

M. C. HINDERLIDER
STATE ENGINEER

C. C. HEZMALHALCH
DEPUTY



L. T. BURGESS
CHIEF HYDROGRAPHER

W. T. BLIGHT
CHIEF CLERK & DRAFTSMAN

STATE OF COLORADO
ENGINEERING DEPARTMENT
DENVER

Durango, Colorado.
February 6- 1952

SUBJECT:

Mr. M. C. Hinderlinder,
State Engineer,
Denver, Colorado.

Dear Sir:

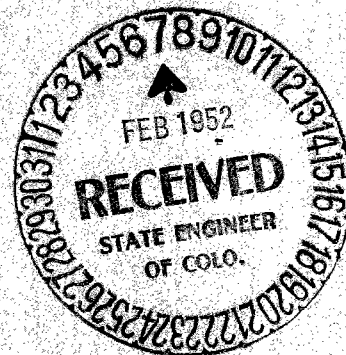
Herewith is the annual report of Division Engineer,
Irrigation Division 7 for the year of 1951.

This is ^a rather lengthy report in comparison with
former reports but since none have been published for
years it was thought that all details of administration
in this division might as well be recited.

Respectfully,

A handwritten signature in cursive script that reads "J. R. Williams".

J. R. Williams
Division Engineer.



ANNUAL REPORT OF DIVISION ENGINEER

IRRIGATION DIVISION 7

1951

The irrigation season of 1951 was a repetition or continuance of the drought that started in July 1949, went thru 1950 and lasted thru July 1951. The greatest deficiencies occurred at the lower elevations thruout the irrigated areas. The official weather records at Cortez afford the best example of the lack of rainfall.

Years:	1949		1950		1951	
Month :	Monthly	: Depart-	Monthly	: Depart-	Monthly	: Departure:
	: Prec. Ins.:	ure	: Prec. Ins.:	ure	: Prec. Ins.:	:
Jan. :	:	:	1.10	: - .10 :	1.27	: 17 :
Feb :	:	:	1.15	: - .26 :	0.41	: - 1.00 :
March :	:	:	0.53	: - 1.08 :	0.41	: - 1.20 :
April :	:	:	0.51	: - 1.14 :	0.60	: - 0.85 :
May :	:	:	0.44	: - 0.47 :	0.55	: - 0.36 :
June :	:	:	0.47	: - 0.13 :	0.02	: - 0.58 :
July :	0.91	: - 0.66 :	0.97	: - 0.60 :	0.35	: - 1.22 :
Aug. :	0.93	: - 0.82 :	0.11	: - 1.64 :	1.63	: - 0.12 :
Sept. :	0.48	: - 1.25 :	0.74	: - 0.99 :	1.37	: - 0.36 :
Oct. :	1.25	: - 0.33 :	Trace	: - 1.56 :	2.08	: 0.52 :
Nov. :	0.64	: - 0.38 :	0.35	: - 0.67 :		
Dec. :	1.25	: - 0.32 :	0.27	: - 1.30 :		
Total	5.44	- 3.76	6.34	- 9.94	Total thru July 3.61 - 5.04	
Percent		- 41		- 61		- 58

Total Prec. 25 Mos. 15.39. Deficiency 18.74. Minus 55 percent.

The extreme dry spell extended from May 21st. to July 22d. During that period there was recorded 0.02" at Cortez, 0.05 at Ft. Lewis and 0.14 at Pagosa Springs. Then there was a 30 day dry spell in September.

The accumulated water content in snow on the water sheds was 8.1 ins. or fifty six percent of average as of April 1st. on the San Juan. ^{and} 8.3 ins. or sixty one percent of average on the Dolores.

Stream flow was about fifty percent of average for the April- July period. The deficiency in ground water and the lack of top soil moisture on farm, pasture and range lands at the beginning of the season and the continued dry conditions thru spring and early summer, combined to cause severe crop losses and to prevent the use of pasture and range lands.

There was a total of 392,260 acre feet used from natural streams which was 152,550 a.f. less than the amount used in 1950. The total number of acres irrigated was 161,500 which was about average but the quantity per acre was 72 percent of last year. The amount used from storage was 77,020 ac. feet which 37,420 a.f. less than in 1950. The reservoir water was applied 84,070 acres. A decrease of 12,500 from 1950 acreage.

The maximum amount stored in reservoirs during the season was 108,360 acre feet which was fifty three percent of the storable or reservoir capacity of 204,000. The total amount stored included 14,600 ac.ft. in Cascade reservoir which is used for hydro-electric ^{power} production at Tacoma. The dates of maximum storage or when reservoirs were filled, varied from May 1st. to June 24th, on which date the Vallecito Reservoir had 63580 a.f.

Administration.

The details of water administration were many and varied and the most complex ever experienced. Exact details had to be kept in respect to delivery of water from reservoirs where the same was delivered to the streams and mixed with natural flow. This was particularly true on Pine River under the Vallecito Reservoir and on Mancos River under Jackson Gulch Reservoir. The summations of operation by such reservoirs follows:

Summary of Operation- Vallecito Reservoir- 1951

Amount in reservoir April 1-----	27,130 a.f.
Computed Inflow, April 1 to Oct. 31-----	<u>119,470 "</u>
Total	146,600 "
Measured Outflow, April 1 to Oct. 31-----	<u>135,310 "</u>
Computed Balance	11,290 "
Amount in reservoir Oct. 31 -----	17,340 "
Apparent Gain-----	6,050 " ?

Summary of Operation - Jackson Gulch Reservoir

Amount in reservoir Feb. 1-----	2,331 a.f.
Measured Inflow, Feb. 1 to Oct. 31 -----	<u>4,417 "</u>
Total	6,748 "
Measured Outflow to Oct. 31-----	<u>5,411 "</u>
Computed Balance	1,337 "
Amount in reservoir, Oct. 31-----	<u>1,022 "</u>
Apparent Loss	315 "

Measured Outflow to Natural Stream-----	5,411 "
Measured diversions to ditches from streams-----	<u>5,222 "</u>
Apparent Loss	189 "
Percent of reservoir water delivered to canals-----	96.5

The details under Jackson Gulch Reservoir involved the determination that water was actually being released each day from storage as ordered out by the water users. This sometimes involved an exchange of water being carried thru the reservoir or used under the inlet canal.

It was the policy of our administration to deduct five percent of the amount for each ditch as turned out of storage as a charge for seepage and evaporation loss in the stream channel. It is worthy of note that the summation shows a delivery of 96.5 percent of the total amount turned out.

The Jackson Gulch and Vallecito Reservoirs were operated by the U. S. Bureau of Reclamation.

In Water District 31, Pine River, it was anticipated early in the season that the stream supply and storage would not be adequate for all lands to have a full supply as has been enjoyed since 1941 when the Vallecito dam was completed. Heretofore all water released thru the reservoir has been shared equally by all ditches irrespective of priority on the stream. The total daily amount released at the reservoir has been the sum of all demands by the several ditch companies. Such demands have been made to the Water Commissioner who phoned the information to the reservoir superintendent. Total headgate diversions for a season has been as high as 5.5 acre feet per acre. The project was originally set up to supply 3.5 acre feet at headgate for about 58,000 acres as a full supply. This season there was diverted 2.98 ac. ft. per acre at headgates for 45,473 acres under the reservoir. This total includes 9,493 acres of Indian land which diverted more per acre than some of the junior white land.

On April 1st. 1951, the amount in storage was 27,130 acre feet. The expected runoff for the April- July period was estimated at about 100,000 ac. feet, based on the water content of snow as shown at snow courses on the San Juan drainage. The actual stream discharge of Pine River for the period mentioned was 102, 070 acre feet.

To advise the water users about the probable water supply and to obtain their decision about procedure of operation, some meetings were held at Ignacio. Officials of the Indian Service were agreeable to the past procedure so long as one sixth of the maximum amount of water stored

would be held for them until required for use. The Indians have priority number 1 on the stream and own one sixth of all storage each year. It was decided by owners of some of the white senior rights that the water should be run on a priority basis with supplemental water from storage to be delivered on demand when natural flow was not sufficient to meet demand, so long as the storage supply existed. An allocation of 1.44 acre feet was made of storage water for 35,980 acres of white owned lands. This was on the basis of an estimated 60,000 acre feet as the maximum probable storage as of about July 1. The actual maximum was 63,580 acre feet on June 24-26. An additional 2,610 a.f. was stored in August and gain on the stream permitted a re-allocation of 1.60 a.f per acre of stored water. A total of 55,000 a.f. was allocated to white lands. Some ditches did not use all the stored water allocated . A total of 53,340 a.f was delivered. The difference accounts for some of the gain shown in reservoir operation in preceding table.

To administer the flow on the plan of priority plus storage for each ditch from day to day made a mass of detail records necessary. On June 24th. when the maximum storage was reached, the reservoir superintendent cut the outflow the next day to the amount of computed inflow. This was not enough water to meet ditch demand for all ditches, and meant quick regulation all along the river to ^{maintain} ~~keep~~ the required amount at lower section for Indian and other early priorities. This went on for three days before we succeeded in ^{meeting} ~~obtaining~~ a constant demand by each ditch for certain periods.

An accounting form was set up as follows: Example-

Month:	Water	: Ac.Ft.:	Loss	:	Mean	: Indian:	Net Amt.:	Priority:
July	El. in:	in	:	Outflow:	Demand:	White	:	Supplied:
Date :	Res. :	Res. :	A.F.:	S.F. :	S.F. :	S.F.:	S.F. :	S.F. :
June 30-	38.69:	62342	:					
1 :	38.49:	61907	:	435 :	219 :	575 :	110 :	246 : 60% # 26 :
2 :	38.25:	61430	:	477 :	240 :	575 :	109 :	226 : 45% # 26 :

Then for each ditch under the reservoir a record was kept as follows: Example is for Spring Cr. & Pine River Canal.

Ditch Spring Cr. & Pine River No. Acres. 15,666
 Month July- 1951 Total Storage S.F. 11,374
 Allocated
 Pr. No. & A'mt. 26 --203.9 S.F. A.F. 22,560

All amounts in Second Feet.

Date	Gage Ht.	Total Flow	Indian Water	River Water	Storage Water	Accum. Storage	Balance Storage	Remarks
Am't For'd.						170	11,204	
1	2.80	243	46	122	75	245	11,129	60 % # 26
2	2.78	240	46	92	102	347	11,027	45 % " 26

A duplicate record was kept by the Bureau of Reclamation but since it was thought that it is the duty of State officials to regulate headgates to allow diversions of priority rights plus storage from day to day, and to close gates when all supply was exhausted, it was deemed necessary to keep exact records and to make the necessary computations. We wanted to be sure that when a regulation was made it could be proven correct, and thus enforced without too much argumnet on the part of the ditch owners. In addition to this phase of the operation frequent check measurements were made of inflow to the reservoir to determine the accuracy of our computations of inflow by use of the capacity table of reservoir. The Water Commissioner had to be helped a large percent of the time as such exacting administration was new to him. The capacity of the Division Engineer to keep every thing straight and accurate was also sorely taxed. Another phase of the operation on Pine and Vallecito Rivers above the reservoir entered . The ditches taking water from the streams above the reservoir were regulated or closed in accordance with their respective priorities on the stream. The use of water from Emerald Lake then entered the picture, for lands on Pine River at Granite Peaks Ranch. The original owners (Kirkpatrick and Ritter) of a decreed right for storage

at Emerald Lake and the new owners had protested the inclusion of their lands in the Pine River Irrigation District on the basis that they had an adequate water supply by virtue of such storage. The result was an exchange of ownership of Emerald Lake right to the District for a contract providing for delivery of water to such lands without repayment cost but at cost of operation and maintenance. The contract also provides that when water is not available for Granite Peaks Ranch from the natural stream, water shall be turned out of Emerald Lake. The ditch taking water for such lands is called the Porter Ditch and is not a decreed right. Having been constructed after the general decree for Dist. 31 in 1934. The Water Commissioner closed the headgate of ~~such~~ ^{this} ditch in July. There was an immediate call by the owner for water from Emerald Lake. Examination of the lake at that time disclosed that there was about two feet depth of storage that could be released by tearing out the existing log crib and rock fill dam. The directors of the Irr. District assumed it their responsibility to get the water out and sent a crew of men in for that purpose. They were required by this office to install a Parshall measuring flume and an automatic water level recorder in order to get the record. A total of 340 acre feet was released over a ten day period. The Porter Ditch diverted 173 ac. ft. The balance went into Vallecito Reservoir where it was carried as a credit for such ditch. No diversion was allowed by this ditch until it was certain that water had been turned out in sufficient head to reach the stream and to come thru the channel. The owner of Porter Ditch threatened suit because he claimed water had been turned out for ten days before he was allowed to use it. A small head of water had been out, we found out later, for a week prior to the date the flume was completely installed and the recorder put in operation., The Bureau of Reclamation loaned two men to supervise the installation of the flume and the recorder. A trip was made in and out a week later by the writer to change the chart record and to make the computations of flow. The threatened suit did not develop. The district spent

fifteen hundred dollars in removing a section of the dam and in building a measuring flume. They planned to restore the dam and put in a headgate but after re-studying the contract the directors decided that it may not be their responsibility after all . Consequently there will be no storage there in 1952 and a first class lawsuit may develop after all, but it will not be against the water officials. Summer flood flow will not erode the dam as it is of tight granite and will withstand overflow but the measuring flume in the channel between the two lakes will probably be washed out.

Trans-mountain diversion from headwaters of Pine to Rio Grande by Weminuche Pass Ditch caused another headache. Early in June the stream flow into the Vallecito reservoir was reported by the superintendent there as being less than the demand on the stream. A trip was made one day and back by the writer via horseback and accompanied by some of the Directors of the District to stop such diversions from the North Fork of Pine and from La Osa Creek. On return it was found that the stream flow had increased so as to allow such diversions. This went on until June 26th. when the flow definitely decreased to a point necessitating the closing of such headgates which was done on the 28th. This time, however, the writer took two days for the trip in and out. The Water Commissioner is too old to make such a trip. There has been no record received by this office from Div. 3 of the total amount diverted to the Rio Grande either from the Pine, Piedra or San Juan Rivers. In fact it is doubtful if the amounts are known. The measuring flume on divide for Weminuche Pass Ditch is a double barreled rectangular outfit with a recorder in the middle of the structure. There had been no rating of the flume last year. This outfit looks more like some farmer's abortion than a structure required by a division or other engineer.

Administration was made more difficult and time consuming by the resignation of Water Commissioner in Dist. 29 at Pagosa Springs. This

made it necessary for the Division Engineer to take over regulations in that area as much as time would permit. No qualified person has as yet been recommended for appointment.

On the Dolores River, Water Districts 34 and 69, there was trouble about diversions along the stream of water being released to the river from Groundhog reservoir. There is need for appointment of a deputy in Dist. 34 to keep close tab on some ditches. The Water Commissioner at Mancos has attempted to take care of both streams but in a tight water year that was found impossible. The present budget for payment of all commissioner's and deputation's salaries will not permit the employment of added deputies. It is also difficult to hire a qualified person to work for the short time required.

For the accurate measurement of water diverted from the streams there were installed last year several steel flumes of Parshall Type. A great many and additional headgates have been ordered installed. Steel flumes and headgates have been specified. Fulfillment of the orders now depends largely on the ability of manufacturers to get steel or it may be necessary to use timber.

This has been a rather complete recital of administration in the division except the details of the La Plata Compact which will be covered in a separate report. Other work accomplished during the season was making the required number of stream measurements to satisfy the hydrographic division.

At present there is a heavy snow cover on the watersheds in this area which will give a good water supply in 1952.

Tables of water content of snow, precipitation during the growing season and the tabulated summaries of water commissioner's annual ditch and reservoir reports complete this report.

Water Content of Snow- 1951

San Juan River

Date	Station	Snow Depth Ins.	Water Content Ins.	Average Water Content	Number Years Record	Percent of Aver. 1951
April 1	Upper San Juan	69.1	22.5	34.4	15	65
	Cascade	20.5	6.4	11.4	15	56
	Silverton	10.8	3.4	4.8	15	71
	Granite Peaks	0.0	0.0	7.4	10	0
	Average	22.5	8.1	12.8		63

The water content at Cascade has been found to reflect almost exactly the stream flow thru April- May period.

Dolores River

Date	Station	Snow Depth Ins.	Water Content Ins.	Average Water Content	Number Years Record	Percent of Aver. 1951
April 1	Rico	12.0	3.4	8.5	15	40
	Lizard Head	38.9	14.0	19.9	15	70
	Lone Cone	26.5	7.4	12.6	15	59
	Average	25.7	8.2	13.7		60

Precipitation Record- 1951

Station	Month													
	April	May	June	July	Aug.	Sept.	Total	April	May	June	July	Aug.	Sept.	Total
	Amt.	Dep.	Amt.	Dep.	Amt.	Dep.	Amt.	Dep.	Amt.	Dep.	Amt.	Dep.	Amt.	Dep.
Cortez	0.60	-.85	.55	-.36	.02	-.58	.35	-1.22	1.63	-.12	1.37	-.36	4.52	-3.49
Ft. Lewis	1.87	.46	.69	-.57	.05	-.75	2.29	.14	2.37	.08	1.06	-.86	8.33	-1.30
Ignacio	1.93	.73	1.12	.16	T	-.84	0.85	1.02	2.32	.16	.29	1.34	6.51	-2/15
Pag. Sprgs	1.17	-.56	0.57	-.75	00	1.03	.14	2.18	3.21	.57	-----	5.09	-3.95	
Silverton	1.13	-.67	1.08	-.30	-----	1.33	1.46	3.21	.05	1.25	1.59	8.00	-3.97	
Vallecito Dam	No Report		.05	-.78	1.48	-.37	3.17	-.02	0.60	1.57	5.30	-2.74		
Average Departure	-.89	-1.62	-3.20	-6.11	Plus 0.72	-5.72	-17.60							
Percent	- 12	-29	- 96	- 49	"	4	- 56	- 32						

Critical period was thru May and June as affecting stream flow and crops.

Tabulated Statement of Water Commissioners Annual Ditch Reports.

Dist. No.	Amount : S.F.	Capacity : S.F.	First Day : Nat. Stream	Last Day : Stream	Number of Days Water Was Used	Average Daily Amt. : S.F.
29	589	* 639				
30	589	958	Apr. 1	Nov. 15	229	245
31	734	887	Apr. 30	Oct. 31	185	277
33	276	577	Feb. 27	Nov. 25	272	25
34	915	1041	Mar. 25	Nov. 15	232	269
69	101	90	Mar. 19	Aug. 25	100	20
Total	3204	4192	Feb. 27	Nov. 25	272	721

Continued:

Dist. No.	Number Acre : Feet Used : Stream	Total Number : Acres That Can Be Irrigated	Total Number : Acres Irrigated
29	* 35,000	* 37,000	* 15,000
30	112,270	59,789	26,523
31	102,580	57,978	57,978
33	13,860	22,455	8,004
34	124,620	59,875	52,987
69	3,930	2,619	1,010
Total	392,260	239,716	161,502

Tabulated Statement of Water Commissioner's Annual Reservoir Reports.

Dist. No.	Reservoirs	Number of High Water Lines	Area of Water in Acres	Capacity in Feet	Amount in Reservoir	Date of Maximum Storage	Amount in Reservoirs	Amount Used From Storage	Number of Acres Irrigated	
							Nov. 1			
							A.F.	A.F.		
29	5	*	670	*	1500	* 700	0	* 700	* 1500	
30	5		899		25390	**14600	** 14600	120	120	
31	2		3077		128050	63580	June 24 : 17700	53340	36110	
33	1		50		1200	980	June 1 : 0	930	699	
34	9		1209		25670	21070	June 1 : (a) 11750	(a) 3820 17990	45619	
69	2		716		22630	7430	June 1 : 4200	70	26	
Total	22		6621		204440	108360		38250	76970	84074

Note: * Estimated by Division Engineer. No report by Water Commissioner.

** Total includes 10,300 a.f. used from Cascade Reservoir for hydro-electric use at Tacoma.

(a) 3820 acre feet stored at Groundhog reservoir in Dist. 69 but used in Dist. 34.