

GROUNDWATER MANAGEMENT
STUDY TOUR 2002

OVERABSTRACTION AS A FAILURE IN OBLIGATIONS

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Water produced from wellfields has many happy benefits and a few insidious costs. The benefits are known to all. The penalties are often deferred or hidden, and are less-widely recognized. The Albuquerque Basin water users have recently awakened to some of the deferred effects.

On the positive side, wellfields are reliable, clean, cost-effective, and generate expanded supplies from access to the stored aquifer resource.

The negative effects include:

- Depletion of the stored and flowing resource
- Increased cost of pumping
- Wetland impacts and habitat degradation
- Earth fissures and subsidence
- Failure to deliver water obligations

Physical depletion of the stored-aquifer supply is not a problem in the Albuquerque Basin. About 3000 million m³ has been depleted to date from a 100,000 million m³ stored resource.

Increased cost of pumping is not a local problem. The large municipal wellfield of Albuquerque is among the low-cost operations in the American southwest.

Surface water and wetland impacts in the form of drying-up supplies or altering habitat have become a problem. The habitat for endangered species on the Rio Grande in New Mexico has been declared critical for several riparian species. To date, the drying conditions have been blamed on every managed and natural water operation, except the local wellfield. The groundwater flow models used for administration, however, account for $6 \text{ m}^3/\text{sec}$ of stream depletion from a baseflow of under $20 \text{ m}^3/\text{sec}$. That aspect largely is overlooked in current proposals for habitat flow restoration.

Earth fissures and subsidence are in evidence in the Albuquerque downtown, a few blocks from this conference site. Wellfield-induced subsidence receives little notice in Albuquerque except as a design factor for new building foundations. Many old buildings have been rehabilitated.

Failure to meet downstream inter-state compact and international treaty obligations is another deferred effect of wellfield development in the Rio Grande Basin. New Mexico has accepted the obligation to deliver water to Mexico and Texas based on an index of basin inflow and outflow (Figure 1). The obligations pre-date the development of large municipal wellfields.

New Mexico has the right to consume about $5.3 \text{ m}^3/\text{sec}$ from the Rio Grande for managed agriculture and municipal uses for the Albuquerque Basin. It is obliged to deliver about $31 \text{ m}^3/\text{sec}$ downstream to Mexico and Texas. Unmanaged consumption from riparian vegetation and open water in the Albuquerque Basin is as large as the managed consumption, but is relatively constant and is less subject to control.

New Mexico claims a position among the first in the history of water management to recognize the importance of administering groundwater and surface water as an interrelated resource. The Pecos Basin was so declared in the decade of the 1930's and the Albuquerque Basin in the 1950's. The interrelatedness is long recognized and carefully administered. New uses of water by wells have been required to offset their effects on the river for the last 50 years. The offsets however, have been done piecemeal for each administrative action in isolation from the cumulative effect on the stream.

The more gradual, cumulative and hidden effect is the magnitude of the pending impacts. Stream depletion grows to become well established before becoming apparent, after which time action to manage the depletion may be ineffectual.

Figure 2 illustrates the Albuquerque situation. Wellfield production has grown through history. Water produced from aquifer storage is a substantial benefit to the basin supply. Stream depletion has grown to be an increasing fraction of wellfield production. With future wellfield production at the level of permitted use, stream depletion grows to balance most of the wellfield production. The problem arises because wellfield use is permitted at levels ($8.48 \text{ m}^3/\text{sec}$) greater than the New Mexico right to consume the flow of the Rio Grande ($5.28 \text{ m}^3/\text{sec}$). The availability of aquifer storage justified the larger level of wellfield use temporarily. If all of the New Mexico allotment is applied to offset the eventual wellfield effects, then New Mexico will fail to meet downstream obligations. At that point, shutting down the wellfield would be ineffective at restoring flow for decades. The principle is that wellfields safely can expand supplies temporarily, but cannot do so permanently without risking failure of other obligations.

The Albuquerque Basin situation brings to light some of the delayed and hidden aspects of groundwater development. It illustrates to resource managers that the long-

term issue of most concern is not necessarily dewatering the resource base or the rising cost of operation, but may be the associated habitat degradation and failure of the capacity to meet obligations.

Alternative water-management operations such as local recharge or flow augmentation can address habitat restoration. Few alternatives are apparent to manage the accumulated depletion effects on basin waters after wellfield production exceeds, for many years, the entitlement to interrelated stream flows. Overabstraction can be conceived of as that level of wellfield abstraction that no longer helps, but begins to harm, an organization's ability to meet its internal and external obligations.

Attachments: Figures 1 and 2.

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FIGURE 1
TRANS-BOUNDARY WATER DELIVERY OBLIGATIONS

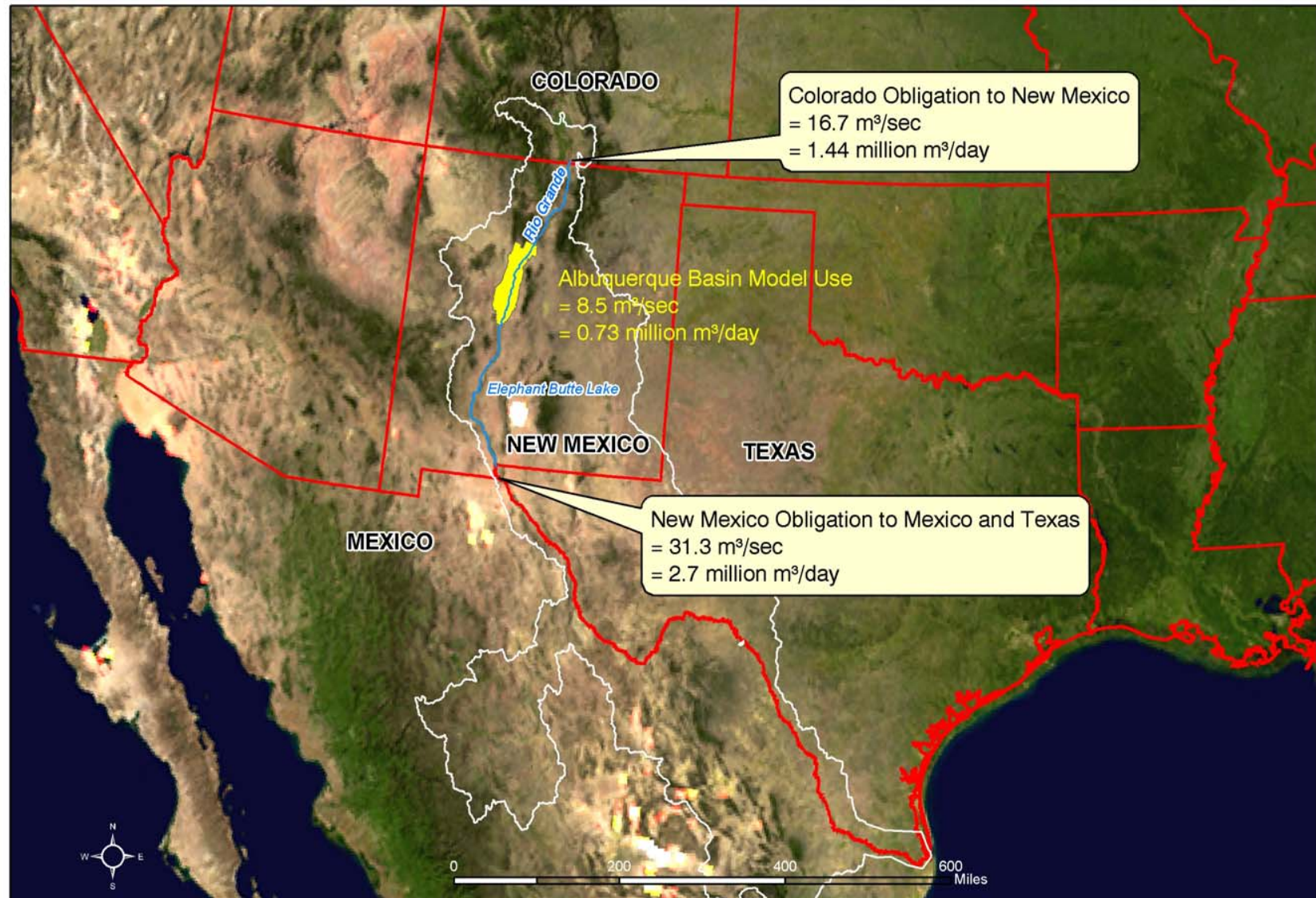


FIGURE 2
WELLFIELD OVERABSTRACTION EFFECT ON DOWNSTREAM OBLIGATIONS

