MEETING FUTURE WATER NEEDS

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As the last speaker at this Annual Conference, I would like very much to be able to select just the right words that would enable each of us to leave the Conference on a high note of enthusiasm and optimism for the future.

This has been an excellent conference. Up to now I have enjoyed it very much. The program has not been too crowded and there has been opportunity for ample discussion by those attending the Conference, as well as the panel members.

The fact that we have been discussing ways of assuring adequate supplies of water for New Mexico to the year 2000 and to the year 2060 appears to have broadened our horizons, and enabled us to speak more freely about things as they may be one hundred years from now than we would have spoken were we saying what will be done or what will be the situation a year or two, or five from now. I am sure each of us has learned a great deal from this Conference and has been stimulated to apply his talents a little bit more effectively to improve our water development and management programs to permit continued growth of the New Mexico economy.

The title assigned to me is: "How Can New Mexico and the Southwest Organize to Meet Its Future Water Needs?" The use of the word "its" indicates to me that perhaps it was desired to convey the thought that New Mexico and the Southwest are one and the same in terms of water needs, or at least their water problems are very similar. The word "their" may be better English but the word "its" is a realistic point of view concerning how to get the overall job done.

New Mexico certainly cannot completely solve its water problems alone and apart from the region and even the two working closely together and in harmony would not be adequate to solve some of the water problems we face, particularly those that may face us 50 or 100 years from now, when our population may be much larger.

How Far Ahead Can or Should We Plan?

I think we would all agree that we cannot leave such important things as our water supplies to chance. I am sure a great majority, if not all of us, agree that effective planning is highly desirable and we must plan ahead.

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There is considerable disagreement on how far ahead we can plan. I remember a major professor of mine in graduate school, years ago, suggested that this topic would make a good doctoral thesis. There is much evidence to show that most of us do not think farther ahead than two generations - our own and that of our children. As we approach our later years perhaps we think ahead for our children and their children; that is, our grandchildren. Probably most of us do not think ahead more than 40 or 50 years. Perhaps because the times and technology are changing faster than ever, a century is not too far to contemplate our problems ahead and try to prepare to meet them satisfactorily.

Recently a serious attempt was made to do some long-range forecasting. Olaf Helmer, of the Rand Corporation, and T. J. Gordon, of Douglas Aircraft Corporation, studied this matter and found a near vacuum as far as tested techniques are concerned. They set up an experiment using 82 top experts who had outstanding records in various fields and divided them into six panels: (1) scientific breakthroughs, (2) automation, (3) space, (4) weapons, (5) population, and (6) war prevention.

This group considered 136 potential futures open to man. After carefully examining these each of the experts or "wise men" indicated a date in which he believed a breakthrough could be achieved. From these dates a median date for each breakthrough was determined.

I will take only the major <u>scientific</u> breakthroughs that were suggested and mention four that may be of particular interest to us. The group came up with 31 scientific breakthroughs out of the 136 potential futures which they examined. Four of these 31 major scientific breakthroughs include:

First, "regional weather control" - predicted for the year 1990. The word "regional" in this case is a general term and does influence one's view as to when such a breakthrough may be accomplished. From what Commissioner Floyd Dominy told us yeaterday we may be able to make a scientific breakthrough before 1990, which will enable us to influence precipitation in a given region significantly. The use of the word "control," however, would go farther than what Commissioner Dominy was emphasizing. Control of the weather of a region would imply more than merely increasing precipitation ten, twenty, or thirty percent by activity in a part of the year in which cloud conditions were favorable for such results. The year 1990 is not far off and the fact that these "wise men" felt that regional weather control was a distinct possibility by that time indicates that we may be closer to outstanding achievements in this field than we think.

The second breakthrough I have selected is "hereditary defects controlled by altering genes." The median date for this breakthrough is suggested as the

year 2000. This kind of breakthrough could be of tremendous significance and I am sure I do not need to explain its ramifications.

The third scientific breakthrough selected is "biochemicals to aid growth of new organs and limbs." The median date for this breakthrough is suggested as the year 2010. Maybe this development will replace the need of heart transfers.

The fourth major breakthrough I have selected from the group is "control of the aging process" permitting extension of life fifty years. The predicted median date for this breakthrough is 2050. Unfortunately, it will be too late for many of us, but I think we can all see what it would mean to our total population numbers. It might even make Ralph Edgel's figures, which he showed us yesterday, on New Mexico's predicted population for the year 2060 look quite conservative and certainly would have a significant effect on water demands.

We all agree that probably the best basis for judging the future is the experience of the past. America has experienced tremendous change and progress through science. Not all change is progress. I like to define progress as "change in the right direction" and the right direction, I submit, is elimination of disease, poverty, ignorance, fear, and other similar human troubles.

I suggest that probably the most important single contributing factor to our great progress has been our nationwide system of "free" public schools - from kindergarten through college. I put the word free in quotes because I realize that education is not completely free, but the bulk of the costs is provided through public tax funds and we have followed the principle of emphasizing quality and merit but have supplemented this with a geographical distribution of schools and colleges to make education more readily available to all our youth and adults. We have defended the position that we would provide this type of education for all up to the limit of each individual's capacity to make effective use of such knowledge, education, and/or training.

The effectiveness of this system is well demonstrated through our land-grant universities with their schools of agriculture and mechanical arts, the agricultural experiment stations, and the Cooperative Extension Service. This campus is a good example of the kind of effective service which these institutions have been rendering the state.

Through the leadership of your Great Senior Senator from New Mexico, Clinton P. Anderson, we have applied some of the same research and informational services that have been applied to agriculture to water. We now have 51 water resources research institutes or centers (one in each of the 50 states and Puerto Rico).

However, the Water Resources Research Act of 1964 improved upon several of the provisions of the Land-Grant College legislation of 1862. In addition to these 51 Institute universities we have other universities affiliated with these 51 so that now more than 100 universities and colleges are affiliated together working on water resources research problems. In New Mexico all three of the major institutions, the University at Albuquerque, New Mexico Institute of Mining and Technology at Socorro, and New Mexico State University, where the Water Resources Research Institute is located, are working together effectively to help solve some of New Mexico's difficult water problems.

I do not mean to imply that no water research was done by universities and colleges prior to the passage of the 1964 Act, but there was no systematic, continuing, cooperative federal-state research effort corresponding to our agricultural experiment station system which has now been operating more than eighty years. But, prior to passage of the 1964 Water Resources Research Act, research in water and resources which affect water was small, spotty, sporadic, and completely inadequate to solve the tremendous water problems that beset us.

This dual approach of emphasizing quality and geographical distribution as criteria for support will continue to help us achieve major breakthroughs in solving our water problems in the years ahead - just as education and research through land-grant and state university system has helped advance scientific discovery and develop technology which have helped to make our country strong and productive.

What are Most Effective Means of Dealing with Water Problems in Water-Short Areas?

The awareness and concern of land-grant universities like New Mexico State for the state's progress, working effectively with sister institutions in the state, is evidenced in many ways. One of these is this Annual Water Resources Conference under the able leadership of Dr. Ralph Stucky and with support which he has had from the staff and administration of this institution. This Annual Conference is one of the most effective means of dealing with water problems intelligently. Adequate support for strong research and educational programs in the water resources field are a major means of dealing effectively with our water problems. I doubt if dollars can be spent more effectively in any other way for bringing about satisfactory solutions to our water problems than through this channel.

There are eight principal ways of solving water shortages in an area such as the Southwest and New Mexico. These are: (1) purification or treatment of wastes to make water usable; (2) reuse, that is, treatment after each major use, to permit a further reuse; (3) restricted or curtailed use through metering or a system of charges to discourage wastes and uneconomic use; (4) use classifications of water with a quality grade or standard consistent with the

quality required for a given use; (5) improved management of watersheds to catch and hold water to increase water recharge; (6) desalination; (7) weather modification through cloud seeding and other techniques; (8) importation from areas nearby or from a greater distance.

The organized effort most likely to achieve the desired goals of adequate usable water to meet New Mexico needs for the next 100 years will be determined largely by which ones of these eight approaches are chosen for major emphasis. For example, the first approach, "purification or treatment of wastes to make water usable" could be carried out in each local community and financed by a combination of state and local government effort, or by local (district and county) or statewide group action.

So could the next three methods, and in a limited way, both items (5) and (6), "improved management of watersheds" and "desalination," but for maximum results the last four approaches, "watershed management," "desalination," "weather modification," and "importation" will require organized effort involving more than local, district, county, or state action, or a combination of these. They will require a regional (interstate) effort and in the case of the last two (weather modification and importation), which perhaps hold greatest promise of almost unlimited quantities of usable water at minimum costs to meet the needs 100 years from now, national and/or international effort may be required.

Obviously the place to begin is at home - within the state. New Mexico has already done a great deal to put its own water house in order. It has developed a strong water resources research program which combines the competence of its three major training and research institutions at Albuquerque, Las Cruces, and Socorro. It has an effective State Planning Office and a State Engineer's Office with a state administration concerned and informed on the water needs and water problems of New Mexico. It has strong community and district groups or organizations and good working relationships with federal and interstate agencies concerned with water resources research, planning and development, and management.

During the next few years, say to 1980, New Mexico may be able to meet its most vital water needs through local, district, county, and state action, together with current federal and regional programs in water research, planning and development, and management. Beyond 1980, however, it appears that unless research can come up with new answers for old problems and the resulting technology enables us to utilize lower cost methods, we will have to look beyond the state for water supplies to meet increasing needs. Research and planning will need to be increased and more effective interstate, national, and international programs developed to meet growing needs in our most critical areas, of which the Southwest ranks at the top.

The economics or costs involved in water development programs will have an important influence on how much and where the various possible approaches will be applied. If New Mexico does have 2-3/4 million people by the year 2000, or 12 million by the year 2060, it will certainly need a lot more usable water than now. It would need at least three times as much as now in the year 2000 and perhaps fifteen times as much in the year 2060. Perhaps a desirable study would be to try to determine how much additional water for New Mexico can be secured through the use of each of the first five of the eight general methods mentioned earlier. The remaining three methods, namely, desalination, weather modification, and importation, could potentially supply almost limitless quantities of water. As yet, however, economic feasibility and/or technical feasibility place definite limits on the extent of their use. In the case of importation, interstate basin transfers would be involved and/or international importation, in which case political feasibility is an added problem. In such cases federal legislation or federal action would be essential to facilitate interstate and international agreements, compacts, contracts, or other arrangements involving both surface transportation of water and possible modified precipitation techniques.

A Program to Meet Future Needs

Any program developed to meet prospective water needs will involve at least three major areas: (1) research, (2) planning and development, and (3) management.

Research. An adequate, sound, systematic, continuing research program is the fundamental underpinning of satisfactorily meeting our future needs. Not only is research vital but lead time is needed in research if results are to be available in developing and applying new technology when such new technology is needed to solve perplexing water problems. Currently the federal government is putting about two percent of its total research budget on water resources research. The Office of Science and Technology's Committee on Water Resources Research has developed a ten-year plan for federal water research and indicated budget needs for the first five years of this ten-year period (1966-1975). Because of current heavy demands on the federal budget for other purposes, the fiscal year 1969 budget for water research is below that suggested in the ten-year plan. Federal expenditures for water research for fiscal year 1968 total $134 million, and the 1969 budget calls for $140 million. The suggested budget for 1971 is $199 million, or nearly $60 million more than the 1969 figure. At current rates of increase the 1971 goal will not be met and there will be a sizeable shortfall.

Currently the New Mexico Water Resources Research Institute, here at Las Cruces, with its affiliated institutions, University of New Mexico and New Mexico

Institute of Mining and Technology, has fourteen water resources research projects underway in cooperation with the federal government's water resources research program. Dr. Stucky and his group have developed a strong research program dealing with some of New Mexico's most acute water problems.

Perhaps the best first step New Mexico could take in preparing to meet its future water needs in the year 2000 and the year 2060 is to make additional state funds available for the water resources research effort. In many cases the money will do double duty since it will be matched with federal funds appropriated for the cooperative effort under the Water Resources Research Act of 1964, as amended in 1966.

Planning and Development. Federal water resources planning funds are now available through the Water Resources Council and average around $40 or $50 thousand per state for developing more adequate water resources plans. New Mexico has an effective State Planning Office and the second step should be a vigorous, concerted, continuing effort to develop the best possible water resources development plans for the state. Adequate state funds, along with available federal funds would make possible more adequate development plans and especially more adequate consideration of alternative plans which are essential for sound decision making by the Executive and Legislative Branches of the Government.

In addition to the development of plans and alternatives for water development should go a strong review function by the State Planning Agency to analyze thoroughly all development proposals so that sound devisions on development priorities, as well as types of construction and development projects can be made.

Under the Water Resources Planning Act of 1965 four regional planning agencies with basin commissions have already been established, namely, the Pacific Northwest River Basin Commission, the Souri-Red-Rainey River Basin Commission (North Dakota-Minnesota), the Great Lakes Basin Commission, and the New England River Basins Commission. There are some 300 or more major river basins in the United States but present thinking is to have perhaps twenty or so river basin planning commissions, one of which would include the Southwest. These regional planning agencies can be very helpful in assisting member states of their region with developing sound plans to solve their water problems. They also can perform a strong review function.

When sound plans are developed at both state and regional levels we are then in a much stronger position to proceed with adequate water development programs. Some of the larger projects will undoubtedly require federal action and possibly international action.

Management. We all know how important good water management on the land and in water project operations is, and we all know we can improve our management. This is a continuing problem but we should not forget that relatively minor improvements in the aggregate can achieve meaningful results. Good management can be advanced significantly by effective water information programs and conferences such as this, which bring together various water users, government officals, and citizens who, together, can help achieve the types of research, planning, development, and management programs vital to most efficient use of New Mexico's limited water supplies.

It has been a privilege to be with you these past two days and I am sure this Annual Conference has been beneficial to all of us. It certainly has helped me to get a better understanding of New Mexico's water problems. The grass roots interest and response evidenced in this Conference will help secure more adequate and meaningful solutions to New Mexico's water problems.