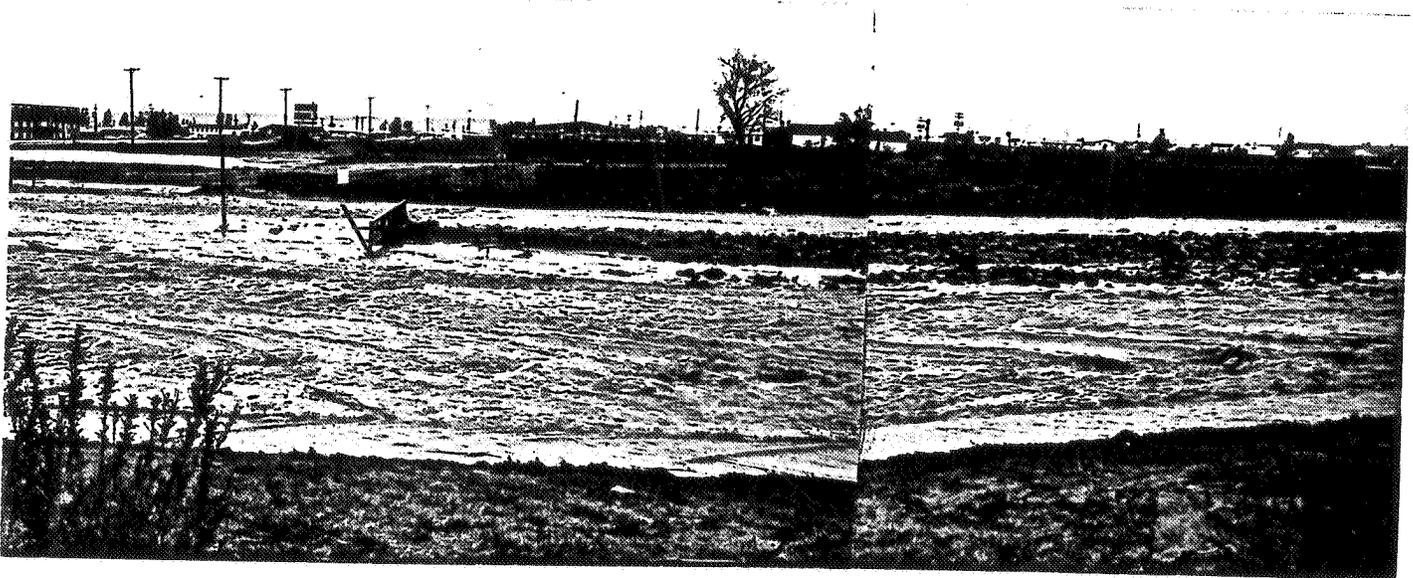
Thus, in 1969, a developer of Sherrelwood Estates was

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* They would not be adopted officially until March 1975.



May 8, 1969. Citizens get to work at Table Mesa Boulevard and Broadway.
photo, Boulder Daily Camera

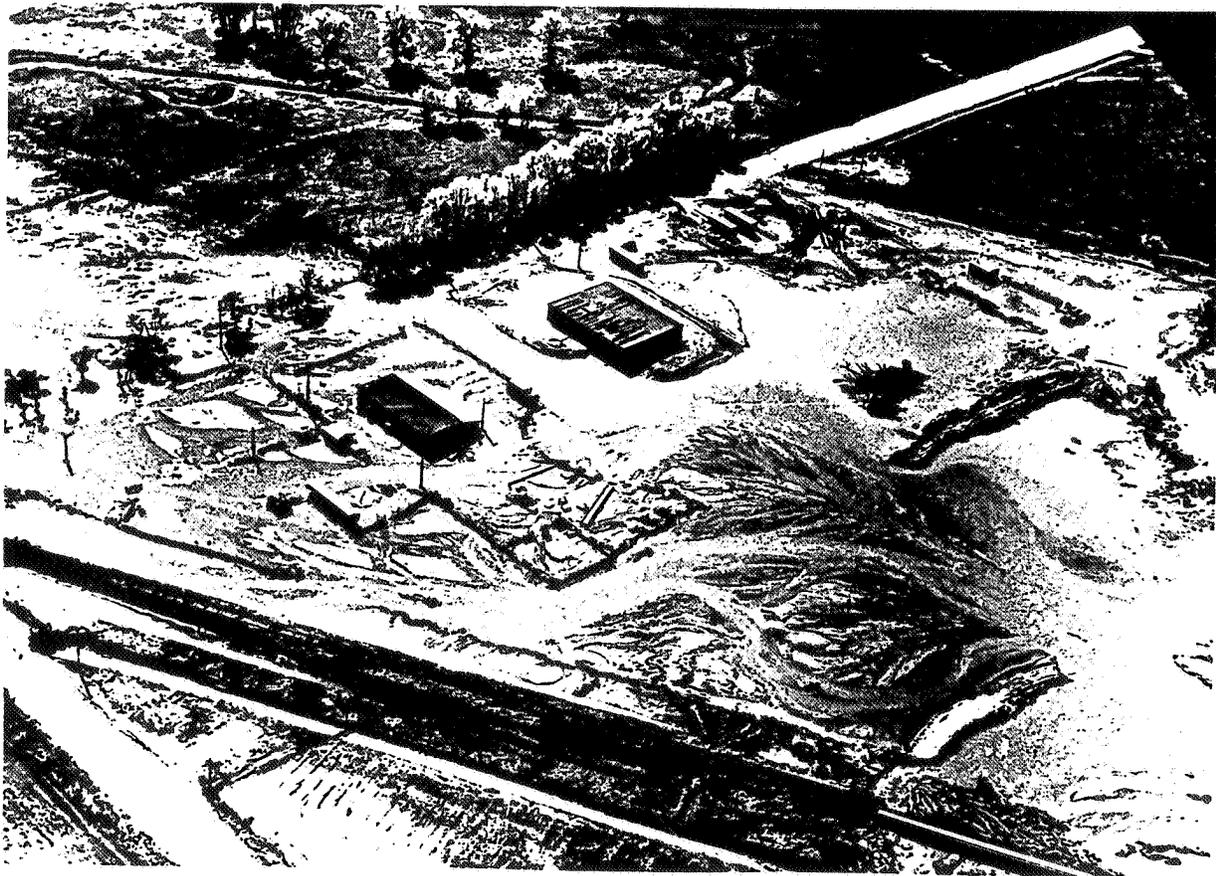


Bear Canyon Creek on a rampage, 1969. Table Mesa Boulevard.
staff photo, Public Works Department



MAY • 69 •

Bear Canyon Creek is full, 1969.
staff photo, Public Works Department



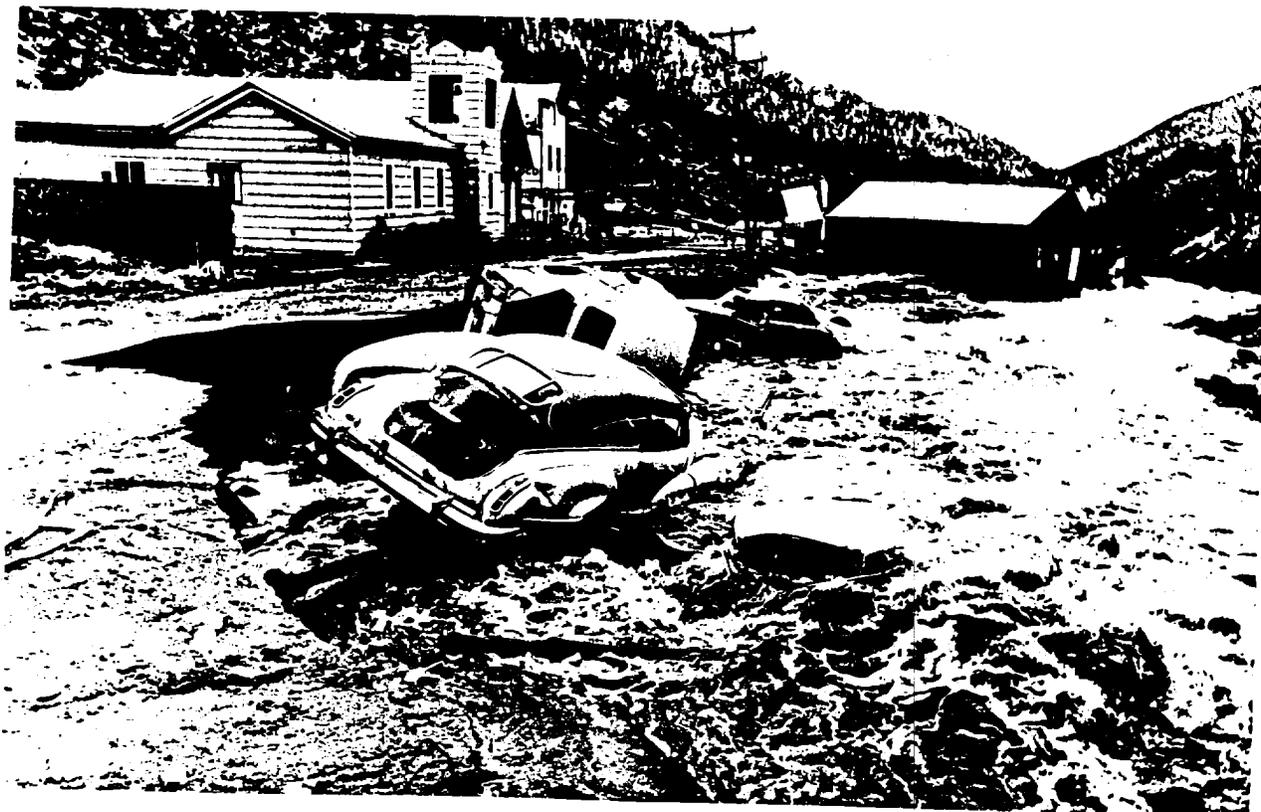
May 11, 1969. Aerial photo east of Table Mesa Boulevard.
photo, Boulder Daily Camera



May 9, 1969. South Boulder
photo, Boulder Daily Camera



May 8, 1969, Jamestown. photo, Boulder Daily Camera



After the flood, the damage. Jamestown, May 1969.
photo, Boulder Daily Camera

issued a construction permit to build the Gold Run apartments, a creekside complex on Boulder Creek, between Twenty-eighth and Thirtieth Streets, there being no legal reason not to. The developer began desultory construction on the site and, a few years later, the Gold Run apartments would be in the news.

During the summer of 1969, the Corps of Engineers was back with a flood plain report of its own; a one hundred-year flood was described by the Corps with a peak discharge of 7,400 cfs, a figure some authorities considered too low.

Since the summer of 1965, an area-wide group of city and county engineers had been meeting informally as the "Five County Engineers."⁵⁷ "This group was seeking a higher level of standards in all areas of municipal construction. First, they attacked the massive problem of solving the diverse criteria then being used to approach the design and construction of storm drainage and flood control."⁵⁸ By 1969, one of their goals had been achieved.

Five counties -- Denver, Adams, Arapahoe, Jefferson, Douglas, Boulder -- had joined forces, by vote in the Colorado General Assembly,* to form the Urban Drainage and Flood Control District. This coordinating agency's goal was to collect and disseminate drainage information as well as receive federal funds for use in flood control projects. The U.D.F.C.D. had authority to plan, design, construct, and operate drainage facilities throughout the five-county

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* A popular vote was not required because the monies to be collected would not be higher than a one-tenth mill.

area. The U.D.F.C.D. was to assist with implementation of early warning systems as well as help municipalities within the district qualify for the National Flood Insurance Program. By 1970, the flood control district was in full operation. Edgar Emerson's dream of such a district was finally fulfilled; no one, apparently, called this new body a "Frankenstein monster."

Late in 1969, the engineering firm of Wright-McLaughlin issued several Council-commissioned reports, the first of a series on various aspects of flood control. Using the 7,400 cfs peak discharge figure, Wright-McLaughlin prepared a master plan for Boulder Creek from Twenty-fourth to Thirtieth Streets as well as master plans for the major tributaries in both north and south Boulder with more precise drainage figures:

	<u>Square Miles</u>
Fourmile Canyon Creek	10
Wonderland Creek	2.2
Twomile Canyon Creek	2.0
Elmer's Twomile Creek	.7
Goose Creek	2.4
Gregory Canyon Creek	1.9
Bluebell Canyon Creek	.7
King's Gulch	.4
Skunk Creek	1.7
Bear Canyon Creek	5.3
Viele Channel	1.4
David's Draw	.7

The following year, another Wright-McLaughlin master plan for Boulder Creek between Ninth and Fourteenth Streets had been completed and brought before Council for discussion. No specific action was taken on these reports at this time.

The decade of the 1970s was perhaps the busiest and the most confusing for local flood control experts, engineers, Councilmembers, realtors, architects, and other Boulder citizens interested in flood control.

This confusion had as its backdrop anti-Vietnam War demonstrations, ever-mobile colonies of transients, a discrimination-against-homosexuals issue, a recall election, and a same-sex marriage license controversy.

During the local elections of 1971, a businessmen-dominated Council was not returned to office -- the usual political pattern -- and was replaced with members with a variety of different orientations, but not business ones.

Although matters related to flood plain management and flood control seemed to be handled in a somewhat more sophisticated manner, the number of reports, studies, reviews, surveys, master plans, and proposals seemed staggering to the average voter and, apparently, judging from the array of letters in the Daily Camera's Open Forum, irritated a good portion of the community.

Citizens were grumbling about a large number of issues in the 1970s; flood control got its share of criticism as well.

In a book on natural hazards published in 1974, Gilbert White discussed Boulder's attitude toward floods; he reported that, from 1945 to 1973, Council had commissioned twenty flood studies, two-thirds of which recommended some kind of structural adjustment to Boulder Creek and its

tributaries.⁵⁹

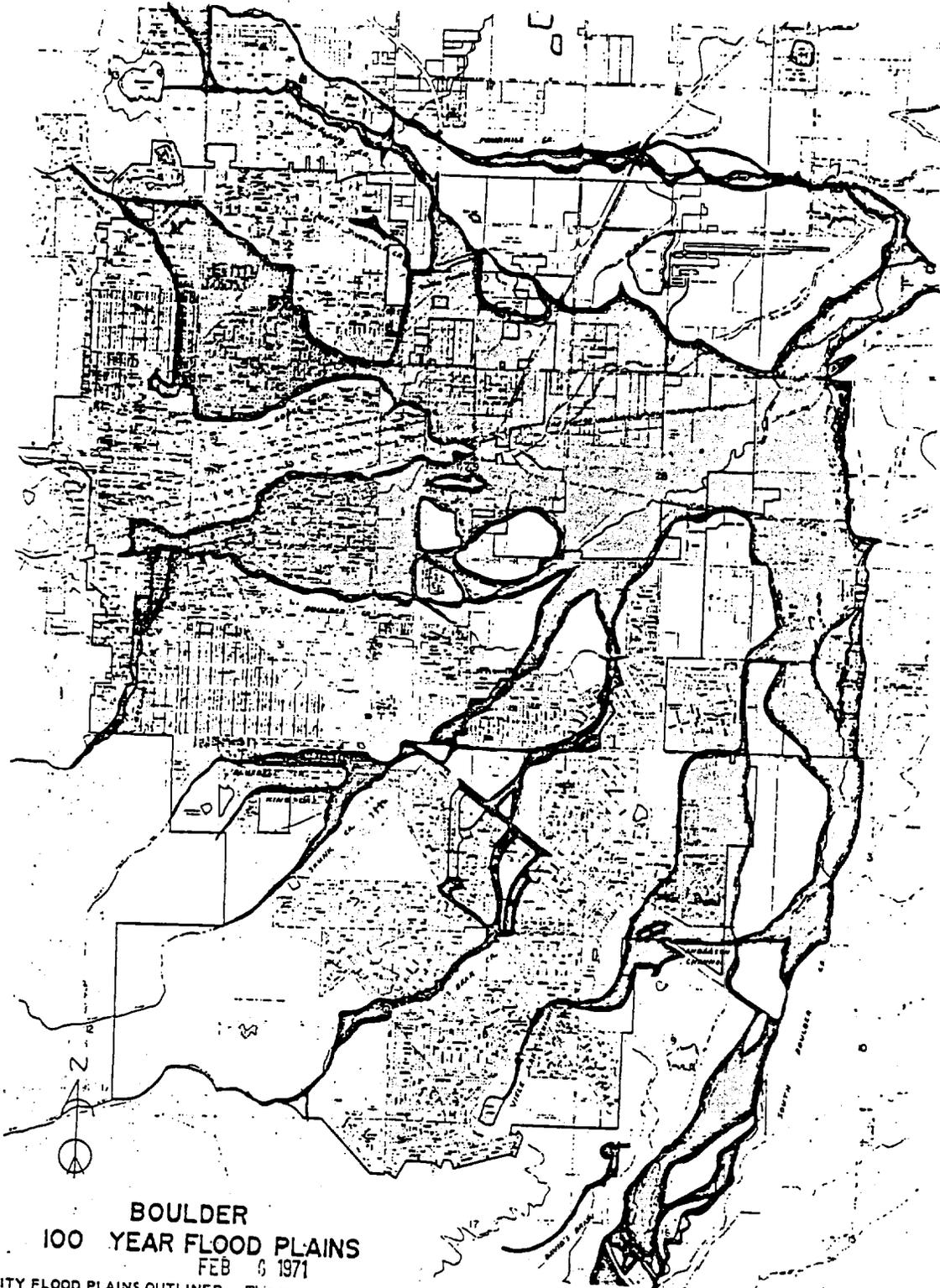
In 1970, the Corps of Engineers, apparently sensed that, without local community support for its recommendations on flood control, implementation of structural improvements on flood-prone creeks in a number of municipalities was going to be an uphill battle.

Therefore, the Corps fostered the formation of the Corps of Engineers Citizens Committee on Environmental Planning, C.E.C.E.P., with subcommittees in a number of regions across the United States. Boulder's subcommittee met with the Corps' Omaha District staff during the early 1970s to discuss a variety of plans for flood control along Boulder Creek.

The group "evaluated more than 50 variations of flood control concepts, involving both structural and management measures, of which only two were economically justified. They were a 'channel enlargement' concept and a levee flood-wall concept (floodway). An environmental analysis of the major concepts, including the two feasible ones, was completed in November 1972 by the Thorne Ecological Institute of Boulder."⁶⁰

In April 1971, Council reviewed a flood map which had been considered and approved by the Planning Board. Council decided to adopt this map (See page 65), described in Ordinance 3701.

During that same year, a radar installation, based at Limon, Colorado, started operations, issuing more accurate weather information than had been available up to that time.



**BOULDER
100 YEAR FLOOD PLAINS
FEB 6 1971**

CITY FLOOD PLAINS OUTLINED — This map combines 100-year flood plain studies in the city that have been determined in the past two years. The map is being considered by the City Planning Board for adoption and addition to the city zoning maps as a step in the city's flood control program and in order to make residents eligible for federally subsidized flood plain insurance. Ted Dieffenderfer, city director of operations, explained that the map is only "pictorial" and that for future land improvements, an engineering cross-section will need to be completed to determine the actual

flood plain. Dieffenderfer pointed out that much of the flood plain areas would have only shallow flooding, such as in Keewaydin Meadows — where he lives. There, the 100-year flood would produce only shallow flooding in the streets and somewhat deeper water at the south end of the subdivision. The planning board will hold the second part of its hearing on the designations in March. In the meantime, this map and those related are available for review in Dieffenderfer's office, 5050 E. Pearl St.

(City Staff Map)

When the Corps of Engineers published its "Special Flood Hazard Information Report" in 1972, in cooperation with the Urban Drainage and Flood Control District, the document formed the basis for Boulder's participation in the federally-sponsored Flood Insurance Program. In the report was also described an "Intermediate Regional Flood" and the amount of danger to residents and damage to property such a deluge might bring.

That same year, another major flood occurred, this time at Rapid City, South Dakota, with a peak discharge of 50,000 cfs at the height of the flooding. Doubtless this event spurred localities along Colorado's Front Range to reassess their flood control needs.

C.E.C.E.P. had continued to meet regularly and, by 1973, was ready to write a report for Council's consideration. Gradually, this subcommittee had turned away from the review of structural solutions to flood control and concerned itself mainly with the consideration of those activities that did not require the building of walls, berms, dikes, or the excavation and cementing of creek channels.

On May 10, 1973, C.E.C.E.P. submitted an eleven-point report -- written by Ken Wright -- to Council. The study concentrated on non-structural solutions but did include, however, the suggested replacement of a number of bridges spanning Boulder Creek. For years, experts had told Council that the present bridges were natural debris-catchers, hence, dangerous in themselves. The C.E.C.E.P. report was adopted

by Council and added to its shelf of flood control studies.

When plans for the expansion of the Boulder Public Library across Boulder Creek were discussed in 1973, an architectural rendering showed a high bridge over the creek, leading to a new children's center and media complex. The bridge was high enough, it was said, to accommodate an underflow of 7,600 cfs, or 200 cfs more than the estimated peak discharge during a one percent flood. Council gave its approval to the library addition. (Ironically, four years later, the Corps of Engineers elevated its estimated peak discharge during a one hundred-year flood to 12,000 cfs.)

After years of discussion, deliberation, consideration, and the subsequent shelving of reports and studies, flood control matters seemed to be moving along at a brisk pace. On August 21, 1973, Council adopted Ordinance 3927 which not only created the storm drainage and flood control utility but also approved the first master drainage plan. Its first director, Ted Dieffenderfer, characterized the new utility as "one of the most significant efforts to date to solve the drainage and flood control problem..."⁶¹ Dieffenderfer went on to say, "In addition to creating a separate utility, and segregating funds for drainage and flood control, the measure also provides for the collection of a service charge to generate a local level of funds..."⁶² It was hoped that the utility could attract federal and state flood control funds as well as the monthly utility fee to establish a \$22 million

budget in twelve years' time. One third of this budget was to come from the assessment of service fees throughout the community. A residence situated outside the flood plain would be assessed \$1 per month; a business would be charged up to \$12 per month. (Such facilities were already operating in Denver, Aurora, Englewood, and Arvada.)

In order to collect these fees for the new utility, the City of Boulder had to devise a fair and equitable method of assessment. Every property within the city limits which lay inside, or partly inside the designated one percent flood plain, must be studied. All properties outside the flood plain, with the exception of single-family residences,* would also be investigated.

Two crews -- eleven employees -- were hired to walk the community, gathering information about lot size, property boundaries, size of existing buildings, and what percentage of the land was devoted to grass, graveled area, and concrete or other impervious materials. The crews operated with two vans and a number of simple walkie-talkies. Some walked the properties with walkie-talkie in hand; others worked inside the vans with contour and aerial maps. As the crews moved from property to property, the "walkers" worked with measuring wheels and reported back their findings to those inside the vans who placed the information on the maps.

"It was a fairly unsophisticated operation," recalled Lynn Macy, a member of that crew, now on the city manager's staff, "but we were an enthusiastic group, working overtime to get the job done."⁶³In four months' time, the crews

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* Such dwellings automatically were charged the lower fee of \$1.

had covered the city of Boulder; more than 13,000 residences had been investigated.

This information thus gathered was developed into a runoff co-efficient which included the amount of water per square foot which would run off a piece of property as opposed to being absorbed or retained on the land. Thus, the square footage of a property was multiplied by .9, or the amount of impervious area, and by .4, or the amount of graveled area, and by .2, or the amount of grassed area.⁶⁴ (See page 70 for a more recent computation.)

When all the information was compiled and recorded, the new Storm Drainage and Flood Utility sent out a brochure to acquaint Boulder residents with its operation. (See page 71 for brochure.)

In December 1973, four Boulder residents filed suit against the City of Boulder, charging the administration with issuing building permits in violation of the 1969 flood plain regulations. Since no official map had been adopted at the time Ordinance 3505 passed, and since no official definition of the flood plain had been adopted, the issues were complicated and confusing.

Of particular interest was the 1969 permit issued the developer of the Gold Run apartments as well as another permit issued the University of Colorado for its proposed complex for married students and their families -- Newton Court -- planned for the "quonset hut" area on Boulder Creek at Arapahoe Avenue.

FLOOD CONTROL FEE COMPUTATION

$$\frac{\text{TOTAL SITE AREA}}{7000} \times \frac{\text{CT}}{.43} \times \text{DD} \times \text{FP} \times 1.67 = \text{RATE } \$ / \text{MONTH}$$

CT: Runoff Coefficient

$$\% \text{ Impervious Area} \times 0.9 = C_1 \quad \text{OR}$$

$$\% \text{ Pervious Area} \times 0.2 = C_2$$

$$\text{CT}$$

Use Frequency 5-year value from Table 13.11.01 City Design Criteria

DD: Drainage Design Factor

Type of Storm the Detention Storage and Drainage Facilities are Designed for;

100 YR - 0.2

5 YR - 0.8

0 YR - 1.0

FP: Floodplain Factor

Whether Site is In/ Out of Floodplain

In Floodplain - 1.4

Out of Floodplain - 1.0

prepared by Alan Taylor, Utilities Division, Public Works Department, City of Boulder.



AN EXTRA CHARGE FOR FLOOD CONTROL?



WHAT IS THE EXTRA CHARGE FOR FLOOD CONTROL THAT APPEARS ON MY UTILITY BILL?

The charge which is reflected on the third line of your utility bill is a service charge to initiate a Flood Control and Storm Drainage Utility, similar to the Sanitary Sewer Utility, that provides facilities to drain and control storm waters generated by runoff from each parcel of land in the City of Boulder. This separate utility was created on August 21, 1973, when City Council passed Ordinance No. 3927. In addition to the service charge, the ordinance further specifies that the funds generated will be used only for this utility.

WILL BOULDER EVER HAVE ANOTHER MAJOR FLOOD?

Flooding in some areas of Boulder at certain times of the year is due to spring snow melt in the mountains, spring rains, or cloudbursts; therefore the question is not whether Boulder will experience another flood proportionate to the flood of 1894,



but when. A 100-year flood is defined as a major flood which has a 1% chance of occurring in any year. In the event of a flood of this magnitude, approximately one-third of Boulder would experience varying degrees of damaging flood waters.



WHAT HAS CAUSED THE FLOOD PLAIN TO RISE?

Over the years as Boulder has urbanized, the amount of runoff has increased proportionate to that land development. Extensive areas of concrete, buildings, parking lots, etc., cause more water to run off the land surface rather than being absorbed by

the land, thus the depth of flood or storm water increases. Consequently, every property, in or out of the flood plain, contributes to flooding.

WILL I BENEFIT FROM THE FLOOD CONTROL PROGRAM IF I DON'T LIVE IN THE FLOOD PLAIN?

Yes. Emergency vehicles such as police, fire and ambulance will be better able to move throughout the City in the event of a flood. Day-to-day pleasure and business trips will be easier. In certain areas of the flood plain, park and open space land will be created to be enjoyed by all. Of course, if you do live in the flood plain, you will receive special benefits.



I LIVE IN A SINGLE-FAMILY DWELLING--HOW IS MY CHARGE DETERMINED?

Single family dwellings have been divided into three categories based on a normal dwelling unit and square footage of the parcel:

- A. 0--15,000 sq. ft. lot \$1.00/mo.
- B. 15,000--30,000 sq. ft. lot \$1.25/mo.
- C. 30,000 and over \$1.50/mo.

In addition, if your house is located in the 100-year flood plain, a special benefit charge is included in order to provide protection from flood waters. Development in Boulder has increased the cost of building the facilities which provide this protection by 40%. The equitable benefit charge is an additional 40% for that portion of property which is located in the flood plain.

BUT I OWN A BUSINESS--WHAT WILL MY CHARGE BE?

Because of the intensity of development on other property, there is a greater amount of runoff generated by these parcels. In calculating your charge, amount of runoff, total area, percent in the flood plain, and amount of water stored on the property were taken into consideration. The service charge is based solely on the amount of runoff, and not on the land use or zoning.



WHAT WILL THESE FUNDS BE USED FOR?

The funds will be used to design, construct, and maintain those facilities which carry flood or storm waters in local areas, and existing inadequate channels will be upgraded. Throughout this process, as each project is planned, public hearings will be held and you will have the opportunity to offer your suggestions regarding drainage in your area. Each year the City will construct facilities in the highest priority areas. Priority is based on potential damage so as to reduce flood hazards as quickly as possible.

I HAVE SOME ADDITIONAL QUESTIONS--WHOM CAN I CALL?

The Flood Control and Storm Drainage Utility will be more than happy to answer any questions you may have. Please feel free to call our office at 442-2020, ext. 258, Monday through Friday - 8:00 a.m. to 5:00 p.m.



The four-citizen suit was dismissed from court in March; an appeal was filed in a higher court.

Meanwhile the new flood control utility was having trouble collecting its money. Final approval had not been given by Council until November 1973 which delayed fee collection. Some residents, including a number of businessmen, refused to pay the assessed charges.

During the next year or two, tempers flared at Council meetings on the subject of the preparation of floodway delineation maps. One Councilmember questioned the competency of the flood control utility director to complete the maps in question. (Ordinance 3973, which concerned the delineation maps, was defeated in December 1973.) The Councilmember's methods of criticism and motives were then questioned. The city manager became involved. Again, the issuing of building permits in the flood plain was brought to public attention. The arguing continued with some members of Council alleging that they had not been informed about a number of controversial building permits.

In 1974, Frazier and Gingery Engineers was hired by Council to rectify the situation of no proper map to go with previously-passed legislation. The firm developed floodway and flood plain maps based upon the Corps of Engineers' estimated peak discharge of 7,400 cfs for Boulder Creek. (In 1977, that peak discharge would be changed to 12,000 cfs.)

The Frazier and Gingery study reaffirmed the City staff view that a floodway is an area where water velocities are two feet per second or greater, where depths are two feet or greater, and where a one hundred-percent development of the flood storage area would not create a rise of more than one-half foot. On March 11, 1975, Council adopted this definition in Ordinance 4026. Later that year, on November 4, Council adopted Ordinance 4056, which revised the flood plain regulations (Chapter 37) which included the elimination of issuing permits for dwellings in the floodway and the approval of map revisions.

The maps and their accuracy had been the subject of hotly debated and acrimonious Council sessions two months before. But, by November, everything was official.* Council had not yet decided what to do about Boulder Creek tributaries and nearby subdivisions and Planned Unit Developments.

Two members of C.E.C.E.P., water engineer and Council-member Kenneth Wright and Ruth M. Wright, Boulder attorney, offered a flood plain management paper to the 1974 sessions of the American Society of Civil Engineers entitled, "Non-structural Urban Flood Control." The Wrights took the position that the artificial channels, dikes, berms, walls, and other structural approaches to flood control, so popular in the 1930s and 1940s, were no long sound.

In the 1970s, they said, "Urban flood hazards can best be resolved using non-structural methods, in effect,

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* Boulder was now a participant in the National Flood Insurance Program under the auspices of the Federal Emergency Management Program.

working with nature rather than against it."⁶⁵

In late July 1976, another major Colorado flood missed Boulder by thirty-five miles. Storm cells had centered over the Big Thompson drainage to the north, west of Loveland, and had unleashed a horrendous storm with four hours of heavy rain. The resulting flooding of the heavily-developed Big Thompson Canyon caused the death of 139 persons and an estimated damage to property of \$35 million. It was the worst natural disaster in Colorado history. The peak discharge at the mouth of Big Thompson Canyon was 31,200 cfs.

There was no way to effectively warn Big Thompson residents and vacationers of the coming deluge. Of those few who were notified, some did not believe that such a flood was possible. Others simply did not know what to do and tried to outrun the flood by tearing down the canyon in their autos.

One year after the Big Thompson tragedy, a sober and thoughtful meeting took place in Boulder at a county-sponsored seminar entitled, "What Boulder County Can Learn from the Big Thompson Flood." Participants included members of various law enforcement jurisdictions, National Weather Service personnel, the media, city and county officials, and interested residents who lived in the flood plain.

A slide show was presented by two students of Gilbert White, Eve Gruntfest and Thomas Downing, who compared the climate, topography, and stream flow of the Big Thompson with that of Boulder Creek Canyon. A flood scenario was

presented to the audience.

Although the participants in the seminar covered a variety of flood-related topics, of particular importance to the group was the timely adoption of a warning system for Boulder Creek and its tributaries. Money for a good warning system must be found. Volunteers should be in place in the mountains to report unusual weather conditions. A four-mode alert system should be developed. Businesses should be encouraged to purchase an emergency radio device which would activate to warn that flooding was imminent.

The seminar audience was told that citizens in the path of floodwaters from a flash flood in the foothills would have just forty-five minutes to leave the area.

Council commissioned Leonard Rice Consulting Water Engineers, Inc. to complete an early warning study. The Urban Drainage and Flood Control District cooperated in the project which was completed the following July 1977 and entitled, "Early Flood Warning Planning: Boulder Creek."

The study included discussion of five alternative warning systems with information on lead time, credibility and reliability, first cost, annual operation and maintenance costs, flexibility, adaptability to phased implementation, and non-flood benefits. A sixth warning system using radar was also described, a system that could benefit Boulder as well as other areas nearby.

The Rice study stated that the "Boulder Creek basin is hydrologically complicated."⁶⁶In many areas, the warning time is so short that a combination of sophisticated systems are needed. Despite this characterization, the Rice

group recommended such "uncomplicated" alert methods as the installation of the volunteer observer network of mountain residents, automatic rainfall and stream measuring equipment, a base radio station, and the hiring of a private weather monitoring service. The engineers also recommended further study on what kinds of cloud systems were apt to produce significant storms.

(By 1981, a series of rainfall and river-rise gauges had been installed on Boulder Creek and South Boulder Creek with six more on order; Left Hand Creek had two sites for gauge installation.)

In 1976, Viele Channel was re-constructed in such a manner that south Boulder's Keewaydin and Frasier Meadows neighborhoods were removed from the flood plain. This work was funded by the Urban Drainage and Flood Control District.

That same year, Council decided to extend its flood regulations to properties annexed to the City of Boulder; Ordinance 4079, which covered that subject, passed on March 2.

For some time, the Corps of Engineers had been re-vising its studies of the South Platte River basin and its tributaries. By 1977, the Corps had adjusted its predicted peak discharge for a one-percent flood on Boulder Creek from 7,400 cfs to 12,000 cfs. (The Corps was getting closer to the 13,200 cfs peak discharge estimated by a

number of local flood experts.)

Council adopted the new peak discharge on May 31, 1977 with passage of Ordinance 4375; the National Flood Insurance Program also adopted the new higher peak discharge for their computations.

The new official peak discharge put a cramp in the planning for a new senior citizens' facility, which was to be at Eleventh Street and Arapahoe Avenue, south of Boulder Creek. Now that that site was officially in the floodway, another site had to be selected. Finally, a property on Arapahoe Avenue at Ninth Street was chosen with the understanding that when a higher bridge at Ninth Street was completed, the senior citizens' center would be out of the floodway.

New bridges were also scheduled for Sixth Street and Seventeenth Street; engineering designs for all three bridges were being completed.

With adoption of the higher 12,000 cfs as a peak discharge for Boulder Creek during a one-percent flood, the Corps of Engineers produced a pamphlet, "Boulder's Flood Protection Decision -- A Choice to Live With," which outlined to the public its views on methods to control flooding. Plan I was devoted to the enlargement of the Boulder Creek channel; Plan II described an excavated floodway; Plan III considered the relocation and flood-proofing of developments already in the floodway.

Boulder residents were still not ready for the solutions

involving structural changes along Boulder Creek advanced by the Corps of Engineers. Nor were they ready for more strict flood plain regulations. The tragic events at Rapid City and at the Big Thompson affected only a few. To many, the risk of the one hundred-year flood seemed remote. More rules were not necessary. Construction in the flood plain was worth the gamble.

In preparing for her doctoral dissertation, "Changes in Flood Plain Land Use and Flood Hazard Adjustment in Denver and Boulder, Colorado, 1858-1979," Eve Gruntfest used the Corps of Engineers' 1977 land use table (See below) and their prediction that, at 1977's rate of development in Boulder's flood plain, the entire flood plain would be filled with buildings of one kind or another by 2006.

Table 2
EXISTING LAND USE IN THE
BOULDER CREEK FLOOD PLAIN

Land Use Type	Total In	Total In
	1%/100-year Flood Plain	0.2%/500-year Flood Plain
	Acres	
Developed		
Residential	27.0	202.7
Commercial	287.5	408.4
Public & University	103.6	117.5
Streets	96.0	120.0
Undeveloped Open Space		
Park	93.4	118.6
Vacant	403.1	485.7
Total	1010.6	1452.9

Gruntfest took the 1958 work of the University of Chicago geographers, Gilbert White and others, and updated Boulder's flood plain occupancy with a 1979 accounting of structural units built. (See chart below.)

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TABLE 13

CHANGES IN FLOOD PLAIN OCCUPANCY
FOR THE BOULDER CREEK FLOOD PLAIN AT
BOULDER 1936-1979

Occupancy Class	Structural Units ^a						
				1936-1957		1957-1979	
	1936	1957	1978	net ch.	%ch.	net ch.	%ch.
Residential A	269	309	316	40	13	7	2
Residential B	0	17	25	17	100	8	47
Residential C	0	11	18	11	100	7	64
Commercial	57	72	254	15	21	182	252
Industrial	0	0	38	0	0	38	100
Transport	3	3	15	0	0	12	400
Public	3	12	19	9	75	7	58

^aOne structural unit is defined for the different occupancy classes as follows:

- Residential -A. A single or double-family dwelling.
- B. A multi-family dwelling for 3-6 families.
- C. A multi-family dwelling for more than 7 families.
- Commercial -A separate store, office or warehouse building. Structures having a ground space of more than 10,000 square feet count one unit for each multiple of 10,000 square feet.
- Industrial -Building. A separate building, exclusive of small auxiliary buildings.
- Transport -Building. Structures having a ground space of more than 10,000 square feet count one unit for each multiple of 10,000 square feet.
- Open. Storage and working yards, in multiples of 25,000 square feet.
- Public -Each building counts as one unit.

Gruntfest, page 112.

In May 1977, Council asked the Corps of Engineers to design a wide, flat channel for Boulder Creek, starting at the mouth of the canyon to a location just past the Seventeenth Street Bridge. By the end of that year, the first bridge to be replaced, the structure at Sixth Street, was scheduled for demolition.

When the new bridge at Sixth Street was completed, the City of Boulder was able to proceed with plans for a low-income housing project for the elderly at Canyon Boulevard near Seventh Street. By September 1978, a nine-hundred-foot berm was constructed along the boulevard to further insure the safety of the housing project.

After an enabling election in 1981, the Crossroads Shopping Center on Twenty-eighth Street was in the process of renovation and expansion. (See charts below for the expansion in the Crossroads area up to that time.)

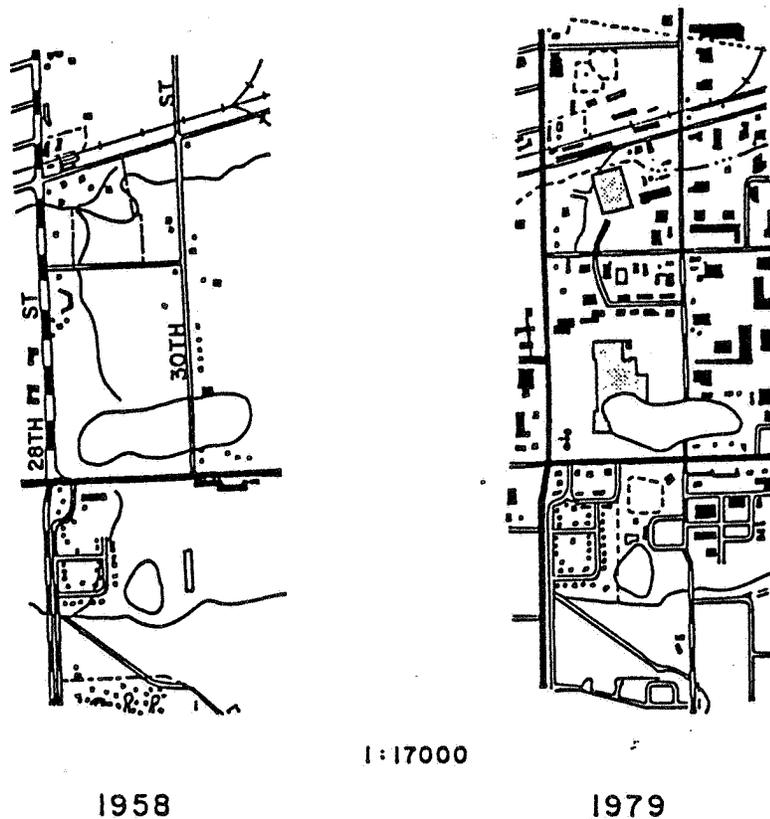


FIGURE 9
THE BOULDER CREEK FLOOD PLAIN:
CHANGES OVER TIME

For a time, city officials feared that the to-be-renovated center was partially in the flood plain. Somehow, irregularities in previous computations by the Corps of Engineers were discovered. Muller Engineering was hired by the City in 1981 to review those flood plain figures for the Crossroads area. The Muller group concluded that the irregularities were indeed computing errors and rectified the figures; the Crossroads Shopping Center structures were officially declared out of the flood plain although a portion of the parking lot remained in the flood plain. A flood wall was included on the south side of the complex, the area closest to Boulder Creek, to effectively take the parking lot out of the flood plain.

The Gold Run apartments were back in the news in 1979. The developer, who had received his building permit ten years before, in 1969, was continuing to work on the property with just enough "diligence" to keep the project alive.

When the City of Boulder sued the Gold Run developer in the mid-1970s, the court, Judge Richard Dana presiding, upheld his right to build the apartments in the floodway, ruling that the building permit in question was issued before the ordinance affecting such construction had been passed.

The Colorado State Land Use Commission became sufficiently exorcised about the construction of the Gold Run apartments that it advised Governor Richard Lamm about the situation; the commission wished to investigate the matter. Lamm issued an emergency stop work order until such an investigation

could be completed. Meanwhile the City of Boulder had appealed Judge Dana's decision in a higher court; in June 1979, the Court of Appeals ruled in favor of the developer. The City was planning to bring the case before the Colorado Supreme Court.

On August 17, 1979, the Colorado Land Use Commission completed its investigation and declared the Gold Run apartments a public hazard. Boulder officials commented to the press that such apartments would not survive even a "light" ten-year flood coursing down Boulder Creek.

Governor Lamm suggested to both the Gold Run developer and the City of Boulder that an appearance before the Supreme Court would be both time-consuming and costly. All parties should sit down and work out a solution, said the governor.

By the end of September, Council reviewed conceptual guidelines proposed by the city attorney's office and the developer. One of the concepts discussed included a proposal to deepen the channel of Boulder Creek. This would necessitate condemning portions of six back yards across the creek at Cordry Court. The proposal inspired Boulder letter writers to complain in the Daily Camera's Open Forum for several months. By the end of September, Council approved an agreement which included construction of a flood wall on the north side of the Gold Run apartments but Councilmembers did not approve stream channelization at that spot.

By 1980, the Gold Run apartments were almost completed, along with bridge renovations at Folsom, Twenty-eighth, and Thirtieth Streets.

During the 1970s, Council had adopted a number of growth control tools to restrict the expansion of Boulder; despite passage of these regulations, Boulder's 1980 population doubled from 1960 -- 37,718 to 83,200.

In 1981, the flood control utility announced a forty-percent rise in flood management fees due to the effects of inflation. A single-family residence located out of the flood plain was now charged a monthly fee of \$1.40 instead of the original \$1 charge in 1973. (See Ordinance 4628.)

The City received revised flood insurance rate maps from F.E.M.A., Federal Emergency Management Agency, in 1981. The following year, F.E.M.A. maps and flood plain regulations were the subject of many a Council session as it considered the development of a commercial office building proposed for the southwest corner of Walnut and Eleventh Streets. Of special concern was the location of the elevator and electrical equipment beneath the building in an area proposed for parking.

During the mid-1980s, the "shade" of Frederick Olmsted, Jr. seemed to be moving about the Boulder Creek area. A many-pronged plan to enhance Boulder Creek and its floodway from Eben Fine Park east to the new Pearl Street at Fifty-fifth Street was moving forward. The City's intention was to "respect, and restore, where appropriate, the Creek Corridor ecology."⁶⁷

This ambitious plan included the proposed acquisition of creekside properties or easements so that a continuous pedestrian and biking path might be built along the creek. Installation of snap-away biker-pedestrian bridges was contemplated. (Such bridges pull to one side of the creek during high water so that debris carried by floodwaters will not pile up behind the structures.)

A program, especially appealing to the public, was developed by Professor of Biology J. Windell and associates to "build" deep pools at intervals along the stream from the canyon eastward by introducing large boulders in the channel. These boulders would form periodic deep areas which, it was determined, would not only lessen damage to the ecology of Boulder Creek during times of low water but also insure that a resident trout population, as well as newly-introduced species, might flourish in a more congenial habitat.

Boulder citizens and, perhaps a number of transient visitors, took time off to fish and boat along the "new" corridor. Volunteers helped local youngsters learn the art of catch-and-release fishing. The Kid's Fishing Pond was enhanced and stocked.

In 1983, Council approved the retention of Muller Engineering to prepare new floodway and flood plain maps in order that such maps conformed to the specifications

of F.E.M.A. That same year, part of the channel for Wonderland Creek was modified to better contain floodwaters so that portions of Folsom Street and the Diagonal Highway would be free from runoff.

In 1984, Council considered a number of staff reports on the management of flood plains and the comparison of flood plain design criteria. (See chart, page 86.) Councilmembers also reviewed a staff report on flood control problems along Boulder Creek tributaries. They were given specific information about possible peak discharges along eleven tributaries during a one-hundred-year flood as well as an accounting of what sites might be affected. (See charts on pages 87 and 88.)

MSM/Greiner was hired to prepare the first detailed flood plain maps on tributaries. Public hearings were held so that residents who lived along these waterways might learn how they would be affected.

Shortly thereafter, Council approved the hiring of Greenhorne and O'Mara to complete a thorough drainage study of the eleven tributaries. Phase A of this study was finished by July 1984.

Since Council desired further review of the Greenhorne and O'Mara study, which tended toward non-structural solutions to tributary flooding, the members appointed, in 1984, J. Ernest Flack, Barbara B. Greenlee, Roger Hartman, and L. Scott Tucker to a "Blue Ribbon Panel" whose charge was to develop a master plan for Boulder Creek tributaries.

Table #1

Comparison of Floodplain Design Criteria

ITEM	AGENCY		
	FEMA	UDFCD	CITY
Modeling	Existing Hydrology	Future Hydrology	Future Hydrology
Structures	No Blockage	Varies	Varies
Floodway Hazardous Velocities	10 feet per second (fps)	None	2 fps
Floodway Rise Criteria	1 ft.	0.5 ft.	0.5 ft.
Flood Proofing Elevation	-0-	-0-	2 ft. freeboard
Storm Water Surface Elevation	100 Year	100 Year	100 Year
Floodway Depth	None	None	2 ft. minimum

Notes: Future hydrology is based on ultimate land use development in accordance with the comprehensive plan. Existing hydrology is based on existing land use. Variable structural blockage indicates that during the expected flood condition, some smaller structures will be fully blocked and some partially blocked. Most larger structures will be partially blocked. Technically, FEMA does not define hazardous velocity; the 10 fps reflects staff opinion of the velocity used by FEMA.

from James W. Piper, Dave Baskett et al, "Floodplain Management in the City of Boulder," March 28, 1984.

SUMMARY OF FLOOD FLOWS
ON TRIBUTARIES

<u>FLOODING SOURCE AND LOCATION</u>	<u>100-YEAR PEAK DISCHARGE (Cubic Feet/Second)</u>
1) <u>Four Mile Canyon Creek</u>	
Confluence-Boulder Creek	3960
28th Street	3920
Broadway	3520
2) <u>Wonderland Creek</u>	
Confluence-Boulder Creek	1410
28th Street	1130
Broadway	480
3) <u>Two Mile Canyon Creek</u>	
Confluence-Goose Creek	1120
Broadway	890
4) <u>Elmer's Two Mile</u>	
Confluence-Goose Creek	790
Iris Avenue	610
5) <u>Goose Creek</u>	
Confluence-Boulder Creek	4180
Confluence-Elmer's Creek	2680
19th Street	1600
6) <u>Sunshine Canyon Creek</u>	
Confluence with Boulder Creek	1159
7) <u>Gregory Creek</u>	
Flagstaff Road	1239
Confluence with Boulder Creek	2092
8) <u>King's Gulch</u>	
Belview Drive	214
Confluence with Skunk Creek	373
9) <u>Bluebell Canyon Creek</u>	
Belview Drive	227
Confluence with Skunk Creek	737
10) <u>Skunk Canyon Creek</u>	
Confluence-Bear Creek	2230
U.S. 36	1350
Broadway	710
11) <u>Bear Canyon Creek</u>	
Confluence-Boulder Creek	4880
Baseline Road	2930
Broadway	1930

Table #2

from James W. Piper, Dave Baskett et al, "Floodplain Regulation on the Tributaries to Boulder Creek," April 3, 1984.

PRELIMINARY ESTIMATE OF
PROPERTIES AFFECTED BY NEW FLOODPLAIN INFORMATION

<u>TRIBUTARY</u>	<u>PROPERTY IN FLOODWAY</u>	<u>PROPERTY IN FLOOD STORAGE AREA</u>	<u>VACANT LAND IN FLOODWAY</u>	<u>VACANT LAND IN FLOOD STORAGE</u>	<u>COMMENTS</u>
Two Mile	130 Single Family and 4 Multi-Family	30 Single Family and 4 Multi-Family	12 Undeveloped Lots	11 Undeveloped Lots	Columbine School playground is in floodway. Foothills School is in flood storage area and playground is in floodway.
Elmers		56 Multi-Family			Glenwood Grove Center is partially in floodway. Commercial west of 28th from Valmont to Bluff is in floodway.
Wonderland	1 Single Family and 17 Multi-Family	61 Single Family and 46 Multi-Family	11 Acres Undeveloped plus 4 Lots	37 Acres Undeveloped plus 9 Lots	Centennial Jr. High football field is in floodway.
Four Mile	39 Single Family and 4 Multi-Family	91 Single Family and 38 Multi-Family	45 Acres Undeveloped plus 11 Lots	25 Acres Undeveloped plus 78 Lots	New approved portion of Palo Park subdivision is in floodplain. Crestview Elementary is in floodplain.
Bluebell		14 Single Family			Note: Floodway map data is not available.
Goose	102 Single Family and 87 Multi-Family	138 Single Family and 39 Multi-Family	10 Undeveloped Lots		Boulder Community Hospital parking lot is in floodway.
Sunshine		11 Single Family			Note: Floodway map data is not available.
Gregory		30 Single Family			Flatirons Elementary & the Senior Citizens Center are in the floodplain. Note: Floodway map data is not available.
Skunk	25 Single Family and 70 Multi-Family	40 Single Family and 290 Multi-Family	20 Acres Undeveloped	27 Acres Undeveloped	Basemar Center is partially in floodplain.
Bear Canyon	38 Single Family	82 Single Family and 26 Multi-Family	4 Acres Undeveloped	55 Acres Undeveloped	Undeveloped CU land is partially in floodplain. Table Mesa Center is partially in floodplain. Martin Park Elementary is in flood storage area.
Kings Gulch		4 Single Family			Vacant NBS land is in floodplain. Note: Floodway map data is not available.
Viele		None			Viele is generally a lined channel.

TABLE # 1

from James W. Piper, Dave Baskett, et al, "Floodplain Regulation on the Tributaries to Boulder Creek," April 3, 1984.

What were the best methods to reduce flood danger on the eleven waterways? The group got to work in October and, by January 1985, made a preliminary report of its findings for three of the most troublesome waterways -- Goose Creek, Elmer's Twomile Creek, and Twomile Canyon Creek.

The Blue Ribbon Panel's suggestions included berming North Boulder Park so that it could be used as a storage basin for Goose Creek floodwaters. In this manner, Boulder Community Hospital, particularly its emergency entrance, might be safe from Goose Creek floodings. The Blue Ribbon Panel's estimated costs for work on the three tributaries was \$16.7 million.

By the time the group had published its final report in March 1985, a number of public agencies and private groups had responded to the Blue Ribbon Panel suggestions. Plan Boulder County, a group of citizens who had been meeting regularly since 1959, wrote Council that its board voted not to support the proposed changes for the three tributaries.

Flood hazard expert Gilbert White stated that the Blue Ribbon Panel recommendations were "too costly, too reliant on structural solutions, and too vague."⁶⁸

Council seemed to favor a more non-structural approach to flood control also and adopted Phase A of the Greenhorne and O'Mara study on May 27, 1986.

That same summer, on August 19, Council reviewed the 1984 storm drainage collection systems study by W.R.C. Engineering, Inc. and voted for its adoption. At that point, staff was able to plan for flood control improvements, using both the Greenhorne and O'Mara study and the W.R.C. work.

By 1985, a new rate study for flood control fees was being discussed. Additional money would insure that the flood control utility could complete long-planned projects such as the purchase of private properties lying in the floodway.

Toward the end of the 1980s, Council's shelf of studies, reviews, master plans, and memoranda on floodways, flood plains, delineations, and tributary research was overflowing. Boulder Creek had become "one of the most carefully documented in the United States."⁶⁹ Weather specialist Todd Malmsbury, writing for the Daily Camera, warned his readers that Boulder was the "highest risk city in the state."⁷⁰

For years, various citizen groups had complained that Council was dragging its feet on proposed solutions to flood control. By delaying decisions on a number of proposed flood measures, however, Council managed to avoid most of the structural solutions aimed at safeguarding flood-prone areas near Boulder Creek and its tributaries. In the 1980s, Councilmembers turned their attention instead to non-structural solutions to flood control.

Earlier councils were also criticized for what the public perceived as too much attention to the means -- the many flood studies -- and not enough attention to the goal of effective flood control. The former sleepy college town, now a growing metropolitan center in the 1980s, was proud of some of its accomplishments in the field of flood control.

A warning system for flood alert was in place; both city and county officials were involved. The alert system was good enough to receive commendation throughout the country. The project was periodically improved, detail by detail, as more effective technologies became available.

The Denver firm of Henz Kelly and Associates, who studied storm conditions along the Front Range, had been retained to provide Boulder with more precise weather information than was available from the National Weather Service.

The number of businesses operating within the flood plain that had purchased emergency alert radio devices was growing. More and more buildings on the flood plain and in the floodway had installed special storm doors and windows that could be bolted into place when an alert was called. The program of floodproofing buildings was going forward. The Hall of Justice, near the mouth of Boulder Canyon, was now protected with a \$500,000 flood wall, installed in January 1986. The program of replacing older bridges whose low spans were debris catchers continued.

In the spring of 1986, Council participated in a de-

tailed study session with regard to proposed land use regulations in the Code, as well as mitigation schemes for Boulder Creek tributaries. The result of this intense study was the passage on March 17, 1987, by emergency vote, interim Ordinance 5035, which temporarily prohibited the issue of any building permit in the floodway of Boulder streams. Councilmembers also approved more strict building requirements for mobile homes and other construction in the flood plains of both Boulder Creek and its tributaries. At the same time, however, requirements for the remodeling of existing structures along the tributaries were somewhat eased.

In August 1987, Water Resources Associates, Inc. of Kirkland, Washington, was hired to review recent Boulder Creek and tributary studies and complete a comprehensive drainage and utilities master plan, called "C.D.U.M.P." by City staff members.

Boulder's habitual civic controversies were not as ferocious in the late 1980s as they had been in years past. There were citizens, however, who still believed that Barker Dam's reservoir would retain floodwaters; there were residents who still felt that building in the floodway was worth the gamble; there were those who still felt a major flood in Boulder was a remote possibility.

There were other residents in the community, however, who, each May, when the warm air masses from the Gulf of Mexico circled again toward the Front Range, looked toward the foothills and thought, "Maybe this year."

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