

Company Background

Walker Water is a technology services company founded in 2021 by John Walker, and built upon his strong passion for conservation, and a budding knowledge of how the complex irrigation system in the Surface Creek Valley of Western Colorado works. The development of our technologies is based upon what we learned as irrigators and water users ourselves within this valley.

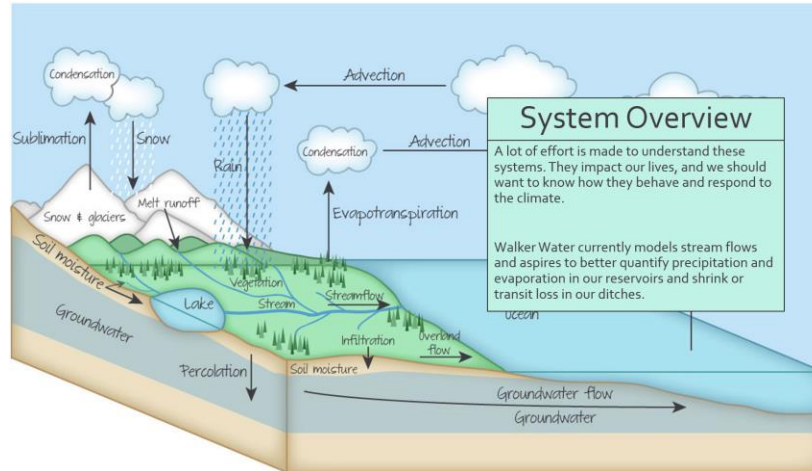
We are a software development and irrigation system consultation services company whose charge is to build administrative tools that help the water administrator to ensure the accurate and timely delivery of their water to the rightful user and allow ditch companies or even individual users to know what water is flowing in their ditch. We are also specialists in assisting our customers to successfully secure grant monies to help fund their water-related projects. See our web page <https://tpf4d.com>.

Introduction

I grew up in Rhodesia (Zimbabwe) and one of the greatest joys was to visit Victoria Falls, one of the 7 natural wonders of the world. The sound of the water falling and the mist creating a rain forest were unforgettable. Several years ago, I read an alarming article that the Falls were dry! How could that be? The article inferred that the lack of water running over the Falls was due to global warming. That may certainly be a contributing factor, however, I find it difficult to believe that is the whole cause of the drying up of the mighty Zambezi River. Could there be another reason? From my experiences with water in the Surface Creek Valley I know we deal with people putting pumps in the creek and pumping water out of the creek without authority. Could this be happening along the Zambezi River? Are there pumps all along the river taking water? Are they authorized to do so? Is the water in the Zambezi being administered properly? I have my doubts. From this came my strong desire to understand what happened and to develop a tool to examine the waters around the Globe, in reservoirs, rivers, streams and ditches. Could we utilize modern technologies such as SCADA or real-time satellite imagery to observe, detect and measure changes in water levels in these systems?

Walker Water is developing a comprehensive irrigation water administration system comprised of numerous software elements including reservoir and stream flow analytics using live sensor/SCADA feeds and dashboards, a full 3D visualization studio, decree priority analytics to ensure delivery of senior water rights in priority and on time, an alarm-based reservoir seep monitor tool, a web-based water ordering and account management system, and an AI-based water usage forecasting tool.

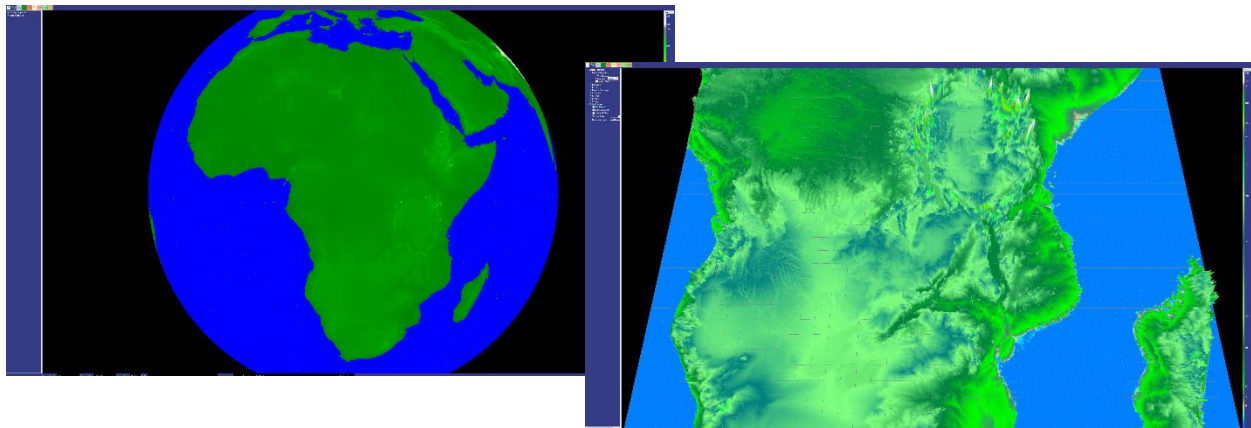
The diagram below shows the variables that make up our Earth's water system. As irrigators we are most interested in transit losses due to evapotranspiration and percolation. We would like to be able to understand these systems better, to be able to model them and predict them.



If we can better understand these subsystems, can we do a better job of managing our water?

Work Description

Walker Water has developed a sophisticated 3D environment (coded in OpenGL) for the visualization of water bodies throughout the world.



The idea behind this project proposal is to leverage satellite data such as Synthetic Aperture Radar (SAR) or thermal imaging to evaluate changes in environmental conditions as related to water and water usage. What do these changes tell us? Do they indicate water usage or sudden water loss? Do they assist in the evaluation of water administration? Will they help us find illegal pumping operations?

See the links below for descriptions of the various technologies and their availability and utility.

[Satellite Imagery from Capella Space Now Openly Accessible on the Amazon Web Services Cloud - Capella Space](#)

[Hydrosat](#)

[Water | Science – NASA-ISRO SAR Mission \(NISAR\)](#)

The phase of the data/wavelengths tell us something about what is changing in the environment. SAR is well suited for detecting the lateral extents of water due to the specular backscattering characteristics

of active radar pulses on open water surfaces. Thermal imaging could help us understand crop stress, water stress, evapotranspiration, etc.

Walker Water needs the assistance of out-of-the-box problem solvers and most creative engineering and computer science minds to take this 3D visualization system to the next level where it can be used to leverage satellite data to assist in the evaluation of changes in environmental conditions in reservoirs, rivers, and streams. Then we need to translate these changes to meaningful administration information.

While this project is not well defined at the moment, I would leave it to the students to determine what product we can produce from these data and the Walker Water software tools. My life expectancy is less than 25 years, and the students have sixty plus remaining. This is going to be their problem to deal with in the future. Let's get them involved now and find solutions to preserving and protecting this vital resource.

I have contacted representatives for Capella Space and Hydrosat. Capella Space has an open dataset we could use, and Hydrosat has an early adopter pilot program starting this Fall or early 2023 with a 1 year 1 location free trial dataset using their initial raw thermal data.

Student Skill Set

Our 3D software is written in C# using OpenGL. Access to AWS servers may be necessary to retrieve the satellite data.

Team Size

The team size should be a minimum of 3 but certainly could support 5 or 6 members.

Internship Possibilities

Walker Water would be delighted to offer internships. This would be a function of our financial condition at the time, and we anticipate this may be a possibility. That may depend on how the students receive our project and the larger scope of what we do.

Work Location

Work can be performed remotely. We deploy a git repository that supports collaboration amongst team members who can be located anywhere. Since we live in Cedaredge, we would not ask nor require anyone to visit our office. However, it would be advantageous for students to see how our valley operates since it is arguably the most complicated irrigation distribution systems in the U.S.

NDA

We will require an NDA for this project. The 3D software is proprietary and as such we want to protect our investment.

Intellectual Property

Walker Water will retain ownership of all code developed theretofore.