Monitoring Water Quality & Movement: Sunland Park, NM

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The Rio Grande River and the water it provides to southern New Mexico are essential to the region's agricultural industry. Agriculture is the dominant use of land within the Lower Rio Grande Basin (LRGB), with farmers growing crops including chili, cotton, pecan, alfalfa, and cereal grains. Understanding the connection between the hydrology of the LRGB, the agricultural fields, and the drainage canals is necessary for meeting the water demands of the region.

Developing new management techniques for riparian zones in arid regions is the overall goal of the Sunland Park research site. The project design will create a managed riparian zone at Sunland Park which will help to conserve and improve water quality, along with improving the biodiversity along the riparian zone. In order to successfully rehabilitate and revegetate the riparian zone at Sunland Park using geo-engineering techniques, it is essential to understand the site hydrology.

Monitoring the movement and quality of both the ground and surface water at Sunland Park was the goal of this REU project. The data collected will be used as a baseline for measurements taken throughout future years. The information will also be used for the development of the managed riparian zone at Sunland Park. Learning more about the hydrology at Sunland Park will assist in selecting the most suitable native plants. Specific grasses and shrubs will thrive in the more saline soils closer to the extended drainage canal. Trees will be planted in certain locations depending on the species root depth and the depth to groundwater throughout the site.

The main objectives of this study were to determine baseline measurements of some important water quality parameters at the Sunland Park research site as well as the general ground and surface water hydrology. This information will be used in the development and maintenance of the managed riparian zone at Sunland Park. The specific objectives were to:

- Monitor depth to groundwater table using a network of piezometers at selected locations within the Sunland Park research site and assess site hydrology.
- Collect ground and surface water samples throughout the site to test water quality: electrical conductivity (µS/cm); salinity (ppt); total dissolved solids (mg/L); and pH.
- Determine if water contaminants (aluminum, iron, and bromine) are present in groundwater and/or surface water to infer their source and fate.

Results

Water table elevations for the seven sampling locations along with the Elephant Butte Irrigation District (EBID) well are shown in Figure 1. From Figure 1, one can see that the water table elevation at the extended drain is the lowest and that the elevations at SP2, SP4, and SP6 are between 1.3 feet and 3.4 feet higher. Water elevations in the main drain and EBID well are also higher, indicating that the extended drainage is functioning as a sink of water and nutrients in this detention pond. Water always flows from areas of higher head to lower head, which means the groundwater at Sunland Park is flowing towards the extended drain during this time period. This confirms the site design created by NMSU and EBID, which is to have the southern portion of the research site function as a detention pond during flash floods.

Figures 2 and 3 show the values of aluminum and iron concentrations at the seven sampling locations in Sunland Park. The aluminum concentrations in the extended drain, main drain, and by the gate stayed fairly constant throughout the testing, and are at levels that should not impact aquatic life at Sunland

Park. The iron concentrations shown in Figure 3 will help the plants at the Sunland Park research site. The iron in the soil and water at Sunland Park will help prevent iron chlorosis and will assist in the plant growth.

Both the aluminum and iron concentrations from the piezometers SP2, SP4, and SP6 were highly varied. The water samples taken from the piezometers had soil in them that was allowed to settle before the measurements were taken. The variation could have been due to the amount of soil in the sample that was run through the HACH DR 6000 Spectrophotometer. For both the aluminum and iron concentrations, more research will have to be done to determine the source and fate of the two contaminants.

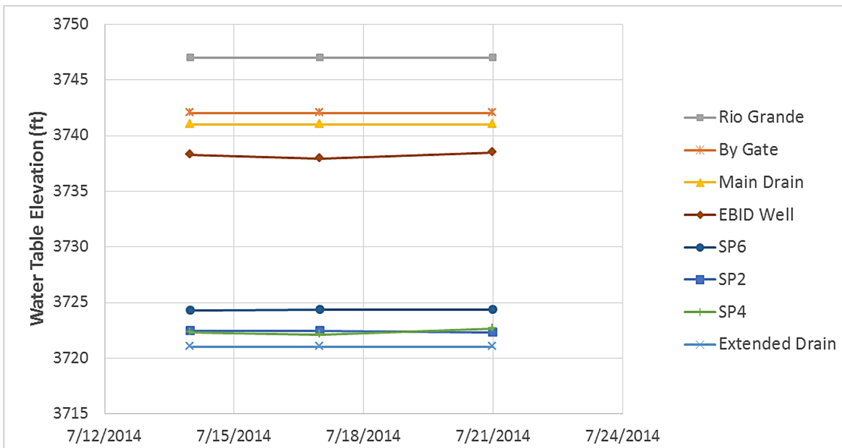

Figure 1. Water table elevations at Sunland Park.

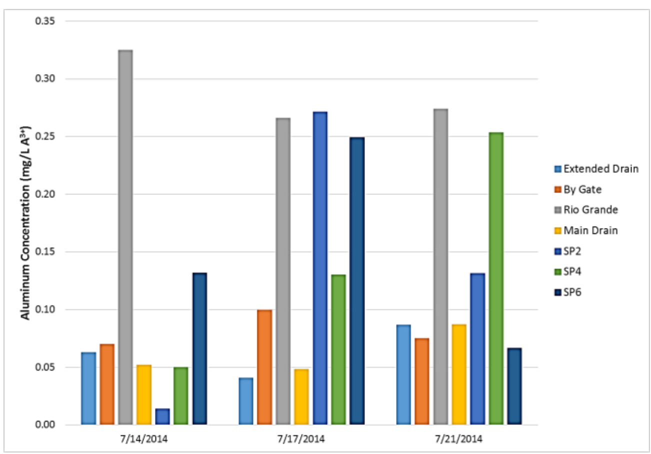

Figure 2. Aluminum concentrations at Sunland Park.

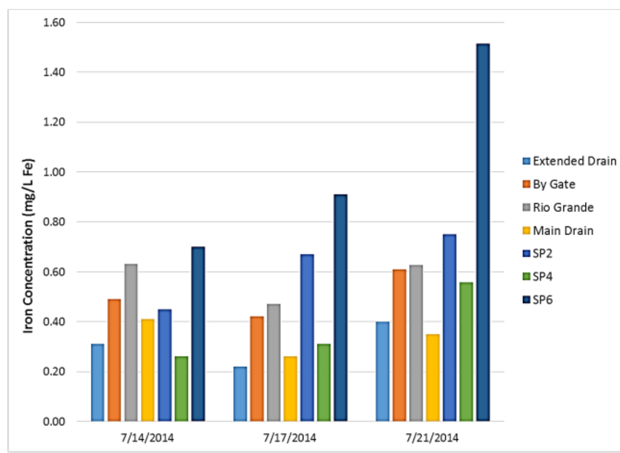

Figure 3. Iron concentrations at Sunland Park.

Conclusion

The goal of this research project was to focus on the movement and quality of both ground and surface water at the Sunland Park research site. The data collected and shown in this report will be used as a baseline and reference point for measurements taken throughout future years. Knowing the water chemistry and depth to groundwater will assist in the selection of the most suitable native plants for specific locations throughout the research site. Salt tolerant plants will be grown in the more saline areas and trees will be planted in locations that match their root depth and the depth to groundwater. Preliminary results show that the contaminants of concern (aluminum, iron, and bromine) and the water chemistry measurements should not negatively affect the ecology of the Sunland Park research site.