

NOTES ON NEW MEXICO'S WATER PROBLEMS

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First, a brief word about the Pack Foundation. Charles Lathrop Pack was a lumberman who believed in the cause of conservation of our natural resources. He founded the Charles Lathrop Pack Forestry Foundation in the early '20's. Since that time the Foundation has contributed extensively in one way or another in its chosen field. In 1956, management of the Foundation became the responsibility of Mr. Arthur Newton Pack who has made Arizona and New Mexico his home for 25 years. In appreciation for Arthur Newton Pack's adopted states, the Foundation has allocated a large part of the resources of the Foundation to education and research on water and watershed problems in this arid Southwest. The hope is to help inform the people of this area on the facts and problem solutions on this all-important matter of water supply for now and for the future. It is a distinct pleasure for me, representing the Charles Lathrop Pack Foundation, to express these views on New Mexico's water problems.

Water supply, as in the past, will always be a limiting factor in New Mexico. Under foreseeable circumstances, there will always be more suitable land than there will be water supply to irrigate it. Nevertheless, irrigation still has some prospect of expansion in the State, chiefly in the San Juan Basin. Despite the limit on water, with good management there should continue for a long time to come to be a supply ample to meet the growing needs for increase in population, expansion in industry, and greater per capita use, and for continuation of most of the present and planned irrigated acreage except in certain ground-water areas. But in this connection, the importance of good management of the water resources needs to be stressed.

It should be noted that this discussion pertains only to water supply derived from streamflow or pumped from groundwater storage where there is a substantial annual recharge. It does not deal with the situation in the High Plains or a number of other localities in the State where the water currently being used consists chiefly of ground water that had accumulated over the ages. These areas require special consideration outside the scope of this paper.

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Among the opportunities for conservation and development of water supply in New Mexico are the following:

1. The full development of the state's share of the flow of the San Juan River and a few other limited water supplies.
2. The reduction of conveyance losses, including seepage, evaporation, and transpiration losses, in main streams and canals and in distribution systems.
3. The control of water-wasting vegetation on overflow areas, along stream channels and in reservoir basins, to reduce nonbeneficial consumptive use.
4. Reduction of evaporation losses in reservoirs.
5. More efficient irrigation practices to reduce the quantity of water that has to be delivered to the crop land.
6. Reduction of needless use and waste in domestic and industrial use of water.
7. Increasing the yield of water from the high watersheds.
8. Solving the sedimentation problem.

I should like to discuss the last two briefly.

Increasing Water Yields

Most of New Mexico's water supply is derived from the higher mountain watersheds where the average annual precipitation is 20 to 30 inches, of which approximately 3 to 10 inches is yielded as streamflow. This is chiefly water that has infiltrated into the soil mantle of the watershed and is subsequently fed into the streams or goes to help restore the water table. At the opposite extreme in the semidesert areas, the 8 to 10 inches of precipitation per annum, on the average, yields only one-twentieth to one-tenth of an inch of runoff. Practically all of this arrives in the drainage channels as over land flow from the occasional torrential rains.

Basic research has already indicated that by manipulating the plant cover on the higher yielding watersheds the amount of water that is transpired by the vegetation may be reduced and the yield to streamflow thereby be increased. What has not been worked out, however, are the practical operating measures, including the evaluation of costs and benefits, which would need to be applied in watershed management. There are so many conditions as regards climate, geology, topography, soil, plant cover, use and economic values to be coped with, even on a single watershed, that it is neither practical nor safe to deal in generalities on this subject. Specific guides must be worked out for the watershed manager for each major set of conditions.

The experiments and pilot tests that need to be undertaken to develop sound watershed management practices to increase water yield will require a dozen or more years of measurements to yield dependable results. What is most important, therefore, is that they be started immediately so that results will be available before the need comes for the additional water that can prudently be derived from the mountain watersheds.

The Control of Sedimentation

Probably the most serious water problem to be dealt with in New Mexico is the salvage of water now wastefully consumed by vegetation, which although not confined to them, has come in extensively on the recent sediment deposits within reservoir basins, on reservoir deltas, and on flooded areas along main streams, and have spread up and down the overflow areas of a great many of the main arroyos and intermittent streams of the State. These sediment deposits also create other difficulties including the destruction of storage space in reservoirs and the clogging and aggradation of stream channels with consequent aggravation of the flood, waterlogging, drainage, and other problems.

Some of this sediment is derived by sheet and smallgully erosion on the sparsely vegetated slopes of the tributary watersheds. By far the greater part of it originates during flood runoff from the side cutting and deepening of the channels which have already been excavated in the valleys of most of the subdrainages and from the gullies that are being cut headward in the few remaining untrenched tributaries. Anyone acquainted with the Rio Puerco, the Rio Gallisteo, and many of the tributaries of the Pecos River, for example, are familiar with the type of channel here referred to.

There was very heavy cutting in most of these valley trenches during the summer and fall rains of 1957. There appears to be no tendency for such channels as the lower stretches of the Rio Puerco, for example, to become stabilized and much sediment is carried out of them whenever there is streamflow of consequence.

The very useful program that the U. S. Bureau of Reclamation has under way to channelize the stream in the Middle Rio Grande Valley as a means of salvaging at least a portion of the water that is now being lost to the thousands of acres of phreatophytes, is in effect a large scale experiment to learn how to deal with the sediment that has already been carried into the Rio Grande in the Middle Valley. However, only very little is being done to solve the problem of keeping the excessive quantities of silt from coming into the main Rio Grande. Until that is done, all measures taken solely in the Valley are mere palliatives.

The limited studies that have been made or are under way at the present time are falling far short of supplying a solution to the chain-of-events

problem of erosion on the watersheds, sedimentation in major valley areas and reservoirs, and establishment of water-wasting vegetation on the sediment deposits. There is an obvious need for a fresh look at the whole problem and the development among the various agencies involved of a comprehensive program of research and investigations looking to the development of an effective program of action to stabilize conditions in the tributary channels and on the slopes of the watersheds.

Other Investigations Needed

As research that should be started now is needed to develop measures for obtaining the optimum yield of water from the watersheds and find a solution to the erosion-sedimentation problem, so also is research needed to determine suitable practices to reduce conveyance losses, to control water-wasting vegetation, to reduce reservoir evaporation, and to increase efficiency in irrigation. It is encouraging to note in various reports, including some prepared for this conference, that work is under way on many of these problems. However, the question naturally arises whether or not current research and investigations constitute a fully rounded out program adequate to meet the needs. The chances are the answer is "no". It would appear that a very important need is for a group or body headed perhaps by the State Engineer, by one of the State's research agencies, or by this Conference, whose function would be periodically to review the problems and the current research work and to strive by whatever means available to assure that an adequate program of research and investigation is being undertaken by the several agencies properly engaged in work in this field. It will be only by solving these problems, together with the development of presently unused streamflow, that New Mexico will be able to meet its growing needs for water. Should economical methods of inducing rainfall or reclaiming salt water be perfected, they would be just so much net gain to the economy and welfare of the State.

A major need in New Mexico, as in most other places, is informing the citizens of their water problems in order that they may develop adequate programs and policies to follow. This conference is an example of informing the public. In recognition of this educational need, the Pack Forestry Foundation has allotted three-quarters of a million dollars to be used mostly in New Mexico and Arizona during the next few years, chiefly for a program of information and education on watershed and related problems. Also, a limited program of research has been started to fill a few of the gaps in the watershed picture and to bring together the basic information for the education phase. At the present time the Foundation has a project under way in Arizona to evaluate the effects of past forest fires on watershed and related values. Some of the permanent demonstrations for use in the education phase are nearing completion at the interpretive center that has been established at the Arizona-Sonora Desert Museum near Tucson. It is expected that work will start on another interpretive center in New Mexico in 1958.