

MATT HAYDEN

Current

Matt Hayden is an expert on data management and analysis. He can manage large data sets and convert them into useable sources of information for water use analyses. In addition his applied math background provides him with the skills needed to do complicated statistical analyses and model construction. He has used these skills to develop numerous model applications for Aquacraft clients. He was the main programmer on Aquacraft's residential demand forecasting model. He was made significant contributions to development of the demand projection models in the Residential End Uses of Water Update study.

Analysis and modeling, 2005 – present.

Aquacraft, Inc. Water Engineering and Management
2709 Pine Street, Boulder, CO 80302.

POSITION EXPERIENCE

Statistical analysis using SPSS

Database construction with Microsoft Access

Development of complex applications using Microsoft Excel, VBA and macros

Arc Map applications and analyses

Android security model and debugging

Cisco MDS Admin

Data mining techniques, algorithms, and visualization

File server (Samba, hardware RAID) and remote backup maintainer, 5 years

Linux (Debian) System Admin, 10+ years

MTA (Mail Transfer Agent) maintainer, Sendmail and qmail, 5 years

Solaris System Admin, 3 years

Spyware and Windows machine code analysis

Water resources quant, 10+ years, several publications

APPLICATION AND PROGRAMMING LANGUAGE EXPERIENCE

Amazon Web Services (and Linux virtualization) deployment, 2 years

ASP.NET

Gdb macros

Git and Subversion

Microsoft Access and MSSQL replication, Excel tricks, 10+ years

Python automation, templating (Django, numpy, Sqlite), 10+ years

Python GUI programming (wxPython) and deployment

Shell script (bash and attendant utilities) automation, 15+ years

SPSS syntax and Python plug-in, 5 years

SQL, database normalization and migration, 5 years

UNIX regular expressions and stream programs 15+ years

VBA with COM, 10+ years
Visual Studio with WiX extension

EDUCATION

Bachelor of Science, 2002, CU-Boulder

Department of Applied Mathematics, specializing in Statistics and Biology, Dean's list
Minor in Environmental Biology, published in Journal of Limnology and Oceanography

PRIOR WORK HISTORY

Webroot, Windows Spyware research and data collection, 2005

UnixOps CU Boulder 1999-2002

SELECTED RECENT PROJECTS

Web-based GIS irrigation budget

Matt oversees a private irrigation budgeting app for Eastern Municipal Water District in California. This is on the ASP.NET platform with Google Maps and MSSQL on the back end. PDF generation will be supported in the next version.

International Association of Mechanical and Plumbing Officials Hunter Curve Update (2013)

Developing a data mining application for a modern update of the Hunter curve
Updating the Hunter curve for modern and conserving indoor fixtures requires a high-quality dataset of household characteristics paired with flow rates. The product of this project is a data mining application that can slice large volumes of data based on demographic and residential characteristics. The scale of this project, in database terms, is hundreds of variables and millions of individual water use events.

Matt Hayden worked on the technical arrangement of this project exclusively, including the integration of many past studies, statistical processing in Python, database design and layout in SQL, and user interface in MS ACCESS.

Abu Dhabi Residential End-Use Study

Matt developed the modeling dataset and flow trace results from 2 GB of intermediate data. The routines to generate this dataset allow arbitrary slicing and OLAP-style reports beyond the typical capabilities of database and spreadsheet programs.

Recreation Center and Swimming Pool Water Use and Efficiency Analysis for Denver Water. (2007)

This study developed a water efficiency model for each of the 36 recreation centers and 6 outdoor pools across the Denver area, as well as a final report detailing the economic potential for water efficiency upgrades. Each comprehensive model combined specialized research, data acquisition, site auditing, and cost-benefit analysis.

Matt Hayden led research and performed experimental design, data acquisition and extensive modeling for this project.

Denver Library Indoor And Irrigation Water Use And Efficiency Analysis for Denver Water. (2007)

Building on other Denver Water projects, this study examined the feasibility of enhancing water efficiency for all public libraries in the Denver area. Each efficiency audit combined more and different types of data than the recreation center project, emphasizing irrigation and leak detection.

Matt Hayden performed integrative modeling, workflow, data acquisition and analysis for this project.

California Single-Family Home Water Use Efficiency Study: Single-Family Residences (2005-present)

This project aims to combine individual sampling with aerial GIS and climate analysis for the purposes of evaluating 10 years of water efficiency programs across California. Over the past 18 months Aquacraft has deployed specialized data logging equipment across the state.

Matt Hayden built the instrumentation preparing different and varied populations for reliable random sampling. In addition, Matt Hayden is the developer of this project's specialized statistical analysis toolset.

Irvine California Multi-Family Residence Water Use Efficiency Study (2005-present)

Local to Irvine, this project builds on the previous single-family residence project. Based on data from the broader population of multi-family apartments, ensuring representative random samples required statistics from more intensive data mining methods.

Matt Hayden worked with the client and extracted the multivariate dataset necessary for reliable survey design.

BMP compliance for the Sacramento Regional Water Authority Commercial and Industrial Water Efficiency Reviews. (2005-2006)

This study provided water and energy audits for high-use CI customers of 20 Sacramento-area water providers. Each of these customers represented a different industrial end-use: propane liquefaction, ice manufacturing, rug cleaning, etc. The product of this study was a final report analyzing the cost-effectiveness of implementing water efficient upgrades in each industry. Interesting specialized topics included several cooling tower designs, car wash designs, and reverse osmosis filtering.

Matt Hayden led research and performed extensive fieldwork, customer contact, and data collection for this project.

Quantec pre-rinse spray valve evaluation (2005)

Restaurants in the Salinas, CA area participated in evaluating the energy efficiency of new dishwashing spray valves. This project involved a custom data logging solution and file format.

Matt Hayden led the experimental design, fieldwork and analysis for this project.

SUMMARY OF EXPERIENCE

Matt Hayden contributes major statistical and technical problem solving skills to every Aquacraft research project. These include methods in modeling, population and sample analysis, and data collection and analysis.

A short list of capabilities includes the following:

- ***Automation and security of networked applications*** Matt's experience in the Microsoft and UNIX worlds allows Aquacraft to take advantage of cutting-edge technology and also securely interconnect with legacy systems
- ***Specialist in quantitative methods in program evaluation: data acquisition, random sampling and data mining.*** Matt brings years of analytical experience from many data intensive national and regional projects, spanning residential and CI, utility and academic.
- ***Fluency across varied computer systems and applications.*** Matt specializes in efficient approaches to computational statistics. This includes but is not limited to computer programming and automation, hardware design, application development, database architecture and network architecture.

PUBLICATIONS

McCutchan, J.H. Jr., J.F. Saunders, III, W.M. Lewis, Jr. and Matthew G. Hayden. 2002. *Effects of groundwater flux on open-channel estimates of stream metabolism*. *Limnology and Oceanography* 47: 321-324.

Online Availability: <http://cires.colorado.edu/limnology/pubs/Pub148.pdf>