Assessing Urban Wildlife Water Availability: Investigating Runoff and Evaporation Dynamics in Fort Worth Ponds

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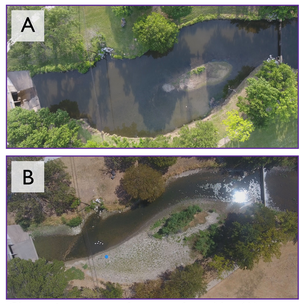
Introduction

- **Water** is vital for wildlife but must be **available and accessible**.
- In Fort Worth, Texas, a hot and dry urban area, many **water sources dry up, becoming unavailable** for wildlife. However, some water sources may be more susceptible to drying up than others.
- **Runoff,** influenced by land use, soil type, and slope, increases water availability (Nageswara Rao 2020).
- **Evaporation,** determined by wind, humidity, and area, decreases water availability and runoff volume (Sawan 2018).
- Our study examines how runoff potential and evaporation rates relate to water surface area changes in ponds in Fort Worth. This insight aids in assessing water source susceptibility to drying up and informs management decisions to ensure wildlife access to available water in Fort Worth.



Change in water surface area from May (A) to September (B) in a pond in Fort Worth, Texas.

Methods

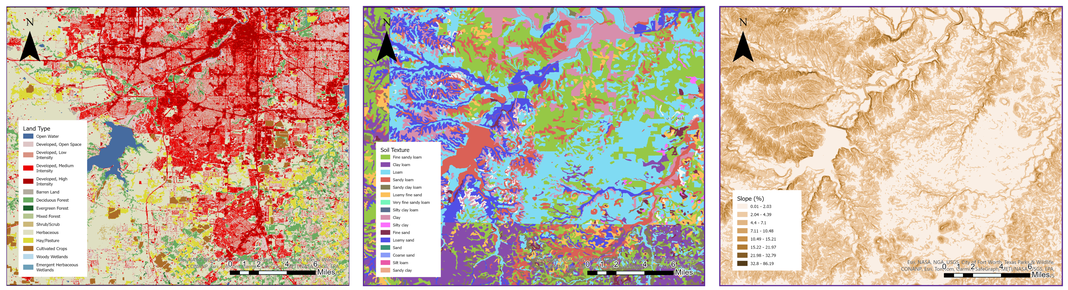
Surface Area Measurements and Evaporation Calculations

- Using a drone, we recorded aerial imagery of six ponds every two weeks from March to September in 2023 to calculate the **change in surface area** from one survey to the next.
- We collected weather data including **wind speed, humidity, and precipitation** for each day for each pond.
- We calculated total water loss from evaporation and water gain from precipitation for each day for the watershed of each pond. These values were summed for the each day between surface area survey dates to find the total loss or gain between each survey.
- We correlated change in surface area with water loss/gain to determine how each site changes in surface area as water loss from evaporation increases.

Determination of Runoff Potential

- Using ArcGIS Pro, we mapped **land use**, **soil type**, and **slope** in Fort Worth, Texas.

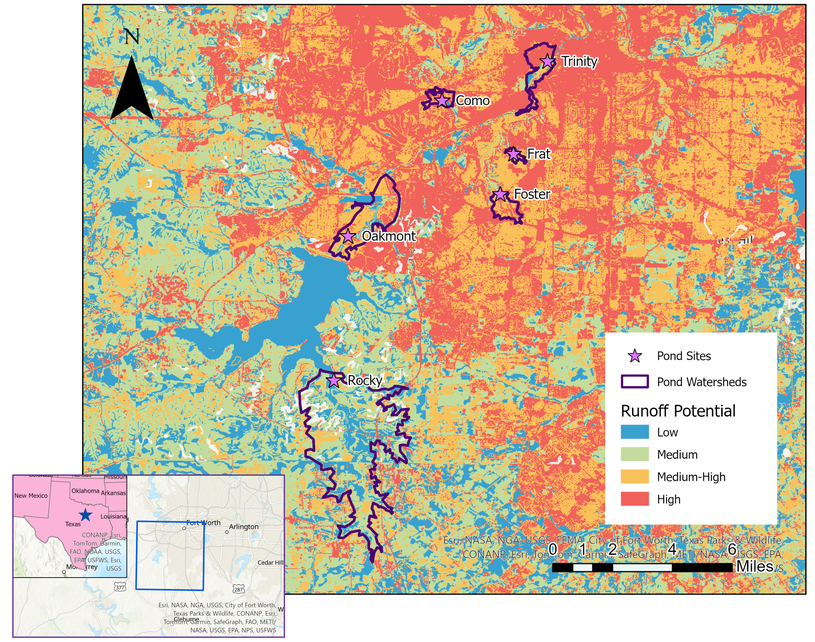
Land Use | Soil Type | Slope



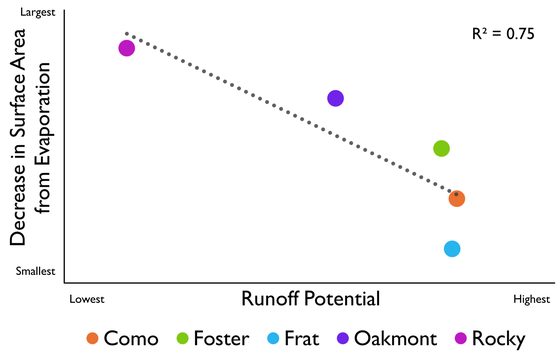
- We reclassified each layer into four classes to rank categories based on runoff potential.

- We used a **weighted overlay** to create a single layer for runoff potential and determined the runoff potential of each ponds' watershed.

Results and Conclusion



- **Trinity** had the **highest** runoff potential. However, this site is a duck pond maintained at a **constant water surface area**. Therefore, we excluded this site from our analysis.
- We found a **negative correlation** between runoff potential and decrease in surface area from evaporation.



- We conclude that runoff potential is an important factor affecting the susceptibility of water sources to drying up during conditions with high evaporation rates.
- Determining runoff potential should be considered when managing water sources for wildlife.

References

Nageswara Rao, K. (2020). Analysis of surface runoff potential in ungauged basin using basin parameters and SCS-CN method. *Applied Water Science, 10*(1), 47.

Sawan, Z. M. (2018). Climatic variables: Evaporation, sunshine, relative humidity, soil and air temperature and its adverse effects on cotton production. *Information Processing in Agriculture, 5*(1), 134-148.