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DISCUSSION OF H. E. THOMAS' PAPER "ESSENTIALS  
FOR OPTIMUM USE OF GROUND-WATER RESOURCES."

by

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Mr. Thomas, with his far wider experience in matters relating to ground water, has much the advantage over me on this subject. I can speak only from the background of work done in Arizona and Colorado. My discussion, therefore, is of limited scope.

Mr. Thomas has leaned heavily upon legislative controls over ground water as a means of attaining optimum use of the resource. In this I find myself in wholehearted agreement. Ground-water development has been and in the future will be carried on by private enterprise. This being so, we are faced with the varying attitudes of individuals on the matter of private and public interest. Human nature, being what it is, will react to a given situation according to the individuals own best interest. We can hardly blame him for that. Public interest or a move in the direction of "the greatest good for the greatest number," as Mr. Thomas puts it, is quite secondary to him. I can see no other solution, therefore, than the employment of enforced direction to accomplish the goals of proper use of our ground-water resources.

Let us discuss conditions in the eastern half of Colorado. Ground water is of relatively minor importance in the west half. There are two distinct and different

types of ground water occurrence. In one there is no association or at most a very minor one, with flowing streams. Each must be treated differently both from physical and legal standpoints. It is therefore necessary to consider them separately in regard to utilization.

The first type of occurrence--that in which there is no immediate association with stream flow--must be further subdivided into three types because of physiographic and geologic differences. One of these is represented by long narrow tributary valleys of the South Platte and Arkansas Rivers. Another is the High Plains area in which recoverable ground water occurs in the extensive Ogallala formation. The third relates to artesian basins of which there are several.

The water ways in the tributaries are normally dry but subject to infrequent floods. These floods are the source of replenishment. Although there are reaches of some of these streams in which storage may become maximum and overflow occur, in general they have attained equilibrium through the centuries without overflowing. This equilibrium has been established through normal ground-water movement to the major stream some distance away.

Since the width of the water bearing gravels is restricted to from one to four miles, irrigation development has tended to be concentrated. The operation of the wells has not only produced severe water-table depressions in the valley troughs but there exists also mutual interference

between wells. Since in general there is no overflow or use by phreatophytes, there can be no salvage and water is being drawn from storage. In a number of places, use has been in excess of replenishment and water tables in heavily pumped areas have dropped significantly. The attendant reduction in well capacity cannot be improved upon by deepening because of the proximity of impermeable rock. Thus we have a serious problem of a relatively short life of the resource. I'm sure we do not all agree with a former State Engineer of New Mexico that we should not expect the life of a ground-water resource to be more than 40 years. Certainly I would not consider such a short life the result of good management, but we must also consider realities. Boom and bust seems to be the American way of life when it comes to dealing with natural resources.

What do we wish to do? Exploit the storage by a sustained high pumping rate for a short time or prolong its life by limiting the withdrawal rate. The individual chooses the former position, because he may be able to reap the harvest within his lifetime. Public policy dictates the latter course. Now that we have the problem, can we find a solution? The obviously most wanted solution would be that of increasing replenishment by some means. A more painful method would be a cut-back in use and of course no additional development. Either one or both would be helpful in attaining optimum use. In these cases individuals or groups are not financially able to institute a program

for increasing replenishment. If one could be found, it would have to be publically supported. There does seem to be some merit in the small watershed program as being effective in delaying and prolonging stream flow. It has promise in that benefits can accrue to two kinds of interests. There must, however, be a spirit of mutual participation financially between the two. To facilitate such cooperation there needs to be enabling legislation.

The Ogallala formation is very great in extent and yields water rather readily. It covers a large part of the most eastern part of the state and continues into Nebraska and Kansas. Drainage is poorly developed over a considerable part and replenishment is from precipitation on the area. Ground-water overflow in Colorado occurs in two widely separated streams forming their base flow. Because wells can be obtained nearly anywhere in this formation, development has not been concentrated as has happened in the narrow valleys. The depth to the water table is considerably greater than average and has the effect of setting an automatic limitation on the rate of development. The economics of the situation is very helpful in providing more time to evaluate the effect of withdrawals. With time on our side an opportunity exists to plan a management program. But what good is a program if it cannot be put into operation? Certainly the owners of the overlying lands will not submit to restrictions on use voluntarily. Again we must look for help from legislative controls.

We have four important areas in which water occurs under pressure; the Grand Junction, Denver, Arkansas Valley and San Luis Valley basins. For all intents and purposes the overflow from these basins is not directly associated with stream flow. As far as our courts are concerned they would be considered as non-tributary. As such they would receive legal treatment different from ground water that is tributary.

The Denver and Grand Junction artesian basins are both composed of several separate and independent strata. Each is insulated from the others and thus each becomes a separate source of supply. In the Denver basin as the pressure dropped off, wells were drilled to the lower strata. Some were deliberately so constructed as to draw water from more than one source. Some were so poorly constructed that high pressure water could escape to zones of lower pressure. Both of these conditions lead to waste. The individual who causes these conditions has not been made responsible for the resultant damage. Until now with our 1957 statute there has been no control over well construction. Police power now exists but it is not as strict as it should be. No attempt has been made to correct previous faults. Conditions in the Grand Junction basin are similar to the Denver basin. The San Luis Valley basin is by far the largest water producer. Here the sand strata are not continuous and natural intermingling of pressures can occur. This does not mean that careless well construction can be tolerated. Leakage above

the topmost confining stratum should not be permitted. Yet both these conditions and deliberate waste at the mouth are notorious. Water use in this valley is tremendous and yet the effect has not been nearly so great as would normally be expected. Replenishment occurs along the perimeter of the valley where streams cross the exposed strata. Absorption of these streams must be high and if the basin were full, water would be refused at these points to go on down to surface water users. Someone is being injured without knowing it.

Legislative controls over artesian developments are most urgently needed. This is rather obvious when we consider the probability of defective wells being drilled and how easy it is to waste the water. Surveys need to be made to discover the characteristics of the resource and management plans perfected for its use. The water should be used and not hoarded, but its use should be such as not to permit waste and be limited to reasonable extent of use. This will not be done voluntarily--the state must step in with a plan and back it up with authoritative legislation.

Mr. Thomas has brought to our attention the relationship existing between ground water and surface water and the possibilities of a conflict of interest between them. We have this conflict in Colorado in a most aggravated form. It is our knottiest problem. Injury to surface right holders has been claimed and some of these claims are no doubt valid. Yet the dual use of these two waters provides for

a program that makes for optimum use of both. Ground water is taking the place of surface storage to equate the supply.

Our development of surface water for irrigation dates back 100 years. For 80 years these waters have either been fully or overappropriated east of the mountains. Gravels, dry before irrigation, have been filled with water so that they now constitute a source of ground water for irrigation wells over a large portion of the irrigated area. A reservoir has been created that can be quickly drawn upon for supplemental water. As such it is most valuable. However, it is quite obvious that the wells are intercepting ground water that is moving towards flowing streams carrying appropriated water. Property rights exist in these appropriated waters that belong to someone and antedate any kind of right a ground water user may have instituted or assumed.

The property rights of the surface water users are well settled. This is not so for the ground-water user. The significant use of ground water dates back only about 30 or 40 years. If such rights were to be adjudicated on the basis of river appropriations, they all would be junior to surface water rights. If they have any rights, they are certainly proscriptive and only the courts can determine their value. No proper suit has been initiated to put this matter squarely before the Supreme Court, but decisions from that Court in the past would indicate that if injury could be proven, the ground-water user would be enjoined. This matter of proving injury is a tough road



block for the surface-water user to get around. The involvements are terrific. It cannot be handily demonstrated that any one individual is causing the injury, rather it is a matter of hundreds or even thousands of ground-water users that are causing it.

The surface-water user is responsible for putting the ground water into the reservoir in the first place albeit inadvertently. He could claim that he has a prior lien on it. However, if he has disturbed the regime of the river to the injury of a downstream or even an upstream user, he is in trouble with the water laws of the state. Since, in nearly all these cases, the ground-water user is also a surface-water user--who will start any injunction proceedings? There are some whose hands are clean but those in that category have a monumental task of taking on a thousand defendants.

So we arrive at a point wherein the dogs and cats find they about have to live together. Now if that is to be the case, can we find an area of compromise and cooperation? If we can, we quite likely will find a method of management that will result in optimum use. It is a most fertile and intriguing area. What could be more efficient than the filling of the ground-water reservoirs in times of good river flows and then drawing upon them in times of low flow. Actually we are doing just that now. The only question is, are we satisfied to let this be an inadvertant adjunct to the irrigation program or can we improve on it by intelligent

planning. Certainly it would make sense to capture all the water we could that might be surplus and store it for future use. Of course, should we get the reservoir too full we might get into trouble with water tables too high. We would need to watch that. A further benefit would be an improvement of the base or winter river flow for the enjoyment of surface-water users. The idea has so much in its favor that it should be explored further. As with all compromises there must be give and take between the two interests. Someone could be slightly injured but it is likely that that someone would always be the same guy.

It is rather obvious to you by now that it is my opinion that good management cannot come about by people voluntarily subscribing to a plan wherein they expect to suffer any injury no matter how small. The answer, perforce, implies compulsion through legislation. The kind of legislation is important. It must be constructive and equitable to the end of benefiting the most people. Whether such legislation should follow the general rule of priority of appropriation or the American rule of reasonable use is not too important. Either one must be so framed as to best meet the needs of the people. It needs to be flexible to permit reasonable use of the resource, not the hoarding of it. I believe optimum use will follow as a corollary.