GROUNDWATER AVAILABILITY AND DEMAND

A major component of this study and its significance to the regional water planning process is the estimation of water-supply availability from the Igneous aquifer system and its potential to meet current and long-term water-supply needs.

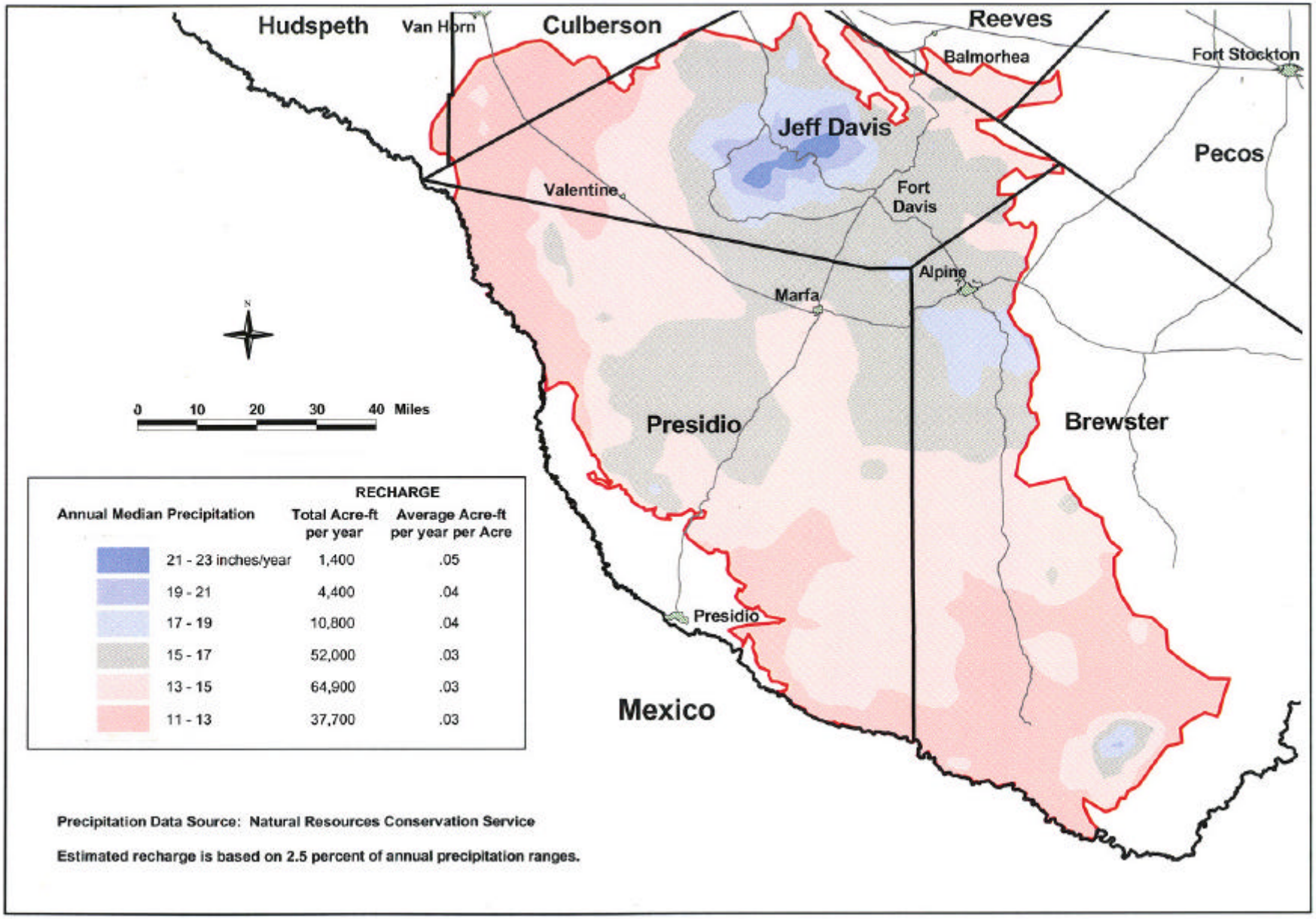
Recharge

The amount of recharge previously estimated by the TWDB for each of the three Igneous aquifer areas delineated by the TWDB is: 5,800 acre-ft in Brewster County; 2,500 acre-ft in Jeff Davis County; and 8,500 acre-ft in Presidio County. These estimates were based on the assumption that 2.5 percent of average annual rainfall (16 inches) is converted to recharge over the 785 mi^2 delineated by the TWDB.

For the purpose of this report, 2.5 percent of median annual rainfall was assumed for the entire 8,200-mi^2 aquifer area. However, rather than assuming an entire area average rainfall, the 2.5 percent was applied separately to each median rainfall polygon shown in Figure 4 and then summed. This allows for a higher volume of recharge per unit surface area in areas experiencing higher rainfall rates. Based on this methodology, average annual recharge to the Igneous aquifer system is 171,200 acre-feet per year (Figure 11). As explained previously in the Hydrogeology section of this report, the actual rate of recharge at any specific location is also a factor of concentration of rock fracturing, surface drainage patterns, and soil infiltration potential.

Recoverable Groundwater in Storage

The assumptions used to derive estimates of the volume of recoverable groundwater within each of the three areas delineated by the TWDB were: (1) that the average saturated thickness of the igneous rocks is 600 ft, (2) that porosity is 10 percent, and (3) that 30 percent of groundwater in storage is potentially recoverable. Based on these assumptions, the following estimates were made: 3.1 million acre-ft in Brewster County; 1.3 million acre-ft in Jeff Davis County; 4.6 million acre-ft in Presidio County; for a total of 9.0 million acre-ft. If these assumptions are extended across the 8,200 mi^2



ESTIMATED AVERAGE ANNUAL RECHARGE
(Based Only on Precipitation)

FIGURE 11

LBG-GUYTON ASSOCIATES

of land within the newly designated boundary, and the fracture porosity is more appropriately set at 5 percent, then the volume of groundwater that is potentially recoverable might be as much as 47 million acre-ft. However, due to the hydrologically disconnected nature of the aquifer, the actual amount of water that might be expected to be recoverable is most likely much less.

It is important to note, however, that the concept of "potential recoverability" is based on the unrealistic assumption that a sufficiently large number of wells spread throughout the aquifer extent can be installed to extract all of the potentially recoverable groundwater. The concept is also based on the assumption that the aquifer is sufficiently homogeneous to permit the pumpage of the potentially recoverable groundwater. There are, however, significant engineering and economic limitations to the amount of groundwater that can be pumped from an aquifer.

The concept of availability does not suggest that all of the potentially recoverable water within an aquifer is either accessible to or producible by all users. In the narrowest sense of the term, then, availability should be regarded as an estimate of the volume of groundwater that a specific user or group of users might reasonably expect to pump from a designated part of an aquifer, based on limitations imposed by financial resources, the depth to water, the cost of pumping, the efficiency of production and distribution systems, and water quality.

Further work will be required to address this issue, so the above estimate should be regarded only as preliminary. For example, it will be necessary to conduct more detailed geophysical evaluations and pumping tests of the igneous rocks to derive better estimates of porosity, saturated thickness, and yield. It will also be important to investigate the extent of hydrogeologic communication between different water-bearing zones.

Demand

Water demand projections, as listed in the 2001 Far West Texas Regional Water Plan (Table 6), show that water demand in Alpine is expected to increase from 1,524 acre-ft in the year 2000 to 2,461 acre-ft in by the year 2050. In Fort Davis, the demand will decrease from 236 acre-ft in 2000 to 225 acre-ft by 2050. Marfa's demand for groundwater is projected to increase from 977 acre-ft in 2000 to 1,189 acre-ft in 2050. Some increase in rural-domestic water demand is expected, while no increase is expected for irrigation, livestock, or other non-human drinking water use. Groundwater availability from the aquifer system appears to be more than adequate to satisfy the expected demands not only of the above cities, but also of other water users (FWTRWP, 2001).

Table 6. Projected Municipal Water Demand (in acre-feet/year)

	YEAR					
	2000	**2010**	**2020**	**2030**	**2040**	**2050**
Alpine	1,524	1,668	1,891	2,055	2,243	2,461
Fort Davis	236	241	240	236	230	225
Marfa	977	1,067	1,175	1,282	1,228	1,189

Source: 2001 Far West Texas Regional Water Plan.