The environmental Resources Assessment and Management System (eRAMS) is an open source modeling and geographic information system (GIS) technology that allows web based collaboration for sustainable management of land, water and energy resources.

The technology offers services under two broad categories: (i) data and modeling solutions as online services; and (ii) an environment for developers to build collaborative business analytic solutions.

The eRAMS system has access to both public cloud storage through Amazon type clouds and private cloud storage through the CSU eRAMS system itself, allowing access to multiple disparate databases for analysis.

Users can access tools and datasets on eRAMS through an internet browser eliminating the need for versions of software on the computer desktop. eRAMS tools can even be accessed and run with mobile devices such as cellular phones and tablets.

Developers can add models and analytical tools as add-on tools in HTML, JavaScript and Python, among other widely used environments.
The eRAMS platform is GIS enabled through open source GIS programs. CSU has developed hydrology tools such as watershed delineation (pictured on page 1), and others to enable effective use of the GIS system for water analytics.

Service management is fully automated and currently serving a suite of model and data services at CSU. Services can be deployed through a CSU cloud infrastructure or public cloud, such as Amazon, with suitable security measures.

GIS & STATISTICAL TOOLS
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eRAMS GIS is the geospatial analysis component of the technology, which provides services for the following features: class overlay (clip, intersect, union), dissolve, spatial interpolation using methods such as kriging, zonal statistics, a field calculator for tables, a raster calculator and many other geoprocessing tools. GIS projects can be stored on eRAMS with a user account and shared via URL with other partners according to the user’s preference.

In addition to GIS capabilities, eRAMS provides services for statistical analysis of location-based time series data, sensitivity/uncertainty analysis and automatic calibration simulation models, optimization of pollution control strategies and green infrastructure, among other tools. Documentation for the statistical features can be found on the documentation page and individual equations can be found within the models.
THE PLATFORM
The components of the platform communicate with one other and with external clients through an application programming interface (API) that is built as a Representational State Transfer (REST) web service. RESTful service catalog of endpoints will enable interactions with customized and standardized URLs, allowing users to easily share information.

This technology allows teams to work collaboratively online without having to worry about sending information back and forth. In addition, work products can be shown in URLs and shared with other team members, clients or stakeholders for real-time review during project implementation.

Content Management
The eRAMS team uses a Codebeamer Application Lifecycle Management (ALM) system that covers all phases of the code development process including development, testing, risk management and requirement management.

Project partners will be able to transparently manage the model development and service release using Codebeamer and the version control system.

Version Control
CSU utilizes Version Control System (VCS) repositories to house models and service development. The repositories provide seamless integration into the automated CSIP model services for updating, testing and deployment of models.

The VCS fosters best practices for reuse, maintenance and updating of models.
DATA ANALYTICS

Watershed Rapid Assessment Program (WRAP)
A summary tool that extracts, organizes, and analyzes data and information at various watershed scales and summarizes readily available geospatial characteristics.

Integrated Urban Water Model
Forecast urban water demand and project potential savings from conservation and use of alternative water sources over varying climatic conditions and land uses.

Flow Analysis
Analyze various aspects of stream flow data including statistical analysis and regression, flood frequency, base flow separation, flow duration curves, and load estimation.

Channel Cross-Section Analysis
Extract and analyze a stream cross-section’s hydraulic properties and sediment transport. Extract a valley-scale cross-section using a 30-meter DEM.

TOOLS

Agricultural Water Management
Makes irrigation scheduling both convenient and as cost-effective as possible. Allows growers to maximize crop yield and minimize excess irrigation in just a few easy steps.

Watershed Delineation
Processes and analyzes Digital Elevation Model (DEM) and DEM-driven rasters to delineate a watershed.

Phosphorus Index
A tool for planners, producers, and consultants to assess the qualitative risk of Phosphorus loss off-site in cropland areas.

Pipe Risk Screening
Prioritize water distribution and transmission pipes for renewal projects.