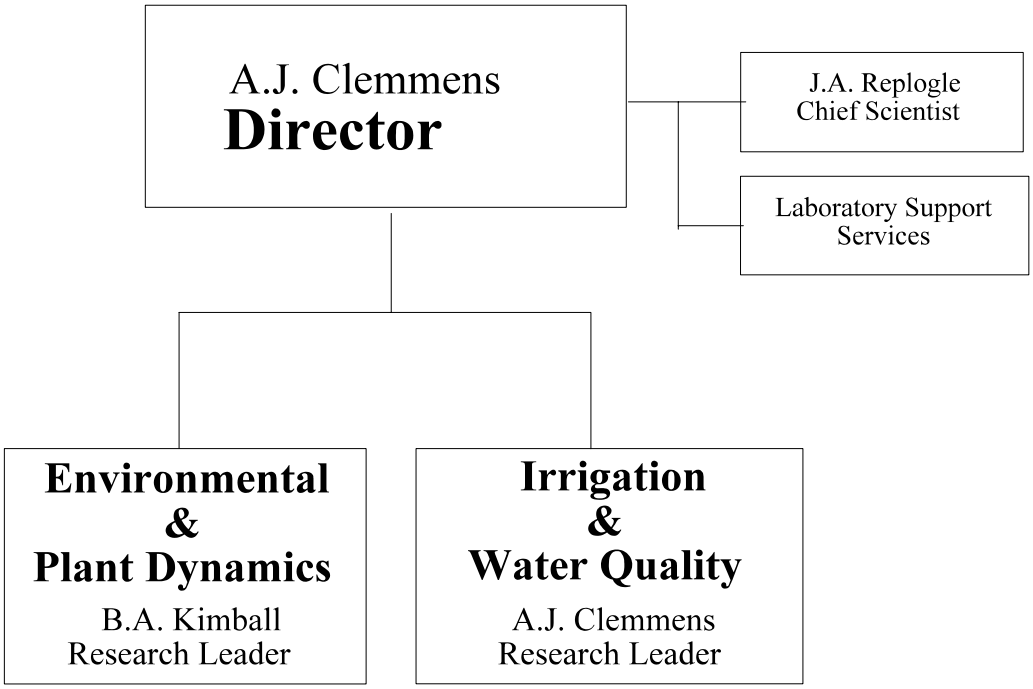
Laboratory Program

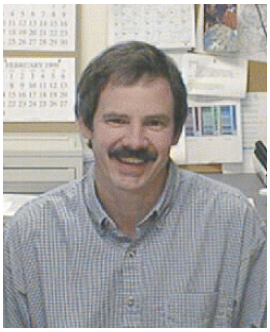
Laboratory Organization



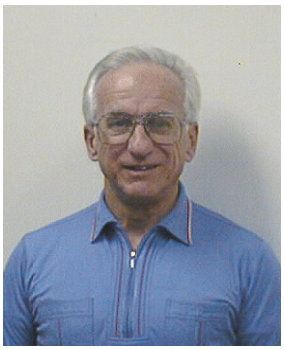
Mission

The mission of the U. S. Water Conservation Laboratory (USWCL) is to conserve water and protect water quality in systems involving soil, aquifers, plants, and the atmosphere. Research thrusts involve developing more efficient irrigation systems, improving the management of irrigation systems, developing better methods for scheduling irrigations, developing the use of remote sensing techniques and technology, protecting groundwater from agricultural chemicals, commercializing new industrial crops, and predicting the effect of future increases of atmospheric CO_2 on climate and on yields and water requirements of agricultural crops.

LABORATORY MANAGEMENT



ALBERT J. CLEMMENS, B.S., M.S., Ph.D., P.E., Laboratory Director, Research Leader for Irrigation and Water Quality, and Supervisory Research Hydraulic Engineer
Surface irrigation system modeling, design, evaluation, and operations; flow measurement in irrigation canals; irrigation water delivery system structures, operations management, and automation.



JOHN A. REPLOGLE, B.S., M.S., Ph.D., P.E., Chief Scientist and Research Hydraulic Engineer
Flow measurement in open channels and pipelines for irrigation; irrigation water delivery system structures, operations, and management.

BRUCE A. KIMBALL, B.S., M.S., Ph.D., Research Leader for Environmental and Plant Dynamics and Supervisory Soil Scientist
Effects of increasing atmospheric CO_2 and changing climate variables on crop growth and water use; free-air CO_2 enrichment (FACE) and CO_2 open-top chambers and greenhouses; micrometeorology and energy balance; plant growth modeling.

LABORATORY SUPPORT SERVICES

ELECTRONICS ENGINEERING LABORATORY

D.E. Pettit, Electronics Engineer

The electronics engineering laboratory is staffed by an electronics engineer whose duties include design, development, evaluation, and calibration of electronic prototypes in support of U.S. Water Conservation Laboratory research projects. Other responsibilities include repairing and modifying electronic equipment and advising staff scientists and engineers in the selection, purchase, and upgrade of electronic equipment. Following are examples of work performed in 2002:

- Evaluated the Palm Pilot (m105) versus a Toshiba pocket PC (e740) personal data assistant (PDA) for compatibility to be used as a data logger. Researched and found an RS232 compact flash (CF) serial input/output (I/O) card capable of being used with the Toshiba e740.
- Evaluated several C++ software packages to handle the communications I/O via RS232 interface standards.
- Wrote software in C++ to utilize the compact flash I/O RS232 serial card with hardware handshaking capabilities.
- Continued design of the GEN III proble utilizing a surface-mount microcontroller that is flash programmable and interfaceable to a new 24-cm variable water detection transducer.
- Continued design of a 24-cm low-power optics source/detector transducer using surface mount technologies to interface to the GEN III probe. Experimented with several optic parts for variable water level detection.
- Continued designing schematic capture parts and circuit board footprints for the appropriate ORCAD libraries.
- Completed multiple field tests of the 10 fiber optic sensing GEN II probes with acceptable results.
- Constructed 60 fiber optic sensing GEN II probes which measure flood irrigation water advance and recession dates and times..
- Continued repairs on LPKF circuit board mill machine and updated the hardware.
- Repairs accomplished: handheld guns, spectrophotometer, paper punch equipment, and microscope.

LIBRARY AND PUBLICATIONS

Lisa DeGraw, Publications Clerk, and Thelma Lou Draper, EPD Secretary

Library and publications functions, performed by one publications clerk, include maintenance of records and files for publications authored by the Laboratory Research Staff, and publications co-authored with outside researchers, as well as holdings of professional journals and other incoming media. Support includes searches for requested publications and materials for the staff. Library holdings include approximately 2600 volumes in various scientific fields related to agriculture. Holdings of some professional journals extend back to 1959.

The U.S. Water Conservation Laboratory List of Publications, containing over 2300 entries, is maintained on ProCite, an automated bibliographic program. The automated system provides for sorting and printing selected lists of Laboratory publications and is now accessible on LAN by the Research Staff and on the USWCL home page (www.uswcl.ars.ag.gov) by the public. Publications lists and most of the publications listed therein are available on request.

We are in the process of converting publications into pdf files which will allow easy access to our lab publications through our home page on the web. There are currently approximately 200 publications available for public use.

COMPUTER FACILITY

T.A. Mills, Computer Specialist

The computer facility is staffed by one full-time Computer Specialist and one full-time Computer Assistant. Support is provided to the ARS Phoenix Location, including the U.S. Water Conservation Laboratory (USWCL), the Phoenix Location Administration Office, and the Western Cotton Research Center (WCRL).

The facility is responsible for designing, recommending, purchasing, installing, configuring, upgrading, and maintaining the Phoenix Location's Local and Wide Area Networks (LAN, WAN), computers, and peripherals. The USWCL LAN consist of multiple segments of 10 Base-T, 100 Base-T, 1 Gigabit hubs and switches. The LAN is segmented using high speed switches. Segments are made up of fiber optics, CAT 5. This configuration currently provides over 200 ports to six USWCL buildings in addition to 48 ports at WCRL. Internet service is provided by Arizona State University (ASU) via a Point-to-Point T-1 line. The facility maintains two Internet domains uswcl.ars.ag.gov, and wcrl.ars.usda.gov. The Laboratory LAN is comprised of several servers operating under Windows NT 4.0 and Windows 2000. End users operate under Windows 2000, and Windows NT 4.0 with a fewWindows 9x and XP workstations. LAN security is enhanced by Cisco PIX firewall and three routers implemented in the LAN.

Services such as print, file, remote access, and backup are provided by the USWCL LAN. Other services such as DNS and E-Mail are provided to both the USWCL and WCRL. The USWCL maintains Web Servers for both USWCL (www.uswcl.ars.ag.gov) and WCRL (www.wcrl.ars.usda.gov). Currently FTP access is restricted to local accounts. This policy may be relaxed during the coming year.

MACHINE SHOP

C.L. Lewis, Machinist, and "Skip" Eshelman, Physical Science Technician

The machine shop, staffed by one machinist, provides facilities to fabricate, assemble, modify, and replace experimental equipment in support of U.S. Water Conservation Laboratory research projects. With the passing of Clarence "Bud" Lewis, the functions were distributed to laboratory personnel with Trathford "Skip" Eshelman monitoring the shop. The following are examples of work orders completed in 2002:

- Manufactured two 8' manometer boards
- Cutting and reassembling via welding various lengths and configurations of aluminum irrigation pipes
- Cutting and bending sheet metal parts for cooling system on greenhouses at Cotton Lab
- Manufacturing copper pressure sensing tubes for bottom of radial gate at SRP
- Fabrication of wooden surface skimmers for use at SRP in the radial gate project
- Manufacture of a variable depth pressure sensing tube for use in radial gate project with SRP
- Designing and fabrication of the first Furrowometer
- Repair and maintenance of various tools and equipment used in everyday research

USWCL OUTREACH ACTIVITIES

The USWCL staff participates in numerous activities to inform the public about ARS and USWCL research, to solicit input to help guide the USWCL research program, to foster cooperative research, and to promote careers in science.

"Experiments for the Classroom." The USWCL web site (www.uswcl.ars.ag.gov/events/exper/exper.htm) contains experiments suitable for high school science classes. We responded to several inquiries about our experiments for students from this site.

AgVentures held at Maricopa Agricultural Center (MAC), February 12 & 14. Scientists from USCL participated in the AgVentures held at MAC. Glenn Fitzgerald and Paul Pinter presented remote sensing concepts while Terry Coffelt, Dave Dierig, and Gail Dahlquist presented New Crops research information to groups of middle and high school children at this event.

Workshop to aid Adelaide, Australia, with the Lower Murray Region of South Autralia's irrigation allocation, February 27-28. Bert Clemmens attended a workshop in Adelaide, Australia, to review rehabilitation options for the Lower Murray Region of South Australia. The region utilizer 20% of the South Australia's River Murray irrigation allocation, but is poorly managed. The workshop was organized by the Department of Primary Industries and Resources, South Australia. While in Australia, Bert examined irrigation practices in other regions along the Murray River.

Arizona Science Bowl, March 2. Kathy Johnson, Mike Wiggett, and Gail Dahlquist participated in the Arizona Science Bowl at Glendale Community College.

Visit by Mexican Students, March 12. Thirty students from the seventh-year irrigation class of the Universidad Autonoma Chapingo, Chapingo, Mexico, visited the laboratory. John Replogle hosted them and presented the overall laboratory history and current programs along with a hydraulic laboratory tour featuring recent innovations involving flumes, Venturi meters, pitot tubes, flap-gate studies and the modification of velocity profiles in pipes to improve flow meter performance and accuracy.

Arizona U.S. Agriculture Day, March 13. Glenn Fitzgerald, Tom Clarke, and Dave Dierig attended the Arizona U.S. Agriculture Day in Phoenix, AZ. They distributed literature about the Water Conservation Laboratory and answered questions from the public about water issues in Arizona agriculture.

Directors Reception of Maricopa Agricultural Center (MAC), April 11. Dave Dierig and Terry Coffelt presented New Crops research to the Directors Receptions of Maricopa Agricultural Center (MAC)> The receptions was held to inform politicians, board of reagents, agribusinesses, and academics about the research being done at MAC.

Automata, Inc. Working on software for Canal Automation, April 16-17. Lenny Fueur from Automata, Inc., visited the lab and was given a demonstration of the SacMan software for canal automation by B3ert Clemmens and Bob Strand. The visit lead to a decision to develop software that provides various levels of automatic control.

Scientist from Hebron University visits lab, April 26, May 28 and June 21.. Akrum Tamimi from Hebron University, on sabbatical at the University of AZ, visited Bert Clemmens, Fedja Strelkoff, and Eduardo Bautista to discuss the progress on new software for estimation of surface irrigation parameters.

American Oilseed Chemist in Quebec, Canada special symposium, May 5-8. Dave Dierig presented a paper on Lesquerella breeding and Terry Coffelt presented one on Vernonia to the American Oilseed Chemists in Quebec, Canada. A special symposium was organized on the progress of commercialization of lesquerella and other oilseed crops by their industrial oilseed division.

Scientist visits Saltillo, Mexico, Octover 21-23. Dave Dierig traveled to Saltillo, Mexico, to begin a study on salt tolerance in lesquerella with cooperator Dra. Diana Jasso de Rodriquez.

Visit by Gila River Indian Community farmers, November 8. Dave Dierig met with farmers from the Gila River Indian Community regarding growing lesquerella on their land.

Governor's Advisory Committee. Throughout the year Bert Clemmens attended meetings of the Governor's Advisory Committee on Agricultural Best Management Practices. This committee was set up by Governor Hull to provide guidance on implementing an interim practice for the Third Management Plans for the state's groundwater Active Management Areas.

Graduate student from Brazil. Terry Coffelt is serving on a committee for a graduate student from Brazil at The University of Arizona.

SAFETY

T. Steele

The Laboratory Safety Committee enjoys well-deserved respect from the employees. It is a time-consuming commitment and requires judicious management of time and work priorities. Serving on the safety committee, however, is gratifying in terms of its record of accomplishments. A few examples of our accomplishments follow:

a. Location physical security was enhanced with the installation of a card access system at the main entry points. All visitors must enter the facility via the main entrance, sign-in and receive and display a visitor badge while on the premises. Vehicle gates have been updated with new electric operators and card readers.

b. The location has been able to maintain its conditionally exempt small quantity generator status by careful review of process start materials and subsequent waste generation.

c. Employees are encouraged to report all safety concerns, even those that might seem trivial.

d. The committee takes its duties seriously and has worked diligently to insure compliance with all EPA and OSHA regulations and radiological safety protocols.

The location staff thanks the committee for their good work on our behalf and looks forward to another year of safety awareness and exemplary records.