Conductivity study through cells of the Lake Waco Wetlands

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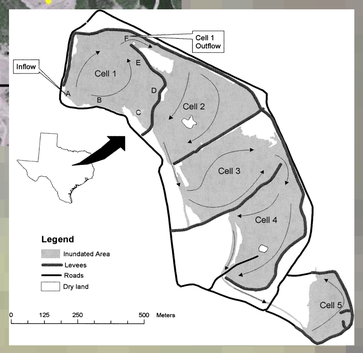
Abstract

This study reveals the cleaning efficiency of the Lake Waco Wetlands by identifying a conductivity gradient present as water passes through. The experiment targeted fifteen test points. This data showed an average decrease in conductivity as the water moved through the cells of water, suggesting TDS levels decreased. This implies the success of the wetlands as a water filtration mechanism.

Figure 1A: (Above) Aerial image of Lake Waco Wetlands with plotted cell data collection points by coordinates (cells 1-5).

Figure1B: (Right) Map showing the layout and water flow through the five cells of Waco Wetlands (Scott 441).



Introduction

A study conducted by the United States Golf Association (USGA) showed "poor water quality" from conductivity readings (USGA 1998). Research into studies of the Waco Wetlands revealed no significant study of Total Dissolved Solids (TDS). An experiment that could reveal the health and cleaning efficiency of the Waco Wetlands would help in the project's goal to, "environmentally show how plants in a wetland help 'clean' water" (EPA, 2004). Total dissolved solids can originate from natural sources, sewage, urban and agricultural run-off and industrial wastewater (WHO, 1996). Extreme concentrations of TDS could have adverse effects, while moderate concentrations could indicate potentially beneficial effects such as (WHO, 1996). This study measured conductivity values throughout the Waco wetlands. Monitoring the conductivity would help in drawing conclusions about its benefits, efficiency and health. The hypothesis stated that conductivity would decrease as water traveled through the wetlands.

Methods and Materials

The study was conducted at the Lake Waco Wetlands, which receives its water from the North Bosque River. The water travels through five depressed areas called "cells". Data points were established in each cell (Fig. 1). Conductivity was recorded over every Wednesday for four weeks. The conductivity was found by a probe that detects ion concentration.

Results

Collected data indicated conductivity decreased as the water flows through the wetland cells (Fig 2). Conductivity measurements were obtained from ranges of 469-548 µs/cm over the four week data collection period. A raised conductivity was consistently measured between points 4A and 5A.

Figure 2: (Below) Conductivity levels through the five cells of the Lake Waco Wetlands from March 31 to April 22, 2010

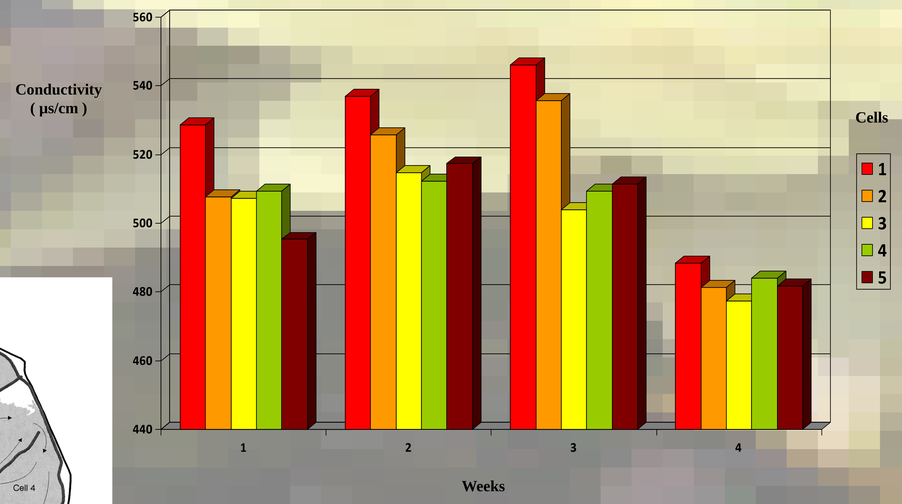
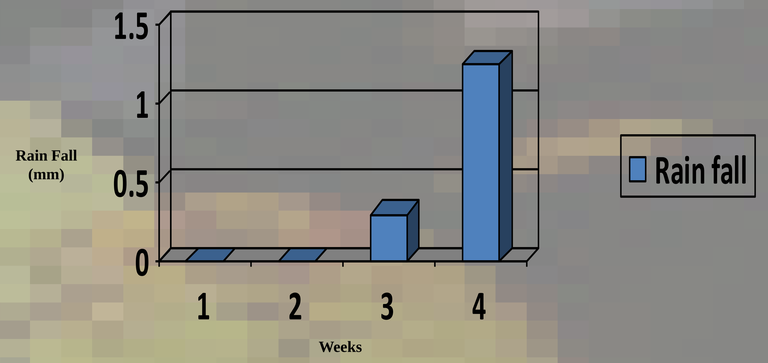


Figure 3: (Below) Rain fall through the Lake Waco Wetlands from March 31 to April 22, 2010



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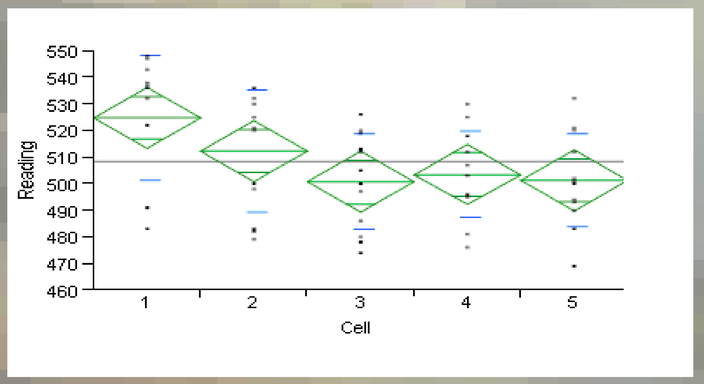
Conclusion and Discussion

Data shows an average decrease in conductivity as the water moves through the cells, suggesting TDS levels decreased. This implies the success of the wetlands as a water filtration mechanism. Statistical evidence shows a negative correlation between conductivity levels and distance from wetland inflow (Fig.4).

However, it was consistently observed that conductivity levels increased between points 4A and 5A. One probable explanation is from micro-environmental effects in the area, possibly obstructing consistent water flow through the region. Another is a lack of aquatic vegetation in the locale which is typically responsible for the "cleaning" properties of wetlands (EPA 1). Rain fall could also influence the range of values for a given collection week as clean water in the form of precipitation diluted TDS levels in the studied wetland cells (see Fig.3).

Despite uncertainties the positive filtering effects of the wetlands was supported by the collected data. It contributes to the many other obvious beneficial properties of the Waco Wetlands and should serve as a valuable example of what wetlands are capable of to other states that are capable of creating and preserving them.

Figure 4: (Below) Statistical visual of conductivity for five cells of the Lake Waco Wetlands



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