Emery Water Conservancy District: Surfing into the 21st Century

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When Jay Humphrey, manager of the Emery Water Conservancy District in Utah, arrives at work, he sits down at his computer and logs onto www.ewcd.org. This public Web site provides hourly updates on weather conditions, the status of the county’s water supply, and general environmental conditions in the district’s watershed and service area. With a click of the mouse, Humphrey can survey real-time environmental conditions throughout Emery County and the San Rafael River Basin. Information on the Web site is never more than one hour old.

The district’s real-time monitoring system and Web site have been particularly useful during the current drought, which is now in its fifth year. According to Humphrey, “the network allows me to react faster to changing weather and streamflow conditions, thereby better managing our water supply.”

Background
Emery County is located in rural east-central Utah, about 115 miles south of Salt Lake City. The county’s most productive farmland is located in Castle Valley, a verdant lowland lying between the mountainous 11,100-foot-high Wasatch Plateau to the west and the arid San Rafael Swell region to the east. The area receives an average of 7.6 inches of rain per year. The principal river system in western Emery County is the San Rafael, which emerges from the confluence of Huntington, Cottonwood, and Ferron creeks.

Environmental Monitoring Network
At the request of Emery County officials, the district began a program 10 years ago to monitor environmental conditions throughout the western half of the county. The U.S. Bureau of Reclamation agreed to assist with the program. The goal was to provide a database for protecting the county’s water supply and water rights. Since that time, the monitoring system has grown from 17 to just over 80 sites, with plans to add at least eight new sites this summer. Included in this system are stream and canal gauging stations, reservoir control sites, weather stations, and water quality monitoring sites.

Operating the real-time monitoring system has not always been easy. On occasion, solar panels have been stolen or vandalized, although the problem has not been as bad as originally anticipated. Wireless communication is frequently difficult. Many of the district’s field sites are located deep in incised canyons. For this reason, Humphrey has had to install six repeaters and still occasionally has trouble with reliable communication to some of his field sites.

Early data communications on the district’s real-time monitor system were by narrow-band VHF radios. The data loggers/controllers, radio modems, radios, and sensors all were powered by solar energy. Because of evolution of equipment and changing district needs, a more complex configuration is now used on major monitoring and control sites. Communication is by spread-spectrum radios to increase the bandwidth and make streaming video surveillance possible. The newer system uses the TCP/IP networking protocol made popular by the Internet to communicate with remote sites. They are also equipped with webcams.

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Since 1993, the base station for the district’s network has evolved substantially. The first unit consisted of a PC running DOS and the data logger manufacturer’s software. The current base station includes a router/firewall, an ADSL modem to connect to the upstream Internet provider, and file and Web servers.

**District’s Web Site**

The district’s real-time environmental monitoring system generates a great deal of information, much of it potentially useful to outside organizations. There was a long debate about the best and most efficient method to dispense the data. At the recommendation of the district’s computer network consultant, it was decided to connect the environmental monitoring system dynamically to the district’s Web site.

In 1999, a first attempt was made at using the district’s Web site to distribute the county’s real-time information. The Web site includes five major sections: reservoirs, rivers, canals, springs, and weather. Each section allows the user to display real-time data in either a graphical or tabular format. Stylized schematic “stick” maps display hydrologic features annotated with current flows which are dynamically updated each time a visitor loads a page. A flexible graphing tool generates time-series graphs that may be exported to an Adobe Acrobat PDF file for publication-quality output.

The Web site is also designed to exchange data dynamically with a variety of other Web sites, including those of the Natural Resources Conservation Service (SNOTEL), the U.S. Geological Survey, Mesonet (a real-time weather system developed by the University of Utah), and the National Weather Service. The goal is to provide water managers and others with a comprehensive data source for the entire Emery County area. The Web site is the start of creating a “virtual” river basin, an accurate real-time representation of the San Rafael River on the Internet. Already, the site has proved to be very popular with Emery County residents.

The software that runs the Web site is based in large part on Open Source packages. The Open Source software movement has created many popular, robust, and secure programs, including the Linux operating system and the Apache Web server. In the spirit of giving back to the open software community, the district’s computer network consultant started the OpenBasin project in 2003. At the project Web site (www.openbasin.org), the software that runs the district’s Web site is being rewritten and released to the public. It is hoped that a community of users will evolve that will use, test, and enhance this software for the benefit of all.

**Future**

By any measure, the Emery County real-time monitoring system and Web site have been successful, but having a product that is continually evolving has not always been easy for Humphrey and other system users. It is not uncommon for them to express frustration with new “improvements.”

Comments such as: “But we just got used to the last one!” are typical. Ways to mitigate the impact of a continually changing product need to be carefully considered, particularly as the rate of technological change continues to increase. Ensuring that new products are backward-compatible is always an issue.

Nevertheless, Humphrey feels that the district has only scratched the surface of the network’s potential. With a grant in 2002 from the U.S. Department of Commerce Technology Opportunity Program, the district will be expanding its monitoring/Internet system to empower an even wider range of users.

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