

WATER RESEARCH NEEDS FOR NEW MEXICO

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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.