

WATER LEVEL FLUCTUATIONS

Results and Discussion

All groundwater levels fluctuated throughout the growing season at each well and at each location (Fig. 23-27). At times, the river had an impact on these fluctuations at the Canadian and Pecos locations. For example, if the river level rose suddenly the water in the wells closest to the river responded similarly. This affected the water use calculation when this occurred.

A river well was installed at the Colorado location; however, there were very few events where surface runoff occurred. The data suggests that the river flows did not coincide with changes in the water levels at these wells. This was probably because the wells are not in the riparian zone of the river and the soils are clay with low specific yields and hydraulic conductivity.

Canadian Location

A significant correlation ($p < 0.05$) resulted when comparing hourly water levels between Wells 2, 3, and 4 during the 2001-growing season. Wells 2, 3, and 4 were poorly correlated with the river well although it was significant (Table 28). However, Figures 23 shows that the wells have similar fluctuations to those that occurred in the river.

Table 28. Coefficient of determination (R^2) for hourly water level fluctuations at the Canadian Location during the 2001 growing season (4/25/01 - 10/4/01).

	River	Well 2	Well 3	Well 4
River	1	0.28	0.20	0.32
Well 2		1	0.99	0.99
Well 3			1	0.99
Well 4				1

Appendix B contains the ANOVA and regression formula.

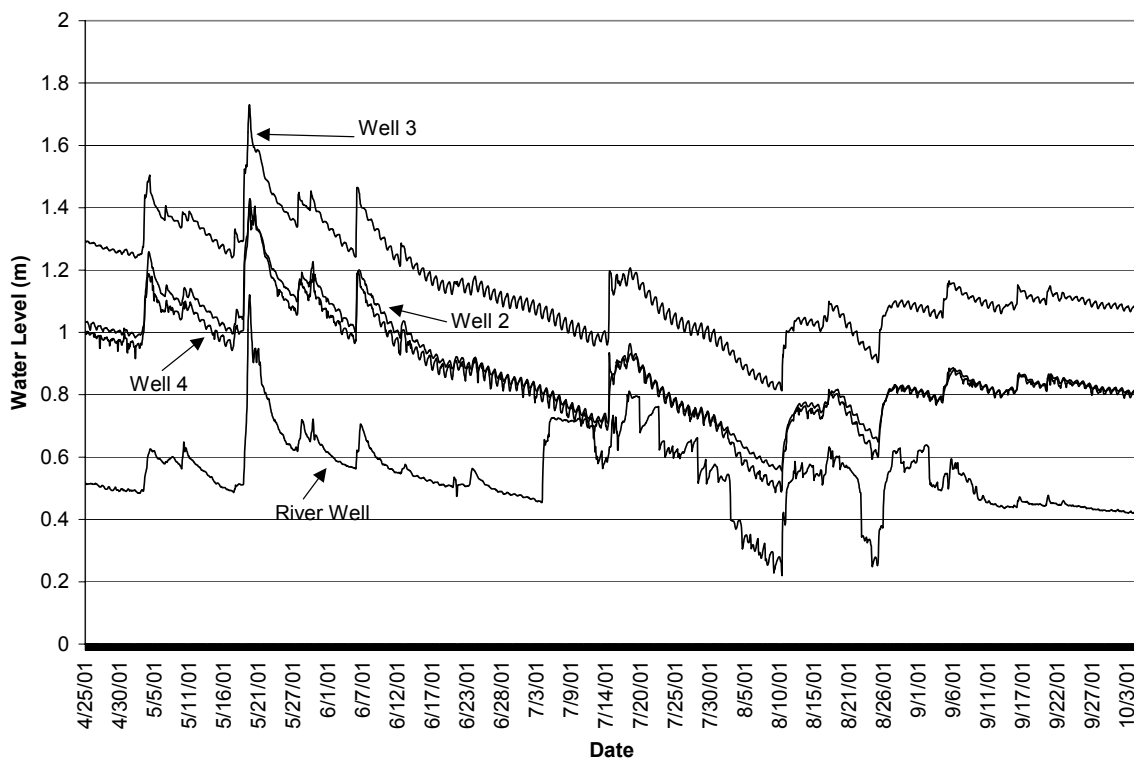


Fig. 23. 2001 Growing season groundwater levels at the Canadian location.

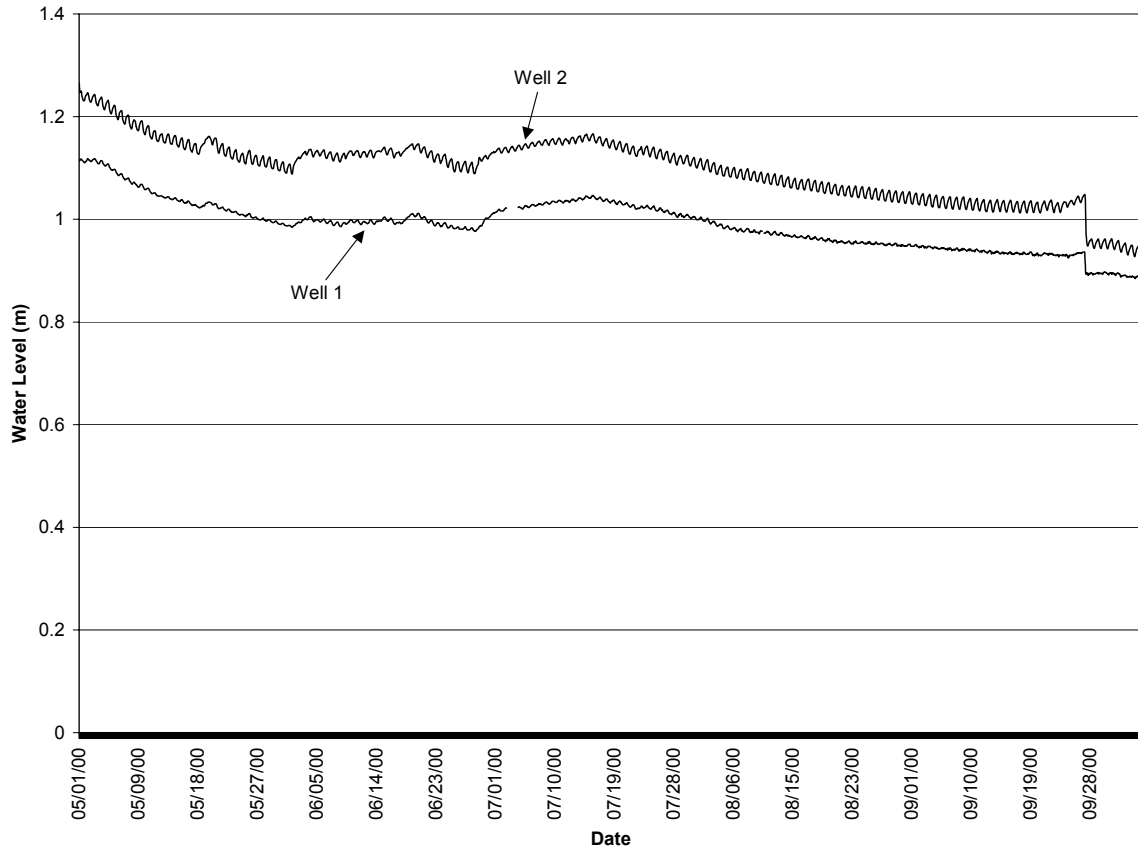


Fig. 24. 2000 growing season groundwater levels at the Colorado location.

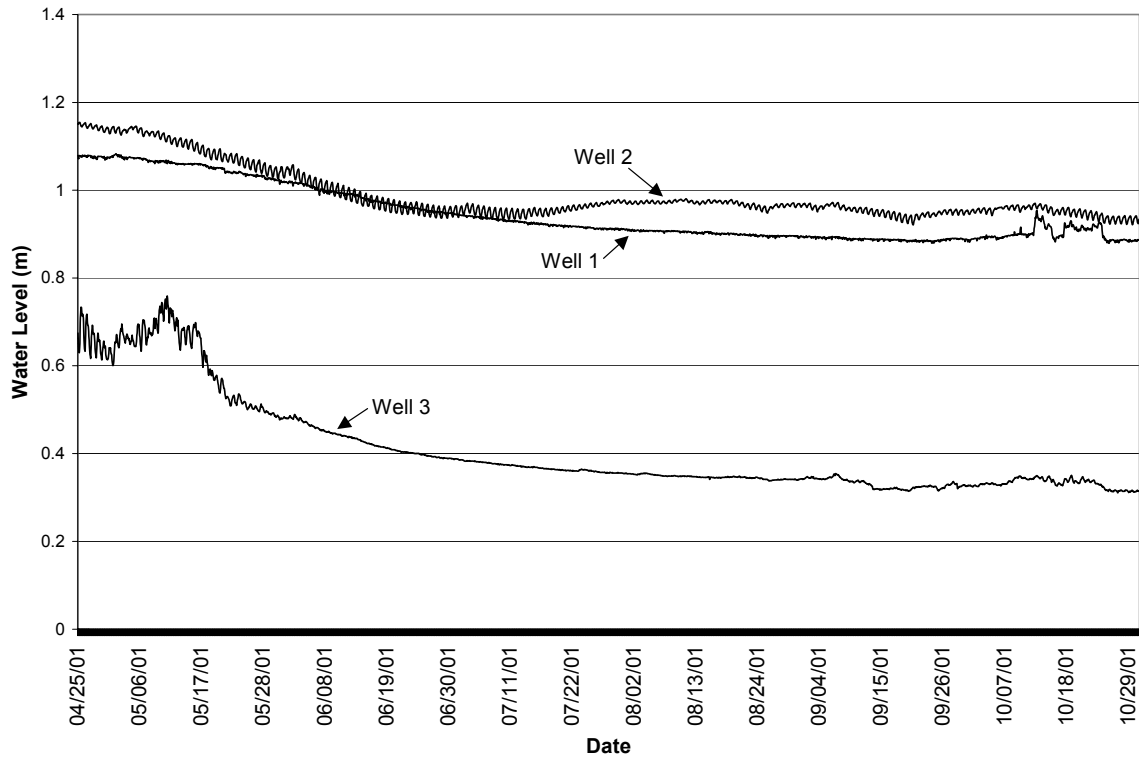


Fig. 25. 2001 growing season water levels at the Colorado location.

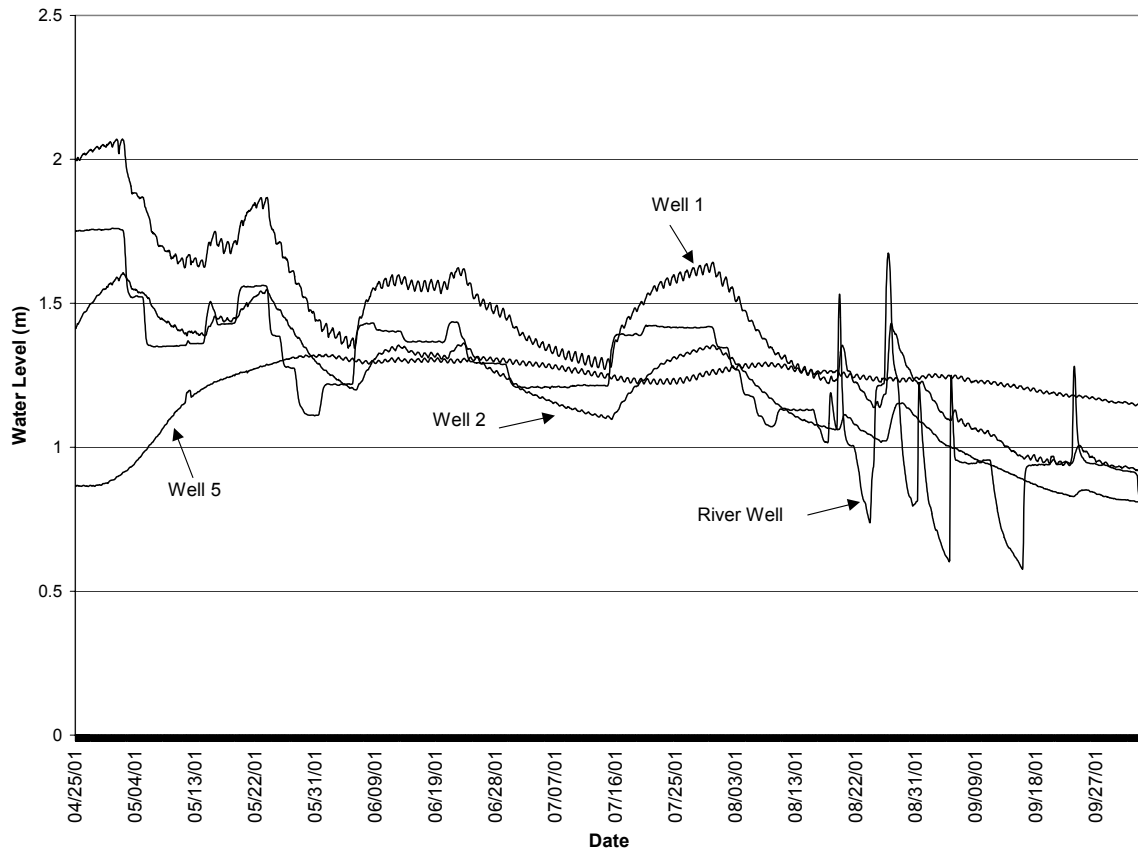


Fig. 26. 2001 Growing season water levels Pecos location Site A.

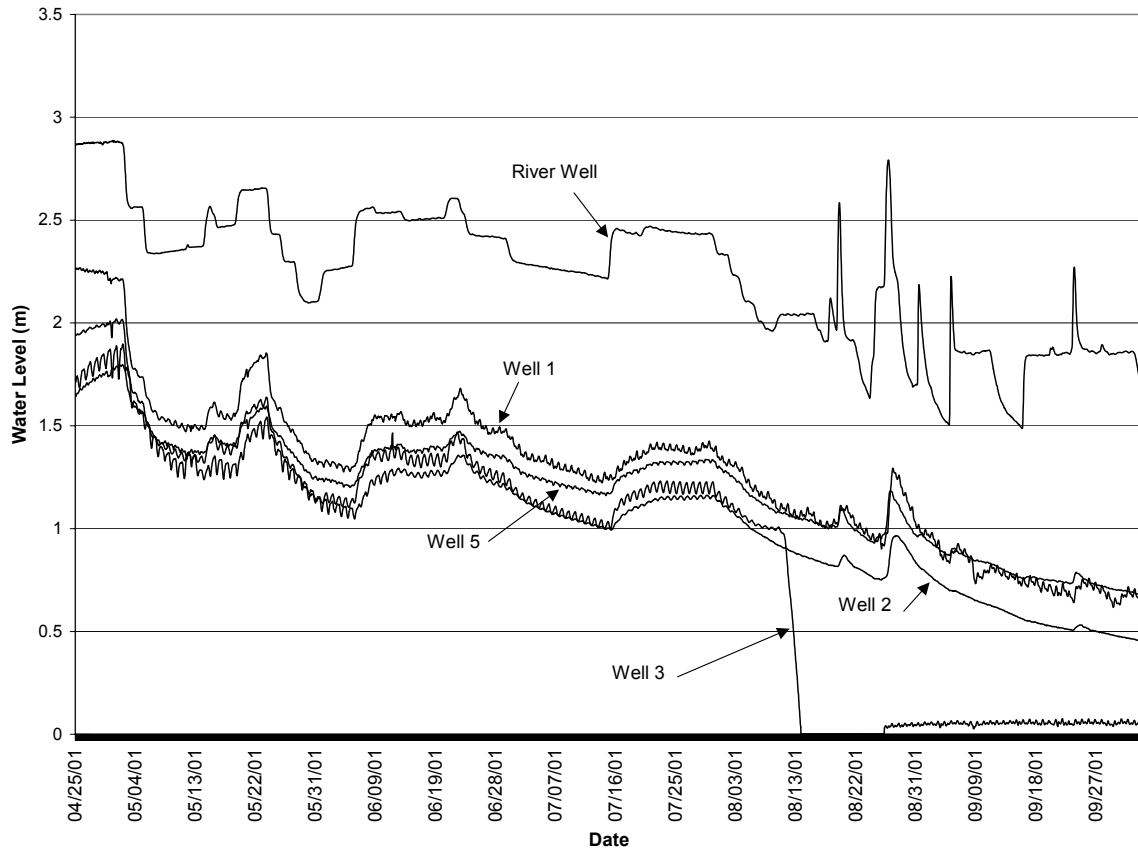


Fig. 27. 2001 Growing season water levels for Pecos location Site B.

Colorado Location

A significant correlation ($p < 0.05$) resulted when comparing hourly water level fluctuations between Wells 1 and 2 during the 2000 growing season (Table 29) and between Wells 1, 2 and 3 during the 2001 growing season (Table 30). However, the correlation between Wells 1 and 2 was lower in 2001. The area surrounding Well 1 was herbicide treated in August 2000 and a 49% mortality of saltcedar was observed in 2001. Well 3 was not operational in 2000.

Table 29. Coefficient of determination (R^2) for hourly water level fluctuations at the Colorado location during the 2000 growing season (5/1/00-10/5/00).

	Well 1	Well 2
Well 1	1	.95
Well 2		1

Table 30. Coefficient of determination (R^2) for hourly water level fluctuations at the Colorado location during the 2001 growing season (4/25/01-10/30/01)

	Well 1	Well 2	Well 3
Well 1	1	.84	.91
Well 2		1	.91
Well 3			1

Pecos Location

A significant correlation resulted when comparing hourly water level fluctuations for Sites A and B during the 2001 growing season (Table 31). However, Well 5 at Site A was poorly correlated to the wells at Site A and B. Well 5 at Site A had only gradual

changes due to distance from the river and clay water bearing strata (Fig. 26). The other wells at Site A and B all responded with river level fluctuations (Figs. 26 and 27).

Table 31. Coefficient of determination (R^2) for hourly water level fluctuations at the Pecos location Sites A and B during the 2001 growing season (4/25 - 10/4, 2001).

		Site A				Site B				
		River	Well 1	Well 2	Well 5	River	Well 1	Well 2	Well 3	Well 5
Site A	River	1	0.80	0.70	0.10	0.97	0.80	0.77	0.78	0.81
	Well 1		1	0.96	0.11	0.77	0.95	0.96	0.86	0.96
	Well 2			1	0.04	0.69	0.88	0.93	0.85	0.94
	Well 5				1	0.06	0.12	0.10	0.04	0.06
Site B	River					1	0.81	0.80	0.80	0.83
	Well 1						1	0.98	0.88	0.97
	Well 2							1	0.90	0.98
	Well 3								1	0.92
	Well 4									1

Conclusions

The water level fluctuations in Wells 2, 3, and 4 at the Canadian location were very similar. This suggested that the wells were responding similarly to the surrounding environment. The groundwater level at this location was close to the soil surface, at times within 0.30 meters from the soil surface.

The water level fluctuations at the Colorado location in 2000 were very similar for Wells 1 and 2 in 2000. However, the correlation was not as strong in 2001. This was attributed to the area around Well 1 being sprayed at the end of the 2000 growing

season. The groundwater level at the Colorado location was the lowest of all the study sites. It was at least 5.49 meters below the soil surface.

The analysis of the groundwater fluctuations at Sites A and B at the Pecos location showed a strong correlation between wells at a site and between sites (Table 31). However, Well 5 at Site A did not have a good correlation with any of the other wells at Site A or Site B. This seems to be due to the fact that Well 5 at Site A was located on the other side of an old oxbow in the Pecos River. Apparently, this has cut Well 5 off from the influence of the river and the groundwater associated with it. Perhaps the groundwater was moving parallel to the river through this abandoned oxbow. Additionally, the groundwater at Well 5 Site A had the highest salinity levels (among all wells at Site A and B) in May and November 2002 (personal communication L.D. White, September 2002). These factors may help explain why Well 5 does not have very good correlation with the other wells at Site A or Site B.

Another interesting phenomenon was that the River Well at Site A had better correlation with the wells located at Site B. This was attributed to the fact that there was a diversion dam located just south of Site A. Evidently, this was backing up the water, which increased the groundwater levels in the riparian zone, and influenced the wells at Site B. The groundwater level at this location ranged from 0.30 meters under the soil surface to 3.35 meters below the soil surface. The groundwater fluctuations at each site had strong correlation between wells except for Site A Well 5 at the Pecos location. The Canadian location had the highest water table and the Colorado location had the lowest.