

ECONOMICS OF BENEFICIAL USES OF WATER
Under the General Topic of
Physical and Economic Trends in Beneficial Uses of Water

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The assigned topic, Economics of Beneficial Uses, is one of three subjects in this section of the program being discussed under the general heading, Physical and Economic Trends in the Beneficial Uses of Water. The legal and the economic basis for the value of water in New Mexico will be considered under the concept of "Beneficial Use" as established by the laws of New Mexico and legal discussions and practices which have been followed in the allocation of water rights.

Before considering economic use we should understand the importance of the term "Beneficial Use" in the laws of New Mexico as applied in the Doctrine of Appropriation.

The Territorial Supreme Court in 1898 - stated that "The law of prior appropriation existed under the Mexican Republic at the time of the acquisition of New Mexico, and one of the first acts of this government was to declare that the laws heretofore in force concerning water courses shall continue in force, as stated in the Kearny Code of September 22, 1846."

The New Mexico state constitution signed January 6, 1912 among other items, states four points quite clearly as follows:

- (1) All existing rights to the use of any waters in the State for any useful or beneficial purpose are hereby recognized and confirmed.
- (2) The unappropriated water of every natural stream, perennial or torrential, within the State of New Mexico, is hereby declared to belong to the public and to be subject to appropriation for beneficial use, in accordance with the laws of the State.
- (3) Priority of appropriation shall give the better right.
- (4) Beneficial use shall be the basis, the measure and the limit of the right to use of water.

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The 1931 act, Ground Water Legislation, replacing one passed in 1927, declares that "The water of underground streams, channels, artesian basins, reservoirs, or lakes, having reasonably ascertainable boundaries, are hereby declared to be public waters and to belong to the public and to be subject to appropriation for beneficial use."

Beneficial use is declared in the 1931 Ground Water Act to be "the basis, the measure, and the limit to the right to the use of the waters" described in the act.

Waste of Water

The State Court said in 1914 - "No one is entitled to waste water. When his requirements have been satisfied, he no longer has a right to use the water, but must permit others to use it." This allows the junior appropriator to use the excess above the prior appropriator requirements.

An ammendment of the appropriation code in 1955 provided that - "In issuing permits to appropriate water for irrigation.....the State Engineer shall permit the amount consistent with good agricultural practices and which will result in the most effective use of the available water to prevent waste."^{2/}

We see from the constitution and from the State law that:

- (1) All existing rights of prior appropriation were recognized.
- (2) Unappropriated water in streams and ground water were declared to belong to the public.
- (3) That these waters are subject to prior appropriation for beneficial use. And
- (4) that beneficial use shall be the basis, the measure, and the limit of the right to the use of water.

There are many "beneficial uses" recognized by either court decisions or legislative action in New Mexico. Among these uses are:

Irrigation, Mining and Other Beneficial Uses. A Federal Court stated that the appropriative rules were applied by the earliest settlers to the uses of water for "irrigation, mining, and other beneficial purposes."

^{2/} The above quotes are from Wells A. Hutchins, LLB (Production Economics Research Branch, USDA). The New Mexico Law of Water Rights, published by State Engineers Office in cooperation with Production Economics Branch, USDA, as Technical Report No. 4, Santa Fe, New Mexico . 1955.

Stock Water. The Supreme Court has held that the use of water in stock raising is a beneficial use for which water may be appropriated.

Domestic Use and Use of Water by Travelers. These have always been considered as a beneficial use of water.

Municipal and Industrial Uses. Most of the water used for industrial and municipal purposes in New Mexico is from wells, as is most of the domestic water for the cities and towns of the state. These are recognized as beneficial uses and water rights have been issued for these.

Recreation. The Supreme Court in 1945 held that an organization which has impounded water for future use has no exclusive privilege in their use while they remain public water and no right of recreation or fishing distinct from the right of the public therein.

The water allocations in the Navajo and San Juan-Chama projects, which are now in the process of development, include uses for irrigation, municipal, industry, recreation and power.

Not An Exclusive List

These statements indicate the wide meaning of the term "actual use for some beneficial and legal purpose." The list above is not intended to indicate all of the beneficial uses recognized in New Mexico for which water rights are now in existence.

A Water Right is a Property Right. Court decisions have had this to say regarding the validity of water rights: "The appropriative right, is property," and "it is property right of high order." In one decision the court stated: "Such a right is real estate," and in another decision "an action to determine rights to the use of water is in the nature of a suit to quiet title to realty."

Much more complete papers on the subject of Water Laws and their application under the Doctrine of Appropriation and the Concept of Beneficial Use are included in the report of the Fourth Annual New Mexico Water Conference. Important papers, among others, which were reread in preparation of this paper were those by Wells A. Hutchins, Robert Emmet Clark, Ross Malone, and Justice Irwin Moise, all eminent attorneys and authorities in this field.

All of these men recognized that there are problems in connection with prior appropriation and beneficial use. Justice Moise stated in his paper, and I quote,

"Let us inquire, whether our reliance on the prior appropriation doctrine slightly modified, by what was said in Young & Norton v. Hinderlider, supra, if still applicable, and in the Cartwright case, supra, and without giving preference to one (beneficial use over another was poorly conceived or has not worked.

"I am constrained to feel it has worked reasonably well for two principal reasons. First, demands for other uses are only now arising. If use for irrigation had not been made, water which flowed unused downstream during the many years since this country was settled would have been lost entirely, either by passing unused to the sea, or to what would have been a worse fate, so far as we are concerned, by being put to beneficial use in states lying between us and the sea, so that prior claims would have arisen in these users to have the flow continue undisturbed.

"What has happened to Arizona on the Colorado River, and to New Mexico to a lesser extent, and what has given rise to the case of Arizona v. California, et. al., is an example of what can happen, and should be sufficient proof of one of the errors present in failing to make the earliest and greatest use of all water available for use in any state.

"Secondly, the appropriation doctrine has been the foundation and basis of a large part of the growth of our State to its present position. It would have been neither desirable nor economical in my mind to have permitted the water to flow by, unused and unclaimed, producing nothing, and being lost forever, with great likelihood that the future flow by the same failure to use was likewise being lost for all time." End of quote.

Professor Clark in his study on "Water Law Institutions and the Community" said,

"our doctrine of appropriation has become hardened into verbal formulations called constitutions and statutes and case decisions, and that whereas our problem heretofore has been one of rights of appropriation and acquisition, we are entering into a new era where the problems are more related to transfer of rights to different locations or other uses or involve more complex forms of ownership and administration."

Justice Moise in answer to his own question,
 "Can we, or should we by changing our laws attempt to
 give preference to these so-called higher uses?"

stated,

"As to the water already appropriated and put to
 beneficial use for irrigation, the short answer is
 that we probably can't even though we would. Property
 rights have been acquired in this water, and these
 rights are protected against confiscation or unrea-
 sonable or unjustified infringement by both our state
 and federal constitutions."

The Select Committee Print No. 32 on "Water Supply and
 Demand," 1960,^{3/} reports the following population projections
 for the major river basins affecting New Mexico in comparison
 to 20 other river basins and the United States.

Population pro- jection areas	Census		Projection - medium rate	
	1950	1960	1980	2000
Upper Rio Grande- Pecos	1,000,000	1,200,000	1,800,000	2,000,000
Colorado	1,200,000	1,700,000	2,900,000	3,200,000
Total	2,200,000	2,900,000	4,700,000	5,200,000
Total Growth in the Two Basins Over 1950			+2,500,000	+3,000,000

Regional Population Growth Ratio to Average of
 United States Growth

Areas	1960-1980	1980-2000
Upper Rio Grande-Pecos	1.65 : 1	1.35 : 1
Colorado	1.40 : 1	1.90 : 1

Note: The Colorado River is projected to have the highest
 area ratio to United States growth in the United States
 in the 1980-2000 period.

The Rio Grande-Pecos is projected to have the fourth highest
 area ratio to United States growth in the 1960-1980 period. This

^{3/} "Water Supply and Demand," Select Committee Print No. 32,
 August 1960.

basis will be exceeded only by three southwest and south Pacific areas.

The Select Committee rated all of the rivers on the basis of water supplies and water needs by 1980. The number one basin, having the least water was the Rio Grande-Pecos, and the number two water shortage area was the Colorado River basin.

Problems Compounded

The water problem of these two basins important to New Mexico are compounded by the fact that the population growth will be high, while the amount of water to be developed to care for this growth is small, relative to increasing needs of the area, and relative to other United States river basins.

In the Life Magazine, dated December 21, 1961, there is a 14-page article reviewing the water supplies and problems of the United States. It lists the Colorado as "the Nation's river where water is most sought-after and fought-over." The Rio Grande-Pecos is not far behind. Also, the magazine quotes an eminent scientist as saying "you never completely solve water problems, you merely create new choices."

Present Volumes of Water Use in New Mexico

The present use for beneficial purposes as indicated by the next table is about 2.25 to 2.50 million acre feet of water. Of this, about 60 percent is from ground and 40 percent from surface water sources (page 7).

In percentage use, about 94 percent of the total is used for irrigation and 6 percent for municipal, industrial, and other uses.

New Mexico's Allocations Are Now Being Developed

The Navajo and San Juan-Chama developments will put to use 600,000 acre feet of water allocated to New Mexico under the Upper Colorado Compact. Also, the Canadian River is now being dammed, at Logan, to make available to New Mexico the 200,000 acre feet allocated to the State under the Canadian River Compact. These developments will increase our usable water by about 800,000 acre feet over present uses. The saline water plant now under construction at Roswell may make available a significant amount of water primarily for industrial and municipal uses.

NEW MEXICO WATER USE IN ACRE FEET*

<u>GROUND WATER (Diversions - 1955)</u>	<u>Acres</u>	<u>Acre Feet</u>
<u>For Irrigation</u>		
From ground water only	443,020	967,140
Ground water - supplement to surface	144,670	<u>294,520</u>
Total for Irrigation		1,261,660
Municipal and Industrial Uses		104,890
Rural Non-agricultural Uses		<u>13,010</u>
Total All Uses From Ground Water		1,379,560
 <u>SURFACE WATER (Depletion - 1950)</u>		
For Irrigation	507,700	922,200
Municipal and Industrial Uses		<u>20,000</u>
Total All Uses From Surface Water		942,200
 <u>GROUND AND SURFACE WATER</u>		
Ground Water and Surface Water Total Use		<u>2,321,760</u>
Losses - evaporation from reservoirs	331,000	
non-beneficial uses	<u>833,000</u>	
Total losses		1,164,000
Total disappearance		<u>3,485,760</u>

* Source: Ground water - U. S. Geological Survey and State Engineer - 1955.
 Surface water - U. S. Bureau of Reclamation - 1950.
 State Engineers report to Select Committee, September 1960.

Even with these developments the people of New Mexico must give full recognition to the increased demand for water which will be associated with the projected population increases. This will also give rise to many questions as to how the present property rights to water may be transferred to other and possibly new uses which may be more economically productive than in its present uses. More attention must also be given to conserving both the quantity and quality of the water for all uses in New Mexico.

The Market System Based on Supply and Demand

We know the supply of water in New Mexico is relatively limited and that the demand of water in its present and in new uses is increasing. Because the population increases will be mostly in cities and the employment opportunities will be in industries, we would expect a considerable expansion in industrial and municipal uses. However, a larger percentage increase in municipal and industrial uses does not require as large a percentage increase of the State's water supply. For example, a 50 percent increase in water used for industrial and municipal purposes would require only 3 percent of the water that is now being used in New Mexico.

The State Engineers report to the Select Committee^{4/} carries an estimate of increase of water in Bernalillo County which was made by the Bureau of Business Research, University of New Mexico as follows:

Projections of Population and Water Requirements of
Albuquerque Metropolitan Area
(Bernalillo County) 1956-80

Year	Population	Million gallons per day	Total Diversion	
			Per capita	Per 1,000 acre feet per year
1956	220,000	47	-210	53
1960	264,000	58	220	65
1965	354,000	81	230	91
1970	463,000	109	240	122
1980	672,000	168	-250	188
Increase				
1980 over				
1960	408,000			123

^{4/} New Mexico Statement submitted to the U. S. Senate Select Committee on National Water Resources, September 1959. Revised September 1960.

The anticipated increase in demand for water for industrial and municipal use, reflects both the increase in population and increase in gallons of water used per person per day.

It is estimated that the population of New Mexico will be 2,256,000 by 1980, or an increase over 1960 of 1,267,000. The diversion for use in the Albuquerque metropolitan area in 1956 was at the rate of 210 gallons per person per day. The estimated required diversion for 1980 is at the rate of 250 gallons per person per day. It should be pointed out that these rates are much higher than present state and national average diversion rates. However, based on these estimated increases in population and in per capita use, it would require a 1980 diversion of 355,000 acre feet more than in 1960.

This 355,000 acre feet is a sizable increase, but we are developing about 800,000 acre feet of new uses from the waters allocated to New Mexico from the San Juan and Canadian rivers. This indicates that New Mexico has adequate water to meet the new demands if the water is conveyed to the correct places. About 110,000 acre feet of water from the San Juan is presently planned for diversion to the Rio Grande Basin and another 125,000 acre feet of diversion is possible under present Bureau of Reclamation plans.

Value in Various Uses

A Resources for the Future Study,^{5/} led by Dr. Wollman at the University of New Mexico and participated in by other staff members at the University of New Mexico, staff members of the State Bureau of Mines and Mineral Resources, and staff members from New Mexico State University came out with a rough estimate of the value of water for various uses as shown on next page.

The Values Maintain Only for Limited Quantities

It should be noted that the value of \$293.00 per acre foot of water was for 18,000 acre feet of water, and the value dropped to \$198.00 when 37,000 acre feet were allocated

^{5/} Wollman, Nathaniel, et. al., The Value of Water in Alternative Uses - With Special Application to Water Uses in the San Juan and Rio Grande Basins of New Mexico, University of New Mexico Press, 1962, 426 pp.

Gross Product Per Acre-Foot of Water in Alternative Uses
San Juan and Rio Grande Basins of New Mexico

Uses	Depletion : acre feet	Value ^{1/} : per acre foot
Recreation	18,600	\$ 293.00
	37,000	198.00
Municipal and Industrial	72,600	\$3300.00
	147,600	1273.00
Agriculture	379,000	\$ 18.00
	379,000	17.00

^{1/} After adjustment for total water cost.

to recreation. In municipal and industrial uses, it was estimated that the use of 72,000 acre feet could contribute as incomes: \$3,300 per acre foot, while 147,000 acre feet in the same uses could contribute only \$1,237 per acre foot. In agriculture with average crops on average quality land water has a value of \$17.00 or \$18.00 per acre for all the water available to it. Also, the per capita income per user of water in agricultural uses is equal or above per capita income per user in the other above mentioned uses.

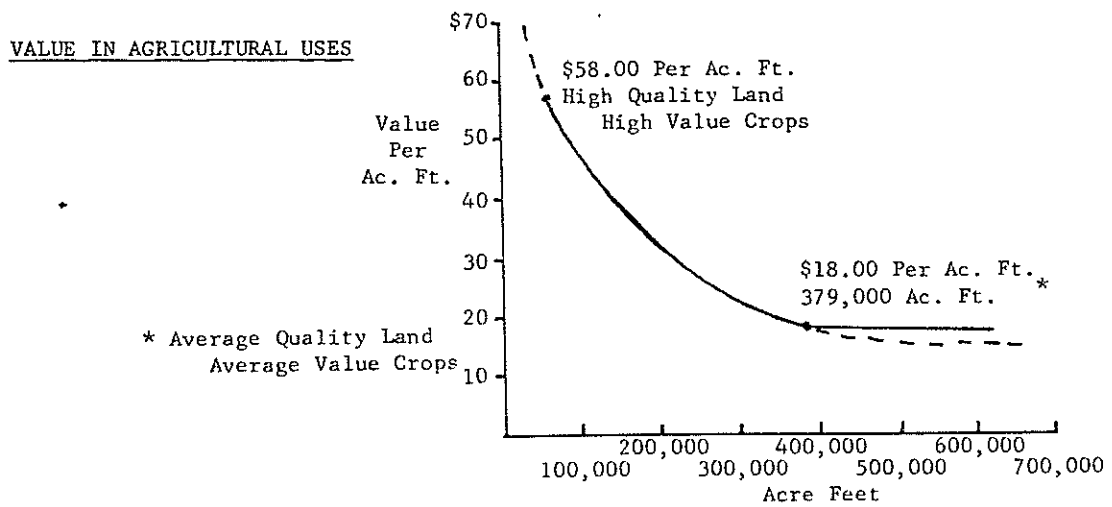
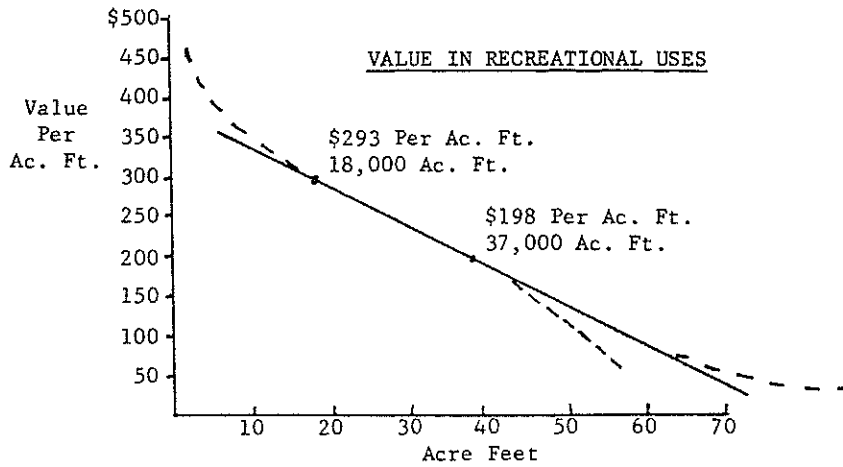
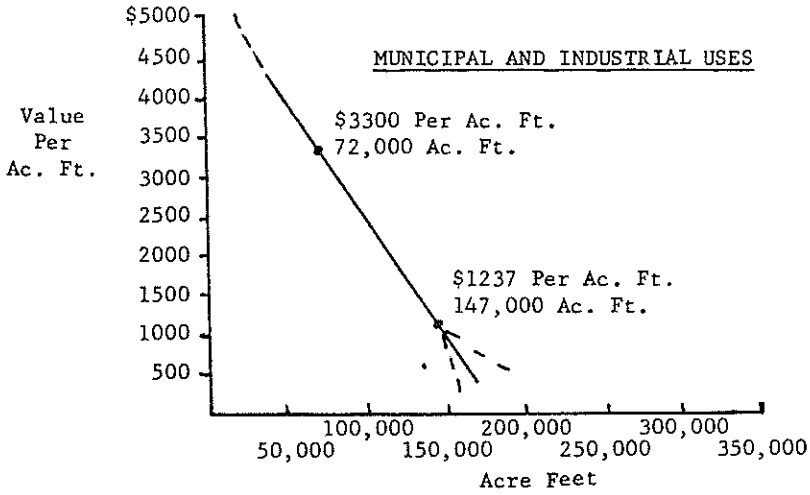
Chart I indicates only the relative values in each and the changes in value as the amounts allocated increase. For minimum amounts of water in municipal uses the values would be much higher than indicated. The same is true in other uses.

This indicates that the marginal value of each added acre foot of water for recreational and municipal uses drops rapidly, but that these uses can pay high prices for the water they can put to efficient use. The marginal value in agricultural uses is stable, regardless of the amount allocated, because we have large acreages of land which are suitable for irrigation if water were available.

Actual Dollar Demand Should Acquire the Necessary Supplies

This indicates that when the demand increases and the demand is expressed in a "bid price" for water for use in recreational and municipal and industrial uses, that the necessary water will easily transfer from agriculture to the higher value uses, under the ordinary market price system.

GROSS PRODUCT PER ACRE-FOOT AFTER ADJUSTMENT FOR TOTAL WATER COST



These water transfers are being made in certain areas of New Mexico now and more will be made as the purchase offers are made. Many acres of land have been transferred from farming uses to municipal and industrial uses. There is no apparent reason why this might not happen rather freely in the transfer of water as the demand increases.

To summarize I should like to emphasize the following points:

The majority of the water in New Mexico has been appropriated under the doctrine of appropriation for beneficial use by those holding the water rights.

These appropriated rights are property rights and as the courts have stated, "property rights of a high order."

New Mexico is an area of scarce water supply. However, we are adding about 800,000 acre feet of water for new uses under the San Juan and Canadian river developments. This amounts to about a 30 percent increase above our present controlled uses.

New Mexico during the last 10 years had an increase in population of 36 percent or about double the national average. It is expected that a similar rate of increase will be experienced during the next 2 or 3 decades.

We will be forced to conserve water and to protect both the quantity and quality of the water available for beneficial uses.

There will be need for shifting some of the water from its present use to other uses.

The market system, based on supply and demand, with demand expressed in firm money offers, and not just on expression of wishes or desires, has functioned in the past and is functioning at present to shift water from one use to another.

Economics indicates that the market system can be depended upon and should be depended upon to allocate these waters to their future uses, whether they stay in their present or move to some other use.

Water transfers are presently being made where purchase offers are made. These real estate rights to water should be expected to move in the future from one use to another just as the realty rights in land and building are commonly transferred.

Winston Churchill has been quoted as follows:
"The further you look back, The further you can see ahead."

A study of our past history with the Doctrine of Appropriation and Beneficial Uses in New Mexico, and of the emerging problems of states, that do not have good basic water laws, indicates that in spite of its faults, New Mexico is fortunate to have a time tested method for the allocation of both surface and ground waters. In 1954 the Iowa Legislature passed a water rights law establishing a permit system administered by a water commissioner (Iowa Code, Chapter 455A, 1958). This Iowa law regulates both existing and unused rights to water. Our State water laws permit development of our water resources based on a long history of property rights in water and a steadily developing economy in New Mexico has resulted under these laws.