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WHAT IS AND WHAT ISN'T A "BRACKISH GROUND-WATER RESOURCE?"

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The theme of this article is that brackish and saline ground water is subject to the same rules, both scientific and administrative, that govern the flow and use of ground water in general. New attention being devoted to New Mexico's brackish-water resources does not imply that they are newly discovered, that they are unrelated to more conventional water resources, or that they can be developed without attention to the constraints that apply to other ground-water supplies. As usual, it is not so much the gross volume of water that might be present, but the costs and effects of withdrawing it, project by project, that determine its usefulness as a resource. Nothing in this paper is new; it is here as a reminder that what we know about fresh-water resources applies to brackish and saline water as well.

Inventories of total ground water in place in the aquifers may appear important, but are really only of academic interest. In the San Juan Basin in the northwestern part of the state, it has been estimated that there are 300 million acre-feet of fresh water and another 50 million acre-feet of brackish water in the aquifers, all within reasonable drilling depth, which would be enough to supply New Mexico at the present rate of depletion for a century or so. Of only slightly more relevance is the same author's estimate of "recoverable" water, less than one-half percent of the total, but even here the huge numbers of wells, the great lengths of pipeline, and the pumping costs that are implied, put most of this "recoverable" water beyond practical reach. Whether a particular amount of ground water can be withdrawn at a cost someone will pay, and with acceptable effects on other resources, is what matters.

People always want to know whether a supply is "sustainable." There is a spectrum of conditions under which ground water is produced, from "mining," simply running down a stock of water stored in the ground, at one end of the spectrum, to intercepting water that would otherwise be streamflow at the other. Ground-water pumping generally involves a component of each, with the "mining" fraction diminishing over time, and the effect on streamflow increasing. Brackish water in an aquifer system is generally at greater depth than better-quality water, or is in an aquifer that is not stream-connected, and is therefore much more likely to be produced by mining. Water that is still more saline is generally even deeper and less in communication with surface streams, and would be produced almost entirely by mining.

Ground-water mining is clearly not sustainable for the long term: the stock is steadily depleted, and eventually runs out. Then what? If users have come to depend on the water but no Plan B is ready to be put in place, discomfort results. Ground-water mining commonly leads to some other negative symptoms: increasing cost over time (attributable to the increasing pumping lift required), declining water-quality as deeper parts of the aquifer contribute proportionally more of the amount pumped, and irregular subsidence of the land surface. Decline in water levels is, of course, greatest in and closest to a pumped well, so that the resource may be depleted only locally, in the sense that individual wells will no longer produce at economic rates. A well field can be exhausted in that sense, even though only a tiny fraction of the water in the aquifer may have been withdrawn. It can happen even if the rate of pumping is much less than the rate of recharge to the aquifer as a whole. This is the predictable future of the City of Gallup's wells, in some of which the drawdown of water levels has already been more than 900 ft.

The supplies of brackish water in bedrock beneath the High Plains Aquifer in eastern New Mexico are available for mining. In Lea County, for example, there are significant volumes of water ranging in quality from fresh to brine, at depths ranging from less than 1,000 ft to about 7,000 ft, but they would be developed on the same terms as the High Plains Aquifer itself has been: continuing decline of water levels, leading to eventual local exhaustion.

For a supply to be sustainable over the very long-term usually requires that it be taken at the expense of streamflow, because that is renewable (albeit with great variation, in a climate like ours) from rain and snow. This generalization applies to ground water pumping as well as to diversion of water from a stream. The rate of depletion of streamflow due to pumping from wells is governed by the properties of the aquifer (its permeability, and whether water in it is confined by overlying impermeable material, or unconfined), the distance from the stream, the pumping rate, and time. In New Mexico, most streams are fully appropriated, and any effect on streamflow due to pumping of brackish water would have to be offset by retirement of equivalent surface-water rights that are already in place.

In some cases, production even of brackish water would affect streamflow significantly. The Capitan Reef aquifer east of Carlsbad supports high well-yields, but one modeling analysis suggests that pumping from as far as 25 to 30 miles from the Pecos River would lead to depletion of river flow equivalent to about 29 percent of the rate of pumping by the end of 40 years. The brackish water could be pumped only if Pecos River water rights to offset that depletion were retired.

Even if a well is far from the river, and the bottom of the well is far above the level of the river, pumping from it will intercept water that would eventually be discharged to the river and be accounted as streamflow. Similarly, even if a well taps only a very deep, brackish-water zone in the aquifer, upward leakage from the aquifer, which contributes to the river's flow, will be diminished. In the latter situation, which would apply in the Rio Grande Valley just as does the former, almost all of the water would be produced by mining for a long time, but the effect on streamflow would always be rising. An insidious problem is that, even if pumping is stopped, the effect on streamflow does not stop at once but declines only gradually.

There is one other possibility–salvage of water that would otherwise be evaporated, under natural conditions, or transpired by vegetation that we don't care about. This is the case of ground-water basins that are not drained by a stream, in which recharge enters and passes through the ground-water system, then is discharged in the middle of the basin to a playa lake where it evaporates, or is "pumped" and transpired by salt cedar or other plants. The Estancia Basin is an example: some part of the water being pumped for irrigation and other uses is being mined (water levels are continuing to go down), and some is water that would otherwise be discharged to the playa lakes and simply evaporate.

In some basins, the brackish water is simply part of a body of ground water that includes some good-quality water already in use. Drawdown due to production of the brackish, or even saline, water may affect water levels in the fresh-water area. In these situations, water-rights administration may not distinguish between brackish water and fresh–except to invoke special guidelines to protect the remaining fresh water. This is the situation in part of the eastern Tularosa Basin.

Using brackish or saline water automatically presents an environmental problem to be solved: what is to be done with the highly saline concentrate left over from the desalination process? Is there a suitable deep aquifer zone into which it can be injected? Or would evaporation ponds be appropriate?

Legal control of the state's brackish and saline water resources is not as well defined as it is for fresh-water resources. Section 72-12-25 of the New Mexico statutes appears at first glance to take much of the poor-quality ground water out of the State Engineer's jurisdiction, but that issue is still debated.

Brackish and saline waters do represent an important resource for New Mexico, but analysis of the effects on other aspects of water resources, and on other parts of the environment, of any proposed project is at least as important as it would be for a new conventional fresh-water development. A useful brackish-water resource is one that meets all of the tests.