

Program
11th International Conference on Irrigation and Drainage

**Water Reuse and Non-Traditional
Water Sources for Irrigated Agriculture**



USCID

The U.S. society for irrigation and drainage professionals

Cooperating Organization

The Water Research Foundation

October 15 -19, 2018

Phoenix, Arizona

Program

Monday, October 15

10:00 a.m. - 6:00 p.m. **Irrigation District Modernization Workshop**

This **optional** one-day Workshop will cover strategies of irrigation district modernization, and technical details that have proven successful in irrigation projects throughout the US and abroad. Problems and failures will also be discussed. Topics will include recirculation of return flows, regulating reservoirs, the difference between improving a single structure versus modernizing a system, canal lining, automation of canals and pumps with PLC-based control and more simple hydraulic structures, SCADA, special considerations of VFDs, pipeline options, and philosophies of modernization. The workshop will be led by Charles M. Burt (Chairman of the Irrigation Training and Research Center) who has extensive practical and theoretical experience in modernization throughout the U.S. and internationally. The ASCE Manual of Practice No. 131, *Canal Automation for Irrigation Systems*, will be the primary reference for the Workshop and copies will be available for purchase.

Tuesday, October 16

7:00 a.m. - 5:30 p.m. **Registration**

8:00 a.m. - 11:30 a.m. **Field Tour — Riparian Preserve and Salt River Project**

The Tour will visit the Riparian Preserve, Salt River Project Eastern Canal, and the Town of Gilbert drinking water treatment plant. In 1986, Gilbert made a commitment to reuse 100 percent of its effluent water. The Town's desire to create innovative and unique ways to combine water resource development with wildlife habitat, educational and recreational opportunities led to the development of the Riparian Preserve in 1999. Of the 110 acres, 70 acres make up the 7 water recharge basins that are filled on a rotating basis with treated effluent and allowed to percolate into the aquifer where it is stored for future use. One of the ponds has a unique distribution stream that mimics the action of an ephemeral desert stream. An additional lake is filled with reclaimed water, and is designated as an urban fishing resource through the Arizona Game and Fish Department. The Preserve is organized into various vegetative zones ranging from marshlands to native riparian and upland vegetation areas. Approximately 298 species of birds have been identified on the site, and many insects, fish, amphibians, reptiles, and mammals have found homes there as well. Over 4.5 miles of trails weave through the park, and there are interpretive education panels on wildlife and vegetation throughout. The Riparian Preserve is one part of the property known as Water Ranch, which extends from Greenfield Road east to Higley Road, encompassing the majority of the land between Guadalupe Road and the utility easement. Water Ranch includes the Southeast Regional Library building, the Salt River Project Eastern Canal, and the Town of Gilbert Drinking Water Treatment Plant.

12:00 noon - 1:15 p.m. **Lunch with Speaker**

Moderator — **Brian T. Wahlin**, WEST Consultants, Inc., and President, USCID, Tempe, AZ

Speaker — **John Shadegg**, former U.S. Representative, Arizona, Phoenix, AZ

1:30 p.m. - 3:00 p.m. **Opening Plenary Session**

Moderator — **Eduardo Bautista**, Agricultural Research Service, USDA, Maricopa, AZ

Keynote Address

Steven Hvinden, Lower Colorado Region, Bureau of Reclamation, Boulder City, NV

Salt River Project Update

Dave Roberts, Associate General Manager, Water Resources, Salt River Project, Phoenix, AZ

Arizona Department of Water Resources Update

Clint Chandler, Assistant Director, Arizona Department of Water Resources, Phoenix, AZ

3:00 p.m. - 3:30 p.m. **Break**

3:30 p.m. - 4:30 p.m. **Opening Plenary Session, (continued)**

Moderator — **Eduardo Bautista**

The Water Research Foundation Update

John Albert, Chief Research Officer, The Water Research Foundation, Alexandria, VA

Transitioning from Rural to Urban Community, Challenges in Construction, Operation and Maintenance

Cheryl Zittle, Salt River Project, Phoenix, AZ

4:30 p.m. - 5:00 p.m. **USCID Update**

Speaker — **Brian T. Wahlin**

5:00 p.m. - 5:30 p.m. **Meet the Exhibitors**

5:30 p.m. - 7:30 p.m. **Networking Reception,
Exhibition and Poster Session**

*A Reclaimed Wastewater Allocation Optimization Model for
Agricultural Irrigation*

Aljanabi Ahmed, Arizona State University, Tempe, AZ

*Impacts of Irrigation with Brackish and RO Concentrate
Water on Soil Thermal Properties*

Akram Ben Ali, Manoj Shukla and **Blair L. Stringam**, New
Mexico State University, Las Cruces, NM

*How to Achieve a High Distribution Uniformity Value in a
Microirrigation System*

Matthew Caviglia, California Polytechnic State University,
San Luis Obispo, CA

Friction Within Drip Irrigation

Erika E. Gomez, California Polytechnic State University, San
Luis Obispo, CA

*Irrigation Water Salinity Effects on Germination and
Emergence of Alfalfa, Triticale and Quinoa Species*

**V. Kankarla, M. K. Shukla, D. VanLeeuwen, B. J. Schutte,
G. A. Picchioni**, New Mexico State University, Las Cruces,
NM

*Feasibility of Partial Root Zone Drying for Water
Conservation In Field-Grown Pecans*

Curt A. Pierce, Blair L. Stringam and **Richard J. Heerema**,
New Mexico State University, Las Cruces, NM

Wednesday, October 17

7:00 a.m. - 5:00 p.m **Registration**

7:00 a.m. - 8:00 a.m. **Continental Breakfast with
Exhibits and Poster Papers**

8:00 a.m. - 10:00 a.m. **Panel Discussion — Use of
Recycled Water in Agriculture**

Moderator — **Kristan VandenHeuvel**, The Water Research
Foundation, Alexandria, VA

Panel Members:

Brent Haddad, Professor, University of California, Santa
Cruz, Santa Cruz, CA

Kara Nelson, Professor, University of California, Berkeley,
Berkeley, CA

Anne Thebo, Research Scientist, Pacific Institute, Oakland,
CA

Bahman Sheikh, Research Scientist, Bahman Sheikh Water
Reuse Consulting, San Francisco, CA

Shannon Spurlock, Director of External Relations, Denver
Urban Gardens, Denver CO

10:00 a.m. - 10:30 a.m. **Break with Exhibits and
Poster Papers**

10:30 a.m. - 12:00 noon **Panel Discussion — Use of
Recycled Water in Agriculture (continued)**

12:00 noon - 1:15 p.m. **Lunch with Speaker**

Moderator — **Brian T. Wahlin**

Speaker — **George Seperich**, Arizona State University,
Tempe, AZ

1:30 p.m. - 3:00 p.m. **Concurrent Technical
Session A — Water Reuse**

Moderators — **Kristan VandenHeuvel**, The Water
Research Foundation, Alexandria, VA; and **Anne Thebo**,
Pacific Institute, Oakland, CA

*Varying Practices and Attitudes Associated with Water
Reuse for Agricultural and Residential Irrigation in Northern
Utah*

L. Niel Allen, Courtney Flint and **Kristen Koci**, Utah State
University, Logan, UT

*Pathogen Occurrence in Treated Domestic Wastewater
intended for Irrigation*

**Walter Betancourt, Libin Zhu, Sadhana Ravishankar,
Channah Rock, Luisa Ikner** and **Charles Gerba**, The
University of Arizona, Tucson, AZ

*Investigation and Analysis of a Variety of Pharmaceuticals
and Personal Care Products in Reclaimed Domestic
Wastewater Used for Urban Agriculture in Northern Utah*

Leila Ahmadi, R. Ryan Dupont and **Joan E. McLean**, Utah
State University, Logan, UT

1:30 p.m. - 3:00 p.m. **Concurrent Technical Session B — Non-Traditional Water Conservation through Design and Construction Techniques**

Moderators — **Peggy B. Graham**, Advanced Drainage Systems, Longmont, CO; and **Hassan A. Elsaad**, Salt River Project, Phoenix, AZ

Use of Geosynthetics for Lining Irrigation Canals
Herve L. Plusquellec, Consultant, Washington, DC

Design Procedures for Fiber Reinforced Concrete Applications in New and Repair of Hydraulic Structures
Barzin Mobasher, Arizona State University, Tempe, AZ

Conservation of Irrigation Water Using Canal³ Geocomposite
Roy G. McClinton, HUESKER Inc., Charlotte, NC

1:30 p.m. - 3:00 p.m. **Concurrent Technical Session C — Infrastructure**

Moderators — **David T. Phelps**, Stantec Consulting Services, Inc., Phoenix, AZ; and **Erling A. Juel**, Greenfields Irrigation District, Fairfield, MT

Modernizing Aging Pipe Infrastructure in Irrigation Districts
Charles M. Burt, **Kyle Feist** and **Zachary Markow**, Irrigation Training and Research Center, San Luis Obispo, CA

Lake Houston Dam Rehabilitation Project
Mike Gerlach, Stantec Consulting Services, Inc., Phoenix, AZ

Hydromodification Water Storage
Tom LaRue, Advanced Drainage Systems, Perris, CA

3:00 p.m. - 3:30 p.m. **Break with Exhibits and Poster Papers**

3:30 p.m. - 5:30 p.m. **Concurrent Technical Session A — Water Reuse** (continued)

Moderators — **Kristan VandenHeuvel** and **Anne Thebo**

Investigating Various Methods of Pharmaceutical Compound Detection in Aerosols from Reclaimed Water Sprinkler Irrigation

Leila Ahmadi, **Kwame T. Duodu**, **R. Ryan Dupont**, **Randal S. Martin** and **Joan E. McLean**, Utah State University, Logan, UT

Verification of Enteric Virus Removal by Soil Aquifer Treatment via Non-human Viruses Used as Conservative Indicators

Christina M. Morrison and **Walter Q. Betancourt**, The University of Arizona, Tucson, AZ; **Daniel R. Quintanar**, The City of Tucson Water, Tucson, AZ; and **Ian L. Pepper** and **Charles P. Gerba**, The University of Arizona, Tucson, AZ

From Plant to Pipe to Plants: Re-Purposing Process Water to Grow the Phoenix Valley

Taylor Ahrensdoerf, Stantec Consulting Services, Inc., Phoenix, AZ

In-Situ Autonomous Bacterial Pathogen Sensor for Ag Reuse Water Monitoring

Dan Angelescu, **Joyce Wong** and **Andreas Hauso**, Fluidion US Inc., Los Angeles, CA

3:30 p.m. - 5:30 p.m. **Concurrent Technical Session B — Non-Traditional Water Conservation through Design and Construction Techniques** (continued)

Moderators — **Peggy Graham** and **Hassan A. Elsaad**

CAP System Use Agreement
Marcus Shapiro, Central Arizona Project, Phoenix, AZ

A New Perspective in Stormwater Management
Ricardo Aguirre, Holistic Engineering and Land Management, Phoenix, AZ

Salt River Project Irrigation Lateral Capacity Tool
Bert Clemmens, **Brent Travis**, **Brian Wahlin**, and **Jorge Garcia**, WEST Consultants, Inc., Tempe, AZ

A Guide to Agricultural Water Conservation Projects and Regulatory Barriers: A Case Study from the Sweeney McCune Automation and Recovery Project in Solano County, California

Justin M. Hopkins, Solano Irrigation District, Vacaville, CA; **Amy E. Storck**, Dokken Engineering, Folsom, CA; and **Kevin L. King**, Solano Irrigation District, Vacaville, CA

3:30 p.m. - 5:30 p.m. **Concurrent Technical Session C — Infrastructure** (continued)

Moderators — **David T. Phelps** and **Erling A. Juel**

SCADA System Maintenance: An Often Overlooked Necessity

Kyle E. Feist and **Charles M. Burt**, Irrigation Training and Research Center, San Luis Obispo, CA

Electronic Monitoring and Control of the Water Delivery System at Hammond Conservancy District

Tom Gill and **Kent Walker**, Bureau of Reclamation, Denver, CO

Infrastructure Issues in Water Use for Irrigated Agriculture: A Case Study from Pakistan

Sajid Ali Bhutto, Irrigation Department Government of Sindh, Hyderabad, Pakistan

Unlined Ditch Conversions with an Emphasis on Thermoplastic Pipe

Peggy B. Graham, Advanced Drainage Systems, Longmont, CO

6:30 p.m. - 7:00 p.m. **Reception**

7:00 p.m. - 9:00 p.m. **Awards Dinner with Speaker**

Moderator — **Brian T. Wahlin**

Speaker — **Guy Carpenter**, Carollo Engineers, Phoenix, AZ

Thursday, October 18

7:00 a.m. - 5:00 p.m. **Registration**

7:00 a.m. - 8:00 a.m. **Continental Breakfast with Exhibits and Poster Papers**

8:00 a.m. - 10:00 a.m. **Panel Discussion — Water Reuse in Irrigated Agriculture: Recommendations Towards a Safe and Sustainable Solution to Climate Variability**

Moderator — **Channah M. Rock**, University of Arizona, Maricopa, AZ

Panel Members

Amy Sapkota, University of Maryland, College Park, MD
Channah Rock, University of Arizona, Maricopa, AZ
Sean Ellis, University of Delaware, Newark, DE
Charles Gerba, University of Arizona, Tucson, AZ
Manan Sharma, Agricultural Research Service, USDA, Beltsville, MD

8:00 a.m. - 10:00 a.m. **Concurrent Technical Session D — Evapotranspiration**

Moderators — **W. Martin Roche**, Consultant, Grass Valley, CA; and **Sara Harper**, Dewberry, Sacramento, CA

Water Use of Micro-irrigated Pistachio Orchards Grown on Increasingly Saline Soils in California

Giulia Marino, University of California, Davis, Davis, CA;
Blake Sanden, University of California Cooperative Extension, Bakersfield, CA; **Louise Ferguson** and **Bruce Lampinen**, University of California, Davis, Davis, CA; **Cayle Little**, California Department of Water Resources, Sacramento, CA; and **Mahesh Lal Maskey**, **Richard Snyder** and **Daniele Zaccaria**, University of California, Davis, Davis, CA

Impact of Sensor Spatial Response in Evapotranspiration Estimation Using Landsat Satellite Data

Aldo Piñón-Villarreal, Angelo State University, San Angelo, TX; and **Zohrab Samani** and **Salim Bawazir**, New Mexico State University, Las Cruces, NM

Evapotranspiration Measurements over Lettuce and Wheat in Yuma, Arizona

Andrew French, Agricultural Research Service, USDA, Maricopa, AZ; **Charles Sanchez**, University of Arizona, Maricopa, AZ; and **Mazin Saber**, University of Arizona, Yuma, AZ

Phenotyping Cotton Water Use with Multispectral Drone Imagery and Geospatial FAO-56 Methods

K. R. Thorp, **A. L. Thompson**, **S. J. Harders**, **A. N. French** and **R. W. Ward**, Agricultural Research Service, USDA, Maricopa, AZ

8:00 a.m. - 10:00 a.m. **Concurrent Technical Session E — Irrigation and Water Management**

Moderators — **David E. Bradshaw**, Imperial Irrigation District, Imperial, CA; and **Blair L. Stringam**, New Mexico State University, Las Cruces, NM

Managing Irrigation with Limited Water Using iCrop

I. Kisekka, University of California, Davis, Davis, CA; and **J. Kim**, Colorado State University, Fort Collins, CO

FloodMAR under SGMA in the San Joaquin Valley, CA

Philip Bachand, Bachand & Associates, Davis, CA; **Calvin Monreal** and **Randy Hopkins**, Provost & Pritchard Consulting Group, Clovis, CA; **David Merritt**, Kings River Conservation District, Fresno, CA; and **Don Cameron**, Terranova Ranch, Helm, CA

Using Net Groundwater Extractions for Farm Level Groundwater Sustainability Monitoring

Daniel Howes and **Morgan Whinery**, California Polytechnic State University, San Luis Obispo, CA; and **Eric Limas** and **Dan Vink**, Lower Tule River and Pixley Irrigation Districts, Tipton, CA

Improving Water Management through Managed Aquifer Recharge Using Agricultural Field Drains

James Norris, California State University, Chico, Chico, CA

10:00 a.m. - 10:30 a.m. **Break with Exhibits and Poster Papers**

10:30 a.m. - 12:00 noon **Panel Discussion — Use of Recycled Water in Agriculture** (continued)

10:30 a.m. - 12:00 noon **Concurrent Technical Session D — Evapotranspiration** (continued)

Moderators — **W. Martin Roche** and **Sara Harper**

Application of Remote Sensing in Agricultural Water Management

Zohrab Samani and **Salim Bawazir**, New Mexico State University, Las Cruces, NM

Evapotranspiration Studies in Yuma, Arizona

Charles Sanchez, University of Arizona, Maricopa, AZ

e-Admin System for Agri-Irrigation Project

Dilip Yewalekar and **Manisha Kinge**, Jain Irrigation Systems Ltd, Jalgaon, India

10:30 a.m. - 12:00 noon **Concurrent Technical Session E — Irrigation and Water Management** (continued)

Moderators — **David E. Bradshaw** and **Blair L. Stringam**

Sharing of Colorado-Big Thompson Project Water for Agricultural, Industrial and Municipal Use

Jim Hall, Northern Water, Berthoud, CO

Alternative Water Sources in Stakeholder Frames of Agricultural Challenges and Solutions

Julia C. Bausch, Arizona State University, Tempe, AZ; and **Clinton F. Williams**, Agricultural Research Service, USDA, Maricopa, AZ

Assessing the Risk of Aquifer Salinization in a Large-Scale Coastal Irrigation Scheme of Southern Italy

Daniele Zaccaria, University of California, Davis, Davis, CA; **Giuseppe Passarella**, Water Research Institute, Bari, Italy; **Daniela D'Agostino**, Mediterranean Agronomic Institute of Bari, Bari, Italy; **Samuel Sandoval Solis** and **Mahesh Maskey**, University of California, Davis, Davis, CA; and **Laura Foglia**, University of California, Davis, Davis, CA

12:00 noon - 1:15 p.m. **Lunch with Speaker**

Moderator — **Brian T. Wahlin**

Speaker — **Larry Mays**, Arizona State University, Tempe, AZ

1:30 p.m. - 3:00 p.m. **Concurrent Technical Session F — Groundwater**

Moderators — **Aldo R. Pinon-Villarreal**, Angelo State University, San Angelo, TX; and **Taylor Ahrens Dorf**, Stantec Consulting Services, Inc., Phoenix, AZ

LAT 7.70R (Canal 1 Joint Works) / MAR 1B Improvements Located Near Coolidge Arizona for Pima-Maricopa Irrigation Project, Arizona USA

David T. Phelps, Stantec Consulting Services Inc., Phoenix, AZ; and **Bill Eden**, Pima-Maricopa Irrigation Project, Sacaton, AZ

Incentivizing Incidental Groundwater Recharge in Teton Valley, Idaho

Kate Burchenal, **Morgan Campbell**, **Lucy Hedley**, **Emily Honn** and **Tessa Reeder**, University of California Santa Barbara, Santa Barbara, CA

Using Hydraulic Profiling for Irrigation Drainage Design

Roger Burnett, Bureau of Reclamation, Denver, CO

1:30 p.m. - 3:00 p.m. **Concurrent Technical Session G — Regulatory Issues**

Moderators — **Randy Hopkins**, Provost & Pritchard Consulting Group, Clovis, CA; and **Aung K. Hla**, Bureau of Reclamation, McCook, NE

New Mexico Unit of the Central Arizona Project

Anthony Gutierrez, New Mexico Central Arizona Project Entity, Cliff, NM; and **David Maxwell**, Stantec Consulting Services, Inc., Silver City, NM

The History of Wastewater Reuse for Agriculture in the U.S.

William F. Ritter, Ritter Engineering, Elkton, MD

Arizona Recycled Water Use

Channah M. Rock, University of Arizona, Maricopa, AZ

1:30 p.m. - 3:00 p.m. **Concurrent Technical Session H — Western U.S. Water Infrastructure Updates**

Moderators — **Reed R. Murray**, U.S. Department of the Interior, Provo, UT; and **Bill Plummer**, Consultant, Scottsdale, AZ

Summary of Proposed California Developments

David E. Bradshaw, Imperial Irrigation District, Imperial, CA

Bureau of Reclamation Infrastructure Plans in the Western U.S.

Delbert M. Smith, Bureau of Reclamation, Denver, CO

Lake Mead Intake No. 3 — Ensuring Access to Water Supply Under Extreme Drought Conditions

Peter J. Jauch, Southern Nevada Water Authority, Las Vegas, NV

3:00 p.m. - 3:30 p.m. **Break with Exhibits and Poster Papers**

3:30 p.m. - 5:30 p.m. **Concurrent Technical Session F — Groundwater** (continued)

Moderators — **Aldo R. Pinon-Villarreal** and **Taylor Ahrens Dorf**

Effect of Conjunctive Use of Surface and Groundwater on Groundwater Recharge

Pooneh Pahlevani, WSP USA, Charlotte, NC; and **Zohrab Samani**, New Mexico State University, Las Cruces, NM

Transit Time of Agricultural Recharge to Aquifer

Hugo Perea, Arizona Department of Water Resources, Phoenix, AZ

Groundwater Issues in Central California

Samuel W. Schaefer, GEI Consultants, Inc., Santa Barbara, CA

Stormwater Runoff from Urbanized Areas as a Groundwater Recharge Source

Michael Milczarek and **Robert C. Rice**, GeoSystems Analysis, Inc., Tucson, AZ; **Jason Keller**, GeoSystems Analysis, Inc., Hood River, OR; and **Laurel Lacher**, Lacher Hydrological Consulting, Tucson, AZ

3:30 p.m. - 5:30 p.m. **Concurrent Technical Session G — Regulatory Issues** (continued)

Moderators — **Randy Hopkins** and **Aung K. Hla**

Rio Grande Compact: A History of Conflict and Compromise

Scott Verhines, Stantec Consulting Services, Inc., Albuquerque, NM; and **George V. Sabol**, Stantec Consulting Services, Inc., Phoenix, AZ

Regulatory and Implementation Topics for Water Reuse in the U.S.

Jeff Mosher, Carollo Engineers, Phoenix, AZ

Use of Municipal Wastewater for Irrigation in California Revisited

W. Martin Roche, Consulting Engineer, Grass Valley, CA

Regulatory-Public Perception Issues in Arizona

Jeff Tannler, Arizona Department of Water Resources,
Phoenix, AZ

**3:30 p.m. - 5:30 p.m. Concurrent Technical
Session H — Western U.S. Water Infrastructure
Updates** (continued)

Moderators — **Reedy R. Murray** and **Bill Plummer**

*Lake Powell Pipeline in Southern Utah and Development of
the Bear River*

Joel Williams, Utah Division of Water Resources, Salt Lake
City, UT

Northern Water and Gross Dam Raise Projects in Colorado

Gerald A. Gibbens, Northern Water, Berthoud, CO

Shasta Dam Raise Proposal

Richard Welsh, Bureau of Reclamation, Willows, CA

Oroville Dam Spillway Update

Jeff Petersen, Kiewit Engineering & Design Co., Omaha, NE

Friday, October 19

**8:00 a.m. – 6:00 p.m. Field Tour — Pima-
Maricopa Irrigation Project**

The Pima-Maricopa Irrigation Project is a tribal program operated through an annual funding agreement with the U.S. Bureau of Reclamation. Since January 2010, P-MIP has constructed more than \$350,651,000 in projects that total 85.37 miles in length. This includes pipeline and open channel canal, with the latter going from a 34-foot bottom (2,000 cfs) down to a 2-foot bottom (15 cfs). In addition, the Project has expended more than \$43,228,000 on design, \$22,322,00 on cultural resources mitigation and contributed \$13,587,151 to the San Carlos Irrigation Project for the Community's cost share in the SCIDD-designed and constructed Florence-Casa Grande Canal and headworks rehabilitation.

The tour of the P-MIP system will include a little history that sets the stage of why P-MIP is constructing the new irrigation system. The tour will then focus on various elements of the system that P-MIP has constructed during the past 10 years. This will begin at the Ashurst Hayden Diversion Dam improvements completed by SCIDD in 2011, and include a visit to the construction of the Florence-Casa Grande Canal reach 1. The tour then goes to the off-reservation Pima Canal MP 11.3 check structure and its appurtenances, before visiting the Southside Canal and the flood protection system. A trip to the 4 Mile Post Lift Station will be followed with a visit to the Community's first Managed Aquifer Recharge facility.

After lunch, the tour will visit the new 16-mile long Casa Blanca Canal, including the four siphons that are part of the canal; and go to the Santan IB canal that is under construction and the new Canal 9 under construction, and concludes with a tour of the Memorial Pipeline inlet structure.

(September 15, 2018)