

208 Colorado Building
Pueblo, Colorado
November 29, 1965

Mr. A. Ralph Owens
Acting State Engineer
State of Colorado
232 State Services Building
Denver, Colorado - 80203

Dear Mr. Owens:

I submit herewith my annual report of activities in
Irrigation Division No. 2 for the 1965 water year.

Respectfully submitted,



JOHN W. PATTERSON
Division Engineer
Irrigation Division No. 2

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FLOODS AND WATER SUPPLY

The 1965 water year was one of those rarities in the Arkansas River Valley. What had started out as a year with an estimated 150% of normal predicted runoff, turned into a year of extreme flooding with moderate to severe property damage and water availability in excess of the demands of appropriators of the main river system for a total period of 48 days.

Prior to the commencement of major flooding on the Arkansas River, a series of localized stream flooding conditions had been observed along the Fountain River and other tributaries of the Arkansas River. The Fountain River had an average daily flow of an estimated 300 cfs on the 11th and 12th of June. On the 15th, another flood occurred which was measured by Mr. Robert Jesse, State Hydrographer, and calculated to have had a maximum flow of approximately 6,500 cfs. This flow was of such magnitude and duration that it served to remove much of the loose debris and vegetative growth that had restricted the Fountain River channel. Had it not been for the early flooding on the stream, and some willow removal by a local work program, it is quite possible that flood damage could have been much more severe than that which occurred with the major flood of the evening of June 17. The peak of the flood was calculated by the Geological Survey to have had a flow of 47,700 cfs.

This exceeded all known records of flow for the Fountain River by about 13,000 cfs.

Flooding also occurred along all tributaries of the Arkansas River with the exception of the watershed areas upstream from Canon City and reaches of the Huerfano River upstream from the City of Walsenburg.

The gates of John Martin Reservoir had been partially closed on June 14 due to minor flooding on the lower tributaries of the Arkansas River. On June 17, at 7:30 A.M., the gates were completely closed. During the period from ~~midnite~~ June 17 to ~~midnite~~ June 18, storage increased in John Martin Reservoir by the amount of 164,089 acre feet. By June 22, total impoundment was equal to 285,582 acre feet. Due to the fact that the majority of the ditches along the Arkansas River had various degrees of damage, diversions were limited until repairs could be accomplished. Meanwhile, storage continued to accumulate in the reservoir. Maximum storage occurred on August 25 when the impoundment attained a value of 429,557 acre feet. This set a new record for storage in the reservoir and meant that the conservation pool of 364,440 acre feet had been filled and an encroachment of 65,117 acre feet had been made into the flood pool. The Corps of Engineers released the excess water from the reservoir at a rate which would not imperil life or property, although some of the farmers along the river contended to the contrary. Recent Congressional Legislation provided for a recreation pool in the amount of 10,000 acre feet to be taken from the then authorized flood pool of 281,150 acre feet.

During the June floods, maximum flows were noted and comparisons were made by the U. S. Geological Survey with previous maximums of record. A few of these comparisons are, as follows:

LOCATION	JUNE 1965 FLOW	PREVIOUS RECORD
Arkansas at Pueblo	10,000 cfs	103,000 cfs
Fountain at Pueblo	47,700	35,000
Jimmy Camp near Fountain	124,000	-----
Black Squirrel near Ellicott	.141,000	-----
Chico near Avondale	50,900	13,000
Arkansas near Nepesta	44,400	180,000
Arkansas at La Junta	31,700	200,000
Purgatoire at Trinidad	15,700	45,400
Purgatoire at Las Animas	43,100	70,000
Rule near Toonerville	276,000	-----
Clay near Lamar	158,000	27,500
2 Buttes near Holly	182,000	1,800

Another flood which originated on August 22 near Florence, Colorado, again created minor flooding in the Pueblo area. This flow was computed by the Geological Survey to have been in the magnitude of 23,500 cfs.

As is readily noted, previous maximums on the main Arkansas River upstream from John Martin Reservoir had greatly exceeded those flows of 1965. However, below the reservoir, many previous records were superseded by new maximums. A flow of 72,800 cfs was measured in the Arkansas River at Lamar, a distance of approximately 15 miles downstream from John Martin Reservoir. Had it not been for John Martin Reservoir and the flow that it captured, damage would have been even more severe in the towns downstream from the reservoir, and, in particular, the towns of Lamar, Granada, and Holly.

Rumors during the June flooding were rampant and it appeared as though most of the news media were trying to outdo each other for sensationalism. Very few reports during the initial periods of flooding compared with the facts available.

Flood warnings were issued approximately 10 hours ahead of the June 17th peak flow on the Fountain River at Pueblo. However, due to the human factor, few owners of property in the flood plain of either

the Arkansas or Fountain Rivers took advantage of this advance warning until too late to prevent major damage to livestock, equipment, and personal belongings.

Due to the previously noted fact that "free water" existed for 48 days on the main river system, it is going to be possible to go into the winter months with all major reservoirs which derive their water from the main stem of the Arkansas and most of its tributaries at or near storage capacity. The only exception to this statement is the Great Plains reservoir complex near Lamar. This system rarely fills due to the fact that it must share feeder capacity with the Fort Lyon Canal Company and their direct flow requirements.

A comparison of the number of acre feet of water diverted in the various water districts, coupled with the change in reservoir storage from October 1, 1964 to October 1, 1965 indicates that total water diverted increased from a total of 1,281,669 acre feet in 1964 to a total of 2,641,546 acre feet for 1965.

Total reservoir impoundment within the Division on October 1, 1965 was 665,334 acre feet as compared to 45,454 acre feet on the same date of 1964.

Water supply for the 1965-1966 water year should be very adequate even if winter precipitation should be below normal.

GROUND WATER LEGISLATION

Ground water legislation which was passed during the 1965 session of the Colorado Legislature imposed additional administrative duties and problems upon the Office of the State Engineer. The bill with which the major problem primarily exists in the Arkansas Valley relates to that water which is tributary to surface streams. According to law,

this water must be administered according to priority of right. If the bill is taken literally, it could well mean the almost complete shut down of those wells in the alluvium adjacent to the Arkansas River and the wrecking of a major portion of the agricultural economy of the area. However, in order to attempt to prevent this from happening, a number of meetings with small groups of users and those who have senior direct flow rights have been held for the purpose of attempting to work out a workable consensus agreement. Agitation on the part of a small number of well water users immediately adjacent to the Arkansas River has been increasing. At the present time, the program appears to be moving very favorably toward sensible agreement, although no final plans have been adopted.

STOCK WATER TANKS

Inspection of the sites for proposed stock water tanks has created no major problem as to personnel work load. However, the requirement as contained in House Bill No. 750 of the 1941 Colorado General Assembly, for outlet pipes in all ponds, unless specifically excepted, has curtailed the indiscriminate construction of stock ponds to the detriment of previously adjudicated water rights.

INFORMATION AND EDUCATION PROGRAM

In order to insure the better administration and understanding of water matters in Irrigation Division No. 2, a one day meeting was held in the Office of the Division Engineer in Pueblo. Subjects discussed included preparation of records, discussion of the recent ground water legislation, stock water ponds, John Martin Reservoir and its proposed recreation pool, the Colorado River controversy between the upper and lower basin states, and other items as requested by the water commissioners. As a result of the information and education program, records

of water diversion are becoming of such quality that their value should be of utmost importance in hydrologic or water right investigations.

Preliminary schematic diagrams have been received from all the water commissioners indicating the relative location of all adjudicated water rights within their particular districts. However, it has been impossible to prepare these schematics into a usable form due to the fact that no personnel are available in the Pueblo office to do the drafting and lettering required, except during such times as all normal work requirements are completed. It is recommended that the proposed budget of the Office of the State Engineer make provision for a draftsman to assist on a part time basis in Pueblo or else on a permanent basis in the Denver office. Completion of schematics for all the water districts in the state is something that will probably take several years to complete. Proper administration of water cannot be accomplished if a water commissioner does not know the location of the districts in his district, or in case of a personnel termination or death, the new employee should have all the required information available in order to avoid a lapse in the proper distribution of water.

INDIVIDUAL WATER DISTRICT ADMINISTRATION

WATER DISTRICT NO. 10

Water District No. 10 had probably its best year of record so far as water availability was concerned. However, the floods of June 1965 did considerable damage to ditches which derive their source of supply from the Fountain and its tributaries. The damage estimates compiled by the Bureau of Reclamation for the Office of Emergency Planning and for which payment has either been authorized or paid are as follows:

Chilcotte	\$ 38,500
Fountain Mutual	28,000
Laughlin	1,250
Liston & Love	4,800
Locke	12,000
Miller	1,560
Owen & Hall	28,560
Robinson	3,240
Stubbs & Miller	1,650
Talcott & Cotton	3,900
Tom Wanless	7,200

The Valley High Golf Course appeal was held in the Office of the State Engineer in Denver. The golf course has dammed off a small tributary of Fountain Creek and has been impounding water without benefit of a decree. They contend that they are creating no additional burden on the stream system, but rather only salvaging water which would be otherwise lost due to phreatophyte and swamp grass vegetation. The State Engineer ruled against the Valley High Golf Course and it appears that the case will eventually wind up in the courts.

WATER DISTRICT NO. 11

Water District No. 11 had one of its best water years of record,

although excessive precipitation did considerable damage to the hay crop of the area.

WATER DISTRICT NO. 12

Water District No. 12 had no major problems in administration during the past year. However, the failure of 3 dams belonging to the Town of Cripple Creek on Beaver Creek in the aggregate storage amount of 600 plus acre feet did create considerable concern for the safety of Skaguay reservoir which is owned by Southern Colorado Power Company. Skaguay dam was overtopped as a result of the surge of water which went into the reservoir from the Cripple Creek Reservoirs. Considerable undercutting took place at the toe of the dam as well as the complete stoppage of the outlet pipe from the dam. These conditions necessitated considerable expense on the part of Southern Colorado Power Company to eventually open the outlet pipe and drain approximately 1,800 acre feet of water from the reservoir. One life was lost by drowning due to the failure of the Cripple Creek reservoirs. Management of Southern Colorado Power Company stated that it was their belief that the overtopping of Skaguay reservoir could have been prevented had the City of Cripple Creek sent notification to the company about the failure of their dams.

At the present time, the Colorado Fish and Game Department is negotiating with Southern Colorado Power Company for the use of Skaguay Reservoir should it be rehabilitated and again entitled to impound water.

WATER DISTRICT NO. 13

The administration of Water in District No. 13 was rather uneventful

throughout the latter part of the season due to a surplus of availability which was excess to the demands of appropriators on the stream system. However, early in the spring, it appeared that litigation might become necessary in order to get the DeWeese-Dye Reservoir Company to bypass the natural flow of Grape Creek for the benefit of senior downstream rights. After considerable time and effort meeting with the company as to their legal rights, a better understanding was attained between the water administrative officials and the company and the problem was solved.

WATER DISTRICT NO. 14

The administration of water on the Fountain River was renewed for the first time in many years. Orders were issued last year for the installation of measuring devices and recorders on a large number of the ditches which had previously based their rights upon "hi-ority" rather than priority. Although a few have indicated that they preferred their own administration, the majority of the water users from the Fountain have stated that administration should have been conducted by the local water commissioner long before the present date.

Parshall flumes and recorders were installed on the West Pueblo and Collier Ditches. Parshall flumes were installed on the Toof & Harmon, Wood Valley, Young & Calloway, Bannister, Southerland, McNeil, Greenview, and Chilcott Ditches. The Cactus and Hobson No. 2 Ditches had installed Parshall flumes, but shortly after being installed they were washed out by the flood of June 17, 1965.

Estimates made by the Bureau of Reclamation on flood damage on the various ditches and canals in the district are as follows:

Collier	\$ 600
Excelsior	700
Oxford Farmers	6,500
Highline	13,000
Colorado Canal	23,500
Bannister	900
Cactus	3,000
Chilcott	2,600
Greenview	2,050
Fountain Underflow	500
Hobson No. 2	2,500
Lincoln	720
McNeil & Steele	600
Olin	2,640
Southerland	1,650
Toff & Harmon	850
Wood Valley	1,140

WATER DISTRICT NO. 15

Water District No. 15 which comprises the St. Charles River and its tributaries had only routine administrative problems.

WATER DISTRICT NO. 16

An effort has been made to go through all the records of the Office of the Clerk of the District Court of Huerfano County in order to make a complete record of legal transfers of water from one ditch to another. As of this date, 41 changes in point of diversion have been noted for which there is no record in the Office of the State or Division Engineers. It is hoped that with the completion of research of these records that much of the conflict between various ditch owners about their proper diversion points can be relieved.

The City of Walsenburg still refuses to install proper measuring devices for the water which it diverts from the Cucharas River. It also refuses to install any staff gages on any of its reservoirs in order

that the contents of water in them can be obtained. They contend that their direct flow rights are their own to either use for an immediate need or for some future use whether it be to the detriment or not of other senior downstream appropriations on the stream system. This problem will have to be resolved before any semblance of authority of the Office of State Engineer in the area can be recognized.

WATER DISTRICT NO. 17

Water District No. 17 had routine administrative problems with the exception of the occasional flooding conditions from the middle of June until August 20, 1965.

Directions were issued to the Fort Lyon Canal Company for some rehabilitation work to be done on Horse and Adobe Creek Reservoirs. These reservoirs have been permitted to let their spillway and control facilities to fall into a partial state of disrepair due to several previous years of lack of water availability.

Damage estimates for several of the major canals in the area as computed by the Bureau of Reclamation are as follows:

Catlin Canal	\$ 86,000
Fort Lyon Canal	56,200
Holbrook	7,500
Las Animas Consolidated	2,500
Otero	10,000
Rocky Ford	5,400

WATER DISTRICT NO. 18

The controversy over the relative priorities of right between the so-called Bent County and Las Animas County adjudications has not been determined as of this date. It seems as though each of the two sides

is confident of victory if and when such a determination be made. There has been considerable talk of negotiation so long as a status quo is permitted to remain, but that appears to be an improbable solution.

Considerable reluctance remains on the part of water users on Trujillo Creek to install proper headgates. The fear is that if they are installed, proper regulation would all but deny those rights which have never been adjudicated. Their position is taken with proper concern although it cannot be permitted to continue.

WATER DISTRICT NO. 19

Water District No. 19 had a majority of its major ditches washed out during the mid June flooding on the Purgatorire River. After this occurred, there was generally more than sufficient water to deliver to those rights which were entitled to the same.

Estimates made by the Bureau of Reclamation to repair the diversion facilities damaged by the June flooding are as follows:

Baca	\$ 42,000
Chilili	12,000
El Moro	4,275
Model	120,000
Lopez	73,500
South Side	8,875
Victor Florez	1,200
Hoehne	12,400
Burns-Duncan	170
Lewelling McCormick	390
Salas	21,000
Juan Vigial	1,000
Tijeras	21,000

Considerable controversy originated in the district regarding a demand by the Highland Canal near Las Animas on the Purgatorie River for satisfaction of its senior right. The Highland Canal has a date of appropriation of May 31, 1866 for 16.7 cubic feet of water per second of

time. Indications are that the right had been ignored so far as its demand requests had been concerned, and, it was permitted to pick up only surplus flooding of water that was in excess to the needs of the users in the Trinidad area. No attempt was made to bypass the water to the Highland Canal from the Trinidad area when the river was dry. However, after one small flood which originated above Trinidad, a bypass of 40 cubic feet of water per second of time from the Trinidad areas was made on the tail-out of the flood. This quantity of water appeared to be adequate to supply the demands of the Highland Canal. Although this passage was made for some three weeks, it appears that water users of the Trinidad area may be unduly concerned about the demands of the Highland Canal. It is my opinion that the bypass of water in a dry river bed would be highly inefficient. Furthermore, it is not too often that 40 cfs of water can be derived from Water District No. 19 for the purpose of satisfying the Highland Canal senior right. The agreement between the Highland Canal and Nine Mile Canal Companies wherein the Nine Mile Company can pick up all water at its headgate on its junior right if the flow gets under 8 cfs during the primary irrigation months, further eases the demand on the appropriators in the Trinidad area.

The stock pond controversy has subsided somewhat. Very few applicants have been required to equip their ponds with outlet pipes. The biggest problem still appears to be related to the delay from the time that an application is sent to the Office of the State Engineer in Denver until it has been processed.

WATER DISTRICTS 66 & 67

Water Districts 66 and 67 had severe flooding during the June floods. Many of the streams within the two districts had flows far in excess of anything previously recorded. The towns of Lamar, Holly, and Granada were inundated in many places to a depth in excess of 7 feet.

The controversy over Clay Creek dam was temporarily deferred in as much as the dam was washed out during the June flooding. There is talk that the Colorado Fish & Game Department may decide to rebuild the dam, but it is my personal opinion from an engineering judgment factor that this should not be done, unless the original plans are completely re-modified.

John Martin Reservoir set new records for storage. As a result of this fact, the controversy has been renewed over the establishment of a recreation pool in the reservoir. Primary problems connected with the establishment relate to the acquisition of water rights to compensate for evaporative losses and agreement as to whether the flood pool, recreation pool, or conservation pool must stand losses due to siltation. The Corps of Engineers made an estimate in 1956 that 15,000 acre feet of silt had been deposited in the reservoir during the runoff of 1955.

Bureau of Reclamation estimates of flood damage to the major canals of the area are tabulated as follows:

Amity Mutual	\$ 25,800
Buffalo Mutual	41,234
Fort Bent	69,000
Granada Drainage	60,600
Holly Drainage	39,200
Lamar Canal	28,300
Lubers Drain	4,400
Manvel Canal	9,800
Hyde	1,400
Keessee	23,800
Buttes Reservoir	49,271

TABULATION OF WATER COMMISSIONERS' ANNUAL REPORTS
FOR IRRIGATION SEASON OF 1965

IRRIGATION DIVISION NO. 2

Dist. No.	First day water was used from natural stream	Last day water was used from natural stream	Number of acre feet water diverted by canals for season *	Total acreage irrigated
10	Nov. 1, 1964	Oct. 31, 1965	51,815	12,498
11	April 13, 1965	Oct. 31, 1965	153,210	26,014
12	Nov. 1, 1964	Oct. 31, 1965	370,722	20,221
13	April 7, 1965	Oct. 31, 1965	71,503	35,827
14	Nov. 1, 1964	Oct. 31, 1965	414,548	110,095
15	Nov. 1, 1964	Oct. 31, 1965	28,932	5,097
16	Nov. 1, 1964	Oct. 31, 1965	71,041	38,135
17	Nov. 1, 1964	Oct. 31, 1965	426,592	160,671
18	April 3, 1965	Sept. 24, 1965	9,575	4,695
19	Nov. 1, 1964	Oct. 31, 1965	92,673	17,728
66	Jan. 5, 1965	Oct. 31, 1965	2,870	493
67	Nov. 1, 1964	Oct. 31, 1965	148,185	65,644
Totals			1,841,666 acre feet	497,118 acres

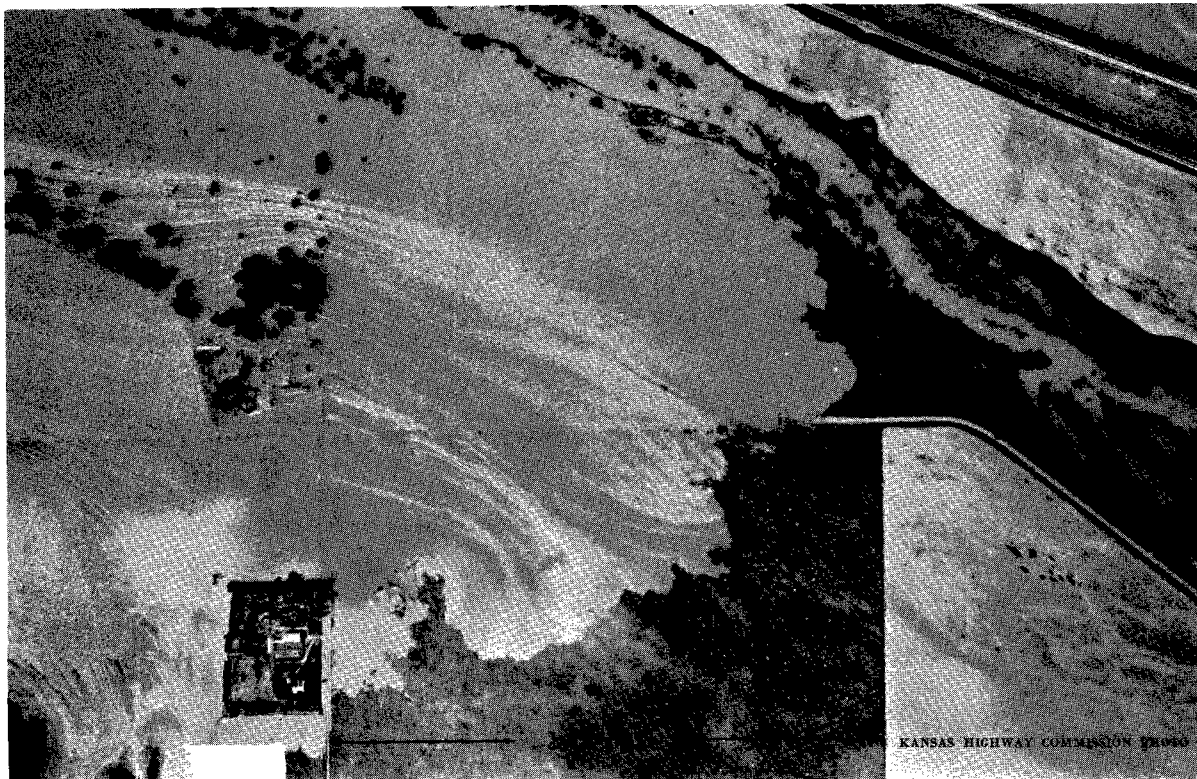
*Includes municipal, industrial, and agricultural uses, as well as that water diverted through a feeder canal for storage purposes.

CONTENTS OF MAJOR RESERVOIRS IN IRRIGATION DIVISION NO. 2.
Oct. 1, 1964 to Oct. 1, 1965, values in acre feet.

Appendix III

Reservoirs	10-1-64	11-1-64	12-1-64	1-1-65	2-1-65	3-1-65	4-1-65	5-1-65	6-1-65	7-1-65	8-1-65	9-1-65	10-1-65
Fountain Valley No. 2	0	0	0	108	115	723	846	876	876	876	2,488	3,110	3,110
Fountain Valley No. 3	0	0	0	0	0	0	0	0	0	0	0	0	0
Monument	210	199	199	199	210	205	228	250	225	363	225	225	225
Sugar Loaf *	5,443	5,436	5,336	5,369	5,369	5,369	5,336	5,041	4,077	17,375	17,375	17,416	16,117
Twin Lakes	9,811	10,264	10,493	10,945	10,983	11,797	12,849	11,773	10,938	54,404	53,375	52,582	50,225
Clear Creek *	10,617	10,506	10,425	10,396	10,392	9,812	8,983	4,346	2,440	11,232	11,232	11,232	11,232
Mt. Pisgah	439	439	439	439	439	439	439	439	439	2,471	2,471	2,471	2,471
Skaguay *	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,952	1,968	1,952	0
Brush Hollow	584	584	584	672	693	704	709	709	709	973	1,271	1,865	2,552
City of Colo. Springs *	4,665	4,399	4,331	4,160	3,972	3,732	3,751	3,604	3,468	6,057	6,105	6,147	6,100
DeWeese-Dye	402	475	869	651	342	1,063	2,310	1,467	778	4,768	4,742	4,612	4,430
Lake Henry	0	0	0	0	0	0	0	0	0	4,370	9,532	8,884	6,773
Lake Meredith	0	0	0	0	0	0	0	0	0	0	2,940	16,630	20,755
Beckwith (Hayden)	155	132	213	301	356	433	520	488	421	497	471	539	502
C.F. & I. Reservoirs *	9,167	9,086	9,860	10,072	10,154	10,167	8,724	10,491	10,219	10,875	11,047	10,669	10,367
Color	672	672	672	672	631	746	735	714	714	1,107	1,421	1,394	1,380
Cucharas	0	0	0	0	0	0	0	272	177	575	1,296	845	666
Huerfano Valley	0	0	0	0	0	0	0	0	0	180	158	158	0
Orlando No. 2	0	0	0	0	0	159	225	0	0	0	0	0	0
Holita	0	0	0	0	0	0	37	37	37	158	158	27	0
Dotson	0	0	0	0	0	0	0	0	0	0	538	538	302
Dye	0	0	0	0	0	0	0	0	0	1,245	3,657	3,697	3,506
Holbrook	0	0	0	0	0	0	0	0	0	3,697	6,899	6,794	6,546
Horse Creek	0	0	0	0	0	0	0	0	0	5,613	23,674	25,712	24,801
Adobe	0	0	0	0	0	0	0	0	0	20,032	49,794	63,894	58,579
Model	0	0	0	0	0	0	0	0	0	12,266	4,513	4,333	3,507
North Lake *	897	870	864	831	755	672	672	652	745	897	897	1,664	1,697
Monument Lake *	1,299	1,266	1,266	1,241	1,152	1,192	1,233	1,217	1,364	1,576	1,625	1,674	1,674
Great Plains	0	0	0	0	0	0	0	0	0	0	0	10,449	21,672
Two Buttes	0	0	0	0	0	840	779	779	1,266	40,014	40,014	39,108	37,113
John Martin	0	0	0	0	0	2,927	642	0	0	343,258	379,073	398,300	369,032
Total	45,454	45,421	46,644	47,149	46,750	52,288	50,447	44,248	39,986	550,557	638,959	696,921	665,334
Munic. Mfg. & Power	33,181	32,656	33,175	33,162	32,887	32,037	29,792	26,444	23,406	49,964	50,249	50,754	47,187
Irrigation	12,273	12,765	13,469	13,987	13,863	20,251	20,655	17,804	16,580	500,593	588,710	646,167	618,147

FLOODS OF JUNE 1965
IN
ARKANSAS RIVER BASIN
COLORADO, KANSAS, AND NEW MEXICO
Preliminary Report of Peak Discharge



UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Denver, Colorado

October 1965

Floods of June 1965

in

Arkansas River Basin - Colorado, Kansas, and New Mexico

Torrential rains June 15 to 18, caused floods in the Arkansas River basin in eastern Colorado, western Kansas, and northern New Mexico. The attached tabulation contains provisional results of indirect measurements of peak discharge and a few peak discharges determined from stage-discharge relations defined by current-meter measurements. All of these are subject to revision after additional studies are made, particularly on streams where measurements were obtained at more than one location. All streams and sites that were investigated are shown in the tabulation, whether or not computations were complete. Field surveys are completed, and values of peak discharges will be available for all stations listed. In addition to the data tabulated, much other information, such as stream cross sections and water-surface profiles, is available for inspection at the district offices, Surface Water Branch of the Geological Survey at 1455 Ammons Street, Denver, Colo., Federal Building, Santa Fe, N. Mex., or 403 Federal Building, Topeka, Kans.

A complete report concerning the floods in the Arkansas River basin in Colorado, northern New Mexico, and western Kansas will be published when all computations are complete.

The summer floods in eastern Colorado, western Kansas, and northern

New Mexico were major hydrologic events. Many previous maxima were exceeded, some several fold. In many instances, alterations of the stream valleys by erosion were greater than any previous changes at least since the area was settled. Undoubtedly, the chance of recurrence of such extreme floods is very small, but there is no assurance that they will not occur again next year, or even within a few months. For example, the flood of July 24, only 5 weeks after the June 17 flood, on Fountain Creek near Security, Colo. was an outstanding event in itself. Then there is the small, but still possible, chance that one of those very rare floods, one that would dwarf the floods of 1965, will occur soon.

Antecedent moisture conditions have a minor effect on extremely outstanding floods, but rains had been fairly general and frequent since May 23. According to the Weather Bureau, meteorological conditions were particularly conducive to production of the series of torrential thunderstorms that caused the floods. Near Larkspur, Colo., 14 inches of rain fell on June 16 and 10 to 12 inches were reported at several other locations. Raton, New Mexico had almost 11 inches of rain June 16-18.

The timing of the peaks was generally fortunate, because seldom did two large peaks coincide in the main stem of the Arkansas River. Damage was severe in many urban areas, damage in the Lamar and Holly, Colo., and Springer, N. Mex., areas being the most extensive and widely publicized. Damage estimates by a special Congressional committee total \$43 million

in Colorado alone.

Western tributaries of the Canadian River above Conchas Reservoir, New Mexico, had a major flood on June 15. The same streams and those in the headwaters of the Canadian River were in flood again on June 17, 18. The stage near Sanchez on June 18 was 3 feet higher than that on June 15, 10.2 feet higher than the maximum in 33 years of record, and the highest in at least 100 years. Runoff from both of these floods was completely controlled by Conchas Reservoir.

John Martin Reservoir on the Arkansas River held the entire flood runoff from the basin above it, however the uncontrolled tributary inflow below John Martin Reservoir was so outstanding that towns from Lamar, Colo. to Dodge City, Kans. were extensively damaged.

Cover photograph courtesy of Kansas Highway Commission.

Front of flood on Arkansas River 8 miles west of Dodge City, Kans.

Main channel is at upper right. Note flow lines.

Summary of Flood Stages and Discharges - Provisional Data

Permanent Station Number	Stream and place of determination	Location		Drainage area (sq mi)	Maximum previously known		Provisional maximum June 1965					
		Latitude	Longitude		Prior to June 1965	Year	Discharge (cfs)	Day	Time (hr)	Gage Height (ft)		
995	Arkansas River near Pueblo, Colo.	38°16'02"	104°39'26"	4,686	1885-87	1921	a24.66	103,000				

Map:

Arkansas River at Gage Station near Pueblo, Colo.

1215	Timpas Creek at mouth, near Swink, Colo.	38°01'15" 103°38'20"	481	1922-25	1923	-	-	17	0400	20.95
1225	Crooked Arroyo near La Junta, Colo.	38°00' 103°35'	87	1922-25	1925	14.0	2,940	17	0800	-
1230	Arkansas River at La Junta, Colo.	37°59' 103°32'	12,210	1889, 1893-95, 1903, 1908, 1912-65	1921	18.4	200,000	19	0530	12.90
-	Horse Creek near La Junta, Colo.	38°05'04" 103°21'10"		-	1941	-	85,400	18	-	-
-	Adobe Creek near Las Animas, Colo.	38°05'23" 103°18'44"		-	-	-	-	18	-	-
1240	Arkansas River at Las Animas, Colo.	38°05'08" 103°12'50"	14,417	1939-65	1955	15.03	44,000	19	1630	14.72
-	North Fork Purgatoire River at Weston, Colo.	37°08' 104°51'		-	-	-	-	16	1800	-
-	South Fork Purgatoire River at Weston, Colo.	37°08' 104°51'		-	-	-	-	16	1800	-
-	Purgatoire River near Weston, Colo.	37°08' 104°48'	381		1955	-	1,790	17	-	-
-	Zarcillo Canyon near Segundo, Colo.	37°07'25" 104°45'25"	36.4	1955, 1965	1955	-	1,460	17	1800	-
-	Purgatoire River at Segundo, Colo.	37°07' 104°45'	485	1955, 1965	1955	-	4,400	16	2000	-
-	Burro Canyon at Madrid, Colo.	37°07'30" 104°38'20"	28.3	1925, 1955, 1965	1925	-	23,600	17	-	-
-	Reilly Canyon at Cokedale, Colo.	37°07'56" 104°36'34"	36.7	1955, 1965	1955	-	2,800	16	-	-
-	Long Canyon near Sopris, Colo.	37°07'20" 104°35'20"	104	1955, 1965	1955	-	9,650	17	-	-
-	Raton Creek near Morley, Colo.	37°00'30" 104°26'50"	5.27	1955, 1965	1955	-	402	16	-	-
-	Joe Creek near Morley, Colo.	37°01'00" 104°28'45"	4.54	1955, 1965	1955	-	642	17	-	-
-	Clear Creek near Starkville, Colo.	37°03'38" 104°31'25"		-	-	-	-	17	-	-
-	Raton Creek near Starkville, Colo.	37°06'53" 104°31'18"	60.5	1942, 1955, 1965	1955	-	9,400	17	-	-
-	Crasnack Arroyo near Trinidad, Colo.	37°09'04" 104°30'45"	3.6	1955, 1965	1955	-	820	17	-	-
1245	Purgatoire River at Trinidad, Colo.	37°10'15" 104°30'31"	795	1895-99, 1905-12, 1915-60, 1962-65	1955	14.35	h28,000	17	2000	13.35

5,610

31,700

8,500

1,630

3,410

4,480

4,660

12,900

15,700

Permanent Station Number	Stream and place of determination	Location		Drainage area (sq mi)	Maximum previously known		Provisional maximum June 1965					
		Latitude	Longitude		Prior to June 1965 Period	Year	Gage Height (ft)	Discharge (cfs)	Day	Time (hr)	Gage Height (ft)	Discharge (cfs)
-	Gray Creek near Trinidad, Colo.	37°12'15"	104°27'10"	16.0	1955, 1965	1955	-	1,960	17	1830	-	3,540

53400

				186	1942-43	1942	5.30	r718	18	0900		
1315	Mud Creek near Caddoa, Colo.	38°01'40"	102°52'05"			1942						
-	Dry Creek near Lamar, Colo.	38°03'23"	102°42'00"			-			18	-		28,300
-	Willow Creek near Lamar, Colo.	38°01'56"	102°37'07"			-			18	-		24,300
1330	Arkansas River at Lamar, Colo.	38°06'15"	102°37'38"	19,780	1913-55, 1959-65	1921	17.0	130,000	18	0800	18.90	72,800
-	Clay Creek near Lamar, Colo.	38°00'44"	102°34'26"	228	1951, 1956, 1964	1952	-	27,500	18	-	-	158,000
-	Big Sandy Creek near Calhan, Colo.	39°05'	104°17'			-			17	1700	-	60,700
-	Big Sandy Creek near Lamar, Colo.	38°07'15"	102°28'50"			-			17	0900	-	3,600
-	South Rush Creek near Karval, Colo.	38°51'	103°32'			-			17	-	-	3,710
-	Smith Arroyo near Granada, Colo.	38°04'25"	102°26'25"			-			17	-	-	
-	Wolf Creek near Granada, Colo.	37°57'	102°26'			-			17	0900	-	35,300
-	Granada Creek near Granada, Colo.	37°55'	102°21'			-			17	-	-	13,000
-	Two Buttes Creek near Springfield, Colo.	37°38'	102°37'			-			17	-	-	
1348.45	Two Buttes Reservoir near Holly, Colo.	37°38'	102°32'			-			17	-	-	
1350	Two Buttes Creek near Holly, Colo.	38°01'40"	102°08'20"	817	1942-46	1944	4.77	1,800	17	0900	-	182,000
1360	Wild Horse Creek at Holly, Colo.	38°03'35"	102°08'05"	272	1922-35, 1938-50	1935	-	22,000	17	-	-	10,600
1375	Arkansas River near Coolidge, Kans.	38°01'33"	102°01'00"	25,410	1903, 1950-65	1951	10.67	60,000	17	1200	13.20	133,000
1380	Arkansas River at Syracuse, Kans.	37°58'	101°45'	25,763	1902-65	1908	14.7	87,000	17	1900	21.8	174,000
1390	Arkansas River at Garden City, Kans.	37°57'	100°52'	27,071	1922-65	1951	12.57	33,500	18	2300	16.58	130,000
1395	Arkansas River at Dodge City, Kans.	37°45'	100°01'	30,600	1902-65	1908 1951	13.35	-	19	0300	-	82,000
1400	Arkansas River near Kinsley, Kans.	37°56'	99°22'	31,066	1944-65	1951	11.20	11,700	21	1000	14.60	49,800
1413	Arkansas River at Great Bend, Kans.	38°21'	98°46'	34,356	1895-1965	1921 1942	11.7	-	23	1000	13.18	27,600
-	Travesser Creek near Guy, N. Mex.	36°54'40"	103°26'50"	74.7		-	-	-	17	-	-	12,500

Permanent Station Number	Stream and place of determination	Location		Drainage area (sq mi)	Maximum previously known			Provisional maximum June 1965				
		Latitude	Longitude		Prior to June 1965 Period	Year	Gage Height (ft)	Discharge (cfs)	Day	Time (hr)	Gage Height (ft)	Discharge (cfs)
1535	Cimarron River near Guy, N. Mex.	36°59'15"	103°25'25"	545	1942-65	1954	20.5	8,500	16	2300	13.5	4,300
1536	Chimayun Creek near Santa Rosa, Doña Ana Co., N. Mex.	36°08'55"	105°51'30"	184	1942-65	1954	20.5	8,500	16	2300	13.5	4,300
1537	Mohave Creek near Santa Rosa, N. Mex.	36°08'55"	105°51'30"	184	1942-65	1954	20.5	8,500	16	2300	13.5	4,300

2063	Talby Creek near Eagle Next, N. Mex.	36°31'20"	105°13'30"	8.5	1961-65	1962	2.04	27	16	1930	1.68	19
2064	Clear Creek near Ute Park, N. Mex.	36°31'35"	105°10'30"	7.44	1961-65	1962	1.90	28	17	2200	3.04	775
-	Turkey Creek Canyon near Cimarron, N. Mex.	36°31'25"	104°58'55"	5.25	-	-	-	-	17	-	-	6,660
2070	Cimarron Creek near Cimarron, N. Mex.	36°31'00"	104°58'35"	294	1950-65	1958	3.10	580	17	2030	12.35	15,100
2075	Ponil Creek near Cimarron, N. Mex.	36°34'35"	104°56'55"	171	1915-29, 1950-65	1929	-	5,200	17	2030	11.5	5,630
-	Chase Canyon near Cimarron, N. Mex.	36°34'30"	104°56'25"	23.0	-	-	-	-	17	-	-	-
2085	Rayado Creek at Sauble Ranch, near Cimarron, N. Mex.	36°22'	104°58'	65	1909-12, 1913-65	1942	4.94	v850	17	-	-	-
2110	Cimarron Creek at Springer, N. Mex.	36°21'30"	104°35'50"	1,032	1930-65	1958	w10.55	6,250	18	0130	19.96	-
2115	Canadian River near Taylor Springs, N. Mex.	36°17'50"	104°29'45"	2,850	1940-65	1942	a24.17	x37,400	18	0500	47.5	137,000
2137	Canadian River tributary near Mills, N. Mex.	36°10'00"	104°15'45"	4.2	1954-65	1957	3.99	918	17	-	4.25	1,000
2140	Canadian River near Roy, N. Mex.	35°55'10"	104°21'10"	4,066	1936-65	1942	a14.22	63,800	18	1000	34.5	172,000
2165	Mora River near Golondrinas, N. Mex.	35°53'40"	105°09'30"	267	1915-65	1952	14.4	y14,000	15	0300	7.80	2,210
2180	Coyote Creek near Golondrinas, N. Mex.	35°54'40"	105°09'50"	215	1928-65	1961	9.60	4,050	16	0330	7.85	2,460
2200	Sapello River at Sapello, N. Mex.	35°46'10"	105°15'05"	132	1915-20, 1956-65	1957	7.40	6,160	15	0040	3.90	1,130
2209	Dog Creek near Shoemaker, N. Mex.	35°49'30"	104°53'30"	11.2	1954-65	1964	11.06	1,930	17	-	9.83	2,000
2210	Mora River near Shoemaker, N. Mex.	35°48'	104°47'	1,104	1914-65	1948	12.79	z15,200	15	0200	12.65	14,800
2215	Canadian River near Sanchez, N. Mex.	35°39'15"	104°22'30"	6,015	1912-14, 1935-65	1942	21.3	87,800	18	1300	31.5	145,000
2216	Lagartija Creek tributary near Sanchez, N. Mex.	35°38'	104°25'	1	1961-65	1963	2.63	-	17	-	.83	-
2223	Trementina Creek at Trementina, N. Mex.	35°28'	104°25'	65	1959-65	1962	8.00	-	17	-	2.58	-
2225	Conchas River at Variadero, N. Mex.	35°24'10"	104°26'35"	523	1936-65	1942	19.96	44,000	17	0100	10.4	8,880

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- a Site and datum then in use.
- b Flood of June 4, 1921, discharge, 34,000 cfs. Flood of May 30, 1935, discharge, 35,000 cfs.
- c Flood of June 4, 1921, discharge, 28,600 cfs.
- d Maximum stage and discharge known since at least 1900. Caused by Apishapa Dam failure.
- e Datum then in use.
- f At site 15 miles upstream.
- g Maximum discharge known since at least 1859, 45,400 cfs Sept. 30, 1904.
- h Greatest flood known since at least 1859 occurred Sept. 30, 1904.
- i Flood of June 22, 1954, reached a stage of 17.23 ft (discharge, 13,500 cfs).
- j Flood of July 22, 1954, reached a stage of 14.40 ft (discharge, 26,300 cfs).
- k Greatest flood known occurred Oct. 1, 1904.
- l At site 9 miles southwest of Caddoa; drainage area, 435 sq mi. Contents in acre-feet.
- m Flood in June 1949 reached a stage of 9.42 ft (discharge, 6,840 cfs).
- n Flood in June 1949 reached a stage of 23.36 ft (discharge, 38,400 cfs).
- s 2.0 ft lower than that in 1951.
- t A peak stage of about 26.0 ft observed in 1942.
- u At outlet of Lake Maloya 4 miles upstream, drainage area 26 sq mi.
- v A greater flood occurred June 10, 1913, discharge not determined.
- w A stage of about 22 ft, present datum, occurred Sept. 29, 1904.
- x Flood of Sept. 29, 1904, discharge, 91,100 cfs.
- y Floods of Sept. 29, 1904, and June 11, 1913, probably exceeded 25,000 cfs.
- z Floods of Sept. 29, 1904, and June 11, 1913, probably exceeded 30,000 cfs.
- aa Contents in acre-feet. Increase in contents, 204,700 acre-feet June 14 to 19.
- bb Little or no flow.
- cc At site 15 miles downstream, drainage area 241 sq mi.
- dd At site 15 miles downstream, drainage area 528 sq mi.
- ee Flood of May 1914 reached a stage of 24.0 ft; a higher stage probably occurred in October 1904.
- ff Flood of Sept. 23, 1941, reached a stage of 13.82 ft (discharge, 44,000 cfs).

