WATER IN NEW MEXICO'S FUTURE

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Historical items on New Mexico are replete with recordings of drought, crop failures, water hole fights, and tribal migrations within this semi-arid Land of Enchantment. Scarcity of water has been the lot of New Mexicans for centuries. There is evidence that fully 800 years ago the art of crop irrigation was practiced with a high degree of skill and efficiency.

William A. Keleher, in his book The Fabulous Frontier, quotes from an interview by Charles B. Eddy for the "Golden Era" in 1885 in which he said, "It is the want of water that makes New Mexico the worst place on the face of the earth for small settlers to go to." Eddy concluded his dismal interview on the cattle raising prospects in Lincoln County with the note that costly efforts to locate water wells in the area had failed utterly.

Keleher added a footnote to the effect that artesian wells subsequently were developed in the Pecos Valley near Roswell, resulting in one of the great agricultural and livestock areas of the West.

Fortunately, since Eddy's time, we have learned a great deal more about the water resources in New Mexico. Thanks to extensive agricultural and industrial developments since the turn of the century and to those dedicated professionals connected with the several federal, state, and local agencies and foundations concerned by water resources development in all its many facets, we have this knowledge.

We know that, in spite of an average annual rainfall of slightly over one foot, there is, in the aggregate, a vast storehouse of underground water available both for present and long-range future use. A relatively small percentage of the supply is fresh and therein lies one of the problems facing us in planning our water supplies for the future.

In a recent address before the Lea County Chapter of the New Mexico Society of Professional Engineers, Steve Reynolds, out State Engineer, cited the U. S. Geological Survey estimate of some 20 billion acre-feet of underground water in storage within the State's boundaries. That amount of water is incomprehensible unless it is figuratively brought to the top of the ground and poured over the surface. This is what Steve did in his paper and came up with a body of water of sufficient volume to cover New Mexico to an average depth of 250 feet! He did not represent all of that water to be either economically extractable nor usable in its native state. However, ultimately much of it can be and, we know, will be put to use.

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New techniques will be developed for more economically pumping from greater depths than known heretofore. High-volume, deep well submergible electric pumps are presently lifting water from great depths at unprecedented low costs for oilfield secondary recovery projects. Costs of electric energy have declined steadily in recent years and are expected to continue on the trend in the foreseeable future. Lifting costs, it follows, will be reduced likewise. One manufacturer of submergible pumps specifies that a barrel of water can be lifted from 8,000 feet for 4½ cents at a power cost of one cent per kilowatt hour and at a 1000 barrel per day pumping rate.

In addition to the large underground water resources known to exist, there are believed to be undiscovered reservoirs in large areas of the State where detailed groundwater studies are yet to be made.

New Mexico, in comparison with most other states, is relatively underdeveloped. It has great potential for growth, socially and economically. Fifth in size among the 50 states, with a total area of 121,700 square miles, it ranks fifth from the bottom with a population spread of 7.8 people per square mile. It also stands fifth from the bottom in inland water area, with a total of 155 square miles being covered by water, the smallest such area of any of the 50 states.

What are the prospects for growth between now and the turn of the century?

Five years ago, U. S. News and World Report projected the following picture of America for the year 2000 A. D.:

> "People in the U. S.: 350 million
> Total output of the nation (in 1959 dollars): $2,000 billion, or about four times the 1963 level.
> Jobholders: 135 million, about twice the 1963 number.
> Average family income (after taxes in 1959 dollars): $14,750.
> Travel: 11,000 miles a year per person, on the average, nearly triple 1960's pace."

Taken from a report of the Outdoor Recreation Resources Review Commission and included in the above forecast was the estimated growth of population in the 8 mountain states - New Mexico included - of from 6.9 million in 1963 to 16.2 million by 2000 A. D.

Almost invariably, projections of U. S., and especially southwestern U. S., population growth turn out to be on the low side. Ten years ago, here at the Third Annual Water Conference, Albin Dearing, then Executive Vice Chairman of the Water Resources Council, quoted the following statistics. He told us, "The estimates now are that we will have, at the end of the century, between two and three hundred million people, in fact

we will pass the 190 million mark before 1975." As we all know, we passed the 200 million mark several months ago!

Ralph Edgel, who will address this conference tomorrow afternoon, will make projections on New Mexico's population growth to the year 2000. His projections - and he will no doubt make it clear that they are projections, not prognostications - will underscore the need for ever increasing fresh water supplies to meet the demands of a rapidly growing populace whose individual's daily requirements also grow. Ralph Edgel will possibly tell us that his projections will likely prove to be conservative.

But regardless of the ultimate accuracy of population forecasts, we know for certain that New Mexico's water supplies cannot be produced for the needs of year 2000 and beyond from sources as we now know them to exist. Where then will they come from?

Those of you who have been privileged, as I have, to have attended the previous twelve Annual Water Conferences and who have retained your copies of the proceedings of those meetings, can find in them many answers to the great problem facing us in the years ahead.

Dr. John W. Clark, Jr., then Associate Professor in the Civil Engineering Department, of a small institution known then as the New Mexico College of Agriculture and Mechanic Arts, presented an excellent and in several ways, a prophetic paper on New Sources of Water for Irrigation, Municipal and Industrial Uses. He stressed the importance of cleaning up and reusing our sewage effluent. Never have I seen a point so graphically illustrated as when, at the end of his theme, John reached into the lecturn, pulled out a pint Mason jar and drank it dry. He then told his unbelieving audience that the contents had been dipped from the campus sewage treated effluent pond that same morning. He had earlier told his audience that the water you drink today may once have been in Cleopatra's swimming pool! I believe there remains a doubt in the minds of his listeners as to whether or not that possibility made the Mason jar contents more or less palatable.

Not much, if anything, has been done in New Mexico in the twelve years since that first meeting to increase the beneficial use of the potentially valuable municipal effluents. Every municipality, with the possible exception of one, within the State has a sewage treatment system. There are in our society qualms which would prevent reuse of treated effluent for domestic purposes without considerable pre-conditioning measures, both to the effluent and the society. It constitutes much too valuable a resource, however, to be wasted as is done in too many cases.

Approximately 65 to 70 percent of water pumped into municipal water mains, except for that which is diverted to lawn and garden irrigation, ends up at the sewage treatment plant. With an estimated 160 gallons per day per person supplied through public water systems in New Mexico in 1962 it might reasonably be expected that a yield of something over a hundred gallons per day per person was made available for re-use as sewage effluent.

Also, presented at the First Annual Conference in 1956 was a paper by Dr. Buel W. Beadle, then Chairman of the Chemical Engineering Department at the Southwest Research Institute of San Antonio, Texas. Dr. Beadle discussed work then being done at Southwest on control of water evaporation losses by the application of monomolecular films. Earliest work in the field had been done by I. Langmuir in 1917.

One can appreciate the importance of achieving success in this experimental program when it is seen that from the 155 square mile inland water surface of New Mexico's lakes and streams, the annual evaporation loss totals 942,000 acre feet of water. This statistic was published in the 1956 World Almanac and cited in Dr. Beadle's paper. The author said that savings of evaporation of 45-50 percent for as long as 5-8 days in the field had been achieved by the experimental use of monomolecular films. He concluded, "The ultimate objective will be to develop a practical and economical method for reservoir evaporation control - one that will be of maximum benefit to water users in the Southwest and other portions of the United States, and, indeed, the world."

A 50 percent control of evaporation, if and when practically developed, could save enough water each year from the 155 square miles of New Mexico inland surface waters to supply twice our nonirrigation requirements and have enough left over to supply the State's oil industry secondary recovery demands for three full years.

Continued work is needed in areas of Watershed Management, Flood Control, Fish and Wildlife Development, Geologic and Topographic Mapping, Phreatophyte Control, Water Quality, Reforestation and Erosion Control, River Basin Studies, Development, Inventory and Conservation of Mineral Resources, Population Growth Studies, Industrial and Tourist Development, Weather Modification, Reclamation, Desalination, Reservoir Recharge, and Water Resources Research.

All are key programs which will need to be pursued and even expanded upon for maximum development of the State's water resources. All of the agencies, institutions, firms and individuals involved in these massive efforts are too numerous to list here. You all know who they are. Most, if not all of them have participated in the twelve excellent programs that have preceded this one.

Review the proceedings of those conferences and you can't help being impressed by the deep concern in New Mexico's future which has been recorded by the dedicated people involved.

Assuming success in all of the programs mentioned above there still will not be enough water to meet the needs of the long-range future.

Food production, not only for our own population but for others outside New Mexico and even outside the United States, will be our most critical need from beyond 2000 A. D. William A. Hewitt, Chairman of Deere & Company (or John Deere, as we better recognize his company), referred in a recent address to the job as that of "Feeding a 'Second World'." Hewitt predicted the doubling in the world's population, which is now 3.2 billion, within the remainder of the twentieth century. "This means," he said, "that in the short span of less than 35 years an ability to feed a 'Second World' must be developed."

The 1962 Agriculture Yearbook tells us that United States water requirements for agriculture, industry and municipal use will double by 1980; triple by 2000 A. D. The Department further predicts that, with expected improvements in conservation technology, 85 percent more land will be irrigated with only 2 percent more water in the year 2000 than was used in 1954.

There are today under serious consideration several large-scale plans for importing supplemental water supplies into New Mexico from far distant sources. Two years ago, Roland P. Kelly, Technical Program Manager of The Ralph M. Parsons Company, addressed this forum on the projects conceived by his company and named the North American Water and Power Alliance, better known as NAWAPA. This venture, as you know, would involve the importation of surplus water from source points in southeastern Alaska and the Yukon Territory of western Canada. A system of canals and tunnels would carry the water southward through British Columbia, across the Rocky Mountains, trench and make deliveries into Utah, Nevada, Arizona, California, New Mexico, Texas, Colorado, and Old Mexico. The project, as then viewed, would require about 20 years to complete after the resolution of political and international features, as Mr. Kelly expressed the view. Estimated cost would be about $100 billion.

The NAWAPA project would include power generation of some 38 million kilowatts in addition to water transport of an estimated 78,000,000 acre-feet per year. Forty million acres of new farm land would be put into production and $30 billion added to the United States economy each year upon completion of the project.

Yet another water resource plan of unprecedented magnitude has been researched by R. W. Beck and Associates, and would involve the transportation and delivery of some 10,200,000 acre-feet per year of water to the Great Plains regions. Source would be the Missouri River below Fort Randall, Nebraska. New Mexico would be one of the delivery points.

But the one great alternative plan given the best promise of success at this time is the importation program under investigation by the United States Bureau of Reclamation and other agencies, both federal and those of the states involved. Water Inc., is a corporation, not yet a year old, which has a most intense interest in this project. John J. Kendrick, who will next address this meeting, is president of Water Inc. and he will tell us as much as is presently known of the plans and investigations of the project. I shall not impose further upon his time or subject.

One, by comparison, small project being considered by twelve communities on the eastern side of the State is that of pipelining some 42,000 acre-feet per year of water from Ute Reservoir on the Canadian River for municipal and industrial use. The member communities in the Eastern New Mexico Inter-Community Water Supply Association are San Jon, Clovis, Texico, Melrose, Portales, Elida, Roswell, Tatum, Lovington, Hobbs, Eunice, and Jal. The Bureau of Reclamation is approaching completion of a preliminary cost and design study of the pipeline and pumping facilities of this system to provide supplemental water to these towns.

Let there be no misunderstanding regarding resulting costs of water from this or any other source not already in existence. The costs will be higher, regardless of the means employed for providing any new source of water from this time onward.

Municipalities of west Texas, where the prototype plan upon which the Ute project is largely patterned, are already paying higher prices for their municipal water as the result of joining in the West Texas Water Project. There is no known alternative if future water needs are to be met.

In conclusion, I believe we would all agree that we in New Mexico must continue to do everything - and more - that we have been doing for a good many years to conserve our natural, in-state water resources. Use not misuse nor nonuse, must be a full partner in any conservation-of-water effort.

While doing all that can be done by all that we know how to do in this regard we, at the same time, must investigate all reasonably attainable

sources of out-of-state water for importation to those areas in New Mexico where other means will, in the years ahead, fall short in meeting water requirements. Transportation of water in large volumes over long distances is feasible and operable in many areas of the world. While economics may not always be the criterion in first consideration, it probably will be satisfied in future, large scale, long-range projects.

Water is the world's number one migrant. It has been since the beginning of time. There is no more nor less water today than in the beginning. Remember Cleopatra's bath? The growing problem in water supply is that of logistics; not enough where it is needed and, quite as often, too much where it is not. Water needs to be moved from areas of surplus to those of scarcity. Flood or drought, feast or famine, life or death together compose the history of mankind. We can't entirely control the eternal pattern, but we can try. The future of coming generations will depend upon the ultimate success of our efforts. We really have no choice but to plan and act with all possible diligence.

We'd better be caught trying.