Rio Grande Salinity Management — *A Real Possibility?*

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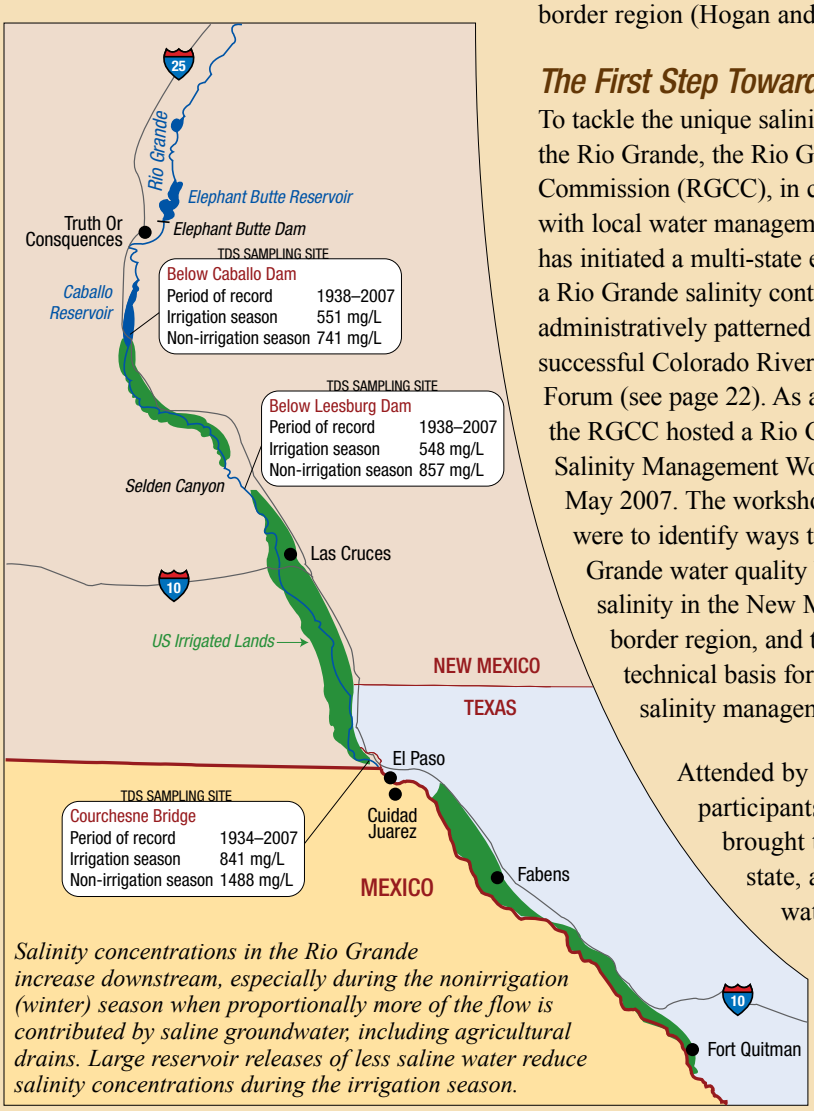
Increasing salinity in the Rio Grande from Elephant Butte Reservoir in New Mexico to Fort Quitman, Texas has been documented for roughly 100 years (Stabler, 1911), and predates construction of the Federal Rio Grande Project in this area.

Recent research has identified natural sources such as the upwelling of deep-circulating groundwater and geothermal waters as the principal salinity contributors in the region. Additionally, these natural salinity inputs appear to be localized, suggesting that source control and treatment may be feasible. Phillips and others (2003) showed that salinity increases from about 40 milligrams per liter (mg/l) to about 2,000 mg/l in a 750-mile stretch of the Rio Grande occur in steps, with large increases localized at the southern ends of sedimentary subbasins, for example, at San Acacia, Elephant Butte (Truth or Consequences), Selden Canyon, and the El Paso Narrows (see map). In order to quantify the flux of brines discharging from these sedimentary basins, isotopic data have been used to fingerprint and separate potential sources (Hogan and others, 2007).

Investigations in the El Paso Valley (Hibbs and Merino, 2007) attribute a different geologic source, specifically, the dissolution of a buried evaporite deposit, as the primary source of salinity near Fabens, Texas. Hibbs notes, however, that "use of an already saline alluvial groundwater for irrigation appears to accelerate evaporative salinity enrichment of irrigation water, leading to greater potential for development of salt-encrusted soils."

Recent water quality studies point to the feasibility and desirability of managing salinity inputs to the Rio Grande. Utilization of water resources in the Rio Grande Project area is restricted where highly saline water results in reduced potable water supplies, smaller crop yields, and soil and groundwater deterioration. Salinity concentrations in the Rio Grande are higher in the winter, when the flow is comprised mostly of relatively saline shallow groundwater. In irrigation season, reservoir releases of fresher water dilute the salinity. The higher salinity levels currently preclude the cities of El Paso and Ciudad Juarez from using the Rio Grande for municipal water supply in nonirrigation months.



Salinity concentrations in the Rio Grande increase downstream, especially during the nonirrigation (winter) season when proportionally more of the flow is contributed by saline groundwater, including agricultural drains. Large reservoir releases of less saline water reduce salinity concentrations during the irrigation season.

Preliminary studies indicate that interception may be feasible where highly saline groundwater upwells into the shallow aquifer system. For example, one shallow monitoring well in the El Paso Narrows area yields groundwater with a total dissolved solids concentration of over 30,000 mg/l. Interception through pumping wells of even modest volumes of such highly saline groundwater in source areas prior to its commingling with surface water could significantly lower salinity levels in the Rio Grande and increase available potable water supplies in the critical Texas/New Mexico border region (Hogan and others, 2007).

The First Step Toward Management

To tackle the unique salinity challenges of the Rio Grande, the Rio Grande Compact Commission (RGCC), in collaboration with local water management entities, has initiated a multi-state effort to create a Rio Grande salinity control program, administratively patterned after the successful Colorado River Salinity Control Forum (see page 22). As an initial step, the RGCC hosted a Rio Grande Project Salinity Management Workshop in May 2007. The workshop objectives were to identify ways to improve Rio Grande water quality by reducing salinity in the New Mexico-Texas border region, and to establish a technical basis for a multistate salinity management program.

Attended by over 100 participants, the conference brought together federal, state, and local water managers, researchers, and water user groups from Texas, New Mexico,

Colorado, Arizona, Utah, California, and Chihuahua who were interested in Rio Grande salinity issues. The workshop was effective in improving understanding of sources of Rio Grande salinity, particularly in the Rio Grande Project region, defining socioeconomic implications of increasing salinity, and exploring potential salinity management strategies to reduce impacts and extend existing water supplies in this fast-growing area.

Discussion focused on how elevated salinity can restrict the full utilization of water resources by reducing 1) available potable water supplies, 2) crop yields and profitability, 3) the quality of urban landscapes, and 4) soil and groundwater quality. All water-use sectors, including residential, commercial and industrial, agricultural, and water utilities themselves are affected by adverse economic impacts of elevated salinity. Some specific issues that were covered include:

- Elevated salinity is not addressed by conventional municipal supply treatment; a separate desalination process is required.
- Consumer preference is the ultimate discriminator for acceptable dissolved solids in municipal water supplies.
- The Lower Colorado River Basin states' salinity damage model estimated total annual quantifiable salinity damages of $376 million for all categories.
- A rigorous economic evaluation of Rio Grande salinity damages is needed to better quantify the impacts of elevated salinity, and to determine what level of investment in salinity control is appropriate and justified.
- Previous studies including those from other regions can be helpful, but Rio Grande economic damages must be based on local conditions.

Additional information and materials from the workshop are available on the web at *www.ose.state.nm.us/special_projects_rgpsmw_menu.html*.

In the Works

An effective salinity management program will require both commitment and active participation from local entities, as well as state and federal water managers. The formation of a multistate coalition of stakeholders to develop a Rio Grande salinity management program in the New Mexico/Texas border region is in the beginning stages. Proposed objectives for the program include:

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- Develop a work plan for funding and implementation of target projects where reduction in salinity could increase the available water supply.
- Attain congressional support for federal funds for salinity control and mitigation projects.
- Identify specific project sites where saline water is adversely affecting the human use of surface water or groundwater and where reductions in salinity could increase the available water supply.
- Conduct feasibility studies for salinity capture and treatment in the Rio Grande Project region.

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References

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