

Source and Disappearance of the Total Water Supply

in

New Mexico

by

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This paper is presented to give a broad picture of the total amount of water received in New Mexico and in a broad way to account for its disappearance.

Water is received by (1) precipitation falling on the state and (2) the flow of streams into the state,

Water disappears or is used as follows: (1) domestic and stock water; (2) municipal and industrial uses, (3) irrigation, (4) native and cultivated plants on non-irrigated lands, (5) evaporation, (6) percolation and (7) run off through streams leaving New Mexico.

A broad accounting is all that is attempted here. This is necessary because the precipitation varies widely from year to year. There is only limited information on plant use and on evaporation. Stream flows fluctuate widely from year to year and the minimums and maximums do not come in the same years, see tables 1 and 2.

WATER RECEIVED IN NEW MEXICO

Surface Area in New Mexico - Acres	77,866,240
13.88" or equivalent in acre feet	1.156
Average Annual Precipitation	
13.88 inches (1892-1954 U.S. Weather Bureau)	
Average acre feet of precipitation for state	90,013,373
Mean in-flow of major streams	<u>1,901,050</u>
Total acre feet received	91,914,423

Tables 1 and 2 give the inflow and outflow of waters through the major streams. There was an average of about 300,000 acre feet more per year flowing out of the state during the period 1945-54 than flowed into New Mexico.

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TABLE 1

In-Flow of Major Streams in New Mexico

Minimum, Maximum, and average for

10 year period 1945-54

	<u>Minimum</u>		<u>Maximum</u>		<u>Average</u>
	<u>acre feet</u>	<u>year</u>	<u>acre feet</u>	<u>year</u>	<u>acre feet</u>
San Juan River at Rosa, N.M.	327,900	1951	1,235,000	1952	656,900
Los Pinos River at Ignacio, Colo.	26,670	1951	297,700	1948	123,700
Animas River near Cedar Hill, N.M.	372,900	1951	985,400	1952	620,000
La Plata River at Colo. N.M. state line	3,400	1934	39,430	1937	14,330*
Rio Grande River near Lobastos, Colorado	71,570	1954	678,000	1948	274,500
Vermejo River near Dawson, New Mexico	1,480	1951	20,180	1948	8,520
Rio Chama at Park View, New Mexico	92,900	1946	384,200	1952	203,100
Total	—		—		1,901,050

\* 7 year average

Source: From work sheets in U.S., Geological Survey, Surface  
Water Branch Office, Santa Fe, New Mexico

TABLE 2

Out-flow of Major Streams in New Mexico

Minimum, Maximum and Average for

10 year Period 1945-54

	Minimum		Maximum		Average
	acre feet	year	acre feet	year	acre feet
Rio Grande at El Paso	273,000	1951	631,800	1943	471,800
Pecos River At Red Bluff, N.M., plus flow of Delaware River near Red Bluff, New Mexico	32,590	1953	165,890	1950	94,360*
Canadian River at Logan, N.M.	21,310	1954	123,600	1947	76,200
Cimarron River near Guy, N.M.	4,340	1947	16,590	1948	7,450
Gila River below Blue Creek near Virden, N.M.	31,880	1951	318,000	1949	96,180
San Francisco River near Glenwood, N.M.	15,660	1953	107,800	1949	37,280
San Juan River at Shiprock, New Mexico	668,300	1951	2,482,000	1952	1,411,000
Puerco River at Gallup, New Mexico	1,470	1944	14,450	1941	6,200**
Total (acre feet)					2,200,470

\* 9 year average

\*\* 5 year average

Source: From work sheets in U.S., Geological Survey, Surface Water Branch Office, Santa Fe, New Mexico

## WATER DISAPPEARANCE - NEW MEXICO

### Domestic, Municipal and Industrial Use

The 1950 use of water in certain communities in the Rio Grande Valley, based on estimates from several sources,\* vary from 25 to 175 gallons per capita. Estimates of future use indicates a need of from 130 to 240 gallons per person in the year 2000.

Using a figure of 100 gallons per person for the entire state of New Mexico, we would have the following domestic and urban requirements.

Estimated population of New Mexico Jan. 1, 1956	806,000
100 gallons x 365 = use per person per year	<u>36,500</u> gal.
806,000 x 36,500 = 29.4 billion gallons or	91,500 (acre feet)

Note: Albuquerque's reported use in 1954 was 159 gallons per person. Albuquerque's present total use is about 26,300 acre feet.  
(150,000 people @159 gallons per day= 8.6 billion gallons or 26,350 acre feet).

### Estimates Future Domestic and Industrial Uses

1. It is estimated that the population of Albuquerque may exceed 375,000 by the year 2000.
2. New Mexico may have a population of 1,250,000 to 1,500,000 by the year 2000.\*  
The population of New Mexico was 531,818 in 1940. It is estimated to be 806,000 in 1956 or an increase of 274,000 or 51.6 percent. At the 1940-56 rate the above estimate seems quite conservative.
3. With modern homes and industrialization, the water use is likely to increase from the above estimate of 100 gallons, to 150 to 175 gallons per person per day.  
By the year 2000 cities, domestic and industrial uses might require about 300,000 acre feet.  
(1,500,000 people at 175 gallons per day = 297,000 acre feet).

\*Bureau of Reclamation, City of Albuquerque and other sources.

Note: Some of this water may be available for other uses. This will depend on whether the water returns to the stream channels and whether adequate sewage reclamation is practiced.

Irrigation Requirements

Acres irrigated in New Mexico  
(from 1950 census of irrigation) 776,000

Water requirements per acre (Mesilla Valley)  
Alfalfa and similar crops 4.52 acre feet  
Cotton and similar crops 2.57 acre feet  
Average all crops 3.63 acre feet

Acres irrigated in New Mexico 776,000  
Estimated requirements per acre (acre feet) 3  
Estimated irrigation requirements  
(acre feet) 2,328,000

Water Use and Outflow of Streams

Present, domestic and industrial use 91,500  
Present irrigation requirements 2,328,000  
Out-flow major streams (average) 2,200,470  
Total acre feet 4,619,970

Some of the water flowing out of the state has been allocated to New Mexico through inter-state compacts as follows:

Canadian River 200,000 acre feet  
San Juan River 800,000 acre feet

Some of the 800,000 acre feet in the San Juan may be lost to New Mexico unless it is allocated to beneficial use in the state in the near future. This could come about by a revision of the total supply available to all states from the Colorado river.

Notes on Water Use

I. Plant use per acre of Alfalfa

Needed for irrigated alfalfa in Mesilla Valley	4.52 acre feet
Normal consumptive use by alfalfa plants	<u>2.49</u> acre feet
Water loss in irrigation (seepage, etc.)	2.03 acre feet

II. Evaporation from water surface

a. Tests in pans

Las Cruces - 80"	Santa Fe - 51"
Deming - 67"	Farmington - 52"

b. Elephant Butte Reservoir

Average content	800,000 acre feet
Average loss	151,600 acre feet
Percent loss	18.95

Conclusion

New Mexico receives, on an average, about 92 million acre feet of water per year. About 90 million of this comes from precipitation and about 2 million from streams flowing into the state. This water supply varies from possibly 60 million acre feet in drought years to above 150 million in the high rainfall years. Some additional water is secured by pumping from underground water which has been, like oil and coal, stored for ages.

The following shows the total amount of water received, amount of water used and outflow, and the amount 87,294,453 or almost 95% of our total supply, where the use might be improved or losses reduced.

Average total acre feet received	
New Mexico	91,914,423
Average total use and outflow	
New Mexico	<u>4,619,970</u>
Average use or loss through:	
(1) grass, forest and brush	)
(2) percolation	)
(3) transportation	)
(4) evaporation	)
	87,294,453

The above 87 million acre feet, (available on the average) is used or disappears in the following ways:

1. Some is used by forests.
2. Some is used on range land to produce grass for sheep and cattle.
3. A little falls on parks and recreational areas.
4. A considerable amount comes in small showers and evaporates from the hot ground without serving any economic purpose.
5. A large amount of the total is used by non-economic plants, such as pinon, juniper, salt cedar and mesquite.

Note: Plants and trees breath off or transpire from 60 to 300 gallons of water for every 1 pound of dry matter produced.

6. Reservoirs lose about 6 feet of water from every surface acre during a year from evaporation.

Small Percentage Reduction in Loss  
Would Add a High Percentage to  
Water Available for Use

If we could save only 3% of this 87,294,000 acre feet of water we would more than double our estimated present requirements for irrigation 2,328,000 acre feet and for domestic and industrial uses 91,500 acre feet.

There appears to be many opportunities to make small reductions in water losses, such as losses through evaporation and through use by non-economic plants. The total of these savings of water could contribute heavily to the economic development of New Mexico.

We have some real opportunities to make economic use of the waters of the approximately 800,000 acres of San Juan water and the 200,000 acres of Canadian River which is allocated to New Mexico but is only partially used at present.