Explanation of Preliminary Research
Recommendations for Water Storage on Brug's Land
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CMB water	SampleID	Sampled	pH	Electrical Conductivity (dS.m)	SAR_1	Calcium (meq/L)	Magnesium (meq/L)	
yes	Brug Irrigated A	7/28/2006	6.6	0.39	4.57	0.49		0.26
yes	Brug Irrigated B	7/28/2006	6.1	0.22	1.75	0.41		0.31
yes	Brug Irrigated C	7/28/2006	5.9	0.32	1.04	0.76		0.78
no	Brug NOT Irrigated A	7/28/2006	5.8	0.17	0.15	0.58		0.43
no	Brug NOT Irrigated B	7/28/2006	5.6	0.14	0.27	0.45		0.35
no	Brug NOT Irrigated C	7/28/2006	5.7	0.21	0.71	0.55		0.52
no	Site #1 BitterCreek A	7/28/2006	7.3	0.82	0.12	4.59		2.14
no	Site #1 BitterCreek B	7/28/2006	7.5	0.71	0.18	4.23		1.87
no	Site #1 BitterCreek C	7/28/2006	7.6	0.49	0.36	2.58		1.29
no	Site #2 BitterCreek A	7/28/2006	7.5	0.66	0.09	4.38		1.7
no	Site #2 BitterCreek B	7/28/2006	7.6	1.01	0.21	6.56		3.65
no	Site #2 BitterCreek C	7/28/2006	7.6	2.69	0.47	21.1		13.9
no	Site #3 BitterCreek A	7/28/2006	7.1	0.79	0.07	5.13		1.97
no	Site #3 BitterCreek B	7/28/2006	7.2	0.85	0.27	5.12		2.25
no	Site #3 BitterCreek C	7/28/2006	7.4	0.73	0.44	3.9		1.9

VII. Recommendations for Brug water storage

Due to the higher pH of the soils in Bitter Creek versus the pH of the soils that are in the cultivated fields on Mr. Brug's property, careful consideration should be taken when making decisions about water storage. Given the nature of the changes in soils in Spotted Horse Creek after discharge in that area, I would recommend that a created wetland area would be the best design for this water storage project. An area of land, where future crop cultivation or cattle forage is not intended, should be identified for the water reservoir. The reservoir should be constructed in a manner, either lined or otherwise so that it will confine the water or re-circulate the water in the specified area without leakage. Salt tolerant vegetation including trees, grasses and shrubs could be planted and carefully monitored so that the vegetation does not become an invasive species problem. This area could become an area of created habitat for birds and other wetland species. If the wetland is created to specific guidelines, the Brug's could deduct the construction costs or the "loss of land" on their taxes to their benefit. I advise caution and careful research based on soils in this area because wetland creation is more than just digging a pond. A recirculation system would prevent stagnation of the created wetland and help reduce eutophication, odor issues and mosquito infestation.

VIII. References

Andrew, Anita S. et al. 2005. Origin of salinity in produced waters from the palm valley gas field, Northern Territory, Australia. Applied Geochemistry. 20:727-747.

Aschenbach, T.A. 2006.Variation in growth rates under saline conditions of Pascopyrum smithii (Western wheatgrass) and Distichlis spicata (Inland saltgrass)

Adding nitrogen accelerates acidification (Brady and Weil 406). "Two moles of acidity are formed for every mole of ammonium nitrogen that undergoes nitrification to nitrates, use of ammonium fertilizers increase soil acidity" and can be increased from ammonia released by heavy manure application (Brady and Weil 574). Adding NH_3 can be problematic for soils by causing NH_4OH to form which increases pH as well (Brady and Weil 444).

Minimal leaching in arid areas minimizes the soil acidification process which is more rapid in moist, humid areas (Brady and Weil 413). Calcium, magnesium, potassium and sodium have a neutral effect on pH in water (Brady and Weil 413). Hydroxyl producing anions (negatively charged ions that raise the pH) are typically carbonate and bicarbonate (CO_3^{-2} and HCO_3^-) which in this case are mainly coming from $CaCO_3$ and $MgCO_3$ from the irrigation water (Brady and Weil 413).

High pH causes nutrient deficiencies for plants as well as osmotic potential making it harder for roots to extract water from the soil (Brady and Weil 430). Sodium competes with essential element potassium making it hard for plants to get the potassium they need when excess sodium is present (Brady and Weil 430). Enough calcium helps the plant differentiate between the competing elements (Brady and Weil 430).

The ratio of the ions can be just as important as the concentrations themselves (Brady and Weil 430). The carbon to nitrogen ration (C:N) ratio average is 12:1 in cultivated soils. Maintaining the proper ratio of C:N is important for proper plant growth(Brady and Weil 507)

Chart on page 706-7 about what different fertilizer impacts on soils may be of interest.

Source:

Brady, Nyle C. and Ray R. Weil. The Nature and Properties of Soils. 13th ed. New Jersey: Prentice Hall, 2002. p. 31-44.