

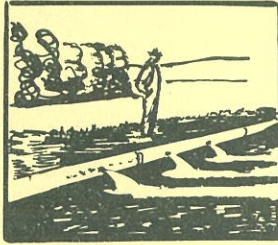
Fourth Annual
New Mexico

WATER CONFERENCE

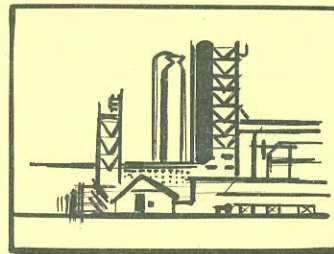
WATER

and

WATER LAW



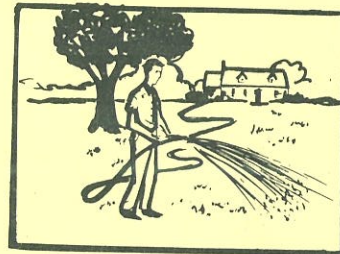
Irrigation



Industrial



Recreation



Municipal

NOVEMBER 5 - 6, 1959

NEW MEXICO STATE UNIVERSITY

UNIVERSITY PARK

NEW MEXICO

NEW MEXICO WATER CONFERENCE

Sponsored by

New Mexico State University Divisions

Agricultural Experiment Station
College of Agriculture

Agricultural Extension Service
Cooperative Agent, USDA-ARS, SCS
College of Engineering

Water Conference Advisory Committee

New Mexico Department of Development

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F. X. Bushman
New Mexico Institute of Mining and Technology
Socorro, New Mexico



The New Mexico State University Water Conference Committee and the Water Conference Committee meet with Governor John Burroughs and President Corbett to discuss plans for the Fifth Annual Conference to be held in 1960. ^{1/} Left to right, far side of left table, Francis Bushman, John Gaume, Wm. E. Hale, Dr. J. L. Gardner, Ralph Charles, Dean M. A. Thomas, College of Engineering, New Mexico State University. Near side of table, left to right, W. L. Hanson, Assistant Regional Forester, U.S. Forest Service, Jesse Lunsford, Fred W. Phelps, Dr. Ross Leamer, W. H. Gary, Eldon Hanson,

Head table (left to right) Dr. H. R. Stucky, Conference Chairman, Dr. R. B. Corbett, President, New Mexico State University, Governor John Burroughs, Robert Emmet Clark,

Left side of table, (left to right) James F. Cole, John Patrick Murphy, Fred Kennedy, Mr. Valdez, assistant to Governor Burroughs; William A. Williams, Right side of table (left to right), Walter Nations, Wm. P. Stephens, Delmar Robert, and Dr. Robert H. Black, Dean and Director of Agriculture, New Mexico State University. University Committee Members not shown are: Dr. Harold Dregne and K.A. Valentine. Advisory Committee Members absent were: S.E. Reynolds, Lloyd A. Calhoun, Rogers Aston, and Dennis Harris.

^{1/} See information on committee members on opposite page.

FOREWORD

Water is King among the resources in New Mexico. It has determined where the people live and how they make their living. Water has been a dominant factor in the state up until now. It will become more important as our population grows and our agriculture and industry develops.

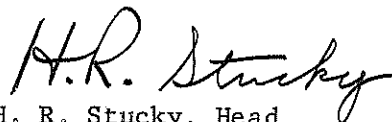
Water Law has been developed in New Mexico over several centuries. The "Public Acequa", or irrigation ditch organization, was established here long before this region became a part of the United States. These organizations were recognized in the Territorial Constitution of 1850 and the State Constitution. The New Mexico Constitution adopted January 21, 1911 reads "All existing rights to the use of any water in this state for any useful or beneficial purpose are hereby recognized and confirmed."

Since the ownership and use of New Mexico's water resources is determined by water laws, it was decided by the New Mexico Water Conference Committee to concentrate the Fourth Annual Water Conference program on the theme Water and Water Law. The conferences are held to assist in focusing the attention of the people of the state on the developing demand for water and the need for a well coordinated program of water use and conservation with all major water user groups participating.

The Fourth Annual Conference was planned with four sections, Water Laws, Water and Recreation, Water Conservation and Research and Education. In each of these topics consideration was given to agricultural, industrial, municipal and recreational needs for water and how the water laws apply to these areas. The conferences are open to every interested person and are designed to permit free and constructive consideration of New Mexico's water problems. Each of the conferences has attracted a cross-section of the people of the state who have an interest in water. Milton Hall on the State University Campus has been the site of each of the four conferences.

This Conference was sponsored by New Mexico State University through the Agricultural Experiment Station, Agricultural Extension Service, College of Agriculture, College of Engineering, and Cooperative Agencies of USDA-Agricultural Research Service, and Soil Conservation Service, with the cooperation of the Water Conference Advisory Committee and the New Mexico Department of Development.

The papers appearing in this publication are in the order in which they were presented. The program which follows this statement will serve as an index to the papers.



H. R. Stucky, Head
Department of Agricultural Economics
and General Chairman of New Mexico
Water Conference

NEW MEXICO WATER CONFERENCE PROGRAM

New Mexico State University of Agriculture,
Engineering, and Science

November 5 - 6, 1959

Milton Hall (Student Union Building)
New Mexico State University Campus

THEME FOR CONFERENCE - "WATER AND WATER LAW"

Thursday Morning - November 5

- 8:00 - 8:45 Registration - Milton Hall
- General Conference Chairman - H. R. Stucky
Head, Department of Agricultural Economics
and Agricultural Business, New Mexico State
University
- 8:45 - 9:00 Opening Conference
- Invocation - Rev. Edward Erzen
Immaculate Heart of Mary Church
Las Cruces, New Mexico
- Opening Remarks
- 9:00 - 9:05 Move to separate session rooms in Milton
Hall
- 9:05 - 12:00 Meeting of four sections
- Section A Room - Ballroom
Water Laws -
Prof. Robert Emmet Clark
Chairman
- Section B Room - Small Dining Room
Water Conservation -
Steve Reynolds,
State Engineer, Chairman
- Section C Room - Patio Lounge
Water and Recreation -
W. L. Hanson,
Assistant Regional Forester
Chairman
- Section D Room - Faculty Club Room
Research and Education -
Dr. E. J. Workman,
Chairman

SECTION A - WATER LAWS

Page Number

Room - Ballroom Milton Hall
Chairman - Robert Emmet Clark
Professor of Law
University of New Mexico

Secretary - James F. Cole
Assistant to President and
Agricultural Economist
New Mexico State University

Speakers -

Wells A. Hutchins, Attorney ----- 1
Agricultural Research Service, USDA
Berkeley, California
Pueblo Rights in the West

T. T. Sanders, Attorney at Law----- 21
And Member of Interstate Stream
Commission, Roswell, New Mexico
Problems of the Interstate Stream
Commission

Robert Emmet Clark, Professor of Law----- 29
University of New Mexico
The Pueblo Rights Doctrine in New
Mexico

SECTION B - WATER CONSERVATION

Room - Small Dining Room, Milton Hall
Chairman - Steve Reynolds
State Engineer, New Mexico

Secretary - Robert Guice
Extension Conservationist
New Mexico State University

Speakers -

Jack Koogler, Office of State Engineer----- 43
New Mexico
Phreatophytes and Water Salvage

Steve Reynolds, State Engineer----- 48
Report on Water Desalinization Program

Ivan Wood, Water Consultant----- 52
Formerly Irrigation Specialist, USDA
Denver, Colorado
Water Conservation in Industries,
Municipalities and Agriculture

SECTION C - WATER AND RECREATION

Room - Patio Lounge, Milton Hall
Chairman - W. L. Hanson
Assistant Regional Forester
U. S. Forest Service

Secretary - Jesse Lunsford, Assistant
Professor of Civil Engineering
New Mexico State University Page Number

Speakers -

Dr. James R. Gray, Associate Professor----- 61
of Agricultural Economics
New Mexico State University
Value of Water for Recreation and
Other Uses

Charles A. Richey, Superintendent----- 68
Boulder Dam Recreation Area
National Park Service
Boulder City, Nevada
Water and Recreation

Fred A. Thompson, State Director----- 77
New Mexico Department of Game & Fish
State of New Mexico
Legal Aspects of the Recreational
Program of the New Mexico Department
of Game and Fish

SECTION D - RESEARCH AND EDUCATION

Room - Faculty Club Room, Milton Hall
Chairman - Dr. E. J. Workman, President
New Mexico Institute of Mining and
Technology
Socorro, New Mexico

Secretary - W. P. Stephens, Associate
Professor of Agricultural Economics
New Mexico State University

Speakers -

A. S. Curry, Associate Director----- 82
Agricultural Experiment Station
New Mexico State University
Water Research Needs for New Mexico

Dr. E. J. Workman, President----- 88
New Mexico Institute of Mining and
Technology
Making the Most of New Mexico's Water
Resources Through Research and Education

George W. Worley, Director----- 89
Pack Foundation Project
University of New Mexico
Education Needs in Watershed Conservation

W. B. O'Donnell, Vice-President----- 94
New Mexico State University
Water Resources Education in the Public Schools

Thursday Afternoon - November 5

Page Number

	Chairman - Delmar Roberts	
1:15 - 1:30	Address of Welcome - President R. B. Corbett	
1:30 - 2:00	<u>Honorable Tom Morris</u> ----- Representative in Congress from New Mexico <u>National Water Legislation</u>	98
2:00 - 2:30	<u>Mr. Ross Malone</u> ----- President of American Bar Association Roswell, New Mexico <u>Water Laws as they Affect New Mexico</u>	104
2:30 - 3:00	<u>Mr. Justice Irwin Moise</u> ----- Justice, New Mexico Supreme Court <u>Concept of Beneficial Use in Water Law of New Mexico</u>	111
3:00 - 3:15	Break	
3:15 - 3:45	<u>Mr. Wayne Criddle</u> ----- State Engineer, Utah <u>Competition for Water Among Various Uses in Utah - Planning, Legislation, Administration</u>	126
3:45 - 4:45	Open discussion on the four subjects	
7:00 p.m.	Banquet	
	Toastmaster - Dr. Robert H. Black, Dean and Director of Agriculture New Mexico State University	
	Speaker - Gladwin E. Young----- Deputy Administrator Soil Conservation Service, USDA Washington, D. C. <u>Water and Land</u>	134

Friday Morning - November 6

	Chairman - H. R. Stucky	
8:30 - 9:40	Section Reports - 15 minutes each The general points from the Thursday a.m. sectional discussion will be distributed, before reports are given.	

9:40 - 10:00 Buzz Session - to discuss section report topics

10:00 - 10:20 Recess

10:20 - 11:15 Discussion from floor

11:15 - 12:00 Address by Governor John Burroughs----- 142
Development of New Mexico's Water Resources
Problem

12:00 - 12:15 Conference Summary
Resolution Adopted in connection with the
work of Wells A. Hutchins

12:15 - General Conference Adjourn



Left to right - Professor R. E. Clark, Judge Moise, Mr. Hutchins, Governor Burroughs, President Corbett.

Mr. Wells Hutchins, Attorney for the Agricultural Research Service United States Department of Agriculture, was honored during the Fourth Annual New Mexico Water Conference for having worked for 50 years in research and writing on Water Law in the Western States.

The resolution on the opposite page was passed in recognition of Mr. Hutchins outstanding work.

NEW MEXICO STATE UNIVERSITY
OF AGRICULTURE, ENGINEERING, AND SCIENCE

OFFICE OF THE PRESIDENT

UNIVERSITY PARK, N.M.
Telephone: JACKSON 6-6611

November 24, 1959

Mr. Wells A. Hutchins
Farm Economics Research Division
Agricultural Research Service
United States Department of Agriculture
Berkeley, California

Dear Mr. Hutchins:

During the Fourth Annual New Mexico Water Conference, the following resolution was presented by Robert Emmet Clark, Professor of Law:

WHEREAS, Mr. Wells Hutchins has spent 50 years in the service of the United States Department of Agriculture in research in Water Law:

WHEREAS, Mr. Hutchins has authored Technical Report No. 4, The New Mexico Law of Water Rights, and similar publications for several other states, and in addition, has written many articles for publication in various other forms:


WHEREAS, all law students who study in water cases and all attorneys who delve into water law, make use of Mr. Hutchins' many publications:

THEREFORE, be it resolved that in recognition of the contribution of this long service and high quality of work in Water Law, and the fine paper presented to this the Fourth Annual New Mexico Water Conference, that the Water Conference and the New Mexico State University express appreciation to Mr. Hutchins for his long and distinguished service and his contributions to the knowledge of law, and for his contribution to the developments in Western Water Law.

Voted unanimously at the Fourth Annual New Mexico Water Conference, New Mexico State University, University Park, New Mexico, November 6, 1959.



H. R. Stucky, Chairman
New Mexico Water Conference



R. B. Corbett, President
New Mexico State University

PUEBLO RIGHTS IN THE WEST*

Wells A. Hutchins**

In western water law, the pueblo water right is the paramount right of an American city as successor of a Spanish or Mexican pueblo (municipality) to the use of water naturally occurring within the old pueblo limits to supply the needs of the inhabitants of the city.

The subject of this paper, Pueblo Rights in the West, is intended to cover only pueblo water rights in the West. Inasmuch as a pueblo water right, in American legal parlance, stems from the water rights of Spanish and Mexican pueblos, the scope of the subject pertains solely to the American Southwest, for it is only in this part of what is now the United States that the Spaniards and Mexicans established their settlements, including the purely civil settlements known as pueblos. The scope is still further restricted geographically by the circumstance that in the high courts of only two southwestern jurisdictions -- California and New Mexico -- have pueblo water rights been litigated and their existence adjudicated.

American law on the subject of pueblo water rights was developed in California over a long period of years beginning in the last century. The immediate interest in the subject in New Mexico stems from a very recent decision of the State supreme court in the Cartwright case.^{1/} In two previous decisions, claims of pueblo water rights had been considered and rejected because of the factual situations then before the court. Now, under different circumstances, the supreme court has applied to the settlement of a controversy in New Mexico the doctrine as developed by the California courts.

The issues in the Cartwright case were strenuously argued before a court which, in reaching its decision, was sharply divided, each order being made by a vote of 3 to 2. The subject is still highly controversial; it may have an important relation to the water economy of New Mexico. Therefore, the speaker desires to stress the fact that this paper does not purport to reflect the official views of the United States Department of Agriculture, nor those of the Agricultural Research Service -- to which he is attached -- or the Office of the General Counsel within the Department. The comments herein portray the considered personal views of this speaker only.

Another matter to be stressed is that this paper presents the results of a study, not of Spanish or Mexican law, but of American law only -- decisions of American courts, with particular attention to their citations or quotations of Spanish-Mexican authority. Desirable as an exploration

* The opinions expressed are those of the author and do not necessarily represent the views of the Farm Economics Research Division, Agricultural Research Service, or the U. S. Department of Agriculture.

**Attorney, Farm Economics Research Division, Agricultural Research Service, United States Department of Agriculture, Berkeley, California.

of the original sources would have been, limitations of time have precluded it. Perhaps such a background study may come later.

Origin of the American Doctrine of Pueblo Water Rights

Inquiry into the origin of this doctrine begins in California. As elsewhere in the Southwest, the colonization of that area by Spain included the establishment of civil pueblos or municipalities, as well as religious missions and presidial towns.^{2/} Under the old Spanish law as it existed in Spain, waters were held by pueblos as a common property for domestic use, irrigation, and other purposes under regulations administered by the town officials.^{3/} In the Spanish settlements of California, this practice was followed in the early agricultural pueblos of San Jose and Los Angeles. Irrigation was an all important consideration in the location of each of these settlements; in fact, instructions of Governor Neve for the founding of Los Angeles required the selection of "a spot for a dam and ditch with a view of irrigating the largest possible area of land."^{4/} The public acequias or ditches at both San Jose and Los Angeles were managed as such by the pueblo authorities throughout the Spanish and Mexican rule. Upon incorporation as American cities, both municipalities were confirmed in their rights and responsibilities as successors of the pueblos and the city councils were given specific authority to provide for irrigation.^{5/} The pueblo rights of Los Angeles as to the distribution and use of waters of the Los Angeles River have been adjudicated in a series of court decisions, as noted hereinafter. The main acequia of San Jose ran through what became the principal business section of the city and was finally abandoned. Whatever pueblo rights San Jose may have possessed have not been adjudicated in the high courts of California. The pueblo water rights of San Diego, which succeeded the pueblo established under Mexican rule, have been adjudicated.

The pueblo water rights doctrine as it is recognized in California was developed in decisions of the supreme court of that State, most of the cases involving the rights of the City of Los Angeles.

Development of the Doctrine in the California Decisions

Foundation of the doctrine

It is noteworthy that in laying the foundation of the California pueblo rights doctrine, a significant part was played by statements of the supreme court in Lux v. Haggin, decided in 1886 -- a landmark case involving riparian water rights, not pueblo water rights.^{6/} The statements in question were dicta -- not necessary to the decision. This the court admitted, in taking notice that no pueblo existed on Kern River, which was the subject of the instant controversy, and that no portion of the waters thereof was dedicated or diverted to the use of the inhabitants of any pueblo. However the subject matter of these observations later became judicial law in California as the result of adjudications in subsequent cases in which pueblo rights actually were adjudicated.

The pueblo rights thesis that the California Supreme Court included in its opinion in Lux v. Haggin was based upon a decision that it had rendered a quarter-century earlier in a land case,^{7/} in which water rights were not involved. It was there held that when, in 1834, a municipality

was erected at the presidio of San Francisco and officially recognized as a pueblo, such pueblo became vested with some right or title to four square leagues of land, to be held in trust for the benefit of the entire community but with such lawful powers of alienation as it might have or acquire. By analogy to this decision and in conformity with its principles, said the court in Lux v. Haggin, "we hold" that the pueblos had a species of property in the flowing waters within their limits, subject to a public trust of continuously distributing the use in just proportion to the common lands and the lands originally set apart to the settlers or subsequently granted by municipal authorities. This trust, said the court, is within the supervision and authority of the State. Further, each pueblo was quasi a public corporation. By the scheme of the Mexican law, it was treated as an entity or person, having a right as such, and by reason of its title to the four leagues of land granted to it, to the use of the waters of the river on which it was situated; while as a political body, it was vested with power to provide by ordinance for a distribution of the water to those for whose benefit the right and powers were conferred.

Actually, the first California decision respecting what came to be known as the pueblo water right was rendered in Feliz v. Los Angeles, in 1881. ^{8/} Here the contest was between upstream riparian owners and the City of Los Angeles. From the founding of the Pueblo of Los Angeles in 1781, a century earlier, said the supreme court, the right to all the waters of Los Angeles River had been claimed by the pueblo and by the successor city; that right had been recognized by all owners of land on the stream; under a recognition and acknowledgment of that right, the ditches of plaintiffs' grantors had been dug; and by the permission and license of the municipal authorities, plaintiffs thereafter used waters from the river. This use was continued until a water shortage deprived the inhabitants of the city of water that they needed, whereupon -- two or three years preceding the action -- agents of the city closed plaintiffs' headgates. Can plaintiffs now assert a claim of right adverse to the city, asked the court? "We think not." Statutes of the California legislature were cited to the effect that the city had succeeded to all the rights of the former pueblo. But, said the court, "We have not examined the rights of the defendant (City of Los Angeles) as they existed under the Spanish and Mexican laws, applicable to pueblos, for the findings in this case render such examination unnecessary." The supreme court specifically held that to the extent of the needs of the inhabitants, the city had the paramount right to the use of the waters of the Los Angeles River, and the further long exercised and recognized right to manage and control the waters for such purposes.

It is significant that in this decision in Feliz v. Los Angeles, the California Supreme Court did not invoke the Plan of Pitic or any particular Spanish or Mexican water laws or texts. The decision rested upon the disability of plaintiffs to assert an adverse claim after their uniform and long continued conduct in recognizing the city's paramount claim and in diverting water with the city's permission, and upon legislative declarations supporting the city's succession to all of the old pueblo rights -- but without particularizing the basis of this adjudicated paramount pueblo water right.

Five years later, the final decision in the riparian rights case of Lux v. Haggin was rendered. Whatever may have been the purpose of the California Supreme Court in including a discussion of pueblo water rights in

its lengthy opinion in this case -- 200 pages in the California reports -- its effect was threefold: (1) to broaden the court's dissertation on Spanish-Mexican water law; (2) to show that in deciding the real issues, questions of pueblo rights could be ignored because of the absence of any pueblo on the river; and (3) even though dictum in the instant case, to establish a persuasive basis for actual adjudications in the future.

In Lux v. Haggin, the supreme court stated that the laws of Mexico relating to pueblos conferred on the municipal authorities the power of distributing to the common lands and inhabitants the waters of an innavigable river on which the pueblo was situated; and that it would seem that a species of right to the use of all its waters necessary to supply the settlers' needs was vested in the authorities for the common benefit. Reference was made to the Plan of Pitic, two sections of which (19 and 20) were quoted. Both quoted sections deal with the distribution of water within the pueblo itself; neither section confers on the pueblo the right to all waters of the stream as against nonpueblo water users. After stating principles analogous to those of Hart v. Burnett, the court inserted several paragraphs from Escriche regarding rights of inhabitants of pueblos and others, one of which states, with regard to rivers: "if not navigable, the owners of the lands through which they pass may use the waters thereof for the utility of their farms or industry, without prejudice to the common use or destiny which the pueblos on their course shall have given them." From the foregoing, said the court, it appears that a riparian proprietor could not so appropriate water as to interfere with the common use or destiny which a pueblo on the same stream should have given to the waters for its own community, and that the pueblos had a preference right to consume the waters even as against another riparian proprietor. But, said the court, it is not necessary here to decide that the pueblos had the preference above suggested.

Granted that in Lux v. Haggin the court was expressing its views on pueblo water rights by way of dictum, the use of these qualified expressions may possibly indicate that the court was not yet entirely sure of the soundness of its tentative conclusions as to the preferential right of a pueblo to the use of all the waters of the stream.

A question of local law

A decade after the decision in Lux v. Haggin was rendered, the California Supreme Court approved the conclusion therein expressed to the effect that Mexican pueblos had a right to the water that had been appropriated under general law to the use of the inhabitants.^{9/} Satisfaction with that conclusion was reached after a perusal of translations of Spanish and Mexican laws, regulations, etc., pertaining to the subject. In the instant case, the court applied the principle to the City of Los Angeles, as successor of the Spanish pueblo of La Reina de Los Angeles, which had been founded in 1781.

Several years later the supreme court, although sharply divided on the issues, again decided important matters respecting the pueblo right of Los Angeles, including the vitally important principle that the paramount right of the city was not limited to the quantity of water required to supply the area within the limits of the original pueblo, but grew quantitatively with the expanded area of the city and with its expanding population.^{10/} As noted hereinafter, the court did not pretend to base this

expansion principle on any specific Spanish or Mexican authority, but frankly grounded it on its own presumption that this would have been the rule had there been occasion to apply it.

As the trend of the California Supreme Court decisions on this matter appeared to be now well charted, objectors sought relief in the United States Supreme Court, but were denied it -- not because of concurrence on the part of the highest court with the State court's decisions -- whether there was agreement or disagreement had no bearing on the case -- but solely on the matter of jurisdiction. That is, the United States Supreme Court held that the assertion of rights or titles to the use of water derived under Spanish and Mexican land grants and United States patents based on the original grants which did not involve any title or right claimed under the Constitution or under any treaty, statute, commission held, or authority exercised under the Constitution, did not raise a Federal question. It was held that the controversy in the California State court did not involve the construction of the Treaty of Guadalupe Hidalgo between Mexico and the United States, but involved only the validity of Mexican and Spanish grants made prior to the treaty. Hence it followed that the question of private title or right in the land and whatever appertained thereto was one of State law and general public law, on which the decision of the State court was final. The first decision to this effect was rendered by the Supreme Court in 1903, although several years earlier a Federal court decree dismissing a suit for want of jurisdiction had been affirmed by the Supreme Court on authority of cited cases, but without comment. 11/

A few years later, not daunted by this ruling of the highest court in the land, the interests that opposed the monopoly of the waters of Los Angeles River that was being accorded by successive State court decisions to the great and rapidly growing City of Los Angeles again went to the United States Supreme Court, this time by way of the Federal courts. 12/ Again it was held that the controversy was not within Federal jurisdiction. A suit does not arise under the Constitution or laws or treaties of the United States, said the court, "unless it really and substantially involves a dispute or controversy as to the effect or construction of the Constitution or of some law or treaty of the United States, upon the determination of which the result depends." Therefore, questions as to the nature and extent of water rights claimed by holders of United States patents based upon Spanish and Mexican grants are necessarily questions of State of general law.

On still another occasion the question was taken to the United States Supreme Court, this time on writ of error to the California Supreme Court, which in 1910 was dismissed for want of jurisdiction. 13/ Whatever may be the rule as to patents conveying title to lands of the United States, said the Supreme Court, "it has been distinctly held in this court that neither the treaty of Guadalupe Hidalgo nor patents under the act of March 3, 1851, are original sources of private titles, but are merely confirmatory of rights already accrued under a former sovereignty." Therefore, so the Court again held, "the extent of the riparian rights belonging to pueblos or persons receiving such patents is a matter of local or general law."

Extent of the California pueblo water right

Needs of inhabitants of the city. - In its first decision respecting the pueblo water right, rendered in 1881, the California Supreme Court held that as against certain upstream riparian owners, the City of Los Angeles had the paramount right to the use of the waters of Los Angeles River to the extent of the needs of its inhabitants, "and the further right, long exercised and recognized, * * * to manage and control the said waters for those purposes." ^{14/} As stated above, in discussing the foundation of the pueblo water rights doctrine, the court admitted that it had not examined the rights of the city as they existed under Spanish and Mexican laws applicable to pueblos, but based its decision on the effects of the conduct of the adversary parties. In other words, the water rights of the city were adjudicated in this case as against the specific individuals on grounds that pertained to them individually. However, in 1895, the city's pueblo water right was adjudicated on the historical grounds stated by way of dictum in Lux v. Haggin -- approved after perusing translations of documents furnished by counsel -- but the court held that the pueblo right to a preferred use of the water extended only to the quantity of water needed to supply the wants of the city's inhabitants, and that the city had no right to take more than that quantity for sale outside the city limits. ^{15/}

Grows with expanding needs of expanding city. - Granting that the pueblo right at no time exceeds the needs of the city, no limit has been placed on the magnitude of actual needs. Not only are the inhabitants of the area constituting the old pueblo entitled to enjoy the full pueblo right, but the right grows with the number of inhabitants to whatever extent this increases. And not only that -- the right grows with the extension of the city limits by the annexation of land not within the limits of the original pueblo, and with the increasing number of inhabitants therein. ^{16/} With the growth of both Los Angeles and San Diego, the Supreme Court of California has said that the pueblo right extends to so much of the waters of the stream "as the expanding needs of such city" require, ^{17/} and that it "thus insures a water supply for an expanding city." ^{18/} In other words, the only limit is the physical extent of the water supply. If the needs of the city justly demand the whole supply, the city may take it all.

Place of use of water. - The California pueblo right extends to the use of water only within the city limits. ^{19/} The city has no right to take for sale outside the city limits any quantity of water in excess of the requirements of its inhabitants therein.

Purpose of use of water. - The California pueblo water right relates to the use of water necessary for the inhabitants of the city and for ordinary municipal purposes. ^{20/} The original pueblo right included the use of water for domestic purposes, watering of stock, and irrigation. The supreme court agreed that the fact that some of the pueblo lands had been converted into ornamental parks would not impair the right to irrigate them and, somewhat reluctantly, approved the use of water for ornamental fountains and artificial lakes in which considerable water is lost through absorption and evaporation. ^{21/}

No restrictions upon the purpose of use of the water under the pueblo right have been imposed by the California Supreme Court. ^{22/}

Waters to which pueblo rights attach. - The pueblo right extends to the use of all surface and ground waters of the stream that flowed through the original pueblo, including all its tributaries, from its source to its mouth. This has been declared by the California Supreme Court with respect to the rights of both Los Angeles in the waters of Los Angeles River and of San Diego in the San Diego River. 23/ This applies to peak flood flows as well as other flows, and to waters impounded for the purpose of controlling floods and subsequently released to rejoin the body of water of which they are naturally a part. (Los Angeles v. Glendale, 23 Calif. (2d) 68 at 73-74.)

The pueblo right attaches only to the waters naturally in the watershed of the stream flowing through the pueblo -- not to waters brought into the area from other nontributary watersheds. 24/

Superiority of the California pueblo water right

Prior and paramount right. - According to the California Supreme Court, the American city as successor of the Spanish or Mexican pueblo has the prior and paramount right to the use of the waters of the stream that flowed through the original pueblo. 25/ The right to the use of the water vests in the pueblo upon its establishment. (San Diego v. Cuyamaca Water Co., 209 Calif. 105 at 126.)

Superior to the riparian rights of other landowners. - In Lux v. Haggin, the California Supreme Court expressed its belief that the pueblo had a preference or prior right to consume the water of the stream even as against another riparian proprietor on the same stream, but the court considered it unnecessary to decide the question in that case inasmuch as no pueblo actually was involved. 26/ In subsequent cases the court has held the pueblo right to be superior to riparian rights of other proprietors. 27/

Superior to appropriative rights. - The pueblo right is likewise superior to the rights of appropriators of water from the stream. 28/

The question whether rights of way acquired under the Act of Congress of 1866 and the supplementary act of January 12, 1891 took priority over the pueblo right of the City of San Diego was presented to the supreme court. Inasmuch as these congressional acts were passed after the rights of the pueblo had become vested, these rights of way were held to be subordinate to the vested rights of the city derived from its succession to the pueblo. 29/

Not inconsistent with the State constitutional amendment of 1928. - The amendment to the California constitution approved in 1928 declares that the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and forbids the waste or unreasonable use or unreasonable method of use or diversion of water. 30/ According to the supreme court, even though the pueblo right includes a potential right to waters not presently needed, it is not thereby inconsistent with the amendment. 31/ The mandate of the fundamental law, said the court, in no way diminishes the rights of a successor to the pueblo, for this right not only protects the reasonable beneficial needs of the city, but also insures a minimum of waste by leaving surplus water accessible to others until such time as the city needs it. "The amendment was designed primarily to destroy the right to object to the use of water

not presently needed, a right that the pueblo or its successor never had."

Preservation of the California pueblo right. - Under the California decisions, an American city that inherited from its Mexican municipal predecessor a pueblo water right owns that right in perpetuity for the satisfaction of its ultimate needs, no matter how great they may become nor how long the time of ultimate need may be delayed. No decision of the California Supreme Court has suggested that the city should be held to any standard of diligence in putting the water to use. On the contrary, the whole tenor of the decisions is to the effect that the pueblo water right is available for the use of the city whenever the city is ready to exercise it.

If there is any method by which the pueblo water right can be lost to the city, the supreme court has not yet declared it. On the contrary, the court has specifically ruled out several suggested ways in which the right might be lost or impaired. 32/ These were:

(1) A statutory provision then extant declaring that waters not put to use by riparian owners for any consecutive period of 10 years thereby became subject to appropriation, was held to be not applicable to pueblo water rights.

(2) The statute providing that failure for 3 years to use beneficially water for the purpose for which it was appropriated or adjudicated, causes such water to revert to the public, does not apply to the pueblo water right, which is not based upon appropriation or adjudication.

(3) The pueblo water right is not lost or impaired by prescription because of the taking, during the period prescribed by the statute of limitations, of part of the water by other during such time as the city does not need that portion. The supreme court said that as the pueblo right entitles the city to take only the water that it needs, it has no occasion to object to the taking of the surplus by others. "It is settled that an appropriation must invade the rights of another before it can destroy them by the establishment of a prescriptive title." In other words, the nature of a pueblo right is such that a taking of part of the water by others when the city does not need it is not an invasion of the right.

With respect to the pueblo water right of San Diego, the California Supreme Court stated that, as a general rule, no invasion of rights of property held by a public or municipal corporation in perpetual trust for public uses can be held sufficient to furnish the basis of a defense based solely upon prescription. 33/

Likewise, even conceding that a right based upon estoppel could arise by virtue of mere acquiescence in its assertion as between private persons, the supreme court expressed itself as satisfied that no such claim of right could come into being as against a municipal corporation, founded upon its mere acquiescence or that of its officials in the diversion by any number of upstream claimants of waters of a stream to the use of which the public corporation is entitled as part of its public rights and duties held in perpetual trust for public use. (209 Calif. 105 at 143.)

California cities having adjudicated pueblo water rights

Los Angeles. - As already stated, the opinion of the California Supreme Court in its first decision respecting pueblo water rights observed that from the founding of the pueblo of Los Angeles a century earlier, the right to all the waters of Los Angeles River had been claimed by the pueblo and by the city, which succeeded to all the rights held thereby; and the court sustained this claim as against an upstream riparian owner under the particular circumstances of the case, but without examining the Spanish and Mexican law on the subject. 34/

In subsequent cases, the supreme court has repeatedly recognized and adjudicated the pueblo water right of the City of Los Angeles. 35/

In four decisions, the United States Supreme Court refused to review questions as to the validity of the pueblo right of Los Angeles and of claims derived from Spanish or Mexican grants in opposition thereto, on the ground that these were questions of State or general law, not Federal questions. 36/

San Diego. - The pueblo water right of the City of San Diego was adjudicated by the California Supreme Court in two cases under the same title decided on the same day. 37/

The predecessor of the American city had been established as a Mexican pueblo in 1834. The pueblo water right was adjudicated in 1930 -- nearly 100 years later. Certain parties to the case contended that they were entitled to have reconsidered and relitigated the question as to whether a Spanish or Mexican pueblo organized in California under the laws, institutions, and regulations of Spain or Mexico during their successive governments, thereby became entitled to a prior and paramount water right, and as to whether an American municipality as successor of the pueblo succeeded to such rights. This question, said the supreme court, is no longer an open one for further consideration and review before it. The "proposition that the prior and paramount right of such pueblos and their successors to the use of the waters of such rivers and streams necessary for their inhabitants and for ordinary municipal purposes, has long since become a rule of property in this state, which at this late date in the history and development of those municipalities which became the successors of such pueblos we are not permitted, under the doctrine of stare decisis, to disturb." (209 Calif. 105 at 122.)

The supreme court therefore held, in these two cases, that the city of San Diego as successor of the Pueblo of San Diego "has had at all times and still has" a prior and paramount right to the use of all surface and ground waters of San Diego River, including its tributaries, from its source to its mouth, for the use of the city and its inhabitants for all purposes, whenever and to the extent that their needs require it. (209 Calif. 105 at 151; 209 Calif. 152 at 165.)

The Pueblo Rights Doctrine in the New Mexico Decisions

The Cartwright case, as it is commonly known, was decided by the New Mexico Supreme Court in 1959. It was preceded by two decisions in which claims of pueblo rights were involved but in which the pueblo rights doctrine

was neither approved nor disapproved. The earlier cases will be noticed first.

The earlier cases

The Tularosa Community Ditch case. - This case ^{38/} was decided in 1914, only a few years after the United States Supreme Court had refused for the last time to review the California decisions on the pueblo rights doctrine. The New Mexico Supreme Court held here that no exclusive right on the part of the residents of the town of Tularosa to the use of water could be sustained under what was known under Spanish and Mexican laws and customs as a "pueblo right," for the reason that this townsite grant was made by officers of the United States Government, under authority of an Act of Congress, long after New Mexico became a part of the United States. The grant of course was subject to and controlled by the laws of the granting sovereign. As such it would carry with it only such rights and privileges as were accorded by the laws of the United States. So there was in this case no Spanish or Mexican pueblo, and therefore no pueblo water right.

The New Mexico Products Co. case. - Nearly a quarter-century later, in 1937-1938, the Supreme Court of New Mexico again was called upon to decide a claim of pueblo right. ^{39/} Here the trial court had ruled that pursuant to such a right, the City of Santa Fe was entitled to take from Santa Fe Creek from time to time all the water needed for the use of the inhabitants of the city and for all municipal and public purposes therein, regardless of prior appropriation and beneficial use by others.

The supreme court considered the origin and nature of the pueblo water right as declared in the California cases, and emphasized that in several of them reference had been made to Spanish and Mexican grants as the source of pueblo water rights. ^{40/} The United States Supreme Court was cited as definitely settling the fact that no grant had been made by the Spanish King to the Villa de Santa Fe, and that the occupancy of the pueblo by the Spanish authorities conferred no title in the inhabitants. ^{41/} Without a grant, said the court, the Villa de Santa Fe had no pueblo right. "We have found," said the New Mexico court, "neither decision nor text suggesting that a mere colony of 'squatters' could acquire under the Spanish law this extraordinary power over the waters of an entire nonnavigable stream known as 'pueblo right,' even though they were organized as a pueblo -- which is the equivalent of the English word 'town' -- with a full quota of officers." (42 N. Mex. at 318.)

In this case, therefore, it was held that notwithstanding the existence of a "pueblo" or town during the Spanish sovereignty, as a question of fact no grant had been made to the pueblo by the King, and hence as a matter of law no pueblo water right had been acquired.

The Cartwright case

This case yields a contemporaneous, definitive decision of the New Mexico Supreme Court on the subject of pueblo water rights. ^{42/}

The decision of the court was rendered December 12, 1958. Motion for rehearing was denied May 14, 1959. A second motion for rehearing and motions on a jurisdictional issue were denied September 3, 1959. Thereupon

the case was officially reported in 343 Pacific (2d), No. 3, advance sheets for October 2, 1959. Each order was made by a divided court on a vote of 3 to 2; to each order the minority filed a long dissenting opinion.

Owing to the fact that the next speaker, Professor Robert Emmet Clark, will present an analysis of this Cartwright case and of its implications with respect to the water law of New Mexico, the present speaker at this point will state only briefly the factual situation and conclusions of the majority -- which necessarily are the conclusions of the court -- on the pueblo rights question. Some general comments will follow.

The action in the Cartwright case was brought by certain users of water from Gallinas River -- on which the Mexican pueblo of Las Vegas was situated -- against the Public Service Company of New Mexico, which was engaged in furnishing water from this stream to the Town and City of Las Vegas under a county franchise. The Town of Las Vegas intervened. On April 6, 1835, the Mexican Government established the pueblo and made thereto a community colonization grant. The Town and City of Las Vegas are American successors to the Mexican pueblo. The trial court decided that the Town and City of Las Vegas had succeeded to ownership of the pueblo water right that had vested in the pueblo with a priority date of 1835, prior and paramount to any rights of the plaintiffs, and that the right of the defendant company under its franchise was a complete defense to the action.

It is an admitted fact, said the court, that the doctrine of pueblo rights as understood by the court and as argued by all parties is well recognized in California; and the parties agreed that the question had not yet been determined in New Mexico. Further, in neither of the two earlier New Mexico cases above cited had the supreme court held that the doctrine of pueblo rights was not applicable in New Mexico; it held that under the facts before it, neither community had such rights. After quoting extensively from several texts and citing the chief California decisions, the New Mexico court declared itself unable to avoid the conclusion that the reasons which brought the California court to uphold and enforce the pueblo rights doctrine apply with as much force in New Mexico as they do in California. The defendant Public Service Company did not own the pueblo rights of the town and city, but acted as their agent in enabling the inhabitants to enjoy to the fullest extent the pueblo rights inaugurated by the King of Spain in the Plan of Pitic. On this major issue, the court believed that the trial court was correct in sustaining the claim of defendant and intervener under the pueblo rights doctrine.

Some General Observations

Certain differences between pueblo and appropriative rights

In the Cartwright case, the majority of the court says (at 343 Pac, (2d) 665) that it sees nothing in the theory of pueblo rights inconsistent with the doctrine of prior appropriation and beneficial use. It is true that under each of the doctrines there is a date of priority based on the time of vesting of the right and, when the water is actually put to use, the necessity for using it beneficially and without unnecessary waste. In the application and exercise of the doctrines, however, there are important differences of which certain ones will be noted with respect to American municipalities.

Preferences in the appropriation of water are granted to municipalities in various western jurisdictions. Statutes of several States provide for the reservation of water to meet the growing needs of municipalities, and the principle has been sanctioned in several court decisions. ^{43/} Although the details differ, in most cases the process comprises appropriation of water to meet future reasonable needs of the municipality and its inhabitants, the effect of which is to prevent the accrual of intervening rights pending the time at which the city will require a larger supply of the water than needed at the time of initiating the appropriation. The appropriation for both present and future uses relates to specific quantities of water; if the city outgrows its estimates, additional appropriations must be made or other water supplies must be purchased or condemned. Use of surplus water may be made by others in the interim; but overestimates by these surplus water users of the longevity of their water tenure are made at their peril, for from the beginning they are on notice that the law is granting them rights that are temporary only.

The pueblo water right under the California doctrine dates from the establishment of the pueblo. The effect of the Treaty of Guadalupe Hidalgo, which was proclaimed July 4, 1848, was to foreclose the establishment of any more Mexican pueblos in the area ceded to the United States. Therefore, the priorities of all pueblos to which American cities succeeded relate back at least to 1848 -- more than a century ago. From the pueblo rights doctrine as declared by the California courts, it would follow that in a jurisdiction in which such doctrine is the law, a city that can trace its succession to a Spanish or Mexican pueblo to which a pueblo land grant was made by the sovereign may -- if not precluded by other circumstances -- find itself in position to assert, without the payment of compensation to existing users, paramount rights to all waters of a stream that flows through or by the city -- waters of which the city and its inhabitants may never have used a drop for more than one hundred years, but a large part of which may have been used for upwards of a century as the lifeblood of farming communities. Under the appropriation doctrine, the priority of a municipality's water right for future use dates from the first assertion of a claim of right therefore; it does not relate back to a date of vesting declared by the courts for the first time a half-century or century later, during which period the municipality may never have used the water or even asserted the right to a preferential use.

Authorities on which the California doctrine rests

The California doctrine of pueblo water rights was created by the California Supreme Court and is contained in the opinions of the court in the cases cited in this paper. In reviewing these decisions, an effort was made to find therein any quotations from Spanish or Mexican authorities that would unequivocally portray the policy of the sovereign respecting the status of the pueblo's rights in the water of the stream on which situated. Most of the discussion of this matter is in the dicta in Lux v. Haggin. ^{44/} Quoted authorities therein relate chiefly to the internal water affairs of the pueblos, not to their rights as against other water users on the stream. On this last vital point, the only quotation found in the opinion is from Esriche to the effect that an upper riparian might use the stream waters "without prejudice to the common use or destiny which the pueblos on their course shall have given them." In Vernon Irr. Co. v. Los Angeles. ^{45/} It was stated that counsel had furnished the court with translations of

numerous ordinances, laws, rules, and regulations of Spain and Mexico relating to the subject, and that after perusing them, the court was satisfied with the conclusion reached in Lux v. Haggin that pueblos had a right to the water similar to the rights in pueblo lands, and that the inherited water right of the City of Los Angeles was superior to that of a riparian owner.

Undoubtedly in these early pueblo rights cases the courts were provided with many documents such as those generally alluded to in the Vernon Irr. Co. case. As to precisely what they were and how well translated, there is no specific mention. By contrast to the 100-page opinion of the California Supreme Court in Hart v. Burnett, ^{46/} decided in 1860 -- a large part of which was devoted to analysis of Spanish and Mexican laws in support of the court's decision respecting the existence of a pueblo at San Francisco and its rights to lands within its limits -- the treatment of Spanish and Mexican law in the pueblo water rights cases is most sketchy. Whether or not well grounded in Spanish-Mexican law, the principle that a pueblo on its creation was automatically endowed with an unlimited preference right to stream water for uses within the original pueblo limits rests -- so far as the authorities quoted in the American decisions show -- on a very narrow foundation.

Assuming for the present purpose the soundness of the foregoing principle from a standpoint of Spanish-Mexican law, its extension to encompass the future needs of a city after outgrowing the original pueblo limits is another matter. This extension was first made in Los Angeles v. Pomeroy, ^{47/} by a divided court. The prevailing opinion sets forth the purpose of establishing pueblos pursuant to the royal regulations of Spain, the original plan of which was for a primitive village, to aid and encourage the settlement of the country. Then, said the court: "Unquestionably it was contemplated and hoped that at least some of them would so prosper as to outgrow the simple form of the rural village. It is in the nature of things that this might happen, and when it did, and the communal lands were required for house lots, we must presume that under Mexican or Spanish rule they could be so converted, and that when the population increased so as to overflow the limits of the pueblo that such extension could be legally accomplished. Had this happened under Mexican rule, can it be doubted that the right vested in the pueblo would have been construed to be for the benefit of the population, however great the increase would be?" (Emphasis supplied.) Here, certainly, is an implied admission that the court's attention had been called to no Spanish or Mexican law or regulation to that effect -- of which it could have taken judicial notice -- but "must presume" that one would have been promulgated had the occasion called for it. Thus this vitally important principle that has enabled great cities to monopolize the entire flows of streams, regardless of water developments thereon by others -- solely because the cities originated from primitive villages organized as pueblos -- was added to the jurisprudence of California as the result of a presumption.

Later decisions of the supreme court reaffirmed and buttressed the principles thus decided, but without adding anything to the authorities on which they rested. After all, there was no need to add to the foundation already established. With the successive decisions, the matter became stare decisis, a rule of property.

The matter of stare decisis

The California Supreme Court had occasion to explore the applications and limits of the rule of stare decisis in reaching its decision in Hart v. Burnett, the case involving lands of the pueblo at San Francisco. ^{48/} The views expressed -- which need not be stated here -- were said to be particularly applicable to cases involving questions of Spanish and Mexican law. "The bench and bar of California, generally," said the court, "have not been familiar with these laws; it has been exceedingly difficult to procure copies of the Mexican statutes, and sometimes impossible to procure the works of the most distinguished commentators on the Spanish civil code. And even when procured, it was equally difficult to obtain correct translations of such laws and of the works of such law writers. Add to this the fact that nearly all the Mexican orders, laws, decrees, etc., respecting California, are still in manuscript, scattered through immense masses of unarranged archives, almost inaccessible, and known, even imperfectly, to scarcely half a dozen persons, and will it appear surprising that errors have been committed by the judiciary?"

Since this was written a century ago, much has been learned about Spanish and Mexican laws relating to water and their availability is much improved over that stated by the 1860 court. For example, valuable sources of information have been furnished to the court in current Texas litigation over waters of the lower Rio Grande. ^{49/} Less favorable than it is now must have been the situation in California when the earlier pueblo rights cases were decided. The commission of errors by the judiciary in applying Spanish and Mexican laws prior to 1860, as suggested by the court in Hart v. Burnett, may have continued in some measure while the earlier pueblo water rights cases were being decided. However, the decisions of the California courts on the subject of pueblo water rights have been definitely held to be stare decisis. ^{50/} The soundness of the foundation on which they rest is no longer material in that State. It has been so for decades. The preferred water rights of the California cities that succeeded pueblos are matters of law. Prospective developers of waters of the same stream are on notice. Those who fail to take account of the situation have no ground for complaint when the city asserts its latent rights.

Authorities on which the Cartwright decision rests

The authorities on which the New Mexico Supreme Court based its decision in the Cartwright case may be briefly and accurately summarized as the California Supreme Court decisions.

It is true that the opinion of the court in this case includes a long quotation from Kinney on irrigation and Water Rights and shorter ones from Wiel on Water Rights, Corpus Juris, and American Jurisprudence. However, the only authorities cited by the writers of the quoted paragraphs are the California decisions. None of the statements so quoted, and none of the statements made by the New Mexico court in the Cartwright case, are supported by any specifically cited Spanish or Mexican law, regulation, or text to the effect that a pueblo was endowed on its creation with "this extraordinary power over the waters of an entire nonnavigable stream known as 'pueblo rights.'" ^{51/}

The reason given for the New Mexico court's adoption of the pueblo water rights doctrine of the California court is not that the New Mexico court has examined the basic Spanish-Mexican authorities and believes that the doctrine has a solid foundation in Spanish or Mexican law -- it is the New Mexico court's conclusion that the reasons for adoption in California apply with equal force in New Mexico. The minority's dissenting opinion severely criticizes the basis of the California doctrine. The majority opinion accepts the doctrine with full approval and applies it to the settlement of the instant controversy.

The New Mexico Supreme Court thus applies to the decision in the Cartwright case American law -- the law of an American sister State -- rather than Spanish-Mexican law. The decisions of the California Supreme Court on pueblo water rights, although stare decisis in California, were obviously not conclusive on the New Mexico court. The latter was free to accept them as precedents or to reject them; as the United States Supreme Court said in refusing to review the California decisions, these were matters of State law, not Federal law. With the now larger and more readily available sources of information, there was an opportunity in the Cartwright case to explore the basic Spanish and Mexican laws, and to reach an independent conclusion as to their applicability to the local situation, before engrafting upon the jurisprudence of New Mexico a concept the authenticity of which has been the subject of so much disinterested criticism. There is no hint in the court's opinion that this was done.

The matter of public welfare

The opinion of the court in the Cartwright case specifically raises a question of public policy. It is said (at 343 Pac. (2d) 668-669) that when a colonization pueblo was established there were no questions of priority of use of water, because it was located in unoccupied territory; that water formed the lifeblood of the community not only at its origin but as it expanded from a handful to thousands of families; and that in the process of growth and expansion the founders of the pueblo carried with them the torch of priority so long as there was water to supply the lifeblood of the expanded community. It is said further that in the pueblo rights doctrine there is present the police power, the answer to claims of confiscation, and thus the elevation of the public good over the claim of a private right.

Granted that the concentration of settlers at carefully chosen points was necessary when the pueblos were established, subsequent removal of the menace of hostile Indians has made possible more widely scattered developments by groups or even individuals among whom priorities of appropriation and actual use of water have been established under Territorial and State law, which purported to continue appropriation methods followed under Mexican sovereignty, not to initiate a new system. Can it be asserted now that these smaller groups on a stream were on notice that some larger group among them could, solely by reason of its establishment as a pueblo, successfully claim in the distant future all the waters of the stream to supply its expanded population, without compensation to them? The first case in which the New Mexico Supreme Court considered a claim of pueblo water right was in 1914, the second in 1937-1938, and the third case -- the first actually to apply the doctrine -- in 1959. Throughout the period of 111 years following the cession from Mexico, no issue of stare decisis could arise.

The time-honored and legally established method of acquiring privately owned water rights by American cities is purchase or condemnation, not confiscation. Regardless of the legal soundness in New Mexico jurisprudence of the pueblo rights doctrine, which dispenses with the requirement of compensation, its introduction at this late date involves considerations of public welfare -- most certainly if the supreme court goes on in future decisions to actually apply the principle of unlimited expansion. Water is no less the lifeblood of a small farming community or single establishment than of a growing city. Widespread acquisition by municipalities of valuable water rights of agriculturists -- rights that may have been exercised for decades or even for generations under the long-established principle of priority of appropriation -- without paying for them, scarcely bears out the court's observation that in the pueblo rights doctrine there is seen the elevation of the public good over the claim of a private right -- particularly after all these years, and in this era of rapidly expanding cities and exploding populations.

FOOTNOTES

1/ Cartwright v. Public Service Co. of New Mexico, ___ N. Mex. ___, 343 Pac. (2d) 654 (1959).

2/ Hutchins, Wells A., "The Community Acequia: Its Origin and Development," XXXI Southwestern Historical Quarterly 261 at 272-273 (1928).

3/ Hall, Wm. Ham., "Irrigation Development. France, Italy, and Spain." p. 370. (1886).

4/ Bancroft, "History of California," vol. 1, p. 345 (1884).

5/ San Jose: Calif. Stat. 1850, ch. 47, act to incorporate the City of San Jose, March 27, 1850. Stat. 1857, ch. 107, act to reincorporate the city, March 27, 1857, authority "to construct wells and cisterns: organize and maintain fire departments, and supply the city with water," omitting reference to irrigation.

Los Angeles: Calif. Stat. 1850, ch. 60, act to incorporate the City of Los Angeles, April 4, 1850; supplementary act, April 5, 1851, p. 329. Stat. 1854, ch. 65, April 13, 1854, construing 1850 statute as vesting in the mayor and common council control over the distribution of water for irrigation within the limits of the ancient pueblo. Stat. 1874, ch. 447, amending charter to provide among other things that the city is granted "in absolute ownership, the full, free, and exclusive right to all the water" of the Los Angeles River from source to southern boundary of the city, together with the right to develop and use all waters in the bed of the river beneath the surface; Stat. 1876, ch. 476, amending the 1874 statute. This exclusive legislative grant of all water was not taken seriously by the California Supreme Court, which could not see that the city had acquired any new rights by reason of the legislative acts, and stated that: "It will hardly be claimed that the legislature could grant to the city the water of the river so as to deprive riparian owners of it." -- Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 252, 253, 39 Pac. 762 (1895).

6/ Lux v. Haggin, 69 Calif. 255, 326-332, 4 Pac. 919 (1884). 10 Pac. 674 (1886).

7/ Hart v. Burnett, 15 Calif. 530, 542, 573 (1860).

8/ Feliz v. Los Angeles, 58 Calif. 73, 78-80 (1881). Elms v. Los Angeles, 58 Calif. 80 (1881), was presented on the same facts and submitted on the same arguments as Feliz v. Los Angeles, and on authority of that case the same decision was rendered by the supreme court.

9/ Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250, 39 Pac. 762 (1895).

10/ Los Angeles v. Pomeroy, 124 Calif. 597, 649-650, 57 Pac. 585 (1899).

11/ Hooker v. Los Angeles, 188 U. S. 314, 317-318 (1903); dismissing writ of error, Los Angeles v. Pomeroy, 124 Calif. 597, 57 Pac. 585 (1899). Crystal Springs Land & Water Co. v. Los Angeles, 177 U. S. 169 (1900); affirming decree in 82 Fed. 114 (C.C.S.D. Calif., 1897), dismissing suit for want of jurisdiction.

12/ Devine v. Los Angeles, 202 U. S. 313, 332-333, 337 (1906).

13/ Los Angeles Farming & Mill. Co. v. Los Angeles, 217 U. S. 217, 233, 234 (1910); dismissing writ of error to the California Supreme Court for want of jurisdiction: Los Angeles v. Los Angeles Farming & Mill. Co., 152 Calif. 645, 93 Pac. 869, 1135 (1908). The act of Congress of March 3, 1851 (9 Stat. 631, ch. 41) provided for the ascertainment and settlement of the land claims derived from Spain or Mexico in the State of California. It created a board of land commissioners for that purpose; provided that all lands, claim to which was rejected or not presented to the board should be held a part of the public domain of the United States; provided that claims of towns or cities should be presented under that act; and provided that decrees and patents issued under that act should be conclusive between the United States and the claimant.

14/ Feliz v. Los Angeles, 58 Calif. 73, 80 (1881). See Elms v. Los Angeles, 58 Calif. 80 (1881). See also the much later case of San Diego v. Cuyamaca Water Co., 209 Calif. 152, 164-165, 287 Pac. 496 (1930).

15/ Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250-251, 39 Pac. 762 (1895).

16/ Los Angeles v. Pomeroy, 124 Calif. 597, 649-650, 57 Pac. 585 (1899); Los Angeles v. Hunter, 156 Calif. 603, 608-609, 105 Pac. 755 (1909).

17/ San Diego v. Cuyamaca Water Co., 209 Calif. 152, 164, 287 Pac. 496 (1930).

18/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 75, 142 Pac. (2d) 289 (1943).

19/ Feliz v. Los Angeles, 58 Calif. 73, 79-80 (1881); Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250-251, 39 Pac. 762 (1895).

20/ Los Angeles v. Los Angeles Farming & Mill Co., 152 Calif. 645, 652, 93 Pac. 869, 1135 (1908); San Diego v. Cuyamaca Water Co., 209 Calif. 105, 122, 287 Pac. 475 (1930).

21/ Los Angeles v. Pomeroy, 124 Calif. 597, 639-640, 650, 57 Pac. 585 (1899).

22/ See San Diego v. Cuyamaca Water Co., 209 Calif. 105, 151, 287 Pac. 475 (1930).

23/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 74, 142 Pac. (2d) 289 (1943); San Diego v. Cuyamaca Water Co., 209 Calif. 105, 151, 287 Pac. 475 (1930).

24/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 73, 142 Pac. (2d) 289 (1943).

25/ Feliz v. Los Angeles, 58 Calif. 73, 79-80 (1881); Los Angeles v. Los Angeles Farming & Mill Co., 152 Calif. 645, 652-653, 93 Pac. 869, 1135 (1908); San Diego v. Cuyamaca Water Co., 209 Calif. 105, 116, 122, 151, 287 Pac. 475 (1930); San Diego v. Cuyamaca Water Co., 209 Calif. 152, 164-165, 287 Pac. 496 (1930); Los Angeles v. Glendale, 23 Calif. (2d) 68, 73, 142 Pac. (2d) 289 (1943).

26/ Lux v. Haggin, 69 Calif. 255, 331-332, 4 Pac. 919 (1884), 10 Pac. 674 (1886).

27/ Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250, 39 Pac. 762 (1895); Los Angeles v. Los Angeles Farming & Mill Co., 152 Calif. 645, 651-652, 93 Pac. 869, 1135 (1908); San Diego v. Cuyamaca Water Co., 209 Calif. 152, 164-165, 287 Pac. 496 (1930); Los Angeles v. Glendale, 23 Calif. (2d) 68, 73, 142 Pac. (2d) 289 (1943).

28/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 73, 142 Pac. (2d) 289 (1943).

29/ San Diego v. Cuyamaca Water Co., 209 Calif. 105, 131-132, 287 Pac. 475 (1930).

30/ Calif. Const., art. XIV, section 3.

31/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 74-75, 142 Pac. (2d) 289 (1943).

32/ Los Angeles v. Glendale, 23 Calif. (2d) 68, 74-79, 142 Pac. (2d) 289 (1943).

33/ San Diego v. Cuyamaca Water Co., 209 Calif. 105, 135, 287 Pac. 475 (1930).

34/ Feliz v. Los Angeles, 58 Calif. 73, 78-80 (1881); Elms v. Los Angeles, 58 Calif. 80 (1881).

35/ Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250-251, 39 Pac. 762 (1895); Los Angeles v. Pomeroy, 124 Calif. 597, 639-640, 649-650, 57 Pac. 585 (1899); Los Angeles v. Los Angeles Farming & Mill. Co., 152 Calif. 645, 651-653, 93 Pac. 869, 1135 (1908); Los Angeles v. Hunter, 156 Calif. 603, 608-609, 105 Pac. 755 (1909); Los Angeles v. Glendale, 23 Calif. (2d) 68, 73-80, 142 Pac. (2d) 289 (1943). In opinions in several cases in which questions of pueblo water rights were not involved, the Los Angeles pueblo right has been mentioned: Anaheim Union Water Co. v. Fuller, 150 Calif. 327, 334, 88 Pac. 978 (1907); Fellows v. Los Angeles, 151 Calif. 52, 61, 90 Pac. 137 (1907); Miller v. Bay Cities Water Co., 157 Calif. 256, 287-288, 107 Pac. 115 (1910).

36/ Crystal Springs Land & Water Co. v. Los Angeles, 177 U. S. 169 (1900); affirming decree in 82 Fed. 114 (C.C.S.D. Calif., 1897); Hooker v. Los Angeles, 188 U. S. 314 (1903), dismissing writ of error, Los Angeles v. Pomeroy, 124 Calif. 597, 57 Pac. 585 (1899); Devine v. Los Angeles, 202 U. S. 313 (1906), appealed from the Circuit Court of United States for Southern District of California; Los Angeles Farming & Mill. Co. v. Los Angeles, 217 U. S. 217 (1910), dismissing writ of error, Los Angeles v. Los Angeles Farming & Mill. Co., 152 Calif. 645, 93 Pac. 869, 1135 (1908).

37/ San Diego v. Cuyamaca Water Co., 209 Calif. 105, 116, 122-132, 151, 287 Pac. 475 (1930); San Diego v. Cuyamaca Water Co., 209 Calif. 152, 164-165, 287 Pac. 496 (1930).

38/ State ex rel. Community Ditches v. Tularosa Community Ditch, 19 N. Mex. 352, 376, 143 Pac. 207 (1914).

39/ New Mexico Products Co. v. New Mexico Power Co., 42 N. Mex. 311, 315, 77 Pac. (2d) 634 (1937, 1938).

40/ Reference was made particularly to San Diego v. Cuyamaca Water Co., 209 Calif. 105, 287 Pac. 475 (1930), and Los Angeles Farming & Mill. Co. v. Los Angeles, 217 U. S. 217 (1910).

41/ United States v. Santa Fe, 165 U. S. 675, 676-678, 691-692, 707 (1897).

42/ Cartwright v. Public Service Co. of New Mexico, ___ N. Mex. ___, 343 Pac. (2d) 654 (1959).

43/ Hutchins, Wells A., "Selected Problems in the Law of Water Rights in the West," pp. 351-352 (1942).

44/ Lux v. Haggin, 69 Calif. 255, 326-332, 4 Pac. 919 (1884), 10 Pac. 674 (1886).

45/ Vernon Irr. Co. v. Los Angeles, 106 Calif. 237, 250, 39 Pac. 762 (1895).

46/ Hart v. Burnett, 15 Calif. 530 (1860).

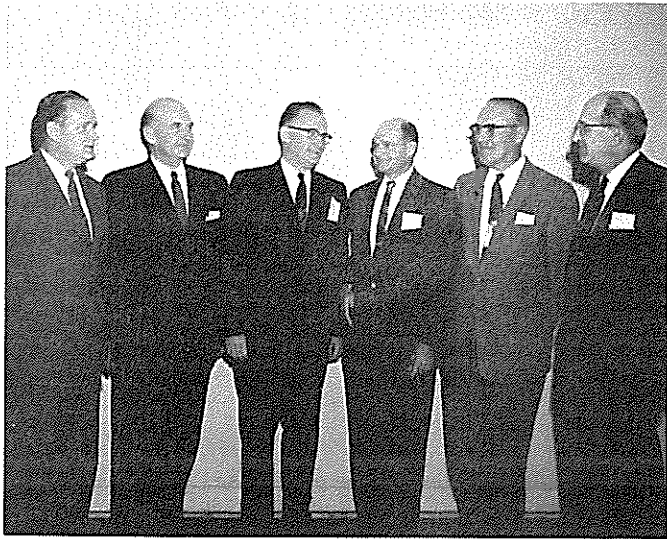
47/ Los Angeles v. Pomeroy, 124 Calif. 597, 649, 57 Pac. 585 (1899).

48/ Hart v. Burnett, 15 Calif. 530, 611 (1860).

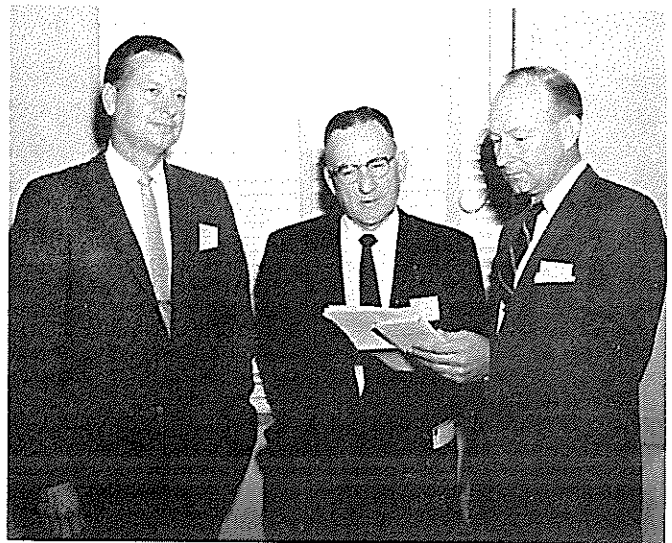
49/ State of Texas v. Valmont Plantations, No. B-20791, District Court of Hidalgo County, Texas.

50/ San Diego v. Cuyamaca Water Co., 209 Calif. 105, 122, 287 Pac. 475 (1930).

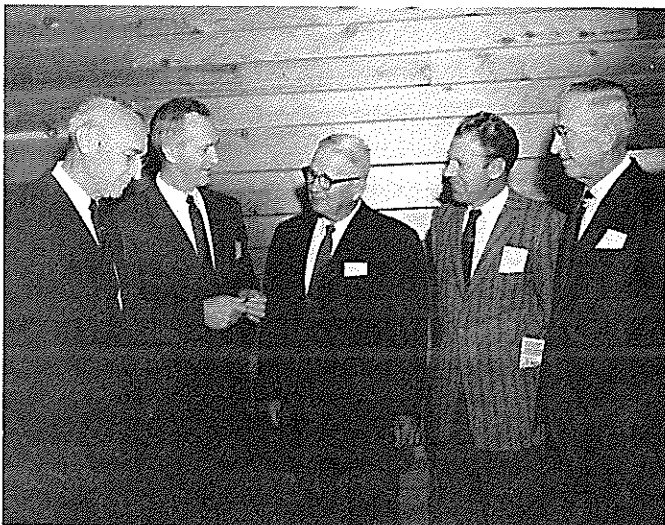
51/ See New Mexico Products Co. v. New Mexico Power Co., 42 N. Mex. 311, 318, 77 Pac. (2d) 634 (1937, 1938).



The speakers in the general session on Water Law were, far left, Wayne D. Criddle, Utah State Engineer, Salt Lake City; Ross Malone, Attorney and former President of the American Bar Association, Roswell, New Mexico; Dr. Roger B. Corbett, President, New Mexico State University; Congressman Tom Morris, Tucumcari, New Mexico and, far right, Irwin Moise, New Mexico Supreme Court Justice, Santa Fe, New Mexico. Serving as Chairman was Delmar Roberts, second from right, farmer and Member of the Board of Regents of New Mexico State University, Anthony, New Mexico.



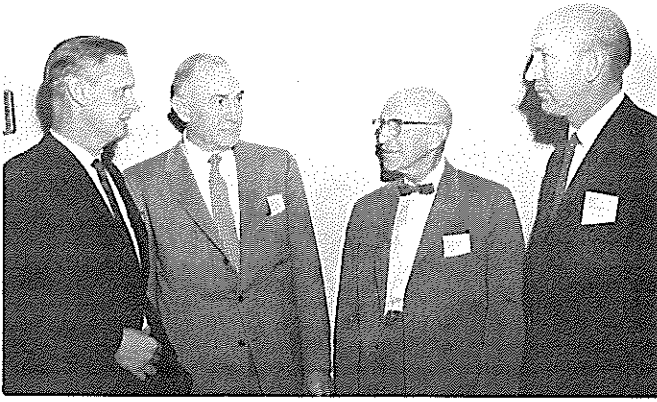
Rogers Aston, left, South Springs Foundation, Roswell, New Mexico with Gladwin Young, Deputy Administrator of the Soil Conservation Service, USDA, Washington D. C., and Dr. Robert H. Black, Dean and Director of Agriculture, New Mexico State University, as they discuss the banquet program.



Research and Education was the topic under discussion here with Vice-President W. B. O'Donnell, New Mexico State University; George Worley, Director of Pack Foundation Program, University of New Mexico; Dr. E. J. Workman, President, New Mexico Institute of Mining and Technology; Wm. P. Stephens, Associate Professor of Agricultural Economics, New Mexico State University; and A. S. Curry, Associate Director of the New Mexico Agricultural Experiment Station taking part.



This group, Jesse Lunsford, Assistant Professor of Civil Engineering, New Mexico State University; Charles A. Richey, Superintendent, Boulder Dam Recreational Area; W. L. Hanson, Assistant Regional Forester, U. S. Forest Service; Fred A. Thompson, State Director, New Mexico Department of Game and Fish; and Dr. James R. Gray, Associate Professor of Agricultural Economics, presented the program in the Water and Recreation Section of the Conference.



Wells A. Hutchins, second from right. Authority on Water Law, has 50 years of service with the Agricultural Research Service in this field meets with, left to right, Robert Emmet Clark, Professor of Law, University of New Mexico, T. T. Sanders, Attorney at Law and member of the Interstate Stream Commission, Roswell, New Mexico, and James F. Cole, far right, Assistant to the President and Agricultural Economist, New Mexico State University following the Water Laws section of the Conference.



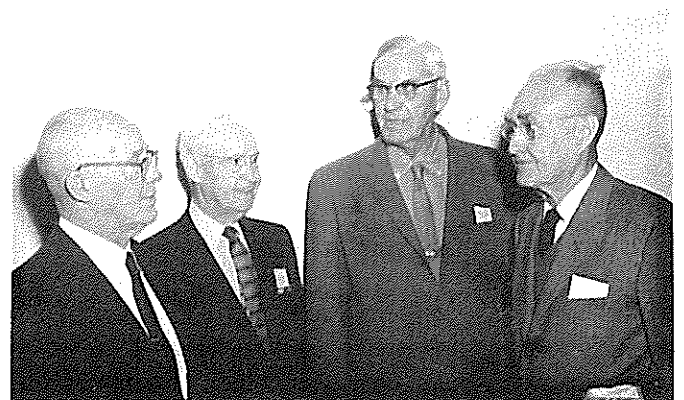
Steve Reynolds, State Engineer and Ivan Wood, far right, Water Consultant, Denver Colorado, enjoy a comment while Eldon Hanson, far left, Head of the Department of Agricultural Engineering, New Mexico State University, Robert Guice, Extension Soil Conservationist, New Mexico State University, and Jack Koogler, Chief of Design and Construction Section, State Engineers Office, look on.



Among the 400 persons attending the Fourth Annual Water Conference at New Mexico State University, November 5-6 were, left to right, Mrs. Howard Rosenthal, Santa Fe, past president of the League of Women Voters; Boyd Tuberville, El Paso Electric Company, Las Cruces; Mrs. Gertrude Lendmann, past president of the League of Women Voters of New Mexico; W. H. Gary, Rincon, Farmer and Member Interstate Streams Commission; and Mrs. Stanley J. Leland, Santa Fe, State chairman for water resources project of National League of Women Voters.



Harold Elmendorf, retired Soil Conservationist and Engineer, Mesilla Park, Fred Kennedy, Regional Forester, U. S. Forest Service, Albuquerque, New Mexico, J. L. Merritt, Farmer and Chairman of the State Soil Conservation District Association, Yaso, New Mexico, and Dr. H. Ralph Stucky, Head of Agricultural Economics and Agricultural Business Department and General Chairman of the Water Conference. Meet before a display poster emphasizing water prepared by the U. S. Forest Service.



Conferring at the Fourth Annual Water Conference are, left to right, Stuart Stirling, manager Silver City Chamber of Commerce; John P. Murphy, secretary, Middle Rio Grande Flood Control Association; W. H. Gary, Rincon, Interstate Streams Commission; and General Clyde Ely, publisher of Silver City Press and Independent.

PROBLEMS OF THE INTERSTATE STREAM COMMISSION

T..T. Sanders*

Professor Clark, ladies and gentlemen. I appreciate very much the opportunity of being invited to participate in the Fourth Annual New Mexico Water Conference. New Mexico State University, Dr. Stucky, and Professor Cole, deserve a note of vote of thanks for continuing this educational program with respect to water and water conservation. It is of the utmost importance to all the people of New Mexico.

My topic deals with the problems of the Interstate Stream Commission, and in order that we may better understand the many problems which confront this Commission, it might be well to give a brief history of its formulation.

The Interstate Stream Commission was created by the State Legislature in 1935, and originally consisted of three members. The Commission was enlarged to five members in 1939, and seven members in 1943. Six of the members are appointed by the Governor for a term of six years, and the seventh is the State Engineer. The Act provides that the appointed members shall be representatives of major irrigation districts, and no two members shall be from the same district or section. The present Commission is composed of I. J. Coury, Chairman, of Farmington; W. H. Gary, of Rincon; L. C. Strawn, of Tucumcari; Jack T. Cargill, of Carlsbad; Peter Gallagher, of Albuquerque; S. E. Reynolds, State Engineer, of Santa Fe, and the speaker. Its offices are in the Capital in Santa Fe.

The duties of the Commission are "to negotiate compacts with other states; to settle interstate controversies or looking toward an equitable distribution and division of waters in Interstate Streams System, subject in all cases to final approval by the Legislature of New Mexico, to match appropriations made by the Congress of the United States for investigations looking to the development of Interstate Streams originating in, or flowing through the State of New Mexico, to investigate water supply, to develop, conserve, protect and do any and all other things necessary to protect, conserve and develop the waters and streams system of this State, interstate or otherwise, to institute in the name of the State any and all negotiations and/or legal proceedings as in the judgment of the Commission are necessary to carry out the provisions of the Act creating the Commission. I might say also, the Governor has the same right to institute action to protect water rights in interstate streams by Art. 75-34-7 and 8.

Some funds of the Commission are appropriated by the Legislature, however, the principal source of funds is from lands granted to the then Territory of New Mexico by Congress, under what is known and called the Ferguson Act, dated June 21, 1898, and which said Act made various grants to the Territory of New Mexico, among which was one for 500,000 acres of land to be selected for the establishment of permanent water reservoirs for irrigation

*Attorney at Law and Member of Interstate Stream Commission, Roswell, New Mexico.

purposes. The other was 100,000 acres of land, the income of which is to be used for "The improvement of the Rio Grande River within the State and for increasing the surface flow of water in the bed of the river." Both of these grants directed that the income only from the respective grants could be used for the purposes for which the grants were made.

Thereafter by the Enabling Act, these grants were expressly confirmed to and accepted by the State to be held in trust, as was provided for in the Enabling Act. Therefore, we have the "permanent reservoirs for irrigating purposes permanent fund" and the "permanent reservoirs for irrigating purposes income fund." The same is true of the permanent funds of the Rio Grande and the income funds of the Rio Grande. There is at the present time approximately \$585,000.00 in the permanent Rio Grande Fund, and \$300,000.00 in the income Rio Grande Fund, of which amounts some \$175,000.00 have been committed to various projects. In the water reservoirs for irrigation purposes permanent fund, there is approximately \$860,000.00, and in the income fund there is approximately \$996,000.00, of which amount some \$475,000.00 have been committed to various projects.

The Attorney General of New Mexico has held that the monies belonging to the various funds referred to, can only be used for the express purposes provided in the Ferguson Act, and no portion thereof may be used for the purpose of developing municipal water projects.

New Mexico is an arid state with a scarcity of water and the development of our water supply must be carried out expeditiously if the best use of our water is to be made.

Our waters can best be divided into surface and underground waters; surface waters being those waters from rivers and streams flowing over and upon the surface of the land; and underground waters being those water supplied from underground basins, the boundaries of which are readily determinable. The problems of the Interstate Stream Commission can, therefore, be roughly divided into those dealing first with surface waters and those dealing with underground water.

One of the duties of the Commission is the administration of interstate compacts dealing with surface waters, and as such, New Mexico is a party to seven (7) interstate stream compacts, namely: the Colorado River Compact, La Plata River Compact, the Rio Grande Compact, the Costilla Creek Compact, Upper Colorado River Basin Compact, Pecos River Compact, and the Canadian River Compact. The first two are considered to be self-operative and the other five are administered by Compact Commissions. The engineering staff of the Interstate Stream Commission has in each instance made engineering studies and computations for the administration of the various compacts, and is participating in the making of detailed independent investigations of various phases of the State's water resources. Among most important of these are studies are those having to do with the San Juan River, and participating in the planning of the Navajo Irrigation and San Juan Chama projects, and studies on the lower Colorado River Basin Tributaries for use in connection with the litigation in Arizona VS California referred to herein.

At the present time the Commission is representing New Mexico in the litigation styled Arizona VS California in the U. S. Supreme Court, which is a suit brought by Arizona against the State of California in connection

with waters of the Colorado River, and in which the State of New Mexico was impleaded with respect to waters claimed, by it principally in the Jila, Zuni, Prieto River, and Black Creek area in Western New Mexico, having a combined drainage area of some 10,000 square miles. The claim of New Mexico to water from these tributary streams amounts to some 115,000 acre feet annually. The main interest of New Mexico in the present hearing is to provide a means whereby the water belonging to this State and claimed by it can be taken from tributary streams.

Hearings are being held and it will be some time before it is finally determined.

The Commission is furthermore assisting in a Cause styled State of New Mexico, ex rel Reynolds VS W. S. Ranch Company, which is a suit pending in the District Court of Taos County, New Mexico, brought by the State Engineer against the W. S. Ranch Company, to enjoin the use by said company waters from Costilla Creek above the reservoir, upon 1300 acres of lands. The Defendant answered the Complaint of the State Engineer, claiming all water users from Costilla Creek both above and below the reservoir, and in the State of New Mexico, as well as Colorado, are necessary parties to any suit brought for the purpose of determining his rights to such water; furthermore claiming a prescriptive right to use the waters from said Creek, claiming by virtue of the terms of the compact between the State of New Mexico and Colorado, his rights to the use of such waters were recognized. The District Court in a preliminary opinion held that all parties claiming any rights in and to the waters of said Creek, both in this State and Colorado were necessary parties to the lawsuit, and the suit at the present time is in the process of being appealed to the New Mexico Supreme Court, for the purpose of determining whether or not the State Engineer has right to bring an action to enjoin an individual from using waters from a stream system under which he has no adjudicated right, without requiring that all parties having rights thereunder, both in this State and without being made necessary parties to such action. The Court will be asked to determine the question of whether or not a water right in this State can be acquired by prescription.

The Colorado River Compact, as you doubtless know, is a compact of what is known and called the Upper Basin States, which are Arizona, Utah, New Mexico, Colorado and Wyoming, and the Lower Basin States, composed of Arizona, California, Nevada, New Mexico, and Utah. The waters involved in the Arizona VS California litigation mentioned above, are waters belonging to the State of New Mexico, are claimed by this State under and by virtue of the Lower Colorado River Compact while under the terms of the Upper Colorado River Basin Compact, we have acquired substantial water rights, and have five major projects planned and in the process at the present time. These projects are the Navajo Dam and Reservoir, the Hammond Project, the La Plata Project, the Navajo Irrigation Project, and the San Juan Chama Project. The Commission has been engaged in studies to determine the best uses of the waters afforded to the State of New Mexico under and by virtue of the various compacts. The Navajo Dam Reservoir at the present time is being built in the Farmington area of New Mexico, and will have a total capacity of 1,700,000 acre feet of water. The original contract in this connection has been let, and there is at the present time being built the Earthan Dam at a cost of some \$25,000,000. This Dam will provide 110,000 acres of new lands lying South of the San Juan River, with irrigation water, and will be

supplied by a 150 mile main canal extending from the Navajo Reservoir. In this same connection the San Juan Chama Project, the initial development of this project calls for the diversion of 110,000 acre feet of water annually from the San Juan River Basin, to the Rio Grande River Basin, to supply municipal and industrial needs and for supplemental irrigation water. This water will be supplied out of the Navajo Reservoir, and it will provide about 57,000 acre feet of water annually for municipal and industrial uses in the Albuquerque vicinity, about 23,000 acre feet to supply supplemental irrigation to the Middle Rio Grande, and about 30,000 acre feet to supply supplemental water to four tributary irrigation units on the Upper Rio Grande River.

In addition to the projects above mentioned out of the San Juan and the Navajo Reservoir, there is the Hammond Project in New Mexico, providing for approximately 3,500 acres of new land, and the Animas-La Plata area, which will provide for approximately 86,000 acres of land in Colorado and New Mexico together, of which amount some 16,000 acres will be new land to be put into cultivation in the State of New Mexico.

The Commission and its engineers and advisors have met numerous times with representatives of the Department of the Interior, the Navajo Tribal Council, and other affected interests, and have assisted in the drawing of legislation presented to the Congress in connection with the Navajo Dam, the San Juan Chama project and the Hammond project, all of which legislation has been submitted to and passed the Congress through the efforts of Senators Chavez, Anderson, and Representative Montoyo and Morris of New Mexico, for which they deserve a vote of thanks.

The problems of the Commission are not limited solely to problems of interstate streams. The use of ground water for irrigation has developed very rapidly and it is estimated that in 1940 approximately 140,000 acres were irrigated with underground water, and in 1955 588,000 acres were irrigated with underground water. The picture with respect to underground water is bleak, and in the Mimbres, Animas, Playas, Portales, Lea County, and Estancia basins, water is being withdrawn primarily from storage, and water levels will continue to decline. The same is furthermore true of the Roswell underground basin wherein it is estimated that approximately 190% of the annual recharge is being taken out annually. As you know, the Roswell basin is a rechargeable underground basin, however, the remainder of the basins are rechargeable from surface percolation, and as to those areas we are in effect mining the water. The policy of the State Engineer has been insofar as is possible, to limit withdrawal from those areas to that which can be sustained for a reasonable payout period of approximately 40 years.

It is estimated that by 1966 approximately 19,000 acres of the Portales area will not be irrigable from present sources and the Commission at present is studying a project which would supply water for about 20,000 acres in the most heavily pumped area in the vicinity of the City of Portales. The project would consist of a series of wells drilled in a sandhill area nearby under which the ground water reservoir has not as yet been developed, and thereafter the construction of works conveying the water some 20 miles. It is estimated that should this project prove feasible the water supply for the Portales project would be reassured for an additional 40 year period.

In many areas of the State surface waters and ground waters are intimately related and ground waters have been used to supplement surface waters. This practice has been approved and encouraged by the State Engineer in the Carlsbad, Hondo, and Rio Grande basins. It is a good economic use of ground water storage and it is anticipated that this practice will be developed in other areas in the State.

One of the most acute problems confronting the State, and with which the Commission is vitally concerned, is the rejuvenation and rehabilitation of underground water projects throughout the State for the reason that in every instance the underground waters that have been developed are being depleted in excess of the estimated safe yield. The depletion and overdraft of underground waters has in some instances resulted in serious salt encroachment, head lowering, and depletion of water in storage in underground aquifers. The principal source of the supply of water for many cities in the State of New Mexico is underground waters, and it is most essential to the economy of these cities that their underground water supplies be preserved and protected. There is at the present time some eighteen (18) cities in New Mexico each having a population in excess of 1,000 using substandard water in connection with their public water supply. A great majority of substandard water is derived from underground sources, and as the underground waters are depleted, fluorides, sulphates, and other solids increase and render the water less usable.

Prompt, and in many cases extreme measures must be taken to preserve, protect and maintain the underground water supplies which are so essential to our State.

There are large quantities, and in fact, almost inexhaustible quantities of brackish water located within the State of New Mexico, and if an economic method can be determined whereby brackish water can be converted, it will be of the utmost benefit to the people of the State of New Mexico, and the Commission is actively participating in an effort to obtain a demonstration plan somewhere in the State for the desalting of water, thereby rendering it usable for both individual and industrial consumption.

Our water problems, both as to surface and underground waters daily become more acute. The tremendous increase in population has accelerated industrial development, increase of acreage under cultivation, subnormal rainfall, acute drought conditions in the water shed areas, all of these factors have contributed toward the water shortage which confronts us at the present time. I do not feel that the average citizen is at all conversant with the acuteness of the water problem. However, I must say that the legislature of New Mexico has, over the past several years evidenced a growing appreciation of the problems confronting the State with respect to the protection and development of our water resources and the legislature did in 1955 pass a small projects Act which was designed to implement the conservation and efficient use of water through small irrigation projects.

This Act transferred the income from the "water reservoirs for irrigation purposes fund" to a new fund called the "New Mexico Irrigation Works Construction Fund." The Commission was authorized to issue revenue bonds for projects conserving and developing water, and the Commission authorized studies in connection with the Canadian River Investigation, the Black River Acre, Cabestro Dam Rehabilitation, Monticello Valley Area, and others.

The 1955 Act was amended by the Legislature in 1959, by Article 75-34-9 et seq and the powers of the Commission were broadened. The power of condemnation, purchase and exchange of property was given to the Commission.

The Commission furthermore has the power to sell, lease and otherwise dispose of all waters, which may be impounded under the provisions of the Act, and they may be sold for the purpose of irrigation, development of power, watering of stock, or for any other purpose.

The Commission may issue revenue bonds, fix rates, charges and prices in connection with projects; however, such rates, charges and prices shall be sufficient to pay all maintenance, and operational expenses, and provide for the payment of interest and sinking funds requirements.

While under the amended Act the Commission has the authority to pledge so much of the income from the Permanent Reservoirs for Irrigation Purposes Fund as it may desire to provide for the repayment of bonds issued by the Commission, it is well to bear in mind the Commission is engaged in water conservation work in the entire State and the income from such Fund is barely sufficient at present to pay current expenses of the Commission in connection with its work it is improbable that any appreciable portion of such fund could be pledged for bond debt retirement of some particular section of the State. The Act furthermore contains a provision stating that the Legislature "knowing that the owners it confers upon Interstate Stream Commission are broad. It is, therefore, in order that the Legislature declare its policy is not that the State Interstate Stream Commission should construct or repair irrigation works now owned, or which will revert to private individuals or corporations, under the powers granted by this amendment, unless the individuals or stockholders of such corporation are also all owners of lands under the irrigation works and users of water supplied by it for agricultural or domestic uses, and the works will result in a substantial conservation of water." The Commission is also authorized to make loans on such terms and for such length of time not to exceed 50 years, as it shall deem proper for irrigation purposes out of unpledged funds in the Irrigation Works Construction Fund, for the purpose of doing engineering and design work on a project, construction of a project, rehabilitation of an existing project, and in connection with feasibility studies, or may make loans for feasibility studies, if it so desires.

The Commission is expressly given the right for the purpose of building, operating and maintaining dams on the Canadian River, to anticipate the proceeds of the collection of taxes imposed upon natural resources to the extent of not exceeding \$5,000,000, provided, however, the Commission shall not allow construction to commence until it has reasonable assurance that this project will produce sufficient income with which to pay the cost of operation and maintenance of the dams constructed. The payment of this particular \$5,000,000 of bonds is guaranteed from severance tax funds, subject to a prior call upon such funds, as provided by Chapter 24 Laws of 1951, and by other Statutes as set forth in Article 75-34-38. It can thus readily be seen that the powers of the Commission have been greatly broadened, and at the same time the burden placed upon the Commission is much greater than ever before. We are charged with the duty of doing any and everything necessary, or which we may think proper for the development and preservation of the waters, interstate and otherwise, within the State of

New Mexico. We are given the authority in our discretion and with the approval of the State Board of Finance, to issue revenue bonds, yet at the same time the responsibility rests squarely upon the Commission to determine the feasibility of these various projects, and no standards have been set up whereby we can determine what factors should be used in determining the feasibility of these projects. The standards which we might or should apply may or should be entirely different from those of the Federal agencies, such as United States Bureau of Reclamation. It would appear that under the language of the Statute authorizing the Commission to issue bonds, no projects be authorized or constructed unless according to our estimates the revenues to be derived therefrom will be sufficient to pay the cost of maintaining, repairing and operating the same, and to pay the principal and interest of revenue bonds which may be issued for the cost of such project. The powers given to the Commission as can be seen are very broad, and the responsibility placed upon the Commission in connection with the issuance of bonds and the ability of the various projects to repay the same is tremendous. It might be recalled that the Government, through the Bureau of Reclamation, takes into consideration as to the repayment of obligations many factors not set forth in our Statutes here with respect to the ability to repay. For example, one of the factors used by the Government is power credits which is anticipated income from power sales, another is the value of recreational and wildlife benefits received, which are given a value set by the Bureau of Reclamation.

Drouth, and in acute shortage of water, has amplified the problems of the Commission, and many, many requests for help and the extension of credit, and funds have come from municipal areas and various other areas of the State, for help and assistance in checking and assisting in their obtaining adequate municipal and other water supplies. Regrettable as it may be, the funds of the Commission cannot be used for any purpose other than investigations, loans, and construction expenditures directly related to the development of water for irrigation purposes. This language contained in the grant of land whereby from which the funds are obtained to carry on the work of the Commission, prohibits the use of such funds for any purpose other than those directly relating to irrigation purposes.

The Commission is and has for sometime, participated with the United States Geological Survey, and the United States Bureau of Reclamation, in connection with surveys throughout the State of New Mexico, and in particular upon the Pecos and Rio Grande Rivers, with respect to cooperative programs whereby water may be salvaged and the supply of water increased, and the salinity of water may be studied and efforts made to combat the same.

At the present time the Commission is cooperating with the Hagerman Irrigation District in the Eastern part of the State for the purpose of assisting and making a survey relative to the feasibility of concreting canals, the drilling of new wells, for the purpose of supplying the users of irrigation water within such district. The Commission has in such connection, pledged to the Hagerman Irrigation District, a loan in the amount of \$250,000, at such time as a study has been completed and proper plans, engineering data and specifications have been submitted to the Commission, and repayment of which is to be secured by revenues from the District itself.

My brief experience with the Commission leads me to believe that since

its inception the Interstate Stream Commission has served the people of New Mexico long and well, and has obtained, preserved and protected for the State and its people, many, many, thousands of acres of water, the value of which to this area cannot be calculated in dollars and cents. I feel that the Commission and its entire staff are fully and wholly devoted toward trying to preserve, protect and obtain for the State of New Mexico, all water from any source obtainable that can be used to benefit the people of this State.

THANK YOU.

THE PUEBLO RIGHTS DOCTRINE IN NEW MEXICO

Robert Emmet Clark*

I

The Decision and its Legal and Other Background

On May 6, 1955, a complaint was filed in the District Court for San Miguel County that eventually produced the consequences to be discussed here. It is my task to outline and evaluate the final decision of the New Mexico Supreme Court in that case. The case is known as Cartwright et al v. The Public Service Co. of New Mexico. Actually Cartwright was joined by over 100 surface water users from the Gallinas River, including the State Insane Asylum, in the action against the Public Service Company of New Mexico. These plaintiffs alleged interference by the defendant with their prior appropriative rights. During the early course of the proceedings the water users were permitted to amend their pleadings and the Town of Las Vegas, a municipal corporation, was also granted leave to intervene in the case.

(At this point it should be made clear that the Public Service Company of New Mexico is a private corporation and is not a governmental or public corporation such as a ditch company or a conservancy district. It is a private corporation that is publicly regulated. In other words, it is a public utility. I make this point because there has been some confusion in the general public's mind between the Public Service Commission, 1/ a state regulatory body, and the Public Service Company of New Mexico, the defendant in this case).

On April 23, 1956, the District Judge who heard the case made findings of fact and prepared conclusions of law upon which he rested his decision in favor of the Defendant Public Service Company.

The District Judge found as a fact^{2/} that the Town of Las Vegas and the city of Las Vegas were successors in interest to the Mexican pueblo (known as Nuestra Senora de las Dolores de Las Vegas) established under Mexican law on April 6, 1835. This pueblo was founded under a colonization grant whereby the grantees were given lawful and paramount rights to so much of the waters of the Gallinas which flowed through and by the pueblo as was needed by the present inhabitants and for the continued uses of water by inhabitants in the future. It is, of course, this portion of the grant's application that gives us difficulty today. The grant was confirmed by Congress in 1860 and a patent to the grant was issued. ^{3/}

Here we must also inject an explanation that the term pueblo in this context had and has nothing to do with rights of Indians. ^{4/} You must realize that the term pueblo means town. The Indians who were discovered by the early Spaniards to be living in towns were called pueblo Indians which distinguished them from the nomadic Apache, Commanche and Navajo. In the discussions I have had with many lawyers on this subject I find this confusion.

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It is also found in some of the briefs. 5/

The most important findings of the District Court for the purpose of this discussion can be summarized briefly: 6/

The District Court found that the Gallinas River was the sole source of supply for the pueblo and its successors, the town and city of Las Vegas; that in 1880 the Agua Pura Company, a private corporation, received a 50 year franchise properly granted by the County Commission of San Miguel County; that this franchise carried the right to distribute the municipal water supply to the town and city and that The Public Service Company is the successor to the Agua Pura Company.

The court also found that water rights of the city and town were not litigated in the Federal equity case entitled U. S. v. Hope Community Ditch, 7/ which began in 1920 and ended in 1933 with a decree that adjudicated a very large number of water rights on the Pecos and its tributaries.

The District Court reached these conclusions of law:

1. That the Town and City of Las Vegas had an continues to have paramount rights to Gallinas waters dating back to 1835 that are superior to Plaintiff's appropriative rights.
2. That the Public Service Company is diverting and distributing this water supply for the proper purposes of municipal needs and may continue to do so.
3. That the Hope decree is not res judicata as to the legal question raised by the case, i.e., the issue of pueblo rights was not cut off by the Hope Decree.

On the basis of the facts as found and these conclusions of law, the District Court entered judgment dismissing the plaintiff's complaint.

The Plaintiff appealed this decision to the New Mexico Supreme Court. Briefs were filed as usual by both sides and by others not parties to the litigation. These were not ordinary briefs. They were the work of a large number of excellent lawyers and they filled many pages. Both the State of New Mexico through the Attorney General and the City of Albuquerque filed amicus curiae briefs because of the great public questions involved. Two irrigation districts, the Interstate Stream Commission and the State Engineer joined in the State's amicus brief. The Court heard oral arguments and had the case under consideration until December 12, 1958, when a 3-2 decision was handed down which affirmed the trial court. Subsequently a rehearing was sought and more briefs were filed. On June 1, 1959, a court reaffirmed its original stand in a one paragraph opinion and denied the motion for a rehearing. The two dissenting judges filed another long dissenting opinion. Thereafter following the mandate there were three additional motions filed -- for another rehearing, to recall the mandate and a motion for a five judge court to hear the motions, Justice Sadler having retired. On September 3, or two months ago, the court denied all of the motions. Under authority of earlier cases they declined to call another judge to break the existing tie. This meant that the original opinion stood. The two dissenting justices filed another dissenting opinion.

It is this mass of material, covering 42 printed pages in the published report, 8/ that I am going to try to summarize and comment on.

The Supreme Court framed the appeal in the context of three questions:

1. Did the Hope decree bar the present assertion of pueblo rights?
2. Did some of the plaintiffs have water rights superior to any pueblo rights because they were prior in time and were based on allegedly older appropriation rights?
3. Is the New Mexico court entitled to apply the pueblo rights doctrine as known and recognized in California?

These questions will be taken up in the order stated:

1. Hope Decree. The nature and effect of the Hope decree, although extremely important to the case, is of more interest to lawyers than to most of this group. However, I will summarize the court's conclusion.

You will remember that the plaintiff water users in this case claimed that the defendant corporation and the town of Las Vegas could not assert pueblo rights in 1955 because the town's rights had been adjudicated by the Hope equity proceeding which ended in 1933. The defendant, on the other hand, contended that the Hope decree had no application because the town and city of Las Vegas had not participated in the proceedings and no water rights as to them had been adjudicated. The Supreme Court interpreted the record to show no appearance or any participation by the Town or the City. Thus, the court concluded the Town and City were not barred by the principle or res judicata from asserting pueblo rights in the present proceeding. (Res judicata applied in this context means that no water rights had been litigated and new claims could be made). As I said, this is a technical legal point which I must pass over too quickly in order to get to the pueblo rights doctrine.

2. Claims of older water rights established before the Town of Las Vegas pueblo established. Here again I must be very brief. The plaintiffs who claimed as heirs under the title of Luis Cabeza asserted rights that were alleged to go back to 1821, or before the pueblo was founded in 1835. The court referred to the Congressional confirmation of the pueblo grant in 1860 and the patent that was issued and pointed out that no conflicting claims were recognized at that time. The court also referred to an earlier decision 9/ that said that a grant by Mexico under conditions that were properly shown did not need legislative confirmation. In effect they recognized judicial confirmation of a grant.

3. The applicability of the pueblo rights doctrine. This is the subject of primary interest to you. It is the part of the decision with the greatest ramifications. The court concluded that the doctrine was applicable in New Mexico and the plaintiffs' claims were held to have been properly dismissed by the trial judge. A number of the court's statements should be read to you.* I have them before me, but I shall read only the most vital excerpts and comment on them. I will also mention the dissenting

*The portions underlined were the ones actually read.

opinion's main themes. At the end I shall comment on the doctrine as announced with respect to its future application in New Mexico.

This leaves for final determination of the three basic questions listed near the beginning of this opinion, viz., the question of whether the doctrine of Pueblo Rights was properly recognized and applied by the trial court in disposing of this case. It should be enough at this point in our opinion, without setting out all the facts pertinent to the question, to say the learned judge did recognize the doctrine and apply it to the facts found, thereby upholding the doctrine in its relation to the rights of the Town of Las Vegas, the City of Las Vegas and the defendant, respectively, in and to the waters of the Gallinas River under said doctrine. 10/

* * * *

It is not surprising that a doctrine such as the Pueblo Rights arose when we consider the fact that these colonization pueblos to which the right-attached were largely, if indeed, not always, established before there was any settlement of the surrounding area. Thus it resulted that there had never been any prior appropriations or use of water of the river or stream, nor any allotment of lands, by the Mexican government prior to the establishment of the Pueblo.

(3) It is the claim of plaintiffs (appellants) that constitutional and statutory provisions touching the use of water is contrary to the Pueblo Rights doctrine and that it can find no place in our jurisprudence. They fail, however, to point out in what respect this is true. This Court has long recognized that we have followed the Mexican law of water rights rather than the common law. In *Martinez v. Cook*, 56 N.M. 343, 244 P. 2d 134, 138, we said:

"Particularly, we have never followed it in connection with our waters, but, on the contrary, have followed the Mexican or civil law, and what is called the Colorado doctrine of prior appropriation and beneficial use."

We see nothing in the theory of Pueblo Rights inconsistent with the doctrine of prior appropriation and beneficial use. The Town of Las Vegas was granted a water right by the Mexican government in 1835.

It is an admitted fact that the doctrine of Pueblo Rights as we understand and all the parties argue it is well recognized in the State of California. The parties agree that the question has not been determined in the State of New Mexico, although both parties seek to gain some comfort from two New Mexico cases which mention the doctrine. They are the cases of *State ex. rel. Community Ditches v. Tularosa Community Ditch*, 19 N.M. 352, 143 P. 207, and the case of *New Mexico Products v. New Mexico Power Co.*, 42 N.M. 311, 77 P. 2d 634. In neither case was any position

taken by the Court on the doctrine. In the Tularosa Ditch case the Court merely referred to it and said the right could not be sustained under the facts of that case because Tularosa was founded long after the territory was acquired by the United States and had never been a Mexican pueblo. In the New Mexico Products Co. case supra, we referred to the decision of the Supreme Court of the United States in *United States v. City of Santa Fe*, 165 U. S. 675, 17 S. Ct. 472, 41 L. Ed. 874, where it was held that Santa Fe was never established by the Spanish or Mexican government as a pueblo and therefore could not claim Pueblo Rights. We did not in either of the cases mentioned hold that the doctrine of Pueblo Rights was not applicable in New Mexico, but only that, under the facts before us neither Town had such rights . . . in *State v. Tularosa Community Ditch*, supra, we said (19 N.M. 352, 143 P. 215):

"At first the plan for the establishment of these pueblos was for the King of Spain, in each case by special ordinance, to provide for the foundation of the pueblo and to set apart for the use of the pueblo and its inhabitants a certain area of land and to prescribe in the ordinance the rights of the pueblo and its inhabitants to the use of the waters flowing to those lands. * * * And, further, it was also at this time provided by the King, by general ordinance, that thereafter, the provisions and rights granted and the general plan followed in the foundation of the pueblo of Pictic should be followed in the foundation of any new pueblos in the jurisdiction of the commanding general of the internal Provinces of the West, of which California, Arizona, New Mexico, and Texas constituted a part. * * * And this pueblo rights to the use of water, or the right of all the inhabitants in common within the jurisdiction of the pueblo, was superior to the individual rights of appropriators, and also superior to the right of the riparian proprietors, through whose fields the stream ran."

As already stated, however, neither this case nor that of the *New Mexico Products Co. v. New Mexico Power Co.* may be cited with any justification by any party to this suit as sustained a position taken by this Court on the Pueblo Rights doctrine. 11/

(4) (And) in California the priority of right in a colonization pueblo to take all the waters of a non-navigable stream for the use of its inhabitants on an expanding scale necessary for the benefit of its inhabitants was early recognized and enforced. *Hart v. Burnett*, 15 Cal. 530; *Lux v. Haggin*, 69 Cal. 255, 4 P. 919, 10 P. 674; *Vernon Irrigation Co. v. City of Los Angeles* 106 Cal. 237, 39 P. 762; *City of Los Angeles v. Los Angeles Farming & Drilling Co.*, 152 Cal. 645, 93 P. 869, 1135; *City of San Diego v. Cuyamaca Water Co.*, 209 Cal. 102, 287 P. 475; *City of Los Angeles v. Pomeroy*, 124 Cal. 597, 57 P. 585; *Hooker v. City of Los Angeles*, 188 U. S. 314, 23 S. Ct. 395, 47 L. Ed. 487; *Treaty of Guadalupe Hidalgo*. 12/

* * * *

It was as early as 1789 that the King of Spain established the Town of Pictic in New Spain and gave the settlement preferred rights to all available water from which evolved the doctrine of Pueblo Rights. 1 Kinney on Irrigation and Water Rights 996. And as shown by the quotation from Kinney in State v. Tularosa Community Ditch, supra, the King decreed that thereafter the general plan followed in the foundation of the Pueblo of Pictic should be followed in the foundation of any new pueblos in California, Arizona, New Mexico and Texas. 13/

* * * *

(6) We are unable to avoid the conclusion that the reasons which brought the Supreme Court of California to uphold and enforce the Pueblo Rights doctrine apply with as much force in New Mexico as they do in California. A new, undeveloped and unoccupied territory was being settled. There were no questions of priority of use when a colonization pueblo was established because there were no such users. Water formed the life blood of the community or settlement, not only in its origin but as it grew and expanded. A group of fifty families at the founding of a colony found it no more so than when their number was multiplied to hundreds or even thousands in an orderly, progressive growth.

And just as in the case of a private user, so long as he proceeds with due dispatch to reduce to beneficial use the larger area to which his permit entitled him enjoys a priority for the whole, so by analogy and under the rationale of the Pueblo Rights doctrine, the settlers who founded a colonization pueblo, in the process of growth and expansion, carried with them the torch of priority, so long as there was available water to supply the life blood of the expanded community. There is present in the doctrine discussed the recognizable presence of lex suprema, the police power, which furnishes answers to claims of confiscation always present when private and public rights of claims collide. Compare, Middle Rio Grande Water Users Ass'n. v. Middle Rio Grande Conservancy District, 57 N.M. 287, 310, 258 P 2d 391. So, here, we see in the Pueblo Rights doctrine the elevation of the public good over the claim of a private right. 14/

* * * *

Public Service Company does not own the pueblo rights of said City and Town, as the trial judge viewed the matter. His findings, conclusions and judgment so reflect and affirm. It merely acted as the agent and instrumentality of said City and Town in enabling their inhabitants to enjoy to the fullest extent the pueblo rights inaugurated by the King of Spain. Yet, even he, the King but bespoke a fact of life as ancient as the hills when he became the author of the Plan of Pictic. Water is as essential to the life of a community as are air and water to the life of an individual. It is frequently mentioned as the "life blood of a community." It is precious. It is priceless. A community, whether corporate or not, possessing such an indispensable right can neither sell, barter, exchange, or give it away. Either this is

so, or the supposed benefaction of the King of Spain in anaugurating the Plan of Pictic became in reality an obituary instead. Water is essential to life. Without it we perish.

Furthermore, we can no more ignore the Pueblo Rights doctrine as a major issue in this case then could we with propriety decline to entertain this appeal. It is raised both by defendant's answer and the "further, separate" and affirmative defense of intervenor filed in the cause, and so recognized by Judge Brand in his letter to all counsel under date of January 30, 1956, and the judgment itself. Either the court and all counsel at the pre-trial conference misapprehended what the major issue was, or it projected itself as such surely and unmistakably.

We think the trial court was correct in sustaining the claim of defendant and intervenor under the Pueblo Rights doctrine. Other collateral questions are argued but they either are resolved by what we have said, found to be without merit or unnecessary to determine. The findings and conclusions are supported by substantial evidence and the judgment should be affirmed.

It will be so ordered. 15/

The dissenting opinions are too long 16/ to take up in detail at this time. Their main thrusts are both technical and policy oriented. All I will give you is an outline of their main points. It seems appropriate, if not necessary, to explain why a five man Supreme Court has split 3-2 over a water law problem.

The dissenters question the applicability of the pueblo rights doctrine on constitutional, historical, procedural, jurisdictional and public policy grounds.

Their first main point is that the pueblo rights question was not properly before the court since the Town of Las Vegas did not assert such rights. The community was merely an intervenor. Thus the Public Service Company was asserting a right which was not its property. The dissent stresses that the Public Service Company is merely a carrier and distributor of water under a franchise with the community and even though the pleadings in the case state that the utility is "the instrumentality of the intervenor" it is not the owner of the community's water rights. The utility could not assert any title or ownership to the "pueblo water rights" because its rights are those obtained from its predecessor The Agua Pura Company, which had its 1881 priority adjudicated by the Hope decree. This contention of the dissenters is supported by the records of the State Engineer's office and other documents in the case. The dissenters believe that the sole issue before the court was whether the Public Service Company was using more than the 2,600 acre feet allocated to the Agua Pura Company and in which, the dissent says the community may have also had an interest. This amount was reconfirmed by the State Engineer in 1950. 17/ On this basis the dissent concludes that the Hope decree is res judicata between the plaintiffs and the Public Service Company, i.e., the assertion of pueblo rights by the Public Service Company at this time is barred by established legal principles.

The dissent also expresses the view that the only possible way the Public Service Company may assert pueblo rights is as Trustee for the Town of Las Vegas and its inhabitants. 18/ But here the dissent directs attention to the fact that the town was a party in the earlier Hope adjudication. It did not file an Answer in the proceeding or make a claim at that time but there was an appearance by the Town's lawyer in these words quoted in the opinion: 19/

"I also appear for the Town of Las Vegas, and consumers of water of the Town of Las Vegas, in the event it becomes necessary to appear for said parties by reason of any adjudication of the title to the water between them and the Agua Pura Company as to the water rights of the consumers of the Town of Las Vegas."

The dissent's construction of these words differs from the view of the majority and is of course a crucial element in the decision. The second dissenting opinion, filed after the second motion for a rehearing was denied, re-emphasizes that the Agua Pura Company's rights were adjudicated in the Hope decree and since the Public Service Company could not have greater rights than it received from its predecessor, its present rights cannot be greater than those received under the decree.

Moving on to a consequence of the majority decision, the dissent declares that it "will cast a cloud on all stream rights in the Pecos stream system, to say nothing of what will happen to the Rio Grande water rights as shown by briefs herein of amicus curiae." 20/ The dissent states that "the doctrine of Pueblo Water Rights as enunciated by the California courts should not be followed and declared to also be the law of New Mexico." 21/ The dissent expresses the view that the new doctrine is California doctrine made necessary by demands for an adequate city supply for Los Angeles and is not the old pueblo rights doctrine. 22/

There is a sharp criticism of the majority's statement of history to the effect that: 23/

"A new undeveloped and unoccupied territory was being settled. There were no questions of priority of use when a colonization pueblo was established because there were no such users."

The dissent quotes from a case decided by the New Mexico Supreme Court in 1892 which recites facts clearly showing that in 1819 a grant was made to one Antonio Ortiz in the area of the Gallinas river. 24/ This record indicates that the Gallinas area was not unoccupied territory.

The old question is raised of whether the Las Vegas area was part of Texas and not subject to the treaty of Guadalupe-Hidalgo. 25/ This treaty with Mexico was required to recognize only vested rights. If there were any water rights existing at that time they were what in law are called contingent rights based on Mexican Law. It was this theory that the California courts and the California legislature molded into the California pueblo rights doctrine. No such evolution of legal doctrine took place in New Mexico. In fact, the court has twice refused to apply this doctrine: "On two prior occasions this court has carefully desisted from expressing an

opinion that the pueblo rights doctrine applied in New Mexico." 26/ Moreover, the dissent says, the doctrine contradicts appropriation theory and practice as developed in New Mexico and which is the doctrine or rights based on actual beneficial uses. In addition, it jeopardizes our interstate relations under the Pecos and other compacts and under established principles of interstate allocation.

The dissenters would have granted all three of the subsequent and final motions filed in the case. Emphasis is placed on a newly raised jurisdictional question, viz., that the Las Vegas Grant created by territorial legislation in 1903 was an indispensable party because the Town of Las Vegas, which did not exist as a municipal corporation in 1860 when the Las Vegas Grant was confirmed by the Congress, was and is within the exterior boundaries of this grant. 27/ The dissenters believe this was a serious question which should have been reviewed by a five man court rather than by the four remaining justices who were divided 2-2 after the retirement of Justice Sadler.

Although I have already taken too much time, I have given you only a glimpse of the contending doctrines, historical uncertainty and legal assumptions.

Let me repeat that the law of the case, the majority opinion, holds that the Public Service Company through its franchise from the Town and City of Las Vegas was entitled to assert the pueblo rights doctrine as imported from California and that the municipalities' rights to the waters of the Gallinas were not litigated or determined in the Hope decree.

II

Significance of the Decision

Now you will want to know what future significance this decision may have for the rest of the state.

The case raises a large number of questions including future attacks on the Hope decree which I will not discuss. However, there are five questions that I will take up.

1. Can the pueblo rights doctrine as derived from the Plan of Pictic (or Pitic) and the California cases be applied elsewhere in the State?

The theoretical answer is yes. However, the likelihood of its application is not great. You will remember that the Plan of Pictic was devised in 1789. 28/ At this time New Mexico, as a part of New Spain, had a pretty well settled tradition. The important Rio Grande towns had long been established, e.g., Albuquerque was already officially over 60 years old. 29/ You will recall that in the history of New Mexico the Rio Abajo towns were established later than the Rio Arriba towns. Most of these lower river towns were settled after the Pueblo Rebellion of 1680 when the Spaniards retreated to El Paso del Norte. 30/ The towns in the north, Santa Fe, Espanola and those in that area were founded earlier. Most of the large land grants in the river areas had also been made before 1789. If the Rio Grande and Pecos river towns are to

establish pueblo rights they will have to find some law older than the Plan of Pictic of 1789 on which to base their claims, assuming of course that water rights were included in them in the manner of the Plan of Pictic. That this can be done is highly doubtful for a number of reasons that cannot be examined in the time allowed us here. It should be pointed out, however, that California precedent will be of little or no help if some pre-1789 pueblo grants are discovered in New Mexico. California was not occupied until long after New Mexico was settled. Although the early explorers had sailed along the coast in 1542-43 California was not of sufficient importance to SPAIN to encourage occupation until 1769-1770 when San Diego and Monterrey were occupied as part of a counterbalance to the Russian activities in Alaska between 1745 and 1765. 31/ The so called "mission period" extended from 1769 to 1823. Civil municipalities, as distinguished from the missions and presidios, were called pueblos. 32/ Los Angeles, El Pueblo de Nuestra Senora La Reina de Los Angeles, was established as a pueblo in 1781. 33/

2. Will communities claiming the benefits of the pueblo rights doctrine be required to produce formal documents establishing the date and circumstances of their founding?

Apparently they will under the principle discussed in New Mexico Products Co. v. New Mexico Power Co. 34/ This case relied upon a decision of the United States Supreme Court in U. S. v. City of Santa Fe 35/ which held that it was never established that Santa Fe was founded by the Spanish or Mexican government as a pueblo and therefore it could not claim pueblo rights. However, at the time the New Mexico Products case was tried the Orders regarding the founding of the City of Santa Fe received by de Peralta, the third governor of the region, had been published and translated in the pages of the New Mexico Historical Review in 1930. 36/ The new governor followed Juan Onate and his son Cristobal who had made some plans for the town. The founding apparently took place between 1609 and 1614 and very probably in 1610.

California of course has followed a de facto or in fact founding principle rather than a de jure or legal theory, i.e., the formal legal documents are not the important test but the actual existence of a community.

3. What effect will this doctrine have on interstate stream apportionment and interstate compacts?

It may have considerable effect in terms of interstate suspicion and complaint even if no actual pueblo rights beyond those claimed in the Cartwright case are recognized. If additional actual claims are made and substantiated some demands may occur for compact renegotiations or new apportionments. The compacts are subject to the overriding appropriation doctrine with its hierarchy of priorities and preferences. The effect on intrastate rights is obvious from this case.

4. What problems does this decision present in the area of public control and supervision of water resources charged by law to the State Engineer?

The case raises questions about methods for determining supply in any given area. It makes the job of the State Engineer extremely difficult in anticipating demands in terms of known rights and projected uses. There is

an increased element of uncertainty in the picture of determining available supply at a given place or for a particular purpose. It will undoubtedly add to the administrative burden of the State Engineer's office in that he will have to spend more time gathering data to show some claim to be baseless in fact.

5. Does the doctrine apply to ground water?

It does not unless the State Engineer wishes to have his interrelationship theory of surface and ground water pressed to the ultimate limits. The California cases if they are followed in this matter may prove helpful to compel the State Engineer to go to that length, although it must be remembered that under the common law and the civil law of Spain percolating ground water belonged to the land owner. 37/

This question is of course very important since most of the claims of towns like Albuquerque will be to ground waters. (Here reference was made to a newspaper story in the Albuquerque Journal for November 3, 1959, entitled, "Town of Atrisco Launches Claim to Grant Waters" and containing the following statement: "The grant has laid claim to all of the Rio Grande water it needs for its growth, including underground water . . ."). In areas outside of the declared ground water basins where the State Engineer has no jurisdiction the problem will also be important if a pueblo right is asserted and proved.

III

Conclusions

Any new public policy that recognizes the claims of a city is good law in terms of utility and necessity. However, the method of reasoning in this case from uncertain historical premises and dubious Spanish, Mexican and California precedents is not very persuasive. The oblique reliance on the police power of the state to limit property rights, i.e., prior appropriation rights seems contrived. Hortatory expressions like the following from the majority opinion 38/ state the obvious, but they are not good substitutes for analysis and explanation:

"Public Service Company does not own the pueblo rights of said City and Town, as the trial judge viewed the matter. His findings, conclusions and judgment so reflect and affirm. It merely acted as the agent and instrumentality of said City and Town in enabling their inhabitants to enjoy to the fullest extent the pueblo rights inaugurated by the King of Spain. Yet, even he, the King, but bespoke a fact of life as ancient as the hills when he became author of the Plan of Pictic. Water is as essential to the life of a community as are air and water to the life of an individual. It is frequently mentioned as the "life blood of a community." It is precious. It is priceless. A community, whether corporate or not, possessing such an indispensable right can neither sell, barter, exchange, or give away. Either this is so, or the supposed benefaction of the King of Spain in inaugurating the Plan of Pictic became in reality an obituary instead. Water is essential to life. Without it we perish." (My emphasis)

The modern reading of the police power into the pueblo rights doctrine^{39/} of the colonial period is not easily accepted as the basis for an act that amounts to confiscation. Here we should recall that the police power is an important attribute of the state's power to provide for the health, safety and general welfare of the people. We must remember that there is no constitutional limitation on its exercise except that it be reasonable. No compensation need be paid. Eminent domain, on the other hand, has been the traditional method for taking private property for a public use and constitutional guarantees require just compensation. It is my opinion that the revival of a community power long dormant and unknown through the conjuring up of doubtful legal history and non-applicable California decisions is not the way to get to the heart of the main problem presented by the case. I refer of course to preferences among water uses. The dissent makes clear "that municipalities do have a preferential right but such right is a preference developed by the law of appropriation"^{40/} and would require condemnation and compensation. No doubt in some communities this method would be inadequate and the police power would have to be invoked to preserve the health, safety and welfare of a community. For citizens must and will have water to drink. However, I do not believe that their supply should be preserved in the guise of historical rights. In summary, I believe the Cartwright case reaches a desirable result in assuring community supply but it does so over a course of intellectual hurdles I find hard to leap.

The case will continue to be important no matter how narrowly the principle it announces is construed. It calls attention to the matter of preferences among water uses which must be re-examined by the public and the legislature. The West's water law institutions have long been dominated by agricultural and mining requirements. While these are extremely important and will certainly continue to be so, it must be recognized that the pressing demands of the future, while not necessarily large in volume, are the key to the West's development. I refer to residential, industrial and recreational uses. It is expected that by 1980 the population of the Nation will have increased by 75 million.^{41/} In the 11 far western states population increases are expected to continue to be over 3 times as great as the rate for the Nation. Between 1940 and 1955 the increase in the 11 western states was 83% as compared with an increase of 24% for the Nation. This means that our Western population of about 26 or 27 million will double to over 50 million by 1980. You know what that means to New Mexico and every one of its communities. And it seems to be a valid assumption that most of our future growth and activity will not be dependent upon the expansion of irrigation.

Available knowledge and an examination of trends leads me to believe that the Rio Grande towns and the cities of the Pecos sub-basin will have to think up some better theories than pueblo rights to augment municipal supplies. I make this statement for several reasons. First, the Cartwright decision probably won't prove applicable to the facts, the law or the history of these many communities in the state. Secondly, the rule of the case does not apply to ground waters. Yet cities will have to rely increasingly on that source of supply. Thirdly, the cloak of the police power in the manner of the Cartwright decision is productive of uncertainty, expensive litigation and unconvincing results. It may be cheaper for towns to condemn water rights and pay for them. Finally, the Las Vegas Grant itself, as distinguished from the Town of Las Vegas, has not yet been finally heard from. It seems to me that it should be. Although the Cartwright decision says nothing directly about this matter it may be that the Grant will find

its way into court and will remain there long enough to limit the Cartwright decision to its own facts and thus put an end to this confusion of history and desirable community goals.

Footnotes

1. The New Mexico Public Service Commission (N.M. STAT. ANN. 1953, 68-4-1 et seq through 68-10-1 et seq) is a statutory public utilities commission. The New Mexico Corporation Commission was established by the Constitution Art. XI, sec. 1 et seq.
2. The Supreme Court reproduced in full the District Judge's findings and conclusions, 343 P. 2d 654 at 655-659.
3. 12 Stat. 70, Section 3 of the Act of Congress, June 21, 1860. See 343 P. 2d 654 at 663: "The Section of the Act of 1860 confirming the Las Vegas Grant is in the same language, except for the claim made, as that confirming the other Mexican grants by the same Act."
4. Indian rights and titles are a field apart. The point under discussion concerns colonization pueblos and not the confirmation of Indian rights. Indians have available additional constitutional, treaty and compact safeguards. However, the question of priority between Indian claims and pueblo rights is not part of this discussion even though, as will appear obvious from the later discussion, the claims of towns under the pueblo rights doctrine to large supplies of water may threaten to impair existing Indian uses, e.g., if Albuquerque were to establish a pueblo right, the effect on the Rio Grande at Isleta would no doubt result in action by the Indians to find out who has a prior legal right.
5. See Amicus Brief of City of Albuquerque (in opposition to motion for rehearing) at page 11-12 where the idea of Indian rights is refuted.
6. There are a total of 25 separate findings of fact and 6 separate conclusions of law. However, formal requirements of statements of jurisdiction and other matters partly explain their number.
7. No. 712, Equity, U. S. District Court of New Mexico (1933).
8. 343 P. 2d 654-696.
9. State ex rel State Game Commission v. Red River Valley Co. 51 N.M. 207, 182 P 2d 421 (1947).
10. Cartwright v. Public Service Co. 343 P 2d 654, at 664-665.
11. Ibid 665-666.
12. Ibid 667-668.
13. Ibid 668.
14. Ibid 668-669.
15. Ibid 669.
16. They cover about 26 printed pages.
17. See dissent page 671.
18. Dissent page 672.
19. Dissent page 673.
20. Dissent page 674.
21. Ibid.
22. Ibid 677-678.
23. Dissent quotes majority at page 686.
24. Ibid 687 quoting from Waddingham v. Robledo 6 N.M. 347, 28 Pac. 663, 667 (1892).
25. Ibid 687.
26. Ibid 674.

27. Ibid 692-693.
28. Ibid 668. "It was as early as 1789 that the King of Spain established the Town of Pictic in New Spain and gave the settlement preferred rights to all available water from which evolved the doctrine of Pueblo Rights"
29. Historians tell us that the City was founded in 1706.
30. Blackmar, Spanish Institutions of the Southwest p.225 (1891).
31. Encyclopædia Britannica, 1955 ed., vol. 4, p. 591.
32. Blackmar, supra p. 153: "The purely civil colonies of California were called pueblos to distinguish them from missions and presidios"
33. See Hutchins paper.
34. 42 N.M. 311, 77 P. 2d 634 (1937).
35. 165 U.S. 675 (1897).
36. Vol. 4, New Mexico Historical Review, pps. 179-194 (1929).
37. See Bristor v. Cheatham, 75 Arizona 227, 255 P. 2d 173 at 176 (1953) Citing Kinney on Irrigation and Water Rights, Vol. 1, sec. 563, 2d ed.
38. Cartwright v. Public Service Co. 343 P. 2d 654, 669 (1959).
39. Ibid 668-669: "There is present in the doctrine discussed the recognizable presence of lex suprema, the police power, which furnishes answer to claims of confiscation always present when private and public rights or claims collide"
40. Ibid dissent p. 679.
41. These figures and those following are from Fox, "Water: Supply, Demand and the Law" a paper read before the Mineral and Resources Law Section of the American Bar Association at the annual meeting August 25, 1959.

PHREATOPHYTES AND WATER SALVAGE

Jack G. Koogler*

INTRODUCTION

Phreatophytes -- or, more exactly, uneconomic phreatophytes that consumptively waste water -- are estimated to cover an area of nearly 16 million acres in the 17 western states. Water requirement for this acreage is about 22 million acre-feet annually. This tremendous loss may be more fully comprehended when it is considered that the average flow of the Colorado River at Lee's Ferry is 13,150,000 acre-feet annually. In 1952, approximately 441,000 acres in New Mexico were infested with phreatophytes having a non-beneficial use estimated at 870,000 (1) acre-feet. A major portion of this waste occurs in two of our most important and productive stream systems, the Rio Grande and the Pecos River.

In the Rio Grande, from Elephant Butte to the narrows below Otowi, there are about 60,000 (2) acres upon which a thriving stand of non-beneficial vegetation, principally salt cedar mixed with cottonwoods, is now growing. The same thing is occurring on approximately 42,500 (3) acres in the Pecos Valley from Alamogordo Dam to the Texas state line. It has been estimated that these areas consumptively waste 240,000 and 117,000 acre-feet respectively.

Salt cedar (*Tamarix pentandra*), the most aggressive of the phreatophytes, has been observed in nearly all stream systems of New Mexico and is rapidly becoming the predominant non-beneficial plant in most of them. In the Pecos Valley in 1915 a mere 600 acres of salt cedars were noted in the delta of McMillan Reservoir. The State Engineer Survey of the Rio Grande Valley in 1918 makes no mention of this species. It had not become significant enough to list until the Scobey Survey of 1936, at which time the infestation in the Middle Valley amounted to approximately 3,570 acres. Today the eradication and control of hundreds of thousands of acres of salt cedar in New Mexico constitutes one of the largest single sources of salvageable water available to water users.

PROBLEMS RELATED TO PHREATOPHYTES

The idea of salvaging water by eradicating phreatophytes is relatively new and must be approached by all with caution. Problems have been created by some of the work accomplished to date, and it might be well to consider a few of these.

SEDIMENTATION OF RESERVOIRS -- Salt cedar invades the normal channel of a stream, thus reducing the carrying capacity and causing flood water to spread out over the flood plain, where it damages areas not normally flooded. As the water spreads and as the velocity of the flow is reduced, ponding and natural levee building result from salt deposition. The open water in the ponds contributes further to water loss by providing more water surface for evaporation

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and also creates a more favorable condition for further phreatophytic growth.

This process makes a very effective sediment screen in the deltas of large reservoirs such as McMillan and Elephant Butte. The life of these reservoirs would be extended many years if this screening process were allowed to continue, but downstream water users would pay a very high price in terms of water loss. It has been estimated that this loss in the swamps of the San Marcial area before the present rechannelization was undertaken amounted to approximately 145,000 (4) acre-feet annually. Channelization through this area is estimated to result in an annual saving of 42,000 acre-feet. A similar channel and floodway now being planned on the Pecos River from Artesia through the delta of McMillan Reservoir will save annually approximately 24,000 (5) acre-feet. The additional clearing of some 35,000 acres of flood plain vegetation in the Pecos Valley would salvage another 114,000 acre-feet annually. Although construction of a channel and floodway through McMillan delta would greatly increase the available water, it would result in a much more rapid loss of storage capacity in the reservoir because of increased sedimentation.

PERSISTENCE OF GROWTH. -- Channels, such as the above, and drains constructed to lower the water table beneath flood plain vegetation tend to lose their effectiveness in salvaging water after a few years. Initially, they concentrate the flow, drain the open ponds, and lower the water table. However, the salt cedars soon extend their root systems to the water table and again use large amounts of water. Also, there still remain the thousands of acres of non-beneficial vegetation on each side of the low flow channels, floodways, and the river channel itself. The obvious way of reducing consumptive waste from these areas would be removal of these undesirable plants, but destruction of salt cedar has proved to be a difficult task. It is not easily burned. If an area is somehow induced to burn through prior spraying with oil or in some other way, by the end of another summer season the roots will have sprouted and a growth of at least six feet will have been attained. Cutting out the plants by means of large crawler tractors effectively removes the brush, but again the roots will sprout, and soon all evidence of the former clearing will be obliterated. Chemical eradication through aerial spraying has been attempted from time to time. Although some spectacular kills have been obtained, generally two or more spray treatments result in less than 50 percent plant kill. When treatment is discontinued, the phreatophytic growth will recover to the original density in about two years. An even more discouraging feature of aerial spraying is that, all too often, it results in expensive law suits for damage to nearby crop land. Spraying by ground rigs usually necessitates the removal of the salt cedar first. This, in itself, is a very expensive process. A combination of mechanical clearing and chemical control by ground spray equipment appears to be the most feasible, but this is not yet an entirely proven method. Recently 1,200 acres in the San Marcial area were sprayed by helicopter. If results are good and the cost not excessive, this method could very well replace the use of ground spray equipment.

COST OF ERADICATION. -- The cost of eradication of phreatophytes by mechanical means ranges from \$4.00 per acre for light stands of young plants, cleared by rotary cutters, to as much as \$80.00 per acre for dense fullgrown stands. Aerial spraying, using 2,4-D, costs approximately \$3.00 (6) per acre, and to be at all effective it must be done at least twice a year. Maintenance averages about \$2.37 (7) per acre per year when light mechanical clearing

equipment is used. A recently developed root plow, consisting of a horizontal blade drawn through the ground approximately 12 to 18 inches beneath the surface by large crawler type equipment, may prove very effective. There is an indication that very few roots will sprout if the crown is cut off at least 12 inches beneath the surface.

REPLANTING WITH MORE DESIRABLE PLANTS. -- A great deal has been said about replacing high water consumptive use plants with those which would use less water. However, plants which would replace salt cedar in the environments which exist in the river valleys of the southwest have not been found, except to a minor degree. Schemes to salvage water by substituting cultivated beneficial use plants which would consumptively use less water than the salt cedar in the flood plains of our rivers have not been adequately evaluated as to benefits to be realized.

RESEARCH

Progress in solving this difficult problem has been slow for a number of reasons. First, the public has to be made aware of the importance of the problem so that the necessary Federal and State legislation can be enacted to provide funds for basic and applied research. Then after funds are allocated, facilities have to be made available and the necessary skilled manpower acquired. Just 16 years ago probably the most comprehensive study on consumptive waste by phreatophytes was made by the U. S. Geological Survey in the Safford Valley (8) in Arizona. Research is continuing, but still many basic facts concerning phreatophytes are unknown, i.e., (1) the exact acreage and extent of the various species of phreatophytes in New Mexico and the West, (2) transpiration rates for these species considering the differences in climatic factors, altitude, water-table depths, and vegetative densities, and (3) relation of quality of water and soils to occurrence and growth.

It appears that the responsibility for research seeking information pertaining to these problems has been delegated to and accepted by factfinding agencies in State and Federal Government, such as State Universities, Interstate Stream Commission, Agricultural Research Service, U. S. Geological Survey, and Forest Service, and many studies are currently underway. One notable example of the work in progress is the water-use study now being conducted near Buckeye, Arizona. This project is financed by the Bureau of Reclamation, is staffed with personnel furnished by the Geological Survey, and is to operate for a period of 10 years. The installation, located in the flood plain of the Gila River, consists of six 30x30-foot tanks approximately 15 feet deep. These tanks, constructed of a black vinyl plastic membrane, are planted to salt cedar and so arranged that the water table can be maintained at predetermined depths. Instruments have been installed so that accurate measurements can be made on radiation, temperature, humidity, and other factors necessary for an energy-budget study. It is hoped that this investigation will provide data which may be used to better evaluate evapotranspiration drafts and to assess the conservation benefits that can be expected to result from the clearing operations in progress in the Rio Grande and proposed for the Salt, Gila, and Pecos Rivers (9).

The Rocky Mountain Forest and Range Experimental Station at Tempe, Arizona is collecting basic information on the life history of the principle species of phreatophytes. Seed-germination studies for salt cedar are now nearly

completed. This organization is developing an apparatus which can accurately gauge water losses from plants by precise measurements of water vapor changes.

An intensive study is being carried on by the Agricultural Research Service near Phoenix, Arizona; to determine the effectiveness of various herbicides by varying the rate, time, method, and number of applications on hundreds of salt cedar test plots. It is hoped that a chemical will be developed which will be economical, safe, and more effective than those presently available.

The Agricultural Research Service has very recently completed a new hydraulic laboratory near Tempe, Arizona, which will work through cooperative agreements with the State universities of New Mexico, Arizona, Utah, and Nevada on problems such as the consumptive use of phreatophytes, the use of radio-isotope tracers in the study of plant physiology, and the reduction in evaporation from stockponds by the use of chemical films.

The research work cited is only a small part of what is beginning to be an intensive study of the phreatophyte problem. Work also is being done by various agencies in Kansas, Nevada, Wyoming, Colorado, and California.

OPERATIONS

Although much study is still required before we can reliably estimate the actual amount of water that is or can be salvaged as a result of phreatophyte control, various agencies are now actively engaged in channelization and floodway construction, drainage, and eradication. The Bureau of Reclamation, in cooperation with the New Mexico State Engineer, has recently cleared 5,300 acres of salt cedar in the delta of Caballo Reservoir. It has been estimated that this will prevent the consumptive waste of about 15,000 acre-feet a year. The initial clearing was accomplished by large crawler tractors. Maintenance of the cleared area is to be carried on by a combination of the rotary brush cutter and the applications of chemicals. The cost of this maintenance work is being shared equally by both agencies. For Fiscal Year 1960 the New Mexico Interstate Stream Commission has authorized about \$12,000. The Interstate Stream Commission has also authorized \$150,000 for Fiscal Year 1960 toward the maintenance of the San Marcial Floodway and for the construction of water-salvage drains along the Rio Grande in the middle valley.

The U. S. Army Corps of Engineers is currently planning two 2,000-foot-wide floodways in Arizona, one about 70 (10) miles long from Gillespie Dam to Granite Reef Dam on the Gila and Salt Rivers and the other 94 (11) miles long, in two segments on the Gila River, from the upper end of Safford Valley to San Carlos Reservoir and from the mouth of the San Pedro River to the Butte Reservoir site. These plans do not propose a low-flow channel in connection with the floodway, but it is estimated that the salt cedar clearing will salvage annually 16,000 acre-feet and 19,800 acre-feet respectively.

CONCLUSION

In conclusion, it is evident that we still have a tremendous amount of work to accomplish in our efforts to effectively salvage the hundreds of thousands of acre-feet of water now consumptively wasted by non-beneficial

vegetation. It is, therefore, felt that basic and applied research by governmental agencies should be accelerated so that plans to salvage water effectively and economically may be carried out in the near future.

The responsibility of basin-wide salvage would seem to properly belong to those public agencies which can integrate a water-salvage program between projects and across state lines.

State law and interstate compacts must, of course, be recognized in the distribution of the salvaged water.

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REPORT ON WATER DESALINIZATION PROGRAM

S. E. Reynolds*

Legislation providing for the construction of demonstration plants for the conversion of saline or brackish waters to water suitable for beneficial consumptive uses was sponsored in the 85th Congress by Senator Clinton Anderson. The legislation was approved by the Congress and became Public Law 85-883 on September 2, 1958.

The law provides, "for the construction, operation, and maintenance of not less than five demonstration plants for the production, from sea water or brackish water, of water suitable for agricultural, industrial, municipal, and other beneficial consumptive uses. Such plants shall be designed to demonstrate the reliability, engineering, operating, and economic potentials of the sea or brackish water conversion processes which the Secretary (of the Interior) shall select from among the most promising of the presently known processes, and each plant shall demonstrate a different process."

The law also provides that "At least one plant which is designed for the conversion of sea water shall be located on the west coast of the United States, at least one such plant shall be located on the east coast thereof, and at least one such plant shall be located on the Gulf Coast thereof; and at least one plant which is designed for the treatment of brackish water shall be located in the area generally described as the Northern Great Plains and at least one such plant shall be located in the arid areas of the Southwest." At least one of the two plants designed for the treatment of brackish water is to have a capacity of not less than 250,000 gallons per day. The law authorized the appropriation of \$10 million for the construction of the demonstration plants together with additional sums for the operation and maintenance of the plants, and the administration of the program.

The saline water program authorized by Public Law 85-883 is not visionary. The water supply problems which it is designed to meet are much closer at hand than many people realize.

Dr. A. L. Miller, Director of the Office of Saline Water has said, "The problem of converting sea water to potable water is an old one going back before the time of Christ. The problem has always been there but the answers change. The Office of Saline Water has the job of finding new answers. We must find new answers and a new way of converting to potable water some of the saline waters that cover three-fifths of the globe. This is necessary because of population growth and the increased use of industrial and agricultural water. The present use of 260 billion gallons per day from all sources will be 597 billion in 1980. This is an alarming figure and is more than double our present demands."

In many places over the world the cost of converting sea water or brackish is less than the cost of developing alternative fresh water sources. For

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example, a few months ago Colinga, California became the first city in the United States to obtain its drinking water from demineralized brackish water. The cost is a very expensive \$1.45 per 1000 gallons, but this is cheap compared with the \$7 per 1000 gallons that the people of Colinga had been paying to haul in fresh water supplies.

The program of the Office of Saline Water has made great contributions to process improvements which result in reduced conversion costs. Engineering estimates indicate that the million gallon per day sea water conversion plant to be built at Freeport, Texas, will produce fresh water for about \$1 per 1000 gallons. The cost of converting brackish waters should be materially less.

There is good reason to believe that desalinized water for municipal and industrial purposes will become economically competitive with alternative fresh water sources at many points in the United States and experts in the field are of the opinion that ultimately it may even be economic to provide water for irrigation from conversion plants.

In October 1958 the State of New Mexico made a strong appeal to the Secretary of the Interior for the location of one of the brackish water conversion plants in New Mexico. The State's proposal pointed out the immediate need for potable water supplies in many New Mexico communities, the tremendous brackish water resources of the State, and the great boon to the State's economy that would result from a practical method of making those resources usable. The proposal also pointed out that the nature of the brackish water's and the water supply problems encountered in New Mexico are typical of those encountered throughout the arid Southwest, so that the results achieved at any one of the numerous potential New Mexico sites could readily be extrapolated for beneficial application elsewhere.

In November 1958 the State entered a cooperative agreement with the Department of the Interior calling for mutual technical assistance and exchange of information in the field of brackish water conversion. Also in November, application forms were provided to the officials of about twenty communities in New Mexico where a conversion plant might advantageously be located. Subsequently, 11* of these applications were completed and forwarded to the Secretary of the Interior. All of these applications offered various inducements and measures of cooperation including water rights, plant site, favorable energy rates, and technical assistance.

At least one of our institutions of higher learning has entered a mutual assistance contract with the Secretary of the Interior in connection with the desalinization program, and four of our institutions have expressed interest in contracting for the operation of the plant if it is located in New Mexico. The availability of competent scientists improves our case for locating one of the plants in New Mexico.

Our Congressional delegates have followed the development of the water desalinization program closely and have kept the Office of Saline Water apprised of our continuing interest in having one of the demonstration plants

*Jal, Carlsbad, Artesia, Hagerman, Roswell, Alamogordo, Tularosa, Carrizozo, Santa Rosa, Espanola, and Farmington.

located in New Mexico.

On November 7, 1958, the Third Annual New Mexico Water Conference at State University adopted a resolution supporting the saline water program and commending Secretary of the Interior Fred Seaton and Senator Clinton Anderson for their contributions to the program. The resolution also provided for the appointment of a standing committee to take all reasonable measures to obtain one of the treating plants for New Mexico. Rogers Aston was named chairman of the committee, and the members are Lloyd A. Calhoun, Jack Campbell, Jack Hobson, James F. Cole, Dr. Harold Stucky, and myself. This committee has made important and possibly vital contributions to the effort to have one of the conversion plants located in New Mexico. As a result of its activities a large number of organizations in the State, all of which are qualified to speak on the subject of the great benefits that could be derived from the location of a plant in the State, have adopted and forwarded to the Secretary resolutions setting forth reasons why the plant should be located in our State and requesting that a New Mexico site be selected. I am confident that the Secretary is very impressed with the intense public interest in the brackish water problem in New Mexico.

Also, the committee was active in generating support for State legislation which provides for a contribution of up to \$100,000 in cooperative funds for the construction of a conversion plant in New Mexico. An important criterion in the selection of the plant sites is the amount and nature of local contributions. This act of our legislature* greatly improves New Mexico's chances of having one of the conversion plants.

In April 1959 Mr. Walter Rinne, an engineer from the Office of Saline Water, visited all New Mexico communities which had submitted applications for one of the plants. He was conducted on this tour by representatives of the Technical Division of the State Engineer Office and by representatives of the U. S. Geological Survey who were familiar with the brackish water resources at each of the points visited. I was able to participate in only a part of the tour, but I am confident that Mr. Rinne was favorably impressed with many of the sites in New Mexico.

Thus far the Office of Saline Water is on schedule with the program outlined by Public Law 85-883. Freeport, Texas, has been selected for the first sea water conversion demonstration plant. This plant will utilize the long tube, vertical, multiple effect distillation process. Point Loma at San Diego, California, has been chosen for the West Coast sea water conversion plant which will utilize the multi-stage flash distillation process. This plant will produce a million gallons per day of fresh water and, under an agreement with the AEC, will receive its energy from a nuclear power plant. The reactor will be used to determine the economic and technical feasibility of nuclear reactors for producing process heat.

The Secretary has selected electrodialysis as the third process for the treatment of brackish waters but has not yet decided whether the plant utilizing that process should be located in the Great Plains area or in the arid Southwest.

*Chapter 285, Laws of 1959.

The sites being considered for the Southwestern plant have been narrowed to ten, four of which are in New Mexico - namely Alamogordo, Carlsbad, Roswell and Santa Rosa. Five of the potential sites are in Texas - at Wichita Falls, Stamford, Ballinger, Monahans, and Pecos. One-Safford is in Arizona. The Site Selection Board will visit the four "still running" New Mexico communities in the period from November 7 through November 11. Once again, arrangements have been made to have personnel of the State Engineer Office and the U. S. Geological Survey conduct the board on its tour.

I think I am justified in predicting that the Secretary will choose the site for the plant to be located in the arid Southwest in early December, and that that site will be in New Mexico.

WATER CONSERVATION IN INDUSTRIES, MUNICIPALITIES
AND AGRICULTURE

Ivan Wood*

The National Water Use Picture.

We have learned to use great quantities of water in the United States. We now require about 1,500 tons per person, per year or more than one acre foot. In ancient times, a man could carry his daily supply of several quarts in a goat skin swung over his shoulder. How we have grown in water use can be shown by the following figures:

1940	135	BGPD*	OR	414,450	ACRE FEET,	per day
1950	203	"	"	623,210	"	" " "
1960	312	" (Est)	"	957,850	"	" " "
1975	453	" (Est)	"	1,390,710	"	" " "

*Billions of gallons per day. Source - U.S. Department of Commerce.

How this water was used in 1955 and how it is estimated it will be used in the year 1975 is shown by the following figures:

	1955	1955	1975
Irrigation		119.84 BGPD	169.68 BGPD
Public Water Supplies		17.00 "	29.80 "
Domestic Supplies		5.40 "	7.20 "
Industrial and Misc.		60.00 "	115.40 "
Steam and Electricity		59.00 "	131.00 "

Since the term billions of gallons will be used many times in this and other discussions at this meeting, it might be well to get a mental picture of what a billion gallons represents. A billion gallons is about 3,070 acre feet or enough water to cover 4.8 sections of land 1 foot deep. Total water use in the United States for the year 1960 is estimated at 957,849 acre feet per day. This would cover the state of New Mexico one foot deep with water in 80 days or 5 feet deep in one year.

Total water falling as precipitation in the United States in one year is estimated at 4,300 billion gallons per day. Stream flow, after evaporation, is estimated at 1,200 billion gallons per day which is about 4 times our present use and 2½ times the estimated use in 1975. This may seem a

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safe margin for future use planning. Unfortunately, as we in the West know all too well "water is where you find it" and this may be far from the point of intended use. While the Pacific Northwest may have the Columbia River with great quantities of water rushing unused to the sea, New Mexico, Arizona, and other states have many acres of fertile land which could use this water if it were available.

Water Use in New Mexico

We are particularly interested in water use in New Mexico and what can be done to conserve the available supplies. As has been shown, the area of the state is 77,856,240 acres. With an average annual precipitation of 1.156 feet annually the potential supply is:

77,856,240 x 1.156 = 90,013,373 acre feet plus the inflow from streams which probably averages about 1,901,050 acre feet annually, giving a grand total of 91,914,423 acre feet.

In speaking of potential water supplies, as measured by the yard stick of precipitation, it must be remembered that much of the rainfall is in showers too small to be effective and which evaporate immediately. This evaporated water may fall again as rain and be measured again. That evapo-transpiration losses are great can easily be seen by comparing the run-off of our western rivers with the total precipitation falling on the basin. This may prove to be as low as 3 or 4% in some cases.

Water use in New Mexico has been variously estimated but I have chosen the following values as representative:

Domestic and Municipal Use.....	91,500	Acre Feet	Annually
Irrigation Requirements.....	2,328,000	"	"
Out Flow Major Streams.....	<u>2,200,470</u>	"	"
TOTAL	4,619,970	"	"
Potential Supply.....	91,914,423	acre feet	annually
Present Use.....	<u>4,619,970</u>	"	"
Annual Difference.....	87,294,453	"	"

What becomes of the more than 87 million acre feet of water falling as precipitation on the state? This question can be answered in a general way as follows:

Immediate evaporation accounts for a large portion of it. Forests, grasslands, parks, crops and other vegetated areas use some. There is about 6 acre feet per acre evaporation from reservoir surfaces. Phreatophytes use valuable underground supplies.

If by some means of careful conservation, we could effect a saving of even 5% of the vast potential water supply not now used, for irrigation and municipal and industrial uses it would amount to more than 4,000,000 acre feet annually.

Industrial Uses in New Mexico.

Industrial and related uses account for about 23% of the total in the national water picture as estimated by the Department of Commerce for the year 1960. If we include that consumed by steam and electrical power, the figure becomes 48%.

In New Mexico, the industrial uses of water are not great, probably not more than 1% of the total. The amount so used is estimated at about 39 million gallons per day or about 120 acre feet used mostly by the potash and oil industries. For a year, the industrial use becomes 43,800 acre feet, an amount to be reckoned with in water planning.

Expansion of industry can be expected in New Mexico. At present the use of industrial water is the lowest of any state in the union. The total income of the state is also among the lowest and can be expected to rise in years to come. Agriculture does not contribute a great deal to the state's total income probably not more than 10 to 12%. It is worthy of note, however, that New Mexico ranks as high as 7th in the United States with 39 million barrel annual production of oil and with 731 billion cubic feet of gas production annually it ranks 3rd. The ranking is also high in total energy production when we consider 3½ million tons of uranium ore.

It may be remembered that Randall F. Montgomery, Manager of the Hobbs District, New Mexico Oil Conservation Commission gave this Conference, in 1958, an estimate of the industrial needs of the state as projected 20 years into the future. His figures were as follows:

USE	NO OF ACRE FEET NEEDED ANNUALLY
Oil Well Drilling	1,688
Gasoline Refining	7,933.3
Oil Refining	2,000
Potash Production	14,887.7
Uranium Processing	3,773.05
Carbon Black Manufacture	613.85
Generation of Electricity	7,372
Secondary Recovery	<u>32,228.90</u>
TOTAL	70,496.85 Acre ft. Annually

This represents only about 1½% of the present water use of the state and small economies of use will not affect the state water picture materially. It is the matter of industrial wastes and saline and brackish waters causing contamination which are important. Contamination of good water supplies is the same as waste. Main sources of contamination are mining, milling, and manufacturing waste, sewage and saline waters. Extent of this contamination and its control will be and have been discussed by speakers better

qualified for the part than I.

Use of Water By Municipalities

The present use of water by municipalities in the United States is estimated at 22 billion gallons per day or about 7% of the total daily use for all purposes. In New Mexico the total annual use by municipalities is about 91,500 acre feet or only about 2% of the amount used for all purposes.

Small economies in municipal use will not greatly affect the total water picture for the state but some economies are possible. Good metering of all users is one of the most important. An economy enforced in some cities is the reconditioning and reuse of water from air conditioners.

In the case of most cities, about $\frac{1}{2}$ of the waste water is returned to the water economy without pollution. The other half is polluted from sewage or other wastes. There is a general move among municipalities to take advantage of the 30% grant offered by the Federal Government for construction of sewage treatment plants.

There is need for better sewage treatment where effluent is discharged into rivers from which other cities further down stream receive their water supply. Lack of proper treatment is causing concern in many quarters and the Public Health Service is beginning to enforce stern measures.

Use of Water By Agriculture

It is estimated that irrigation will use about 43% of the presently available water supply of the United States in the year 1960. This amounts to 135 billion gallons per day or 414,450 acre feet. In one year, it is about 150 million acre feet or 5 acre feet per acre for every acre irrigated.

It is now estimated that the present, irrigated acreage in the United States is approximately 30 million. There is much more land which could be developed for irrigation if there were water available with which to irrigate it.

As has been shown, the total volume of water diverted from streams or pumped from the ground for irrigation purposes is about 5 acre feet for each acre irrigated. This speaks of low efficiency in irrigation practice and such is well known to be the case. Probably not more than $\frac{1}{3}$ of all water diverted or pumped ever reaches the plant root zone. An analysis of irrigation losses will be presented in coming paragraphs.

Water Use For Irrigation in New Mexico

Irrigation agriculture in New Mexico accounts for about 2,328,000 acre feet of water of the 4,619,970 total acre feet now used for all purposes. This is about 50% of the total or slightly above the national average. However, it represents only about 2% of the total water used for irrigation in the United States. Estimating the irrigated area in New Mexico to be 645,750 acres, the total diversion and pumping is about 3.6 acre feet per acre which is well below the national average. This figure would tend to show better than average irrigation efficiency.

It is generally admitted that irrigation efficiencies are low. If this be the case, where are the losses and what can be done to improve the situation? Some of the more obvious causes of water loss between the point of diversion and the plant root zone are:

1. Reservoir Evaporation

Evaporation from the free water surface of a reservoir in New Mexico is about 6 acre feet per acre of surface per year. Loss from the Elephant Butte Reservoir alone is estimated at 150,000 acre feet or more per year. At the state average of consumptive use, this would irrigate more than 40,000 acres of additional land. Reservoir evaporation may eventually be reduced by the use of films of various types placed on the surface. Various chemicals, one of which is cetyl alcohol, tend to reduce evaporation by forming a layer on the water surface which is one molecule in thickness. Investigations by the Bureau of Reclamation in this country and by other agencies in Australia seem to show some promise.

2. Loss By Phreatophytes

Loss by phreatophytes has been discussed in a previous paper on this program. It is a loss which cannot be disregarded since it removes water from underground storage where it is safe from evaporation and some other losses. Blaney of the U. S. Agricultural Research Service estimates the loss to agriculture from this source at 25 million acre feet of water annually in the United States. In 1955 T. W. Thompson of the U. S. Geological Survey estimated that New Mexico has at least 300,000 acres of these plants and that the loss occasioned by them was 900,000 acre feet annually. In many areas of the West, it has been estimated that at least one half of the infested areas could be profitably cleared with a great saving of water.

3. Seepage Losses From Canals and Reservoirs

Losses in water delivery systems probably account for from 1/4 to 1/3 of all water diverted from streams or pumped from the ground. Losses from the point of diversion to the irrigated field are sometimes difficult to pinpoint. Some water evaporates from canal and reservoir surfaces, some is transpired by plants growing on or near the canal banks, and a great deal is lost by seepage. Some water entering the transportation system and counted as diverted water is delivered back to the stream from which it was diverted and is called regulation losses. It is next to impossible to divert the exact amount of water which the irrigators may be using at any particular time.

It is sometimes advantageous to allow a canal company to carry a much larger volume of water than it ordinarily uses and dump it back to the river again at point down stream since the canal may be a far more efficient means of transportation than a shallow river bed grown up to willows.

It has shown that 4.52 acre feet per acre are diverted in the Mesilla Valley for the irrigation of alfalfa. Normal consumptive use of water for alfalfa in that region is about 2.49 acre feet per acre. This would seem to indicate a loss of 2.03 acre feet per acre of 45% due to seepage, deep percolation, poor application and other losses.

Actual measurements of transportation losses have been made on the

project at Tucumcari in New Mexico. This was done by comparing the actual volume of delivery at the farm headgates with volume released at Conchas Dam. As I remember the loss was about 45 to 50%. Measurements by the Bureau of Reclamation average about the same.

What becomes of the seepage water? In some cases it may reach aquifers which carry it directly back to the stream from which it was diverted or to the body of ground water from which it was pumped. In far too many cases it waterlogs land at lower levels, rendering them unfit for further agricultural use. By capillary and by actual static pressure, much of the seepage water may reach the land surface where large areas are exposed to evaporation or transpiration by useless plants. The evaporated moisture may be carried far from the irrigated area and fall as precipitation in some humid region. As a byproduct, seepage waters often carry chemical substances harmful to plant growth. Seeped areas impregnated with salts and alkali are difficult and costly to reclaim. The 1950 census shows New Mexico with 42,324 acres of irrigated land artificially drained and 10,741 acres of such land in need of drainage. In the western 17 states the irrigated acreage in need of drainage is well over 1,000,000.

Return flow from seepage and over application of irrigation water which reaches a stream may be diverted and used again. In some cases this process is repeated further and further down stream until the water becomes so impregnated as to be almost unfit for use in periods of reduced flow. Seepage losses from irrigation may never reach a stream for reuse but be lost thru deep percolation to unused, underground supplies. In many cases return flow reaches the stream from which it was diverted to far down stream or too late in the season for irrigation use, in which case it is lost to the irrigated area.

Attention should be called to the usual western river as an inefficient means of water transportation. The Platte, the Arkansas and the Rio Grande expose broad surfaces to evaporation and loss by transpiration thru water loving vegetation. A gradation below large river dams is not helping the situation. Vegetative growth forming in the old channel may, in some cases, call for heavy dredging operations.

In the early development of the West hundreds of small irrigation enterprises were formed. In one western state there are more than 200 varying in size from one or two users to two hundred. The maze of small canals and ditches are poorly maintained and the banks are overgrown with cottonwoods and willows often getting more water than the farmers. There are many cases in which one small farm unit is served by as many as three irrigation companies and traversed by two canals which do not serve it. It is estimated that there are more than 137,000 miles of canals or ditches of more than 5 cubic foot capacity in the United States. In some cases one well designed and maintained system could replace a dozen of these small inefficient systems with a great saving of water.

4. Losses From Application

Application losses result from the use of more water than is required. Examples of water waste can be seen in almost all irrigated areas with few exceptions. If the farm irrigation schedule is laid out with consideration of the moisture holding properties of the soil and the depth of root zone of

the plants, water can certainly be saved if only enough is applied to fill the root zone reservoir when it is depleted.

The term consumptive use refers to the amount of water used in building plant tissue and in transpiration plus that evaporated from the soil in the irrigation process. It may be expressed in acre inches or acre feet per acre per season or in various other ways. Consumptive use measurements have been made in many areas for many types of crops. It may vary from 12 acre-inches per acre per season for grain at Davis, California, to 52 acre-inches per acre for alfalfa at Mesa, Arizona. In one western area in which the average consumptive use was known to be 24 acre-inches per acre per season the farmers were applying more than 60 inches. This over-application resulted not only in water waste but caused many acres of land at lower levels to be deserted due to poor drainage.

Losses after water reaches the farm are due to evaporation from ditches and wet land surfaces, transpiration from plants on ditch banks, runoff from lower ends of fields, and from deep percolation below the plant root zone. Water lost by over application meets about the same fate as that from seepage from laterals. Some returns to the stream from which it came; some waterlogs lower areas; some evaporates in road ditches and stagnant pools; some joins the underground supply and may or may not be reclaimed.

One of the most conspicuous losses in the application process is the water which runs from a field. The seriousness of this type of loss is best exemplified by the pump irrigator in the High Plains of Texas who fills the road ditch for two miles with water lost from the lower end of a cotton field. Most of this water evaporated probably to fall as rain in the humid regions of the East. This loss is reflected not only in the farmers pocket book, but is a loss to the whole community since it added to the lowering of the water table without gain to anyone.

In general, however, I have observed that pump irrigators are far more careful to avoid loss than those who receive water from surface sources. Pump irrigation areas almost never have a drainage problem. The pump irrigator pays for water at about the same rate at which he uses it. True, some fixed costs continue even when the pump is idle, but operating costs stop when the pump stops.

How Can Water Be Conserved In Irrigation

We now have the technical knowledge to prevent most of the losses which occur in irrigation practice. Some of the cures are too costly or legally involved but great progress is being made to bring corrective measures within the reach of the farmer and the irrigation district. Some of the measures now in use are listed:

1. Lining of canals and ditches.

In the field of water transportation, ditch lining and the use of pipe are the bright stars on the horizon of progress. The unlined ditch has almost passed out of the picture in some short water areas. One may drive for miles in California to see no ditches as all distribution is made by underground pipe. The state of Texas reports more than 4,000 miles of underground pipe installed in the last 7 years. Many concrete pipe factories are springing

to life in western states and doing good business. Large diameter cast-in-place pipe is now being laid in sizes ranging from 24 to 60 inches in diameter for the use of irrigation districts and companies with large flows of water to handle.

Lining of irrigation ditches is taking place everywhere. The use of concrete linings using the slip-form method is making great strides particularly in the Southwest. The cheapness of cost and the rapidity with which it can be constructed has an appeal for the irrigator. Little or no hand-work is required as the form operating as a combination screed and trowel strikes off the concrete to the desired thickness and imparts to it a smooth finish as it moves along.

There has always been need for a type of ditch lining which is relatively low in cost, durable and yet flexible enough to use even under unstable earth conditions. The Agricultural Research Service, under the guidance of Mr. Lauritzen at Logan, Utah, and with the cooperation of the Indian Jute Mills Association and the Flintkote Company of New York have in the process of development a lining which is prefabricated of strong burlap and a special type of asphalt. It is in strips about 33 inches wide, is not tacky and can be joined by heating with a blow-torch. It can be quickly placed in a ditch with inexperienced help. Experimental installations seem to hold good promise of a lining which can be installed and used under conditions in which less flexible linings would fail.

There are now available many types and sizes of plastic, rubber, and canvas surface pipes for convenient and economical transportation of water. These can be used from pump or ditch outlet to any part of a cultivated field. It has been shown that a butyl rubber pipe will withstand considerable static pressure. Light, metal surface pipe has been gaining in popularity in almost all irrigated areas.

Improving Application Methods

Good application methods begin with the choice of the right system for site conditions of the land to be irrigated. If conditions call for a sprinkler system good results can probably not be had with surface methods. Preparation of good conservation maps of the area is a good start. Soil topography, quality and quantity of water supply, and type of crops to be grown are all important factors to be taken into consideration.

Good water use for surface methods begins with good land preparation. Modern methods of land grading often permit the use of large flows of water on border strips and furrows alike with little or no land slope. Where soil and other conditions permit, quick flooding of the surface to pre-determined depths makes for good efficiency of both labor and water. Water enters the soil uniformly over the entire flooded area and, if properly regulated, will fill the soil to field capacity through the root zone of the crop. This method is being used even in areas of high average annual rainfall but where irrigation is necessary due to protracted, summer drouth periods.

Bench leveling on lands with natural slope is a great step to water and soil conservation. It is possible with it to conserve almost all natural rainfall, control irrigation water so that no erosion or run-off occurs and high application efficiencies are obtained with a minimum of labor.

The Fort Sumner Project in New Mexico is a fine example of what can be done with proper land preparation, large delivery heads of water, and lined ditches. A story could be written about almost every farm on the project. It could tell of the water waste and labor of the old, weed infested ditches where now highly efficient irrigation is done with a minimum of labor. The same water volume which barely served the 6,500 project acres is now being used not only for the old project but for many acres of new land which is being developed for irrigation. Time will not permit a discussion of the many techniques of good water application. Let it be said that we have the knowledge but the widespread putting of that knowledge into use has been slow.

What of the Future

What are some of the ways that present water supplies can be extended for future use? There are some ways with which we are all familiar:

1. Use of River Basin Developments.

Use of river basin developments such as that now being brought into being on the Missouri will make use of water now being lost to the sea and permit all water in the basin to be put to use where it will produce the greatest good for the greatest number.

2. Reclamation of Sewage and Other Waste Water.

The reclamation of waste water has not been given much thought in the times when water was plentiful. Now in areas of scarce water supply waste water is being reclaimed. All the sewage water from the city of Lubbock, Texas, is used for the irrigation of more than a thousand acres of land.

3. Development and Utilization of Saline Water Resources.

4. More Efficient Use of Industrial Water.

5. Increased Irrigation Efficiency on Irrigation Projects and Farms.

6. Use of Underground Aquifers for Storage of Water Which Would Otherwise Runoff as Waste.

7. Destruction of Phreatophytes.

8. Lining of Irrigation Canals and Ditches and Use of Pipe for Water Transportation.

9. Appraisal of Entire Water Law and Water Right Structure.

VALUE OF WATER FOR RECREATION AND OTHER USES

James R. Gray*

Those of you present who have had previous experiences with economists probably are bracing yourselves for a flood of values, trends, and curves. I am happy to report to you that these will be kept to a minimum. In making studies concerning recreational value of water, until recently economists have been divided into two groups -- highly qualified economists, those who wouldn't and less highly specialized economists who shouldn't. Perhaps I should be included in the latter group.

Historically economists have either (1) ignored recreation in analyses of water values and thus relegated it to a zero value, (2) paid lip service to it acknowledging its presence and then proceeded to ignore it, with the same result, (3) attempted to include recreational values only to have them partially eliminated by federal edict, or (4) taken the bull by the horns and provided us with some rough usable measures. In multi-purpose water development plans, these rough measures of recreational values must be refined and included in the overall plan before efficient allocations of our present water supplies can result.

Very recently the economists have bestirred themselves to the extent of agreeing to disagree concerning measurement techniques. Some of them have advanced to the point where studies are being made to measure different kinds of water values. An outstanding example of this advancement is a New Mexico study based on a Resources for the Future grant which resulted in "A Study of the Value of Water in Alternative Uses", to be released soon. The study deals with alternative uses to which San Juan River and Rio-Grande River waters might be put under given sets of circumstances and the values which might be expected to result.

Why are we concerned specifically with water values in various uses? The answer is almost too easy. We want to use them for yardsticks in allocating water to the competing uses. A further question would be, why is a yardstick so important. The answer to this one is equally obvious--because we are experiencing serious water shortages. For example, it has been estimated that about one-quarter of our nation's population is faced with actual water shortages or poor quality of water or both. For this insufficient quantity or quality of water we are paying three billion dollars annually and we have invested a total of 50 billion dollars to use or control water. During the next 50 years it is estimated that we will invest an additional 75 to 100 billion dollars.¹ With this situation in prospect, the economist would say that the most efficient allocation of our money to water or any other resource would be to allocate water in such a way so that any change in allocation would result in a net value

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1 Frank, Bernard, "The Story of Water as the Story of Man", In Water, the Yearbook of Agriculture 1955, U.S. Department of Agriculture, Washington, D. C., House Document No. 32, 84th Congress, 1955. p. 7.

of product. We have now turned in a full circle and are up against that "value yardstick" once more.

Given a suitable yardstick to measure value, what use can be made of it by recreationists, irrigationists, industrialists, and others? Would the yardstick be of help particularly to the recreationists? To answer these questions we should understand the water situation in the West as it is right now. There are three general situations facing western water users: (1) By and large the presently usable water in the West has been appropriated, allocated, or fixed by law as personal property. This cannot be changed to any great extent except by legislative action and compensatory payments -- a very slow process; (2) There are very great hopes that in the future usable supplies of water can be increased from the total falling on the land or is present under the land or in the seas; and (3) Some of the uses which originally were the most advantageous use are much less so now. Although the second and third situations offer most promise to recreationists, even the first situation is not hopeless. Very briefly, water can and is being purchased from the prior appropriators for various uses. As will be shown later, recreational use results in a rather high value for the amounts of water involved. As regards situation (2), we are using only very small proportions of the total water supply falling from the skies. Technological advances may make usable huge reservoirs from fresh and salt water areas at any time. The third situation, changes in the future, appears to be extremely advantageous toward increased transfers of water to recreation. In all of these situations recreational values will be needed to fix allocations of additional water as it becomes available and to share in the costs and benefits of any reallocations of present supplies as they are made.

Following this brief introduction and presentation of the problem, I would like to discuss briefly with you the competitive and complementary uses of western water, the ways in which water values are measured, the results of these measurements in terms of present water values, and finally, some educated guesses on future western water values uses.

The use of the value yardstick for water is important mainly as water quantity or quality is in short supply and the uses of water are highly competitive. This assumes that varying quantities of water are prime requisites for recreational use of our natural resources. This is a safe assumption. The major uses of water in the West are irrigation, manufacturing, mining, hydroelectric, municipal consumption, production of vegetation other than irrigated crops, recreation and navigation. Flood control is a factor in many of our projects.

In general, recreational use of water is complementary or has little effect on water used in flood control projects, hydroelectric projects, production of vegetation other than irrigated crops, and navigational uses. Recreational use of water is highly competitive with irrigation industrial uses and manufacturing. The latter use, manufacturing, is competitive from the change-in-quality-of-water standpoint as well as consumption. Municipal water works may permit recreational use on the watershed, sewage systems will discourage recreational use if sewage is permitted to pollute streams below the municipalities. Special situations exist which may reverse these relationships. For example, irrigation may provide canals capable of producing game fish, or flood control projects may destroy natural habitats

of wildlife. The relationships are not always clear cut. At best we can say that they are mostly competitive, mostly have effect, or are mostly complementary.

Past efforts in measuring the value of water were made largely by the Bureau of Reclamation to justify to Congress their requests for large appropriations for water developments. The Bureau used and still uses a system called benefit-cost ratio. This was simply to estimate the benefits, compute the expected costs, and express the result as a ratio. The proposed construction with highest ratios were supposed to have received priority. No construction was considered with an unfavorable ratio, i.e. costs exceed benefits. Originally the Bureau included some aspects of indirect benefits along with direct benefits in the computation. Direct benefits are the values of increased crop production, hydroelectric power, decreased flood damage, reduced transportation costs, etc. which would result if the development were built. Indirect or secondary benefits were the values which would result from this increased activity indirectly by other industries (including recreation). The Bureau classed these benefits into two subcategories -- local and national. A ruling by the Bureau of the Budget required elimination of most secondary benefit calculations from the quantitative benefit-cost ratio. Economists at present are split into two groups concerning the advisability of including secondary benefits in the benefit-cost ratio. The major arguments against inclusion are that the measurement is difficult and should dam development not take place in one area, business and social investments would be made in another area and these benefits would occur anyway.

Recently, we have had several of our western states' Fish and Game departments conduct surveys to determine what recreationists have spent in various activities. This type of a study assumes that cash expenditure approximates value, or in the language of the Bureau of Reclamation, it assumes that the benefit-cost ratio is 1. Some of these fish and game commission reports are open to question because groups of expenditures are included that would occur even if those using the recreational resource stayed at home. Also, comparisons were made with other industries to indicate the value of recreation; in the comparison the expenditure for recreation was at retail value. The values of comparative industries were at manufacturers' prices. Refinements in techniques would tend to lower the comparative values of recreation.

Just as serious in the cash expenditure effort is the underestimation of recreation value by assuming that value to the consumer is synonymous with the price he pays. Surely an avid fisherman would be willing and able to pay several times the present fee for a fishing license. This difference is called consumer surplus. The exclusion of consumer surplus results in a grossly undervalued estimate.

The next measure of recreational value to be presented, the value-added technique, attempts to include at least a part of this surplus. So far, the value added technique has been the most successful in that the technique has been applied to various areas and it is a more accurate tool than the cash expenditure technique. We do have values of water for various uses available which include cash expenditures for the

various uses of water as well as the direct and indirect benefits that result. The primary weakness in the technique lies in the estimation of indirect or secondary benefits.

The final technique that I wish to discuss today is a rather complex treatment devised by Clawson.² For brevity it is called the demand curve analysis. Clawson has applied a portion of the technique to data compiled by the National Park Service. In its simplest form it is a series of schedules of prices that recreationists have paid and would have to pay to visit one or another of our national parks. In his bulletin Clawson gives a six-step procedure to measure the demand for and value of outdoor recreation. Briefly and I am quoting directly in some cases, these are:

- (1) Physical alternatives of the resource being measured should be considered and described.
- (2) Social and economic setting of the proposed recreational area should be considered, such as number of people at various distances from the area, their income levels, alternative recreational likes and dislikes of these people, etc.
- (3) Cost of actually using the proposed new area for different types of uses by people living at various distances should be estimated, with costs in terms of money, time, and other benefits.
- (4) Demand curves should be estimated for the most nearly similar other areas that can be found. The demand curves may be constructed in two ways -- directly by survey of expenditures per recreationist, or indirectly by cost of various facilities in the recreation area, including transportation.
- (5) On the basis of these studies for the various sample areas, estimate two types of demand curves -- one a demand curve for local residents obviously making a trip for the sole purpose of using the recreation area, and the second curve for distantly-located visitors who use the area as a part of their overall vacation trip.
- (6) For each major method of developing and managing the proposed new recreation area, and for a considerable range in fees, calculate the number of visits by zone of origin, probable expenditures for all persons, value added locally and within the state by their expenditures, and the total fee revenue.

Clawson's technique not only will provide values, but it is an ideal instrument for recreation planning.

To present values of recreation and value of water for recreation and other purposes, we must employ mainly the second and third techniques, the cash expenditure and value added techniques. This section will present findings of various studies in various parts of the country.

² Clawson, Marion, "Methods of Measuring the Demand for and Value of Outdoor Recreation", Resources for the Future Reprint No. 10, February, 1959.

The Tennessee Valley Authority increased its investment in recreational facilities from \$13 million in 1947 to \$61 million in 1956. The gross receipts (cash expenditures) increased from \$1.8 million in 1947 to \$6.9 million in 1956.³ Approximately 600 thousand surface acres of water were involved. In 1956 the gross return per surface acre was approximately \$11. The gross return was about 11 percent on investment.

One of the major efforts in attempting to place a value on water was the value added approach of New Mexico workers in a Resources for the Future grant of the past few years.⁴ Briefly, eight different models (levels of allocations to the uses in two river basins) were used. When a high allotment was made to irrigation of about 473 thousand acre feet of San Juan and Rio Grande water, and 37 thousand acre feet to recreation, the value added per acre foot was estimated at an agricultural value of \$29 for San Juan water and \$46 for Rio Grande water; a municipal and industrial value of \$2,800 and \$3,600 per acre foot for water in the two basins, \$212 for recreation using Rio Grande water only, and \$185 for San Juan water and \$1,054 per acre foot using Rio Grande water for combined uses. Shifting the allocation to a relatively heavier municipal and industrial use resulted in a lower range in values for water for this purpose and the same values for agriculture and recreation.

With a different allocation of water the recreation allotment was cut to about 19 thousand acre feet. The values added per acre foot were estimated at \$28 for agriculture in the San Juan basin, \$1,800 for municipal and industrial use in the San Juan basin and \$3,658 in the Rio Grande basin, and \$307 for recreational use in the Rio Grande basin.

The cash expenditure technique referred to previously has been used by our sister state, Arizona, and by our own state. The Arizona study indicated that \$43 million was spent for hunting and fishing in 1956 compared to \$1.3 billion in retail sales in the state, \$50 million in rental income, \$114 million in restaurant sales, and \$264 million cash sales of agricultural products.⁵ No estimates were given for recreation other than hunting and fishing and the amount of water involved in each use was not indicated.

The New Mexico Department of Game and Fish made similar estimates for the state for 1956. They found cash expenditures for hunting and fishing were about \$31 million, versus \$1.1 billion in retail sales, \$479 million

3 Clawson, Marion, "Statistics on Outdoor Recreation", Resources for the Future, Washington D. C., April, 1958, p. 52.

4 New Mexico Special Project Committee, "Report to Resources for the Future on the Value of Water in Alternative Uses", New Mexico Agricultural Experiment Station and others, University of New Mexico, in cooperation with Resources for the Future, Washington D. C., preliminary draft, 1959.

5 Armstrong, W. V., "Economic Value of Hunting and Fishing in Arizona in 1956", Wildlife Bul. No. 4, State of Arizona Game and Fish Department, February 1958, pp. 26-28.

in value of minerals, \$202 million in cash sales of agricultural products, and \$129 million in retail values of personal and professional services.⁶

Before leaving these estimates of values or expenditures, I would like to voice a short objection to (a) the inclusion of food as an item of expenditure for hunting and fishing as hunters and fishermen buy food whether they hunt and fish or not, and (b) comparisons of retail values in some cases with manufacturer's prices in other cases tend to inflate the comparative values for the former. Even the rather careful study by the Resources for the Future Committee in estimating hunting and fishing values made the mistake of including all food costs as a recreational value-added item.

Finally, what are the prospects in the future concerning use of water for recreational purposes. We are anticipating a continued increase in population, income, leisure, and industrial growth. With present supplies of water, uses would be even more competitive than they are today. But we are also anticipating an increase in our usable supplies of water. The rate of increase in each of these two groups of items becomes important.

Johnson has indicated that the demand for farm products by 1975 is likely to increase by 30 to 40 percent over 1950.⁷ From another study the demand increase was estimated to require about a 69 percent increase in water for irrigation.⁸ The demand for public water supplies for industrial use were expected to increase by about 111 percent while the increase in self-supplied water was estimated at a 151 percent increase. Steam-electric power requirements were estimated to require about a 241 percent increase in water presently allocated to this use. The overall U. S. increase in use of water expected was 123 percent. This compares to an expected increase in use of water of 140 percent for the Western states. Undoubtedly, New Mexico's needs will be in the forefront of those of the Western states because of our comparatively high rate of population increase.

We do not have estimates of the increased need of water for recreation, but we do have estimates of both future number of recreationists demanding western resources and changes in the factors which affect their demands. Clawson estimated that the trend in use of western recreational resources in recent years has been upward by about 10 percent per year. By the year 2000 he expects the use to increase by about 20 to 40 times over the present-- this is a 2000 to 4000 percent increase.⁹ His estimate is based on a U. S.

6 Campbell, Howard, "The Economic Value of Hunting and Fishing in New Mexico," Bul. No. 7, New Mexico Department of Game and Fish, 1958, pp. 26 and 35.

7. Johnson, Sherman E., "Prospects and Requirements for Increased Output", In Journal of Farm Economics, Vol. 34, No. 5, December 1952, pp. 682-697.

8 Federal Reserve Bank of Kansas City, "Water Availability, A District Problem", In Monthly Review, February 1959, pp. 4-5.

9. Clawson, Marion, "The Future Demand for Western Resources for Recreational Purposes", In Proceedings, Western Farm Economics Association, 1959 (In manuscript).

population of 310 million people, a real per capital income of double the present level, a work week of about 28 to 30 hours, and a per capital travel average at double the present 5,000 miles per year.¹⁰

These future estimates point to a very heavy increase in the pressure on our water supplies unless technological developments result in at least a doubling of our present usable supply. Competitively, recreationists are in a very favorable position for an increased share of the nation's water supply because of the expected astronomical increase in demand for recreational facilities expected in the future.

¹⁰ Ibid., p. 7.

WATER AND RECREATION

Charles A. Richey*

It is a privilege to be here and to see emphasis placed on the recreational aspects of water. This has too long been almost disregarded or in other cases completely overlooked in planning for the development and use of this great resource.

Water is life. It is one of those God-given natural resources, which, like the air we breathe and the sun that shines upon us, have been created for the need and benefit of mankind.

We cannot consider water for recreation purposes without we consider the surrounding shore line lands that contain it. Furthermore, in a reservoir area such as Lake Mead that fluctuates constantly the receding lake bottom may have important auxiliary uses related to recreation, such as launching ramps, swimming beaches, ski beaches, or boat and car parking areas, etc. Such use can be provided satisfactorily only by avoiding pollution of the waters through proper sanitation. This has been accomplished at Lake Mead NRA in a number of unique ways. I wish there were time to enumerate and explain them.

Unlike the sun and air, which we might classify as intangible objects, water is a resource that may be captured and controlled. Control is use and we should preface "use" with a limiting factor called "wise" for it is wise use of this fluid benefactor with which all of us should be concerned. Some states have not included recreation as a beneficial use of water. This is short-sighted and old fashioned for it may bring the greatest benefit and is one of the least consumptive for it can be used over and over again.

But the theme of my remarks is a combination -- "Water and Recreation" -- Then just what is Recreation? We are talking about water and land area that surrounds it. In the words of John Collier, District Representative of the Pacific Southwest District National Recreation Association:

"The word 'recreation' is a collective term, a generic term if you will, denoting all the things that man might do in his leisure that provides him with relaxation, enjoyment and release from tensions."

When you couple this with water and the land you can understand what a broad concept we are trying to cover in these brief minutes.

While many groups and individuals in America have been concerned with the conservation and use of water for domestic and commercial purposes, it was not until the 1930's that recognition was given to the great potential of water for recreation purposes.

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LEGAL ASPECTS OF THE RECREATIONAL PROGRAM
OF THE
NEW MEXICO DEPARTMENT OF GAME AND FISH

Fred A. Thompson*

In order that we might better understand the role of the New Mexico Department of Game and Fish plays in the activities and the economy of the State of New Mexico, we should reflect somewhat on the history of its establishment and bring it up to the present complexities of the world as we know it today.

On March 12, 1903, the Territorial Governor and the legislative assembly recognized the fact that there was a need for protecting our wild-life species and, to back up their recognition, they introduced, and passed an act to create the office of the Game and Fish Warden of the Territory of New Mexico. They also made provisions in the act to protect the game and fish of the state. The Game and Fish Warden of the Territory was to be an appointee of the Governor for a period of two years and said Warden was to appoint his staff of deputies as required in each county of the Territory.

The system of appointment in the Territory and in the State after 1912 was done by the Governor. On February 28, 1921, the State Game Commission was established with three members. In the act establishing the State Game Commission and in other acts of 1921, many of the past laws were revised and many new laws were passed which we now find to be the basis of the laws under which the Department operates.

On April 6, 1945, a State Game Commission of five members was created with the stipulation that not more than three of these members shall be of the same political party at the time of their appointment by the Governor and that their term of office shall be staggered to provide that one member shall be appointed each year. The bill also provided that due consideration shall be given to population, geographical features and wildlife areas of the state in the appointment of Commissioners.

The State Game Commission, being a policy-making body as empowered by law, can hire only one person, that person being the Director. The Director, in turn, shall be authorized by the State Game Commission to hire such other employees as necessary to carry on the administrative functions of the Department.

It is the author's opinion that after considerable research on the subject of state laws as they are affected in other states, New Mexico has one of the best game codes of any state in the union. It is true that perhaps some particular features of our law should be corrected to make them more operative in the present day fish and game management program; however, in general, they are good. This feature is also borne out by a statement made

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by Dr. Ira N. Gabrielson, President of the Wildlife Management Institute and former Director of the U. S. Fish and Wildlife Service in his survey of the New Mexico Department of Game and Fish in 1949 in which he stated that, to his knowledge, New Mexico has one of the best game and fish codes now in existence. We find that in going over the laws, the wording is generally in detail covering every phase of the Department's operation. A most important factor, however, is the authority given to the State Game Commission so that they may properly manage the game and fish resources of the state.

In New Mexico, the management can be done by regulation authorized by law whereas in many other states, seasons, bag limits and other essentials of game and fish management are left up to the state legislature. This system is cumbersome, almost to the point of being inoperative.

The sum total of our laws can be found in "Declaration of Policy." This policy sets the course of action of the Department and all other laws are designed to carry out this policy. "It is the purpose of this act and the policy of the State of New Mexico to provide an adequate and flexible system for the protection of the game and fish of New Mexico and for their use and development for public recreation and food supply and to provide for their propagation, planting, protection, regulation and conservation to the extent necessary to provide and maintain an adequate supply of game and fish within the State of New Mexico."

In order to carry out the policy, the State Game Commission has been given general powers and duties as found in Section 53-1-8, New Mexico Statutes 1953, Annotated.

"53-1-8 GENERAL POWERS AND DUTIES OF STATE GAME COMMISSION--GAME PROTECTION FUND.--The state game commission shall have general control over the collection and disbursement of all moneys collected or received under the state laws for the protection and propagation of the game and fish, which money shall be paid over to the state treasurer to the credit of the game protection fund and shall not be transferred to another fund; and this act shall guaranty to the person who pays for hunting and fishing licenses and permits, that the money in said fund shall not be used for any purpose other than as provided in this act, and the state game commission shall have authority:

"To establish and, through the state game and fish warden, to operate fish hatcheries for the purpose of stocking public waters of the state, and to furnish fish fry and fingerlings to stock private waters, receipts from such sources to go into the game protection fund;

"To declare closed seasons in any specified locality or localities, and on any species of game or fish threatened with undue depletion from any cause;

"To establish game refuges for the purpose of providing safe sanctuaries in which game may breed and replenish adjacent hunting ranges; it being the purpose of this provision to establish small refuges rather than large preserves, or to close large areas to hunting;

"To purchase lands for the game refuges, where suitable public lands do not exist; to purchase lands for fish hatcheries; and to purchase lands to

be maintained perpetually as public hunting grounds, particularly lands suitable for waterfowl hunting; all such lands to be paid for from the game protection fund;

"To receive by gift or bequest, in the name and on behalf of the State of New Mexico, lands suitable for game refuges, hunting grounds, fish hatcheries, or for any other purpose necessary to carrying out the provisions of this act;

"To designate certain areas as rest grounds for migratory birds, in which hunting shall be forbidden at all times or at such times as the commission shall provide, it being the purpose of this provision not to interfere unduly with the hunting of waterfowl, but to provide havens in which they can rest and feed without molestation;

"To close any public stream or lake or portion thereof to fishing, when such action is necessary to protect a recently stocked water, to protect spawning waters, or to prevent undue depletion of the fish;

"To propagate, capture, purchase, transport or sell any species of game or fish needed for re-stocking any lands or streams of the state;

"To withhold license privileges for not to exceed two (2) years from any person procuring a license through misrepresentation, or hunting without a proper license.

"The game and fish warden shall exercise all the powers and duties conferred upon the state game and fish warden by all previous statutes now in force, not in conflict with this act.

"The commission shall have authority to prohibit all hunting in periods of extreme forest fire danger, at such times and places as may be necessary to reduce the danger of destructive forest fires.

The hunting, pursuing, capturing, killing or wounding, of any game animals, bird or fish, in or upon any game refuge, rest ground, or closed water, or closed area, or during any closed season established or proclaimed by the state game commission in accordance with the authority herein conferred, shall constitute a misdemeanor and shall be punishable as prescribed in this act."

The financial structure of the Department besides being controlled by the State Game Commission, must be appropriated in the same manner that money is appropriated to other departments and the expenditures come under the same scrutiny of the Department of Finance and Administration; however, there is one basic difference in the financial structure of the Department; that being, that the Department operates under earmarked funds, such funds being derived entirely from the Department activities. The license sales constitute the major portion. No money is received from the General Fund.

Although the penalty is provided in the statutes for certain game and fish law violations, the money received from fines does not constitute part of the Department's income but rather, under another statute,

is earmarked to go into the State's School Fund. Furthermore, the penalties and violations are within the framework of a misdemeanor.

Granting that a discussion of the laws of the New Mexico Department of Game and Fish may be enlightening, particularly to those who have been wondering about the Department's operations, there is really more to this background than laws and regulations. Where does all this fit into the pattern of our everyday life? Where does it fit into the economy of the nation? Or the economy of the state?

In 1955, the U. S. Fish and Wildlife Service and a few cooperating states sponsored a nation-wide survey of the economic value of hunting and fishing throughout the U. S. and, briefly, this is what they found: persons 12 years of age and over, 25 million of them, hunted and fished, in 1955, in round figures, \$3,000,000,000.00 were spent in the pursuit of the recreation of fishing and hunting. Of this, \$2,000,000,000.00 were for fishing alone.

In 1956, the New Mexico Department of Game and Fish made its own independent survey to determine the economic impact on the state by hunters and fishermen. In this survey, we find a very interesting parallel of the cost to each hunter or fisherman in the pursuit of this type of recreation to that of the national average. Resident hunters spend \$157.27 and non-resident hunters spend \$363.13. Resident fishermen spend \$197.06, non-resident fishermen spend \$174.15. Although we realize that the cost of living has increased to some extent and would undoubtedly increase the aforementioned figures, we have taken these figures and used them along with the licenses sold the past license year to determine our current economic value of hunting and fishing recreation. We find that the hunter spent \$17,000,000.00 last year and the fisherman spent \$27,000,000.00. This makes a grand total of \$44,000,000.00 and does not include the cost of the license for which we could add another million. In order that we may get a better picture of the impact of hunting and fishing as concerning our state, it is interesting to note that the increase in the past three years has been 27%, jumping from \$33,000,000.00 to \$45,000,000.00. For the sake of comparison, we might say that game and fish recreation amounts to about half of the livestock and related products; about half of the field crops and about a tenth of the mineral products produced in New Mexico.

What is the role that water plays in the recreation of the state? Already, we have noted that the economic value of our fishing amounts to \$27,000,000.00. A few years ago, we used to hear the comment about two cars in every garage, now the common remark is, 'a boat and a car in every garage.'

It was established in a Supreme Court decision of September 24, 1945, the "State vs. the Red River Company" that the public waters shall not be denied to the fishing public. This opinion is based primarily upon the fishing in reservoirs where the private lands are not trespassed. Under this opinion, it is concluded that water can be classed as a beneficial use for the purpose of fish propagation and recreation. These two activities are established as part of the economy of the State of New Mexico as well as being given high priority for the health and welfare of the state.

The State Game Commission well realizes the necessity of acquiring water rights for fish and recreation purposes through the normal channels as required under our state water laws and regulations. This presents problems in many instances, and is sometimes resented by some because the water is not being used for irrigation or domestic purposes. This reaction, however, is decreasing and I am happy to say that more people are appreciating and requesting water for recreational purposes.

In closing, I would like to make this observation: New Mexico, by physical characteristics is a recreation state. We have the climate and the scenery that attracts visitors to the state in large numbers, however, we have the weak point in a shortage of facilities. One of the major supporting activities for tourists is fishing. We must develop more fisheries in the state and in order to do that, we will be required to better utilize our water resources. I think you will readily agree that our agriculture potential is limited, in fact our manufacturing potential is limited. Grazing has been exploited to the maximum or has been utilized to the point that precludes further expansion.

More water recreation in New Mexico is a must and it is the only way that I know where you can virtually have your cake and eat it too.

What is the future of the economy of this renewable resource? I believe that the facts are clear: we have better hunting and fishing; we have more people; we have more leisure time. Facilities to enjoy this type of recreation are improving. The curve of hunting and fishing recreation continues on the rise and the prospects for the future are for more of the same.

WATER RESEARCH NEEDS FOR NEW MEXICO

A. S. Curry*

The importance of water in our everyday lives cannot be over estimated. All of our activities are completely dependent on our ability to provide ourselves with an adequate and readily available supply of high quality water. In the Southwest it is our most valuable asset. Also, it is our most important resource problem. Without it, there would be no people. It is of real concern to us and should have the interest of all people whether they are engaged in public or private activities. The success and well-being of the lawyer, teacher, farmer, groceryman, livestockman, preacher, the medical profession, the plumber, the builder and all others is fully dependent upon this resource.

Normally we have a small amount of precipitation, low humidity, a lack of moisture laden air currents, and unfavorable location in the moist air weather pattern, a high percentage of clear weather and a lack of large perennial streams. The combination of these forces is making our task of survival an extremely difficult one. These conditions have made water our master. We must consider these forces and weigh them carefully in connection with all of our water problems. All of our economic and social activities and related undertakings must appraise the water situation. Evaluations must be made regarding its quality, quantity, permanence, dependability, availability, conservation, value, and use if we are to enjoy the American standard of living.

President Eisenhower, in his message to Congress in July of 1953, recognized that the government has a real responsibility in managing resources for the benefit of ourselves and for future generations.

Earlier presidents, and other congressional sessions, have on many occasions recognized the importance and seriousness of the water situation. They have taken action of a constructive nature to provide greatly needed information. This was done on the basis of surveys, construction jobs, establishment of laboratories, the creation and maintenance of special and permanent study teams and through the support of many services, regulatory and research activities designed to alleviate the water problem. Many of these activities were established to serve specific localities, while others were established to provide greatly needed information on production, utilization and control. Some of these activities will continue to be a source of new basic information pertinent to various phases of the water picture. These actions are excellent indications of the fact that the public is cognizant of the need to conserve our water. This recognition by the people has resulted in various agencies accepting responsibilities regarding the regulation, conservation and utilization of our water supplies. In this state, some of them are the various institutions of higher learning, the State Engineer Office, Soil Conservation Service, the Agricultural Research Service, the Bureau of Reclamation, U. S. Geological Survey, Forest

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Service and many others. These groups have various responsibilities in connection with water problems depending upon their charters, interests, funds and facilities. In general, their activities are built and operated around the broad problems concerned with education, regulation and utilization. To cope with their responsibilities and accomplish the tasks assigned to them a large amount of information is required. Some of it can be obtained from reports and surveys previously conducted and some must be obtained as new information from new studies and additional surveys.

As we delve into the problem and give consideration to the many details concerned with the full accomplishment, we find that the interests of the many segments of our population must be recognized. Domestic, municipal, agriculture, industry, forestry, fish and wildlife and recreation all have a vital interest in any water program which affects our social and economic well being.

Each and all of the segments of responsibility and interest should be intelligently, fairly and properly treated. To form judgments and make sound decisions regarding these matters, much more information is required. As indicated above some of it is already available. However, because of the increasing seriousness of the situation it is rapidly becoming recognized that there is inadequate information to permit our leaders to form the necessary decisions and recommendations. This information will have to be obtained before we can make much progress in obtaining better use of our water. To accomplish this, many new and detailed studies will have to be made. They will have to be concerned with beneficial use of water, institutions, laws, land management, hydraulics, economics, hydrology, plant reactions to moisture, soils, water conveyance, various phases of engineering, sanitation and health, power, fish and wild life, range and forest management, community development, topography, geology, water supply and quality, storage, seepage, evaporation, transpiration, consumption, pollution, reclamation of land and water, well development and maintenance, water movement in the soil, desalinization, weed control, precipitation, stream pollution abatement, instrumentation, and many other things.

Much work has been done, many reports have been written, innumerable surveys have been made and many conferences have been held regarding these and associated problems. However, it seems that the surface has only been scratched and many more things must be learned before we can properly manage our water. Ways must be discovered to permit industry to use and re-use her processing water with a minimum of loss. Much progress has been accomplished in this area. The petroleum industry, where required, has reduced her new water requirement for processing from 27% to 5%. Procedures for purifying contaminated and impure waters will increase our available supply. Means must be discovered to reduce the requirements for municipalities. Agriculture is our largest user and waster of water. Although much research has been done on this problem in the last 60 or 70 years, we still, in some instances lose as much as 75 or 80% of the water applied and much of this cannot be avoided or recovered by presently known methods.

If the total research job ahead of us is viewed from the over all angle, it seems almost impossible to accomplish. However, if we view it from the many angles of the many interested groups we can find encouragement. The task can be broken down into many segments and can be accomplished on the basis of individual group effort or on the basis of cooperation by exercising

reasonable organizational methods. This would require an overall approach concerning an area of work with various groups accepting specific lines of research falling within their interests and in line with their funds, facilities and capabilities of their personnel.

Because of the varied interests and responsibilities of the many groups and individuals it seems undesirable to attempt to develop a classified list of jobs to be done on a priority basis.

There is much evidence of an across-the-board interest in water quality. Much research is needed to get the necessary answers. Health groups, agriculture, industry and municipal operators all have a vital concern.

Evaluation studies should be made to determine the chemical and biological characteristics of various waters. If they are to be used for agriculture, we need to know if they are suitable for plant and animal use. We should be aware of their effects on, and possible future effects on, plant behavior and soil reaction. We need to know how and why different plants react under different water and soil conditions. If the reactions are undesirable we should learn how to alter them in our favor. Many of the relationships among the various chemical constituents of water and their effects on the chemical and physical conditions in the soil are known. However, there is still much to be learned. How do the many combinations affect the water movement within the soil? What are their physical and chemical effects on the Soil? How do they affect absorption, percolation and drainage? How do all these things affect the availability of plant nutrients? How do they affect plant growth, fruiting and yield of various plants.

Health interests will be concerned with information on the availability of potable water supplies. They will need information as to depth, type and location of aquifers, quantity of water, quality as related to chemical content and purity. Data of this sort will be required for the proper development of all communities. For established communities suitable methods and procedure need to be developed for handling the domestic water so it can be kept in a healthful condition or so it can be satisfactorily treated if it becomes contaminated. Research in chemistry, biology and engineering will be utilized in getting these answers.

Industrial uses will require information regarding quantity, quality and availability. For industry new engineering designs will be needed to permit more efficient handling of the water in the plant operations. New water treating methods are needed to permit satisfactory reuse of a larger portion of the original water. New processing procedures should be developed which will require smaller amounts of water. Chemists and design engineers would be quite active in these areas of research.

Waters to be used for fish and wildlife and recreation purposes are entitled to consideration. Their specific purposes will require special research on problems that will become evident in these activities. Among various things the supply and maintenance of purity and sanitation will require special attention.

Beneficial use is a major problem. We must know if beneficial use should mean the same thing to agriculturists, city managers, industry, the legal profession and the public. Evaluations should be made of various

interpretations of beneficial use. Should plant and animal production, industry and people be subject to the same restrictions and regulations? Satisfactory and generally acceptable measures of beneficial use must be established. These measures and their interpretations should be applicable to all groups using water or materially influencing its use.

This will be a time consuming and difficult task. Engineering, legal, industrial, agricultural, municipal, economic, social and health interests will all have to be considered. Many studies will have to be made to secure the required information for each of these interests. Some of the information will apply to more than one group. To obtain it the services of biologists, engineers, economists, lawyers, sociologists, agriculturists and many others will be needed. These people, of course, will have to be supported by the necessary fact finding and research facilities.

The acquirement of the information will have to be followed by decision making procedures so that firm and appropriate definitions of beneficial use will be established. After this is done a reasonable system of controls should be agreed upon and put into effect.

Our water laws are considered unsatisfactory by many people. There is still the element of unfairness that continues to appear. It may pertain to the quantity, quality, priority, purpose of use, location or change of location, drainage, and source of supply. Although the water laws of New Mexico generally are considered to be good ones, there is still much room for improvement. Studies should be made of the various laws over the country. They should be evaluated for their strong and weak points and for their applicability to our conditions. These evaluations should be followed by the preparation of a new set of water laws or a revision of the present ones. All evaluations and new proposals should be prepared with beneficial and conservative use kept uppermost in mind. In these preparations, consideration must be given to all vitally concerned interests. Engineering, agricultural, health, and management aspects are important and trained men from these areas, as well as from the legal profession, should be involved in making the studies, evaluating them and in preparing the recommendations.

Drainage continues to be a problem. More must be learned about lateral movement of water, depth and size of channel or tile. The relationship between drainage design and soil conditions should be studied. Procedures for construction should be devised to improve functioning and reduce cost.

Well drilling, development and maintenance present us with problems requiring solving. The adoption of proper laws for this area would be of considerable assistance. Other well problems are concerned with economics and engineering. Procedures and designs of a less expensive nature are needed. Metals of longer life should be devised. Strainer design needs improvement. More should be learned about the relationship between the water bearing formation and the design of the casing, the strainer and the area surrounding the casing. In the drilling operations, procedures should be devised that will readily, economically and efficiently cause the maximum inflow to the well.

In connection with irrigation project development, we must learn more about the relationships between the construction job, the land to be used, the water and the expected community development. Can the land be economically

prepared for irrigation and crop production? Will it produce marketable crops of high yield and quality? Will the water supply be permanently adequate and dependable? Will crop production continue at a high level without undue soil management expense? Will the distribution system properly consider seepage, weed growth and expense of construction, operation and maintenance? Will the project construction costs be in excess of the repayment capacity of the land? Is the project of adequate size and kind to support a community with the necessary roads, schools, churches, stores, filling stations, shops and other businesses?

Further studies should be made to determine if the water will yield a more beneficial use on the project or if it should be diverted to some other area for municipal, industrial or recreational purposes. To make these decisions much information will be needed regarding the land and its characteristics, the water and its alternate uses, type of construction and its cost for the various areas, the possibilities of permanence, the probable economic and social levels that might occur in the various alternate uses. The proper evaluation of these and other points should permit the establishment of communities with prospects for a permanently sound economic future.

Evaporation as a single item is probably our Number 1 public enemy. It is responsible for the loss of very large quantities of water. Once water has been lost in this manner it is beyond recapture or recovery and we can obtain no further benefit from it. This area of study offers many opportunities for obtaining a more beneficial use of our original supply. It is a problem on irrigated land, on dry farm land, on range land, in stream channels and on open bodies of water. Although many studies have been made about this problem we need information that will give us cultural practices that permit land management and cultural procedures of a sort that will give us high yields without losing so much water from the ground surface. If successful treatments can be devised in this area which will still permit the ready percolation of rain into our range lands, many of those problems would be solved.

Evaporation from streams, lakes and other open bodies of water exacts a large toll from our available supply. We need control treatments for these surfaces that will stop this loss but still not harm the water for fish, wildlife, recreation, irrigation or other uses.

Many studies have been made to reduce or control evaporation and many worthwhile recommendations have come from them. However, the right answers have not been found. Effort in this direction must be continued. Perhaps mechanical treatments can be devised for some phases of it. Other phases may require the development of special chemicals or protective films.

Studies are needed to determine the permanent relationships and effects of various upstream forest and range management practices on erosion and conservation and on downstream sedimentation, water supply, industrial, agricultural and community development. In these studies particularly, attention should be given to topography, vegetative cover, and soils as they influence runoff and erosion. Many detailed studies will be required to determine the many relationships between rainfall amounts, seasonal pattern and intensities on erosion, runoff and downstream supplies and sedimentation.

Not enough is known about watershed projects - where are they feasible? Are they worth the cost? Where should control structures be placed? What are their effects on vegetative cover and downstream water supply?

Studies in snow hydrology must be intensified to provide data for better management of water for flood protection and downstream use. Almost nothing is known about ground water recharge and its possible benefits are numerous.

In considering this whole problem, we must not only use every opportunity to improve the efficiency of our present supply but must conduct research which indicates possibilities of increasing this supply. Desalinization and weather modification - It seems justifiable to continue research in both these areas. Further research in desalinization would surely yield methods of greater efficiency than those presently known. Also, it would assist in developing procedures that are within the bounds of economic feasibility. At that stage it would be of major value to New Mexico.

Although the rain making phases of weather modification have not been greatly encouraging further research in this area seems justifiable. Information gained regarding cloud physics, temperatures, air currents, drop-plet formation, cloud seeding and associated conditions is needed in much larger quantity and for more areas than is now available. Your Chairman is well qualified to discuss this point.

Many of these tasks can be accomplished by continued and increased effort with our present methods and procedures. Others will require the use of new instruments and new methods. Proper instrumentation and methods will greatly improve the speed and accuracy of various jobs. Better instruments are required for measuring the location and movement of water and moisture in the soil and aquifers. Plant transpiration and evaporation from the soil and water surfaces cannot be satisfactorily measured at present. Sediment measurement under different conditions is still a problem. New instruments are needed for testing materials used in construction jobs.

There are many detailed phases of this problem that have not been mentioned which will require additional and intensified research to provide the required information if we are to cope with this problem successfully.

Perhaps this discussion has left the impression with some of you that some areas of concern have been treated rather lightly and I am sure this is true. This was done because I am not sufficiently well informed regarding all the various interests to suggest points needing further study. However, in other comments, I have attempted to recognize the fact that the overall problem concerns all of us, that the needs of each area are of concern to the needs of all areas and that the total job can be accomplished only if we solve all parts of it in an order of priority of greatest service to all of us.

MAKING THE MOST OF NEW MEXICO'S WATER RESOURCES
THROUGH RESEARCH AND EDUCATION

E. J. Workman*

The citizens of New Mexico need to understand the water problems with which we are faced. It is the responsibility of research and education to keep the citizens informed on the problems and possible solutions.

Within any political boundary, like our own state, there are certain resources and specific ways we might deal with these resources. This could be visualized in the following formula.

$$\frac{F \neq M \neq I - O - W}{\text{Number of People}} = \text{Potential Standard of living}$$

F = Find -- What do we Find or have.

M = Make -- What can or do we Make.

I = Into -- What do we bring Into.

O = Out -- What do we take Out.

W = Waste-- What do we Waste.

If the resource in the top part of the formula is water, then most of the factors are not fixed. Through research and education, most of these can be adjusted. Some real opportunities are offered for decreasing waste.

We are interested in increasing the number of people, but only if it does not lower our present or potential standard of living. Perhaps, more water should be used for industrial and recreational purposes. We must keep in mind that the water eventually will be used for the purpose for which people are willing to pay the highest price.

The facilities for living in a particular region determine greatly the population growth which may be expected. In facing this problem, the people of New Mexico should provide research and investigators to keep in very close touch with the desires and thinking of the people with respect to living facilities and resource requirements likely to be demanded by the population growth.

Questions concerning coordination of research were raised and it was the expressed opinion of the speaker that research is not something you can coordinate. It amounts to creative efforts and the results will depend upon the kind of environment that has been provided for the conducting of research and the facilities available. Beyond that the society which employs the investigator cannot direct production, recognizing of course, that an institution has a natural sphere of influence and therefore, can direct its destiny somewhat by the kind of people it employs, but once employed, we must depend upon ability of investigators working in the environment we create for them.

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EDUCATION NEEDS IN WATERSHED CONSERVATION

George W. Worley*

I believe this is the first of these conferences at which the educational aspects of water resources and water problems have been given special recognition. I know it will not be the last. A broad educational program is important, perhaps essential, to the solution of our water problems.

Under a truly democratic system of government public opinion is, eventually, the force which determines the direction of action in major issues. When water problems are of major interest, as they are in the southwest, it is important that the public be given timely, adequate, accurate information concerning these matters. Only when such information is available can the public be expected to give significant and continuing support to water conservation programs. Providing useful, accurate information is a form of education.

What are some desirable characteristics of an educational program to stimulate interest, thought, and action on water resource problems? I suggest the following:

1. A conservation education program should enjoy the approval and active support of the State Department of Education and the institutions related to it.
2. There should be state-wide coordination of planning and activities. All organizations, agencies, groups, and individuals involved in the program should have opportunity to participate in the coordinating process. There should be a harmonious working relationship between researchers and technicians who provide pertinent information, and those persons who are primarily concerned with interpreting this information and presenting it to the public.
3. The conservation education program should involve information for all age levels from pre-school to adult.
4. The program should be regular, continuing, rather than sporadic. We should be concerned with teaching a basic philosophy rather than only advocating emergency measures.
5. A conservation education program should utilize modern educational methods, materials, and equipment.
6. There must be provision for evaluating progress.
7. The personnel who plan, organize, and execute the program should have clearly in mind what concepts and principles are to be taught

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and how to teach them. This involves a program of leadership training.

What is the status of the conservation education program in New Mexico? How many of the desirable characteristics suggested does our state conservation education program exhibit?

This is the situation as it appears to me, on the basis of observation admittedly limited both as to time and opportunity. Current status, recent progress, and remaining problems will be suggested in relation to each of the desirable characteristics of a good conservation program mentioned earlier.

1. The State Department of Education

It appears that personnel of the State Department of Education are aware of the importance of conservation education, particularly those aspects relating to water, and are aware of their responsibility concerning it. They are justifiably concerned with the problem of increasing emphasis on the conservation education program in the face of a jam-packed curriculum and insistent demands for added time and effort in many fields.

No one person in the State Department of Education is charged with attention to a statewide conservation education program. Certain individuals, because of personal interest or the nature of their assigned work, tend to be more active in conservation education or are thought of as representing the department in conservation education matters. More and more active leadership in conservation education from the state department is always desirable. It is to be hoped that additional personnel may become available to the department, either to give direct attention to the conservation education program, or to reduce the individual work load so that present personnel can give more time to this important activity.

2. State-Wide Coordination of conservation education

There are examples of planned coordination of education activities by a number of agencies and organizations. Conservation education workshops, the activities of Soil Conservation Districts, forest fire prevention programs, and the Rural Development Program, to mention a few, involved working together to inform the public of resource problems and conservation measures. However, there is no permanent state-wide organization to coordinate efforts in conservation education, prevent duplication of effort, and plan for increasing the scope and effectiveness of conservation education. Such organization may come soon.

On October 5th and 6th a Watershed Conservation Education Conference was held at the University of New Mexico under the sponsorship of the Pack Foundation project. One of the major outcomes of the conference was the recommendation that a state-wide conservation education council or committee be organized. A working committee was appointed, and will meet very soon to initiate the organization recommended.

3. Conservation education at all age levels

The extent of uniformity of the conservation education program with respect to age levels is not known to me. Certainly conservation concepts are taught at most school grade levels, but I suspect that there is much variation in the degree of emphasis. Quite often we find that interest and activity is high in the upper elementary and junior high levels.

I am inclined to believe that conservation information for adults is directly proportioned to the personal initiative and leadership of local representatives of the state and federal agencies concerned with water, soil and other resources.

4. Is the conservation education program regular or sporadic?

Certain elements of a watershed or general conservation education program are regularly included in the programming of schools and local, state, or federal agencies. However, emphasis on conservation matters all too often waits upon a flood, sedimentation problem, or other emergency. This should not be so. Stimulus for conservation planning and practices should come from an appreciation and understanding of the fundamental relationship of man to water and land, rather than from transitory emergency conditions. Deliberate planning for regularity should be a part of conservation education program development.

5. Use of modern educational methods, materials, and equipment

Use of the most effective teaching techniques and materials often hinges on the interest, initiative, and training of the leaders involved. Information about natural resources and their conservation can be presented in a highly interesting and satisfying manner. Water, land, plants, and animal are tangibles in which people are naturally interested. Possibilities for presenting information on resources by means of experiences, meaningful activities, visual and tactile materials are practically endless. Unfortunately, the information is often made to conform to the traditional "bookish" approach and loses its natural appeal. One hour in the field is often worth ten in the classroom, one good motion picture can teach as much as several books, and one project where the learner "does something" with resources is worth several lecture sessions where the learner is "told about resources".

There is a distinct need for the development and distribution of useful reference materials in conservation education to teachers, youth leaders, civic clubs, church groups, and other potential sources of leadership. Examples of such material are: bibliographies, lists of available visual materials, sources of assistance from local and agency personnel, suggested field trip routes, meaningful activities and projects, etc.

6. Progress should be regularly evaluated

Any program benefits from occasional "stock-taking" to determine

strong and weak points, progress, and relative failures. We need answers to questions such as these: What is the general level of understanding with regard to natural resources and their conservation? How was the conservation knowledge acquired? What effect does location within the state, economic status, occupation, and rural or urban life have upon acquisition of conservation attitudes? At what grade level does the most rapid acquisition of knowledge of conservation concepts occur?

Missouri, Iowa, California, Virginia, and recently Utah, have benefited from surveys of the effectiveness of conservation education programs.

In New Mexico, provision should be made for some type of periodic evaluation of the extent of conservation knowledge and the means which are used or may be used to achieve this knowledge.

7. A leadership training program

We are accustomed to finding great variation in the interest and achievement in communities. We find a certain community which has a reputation for its parks, public buildings, utilities, streets and roads. Another community has an outstanding interest and accomplishment in art. Still another is noted for its fine school system. Behind each outstanding program there is almost certain to be outstanding leadership.

Conservation-conscious communities are almost invariably the result of conservation-minded teachers, resource agency personnel, or conservation-minded civic leaders. It has been said that school administrators and teachers are the key to a successful conservation program. When teamed with other interested and informed persons in the community they exert an almost irresistible force for the improvement of conservation attitudes.

It follows that if leadership is of such obvious importance, a program to stimulate and train leaders will pay excellent dividends.

Probably the most outstanding examples of conservation leadership training in New Mexico were the conservation workshops for teachers held from about 1947 to 1953. Mrs. Ruth Bush Jones, Information Specialist, U. S. Forest Service, was instrumental in establishing these workshops at New Mexico Highlands University; Eastern New Mexico University; New Mexico Western College; and the College of St. Joseph. Other conservation workshops in the southwest were held at the University of New Mexico, Albuquerque; University of Arizona, Tucson; and Arizona State College, Tempe. Teachers attending the credit workshops received basic information in conservation principles, spent much time in the field under the leadership of resource persons from local, state, and federal conservation agencies, and developed conservation teaching activities, projects, and materials.

Every effort should be made to re-establish regular conservation

workshops or conservation field courses for teachers. Such a workshop is planned for the summer of 1960 at the University of New Mexico. It may be desirable to stimulate increased attendance at such leadership training sessions by offering tuition scholarships or similar inducements. In a number of states Soil Conservation Districts, women's clubs, garden clubs, sportsmen's organizations, and service clubs encourage attendance of teachers and youth leaders at conservation training courses by paying all or part of the expenses of those attending.

Too often, teachers are the only potential leaders to whom conservation training courses are offered. The establishment of short but intensive workshops in conservation education principles and techniques for soil conservation district supervisors, Boy Scout and similar youth group leaders, 4-H leaders, representatives of sportsmen's organizations, playground directors, camp counselors, and others in positions of leadership would have a tremendous impact on the conservation attitudes of the public.

The comments, references, and suggestions in the foregoing paragraphs are presented humbly. They are intended, not as a complete analysis of conservation education in New Mexico, not as a master plan for a new and better conservation education program, but simply to suggest some of the needs related to a public information program on our natural resources and their management. There is no implication that we lack a conservation education program. Much has already been done and is being done, but the matter is so important that we cannot afford to rest here. William Vogt, author of "Road to Survival" says, "A conservation program, my experience shows, inescapably rests like a tripod on three legs: research, education, and action on the land. These must function simultaneously if the structure is not to collapse."

We are, and we must continue to be, concerned with keeping the education leg of the tripod straight, sturdy, and on firm ground if we are to have a broad, effective conservation program on the land.

THE NEED FOR WATER RESOURCES EDUCATION IN THE PUBLIC SCHOOLS

W. B. O'Donnell*

I. Introduction

- A. The Public Schools are called upon to meet the changing needs of society. Two examples of this are -- driver education, and the school lunch program.
- B. Administrators have become wary, rightfully so, to the many demands made for new elements to be added to the curriculum. Once an element is added, it is difficult to eliminate even if later it becomes unnecessary.
- C. However, basically, we expect to accomplish lasting and long range objectives by depending on the curricula of the schools; therefore, water resources education may be an exciting area for development in New Mexico.

II. What is being done, now?

- A. State Department of Education - in teacher's handbook "Elementary Science and Conservation"
Brief 'foreward' or 'overview' - "Water is the life blood of a civilization and it is used continually in the process of living. Water cannot be destroyed but can be used over and over again. Water is of value in proportion to the number of times it is used.

New Mexico has about 700,000 acres of irrigated land. The largest irrigation systems in the state are those that the Federal Government developed along the Rio Grande and Pecos rivers.

Water conservation concerns itself with the prevention of unwise water use. Pollution of streams and lakes can easily undo many construction conservation efforts. Devastating floods and soil erosion by water need no longer menace a people if the will to prevent them is strong enough. Proper knowledge of water engineering and agricultural practices have been developed scientifically and practically. The agricultural expert, the engineer, and the legislator are cooperating to make possible the intelligent use of water, but more education is needed to direct the attention of the average citizen toward helping in this much needed work." 1/ - Certainly this represent no undue emphasis upon water. This is followed by division into primary and intermediate with a few "understandings and learnings" and "pupil activities" suggestions

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1/ Elementary Science and Conservation, Teachers Handbook for New Mexico, page 91, issued by Superintendent of Public Instruction, Bulletin No. 16, 1953, Santa Fe, New Mexico

in each division. This, however, is a start only.

- B. Survey of selected schools showed eleven out of twenty offering some water education.
- C. Survey of selected schools, Elementary level.
1. Ten out of twenty provided some water education.
 2. Four out of twenty stated this effort incidental only.
 3. One out of twenty stated this was an important area.
 4. Seven out of twenty stated water education was taught through unit or problem approach.
- D. Survey of selected schools, Secondary level.
1. Ten out of twenty offer some water education.
 2. The following subject fields were indicated as areas where water education occurs:
- | | |
|-------------------------|---------------------|
| Biology | Seven out of twenty |
| Vo. Agriculture | Six out of twenty |
| General Science | Six out of twenty |
| History | Six out of twenty |
| Economics and Sociology | Five out of twenty |
| Chemistry | Three out of twenty |
- E. Additional information from survey.
1. Ten out of twenty elementary schools cooperate with U. S. Forest Service in forest conservation education.
 2. Twelve out of twenty believe New Mexico schools should include greater emphasis on water education. Comments:
 - a. "not to the extent of any special courses in it."
 - b. "Yes, provided emphasis is on water resources conservation."
 3. Twelve out of twenty believe more adequate sources of water resources education materials would increase the desirability of strengthening the program in public education. Comments:
 - a. "perhaps."
 - b. "we have lots of material now."

III. Colleges and Universities.

- A. What are the higher education institutions doing?

The following is a selected list of courses pertaining to water, offered in New Mexico Colleges and Universities.

WATER RESOURCES EDUCATION

<u>University of New Mexico</u>	<u>Semester Hours</u>
Bio 179 Conservation	3
CE 120 Engineering Hydrology	2
CE 161L Water Supply	3
Geol 161 Ground Water	2

<u>Eastern New Mexico University</u>		<u>Semester Hours</u>
Ag 301	Soil Management	3
Geog 403	Geography of North America	3
Geog 481	Principles of Conservation	5

<u>New Mexico Institute of Mining and Technology</u>		
561-562	Theory of Ground Water Motion	3
566	Prospecting for Ground Water	3

<u>New Mexico State University</u>		
Ag Econ 450	Land Economics	3
Ag Econ 460	Economy of Water Resources & Use	3
Agron 313	Irrigated Soils	3
Agron 452	Soil Physics	4
Geog 321	Geography of North America	3
Geog 330	Geography of New Mexico	2
Geog 440	Conservation of Natural Resources	2
AEngr 343	Soil and Water Conservation	3
AEngr 345	Irrigation and Drainage	3
AEngr 445	Engr. for Soil and Water Conservation	4
AEngr 447	Irrigation and Drainage Engr.	4
CE 451	Water Supply	3
CE 480	Irrigation and Drainage	3
CE 551	Advanced Water Supply	3

<u>New Mexico Highlands University</u>		<u>Quarter Hours</u>
Bio 385	Conservation of Natural Resources in New Mexico	4
Geog 310	Geography of North America	3

Below is the approved Agricultural Economics curriculum in Water Resources at New Mexico State University:

<u>Freshman Year</u>		<u>Semester Hours</u>
AH 100	Introduction to Animal Husbandry	3
Bio 101	Plant Biology	4
Bio 102	Animal Biology	4
Chem 101-102	General Chemistry	8
Eng 101-102	Freshman Composition	6
PE 104-105	Basic Activities	2
AS or MS 101-102	First Year Basic	4
PH 101	General Poultry	3

<u>Sophomore Year</u>		
Agron 251	Farm Crops	4
Agron 252	Soils	4
Chem 211	Organic Chemistry	4
Econ 253	Introduction to Economics	3
Math 131-132	First Year College Math	8
AS or MS 201-202	Second Year Basic	4
Hort 200	General Horticulture	4
ME 111	Graphics I	3

<u>Junior Year</u>		
Math 231-232	Calculus I, II	7

CE 222	Plane Surveying	3
Phys 231	Engineering Physics	4
Eng 205	Engineering English or	
Eng 207	Communication in Agriculture	2
CE 233	Statics	3
English Elective		2
Speech 253	Public Speaking	2
Agron 452	Soil Physics	4
ME 234	Dynamics	3
Ag Econ 454	Agricultural Prices	3
Ag Econ 460	Economics of Water Use	3
Electives		1
<u>Senior Year</u>		
Ag Econ 458	Farm Finance	3
Ag Engr 445	Engr. Soil and Water Conservation	4
ME 338	Fluid Mechanics	3
Ag Econ 480	Ranch Economics	3
Ag Engr 447	Irrigation and Drainage Engr.	4
CE 431	Hydraulics Lab	2
Ag Econ 490	Agricultural Policy	3
CE 254	Advanced Surveying	3
Ag Econ 450	Land Economics	3
Electives		10

- B. If we accept that the public schools are called upon to meet the changing needs of society then, rightfully, we should explore what the higher education institutions are doing about water problems in the preparation of teachers.

Usually a course is offered to prospective teachers, elective in nature, and ordinarily with a title such as "Conservation" or "Conservation of Natural Resources in New Mexico."

In preparation of teachers, using methods course and the state course of study, could increase emphasis on water resources education in intermediate through 8th grade.

More units on dams, earthen tanks, movement of water, conversion of sea water, etc.

Probably one of the most important steps would be to insure that all elementary teachers of the future are conscious of water problems and integrate water as an important part of the curriculum.

This could and should be accomplished through existing courses, not new courses.

NATIONAL WATER LEGISLATION

Tom Morris*

It is a pleasure to be with you today for this Fourth Annual New Mexico Water Conference. I have followed the previous yearly events with great interest and am quite familiar with the excellent developments resulting from this discussion and exchange of ideas and information.

My topic today is Legislation at the national level which affects state water rights. Western State water rights law, basically the prior appropriation doctrine, has for many years been thought to be well established, understood and respected by all concerned with the use, conservation and development of water, that most precious of all natural resources. It, therefore, came as a great shock to all western authorities when the Federal government challenged successfully water rights acquired under State laws based upon the principal of prior appropriation of rights to use of water whereby existing beneficial uses were recognized as constituting a prior right to the water of a stream, that first in time of beneficial use constituted first in right, and that through its beneficial and productive use valid property rights could be acquired.

The right acquired by appropriation of water has been recognized from the beginning of development in the semi-arid West as a property right, as valuable and as much protected by law as title to the land itself.

As I said it came as a shock when it was discovered that water rights acquired under State law, and the State-prescribed procedure for obtaining same could be challenged or ignored by action of Federal agencies. This was revealed by a series of court decisions beginning in 1955. The best known and possibly most far-reaching case was the Pelton Dam Case, decided that year.

I am not going to enter into a long discussion of that case since most of you are already familiar with it. For those who are not, and are concerned closely with water resource development I recommend you familiarize yourselves with it. I commend heartily the dissenting opinion of Mr. Associate Justice Douglas in that case as representing the feelings of the western States.

Briefly, the Pelton case is of major importance because it establishes the principle that severance of water from the public domain by the Desert Land Act of 1877 did not apply to reserved public lands of the United States, a new and startling interpretation of that Act. In the decision the Supreme Court used the term "reservations" to include all public lands withdrawn or reserved from sale or disposition under the public land laws. If this holds, then hundreds of millions of acres of land within the western States and the water resources therein are removed entirely from State control and State water rights laws become lost in a chaotic maze of uncertainty.

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As a result of this decision and the succeeding Fallbrook and Hawthorne cases it has become necessary to restore order and system in the realm of water rights. This can best be accomplished by Federal legislation somewhat in the nature of "quit-claim" Acts of Congress.

Water rights are literally the life blood of the economic structure of the West. Year to year variations in total supply are bad enough. In addition now all those concerned with conservation, storage, and development and use of water resources must cope with the possibility that a large proportion of the available sources of water may be beyond the systematic, orderly procedure for establishment of rights under State laws. They may now be subject to the whims of individual Federal agencies which may ignore or contravene these procedures. These agencies of recent years have seen fit to do just that in too many instances.

The general feelings of mistrust created by these court cases throughout the West has led to a heavy demand upon the Congress to bring order out of chaos.

Federal activities in the development of water resources in the West have, from time to time, caused uneasiness as to the status of water rights acquired under State law should the Federal Government assert the right to use the water for navigation or for other Federal purposes. Previously several piece-meal steps have been taken by Congress to reassure the western States.

Section 8 of the Reclamation Act of 1902 served to quiet such fears so far as Federal irrigation projects were concerned.

The Milliken-O'Mahoney amendment to the Flood Control Act of 1944 subordinated the use of water for navigation west of the 98th Meridian to any present and future beneficial consumptive use. This applies to all projects authorized for construction by the Corps of Engineers by that and subsequent Acts and seems to assure that water needed in the operation of its projects would not interfere with water rights acquired under State law.

It had long been presumed that the Desert Land Act of 1877 passed control of non-navigable waters arising from the public lands to appropriation under State laws. The Pelton Dam decision disabused us of that idea.

Since waters arising from many Federal reservations have long since, in many areas, been put to beneficial use under water rights acquired under State laws, this reopened the entire problem of Federal-State relationships in the water rights field by raising a question as to the value of such rights. The Federal government has used the Pelton Dam decision as the basis for casting further doubt on other water rights held under State law.

While this troublesome question has had the fullest impact on the States of the West, I am aware of an increasing interest among Eastern water authorities in this very problem. This augurs well for the chances of some early Congressional action.

Following the Pelton Dam Case, the Cabinet Committee on Water Resources Policy recommended that the principle which recognized water rights as property

rights be accepted and that a study of the whole issue be made. So far no such study has been made nor proposed by the Federal government.

In the succeeding sessions of Congress numerous bills have been introduced which would resolve the issue by requiring all Federal agencies to operate under State laws with respect to water rights. This has met with the opposition of the Executive Departments, particularly the Justice and Defense Departments, primarily on the grounds of doubt as to their constitutionality.

The Departments of Agriculture and Interior have usually signified their agreement with the philosophy expressed in the language contained in the bills and have indicated their willingness to participate in the development and drawing of a workable bill upon which all concerned could agree. Near the close of the 85th Congress the draft of such a short bill, agreed to by the Departments of Justice, Defense, Interior, and Agriculture as well as the Budget Bureau was recommended to the Congress by the Secretary of the Interior.

This bill would have in effect, overridden the so-called "reservation theory" as determined in the Pelton Dam decision. However, the bill made no progress before adjournment of the Congress primarily because it fell far short of being satisfactory to the West.

A number of proposals were made in the just-ended first session of the 86th Congress to bring some order out of chaos in this most important field. I shall discuss them briefly. Unfortunately none of those proposing a positive step toward preventing potential future evasion of States water rights law, particularly in the western States, by Federal agencies, have progressed to the point of holding public hearings. Federal agencies themselves have expressed general opposition to most of them either directly or by suggesting amendments they would require before giving their approval. In most cases these amendments would so water down the effect of the bill itself as to make it nothing but a general statement to the effect that State water rights should be observed, removing most of the element of compulsion.

The Senate this past session approved a resolution (S. Res. 48) which established a Select Committee on Water Resources. Its declared purpose is the study of development and coordination of water resources development by Federal, State, local and private agencies. Although not specifically stated, it may develop some means of cooperative understanding as to the future status of State water rights. It will depend largely upon existing agencies for information and recommendations, as well as a proposed series of public hearings throughout the nation. The States will have an opportunity to present their views at these hearings. They should take every advantage of this opportunity.

A House bill designated HR 1234 would require Federal officers, agencies and employees to act in accordance with State water laws relative to the control, appropriation, use and distribution of water. It provides that the United States shall sue and be sued in the courts of States when litigation arises from failure to comply with the provisions of this measure. It specifies that Federal agencies comply with the same procedures as citizens of the various States in carrying out Federal law relating to water-resources development and utilization, and that those agencies shall not interfere with any right recognized by local custom or law without due process

of law and just compensation therefor. The terms of this bill would apply to the entire country, although with greatest impact on the western States.

Senate Bill 1592, entitled Western Water Rights Settlement Act of 1959, is the re-introduction of a bill (S.863) that was introduced in the 84th Congress and 85th Congress, and which has been the subject of considerable interest and discussion. Its principal purpose is making Federal lands and agencies subject to State water laws in the States lying wholly or partly west of the 98th meridian. The measure contains a declaration that "Federal agencies and permittees, licensees, and employees of the Government in the use of water for any purpose in connection with Federal programs, projects, activities, licenses or permits, shall acquire rights to the use (of water) in conformity with State laws and procedures relating to the control, appropriation, use or distribution of such water." As introduced in the 86th Congress this bill would suspend any existing Federal Power Commission licenses for impoundments or diversions on non-navigable and intra-state waters if construction has not reached a state of completion which affects such impoundments or diversions. It is similar to HR 2363 introduced previously in the House.

Sixteen western Senators joined together to introduce S. 851. This bill provides that the withdrawal or reservation of surveyed or unsurveyed public lands shall not affect any right to the use of water acquired pursuant to State law and that any public land withdrawal or reservation shall not affect the right of any State to exercise jurisdiction over water rights. It would apply in all States. This is identical to HR 4604, 4607, 4567, and 6140 introduced in the House.

Some conservation interests feel that these bills do not provide adequately for State laws which fail to recognize fish and wildlife conservation and public recreation as beneficial uses of water and thus oppose them unless, as they suggest, amendments are accepted which would provide for the use of water on Federal lands for fish, wildlife, public recreation and multiple-use management purposes by agencies of either the State or Federal governments.

On March 16, 1959, I introduced HR 5718. This I did for the purpose of requiring the Federal government to recognize the authority of the States relating to the control, appropriation, use, or distribution of water within their boundaries. It would apply to water resources on and deriving from the Federal public lands. It declares it to be the policy of the Congress that this authority be given full recognition by the Federal government in connection with Federal programs, projects, or activities for the conservation, development, and use of the Nation's land and water resources.

Section 2 of my bill provides that Federal government agencies, in connection with Federal projects for conservation, development, or use of water shall be bound by all water rights acquired under State laws or recognized by State courts. As a condition precedent to the use of any such water, Federal agencies shall acquire rights to its use in the same manner as, and be given the same consideration as an individual citizen of that State. This must be accomplished by the same procedures in accordance with the laws of the respective States relating to the control, appropriation, use or distribution of water within their geographic boundaries as is required of any citizen of that State. The Federal government agencies shall not acquire

nor interfere with the exercise of any water rights acquired in accordance with State laws or which are recognized by State courts except upon payment of just compensation therefor. This does not preclude acquisition of such water rights by purchase, exchange, gift, condemnation or, where water is available for acquisition; upon proper application to a State for a right to water to be used for any purpose when certified as necessary to the conduct of an authorized Federal program.

These provisions do not affect any right to the use of water acquired pursuant to State law. They do not modify or repeal any provision of existing Federal laws requiring that rights of the United States to the use of water be acquired pursuant to State law. Nor do they affect in any way provisions of international treaties of the United States or any interstate compact or existing judicial decree as to water rights nor those held by or for Indians.

I believe that this bill will halt the steady encroachment by irresponsible Federal agencies upon control of the most important single resource of our western States.

Although there has as yet been no formal action taken upon this bill I feel justified in hoping for action in the next session of Congress.

I am happy to say that other Members of the House of Representatives have proposed identical bills (HR 5555, 5748, 5618, 5587) and six Members of the Senate have joined in sponsoring an identical bill (S. 1416) in that body.

As I noted previously no formal action has been taken as yet on any of these bills. However, the general interest and public discussion which will no doubt be engendered by the public hearings scheduled by the Senate Select Committee on Water Resources, and the report and recommendations of that committee which are scheduled early in the next session, may provide the impetus necessary to prod the various Congressional Committees into action.

There is opposition by some Federal agencies. The Department of the Interior has expressed its opinion numerous times on the general idea of requiring Federal compliance with State water laws. It holds that such action would be an unconstitutional delegation of authority. In general the Federal government does not comply with State law and the States do not comply with Federal law in their activities. The Department has held that to delegate to State authorities control over the operations of Federal programs, projects and activities requiring the exercise of rights to use water might violate the basic right of the Federal Government to exercise its constitutional powers thus raising doubts as to whether Congress can require compliance with State laws by Federal agencies where that requirement would conflict with basic property claims of the Federal government.

The Department of Justice has indicated that there are major State law difficulties in the way of the water program as legislated by Congress. These have resulted from the fact that a large Federal investment must be made in, for instance, a reclamation project, before a beneficial use of water can be shown under State law, and until that stage has been reached water rights are very uncertain.

Opposition has been expressed by Federal agencies to complying with State water laws on the score that an impossible situation is created when a Federal water project is in more than one State, each having different water laws. In general, this is part of the Federal agencies' contention that it is difficult, if not impossible to operate a largely Federal water resource development program under uncoordinated State water laws.

There is no doubt that Western water resource control, and Eastern, to an increasing degree in the future, presents a real dilemma. In the modern era of large-scale, multiple-purpose water resource development, which no one contests the need for, there can be little doubt that Federal assistance is necessary. Yet, the freedom to appropriate water and apply it to beneficial use is essential to the growth, development and prosperity of the public land States. Large investments by private capital and local agencies have rested upon the stability and security of the assumption that by settled rule of law, western water rights were dependent on and determined by State law.

The growing challenge of such water rights by the Federal government in carrying out Congressional mandates for large-scale water resource programs has produced a crisis which must be resolved before the orderly, equitable full development of water resources which is so vital to Western programs can proceed. It is to that end that I have introduced HR 5718. I hope that a solution will be reached following full discussion and I shall continue to work toward that goal.

Thank you.

WATER LAWS AS THEY AFFECT NEW MEXICO

Ross L. Malone*

The history of the effect of water laws upon New Mexico is the history of New Mexico itself. Water is the life blood of our state. The laws by which the development of adequate supplies has been encouraged, its regulation has been effected and conservation has been accomplished may be said to constitute the very warp of the fabric of the existence of New Mexico.

Fortunately, the United States, by the Act of July 26, 1866, and supplemented by the Desert Land Act of 1877, accepted the laws of the state as the basis for determining the validity and extent of rights to water found within the state. As a result it has been the laws of New Mexico and not the laws of the United States which principally have affected the development of the state and its water resources.

To say that such state control is highly desirable is the ultimate in understatement. With water the sine qua non of our existence, if the Federal government had retained the right to control the surface and underground waters of New Mexico, it would have been of little consequence whether other state rights were reserved or protected. It is doubtful that any more effective means of controlling the social, economic and political life of a state such as New Mexico could be devised than through absolute control of its water resources. The fact that this control has been in the state and not in the Federal government has been an important factor in the development of the laws which govern the use of water in New Mexico. We can only speculate as to the situation had not Congress quit-claimed control of water on the public domain to the states, but many considerations indicate that only with state control could we have devised a system so well suited to the needs of the state, at a time when many other states had no appreciation, and were giving little serious attention, to the problems involved.

In considering water laws as they affect New Mexico, it is important to bear in mind the relative importance of underground water in New Mexico as compared to surface water. When Dr. Black opened this conference last year, he directed attention to the fact that of the 860,000 acres of land under irrigation in the state, 66% was being irrigated from underground sources. Inasmuch as 94% of the water used in New Mexico is used by agriculture, it is apparent that underground sources are supplying well over 50% of the water used in the state for all purposes. It is also apparent that while the amount of water available from surface sources is decreasing, the water used from underground sources is increasing as new deposits are discovered and developed.

In the light of that situation, and because the regulation of surface waters has posed fewer legal problems than has underground water in the history of New Mexico, my discussion today will deal primarily with the impact of our water laws upon the development of the underground waters of the

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state. If a further ground for this emphasis upon underground water is needed, I will confess that it results also from the fact that my personal experience and interest in water law in New Mexico during the past 25 years has involved underground water principally.

The impact of laws governing the use of underground water upon New Mexico has been, to a large degree, the impact of the doctrine of prior appropriation upon the state.

The drafting and enactment of the first comprehensive underground water control act in the United States resulted directly from the overdevelopment of the Roswell Artesian Basin, which had become acute by 1925. The decline in water levels which resulted, coupled with the rudimentary pumping equipment then available, caused farms to be abandoned and destroyed land values throughout the area. Loan companies were only willing to accept irrigated lands as security at dry land values, even though market prices of such lands were many times those of dry lands.

Assistance was sought from the United States Geological Survey, which responded generously, as it has throughout its history. The Fiedler & Nye study during the period from 1925 to 1928 made available for the first time authoritative information as to the quantity and sources of the water in the Roswell Artesian Basin, the speed of recharge and other factors necessary to establish a sound economic basis for the regulation and use of the waters of the basin.

In the first preliminary report of the study, published in 1926, the authors recommended the enactment of legislation which would make possible the control of withdrawals from the basin. The Fiedler study having established the extent of the supply and rate of recharge of the basin, it would be possible to intelligently administer the waters of the basin if suitable legislation were enacted to make it possible. The objective of balancing the recharge and withdrawals was thus within reach for the first time.

The authors of the legislation which became Chapter 182 of the Session Laws of 1927 had at least five different precedents available from other states which could have been made the basis of the proposed legislation. Some had come into existence through court decree, others were given force by statute. Some had evolved as applicable only to surface waters, others to underground streams and still others had been applied to percolating ground water. No doubt all were considered as underground water was then thought to be in an entirely separate category from surface waters and not necessarily to be governed by the same basic rules of law. The alternatives available were these five rules, each of which would have had a different effect upon New Mexico if adopted:

- (1) The English rule of absolute ownership by the landowner of the sub-surface waters found within his land.
- (2) The so-called American rule of reasonable use.
- (3) The rule of correlative rights.
- (4) The rule of riparian rights.
- (5) The rule of prior appropriation.

The English rule laid down in Acton V. Blundell, (12 Mess & W. 324, 1843), which recognized absolute ownership of the ground water in the

landowners and permitted any use by him without reference to its effect on others held no promise for New Mexico. This was the basis on which the Roswell Artesian Basin had been overdeveloped. Every landowner had claimed the right to drill as many wells on his land as he desired and to produce as much water as he might see fit. Neither the state nor his neighbors had the right to stop him, regardless of the effect of his action upon other property owners. But it had become obvious that there was more land underlaid with water and suitable for irrigation in the Pecos Valley than there was water in the Roswell Artesian Basin with which to irrigate it. The English rule obviously offered no solution for the problems besetting the Pecos Valley.

The so-called American Rule had its origin in the dissenting opinion in the English case of Chasemore v. Richards, decided in 1857. (2 Harl. & N. 168, 1857). In that case, which affirmed the doctrine announced in Acton v. Blundell, the defendant had diverted percolating underground water which supplied a stream on which the plaintiff operated a mill, thus interfering with the plaintiff's mill operations. Plaintiff sought relief. The majority of the court applied the rigid English rule of absolute ownership and denied relief on the principle that the landowner owned from the center of the earth to the heavens. Justice Colderidge dissented, arguing that the rule that one must so use his own property as not to injure another's should be applied, and, hence, that the court should consider the reasonableness of the use by the defendant in deciding whether relief would be granted. This minority view was subsequently adopted by many American courts and became known as the American doctrine. It permitted the use of underground water by a landowner, regardless of its effect upon other users, so long as the use involved was a reasonable one.

Obviously this rule also provided no solution for the problem with which the 1927 legislature was dealing, inasmuch as substantially all water in the Pecos Valley was being used for agriculture - an obviously reasonable use. In that situation the result of the application of the American rule would have been substantially identical with adoption of the English rule.

The third possibility available to the legislature in 1927 would have been the application of the doctrine of correlative rights to underground water produced from a common source of supply. This doctrine was originally developed in the states of California and Utah, although Utah later abandoned it for a system of appropriation. The doctrine recognizes the right of each landowner overlying a common source of supply to an amount of water proportionate to the surface area owned by him. The doctrine is a familiar one to the oil and gas industry today. Its application is the basis for the allocation of allowable between oil and gas wells in almost all pools today, but most of its development has occurred since 1927. As applied to water it would permit an owner of land overlying a common source to drill for and produce water in an amount proportionate to his acreage, and when the development reached the point that the supply was inadequate for the needs of all owners, all would be subject to a reduction similarly in proportion to their acreage.

While this doctrine undoubtedly had some appeal as treating all property owners equally, in relation to their acreage, it had many of the disadvantages of the English rule, as applied to New Mexico. It had been demonstrated conclusively that the land overlying the Roswell Artesian Basin

exceeded the supply of water available to irrigate it. In other words, there just was "not enough water to go around." That being true, while it would be fair and just to divide the available supply between all owners on the basis of their ownership, experience had proved that it would not provide anyone enough water to make a crop. Such a system not only would subject all property owners to slow death by starvation, but would not be in the public interest in that it would not result in a maximum contribution to the economy of New Mexico from the lands affected. Such a system had little to recommend it when viewed in the light of the problems with which the people of the Pecos Valley and the legislature were wrestling.

The fourth alternative, which was provided by the riparian rights doctrine, probably received little consideration even though it has been said that "by 1900 it constituted the backbone of American water rights law in the eastern states." As applied to surface waters, and it is, of course, basically a surface water doctrine, the rule provides that the water from streams and lakes may be used only by persons owning land adjacent to these bodies of water, and that each owner must use the water reasonably in relation to the uses which other persons similarly situated are making. The doctrine further limits the use of the water to those tracts actually in contact with the body of water and does not permit the enlargement of "riparian lands" through acquisition by a riparian owner of a tract of land adjacent to his but not to the water source. No transfer of riparian water rights is possible. But this doctrine was already in disrepute in New Mexico.

In 1898, when the Supreme Court of New Mexico first considered the possible applicability of the riparian rights doctrine in New Mexico, the Court in U.S.A. v. The Rio Grande Dam and Irrigation Company, (9 N.M. 292, 51 Pac. 674), pointed out that the United States had surrendered its riparian rights to water on the public domain in 1866, and that prior to that time "it had become established that the common law doctrine of riparian rights was unfitted to the conditions in the far West"

In 1907 the legislature had enacted a comprehensive surface water control act, Section 1 of which provided:

"All natural waters flowing in streams and water courses, whether such be perennial or torrential, within the limits of the Territory of New Mexico, belong to the public and are subject to appropriation for beneficial use."

This was followed by the adoption of the Constitution of New Mexico in 1911, Article XVI, Section 2, of which reaffirmed and expanded the provision of the 1907 act quoted above and established prior appropriation as the law of this state with reference to surface waters.

The constitutional provision having sounded the death knell of the riparian rights doctrine in New Mexico, and the courts having given their blessing to the doctrine of prior appropriation as applied to surface water on a number of occasions, it is not surprising that the legislature of 1927 turned to the prior appropriation doctrine in finding a solution for the underground water problems typified by the situation in the Pecos Valley.

The decision to make the doctrine of prior appropriation applicable to underground water in New Mexico was effectuated by Section 1 of Chapter 182

of the Laws of 1927, which provided:

"All waters in this state found in underground streams, channels, artesian basins, reservoirs, or lakes, the boundaries of which may be reasonably ascertained by scientific investigations or surface indications, are hereby declared to be public waters and to belong to the public, and subject to appropriation for the beneficial uses under the existing laws of this state relating to appropriation and beneficial use of waters from surface streams."

The further provisions of the Act vested administrative control in the State Engineer, recognized existing rights based on application to beneficial use and provided that the Engineer should proceed with administration of any underground water supply subject to the Act on petition of 10% of the users of water from the source in question.

It was inevitable that the law would be challenged on constitutional grounds, and the challenge was not long in coming. In fact, sponsors of the law encouraged the attack in order that there might be a judicial determination of the validity of the legislation before too many investments had been made in reliance upon it.

The case of Yeo v. Tweedy, and its companion cases involving the validity of the 1927 Act, were among the most important cases ever considered by the New Mexico Supreme Court. Had the court held, as contended by opponents of the 1927 Act, that proprietors of property had a vested property interest in the water underlying their land, or that the riparian rights doctrine had been applicable to underground water in New Mexico prior to passage of the Act, the statute would have been declared unconstitutional. If that had occurred, it is extremely doubtful that any effective control statute could have been passed by the New Mexico legislature without an amendment of the Constitution. The chaotic conditions which could have resulted from that situation are frightening to contemplate when we realize that more than half of the state's current water supply comes from sources which would have been affected by them.

The Supreme Court's opinion in Yeo v. Tweedy upheld the statute against all substantive constitutional attacks, but held it fatally defective in seeking to expand by reference the provisions of various surface water statutes to make them applicable to underground water. This defect was one readily susceptible of correction by redrafting certain provisions of the Act. The 1931 session of the legislature convened about eight months after the final decision in Yeo v. Tweedy. A new act, redrafted to correct the defects pointed out by the Court, but in its principle aspects a re-enactment of the provisions of the 1927 Act, was promptly passed and, with minor amendments, has regulated the use of underground water in New Mexico since that date.

One aspect of the decision in Yeo v. Tweedy merits special mention. In spite of the fact that the Court's opinion held the statute void for attempted expansion of legislation by reference, it considered at length, and approved, its application of the doctrine of prior appropriation to underground water and its declaration that they are public waters.

In legal parlance, anything discussed by a court in its opinion which

is not required as a basis for the decision in the case is known as dicta. Because dicta constitutes a gratuitous expression of opinion by the court, not required by the disposition made of the case, it is not considered precedent for future cases. Only the disposition of the issues upon which the decision in the case rests become precedent.

Since the effect of the decision in Yeo v. Tweedy was to declare the statute invalid, the extended discussion of principles applicable to the constitutional attack and the court's conclusion that in that respect the statute was valid, constituted dicta in every sense of the word. Nonetheless, the court devoted some fourteen pages of its opinion to the dicta. This very unusual deviation from accepted standards of appellate opinion writing undoubtedly reflected the court's appreciation of the unique and vital importance of the legislation being considered and the urgent need that valid legislation on the subject be enacted at the earliest possible time.

That the court's effort to set at rest the substantive constitutional questions involved was successful is attested by the fact that the validity of the 1931 Act was not attacked in the courts until the case of State v. Dority some twenty years later.

The Dority case, which was decided by the Supreme Court of New Mexico in 1950, resulted from an enforcement campaign undertaken by the Pecos Valley Artesian Conservancy District and the State Engineer jointly following World War II. High prices during wartime, coupled with a patriotic salve for their consciences, had led a substantial number of Pecos Valley farmers to expand their irrigated land without the benefit of water rights. A great many suits for injunction were filed to enjoin illegal irrigation of dry land. A group of farmers, many of whom were defendants in these cases, joined together, raised a fund and announced their intention to contest the validity of the 1931 Act all the way to the Supreme Court of the United States on the ground that they owned the water under their lands and the state could not take it away from them without compensation.

Three typical cases were selected to constitute test suits. The defendants in the three cases were Bert Troy Dority, Loman Wiley and T. A. Lanning, Jr. One case involved the use of artesian water, one the use of shallow ground water of the valley fill and the third involved the use of artesian water on lands having shallow rights only.

The validity of the 1931 Act and of the State Engineer's action in assuming jurisdiction of both the artesian and shallow ground water deposits of the Roswell Artesian Basin were upheld by the trial court, the Supreme Court of New Mexico and the Supreme Court of the United States - and thus were finally set at rest the questions as to the applicability of the doctrine of prior appropriation to the underground waters of New Mexico and the validity of the principles involved in the 1927 Act.

When enacted, the 1927 Act was the first comprehensive underground water control act in the United States. The same year Oregon enacted a similar statute, a portion of which was modeled after the New Mexico Act. The benefits to New Mexico of this early action to establish the law of underground water in New Mexico are obvious. Suffice it to say that in a conference with a group of Texas state officials, who came to New Mexico to

observe the operation of an underground water control act a few years ago, one statement was heard time and again from the Texans: "If only we had done this back when you did."

Having benefitted to such a great extent from the early enactment of our statute and establishment of its validity in the Courts, we have a special responsibility to see that New Mexico continues to progress and does not retrogress in the utilization and conservation of our underground water resources. This Conference by its contribution to public understanding of our water laws and public appreciation of the importance of our water resources, renders a significant service to the State of New Mexico. I congratulate New Mexico State University upon its sponsorship and express my appreciation of the opportunity to participate with you in the Conference.

CONCEPT OF BENEFICIAL USE IN WATER LAW OF NEW MEXICO

Irwin S. Moise*

At the outset of this paper, I wish to insert one word of caution. All opinions expressed are my own. When I discuss decisions of our Court, or interpret language used by Judges, I do not intend to be understood as speaking for anybody except myself - and even then I reserve the right to change my mind.

Any discussion of this subject necessarily must start with our State Constitution where in Art. XVI, Sec. 2, it is provided:

"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. Priority of appropriation shall give the better right."

We should note that this section states that these unappropriated waters "belong to the public." However, the right of the public to use and exploit the water is to be in accord with laws of the state under which "appropriation to beneficial use," is accomplished, with full recognition being granted to the doctrine of prior appropriation.

It is thus seen that by this provision the right to appropriate water in natural streams after adoption of the constitution was provided for - the method to be in accordance with the "laws of the state," the purpose to be "for beneficial use," and the test of right to be the doctrine of prior appropriation. The provision applied only to unappropriated waters.

By Sec. 3 of Art. XVI the position of beneficial use in the picture is set forth in the provision that it "shall be the basis, the measure and the limit of the right to the use of water."

By Sec. 1 of Art. XVI "all existing rights to the use of any water in this state for any useful or beneficial purpose" were "recognized and confirmed."

By this last provision it is clear that all uses or the right to make use for any purpose was not preserved and protected, but only those uses which were "useful or beneficial."

Accordingly, with the adoption of our constitution we start out with a recognition and confirmation of water already appropriated "for useful or beneficial purposes," which is likewise the basis, measure and limit of the right and with a declaration that unappropriated waters could be appropriated "for beneficial use" with time or priority of appropriation - not type of use - being the yardstick for determining questions of right between conflicting claims.

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Before proceeding further it probably would not be amiss to point out that the doctrine of prior appropriation to beneficial use, although generally accepted as being well suited to accomplishing development of the limited waters in an arid region, has been criticized as not being based upon sound principles and not suited to the situation when the pioneering era is passed. Also, it has been pointed out that the doctrine leads to wasting of water, and does not guarantee the best use.

Moses Lasky in his paper appearing in 1 Rocky Mountain Law Review 161, written in 1929, stated that prior appropriation did not long remain as the law, and further that it "was not fit for the West." He quotes Elwood Mead, as follows:

"The whole principle is wrong. It is wrong in principle as well as faulty in procedure. It assumes that the establishment of titles to the snows on the mountains and the rains falling on the public land and the water collected in the lakes and rivers, on the use of which the development of the state in a great measure depends, is a private matter. It ignores public interests in a resource upon which the enduring prosperity of the community must rest. It is like A suing B for control of property which belongs to C. Many able attorneys hold that these decreed rights will in time be held invalid because when they were established the public, the real owner of the property, did not have its day in court."

That eminent writer on water law, Mr. Samuel C. Wiel, as early as 1913, in an article entitled "Theories of Water Law" appearing in 27 Harvard Law Review 530 - was critical of the doctrine.

More recently Professor Robert Emmet Clark of the University of New Mexico law school faculty, in an article appearing in XXVIII, New Mexico Quarterly 97, suggests the possibility that our existing concepts and laws are in need of overhauling.

For the short time allotted me, it will be my purpose to explore our statutes and decisions with a view to determining as best we can what uses may be made of our waters within their framework, and whether or not our laws and constitutional provisions are badly in need of amendment to obtain better and greater use - and incidentally consider possible changes which might be made in our laws to bring them up to date to accomplish such an end.

At the outset, since we are going to talk about "beneficial use" it should be helpful if we orient ourselves by attempting to define it.

Recently, in connection with the work on a Model Water Use Act by the National Conference of Commissioners on Uniform State Laws, a definition has been suggested. It is as follows:

"'Beneficial use' means a use of water, including the method of diversion, storage, transportation, and application, that is reasonable and consistent with the public interest in the proper utilization of water resources, including, but not limited to, domestic, agricultural, industrial, power, municipal, navigational,

fish and wildlife, and recreational uses."

This may seem to be a reasonably adequate definition. It will be noted that the emphasis is on "the public interest in the proper utilization of water resources." As will be hereinafter pointed out, the "public interest" is to be considered in granting rights to appropriate surface water to beneficial use in New Mexico, but here the emphasis is upon the element of time - priority of time giving the better right. The proposed Model Code will be referred to again in this discussion.

As long ago as 1900 in the case of *Millheiser v. Long*, 10 N.M. 99, 61 P. 11, the Territorial Supreme Court held that the doctrine of prior appropriation applied in New Mexico, and that a necessary element in an appropriation was the placing of the water to beneficial use. The court there said, "It is not the capacity of the ditch merely that determines the appropriation of water, it is the amount actually applied to a beneficial use that is appropriated within the meaning of the law." It was apparent in that case that the appropriators had undertaken to sell water diverted by them into their ditch. The court said, "These sales of water were * * * contrary to the law governing water rights in this Territory except to the extent" that there had been a "valid appropriation." It was held that water rights once acquired by being put to beneficial use could be sold, "but they could not sell and retain the water at the same time," and that the capacity of the ditch did not constitute a valid appropriation, unaccompanied by application of the water to some beneficial use.

In the case of *First State Bank of Alamogordo v. McNew*, 33 N.M. 414, 269 P. 56, it was held that use of water for domestic purposes, including stock watering, is a "beneficial use" of water.

Later, in the case of *State v. Red River Valley Co.*, 51 N.M. 207, 182 P. 2d 421, the court said, "we are unable to find authority, or justification in reason, to support the claim that the "beneficial use" to which public waters, as defined in this and other jurisdictions, may be put, does not include uses for recreation and fishing." This may be an awkward method of saying that uses for recreation and fishing are beneficial uses, but that they are so recognized here, can not be doubted.

Finally, in 1957, in the case of *State v. McLean*, 62 N.M. 264, 308 P. 2d 983, the court discussed the meaning of "beneficial use" at some length. It reviewed the earlier cases and stated that they held it "to be the use of such water as may be necessary for some useful or beneficial purpose in connection with land from which it is taken." This was a case involving artesian water permitted by the claimant to run uncontrolled onto grass lands - thus the reference to "connection with land from which it is taken." However, I do not perceive any difference as to surface water and "the useful and beneficial purpose" to which the water must be put. The court then held that under an appropriation a person may not receive more water than is necessary for actual use. They also held that water wasted was not beneficially used. The court said, "The use must not only be beneficial to the lands of the appropriator, but it must also be reasonable in relation."

From the foregoing may be determined the extent to which our court has gone in attempting to define "beneficial use". That it is not too explicit should not be too difficult to understand. It would seem that what is or is

not beneficial use could only be determined definitely in a given case, upon consideration of the particular facts of that case. (See City and County of Denver v. Sheriff, 105 Colo. 193, 96 P. 2d 836).

In New Mexico, rights to water "flowing in streams and water courses" which were "recognized and confirmed" by Art. XVI, Sec. 1 of the Constitution were those acquired under Chapter 49, Laws of 1907, (L. 1907, Ch. 49, Sec. 75-1-1, N.M.S.A. 1953), as well as those vested prior to adoption of Chapter 49, Laws of 1907, and recognized by Section 59 of that act, as well as those rights to waters where appropriation "for beneficial use" had been initiated prior to March 19, 1907, by the filing of "affidavits, applications or notices." (Sec. 75-8-1, N.M.S.A. 1953).

It is interesting to note in passing that all "vested rights" were left unimpaired by the 1907 act - whether for beneficial use or not - but as to those in process it was required that they be for beneficial use. It is doubted that this is material because no cause has come to my attention where any use vested prior to the 1907 act was ever questioned on a basis of its benefits or lack thereof, and as has already been seen the law in Territorial days required that uses be beneficial. Because of the language of the section such a question was possible. At this late date, and for the reasons stated it is most doubtful that it will ever arise.

In addition to recognizing vested rights and initiated rights of appropriation for beneficial use, the 1907 law provided for preservation of rules and regulations adopted or to be adopted for distribution of water from ditches or ditch systems where "economical use" was accomplished. (Laws 1907, Ch. 49, Sec. 57; Sec. 75-8-2, N.M.S.A. 1953). By amendment in 1909 (Ch. 54, Sec. 1) "water tanks or wells for watering stock" were exempted from the other provisions of the act of 1907. By Chapter 126, Sec. 24, Laws 1941, this was amended so that the exemptions no longer apply to "wells for watering stock" but are now applicable to "water tanks or ponds for the purpose of watering stock which have a capacity of ten acre feet of water or less." (Sec. 75-8-3, N.M.S.A. 1953).

A brief review of the situation with reference to underground water under the Constitution is here indicated. The rights recognized and confirmed are identical with the surface water rights, the difference being that until 1931 we had no underground water law. (See Yeo v. Tweedy, 34 N.M. 611, 286 P. 970; Bliss v. Dority, 55 N.M. 12, 225 P. 2d 1007). In the legislature of that year a law was passed declaring as public waters, and subject to appropriation for beneficial use "the water of underground streams, channels, artesian basins, reservoirs or lakes having reasonably ascertainable boundaries." (Laws 1931, Ch. 131, Sec. 1; Sec. 75-11-1, N.M.S.A. 1953).

The act provided that "existing water rights based upon application to beneficial use were 'recognized' and provided that the act was not 'intended to impair the same or to disturb the priorities thereof.'" (Laws 1931, Ch. 131, Sec. 4; Sec. 75-11-4, N.M.S.A. 1953). Although no particular significance is attached to the differences present in this statute and those present in Sec. 75-8-1 mentioned above, it is interesting to note that here the rights "recognized" and the priorities not "impaired" are those "based upon application to beneficial use" whereas in Sec. 75-8-1 the rights not impaired are "existing vested rights" without reference to whether they were based upon application to beneficial use. As already stated this is probably not

material, or if it ever was, at this late date it no longer is.

In addition to the provision mentioned above, the 1931 act contained a provision not present with reference to surface water that permitted claimants of vested water rights which had been applied to beneficial use prior to the passage of the 1931 act to file a declaration with the State Engineer "setting forth the beneficial use to which said water" had "been applied" together with other information, and gave the same effect as "prima facie evidence of the truth of their contents." (Laws 1931, Chap. 131, Sec. 5; Sec. 75-11-5, N.M.S.A. 1953). Prior to 1959 we had no comparable statute covering vested surface water rights. This omission became material in the efforts of New Mexico to establish certain old rights to waters in the Colorado River watershed in the law suit brought by Arizona against California in the United States Supreme Court, and to which New Mexico was made a party. The 1959 session of the legislature passed Chapter 222 (Sec. 75-1-2.1 and 75-1-2.2, N.M.S.A. 1959 Supp.) which makes similar provisions for filing declarations of "beneficial use" of surface waters as had been authorized for underground water since 1931. Although providing for the filing of the declarations, the act does not purport to state the legal effect of doing so.

I come now to what I hope will be the substance of my discussion of "beneficial use" under New Mexico law. What I propose to do is to explore the proposition of whether or not beneficial use is necessarily the best or most economical use, and further, if it isn't, are certain changes indicated that would result in a better or more economical use of our waters.

Section 75-5-6, N.M.S.A. 1953, provides as follows:

"If, in the opinion of the state engineer, there is no unappropriated water available, he shall reject such application. He shall decline to order the publication of notice of any application which does not comply with the requirements of the law and the rules and regulations thereunder. He may also refuse to consider or approve any application or notice of intention to make application, or to order the publication of notice of any application if, in his opinion, approval thereof would be contrary to public interest."

This language clearly states that the application shall be rejected if there is no unappropriated water available. This has nothing to do with economics and would seem to be regardless of intended use. The last sentence seems to give the State Engineer considerable discretion to refuse to consider or approve " * * * if, in his opinion, approval thereof would be contrary to public interest." Can this be made to coincide with our constitutional requirement that "priority of time shall give the better right"?

What is meant by "public interest"? Is it in the public interest to permit a use which is not the best use economically?

These questions are only pertinent, if pertinent at all, insofar as surface water is concerned, because the right to deny an application to appropriate underground water would appear to be limited by the statute (Sec.

75-11-3, N.M.S.A. 1953) to a determination "that there are no unappropriated waters in the designated source, or that the proposed appropriation would impair existing water rights from such source." There is no provision for rejecting or denying an application because not in the public interest. Also, it would seem clear, that at least as far as underground waters are concerned priority of appropriation to beneficial use, without subsequent abandonment or forfeiture by failure to use for four years (Sec. 75-11-8, N.M.S.A. 1953) is the sole determining factor - without regard to relative merits of the proposed use or other possible uses.

Let us examine the problem then, insofar as surface water rights are concerned.

As has already been pointed out, water in "tanks or wells for watering stock" was exempted from the 1907 act. In 1941 this exemption was made to apply to "tanks or ponds for the purpose of watering stock which have a capacity of 10-acre feet of water or less." (Sec. 75-8-3, N.M.S.A. 1953).

In addition, in the case of First State Bank of Alamogordo v. McNew, supra, it was decided that "use of water for domestic purposes, including stock watering, is a 'beneficial use' of water." In that case large amounts of water were being appropriated and distributed through a pipeline for stock watering purposes on public domain. The water right found to be present was incident to the right of the owner to enjoy the use of the range.

It has been generally considered that our system of acquiring and preserving water rights was devised with agriculture and irrigation in mind and that it works to the advantage of these uses. It has been stated by the Utah Supreme Court "that domestic use is the most beneficial use for water and that irrigation is the next most beneficial use in the arid western states is a self-evident and well recognized fact regardless of any statute." (Tanner v. Bacon, Utah, 1943, 136 P. 2d 957). There are those who, no doubt, would take issue with this statement today. Many new uses of water and uses which possibly would bring a larger monetary return than can be realized from farming or stock raising are now seeking recognition. Among these are uses for power, industry, oil recovery, and last but not least, use for recreation. A few years ago, anybody who suggested that water should be stored for recreational use in preference to agricultural uses would have been laughed out of court. Today, with more people, easier accessibility, and increased leisure time available, there is a growing recognition of the value of such uses - not only for its sociologic benefits, but principally for its economic benefits. That such use is recognized as beneficial in New Mexico has already been pointed out.

With aspirations for the best and most economical uses I am disposed to agree, but can these considerations enter into the deliberation of the State Engineer when passing on an application to appropriate water? If two applications are filed at the same time and there is only sufficient water to satisfy one, the Engineer could probably grant the right to whichever use could be demonstrated to be economically most beneficial - this under the provision that he could refuse to approve any application "which would be contrary to public interest." I assume that to approve a less economical use than is otherwise available would be considered "contrary to the public interest."

However, it can be argued that if any intended use would contribute something of public value or benefit, it could not be found to be "contrary to public interest," and accordingly if it was first in time, the Engineer would have to approve it. Also, would he have the right to deny an application for use to irrigate with available water in order to hold that water for some possible future application for a more economical use, or on the other hand, could he grant a right conditioned on such better or more beneficial use applying for it?

The Supreme Court of New Mexico has spoken only once on this subject and that was almost 50 years ago in the case of Young & Norton v. Hinderlider, 15 N.M. 666, 110 P. 1045, decided in 1910. In that case the Territorial Engineer had for consideration three applications. The first was from the appellee, Hinderlider, to appropriate 200 second feet of the flow of the La Plata River, to be stored in a reservoir of 12,406 acre feet capacity to be built and to be used to irrigate about 14,000 acres.

This application was followed a couple of months later by the application of appellants to appropriate the waters of the stream, to be stored in a reservoir of 10,149 acre feet capacity and to be used to irrigate about 5,000 acres of land. The third application need not be considered.

After a hearing the Engineer rejected appellee's application and approved appellants' basing his decision on the fact that although junior in time, appellants were settlers and would be using the water themselves, and not for speculative purposes, the amount of water sought by them was more within the available supply, that the cost was more reasonable, being only about half the cost of the appellee's project.

This decision by the Engineer was appealed to the Board of Water Commissioners of the Territory (since abolished) which heard the evidence and reversed the decision of the Engineer. This decision was appealed to the district court which affirmed the decision of the Water Commissioners and the case was then appealed to the Supreme Court which disposed of the case by remanding it to the district court with instructions that it make some additional findings which were deemed to be necessary for a final decision.

However, concerning the question of the rights, duties and powers when applications to appropriate waters for beneficial use are present, the Supreme Court pointed out that it "should be borne in mind" that "the entire statute is designed to secure the greatest possible benefit from them (the public waters) for the public **." The court further stated that it was "obviously for the public interest that investors should be protected against making worthless investments in New Mexico" and further that if there was water available only sufficient to irrigate 5,000 acres, "it would be contrary to the public interest" to give "official approval" which would make possible the sale of stock which was "reasonably sure to become worthless, and land which could not be irrigated at the price." The court expressed a concern about irrigation projects failing, not only because of the effect on the farmers dependent on it, but because such failures reflect upon all irrigation enterprises.

They said that the relative cost of the proposed works, although not conclusive on the question of "public interest" should be considered. Quoting from the decision we find the following:

"It may be said that the territorial engineer could have approved the Hinderlider project for the number of acres which could be irrigated from it. He makes it clear, however, from his report, that the cost of the works for that project would be much greater than for works fit to irrigate the land which could really be irrigated from the available water there."

Further along in the decision, the court points out that there was no reason under the inadequate findings and conclusions made that the earlier application should not have been approved for the acreage for which water was available. Quoting again, they say, "The price which the owners of land can afford to pay for irrigation must depend in part on the use to which it can be put" and then state that \$40.00 per acre foot as a cost of water for one type of crop might be prohibitory whereas for another type it would not be excessive or unreasonable.

This decision caused Mr. Lasky in another law review article in 2 Rocky Mountain Law Review 35, at page 41, to state, "In the face of such decision, it seems difficult to say that prior appropriation still exists." This comment evidently stems from the fact that the court recognized considerations other than time as being proper for the State Engineer to weigh in granting or denying permits to appropriate water. That it did alter what might otherwise be simon-pure "prior appropriation" cannot be denied. This case arose before adoption of our constitution. Although the statute has remained unchanged and still contains the reference to "public interest," if the question of its constitutionality were raised in the light of the provision of Art. XVI, Sec. 2, that "priority of appropriation shall give the better right," there could be a real question of its continued application, at least in the manner just discussed. Possibly that is the reason there are no later cases where the question has arisen.

This is an appropriate place to note the recent case of Cartwright v. Public Service Co. of New Mexico, finally decided September 3, 1959, and appearing in 343 P. 2d 654, in which our Supreme Court by a three-to-two decision determined that the so-called pueblo doctrine of water rights applied in New Mexico. By this doctrine it is held that with the original grant of a pueblo for colonization purposes went the right to all waters necessary for the use of the pueblo, not only if put to beneficial use promptly, but for all future time.

The violence that such holding does to the prior appropriation doctrine and the requirement of beneficial use in order to acquire and maintain a right to water should be evident.

The majority of the court, in its opinion stated, "We see nothing in the theory of pueblo rights inconsistent with the doctrine of prior appropriation and beneficial use." However, Judge Federici, in his dissenting opinion on motion for rehearing, points out how this theory of pueblo rights cannot be supported under our laws as they have been heretofore announced. Although Judge Federici covers the matter at some length, the following quotation covers the matter directly and pertinently:

"What does prior appropriation mean? What is meant by beneficial use? Can the term 'first in time, first in right' be defined? What has this Court said about defining prior appropriation?"

In Carlsbad Irr. Dist. v. Ford, 46 N.M. 335, 340 128 P. 2d 1047, this Court, speaking through Justice Bickley, adopted the definition of the term 'appropriation of water' from Kinney, Irrigation and Water Rights, 2d Ed., Sec. 707, as follows:

'Therefore, we believe that the following definition of the term "appropriation of water" under the Arid Regions Doctrine of Appropriation comes nearer being correct than any which we have found; the appropriation of water consists of the taking or diversion of it from some natural stream or other source of water supply, in accordance with law, with the intent to apply it to some beneficial use or purpose and consummated, within a reasonable time, by the actual application of all of the water to the use designed, or to some other useful purpose.'
(Emphasis of Writer).

How can the theory of pueblo rights be considered consistent with the doctrine of prior appropriation with the language of this Court describing the doctrine of appropriation requiring an intent to apply it to some beneficial use or purpose and consummated within a reasonable time by the actual application of all of the water to the use defined or to some other useful purpose? Kinney and this Court were talking about the Arid Region Doctrine of Appropriation, the same thing that the majority is talking about when they say:

'We see nothing in the theory of pueblo rights inconsistent with the doctrine of prior appropriation and beneficial use.'

How about the words and phrases: intent, consummated, reasonable time, the use defined?"

and then Judge Federici concludes, as follows:

"The theory of pueblo rights, as construed by the majority here and by the California courts, is as antithetical to the doctrine of prior appropriation as day is to night."

It is still too early to be able to fully appreciate the effects of this decision in New Mexico. It seems clear that all municipalities in the state, which even remotely might trace their origins to pueblo grants, when finding themselves in need of more water to maintain their growth will seek to establish a pueblo right. What success in this effort will ultimately do to our agricultural economy built upon what have heretofore been supposedly valid appropriations to beneficial use will become clear only with the passage of time. Also, it has great potentialities for making our problems in interstate compact compliance difficult if not insurmountable.

However, before predicting disaster to what had been thought to be well settled principles, we should consider that it is possible that the right determined to be present in Las Vegas may not be generally present in all or many of our towns. There are those who have given the matter considerable study and thought who so assert - and as a matter of fact say that Las Vegas is the only town in the state where these rights exist.

Whatever the ultimate extent to which the doctrine may be applied, it is clear that we are entering upon an era of competition between municipalities and farmers for water heretofore used beneficially in agriculture, and now needed to assure continued urban growth. Also, it is clear that these municipalities prefer to establish their right to this water under the pueblo doctrine rather than to acquire existing rights and transfer them from present uses to the new uses. Why this should be true is obvious.

Our statutes do not require preferential treatment of any beneficial use over any other beneficial use except on a basis of priority, with such possible consideration of "public interest" as is hereinbefore indicated. As already mentioned, this may have played into the hands of those interested in using water for irrigation.

Certain states have seen fit to provide by statute for the relative preference to which various types of uses should be accorded. (See the article by Professor Trelease of the University of Wyoming School of Law, appearing in 27 Rocky Mountain Law Review 133). This may have something to recommend it, but to say the least is subject to criticism on the ground that it merely adds another inflexible element into the law, and this is admittedly not desirable. New Mexico never saw fit to adopt such a legal strait jacket to govern its uses.

It can be said that municipal and other public uses for which condemnation powers are granted have a preference, as hereafter noted. Also, we may have "public interest" considerations already discussed which, theoretically and if constitutional, permit certain preferences. We have the pueblo doctrine which, at least in Las Vegas, and any other municipality which can prove a pueblo grant, gives a preference for future growth of the municipality. In addition, we have the exemption of reservoirs of less than 10-acre feet capacity built by stockmen for stock purposes, as already pointed out (Sec. 75-8-3, N.M.S.A. 1953) and a right in travelers who do not have a large number of cattle to the free use of water from all sources except wells, ponds or reservoirs. (Sec. 75-1-4, N.M.S.A. 1953). The underground water law provides that although application must be filed with the State Engineer by those desiring to make use of waters from wells for watering livestock, for "irrigation of not to exceed one acre of non-commercial trees, lawns or garden, or for household or other domestic use," when an application is filed a permit allowing such use shall issue. (Sec. 75-11-1, N.M.S.A. 1953).

Also, in passing, it is interesting to note that in the Colorado River Compact, which is a formal agreement of all of the states in the Colorado River drainage basin and the United States, adopted in 1922 and ratified by New Mexico in 1923 (Chap. 6, N.M.S.L. 1923), and therefore a part of the law of New Mexico, it is provided in Art. II (e) that "The states of the upper Division (of which New Mexico is one) shall not withhold water, and the states of the Lower Division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses," and in Art. II (h) "domestic use" is defined to "include the use of water for household, stock, municipal, mining, milling, industrial and other like purposes, but shall exclude the generation of electrical power."

Thus it is seen, that at least in this area of the law of New Mexico, agricultural and domestic uses which include all forms of industrial uses

are put in a higher category of importance than the use of water for production of power.

Out of these provisions arise the dispute which is presently raging between the states of the upper and lower division concerning filling procedures for Glen Canyon Reservoir. May the upper states withhold water to fill this reservoir if Lake Mead and the other storage lakes below contain sufficient water for domestic and agricultural purposes? The lower basin states say "no" because they claim that the only reason for filling Glen Canyon as rapidly as possible is to build up a sufficient head of water to develop power which is the least preferred use under the compact. The upper basin states say "yes" for the reason that their right to build the dam to store water is recognized in the compact - aside from any rights to manufacture power, and the lower basin states have no right to demand water so that they have a greater head for power at Hoover Dam. This argument is still unresolved, and merely mentioned here to demonstrate the type of dispute that can arise when uses are assigned relative positions in the scheme of things.

Incidentally, I would call your attention to the fact that fishing and recreation are uses not even mentioned in the compact, although as already stated there are those who ascribe to such uses the highest economic return of any.

Let us next 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, it 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.

It is suggested by Professor Clark in his study of "Water Law Institutions and the Community," already referred to, that 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 or rights to different locations or other uses or involve more complex forms of ownership and administration."

True it is that with some exceptions on the San Juan River and on the Canadian River, all our surface water has been appropriated to beneficial use - largely for irrigation. Now arise the demands for other uses, assertedly more beneficial - for industry, power, etc. Can we, or should we by changing our laws attempt to give preference to these so-called higher uses?

As to the waters 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 unreasonable or unjustified infringement by both our state and federal constitutions. Professor Clark suggests that some means should be found to make these vested rights available to new uses so that the social and economic aspirations of the state may be nurtured. He does not suggest what he has in mind, and it may be that some formula for accomplishing this within the framework of our constitutional protection of human and property rights has escaped me, but I am frank to admit that I perceive of no method, except the laws of nature - of supply and demand - of economic necessity which can in any manner supply the answer.

True, we can condemn water rights for public use, paying the owner the reasonable value thereof. Our laws already provide for condemnation by cities and towns to provide the municipality with water (Sec. 14-21-52, Sec. 14-40-23 and Sec. 14-48-1, N.M.S.A. 1953) and also for condemnation by the Interstate Stream Commission when "deemed necessary or proper for the construction, operation and maintenance of * * * works" as provided in Chapter 266, N.M.S.L. 1955 (Sec. 75-34-10, N.M.S.A. 1953, 1959 Supp.) and these rights could be broadened to include other public bodies and anything which might be described as public purposes.

In this connection mention might be made of Chapter 286, N.M.S.L. 1959 (Sec. 75-4-1.1 N.M.S.A. 1953, 1959 Supp.) where county commissioners were given the power to condemn water rights within a county for developing a county water supply system. Possibly this is a step in the direction of broadening the power of eminent domain to accomplish some preferable beneficial use. However, unrestrained granting of the right for any and all purposes would be of questionable constitutionality. Accordingly, it is doubtful that any such method would resolve the problem.

I have already made mention of the proposed Model Water Use Act. A draft of this act was presented to the conference of Commissioners of Uniform State Laws last year. What progress it has made since then I do not know. It is interesting to note, however, that this model code sets up a system of licensing the use of water for limited times and so as not to impair "the most beneficial use and development of the water resources of the state," giving "no preference or priority to applications first in time."

Thus it is seen that whereas priority in time generally controls here, it plays no part under the suggested model code; and whereas, public interest is only incidentally considered here, it becomes the major and controlling

consideration in the model code.

The interest in this model code and the impetus behind it has come primarily from the eastern and southern states where the riparian doctrine has been in vogue and consequently rights in water have not become vested as they have here. The principle of licensing rather than granting rights to water would seem to have considerable merit, and although I do not want to be understood as giving unqualified endorsement to the proposed code, I am free to admit that if we had adopted it in 1912 instead of the prior appropriation doctrine, the problems now facing us of finding water for further development after practically the entire supply has been appropriated would not be so critical.

However, we must face reality. As already stated, except for the Canadian and San Juan Rivers, all our surface water has been appropriated to beneficial use - if not over-appropriated. I doubt if any great service will be performed by trying to evolve ways to overturn these rights. Neither do I think we should address our energies toward devising methods of tearing the rights away from those who have acquired them and are using them, as for example, proving rights to water under the pueblo doctrine recognized in the Cartwright case, supra. Rather, as already suggested in this paper, we should put our faith in the laws of nature - rather than in man-made laws. For one thing, they are more easily enforced, and if not more equitable, at least they are certain in their application.

Accordingly, as I see it, when the need becomes great enough, or the profits become inviting enough, there will come a time when the new uses will require that old water rights be legally acquired from those holding them. The fact that very few applications to change uses have arisen to date does not surprise me. (See XVII New Mexico Quarterly 103). In my opinion, we are only now arriving at the time when the demand for changes of use could be expected to be increasing. In addition, until the courts have spoken out clearly that only by acquiring valid existing rights and getting approval of a change of use is the only legal method open, there will continue to be resistance and objection.

Although the day when no water was available for new or better uses has been rapidly approaching, the action of the State Engineer in closing the underground basin of the Rio Grande Valley from the Colorado line to Elephant Butte in 1956 advanced the day of reckoning materially. It would have come sooner or later, but with this basin closed to new development unless old uses were retired, the day of decision had arrived. The Rio Grande Valley is the area where the new demands are the greatest. Resistance has been present and to date there has been no decision by our Supreme Court delineating what may be done and what may not be done, except only the case of State v. Myers, 64 N.M. 186, 326 P. 2d 1075, holding that in the exercise of its police powers the State could require a license before a well could be drilled, even though the water right was already in existence, and the Cartwright case which held out to municipalities in the valley the hope of getting this water as a matter of right. Of course, the actions of the State Engineer in declaring underground basins had long since been upheld generally in Pecos Valley Artesian Conservancy District v. Peters, 50 N.M. 165, 173 P. 2d 490.

However, since the area of greatest growth and biggest demand is around Albuquerque, and within the district declared in 1956, the problem has brought to a quick head, and a solution is required.

Examples of what I am talking about have been in the press during the last few days. I refer to applications by the Kaiser Cypsum plant, south of Santa Fe, at Rosario, and by the Hoffman City, west of Albuquerque.

You will recall that Kaiser made application to change use and point of diversion of a right acquired by it, and the State Engineer denied the application because the right sought to be moved was an abandoned or forfeited right that had not been used for many years.

When this occurred, Kaiser went out and acquired another right. If it isn't a valid and existing right there are still literally thousands of rights of varying value that can be acquired and moved. The application of the Hoffman development at Albuquerque is in the same position. These are two cases of natural needs and economic ends dictating changes in use from agriculture to what is a better or more economic use in these days and times. I anticipate that instances such as these will multiply as time passes, and that our progress will not be delayed by continued adherence to our established legal principles.

Before closing, I should probably mention that although, insofar as beneficial uses in New Mexico are concerned, there are no apparent differences between the law applicable to underground water that applicable to surface water, except as hereinbefore mentioned; nevertheless, the fact that we have proceeded under a theory that the two types of water are separate and distinct has caused some problem in the past.

There are those who persist in their position that there is no relation between underground and surface waters - and as to certain waters this is probably true to all practical purposes. However, as to other waters there undoubtedly is a relation, and in the administration of the whole of the water - some surface and some underground - under two different laws, difficulties of decision and administration are not surprising.

The recent case of Templeton v. Pecos Valley Artesian Conservancy District, 65 N.M. 59, 332 P. 2d 465, decided in November, 1958, probably went a long way toward resolving this problem. In that case the court sustained the lower court in its finding that surface water appropriations, were "in effect," appropriations from the underground. To an argument that this amounted to a change from a surface to an underground right, the court replied:

"If the river and underground waters had two separate sources of supply and if there were no connection between them, this argument might be sound, but under the facts set forth above, the Valley Fill was the source of the flow of the river."

The same problem is present in the declaration of the Rio Grande Underground Water Basin in 1956, where the State Engineer found and declared that "the waters of said basin are interrelated with the flow of the Rio Grande Stream System, so that such underground waters are a substantial source of the flow of said stream system."

My reference to this phase of our present water problems is only indirectly connected with the discussion of beneficial use, but since all aspects of water appropriation are not too far removed from the basic problem

of use and the economic growth resulting from such use, I felt I could not close without at least pointing out the problem.

In conclusion I would like to say that although I may be guilty of inexcusable optimism, as I see it:

- (1) We have benefitted most by fostering the greatest use possible at the earliest date possible which resulted from adoption of the prior appropriation doctrine.
- (2) To have held any of this water for future better uses would have resulted in waste if not loss.
- (3) A licensing system such as is suggested in the Model Code would possibly have been preferable, although it is doubtful that development to full use would have been as rapid thereunder.
- (4) Adoption of a licensing system in New Mexico such as is proposed in the Model Code would not seem desirable at this late date after most of our water has been appropriated to beneficial use.
- (5) The law of supply and demand will take care of changes from one beneficial use to another or better one.
- (6) This change may not be as rapid as would result if our law could be changed, but is more in keeping with our concepts of property rights and moral responsibilities, than to attempt disappropriation through whatever method might be devised, and will come as rapidly as the changes are economically justified.
- (7) The situation resulting from a recognition of the interrelation of certain surface and underground waters needs to be generally accepted so that the orderly appropriation of water to the greatest beneficial use may proceed.

COMPETITION FOR WATER AMONG VARIOUS USES IN UTAH -
PLANNING, LEGISLATION, ADMINISTRATION

Wayne Criddle*

Precipitation falling as rain, snow, and dew serves the consumptive water needs of all plant and animal life. But water also serves many other purposes. It carries away our wastes, and is used almost universally to help control our fires. It is used in our production of electricity through hydro turbines or for generation of steam in thermal plants. Heavy transportation is dependent upon this medium. It is used as a coolant, solvent, flotation medium, energy transfer agent, diluent, cleaning agent and in many other ways about the home and factory. Recreation also presents a growing need for water. Thousands of new swimming pools, boating and water skiing, and our desire for more fishing waters and more wildlife areas all require more, and more water.

Available water

Of the 4.8 billion acre-feet falling on the continental United States, some 70 percent is returned directly to the atmosphere or is absorbed by the soil, and 30 percent becomes surface discharge or runoff. However, as we all know, precipitation and runoff vary widely from place to place throughout the country. A study of San Simon Creek, located in Arizona near the New Mexico line, shows that from a total fall of 1,560,000 acre-feet, only 9,000 acre-feet, or about one-half of one percent, normally reaches the mouth of the creek.

On all of Utah, more than 50 million acre-feet of precipitation falls each year. At least 45 million acre-feet of this is consumed through the natural processes of evaporation and transpiration where it falls and only 10 percent becomes surface runoff and available for controlled uses by man. The quantity of total water and the "manageable" water available to the state and its overall use has changed little since white man first settled the area over 100 years ago. We still have little control over 90 percent of our total precipitation. But we are now looking more carefully at the 20 percent of our state that furnishes some 80 percent of our usable runoff. We would like to manage these "water-supplying" areas in such a way that more of the precipitation would run off when we need it, particularly during the late spring and summer period. If we could capture the 50 million acre-feet falling on Utah we would be able to fill Lake Mead nearly twice every year. However, the total artificial reservoir storage capacity in the state is less than 5 percent of this fall and the amount of irrigation water actually consumed on our lands is less than 4 percent. Still, from that 4 percent of our water supply comes about 75 percent of our agricultural income. (Nearly 90 percent of the area of the state is used for some sort of agricultural production; some 87 percent for grazing of livestock).

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Use of water

Although only 2 million acre-feet of the total precipitation is accumulated into irrigation systems and consumed on the irrigated land, upwards of another million acre-feet falls directly on the irrigated land and is practically all consumed where it falls. Thus, total water consumption on irrigated land is probably close to 3 million acre-feet.

To meet the consumptive irrigation water requirements, considerably more water is diverted from the streams and wells than the 2 million mentioned. Probably diversions and rediversions would total not less than 5 million acre-feet per year.

Present consumptive use of water by the people of Utah for culinary and domestic purposes is only a small part of the water that is needed for agricultural purposes. If we assume about 200 gallons per person per day as the delivery requirement, (1958 use in Salt Lake City was about 260 gpd/cap.) then one acre-foot of water would serve more than four people for an entire year.

With a population of about 750,000 people, Utah would then require less than 200,000 acre-feet per year for this purpose. If we assumed that all of this 200,000 acre-feet were consumed, which is far from correct since much of that delivered could be reclaimed and reused, this would represent only 10 percent of the 2 million consumptively used by agriculture, or about 4 percent of the water diverted for irrigation.

Industrial uses of water and uses by fish and wildlife are small in relation to the agricultural uses of water.

Present development

Although we Utahns have considerable money invested in irrigation works and water rights, only a small part of that investment is in ground water development. We have more than 450 storage dams, nearly 10,000 miles of canals and ditches, and 300 miles of pipe lines. We have spent large sums of money investigating and developing surface water supplies and storage. We are rapidly approaching the limit in surface water development. Still, in some areas, we have underground reservoirs that have been barely tapped. Our laws and lack of information are such that we allow water to "waste over the spillways" of these underground reservoirs year after year. This water, although perhaps not easily seen, is lost by phreatophytic vegetation whose roots, stems and leaves are syphoning the water from the ground to the atmosphere without serving any real useful purpose. In many such areas, springs and seeps occur too low in the basin to be easily captured. This water goes unused to the Great Salt Lake or to other low areas from which twice as much is evaporated each year as is consumed by all of our irrigated crops. Of the 1,200,000 acres of land irrigated in the state, only about 80,000 acres, or 6 percent, is irrigated from ground water. However, several of these ground water developments are already giving us some of our worst headaches in administration.

Most areas in Utah are underlain with ground water, some of which may be recovered. Frequently ground water development costs much less per acre-foot than does surface water development. However, fully developing ground

water basins often conflicts with early rights to the use of water from flowing or low lift wells. Most of the 32,000 registered wells in Utah are in counties where considerable acreages of wet lands are also found. A large proportion of these wells are small but flowing. Naturally as new wells are drilled and pumped in these areas, existing wells cease to flow. Although these small flowing wells produce little water, they are often the only sources of culinary and stock water that have ever been used by many of the old settlers. These people feel strongly about their rights to the continued use of such water and to having it delivered under pressure, even though many thousands of gallons may be wasted to evaporation and transpiration for every gallon used from the well. Our courts have been reluctant to allow interference with such established rights.

Future developments

This brings us to the point of deciding where we are going in the future in this water field if we are to grow and develop. Can we sit idly by and watch water go to waste without using our technical "know-how" for stopping this waste? Will our laws and courts prevent the necessary readjustments that are inevitable with the changing times? Shouldn't our educational system stress more and more the idea that this great resource, water, must be managed in such a way that it will return the greatest potential benefit to the public? These are but a few of the questions that must be answered in the near future. Such questions must be given mature study and investigation. Perhaps our present concepts of research in the water field may need some readjustments or expansions.

Conflicting demands

Since pioneer days, we in Utah have worked on the theory that irrigation is one of the highest uses to which water may be put. This was true, especially when home-grown foods were needed so badly, and when it could not easily be shipped in by truck or train. This is well illustrated by the fact that we once found it desirable to produce cotton in the southwest corner of our state, a practice which is no longer considered economic for this area. However, today any one state of our Nation is far from being wholly dependent upon its own agriculture for food and fiber. Fresh vegetables, fruits, rice, flour, meat, and all other foods are shipped to distant points, and agriculture, which is largely dependent upon irrigation, is expensive in terms of water usage. I believe that in the arid West, there may be a continual shift from uses of water by agriculture to uses for municipal and industrial purposes. Water needed to supply a living for one family on an irrigated farm may adequately serve industry that will furnish a living for 50 or more families. Some of us "old timers" in irrigated agriculture may shudder at such a statement. But we must face the fact that many water developments for agriculture at the present time may just be "banking" the water for a higher economic use later on. This is not a new idea or concept. In fact, we are well on our way towards such a shift in certain areas. Subdivisions and industrial plants are pushing agriculture out of many of our irrigated areas. The waters formerly used on the lands are not being released for agriculture in other areas. They are being used on these same lands and frequently considerable supplementary water is needed to serve the new uses that develop. And to develop minerals and other natural resources, we must have water; water for direct processing purposes, water for power production and water for drinking by

the people who will be employed in the new industries that will result from the development of these natural resources.

An example of the conversion of agricultural water to industrial purposes is a current project in one of the counties of central Utah. A new two-unit steam power plant recently constructed in the area soon will be in full operation. These two units will produce 166,000 kilowatts of electricity. This is sufficient to supply general needs of a city of some 300,000 people. To produce this much power will require 1690 tons of coal every day. When operating at full capacity approximately 180,000 gallons of water per hour, or about 7 cubic feet per second, will be needed to produce steam for this operation. It is estimated that between 50 and 60 full-time employees will be required at the plant. This is exclusive of those people needed to mine the coal and to distribute the power out over the system to all users.

In contrast, 7 cubic feet per second of water will adequately irrigate less than 500 acres of land during peak-use periods. To operate 500 acres of irrigated land in this area would require the full-time services of fewer than 10 people. Returns from irrigated agriculture on 500 acres would equal only a small part of the returns from the electric plant.

Furthermore, it has been estimated that the returns from industry in this same area represent something like \$28,000,000 a year, and agricultural returns are in the neighborhood of \$1,250,000 a year. However, in this area, about 3 acre-feet of water is used for irrigation for every acre-foot that is used for industrial and other purposes. It might be of further interest to know that of all property taxes in this county, agricultural interests paid less than 10 percent. Mining and utility companies paid over 60 percent.

With water resource development becoming more and more expensive, the ability of users to repay the costs decides whether or not the development can be made. Thus, the costs of our more difficult water development projects must probably be underwritten by industry or municipalities.

This principle is rather well illustrated by the Weber Basin Project whose lands lie between Ogden and Salt Lake City, and which is developing 285,000 acre-feet of water. Of this new water, 40,000 acre-feet has been allocated for municipal use and 245,000 acre-feet for irrigation, or at a ratio of about 1 to 6. However, the municipal users will repay about one-half of the total costs of the water development.

I do not wish to imply that this is unfair. Municipal users will benefit indirectly to a point where they should pay more per unit of water. If they were to develop the water they alone needed, the costs to them would probably be about the same as under the joint venture. Also, they have the ability to pay. Such an arrangement will be necessary for future developments. Our proposed Dixie Project in Southern Utah may be too costly if agriculture must pay all the costs under present economic conditions. However, under the theory that the water will temporarily be banked for future users who will be able to meet the repayment requirements, then I don't think we should hesitate to move ahead. Certainly this area is one with the kind of climate and recreational activities that are being sought after by many people today - but only if water is available.

These same changes are underway, but even more drastically, in other areas of the West. According to McGauchey and Erlich, 1/ there was 68 times as much water used for agricultural purposes in California as for industrial use in 1950. By 1955 the ratio had decreased down to 3.8 to 1 - not because irrigation use had decreased (In fact, it increased 12.6% in the 5-year period) but because industrial use increased over 2,000 percent. This same report shows that municipal and domestic uses, exclusive of self-supplied industrial users, amounts to only about 2 percent of the total use.

Administration problems

The above discussion has attempted to help you understand several of the problems of water administration that will not be discussed. Certainly many physical conditions in other states are different than we have in Utah. Also, water laws sometimes require that identical problems occurring in two or more states, may need to be handled much differently in each. This is somewhat unfortunate because we probably should have a more nearly common denominator for water laws regardless of where we are in the Western United States. However, there are some basic principles that cannot be ignored. And, regardless of the state, I think any water administrator has need for more and more information on sources, supplies, and uses of water in his state, and how the various problems are being handled in other states.

Canal seepage and linings - Over the years irrigation and drainage engineers have measured canal losses and have come up with the startling discovery that some 25 to 30 percent of all water diverted into the larger canals is lost through seepage and other losses. Probably a larger percentage is lost from smaller canals and ditches. This has led to a crusade for canal lining to "save" these heavy losses. Likewise, there has been a considerable study made on the efficiency with which irrigation water can be applied to the land.

We are now finding that canal lining, although good in theory, may sometimes be adverse to old rights developed as a result of these seepage losses. If the seepage returns to the water supply system, as is often the case, then lining and expanding the use of this "saved" water deprives other users who are dependent upon these return flows. Many times these rights have developed and have been in good standing for many years.

At the same time, to prevent further canal lining on the theory that downstream users may be hurt, even though some damage does occur, would be wrong. Water not under control is never good, and seepage waters are in this category for at least part of the time. But there must be a happy balance between any increase in use of the water saved and decrease in flow to downstream users. Perhaps a "change in use" should be filed so that other users have opportunity to see what such a project will do to their water rights. The facts of each case must be considered.

The term "saving water" has been used entirely too loosely in many

1/ "Economic Evaluation of Water" by P. A. McGauchey and Harry Erlich, Paper 2058 Vol. 85, No. IR-2, June 1959, Proceedings of Am. Soc. of Civil Engineers.

areas. When we start a water-saving project, we must take a look at whom we are saving the water from whether it be by canal lining, draining a swamp area, or by any other means. If it is saved from our neighbor downstream who has developed rights that have been in existence for some time and forms the basis for a going economy, then such a "saving" probably is not good from the community standpoint. If the saving is from phreatophytes that have little or no economic value, from evaporation, or from mixing with other water or waste that makes it non-usable, then we have a true salvage. In my own state, any water reaching Great Salt Lake is gone insofar as any appreciable economic return is concerned. Water which normally reaches the lake but which is prevented from doing so, is true salvage. Much of that water which now feeds the marshes and wet lands surrounding the lake can also be claimed as salvageable.

Well plugging - Along the Wasatch Mountain front and in certain other areas of Utah, we have artesian pressure areas. Many small flowing wells have been developed to take advantage of this natural condition but most have limited flow and pressure. Originally, these wells were developed for culinary and stockwatering purposes. However, as communities have grown and developed, municipal-type water systems have been constructed. These community systems are replacing wells that do not have adequate pressure for modern-day needs, and do not meet quality and health standards. As a result, wells are often abandoned, sometimes without plugging. More often they are plugged but the casings rust out below the ground surface and they continue to waste water from the pressure aquifer.

In order to salvage these waters - or prevent their waste - a well repair and sealing program has been underway since 1945. The state furnishes the equipment and personnel to operate it. A reasonable charge is made against the owner of the well for complete sealing with clay and cement. Incidentally, this service has been used by our state highway department when new highway locations cross flowing well areas. It has also been used some to help stabilize foundation areas for large structures. In general, this operation pays its own way and has resulted in the control of about 62 second-feet of water that was wasting from the 500 wells that have been repaired or sealed since 1945.

Changes in diversion points and places of use - In connection with surface water uses, oftentimes there is a desire on the part of a water user to change his point of diversion on a stream and perhaps use the water at some other location. Under the law, such changes are permissible in Utah providing other rights are not interfered with. However, if the move is downstream and if there are rights with points of diversion between the two places of use, there may be serious conflicts. If the applicant wishes to move water downstream past other diversion points, he may be limited to take only the stream depletion that occurred above these other rights - not the diversion right he has developed.

We find that this may reduce a man's diversion right when moved downstream to half that which he was allowed to divert upstream. In other words, his diversion downstream is limited to the diversion upstream minus the returns, (return flow from ditch and canal seepage and from excess application of water to the land). If this procedure were not used, there would be insufficient water to meet the intervening rights. We have somewhat similar problems in moving a diversion right upstream or from one

tributary of a stream to another tributary of the same stream. The magnitude of the factors that must be considered in these exchanges requires a great deal of judgment accompanied with all the basic data that we can assemble on the problem.

Water Commissioners - Under Utah law, water commissioners may be appointed either by the court or the State Engineer on streams or ground water basins "needing administration". Our interpretation of "need" has been when the water users cannot get along with each other and handle their own distribution problems.

When a commissioner is appointed, the burden of paying his costs must be assessed against the water users usually on a water-delivery basis. This often raises some real problems insofar as obtaining good administration is concerned and especially at the time when a commissioner is first appointed. The water users want to keep costs at a minimum and assessments down. And in some areas a few "near-sighted" men can often influence other water users to a point where raising an adequate budget is most difficult.

A much more workable plan, and one used by most of Utah's neighboring states, is to pay water commissioners from general state appropriations. Certainly this seems more workable than the direct assessment system and is probably justified since all people of the state are water users and benefit from good regulation.

Costs of administration on the "piece-meal" basis under which we have been operating have ranged from less than one cent per acre-foot to 20 cents per acre-foot for one small isolated creek. At the present time about 2,127,600 acre-feet are delivered under commissioners each year at an average cost of $3\frac{1}{2}$ cents per acre-foot. It is estimated that if the entire water supply of the state is some day put under commissioners (some 5,000,000 acre-feet of diversion) the total cost will be about \$250,000 or 5 cents per acre-foot average. This would allow for a much improved administration program, even under existing systems. It would justify the employment of full-time, qualified commissioners which is not possible under present conditions.

Changes in pumping costs and practices - Utah, like most other states, is facing the problem of trying to balance the available water supply with the rate at which it is being used. The Milford Valley in the southwestern part of our state represents one of the problem areas. Electric power costs for pumping in 1951 averaged \$1.13 per acre-foot. Although the power rates have not changed, the average cost in 1957 had increased to \$1.95 per acre-foot because of increased pumping lifts. This is still relatively inexpensive water when compared with costs in many areas of the West. However, it is startling to see the increase in pumping costs that has taken place in just 6 years. This increase is 73 percent or an average of 12 percent per year. Furthermore, it is estimated that the average annual cost of deepening the wells, lowering the pump bowls and increasing the motor size has averaged more than the increased cost of power. Therefore, it appears that the cost of pumping water in the Milford Valley in 1957 is about $2\frac{1}{2}$ times what it was in 1951. Again I wish to emphasize that this increased cost is without any increase in power rates. It should be noted also that 80 percent of the water is pumped with lifts of less than 100 feet.

As a result of the lowering of the water table in this area, an adjudication of the water rights was made. The court has signed the adjudication order, limited the pumping to 4 acre-feet per acre on a trial basis, and ordered measuring and recording meters installed on each well. It is now the responsibility of the State Engineer to administer these waters in accordance with the restrictions imposed. This, of course, is an unpopular action to many of the people accustomed to unlimited pumping. Also, they must bear the expense of measuring and administering the water. Over past years, the amount of water pumped by various farms has varied from about 1.6 acre-feet per acre to about 8. The medium has been about 4.0. According to our best estimates, consumptive irrigation water requirements on all of the cropped valley land should average about 1.73 acre-feet per acre or could be met by the 4 acre-feet per acre allowance at about 43 percent irrigation efficiency. This is certainly liberal for those farms having an average cropping pattern. However, some farms may be planted wholly to alfalfa in any one year. Consumptive irrigation water for alfalfa in this area is nearly 3 acre-feet per acre or the water would need be applied at 75 percent efficiency which is rather high.

Utah water law rather broadly defines the duties of the administrative officer. In addition to being charged with seeing that the rights of all appropriators are respected, it is also his duty to prevent waste, loss or pollution of all surface or underground waters. Here is really where some of the fundamental controversies of administration develop. What is a man's right and where does waste, loss, or pollution begin? This is where we need help.

I do not wish to burden you with a recitation of all of Utah's administration problems. Certainly, I could not cite them all in the time allotted to me here today. However, I do feel that it is most important for people working in the fields of irrigation research, project planning, and associated work to better understand some of the administration problems. Only through mutual understanding are we able to most efficiently guide our work and obtain maximum utility of our information.

WATER AND LAND

Gladwin E. Young*

I consider it a special privilege to participate in this Fourth Annual New Mexico Water Conference. It seems to me this is a very fine thing that New Mexico State University is doing for the people of this State.

The colleges and universities of this country have a unique contribution to make as the Nation studies and restudies its own experiences and as it shapes and reshapes its policies for water and land resource conservation, development and use. When President Eisenhower transmitted a report of his Advisory Committee on Water Resource Policy to the Congress in January 1956 he made this statement: "The policies we adopt for the development of our water resources will have a profound effect in the years to come upon our domestic, agricultural and industrial economy."

No one can help being impressed by the prominence now given to water problems in the United States. The number of committees, commissions, study groups and conferences throughout the country dealing with water policy and water development is an indication of the very high priority being given to this problem everywhere.

Yet there is no national water crisis in any general sense. We are not out of water in this country. On the whole, we are water rich, as in a similar sense we are richly endowed with productive land and other natural resources. To be sure, our water, land and mineral resources are not equally and evenly dispersed. We experience problems of having them in the right amounts and in the right places at the right time.

I think it is especially significant that, even though we are not now confronted with any immediate crisis from a national standpoint, the public is willing to take time to consider seriously these problems. More important, there is a willingness to invest large amounts of public funds in water resource developments in anticipation of the needs in the years to come. It seems to me that everyone can take enormous pride in the fact that in this country we are willing to face problems before they become disasters. This willingness to be foresighted characterizes all of our conservation programs -- not only water, but soils, forests, wildlife, and other natural resources.

I do not mean to imply that the shoe had not begun to pinch before serious nationwide resource conservation and development programs were started. Certainly parts of our country have always been confronted with major water problems. Other communities have experienced the economic decline that has followed the depletion of timber resources. Still other communities have declined as the fertility of the soil became exhausted. But even so, it is significant that conservation programs have been given nationwide support long before residents in most of the country felt the

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economic pinch or experienced it firsthand. This, I think, is a tribute to the educational system that keeps the people of the Nation informed, that provides them with the basis for making appraisals of situations confronting the entire country and that provides a background of judgment on which to base rational action.

Western States have faced special kinds of water problems from the time of settlement. Too little or too much water at the right time -- mostly too little. As more and more communities in all parts of the country have suffered disastrous floods or found industries moving to more dependable water supplies, the East has joined the West in recognizing that there is a water problem that justifies attention and efforts on a nationwide basis.

I shall not attempt to review with you the history of water problems that have confronted the Western States. Certainly New Mexico has one of the oldest histories of organized efforts to control and use water for irrigation. For the purpose of this discussion, I have more interest in reviewing with you some of the circumstances that seem to me have led to water interests in the East joining with water interests in the West and which have resulted in new nationwide programs and new nationwide emphasis on water resource development.

Water and Land Policies Expanded

After a generation of experience and efforts of the Federal Government in reclamation and after a still longer experience in rivers and harbors development, the drought and depression of the 1930's gave impetus to two additional nationwide programs that are now an integral part of our Nation's water and land resource policies.

I refer specifically to Public Law 46, 74th Congress, establishing the Soil Conservation Service and to the Flood Control Act of June 22, 1936. Both Acts initiated far reaching policies with respect to the responsibilities of the Federal Government in protecting and developing the Nation's land and water resources.

It is significant that both Acts have similar wording in their declaration of policies. The Soil Conservation Act stated: "That it is hereby recognized that the wastage of soil and moisture resources on farm, grazing, and forest lands of the Nation, resulting from soil erosion, is a menace to the national welfare and that it is hereby declared to be the policy of Congress to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources, control floods, prevent impairment of reservoirs, and maintain the navigability of rivers and harbors, protect public health, public lands and relieve unemployment....."

The Flood Control Act stated: "It is hereby recognized that destructive floods upon the rivers of the United States, upsetting orderly processes and causing loss of life and property, including the erosion of lands, constitute a menace to national welfare; that the Federal Government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, for flood-control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, Federal investigations and improvements of

rivers and other waterways for flood control and allied purposes shall be under the jurisdiction of and shall be prosecuted by the Department of the Army under the direction of the Secretary of the Army and supervision of the Chief of Engineers, and Federal investigations of watersheds and measures for runoff and waterflow retardation and soil erosion prevention on watersheds shall be under the jurisdiction of and shall be prosecuted by the Department of Agriculture

It is significant that the policy declaration in each of these Acts recognizes interdependence of water resources and land resources in any program of water control or water utilization. Both Acts recognize the fact that water falls first on the fields and farms and forests of the Nation. Both Acts recognize that the first opportunity to begin control and profitable use of water is on the watershed lands of the creeks and tributaries that make up the component parts of the river basins.

For two decades following the enactment of these laws there was widespread acceptance and adoption of both programs. Thousands of farmers throughout the United States cooperated with their soil conservation districts in applying soil and water conservation practices to their individual farms.

The Soil Conservation Service participated in this movement by furnishing technical assistance to individual farmers in working out and applying management practices to their lands and to the water available to those lands. The Agricultural Conservation Program Service assisted by providing cost sharing for approved conservation practices. Extension Services helped farmers see their problems and take leadership. Researchers sought out workable solutions to soil and water conservation problems.

During this same period, while farmers were applying conservation measures to their farm lands and observing the effects of these measures on the behavior of creeks and streams in the upper watersheds, the Corps of Engineers was cooperating with the States and municipalities on the main stems and river valleys of the major rivers of the Nation. Systems of flood control reservoirs, levees, and channel improvements were being installed to reduce damage from floods in the main stems of the major rivers.

It was inevitable that the experience and observation of the operation of these two important nationwide programs would lead to a demand for closing the gap between them. In 1954, the Watershed Protection and Flood Prevention Act (Public Law 566) was passed to close this gap. The new law provided proper authorization for a program of land and water management on the small watersheds of the Nation. The same year, Congress enacted the Small Irrigation Projects Act that recognized the importance of closing the gap between the small irrigation projects and the large reclamation projects developed by the Bureau of Reclamation.

The Watershed Program

Watershed protection and management as conceived in the Watershed Act is by no means a new concept. The relationship of forest cover to streamflow has received public recognition for more than a century in the United States. The interrelationship between the use of land in the watershed and the behavior of runoff and streamflow has been apparent, not only to hydrologists

and engineers, but also to farm people in communities where soil conservation measures have been most widely applied. While these relationships have long been recognized, nothing very effective could be done about it without the organized efforts of the majority of landowners and other interests in the watershed community. For this basic reason, therefore, significant progress in watershed protection and development on watersheds involving mostly privately-owned land did not take place until a special authorization made it possible for the Department of Agriculture to approach this problem with organized watershed communities on a project-by-project basis.

The Watershed Protection and Flood Prevention Act which now provides for a nationwide program of watershed development places full responsibility for starting a watershed project on local people who will act through their own organizations. Only local organizations can initiate a project. Federal help cannot be given if a project is disapproved by the State government. The Department of Agriculture provides help only when the State takes affirmative action to approve an application for Federal help.

Local organizations, to be eligible as legal sponsors, must have authority under State law to carry out, maintain and operate works of improvement. They must finance their required share of costs of the project including land, easements, and rights-of-way; must acquire any necessary water rights required under State law; must agree to operate and maintain the structures and other improvements after the project is completed; must construct or let contracts for construction of works of improvement agreed upon in the work plan; must obtain agreements from owners of at least one-half of the land above each detention structure to plan and apply soil and water conservation measures; must comply with all State laws governing watershed improvements, water rights, or specifications for structures; and must submit a satisfactory plan for repayment of any loan or advancement obtained under this Act.

A basic principle of the watershed program is that it shall be multiple-purpose in nature. Basic to all watershed projects is the application of required soil conservation measures and farm conservation plans on the farms of the watershed, as well as minimum requirements for conservation practices on the forest lands and range lands, either public or private.

One of the principal purposes as set forth in the Act is flood prevention -- the reduction of damages from flood and sediment. Reduction of flood damages to agricultural areas and to urban areas are equally eligible under this Act. Since the Corps of Engineers also has authorization to protect agricultural values as well as urban values from flood and sediment damages, the Soil Conservation Service and the Corps of Engineers have developed a memorandum of understanding that provides a practicable and workable basis for both agencies to cooperate with local organizations in carrying out projects that may involve urban protection.

Another principal purpose of the watershed program is the development of benefits from agricultural water management. This involves improvements that serve two or more farms, and includes drainage, irrigation, and measures to provide more uniform supply and distribution of water for agricultural purposes. Authorization is also given under the Act to make available to local organizations assistance for the development of fish and wildlife

resources whenever these can be incorporated in a watershed project. Watershed work plans may include developments for municipal or industrial water supply, pollution abatement and salt water intrusion control provided these are integral parts of the plan for protection and improvement of the entire watershed. While these measures are not eligible for cost sharing assistance from funds appropriated under the Watershed Act, they are eligible to receive Federal loans from the Farmers Home Administration in the same way that all other purposes previously mentioned are eligible.

Agriculture's Concern with Water Policies

Evolution of national policies in recent years has been in the direction of greater participation of the Federal Government in resource conservation and development. Responsibilities of the Department of Agriculture and the importance of agriculture generally in water resource development has been brought into the picture more and more. It seems to me that this was inevitable as the interdependence between water resource development and land resource development became more clearly recognized.

There have been several efforts to develop statements of the Nation's water policies. In my opinion, these have never been very satisfying endeavors because of the simple fact that policies for the development of water resources cannot be successfully isolated from policies that relate to the development of land resources. This point of view is borne out by the more recent experiences of the river basin study commissions and by river basin interagency committees. These experiences indicate that it is not practical to try to plan for the development of water resources as a separate and distinct function. It has been found to be more realistic to attempt to plan the development of land and water resources as interrelated resources.

The President's Water Resources Policy Commission in 1950 emphasized that water resources developments must also take into account land development. As a matter of fact that Commission's report "A Water Policy For the American People" gave so much emphasis to river basin planning that it is surprising the Commission did not discover that their policy statement dealt almost as much with land as with water.

President Eisenhower recognized this interrelationship in his letter establishing the Cabinet Committee on Water Resources Policy when he made this statement: "If we are to continue to advance agriculturally and industrially we must make the best use of every drop of water which falls on our soils, or which can be extracted from the oceans." Quite recently the Department of Agriculture expressed the same idea in a report to the Senate Select Committee on National Water Resources. A statement in that report reads as follows: "This Department would list as a problem of first priority the use of water in combination with soil resources for the production of food, fiber and forest products required to meet the increasing demands of the Nation for these basic commodities. With a present population of 177 million people and a potential of 370 million in 50 years, this Nation must manage its soil and water resources for agricultural and forestry production on a sound and efficient basis to meet these future demands."

It is recognized that the competition for the use of water will continue to increase: It is going to be impossible for water resource

developments from now on to escape this environment of continuous competition for the use of water resources. In recognition of this, the Department of Agriculture's report to the Senate Select Committee on National Water Resources emphasizes that the Nation's farmers and ranchers must be able to count on having reliable water supplies in the amount required for good management of lands for economic production.

In economic competition for water, industrial and municipal users can now buy water away from agriculture. Public policies for resource development must therefore beware of shortsighted developments that do not take into account long time agricultural needs. More specifically, this is what I mean -- location of Government installations as well as locations of sites for new industrial expansion frequently offer a wide latitude of choice. It would be possible in many instances to choose locations that would drive out agriculture while an equally good location elsewhere would have little effect on agriculture.

So far there is nothing in the conscience of either the Federal Government or of industry to serve as a reminder that productive agricultural land and water are in fact limited and not replaceable. Future policies should develop such a conscience.

Abundant Agricultural Production an Asset -- Not a Liability

It may seem a little surprising to some that the Department of Agriculture would list as a problem of first priority the use of water for agricultural production. The problem of handling agricultural surpluses over the last three decades has received so much emphasis and attention that the general public might have a right to think that the situation of agricultural overabundance would last forever. While no student of agricultural production would forecast that the surplus problem is about to vanish in the near future, it is, nevertheless, a responsibility of those in policy positions to try to look further ahead than merely a decade or even a generation.

The Senate Select Committee on National Water Resources is obviously attempting to look at the water and land program from a long range point of view. As evidence of this, they have asked the Department of Agriculture for a report estimating the demands that will be placed on lands and water for agricultural production needed by the year 1980 and on to the year 2000. This report is now being prepared.

The Department of Agriculture started this projection of agricultural needs on the basis that population may reach at least twice the present number some time between the years 1980 and 2000. While the report is not yet complete, it is obvious that if people are to eat as well in the year 2000 as they are now eating it will require double the present agricultural production.

In the early history of this country we doubled our agricultural production by doubling the amount of land brought under cultivation. Obviously this cannot be done to meet the situation that lies ahead. Our land resources have been culled over pretty hard. Our last census indicated that we had about 478 million acres of cropland in the United States. The Soil Conservation Service in a study in 1952 estimated that all privately-owned

land falling in land capability classes I, II and III - which are capable of being used for crop production -- totals about 593 million acres.

This means that if prices were favorable enough to pay the cost, cropland could be increased by about 24 percent. This figure, however, does not take into account the fact that nonagricultural uses of land will continually be competing with agriculture for the use of land. We now know that about a million acres a year of potential croplands are being taken up by cities, highways, parks and other nonagricultural uses. This means that the additional cropland that will be brought into production through irrigation and drainage in the next 40 years will be just about offset by the amount of agricultural land that will go into the nonagricultural uses.

Obviously the answer to doubling the agricultural production in the next 40 years to meet the doubling population in the same period is that we will have to obtain double the production from the land and water already being used.

As we look into the future it becomes increasingly apparent that we will have to make better use of our land and water resources, not only for agricultural purposes, but for all purposes. This means that we will not only need to increase our research, but we will have to increase the effectiveness of our research. We not only need to increase education and training in the scientific fields of agriculture, but we also have to close the gap between what our scientists know and what our farmers practice.

We will have to increase the application of soil and water conservation practices that fit soundly into improved efficiency in agriculture. Agricultural uses will have to make way for other competitive uses. We are going to need more room for recreation. Our factories are going to be located in the country. City people will drive out to the factories for a while, and then new cities will spring up around the factories. Increased values are going to continue to be placed on the use of land and water for fish and wildlife purposes. All of these are the inevitable consequences of economic growth and population expansion. Competition for land and water will challenge existing uses and existing rights to those uses.

With such an outlook, resource conservation and resource development must be given first priority. Productive land will become more and more important, not less important in our total economy. Those who would neglect the conservation of productive soils now in the hope that technological advancement in machinery, fertilizers, or biological improvements will make land relatively unimportant would indeed gamble with the Nation's security.

To speculate on what lies in the future is always an interesting thing to do, but whether or not it is a profitable and worthwhile thing to do depends on how well we are able to fit our actions into directions that will pay off in the future without costing too much now. It seems to me that it is a fundamental responsibility of government and of our higher educational institutions to continually look ahead as far as is humanly possible. Who else will take the responsibility for staking out guidelines that give most promising means for meeting present day needs without being shortsighted about the future? Certainly the problems ahead in water resource developments and related land resource developments demand this sort of forward look.

On this note I would like to conclude by again commending the New Mexico State College and all who have responsibility for this series of annual water conferences for directing attention to this important problem -- water and land.

DEVELOPMENT OF NEW MEXICO'S WATER RESOURCES PROBLEM

John Burroughs*

For one who is as directly concerned with the development of our State's overall economy as I am, participation in this annual water conference is a very real privilege.

I am particularly impressed by the scope of the program which has been arranged by this conference. I believe it is essential for us here in New Mexico and the Southwest to consider our water problems in their broadest aspects and in all their varied phases.

As I view it, New Mexico's water resources problem is to achieve the fullest possible development, conservation and control of our available water. We must develop our water resources at a pace which will meet the needs of a rapidly expanding economy and population, and we must do so within the limits of the interstate agreements by which we are bound. Also of course, we must operate within the bounds of economic feasibility.

The theme of this conference, "Water and Water Law," is one which relates to the basic structure of our State's economy. It is essential that we develop economic criteria which will enable us to give effective direction to whatever modification of our water laws may be found necessary.

I personally feel we can take a great deal of assurance from the amount of water research that is being carried out at our various institutions, and through various divisions of our government.

Water problems are ones which have, throughout our history demanded bold action. But by the same token, effective action in this field has permitted outstanding economics progress, both for our own State and to the nation as a whole.

With any resource as basic as water is to our economy, you would expect universal interest and universal concern with its conservation and greatest utilization. But, as you whose immediate activities are related to water problems have learned all too well, there are many, many divergent views, not only as to methods and procedures, but also as to the extent of the need itself.

In formulating a general policy of dealing with our water problems, I feel we can place these problems in three broad categories: Those related to the increasing demand for water; those associated with the development of increased supplies of usable water; and those dealing with conservation and multiple use of water.

More and more, we must develop acceptable criteria and methods for allocating water, both as to uses and users. As more and more emphasis is placed on the multiple use of this resource, the problem gains

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tremendously in complexity -- both from a priority and a legal standpoint.

As our economy continues to expand, it becomes more and more essential to achieve improved methods of placing values on various types of water development and use.

In addition to determining how and when water resources should be developed, we also must give serious consideration to the question of who should carry out such development -- public or private agencies, and in either case how to assure continuation of local participation.

To my mind, it is of major importance that a broad educational program be carried out, both to assure public awareness of the many facets of the problems involved, and to stimulate the continuing interest of the widest possible number of specialized interest groups such as economists, sociologists, political scientists and public officials, engineers and various planning experts.

Since there will continue to be less water than we can use, and since there will continue to be overlapping interests wherever usable water exists, we must accept as a basic factor in our approach to water development the existence of conflict in water use.

It is for this reason that I feel that water resource planning is one of the most essential types of planning in which we can engage, and one of the types of planning which can bear the greatest fruits.

Such planning cannot be carried out effectively, however, without continuing research -- research of the type which you who participate in this annual conference are engaging in on an ever increasing scope.

Already the research accomplishments in water problems are proving of inestimable benefit to public officials and lawmakers, as well as those who deal more directly with our water resources. We are never going to be able to eliminate conflict from our efforts at water development, but as more and more of the benefits of research are applied to our water resource planning, a great deal of such controversy can be avoided.

The population of our State is increasing steadily and at a rate that is above the national average. Our per capita income also is increasing, but it, on the other hand, is below the national average. It is essential that we gear our growth and development to increasing industrialization, and to increasing processing of our mineral products within the State.

We in State government are making a concerted and concentrated effort to create the kind of economic and regulatory climate which will attract new industry and promote the expansion of industry already in our midst.

Part of the job that must be done is an educational one. We need to make it known -- and this involves the contradiction of definite public misconceptions -- that New Mexico has the raw materials -- including water, for a major industrial development.

But while water is available for a greatly expanded industrialization in our State -- much of this water is not where we would like it to be.

At the same time, much of our available water is not economically feasible for use by the type of industry best suited to our geography and economy.

What this means is that perhaps the most vital area in which we can seek solutions to water problems is in obtaining sources of water which are cheap enough for industrial use and in achieving sound, workable planning for the development of increasing amounts of industrial water in the future.

At the present time, 93 percent of all water diverted in New Mexico is used for irrigation. Most of the balance of 7 percent goes for municipal and industrial purposes, with only minor amounts being chargeable to recreation, fish and wildlife propagation and other uses.

The important point of this is the resultant fact that municipal and industrial usage could be doubled by a reduction of only about 7.5 percent in the amount of water used in the agricultural economy of the State. This is particularly significant when it is pointed out that only 9 percent of our State's personal income was derived from agriculture.

As this administration views it, adequate definition and solution of New Mexico's water problems is dependent to a large extent on the continuous operation of a planning program of broad scope. This program is being developed on an exploratory basis through our newly inaugurated State Planning division, with water being treated as one of several major factors affecting the development and future well being of the State.

This program will become increasingly complex as it brings into collaboration the many responsible agencies of government and the many interested private organizations and groups. Such a program calls for the application of many and varied techniques of economic and social research, regional planning, and engineering and scientific analysis.

Here we arrive at the significant fact: New Mexico is still far from maximum utilization of her water resources. But the time for determining both the maximum and most effective usages of that water is here now. It is a goal this conference is helping us powerfully to move toward. We must not only come up with answers to how to make the best usage of our water, but we must also translate those answers into action. By continuing to work together, I know we can get the job done.