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Water stress in the watersheds of the state of Pernambuco

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INTRODUCTION

The definition of "water stress" in hydrology refers to a situation where the demand for water exceeds the available amount during a certain period.

Human Health



water availability, as scarcity can lead to **dehydration** and an **increase in waterborne diseases**.

Agriculture



relies heavily on **irrigation**, suffers crop losses and reduced production during water stress, directly impacting local food security.

Aquatic ecosystems



as rivers, lakes, and wetlands **require adequate flow** to maintain their biodiversity and healthy functioning.

Economy



Sectors such as industry, tourism, and transportation depend on **sufficient water supply to operate efficiently**.

Understanding the quantity of **days of water stress** in a watershed is essential for sustainable water resource planning and management.

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Water Stress Days

allows managers to **identify vulnerable areas, implement water conservation measures and efficient water use, and develop strategies for adapting to climate change.**

understanding and **addressing** water stress is crucial to ensure human well-being, ecosystem health, and economic sustainability.

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TO EVALUATE THE QUANTITY OF DAYS OF WATER STRESS IN THIRTEEN WATERSHEDS IN THE STATE OF PERNAMBUCO.



METHODOLOGY

Study Area

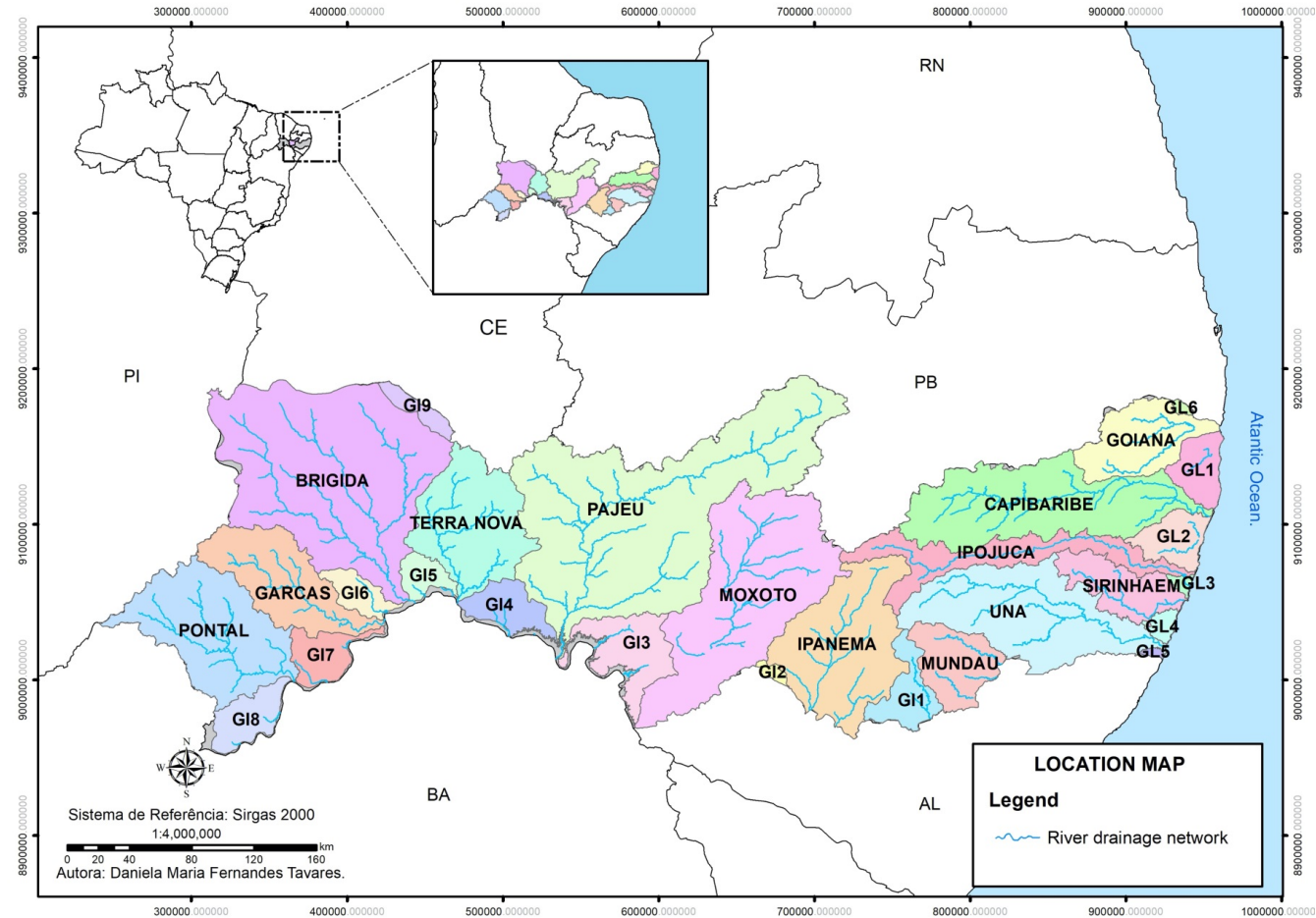


Figure 2 - Location map of the Pajeú River watershed.

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São Francisco River Transposition

Provides water supply for almost **12 million** people in Brazil's semi-arid.



The idea is to transfer water of the São Francisco river through two distribution channels, east and north axis.

INTRODUCTION

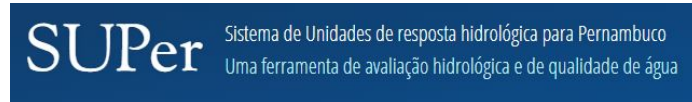
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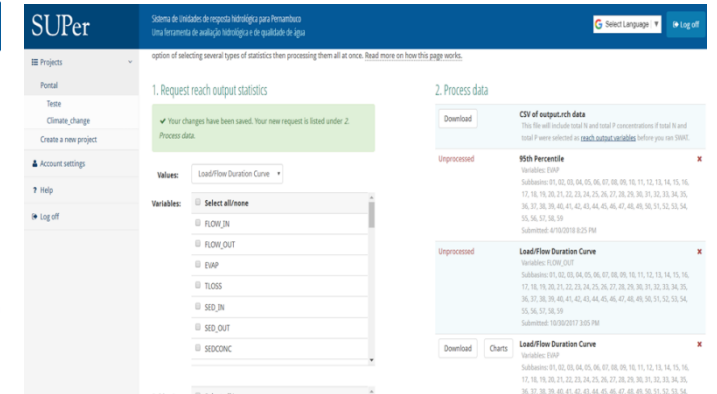
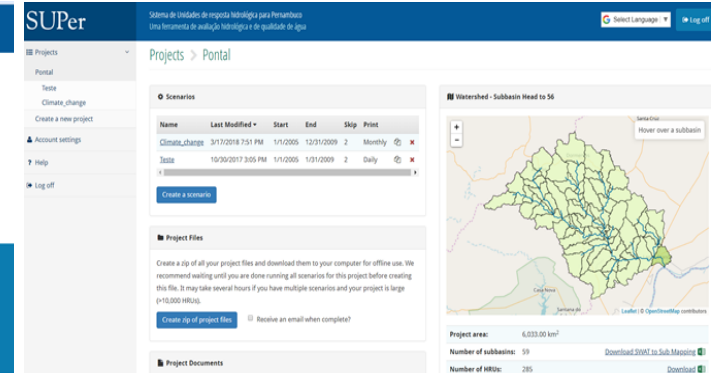
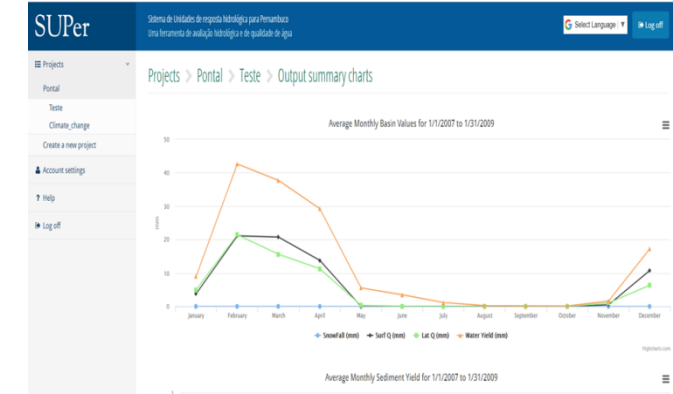
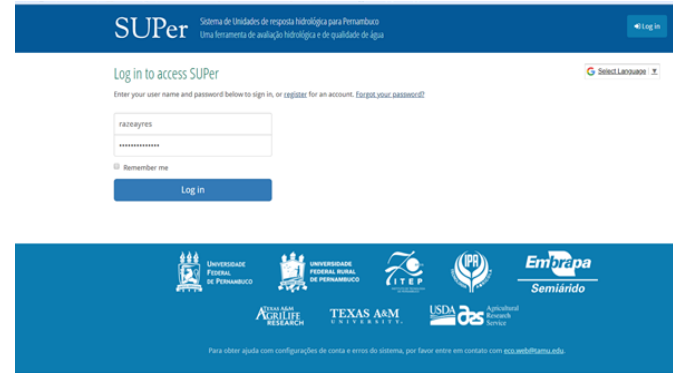
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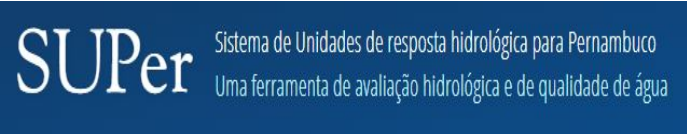
METHODOLOGY



The Pajeú River basin has a project in SWAT available to the public sector through the SUPER platform (Sistema de Unidades de Resposta Hidrológica para Pernambuco) (<http://super.swat.tamu.edu/>). This tool was developed through a partnership between UFPE, UFRPE, UFCG, ITEP, and Texas A&M University, with the aim of supporting the management of the basins of the State of Pernambuco in economic, political, and social contexts.



METHODOLOGY



In the SUPer Plataform the **Water Stress Days** can be found under the **Plant Growth** results.



Phosphorus Cycle

Plant Growth



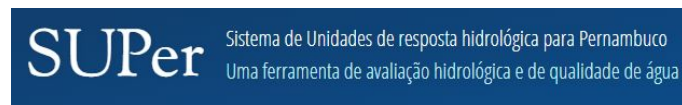
Proper plant growth is key to accurate runoff and sediment predictions. Problems in plant growth are often related to excessive stress due to temperature or the lack of water/nutrients. The data presented here are basin averages, and may not reflect problems with individual land uses. Carefully review the land use summary tab.

Temperature Stress Days	7.170
Water Stress Days	98.900
Nitrogen Stress Days	39.180
Phosphorus Stress Days	34.610



METHODOLOGY

- To obtain the results of this research, the Pernambuco Hydrological Response Unit System (SUPER) and the SWAT model (Soil Water Assessment Tool) were used.



- **Semi-conceptual,**
$$SW_t = SW_0 + \sum_{i=1}^t (R - Q - ET - P - QR)$$
- **Semi-distributed, physically based and continuous in time.**
- **The analysis period spans from 1961 to 2021.**



RESULTS

Watersheds	Water Stress Days (annual average)
Moxotó	90
Una	76
Goiana	60
Mundaú	58
Capibaribe	97
Sirinhaém	46
Terra Nova	171
Graças	154
Pontal	163
Brígida	151
Ipanema	93
Ipojuca	99
Pajeú	108

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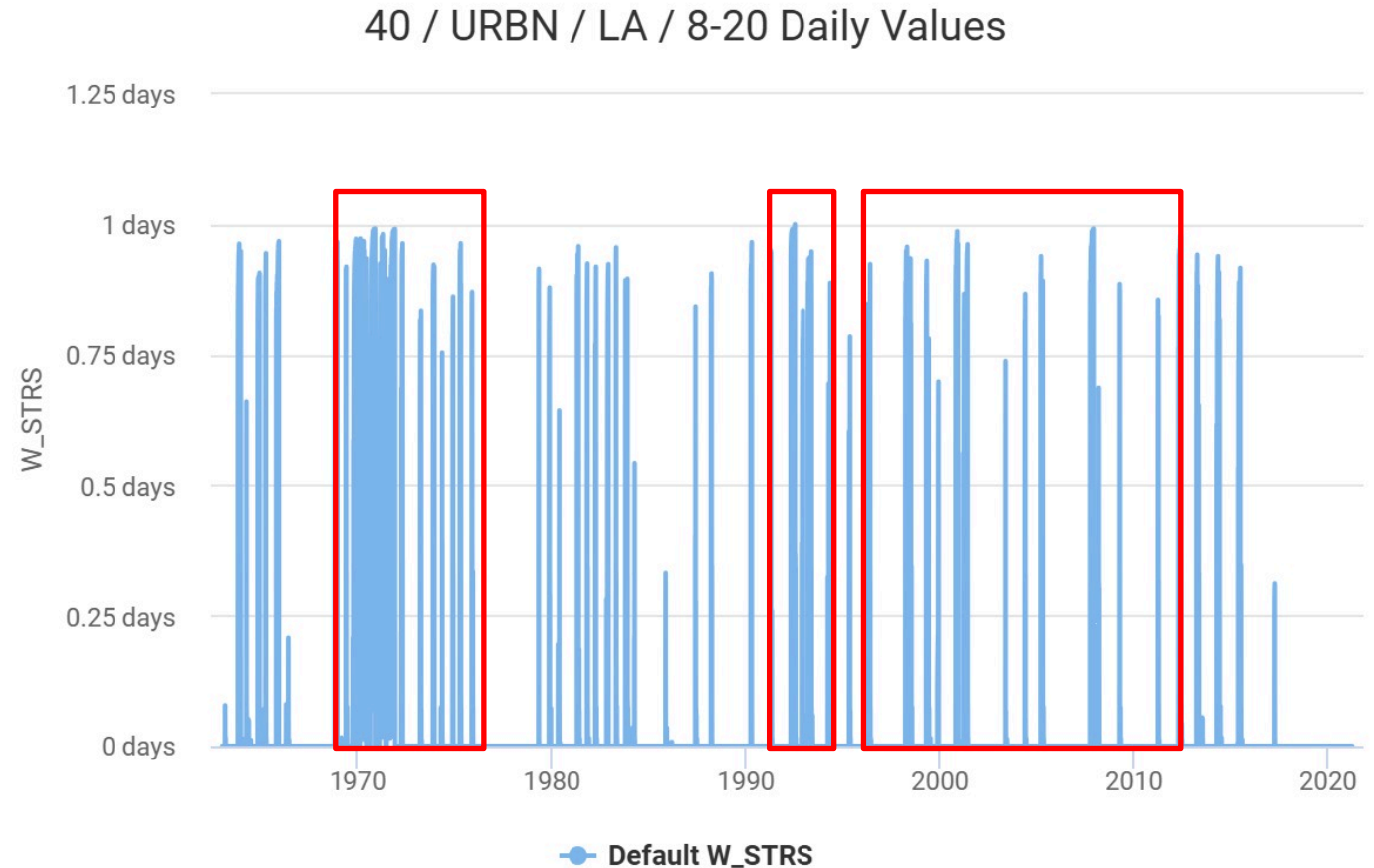
RESULTS

Una Watershed

Daily stress in Urban land use and elevated areas

- In urban areas, water stress is less frequent.
- High intensity period starting in 1970
- Lower intensity period in the 2000s

Observation: soils are more saturated.

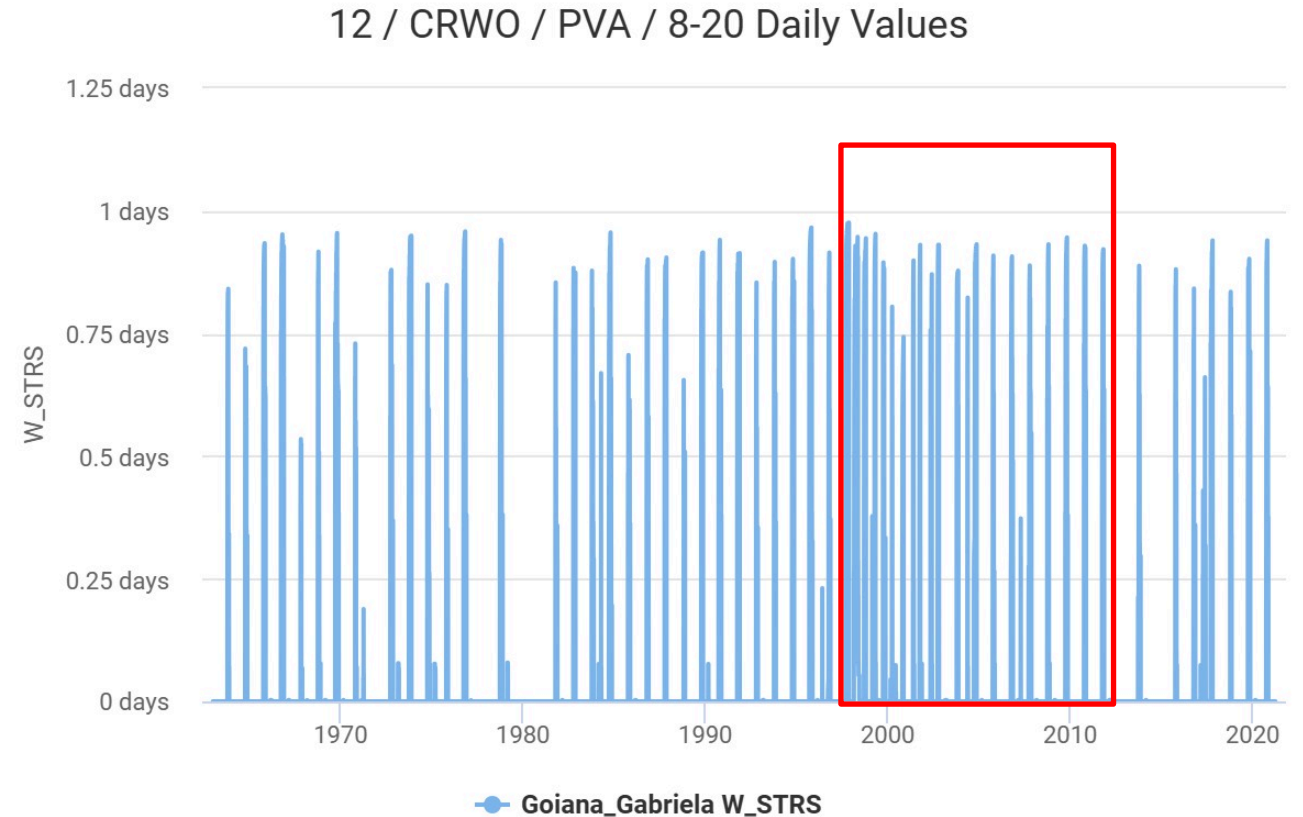


RESULTS

Goiana

Daily stress in Cropland/Woodland Mosaic use and elevated areas

- From 1970s to mid-1980s there is a lower frequency of water stress days
- Water stress days are more frequent from 2000 to 2010



Highcharts.com

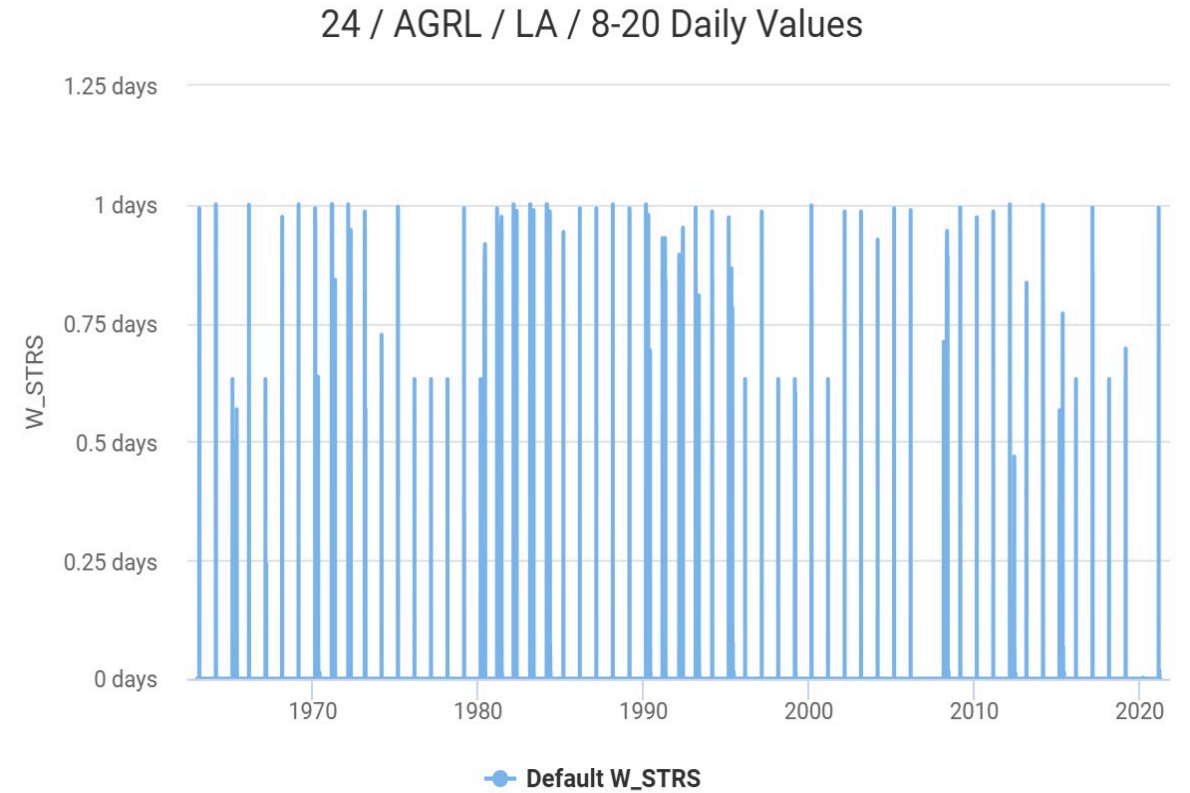


RESULTS

Mundaú

Daily stress in Agricultural land use and elevated areas

- No noticeable changes for the Agricultural land use.



CONCLUSIONS

- Based on the results obtained, it is clear that there is a wide variation in water stress across Pernambuco
- Ranging from 46 days in the Sirinhaém watershed to 172 days in the Terra Nova watershed.
- When comparing different land use for different watersheds it's noticeable how urban areas are less susceptible to having water stress than agricultural or cropland/woodland mosaic areas.
- This disparity highlights the complexity of water management in the region and the need for adaptive and sustainable strategies to address future challenges related to the supply and efficient use of water resources.



WATER STRESS IN THE WATERSHEDS OF THE STATE OF PERNAMBUCO

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THANK YOU!

