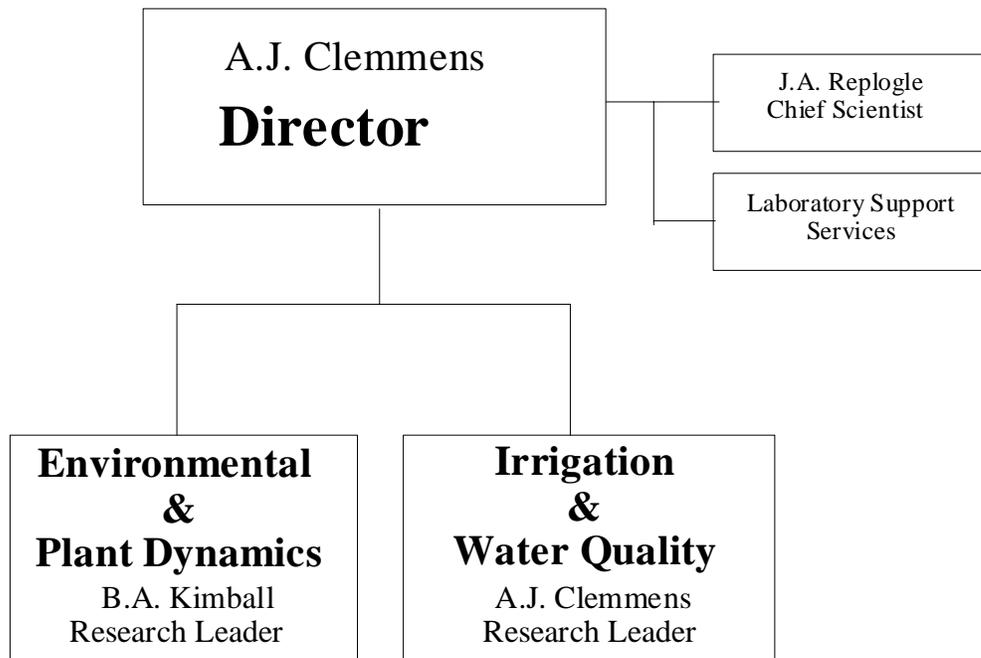


Laboratory Program

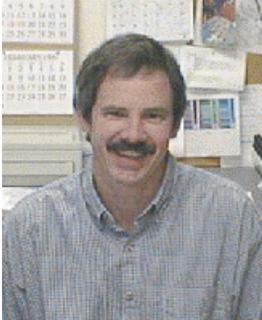
Laboratory Organization



Mission

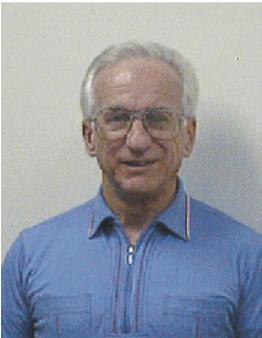
The mission of the U. S. Water Conservation Laboratory (USWCL) is to conserve water and protect water quality in systems involving soil, aquifers, plants, and the atmosphere. Research thrusts involve developing more efficient irrigation systems, improving the management of irrigation systems, developing 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 CO₂ 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 CO₂ and changing climate variables on crop growth and water use; free-air CO₂ enrichment (FACE) and CO₂ 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 2003:

- Evaluated a soil moisture probe that uses fiber optics by Alessi and Lyle Prunty for a possible project with Floyd Adamsen. Also consulted with John Replogle on a 24 cm depth gage transducer that would be portable for field use.
- Evaluated and advised Bruce Kimball on interfacing a control unit between his infrared heater units the data loggers.
- Assisted Neal Adam in the design abilities and methods used for his seed germination project using thermal piles versus hot-water bath methods.
- Redesigned the interface for three Xerox SPAD meters connecting to Palm PDA for Paul Pinter's field measurement studies.
- Designed and constructed 8 ten-channel PH probe amplifier boards using surface mount technology for Floyd Adamensen's and Clint William's Trace Rios project.
- Designed and constructed a DC to DC converter and installed a switch control to provide power to the three enclosed units for Floyd Adamsen's flow controller.
- Continued design of hardware and software for the GEN III probe utilizing a surface-mount microcontroller that is flash programmable and interfaceable to a new 24-cm variable water detection transducer.
- Redesigned the 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.
- Continued repairs on LPKF circuit board mill machine and updated the hardware.
- Repairs accomplished: centrifuge CR 412, thermostat and temperature sensors and precision of them, spectrophotometer 480 LC, and vehicle trailer wiring.

LIBRARY AND PUBLICATIONS

Selina McCain, 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 2400 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 300 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 wcr1.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 few Windows 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.wcr1.ars.usda.gov). Currently FTP access is restricted to local accounts. This policy may be relaxed during the coming year.

MACHINE SHOP

“Skip” Eshelman, Physical Science Technician

The machine shop provides facilities to fabricate, assemble, modify, and replace experimental equipment in support of U.S. Water Conservation Laboratory research projects. Trathford “Skip” Eshelman monitors the shop and provides assistance to laboratory personnel in the use of shop equipment. The following are examples of work orders completed in 2003:

- Built a narrow and a 4-ft wide sampler rack for test as a water flow-measuring device.
- Constructed sampling devices for use in water treatment ponds at Tres Rios.
- Made solar panel frames.
- Designed and assembled trailer for use in the field with 4 track vehicle.
- Built an adjustable bracket to hold sensors to wheeled linear.
- Performed repair and maintenance on injector pumps.
- Constructed table for soil grinder.
- Painted rebar ruler stakes.
- Made reference panels for different white color readings.
- Constructed new drip pans for coolers on the large greenhouse.
- Fabricated weatherproof enclosures for data loggers.
- Milled airborne multiple camera platform.
- Made brackets for mounting sensors on stand pipes.
- Built temperature gradient table.

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.

The Science Open House Water & Science Ag-Ventures, February 25-26. The event was held at the University of Arizona, Maricopa Agricultural Center, and targeted high school and junior high school students encouraging them to seek science careers. Some charter schools with agricultural interests also attended. Five displays and presentations were included, four from the USWCL and one from the Western Cotton Research Lab (WCRL). Glenn Fitzgerald and Tom Clarke presented “Remote Sensing Tools,” Gail Dahlquist and Terry Coffelt presented “New Crops and New Products,” Norma Duran presented “Wastewater,” and Jackie Blackmer from WCRL presented “Insect Communication.”

Visit by Mexican Students, March 5. Students from the seventh-year irrigation class of the Universidad Autonoma Chapingo, Chapingo, Mexico, visited the laboratory. John Replogle presented an overview of our laboratory and discussed current programs and gave them a tour of the hydraulics laboratory, which featured recent innovations involving flumes, Ventury meters, pitot tubes, flap-gate studies and the modification of velocity profiles in pipes to improve flow meter performance and accuracy. John also presented current research on open-channel and pipe flow measurement. Theodor Strelkoff discussed current research on surface irrigation modeling.

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:

1. In preparation for vacating the facility when the Location consolidates and relocates to the Maricopa Agricultural Center (MAC) a Phase I Environmental Site Assessment SOW was developed and the contract awarded. The final report has been delivered and a proposal for Phase II is in progress.
2. Both the Nuclear Regulatory Commission and the USDA Radiation Safety Staff conducted inspections of our Radiation Program during the year and no violations were noted by either group.
3. A Location Continuity of Mission Plan was developed and disseminated. The plan outlines essential decision-making personnel, mission critical assets that require protection and the specific employees that are delegated responsibilities for executing the plan.
4. 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.

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

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.