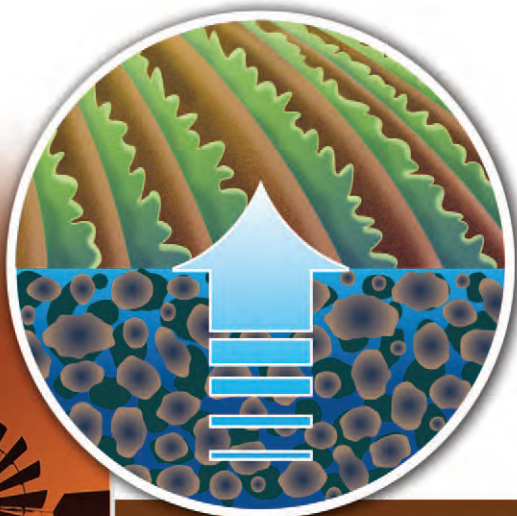


Program

# Toward Sustainable Groundwater in Agriculture



*2nd International Conference Linking Science and Policy*

June 28-30, 2016 • Hyatt Regency San Francisco Airport • Burlingame, California

**Organized by:**



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- Groundwater Resources Association of California • Canadian Water Network
- International Association of Hydrological Sciences • International Association of Hydrogeologists
- U.S. Department of Food and Agriculture • U.S. Geological Survey • UNESCO
- International Water Management Institute • National Ground Water Association



# Conference Highlights

Groundwater is the lifeline for many rural and agricultural regions and their associated cultures and populations around the globe. In fact, groundwater is a cornerstone of global food production and constitutes nearly half the world's drinking water. The challenges of protecting this resource's quality and ensuring sufficient quantities are the focus of this conference.

**Plenary Sessions:** The four plenary sessions will highlight the importance of information sharing, management, policy and legal control of groundwater in agricultural regions, and assessment of agricultural practices and associated effects on groundwater quantity and quality. Experts from California, the U.S. and around the world will speak about the connection between groundwater supply and quality, rural livelihood, and agriculture/food production for local, regional and global communities.

**Concurrent Tracks:** Four tracks featuring more than 200 speakers – policymakers, researchers, water district managers, scientists, and others – will address a wide range of policy and technical presentations

on such topics as irrigation and sustainability, salinity, nitrates, groundwater management, environmental justice, climate change, modeling and data and groundwater recharge. Be sure to visit our exhibitors: BESST Inc., DHI, Enviro Tech, Groundwater Resources Association of California, McGeorge School of Law, Water Technology Alliance, California and the Water Education Foundation.

**Tuesday Reception and Poster Session:** More than 40 posters and our exhibitors will be showcased at a hosted reception from 5:30 p.m. until 7:30 p.m. This is the perfect place to network with colleagues and learn about cutting-edge research and policy issues related to groundwater and agriculture.

**Tuesday Documentary Screening:** See an exclusive screening of "Pumped Dry: The Global Crisis of Vanishing Groundwater," a *USA TODAY* Network Production at 7:30 p.m.

**Wednesday Poster Session:** The posters will continue to be on display during a hosted reception from 5:30 p.m. to 7:30 p.m.

## Program Council

### Executive Committee:

Thomas Harter, *University of California, Davis*  
David Rudolph, *University of Waterloo, Canada*  
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Dico Fraters, *Dutch Environmental Protection Agency, The Netherlands*  
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Tim Parker, *Groundwater Resources Association of California*  
Bridget Scanlon, *University of Texas at Austin*  
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John Selker, *Oregon State University*  
Karen Villholth, *IWMI, South Africa & Denmark*  
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# Program

Tuesday, June 28, 2016

Plenary Session 1

## California Perspectives: Agriculture at a Crossroads to Groundwater Sustainability?

Moderator: Glenda Humiston, Vice President, Agriculture and Natural Resources, University of California

8:15 a.m.

### Welcome and Opening Remarks

Jennifer Bowles, Executive Director, Water Education Foundation

Thomas Harter, Robert M. Hagan Chair, University of California, Davis

Glenda Humiston, Vice President, Agriculture and Natural Resources, University of California

### California's Groundwater-Agriculture Nexus

Karen Ross, Secretary, California Department of Food and Agriculture

### California's Sustainable Groundwater Management Act

Gordon Burns, Undersecretary, California Environmental Protection Agency

### Nitrogen Fertilization in Central Valley Crops: Answering the Question "Are we Doing it Right?"

Parry Klassen, Executive Director, East San Joaquin Water Quality Coalition

10:00

BREAK

#### Track A

### Session A.1 Nitrate Policy

Chair: Dico Fraters

#### Track B

### Session B.1 Irrigation and Sustainability

Chair: Helen Dahlke

#### Track C

### Session C.1

#### Track D

### Session D.1 Sustainable Groundwater Management Act

Chair: Tim Parker

10:20

### Agricultural Emission Reduction Policy and its Effect on Groundwater Quality in Nature Areas in The Netherlands Over the Past 25 Years

Esther Wattel, National Institute for  
Public Health and the Environment,  
The Netherlands

### Irrigation Impacts in the Northern Great Lake States

George J. Kraft, University of  
Wisconsin, USA

### Building Capacity for Regional Sustainability with SGMA

Trevor Joseph,  
California Department of  
Water Resources, USA

10:40

### Harmonizing Agriculture and Vulnerable Drinking Water Abstractions in Overijssel, The Netherlands: A Collaborative Approach

Cors van den Brink,  
Royal Haskoning DHV,  
The Netherlands

### Field Kites: Evaluating Supplemental Irrigation with Climate Change

Mikhail Smilovic,  
McGill University, Canada

### State Implementation of the Sustainable Groundwater Management Act (SGMA)

Erik Ekdahl, California State Water  
Resources Control Board, USA

11:00

### Does Variable Rate Irrigation Decrease the Loss of Water Quality Contaminants from Grazed Dairy Farming?

Richard McDowell,  
Ag Research, New Zealand

### Hydroeconomic Modeling of Sustainable Groundwater Management

Duncan MacEwan,  
ERA Economics, LLC, USA

11:20

### Development of Sustainability Strategies in the Agri-food System – Regional Nitrogen Management

Morten Graversgaard,  
Aarhus University, Denmark

### Models to Inform Policy on Agricultural Groundwater Use in the Upper Midwest

Charles B. Andrews,  
S.S. Papadopoulos &  
Associates, Inc., USA

### California's Sustainable Groundwater Management Act: A Perspective Looking Across the Southwestern United States

Debra Perrone,  
Stanford University, USA

	Track A	Track B	Track C	Track D
11:40	<p><b>Nitrates, Groundwater and Drinking Water – A Tale of Two Communities</b> Virginia A. Stern, Washington Department of Health, USA</p>	<p><b>Drought Governance and Response Strategies Including Mission Kakatiya in Telangana, India</b> Devi Prasad Juvvadi, Centre for Good Governance, India</p>		<p><b>Institutional Approaches to Manage Groundwater in California: Evaluating Special Act Districts and Court Adjudications</b> Ruth Langridge, University of California, Santa Cruz, USA</p>
NOON	Lunch and Keynote Speaker • Michael Kiparsky, Director, Wheeler Water Institute, University of California, Berkeley			
	<p><b>Session A.2 Nitrogen Losses to Groundwater</b> Chair: Karen Burow</p>	<p><b>Session B.2 Groundwater and Livelihoods</b> Chair: Debra Perrone</p>	<p><b>Session C.2 Recharge and MAR</b> Chair: Josep Mas-Pla</p>	<p><b>Session D.2 Sustainable Groundwater Management Act</b> Chair: Tim Parker</p>
1:25	<p><b>The California Nitrogen Assessment: Implications for the Future of Groundwater Resources</b> Daniel Liptzin, University of Colorado, USA</p>	<p><b>Implementing California's Sustainable Groundwater Management Act: Farmer Perceptions and the Balance of Groundwater and Economic Sustainability</b> Charles A. Young, Stockholm Environment Institute, USA</p>	<p><b>The McMullin Project: The Justification and Process to Bring On-farm Flood Capture from Concept to Implementation</b> Philip A. M. Bachand, Bachand and Associates, USA</p>	<p><b>Evolution of Water Availability and Land Subsidence in California's San Joaquin Valley</b> Michelle Sneed, U.S. Geological Survey</p>
1:45	<p><b>Groundwater Pathways for Nutrient Transport from Agricultural Land to the Great Barrier Reef</b> Lucy Reading, Queensland University of Technology, Australia</p>		<p><b>Integrated Modeling of In-lieu Groundwater Recharge Using Recycled Water for Agriculture – Maximizing Benefits to Groundwater Dependent Ecosystems and Sustainable Groundwater Management</b> Linda Dorn, Sacramento Regional County Sanitation District, USA</p>	<p><b>Groundwater Management: Past, Present, and Future in the Upper Kings Basin of the Central Valley, California</b> David Cehrs, Kings River Conservation District, USA</p>
2:05	<p><b>Bayesian Nitrate Source Apportionment to Individual Groundwater Wells in the Central Valley by Use of Elemental and Isotopic Tracers</b> Katherine Ransom, University of California, Davis</p>	<p><b>The Importance of Rural, Farmworking Communities in Advancing Policy Solutions that Address Agricultural Pollution of Groundwater</b> Jenny Rempel, Community Water Center, USA</p>	<p><b>Soil Water Repellency – A Concern for Groundwater Recharge and Quality?</b> Karin Müller, Plant &amp; Food Research, New Zealand</p>	<p><b>Napa County Groundwater Resources: A Comprehensive Program to Ensure Sustainability</b> Vicki Kretsinger Grabert, Luhdorff &amp; Scalmanini, Consulting Engineers, USA</p>
2:25	<p><b>Spatial and Temporal Variability of Nitrate in Wisconsin's Groundwater</b> Kevin C. Masarik, University of Wisconsin, USA</p>	<p><b>The Groundwater Constraint: Responses to Falling Water Tables in India</b> Aaditya Dar, George Washington University, USA</p>	<p><b>Historic, Current and Future Availability of Surface Water for Agricultural Groundwater Banking in the Central Valley, California</b> Helen E. Dahlke, University of California, Davis, USA</p>	<p><b>Working Toward Sustainable Groundwater Resources in an Uncertain Future</b> Brian Lockwood, Pajaro Valley Water Management Agency, USA</p>
2:45	<p><b>Decadal Changes in Agricultural Contaminants in Groundwater in the United States, 1988-2015</b> Bruce D. Lindsey, U.S. Geological Survey</p>	<p><b>Options for Viable Small-scale Groundwater Irrigation Systems in the Least-developed, Water-rich Case of Lao PDR</b> Paul Pavelic, International Water Management Institute, Lao PDR</p>		<p><b>Sustainable Groundwater Management: What We Can Learn from California's Central Valley Streams</b> Sandi Matsumoto, The Nature Conservancy, USA</p>
3:05	BREAK			

**Track A****Session A.3  
Nitrogen Losses  
to Groundwater &  
Attenuation***Chair: Karen Burow***Track B****Session B.3  
BMPs for Water Quality***Chair: David Rudolph***Track C****Session C3  
(Managed) Aquifer  
Recharge***Chair: Josep Mas-Pla***Track D****Session D.3  
Groundwater  
Management:  
Modeling & Data***Chair: David Hyndman*

<b>3:30</b>	<b>Groundwater Nitrate Concentrations in the Permo-Triassic Aquifer of the Eden Valley, UK</b> <i>Sean Burke, British Geological Survey, England</i>	<b>Sensitive Catchments – Managing Nutrient Pathways and their Attenuation in NZ Agricultural Catchments</b> <i>Ranvir Singh, Massey University, New Zealand</i>	<b>Aquifer Studies and Recharge Assessment of the Northern California Lower Tuscan Aquifer System</b> <i>Joseph B. Turner, Kleinfelder, USA</i>	<b>Enhancing Groundwater Management Capabilities in California's Central Valley – Generating High-Resolution Groundwater Maps from GRACE and In Situ Data</b> <i>Jay Famiglietti, California Institute of Technology, USA</i>
<b>3:50</b>	<b>A Combined Approach for Understanding Nitrogen Loading to Groundwater from a Field under Potato Production in Prince Edward Island</b> <i>Serban Danielescu, Environment and Climate Change, Canada &amp; Agriculture and Agri-Food</i>	<b>Groundwater Remediation for Nitrate Contamination in Public Supply Wells: Challenge of the Non-Point Source</b> <i>David L. Rudolph, University of Waterloo, Canada</i>	<b>Storm-water Runoff Analysis for Placement of Managed Aquifer Recharge Projects in Santa Cruz and Northern Monterey Counties, California</b> <i>Andrew Fisher, University of California, Santa Cruz, USA</i>	<b>Can California Groundwater be Sustainably Managed with Agricultural Water Transfers? Effects on Aquifer Declines, Energy, and Food Production</b> <i>Steffen Mehl, California State University, Chico, USA</i>
<b>4:10</b>	<b>Hydrogeochemical Characterization in Relation to Nitrate Concentrations in Central Valley (California, USA) Domestic Wells</b> <i>Ate Visser, Lawrence Livermore National Laboratory, USA</i>	<b>Direct Monitoring of Agriculture Impact on Groundwater Quality</b> <i>Ofer Dahan, Ben Gurion University of the Negev, Israel</i>	<b>Freshwater Storage in Brackish-Saline Aquifers for Irrigation Water Supply: A Bottomless Pit or a Fountain of Gold?</b> <i>Koen Zuurbier, KWR Water Cycle Research Institute, The Netherlands</i>	<b>Remotely Sensed Crop Mapping Applications for Water Resource Management and Decision Support</b> <i>Joel E. Kimmeshue, Land IQ, USA</i>
<b>4:30</b>	<b>Efficient Data-driven Estimation of Nitrate Transport and Reactions in Groundwater Using a Vertical Flux Model</b> <i>Christopher T. Green, U.S. Geological Survey</i>	<b>Selective Groundwater Extraction for Agricultural Yield Optimization</b> <i>Noah R. Heller, Best Environmental Subsurface Science and Technologies, USA</i>	<b>Economic Analysis of Groundwater Banking on Agricultural Lands in California</b> <i>Samuel Sandoval, University of California, Davis, USA</i>	<b>Operational Mapping of Evapotranspiration over Agricultural Land in the California Central Valley</b> <i>Forrest Melton, NASA ARC-CREST, USA</i>
<b>4:50</b>			<b>Potential for Managed Aquifer Recharge on Alfalfa Crop Land in California</b> <i>Helen E. Dahlke, University of California, Davis, USA</i>	<b>Towards Development of a Complete Landsat Evapotranspiration and Energy Balance Archive to Support Agricultural Consumptive Water Use Reporting and Prediction in the Central Valley, California</b> <i>Justin Huntington, Desert Research Institute, USA</i>

**5:30-7:30****Hosted Reception and Poster Session 1****7:30****Special Screening of Pumped Dry: The Global Crisis of Vanishing Groundwater***A USA TODAY Network Production**Produced by Steve Elfers, USA TODAY and Ian James, The Desert Sun*

# Program

Wednesday, June 29, 2016

Plenary Session 2

## ***Toward Sustainable Groundwater in Agriculture: Global Perspectives***

8:00 a.m.

*Moderator: Thomas Harter, Robert M. Hagan Chair, University of California, Davis*

### **The Irrigation-Groundwater Nexus at the Global Scale**

*Petra Döll, Professor of Hydrology, Institute of Physical Geography, University of Frankfurt*

### **Contribution of Sustainable and Unsustainable Groundwater Use to Global Food Production**

*Karen Villholth, Principal Researcher, International Water Management Institute*

### **National Assessment of Groundwater Quality and Changes in Groundwater Quality in Agricultural Areas**

*Kenneth Belitz, Chief, National Water-Quality Assessment, Groundwater Studies, U.S. Geological Survey*

### **Engaging Growers/Farmers in the Path Toward Sustainability**

*Gabriele Ludwig, Director, Sustainability & Environmental Affairs, Almond Board of California*

10:00

BREAK

#### **Track A**

### **Session A.4 Nonpoint Source Pollution in Animal Farming**

*Chair: David Rudolph*

#### **Track B**

### **Session B.4 Salinity Policy**

*Chair: Vicki Kretsinger Grabert*

#### **Track C**

### **Session C.4 Energy/Biofuel – Groundwater Nexus**

*Chair: Dico Fraters*

#### **Track D**

### **Session D.4 Groundwater Management & Policy**

*Chair: Rob Gailey*

10:20

**Stable Isotopes as Indicators of Sources and Processes Influencing Nitrate Distributions in Groundwater beneath Dairy Farms in California**

*Megan B. Young,  
U.S. Geological Survey*

**The Netherlands Water Nexus Research Program: Brackish Water as a Resource for Solving Agricultural and Industrial Fresh Water Needs**

*Huib H.M. Rijnaarts, Wageningen University, The Netherlands*

**N-E-W Tech™: Advancing the Agricultural Circular Economy at the Nutrient-Energy-Water Nexus with Technology Innovation**

*Gregory Möller,  
University of Idaho, USA*

**Innovations in Agricultural Groundwater Management: Smart Markets for Transferable Pumping Rights**

*Nicholas Brozovic,  
Daugherty Water for Food Institute,  
University of Nebraska, USA*

10:40

**Investigating Livestock Manure Storage Facility Impacts on Groundwater in Alberta, Canada**

*Mike Iwanyshyn, Natural Resources Conservation Board, Canada*

**Soil Leaching in Saline Areas: Is it the Best Practice for Salinity Management in Agriculture? A Case Study from the Aral Sea Basin, Central Asia**

*Bogachan Benli, International Center for Agricultural Research in the Dry Areas, Uzbekistan*

**Evaluating the Effects of Over Pumping and Drought on Water Supply, Well Production Capacities and Pumping Costs**

*Brad J. Arnold, UC Davis, USA*

**The Relative Influence of Groundwater Versus Surface Irrigation Sources for Agricultural Production in India**

*Meha Jain, Stanford University, USA*

11:00

**The Central Valley Dairy Representative Monitoring Program – Insight from 4 Years of Monitoring and Special Studies**

*Till E. Angermann, LSCE, USA*

**Produced Water from Oil & Gas Fields as a Potential Source of Irrigation Water**

*William Stringfellow, Berkeley National Laboratory, USA*

**RZWQM Simulations of Nitrate Loss to Subsurface Drains from a Midwest Bioenergy Production System**

*Robert W. Malone, USDA-Agricultural Research Services, USA*

**Factors Influencing the Adoption of Water Pollution Mitigation Measures by Farmers in England**

*Emilie Vrain, Environmental Science Department, United Kingdom*

	Track A	Track B	Track C	Track D
11:20	<p><b>What Will It Take To Protect Groundwater Quality Under California Central Valley Dairies?</b>  <i>Marsha L. Campbell, University of California Cooperative Extension, USA</i></p>	<p><b>Regional Management of a Stock Pollutant: Agricultural Drain Water</b>  <i>Keith C. Knapp, University of California, Riverside, USA</i></p>	<p><b>Groundwater, Bioenergy and Soil Health – Is the Nexus Sustainable?</b>  <i>Douglas L. Karlen, USDA-Agricultural Research Services, National Laboratory for Agriculture, USA</i></p>	<p><b>California's New Groundwater Management Laws, and Strategies to Avoid Adverse Impacts on Agriculture in Urbanizing Communities</b>  <i>Kristin Garcia, Jackson, DeMarco, Tidus &amp; Pechenpaugh, USA</i></p>
11:40	<p><b>Evaluating the Influence of Tile Drainage Management on Shallow Groundwater Resources</b>  <i>Steve K. Frey, Aquanty, Canada</i></p>	<p><b>Characterization and Treatability Assessment of Abattoir Wastewater Using Elephant Grass as Filter Media</b>  <i>Nurudeen S. Lawal, Olabisi Onabanjo University, Ubugun Camous, Nigeria</i></p>	<p><b>Designing Production Wells to Optimize Performance and Efficiency</b>  <i>Charlie Hoherd, Roscoe Moss Company, USA</i></p>	<p><b>On-Farm Recharge: Acceptance and Use by Farmers and Water Managers in the San Joaquin Valley, California</b>  <i>Daniel C. Mountjoy, Sustainable Conservation, USA</i></p>
NOON	<b>LUNCH</b>			
	<p><b>Session A.5 Emerging Contaminants</b>  <i>Chair: Chris Green</i></p>	<p><b>Session B.5 Environmental Justice</b>  <i>Chair: Debra Perrone</i></p>	<p><b>Session C.5 BMPs for Water Supply</b>  <i>Chair: Karen Villholth</i></p>	<p><b>Session D.5 Groundwater Management</b>  <i>Chair: Rob Gailey</i></p>
1:25	<p><b>Veterinary Antibiotic, Pathogen, and Antibiotic Resistance Genes in Tile Effluent and Shallow Groundwater Following Manure Application: Influence of Controlled Tile Drainage</b>  <i>David R. Lapen, Agriculture and Agri-Food, Canada</i></p>	<p><b>Understanding the Timing and Duration of Implementation Processes of Groundwater Management plans (GMPs) Under AB3030 in California</b>  <i>Linda E. Mendez Barrientos, UC Davis, USA</i></p>	<p><b>Quantifying the Impacts of Irrigation Technology Adoption on Water Resources in the High Plains Aquifer</b>  <i>Anthony D. Kendall, Michigan State University, USA</i></p>	<p><b>Economics of Long Term Groundwater: A Case Study for the Tulare Lake Basin, California</b>  <i>Josue Medellin Azuara, Center for Watershed Sciences, UC Davis, USA</i></p>
1:45	<p><b>Linking Microbial Community Composition to In Situ Natural Attenuation of Emerging Contaminants</b>  <i>Nora B. Sutton, Wageningen University, The Netherlands</i></p>	<p><b>Groundwater Challenges Faced by Southeast Asian Smallholder Farmers in Fresno County, California</b>  <i>Ruth Dahlquist-Willard, University of California Cooperative Extension, USA</i></p>	<p><b>The Exportation of Agricultural Water in California and Other Arid Regions of the USA</b>  <i>Kelly Archer, University of California, Berkeley, USA</i></p>	<p><b>Safe Yield of Large and Small Aquifers in Agricultural Regions</b>  <i>Hugo A Loaiciga, University of California, Santa Barbara, USA</i></p>
2:05	<p><b>Exploring the Origin and Migration of Antibiotics in Aquifers to Evaluate Their Impact on Groundwater Resources Quality</b>  <i>Jospe Mas-Pla, Catalan Institute for Water Research &amp; University of Girona, Spain</i></p>	<p><b>Experiences of Participatory Irrigation Management in the APWELL Project</b>  <i>Ratnakar Ramadugu, AP &amp; TS Community Based Tank Management Project-SPIL, India</i></p>	<p><b>To Maximize Net Benefits, Abolish or Limit Water Data Confidentiality to 1-5 Years</b>  <i>Peter Reinelt, State University of New York, USA</i></p>	<p><b>Regulating Water Bore Drillers: Lessons from Australia</b>  <i>Cameron Holley, Connected Water Initiative Research Centre, UNSW Australia</i></p>
2:25	<p><b>Decadal-scale Changes in Uranium and Bicarbonate Concentrations in Groundwater in the U.S.: Effects of Irrigation on the Mobilization of Uranium</b>  <i>Karen R. Burow, U.S. Geological Survey</i></p>	<p><b>Groundwater for More Resilient Agriculture in the Lower Mekong: Governance Challenges and Lessons at the Local Level</b>  <i>Binaya Raj Shivakoti, Institute for Global Environmental Strategies, Japan</i></p>	<p><b>California Almond Water Footprint</b>  <i>Fraser M. Shilling, University of California, Davis, USA</i></p>	<p><b>Summary of Managed Aquifer Recharge Concepts and Planning Methods</b>  <i>Daniel Gamon, Kleinfelder Inc., USA</i></p>

	Track A	Track B	Track C	Track D
2:45	<p><b>An Index for Evaluating the Risk of Water Contamination by Pesticides: Development and Validation</b>  <i>Henrique M.L. Chaves, EFL  University of Brasilia, Brasil</i></p>		<p><b>Control of Topology of Water Fluxes in Arid Agriculture: Amalgamation of Subsurface Irrigation, Managed Aquifer Recharge and Engineered Soil Substrate</b>  <i>Anvar Kacimov, Sultan Qaboos  University, Oman</i></p>	<p><b>Groundwater Management in Mexico – Embarking on New Horizons?</b>  <i>Tim Parker, USA</i></p>
3:05	BREAK			
	<p><b>Session A6  Nitrate Monitoring &amp; Modeling</b>  <i>Chair: Chris Green</i></p>	<p><b>Session B.6  Climate Change Adaptation</b>  <i>Chair: Graham Fogg</i></p>	<p><b>Session C.6  Groundwater Management: Modeling &amp; Data</b>  <i>Chair: David Hyndman</i></p>	<p><b>Session D.6  Managing Groundwater Quality</b>  <i>Chair: Karen Villholth</i></p>
3:30	<p><b>Will Our Traditions for Groundwater Sampling in Agricultural Settings Survive the 21st Century?</b>  <i>Joachim Rozemeijer, Deltares,  Department of Subsurface and Groundwater, The Netherlands</i></p>	<p><b>Markets, Groundwater and Law: Water Reform Lessons from Australia</b>  <i>Cameron Holley, UNSW, Australia</i></p>	<p><b>Incorporating Land-Atmospheric-Vegetation Feedbacks into Subsurface Models Used for Agriculture Water Management</b>  <i>Tissa H. Illangasekare, Colorado  School of Mines, USA</i></p>	<p><b>Reducing Environmental N losses and Increasing N Uptake on Grazed Dairy Farms with Simple, Low Cost Detection and Treatment of Fresh Cow Urine Patches</b>  <i>Bert F. Quin, Pastoral Robotics Ltd,  New Zealand</i></p>
3:50	<p><b>Use of Early Warning Monitoring Systems for Groundwater Protection in a Policy Decision Context</b>  <i>Dico Fraters, Institute of  Public Health and the Environment,  The Netherlands</i></p>	<p><b>Sustainability Economics of Groundwater Usage and Management: A Perspective from Environmental Macroeconomics</b>  <i>Keith C. Knapp, UC Riverside, USA</i></p>	<p><b>Balancing of Interests in Polder Dewatering: A Starring Role for an Integrated Groundwater-Surface Water Model</b>  <i>Volker Clausnitzer,  DHI-WASY GmbH, Germany</i></p>	<p><b>Tools for Monitoring and Evaluating Potential Sources of Nitrates to Groundwater, Eastern Idaho</b>  <i>L. Flint Hall, Idaho Department of  Environmental Quality, USA</i></p>
4:10	<p><b>Knowledge Based Protection of Groundwater Through Monitoring and Modelling of Nitrate in Groundwater in Rural Areas</b>  <i>Lærke Thorling, GEUS, Denmark</i></p>	<p><b>The Effects of Climate Change on Groundwater Extraction for Agriculture and Land-use Change</b>  <i>Ernst Bertone Oehninger,  UC Davis, USA</i></p>	<p><b>Planning for Sustainable Management of Groundwater Resources, Case Study: Nishapur Plain in Iran</b>  <i>Ahmad Abrishamchi, Department of  Civil Engineering, Sharif University of  Technology, UNESCO Chair in Water  &amp; Environmental Management for  Sustainable Cities, Iran</i></p>	<p><b>A Flow and Transport Model Developed as a Salt and Nitrate Management Analysis Tool for a Management Zone in California's Eastern Kings Subbasin</b>  <i>Vicki Kretsinger Grabert,  Luhdorff &amp; Scalmanini Consulting  Engineers, USA</i></p>
4:30	<p><b>A Statistical Learning Framework for Groundwater Nitrate Models of the Central Valley, California</b>  <i>Bernard Nolan,  U.S. Geological Survey</i></p>	<p><b>Matching Agricultural Freshwater Supply and Demand: Using Industrial and Domestic Treated Wastewater for Sub-irrigation Purposes</b>  <i>Ruud P. Bartholomeus,  KWR Watercycle Research Institute,  The Netherlands</i></p>	<p><b>New MODFLOW's One-Water Hydrologic Flow Model and Application to Conjunctive Use of the Rio Grande River and Transboundary Aquifers</b>  <i>Scott E. Boyce,  U.S. Geological Survey</i></p>	<p><b>Nitrate Sensitive Salinity Management</b>  <i>Maziar M. Kandelous,  UC Davis, USA</i></p>
4:50	<p><b>Scale Dependence of Controls on Groundwater Vulnerability to Nonpoint-source Nitrate Contamination, California Coastal Basin Aquifer System</b>  <i>Jason J. Gurdak, San Francisco  State University, Department of  Earth &amp; Climate Sciences, USA</i></p>	<p><b>Trends in Extreme Droughts and Their Impact on Grain Yield in China Over the Past 50 Years</b>  <i>Min Liu, Institute of Hydrogeology  and Environmental Geology,  Chinese Academy of Geological  Sciences</i></p>	<p><b>Numerical Evaluation of Managed Aquifer Recharge as a Conjunctive Water Resource Management Tool in the Walla Walla Basin</b>  <i>Jacob Scherberg, GeoSystems  Analysis Inc., USA</i></p>	<p><b>Nitrogen Surplus Key Factor in Relation between Farm Practices and Water Quality</b>  <i>Marga W. Hoogeveen, Agricultural  Economics Research Institute (LEI),  The Netherlands</i></p>
5:30-7:30	Hosted Reception and Poster Session 2			



# Program

Thursday, June 30, 2016

Plenary Session 3

## Stepping Toward Sustainable Groundwater in Agriculture

8:00 a.m.

*Moderator: David Rudolph, Groundwater Professor, University of Waterloo*

### Groundwater Sustainability in America's Farmland?

*Ann Mills, Deputy Under Secretary, Natural Resources and the Environment, U.S. Department of Agriculture*

### What Policies to Manage Groundwater Use in Agriculture? Lessons from a Study of OECD Countries

*Guillaume Gruère, Senior Policy Analyst, Natural Resources Policy Division, Trade and Agriculture Directorate, Organisation for Economic Cooperation and Development*

### Quantifying the Impact of Human Activities on Water Sustainability and Crop Yields Across the High Plains Aquifer Using Process-Based Models

*David Hyndman, Associate Professor, Department of Geological Sciences, Michigan State University*

### Utilizing Natural Nitrogen Reduction in National Regulation

*Anker Lajer Højberg, Senior Researcher, Department of Hydrology, Geological Survey of Denmark and Greenland*

10:00

BREAK

#### Track A

### Session A.7 Climate Change Adaptation

*Chair: Graham Fogg*

#### Track B

### Session B.7 GDEs & GW-SW Interaction

*Chair: Sam Sandoval-Solis*

#### Track C

### Session C.7 United States Department of Agriculture (USDA) National Insights and Action

*Chair: Mary Scruggs*

#### Track D

### Session D.7 Groundwater Governance

*Chair: Jay Famiglietti*

10:20

**Quantifying the Role of Agricultural Groundwater Use for Drought Mitigation**  
*Alexandra S. Richey, Washington State University, USA*

**Managing the Groundwater-Surface Water Interface under California's New Groundwater Law**  
*Thomas Harter, UC Davis, USA*

**Water Quality Trends in Irrigation Return Flow from a Southern Idaho Watershed**  
*David L. Bjorneberg, USDA-Agricultural Research Service*

**New Model for Groundwater Management in Rural-Agricultural Basins**  
*Carolyn K. Berg, County of San Luis Obispo, USA*

10:40

**The Economic Value of Emergency Groundwater Pumping During Drought: The Yakima Basin, Washington State**  
*Ballav Aryal, Washington State University, USA*

**Informing Restoration Practice Through Estimation of Groundwater-Surface Water Time Lags With Windowed Cross-Correlation**  
*Jenny Ta, UC Merced, USA*

**Climate Change May Affect Groundwater Deeply and Impact Agriculture on the Surface**  
*Timothy R. Green, USDA-Agricultural Research Service*

**Aquifer System Uruçuaia: Governance and Integrated Water Management in the São Francisco River Basin – Brazil's Northeast**  
*Oswaldo Aly, CEPAS-IGC-USP, Brazil*

11:00

**The Future Of Agriculture In A Changing World With Less Water And More Regulations**  
*Wes Miliband, Stoel Rives LLP, USA*

**Predicted Impacts of Conjunctive Water Management on Late Summer Streamflow in an Agricultural Groundwater Basin with Limited Storage, Scott Valley, CA**  
*Douglas G. Tolley, UC Davis, USA*

**USDA Conservation Programs and Groundwater – Advances in Data and Modeling**  
*Steven Wallander, USDA Economic Research Service*

**Managing Groundwater in a Time of Increasing Demand and Changing Climate**  
*Eric L. Garner, Best Best & Krieger LLP, USA*

	Track A	Track B	Track C	Track D
11:20	<p><b>The Case for Subsurface Storage of Water in Agricultural Basins</b> <i>Graham Fogg, UC Davis, USA</i></p>	<p><b>Addressing Model Uncertainty in Groundwater-Management Modeling: A Case Study from the Upper Klamath Basin, Oregon and California</b> <i>Brian Wagner, U.S. Geological Survey</i></p>	<p><b>Evaluating NRCS Water Conservation Practice Impacts over the Ogallala Aquifer</b> <i>Noel Gollehon, USDA Natural Resource Conservation Service</i></p>	<p><b>Framing the Issues Associated with Groundwater Governance and Agriculture in the United States</b> <i>Sharon B. Megdal, University of Arizona Water Resources Research Center, USA</i></p>
11:40		<p><b>Ecosystem-based Groundwater Recharge to Help Farmers and Fish: Why California Needs 10,000 More Dams</b> <i>Michael M. Pollock, National Oceanic and Atmospheric Administration, USA</i></p>	<p><b>USDA-NIFA's Water for Agriculture: A Mechanism to Fund a Broader Portfolio in Groundwater Sustainability</b> <i>James Dobrowolski, USDA National Institute for Food and Agriculture</i></p>	<p><b>Evolution of Groundwater Law in Arizona and Jordan – Legal Dimension of the Groundwater Revolution and Implications for the 21<sup>st</sup> Century</b> <i>Silvan Eppinger, Universität Heidelberg, Germany</i></p>
NOON	LUNCH			
	<p><b>Session A8 Nitrate Policy</b> <i>Chair: Vicki Kretsinger Grabert</i></p>	<p><b>Session B.8 GDEs &amp; GW-SW Interaction</b> <i>Chair: Sam Sandoval-Solis</i></p>	<p><b>Session C.8 Economics &amp; Policy</b> <i>Chair: Mary Scruggs</i></p>	<p><b>Session D.8 Groundwater Governance</b> <i>Chair: Jay Famiglietti</i></p>
1:25	<p><b>Nitrate in Groundwater – Implementing Groundwater Monitoring Requirements for Irrigated Agriculture and Ensuring Safe Drinking Water in the Central Coast Region of California</b> <i>Angela Schroeter, Central Coast Water Board, USA</i></p>	<p><b>Incorporating a Dynamic Irrigation Demand Module into an Integrated Groundwater/Surface Water Model to Assess Drought Sustainability</b> <i>Dirk Kassenaar, Earthfx Inc., Canada</i></p>	<p><b>California Groundwater Management – the 21<sup>st</sup> Century Gordian Knot</b> <i>Kirk Schmidt, Central Coast Water Quality Preservation, Inc., USA</i></p>	<p><b>Connecting Regional Groundwater Assessments, Agriculture, and Groundwater Governance</b> <i>William M. Alley, National Ground Water Association, USA</i></p>
1:45	<p><b>Changing California's Groundwater Policies and Implementation Strategies Could Increase Opportunities for Protecting Drinking Water While Improving Dairy Farm Environmental Performance</b> <i>Jean-Pierre Cativiela, Dairy Cares, USA</i></p>	<p><b>Watershed Modeling to Evaluate the Impact of Irrigated Agriculture on Surface Water – Groundwater Interactions</b> <i>Hedeff I. Essaid, U.S. Geological Survey</i></p>	<p><b>Hydro-Economic Analysis for Sustainable Groundwater Management</b> <i>Robert M. Gailey, UC Davis and R. M. Gailey Consulting Hydrogeologist, USA</i></p>	<p><b>Mexico's Emerging Illegal Groundwater Market: the Product of Corruption and Neoliberal Regulations</b> <i>Ashley Overhouse, University of California, Hastings College of Law, USA</i></p>
2:05	<p><b>Managing Freshwater Resources: Insights from New Zealand's Policy Experience with Managing the Impacts of Agricultural Non-point Sources</b> <i>Suzie E. Greenhalgh, Landcare Research, Australia</i></p>	<p><b>Global Scale Study for Determining Groundwater Contribution to Environmental Flows and Sustainable Groundwater Abstraction Limits for SDGs</b> <i>Aditya Sood, IWMI, Sri Lanka</i></p>	<p><b>The Challenges of Integrating Groundwater in a Significant Way into California's Water Supply Portfolio</b> <i>Philip A.M. Bachand, Bachand &amp; Associates, USA</i></p>	<p><b>Towards Understanding the Role of Social Capital within Adoption Decision Processes: An Application to Adoption of Irrigation Technology</b> <i>Claudia Hunecke, Department of Agricultural Economics and Rural Development, University of Göttingen, Germany</i></p>

	Track A	Track B	Track C	Track D
2:25	<p>California Central Valley Irrigated Lands Regulatory Program: The Sacramento Valley Rice Growers Approach to Groundwater Quality Management <i>Lisa Porta, CH2M, USA</i></p>	<p>Anthropogenic Depletion of Water Resources in the TG Halli Catchment Near Bangalore, India <i>Gopal Penny, UC Berkeley, USA</i></p>		<p>Negotiating Agriculture Representation in Decision Making on Groundwater Sustainability <i>Gina Bartlett, Consensus Building Institute, USA</i></p>
2:45	<p>Action Plans to Protect Groundwater from Pesticide Pollution in Aarhus, Denmark <i>Bo Vægter, Aarhus Water Inc., Denmark</i></p>	<p>Potatoes and Trout: Groundwater Model Optimization to Balance Agricultural and Ecosystem Stakeholder Needs in the Little Plover River Basin, Wisconsin <i>Michael N. Fiene, U.S. Geological Survey, Wisconsin Water Science Center</i></p>		<p>Sustainable Groundwater Management: Lessons on Institutionalizing Participation to Achieve the Human Right to Water in California <i>Kristin Dobbin, Community Water Center, USA</i></p>
3:05	BREAK			
3:20	<p>Plenary Session 4</p> <p><b><i>Toward Sustainable Groundwater In Agriculture: Challenges, Observations, &amp; Key Outcomes</i></b></p> <p><i>Moderator: Bernadette Conant, Chief Executive Officer, Canadian Water Network</i>  <i>Panel: J.P. Cativiela, President, Cogent Consulting and Communications, and Regulatory Director, Dairy Cares</i>  <i>William Alley, Director of Science and Technology, National Ground Water Association</i>  <i>Karen Villholth, Principal Researcher, International Water Management Institute</i>  <i>Cameron Holley, Associate Professor, University of New South Wales</i></p>			
5:00	ADJOURN			

## Exhibitors

**BESST Inc.**  
**DHI**  
**Enviro Tech**  
**Groundwater Resources Association of California**  
**McGeorge School of Law**  
**Water Technology Alliance, California**

*– Special thanks to Best Best & Krieger LLP and CPS for sponsoring a student –*

# Poster Presenters

June 28, 1 p.m. – June 29, 11 a.m.

## Agricultural Management Practices

- Yefang Jiang**, Agriculture and Agri-Food Canada: Assessing the effects of buckwheat as a wireworm control crop on groundwater quality
- Nana Phirosmanashvili**, Association for Farmers Rights Defense, AFRD: Groundwater Protection and Raising of Farmers Awareness
- Yefang Jiang**, Agriculture and Agri-Food Canada: Contrast flow patterns in shallow and deep vadose zones: new insights from coupled LEACHN and MODFLOW modeling
- Ruud Bartholomeus**, KWR Watercycle Research Institute: Sub-irrigation with waste water: a soil column experiment to foresee and mitigate clogging
- Maria Teresa Vilela Nogueira Abdo**, APTA: Physical and chemical water features as indicators of changes from soil management and land use
- Teddy Kizza**, NARO Mukono ZARDI: Model based estimation of turmeric yield response to saline groundwater irrigation
- Mohsen Mehran**, Rubicon Engineering Corporation: Sustainable Application of Recycled Water Nitrate in Agriculture

## Nitrogen Assessment and Impact

- Efstathios Diamantopoulos**, University of California Davis: Regional scale simulations of nitrate movement through the vadose zone using Hydrus 1D
- Barbara M. Carey**, Washington State Department of Ecology: Evaluation of N mass balance and soil nitrate as indicators of N leaching to groundwater in a Pacific Northwest dairy grass field
- Taryn E. Parsons**, University of California, Davis: Fate of Nitrogen on California Dairies as Measured by Regulatory Reporting
- Shahar Baram**, University of California, Davis: Can Nitrate Leaching from an Orchard Be Accurately Estimated?
- Brian Marsh**, University of California Cooperative Extension Kern County: Does following the recommended potato nitrogen fertility guideline contribute to groundwater contamination?
- Janko Urbanc**, Geological Survey of Slovenia: Influence of agriculture on the groundwater chemical status in Slovenian alluvial plains
- Cynthia N. McClain**, Stanford University: Cr(VI) and nitrate in groundwater and sediments of the southwestern Sacramento Valley, California, USA

## Groundwater Salinity, Nitrate, and Pesticides

- Zhilin Guo**, University of California, Davis: Groundwater salinization due to hydraulic closure in Tulare Basin over a long term time scale
- Katherine Ransom**, UC Davis: Bayesian Nitrate Source Apportionment to Individual Groundwater Wells in the Central Valley by Use of Elemental and Isotopic Tracers
- Thomas Harter**, University of California, Davis: Field Scale Groundwater Nitrate Loading Model for the Central Valley, California, 1945-Current
- Josep Mas-Pla**, Catalan Institute for Water Research & University of Girona: Characterization of agricultural nitrate pollution in a Mediterranean region: what should be the next step to deal with this environmental problem?
- Lærke Thorling**, GEUS: Indicators to identify the source of pesticide contamination to groundwater
- Martha I. Valverde Flores**, Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias: Environmental impact of soil moisture monitoring through capacitance probes over aquifer contamination by nitrates
- Amanda H. D'Elia**, UC Davis: Groundwater Nitrate Attenuation and Changes in Groundwater Quality Across a California Delta Floodplain
- Noa Bruhis**, Decagon Devices Inc: Evolution and future of nitrate sensing technology

## Land Use, Water Quality, and Emerging Contaminants

- Maria Teresa Vilela Nogueira Abdo**, APTA: Evaluation of water quality improvements from local and state environmental projects in the Sao Domingos Basin, Brazil, 2000 – 2010
- Abdul Hakim**, California Department of Public Health: Approach to Reduce Drought in California

- Mohammad Monirul Hasan**, Center for Development Research (ZEF), Uni-Bonn: The impacts of piped water on water quality, sanitation, hygiene and health in rural households of north-western Bangladesh – a quasi-experimental analysis
- Mercè Boy-Roura**, Catalan Institute for Water Research: Fate and persistence of emerging contaminants and multi-resistant bacteria in the continuum surface water - groundwater (the PERSIST Project)
- Takeshi Sato**, Gifu University: Improvement of phytoremediation by using chelating agents

June 29, 1 p.m. – June 30, 11 a.m.

## Groundwater Management: Tools

- Mehdi Ghasemizadeh**, Eawag: Swiss Federal Institute of Aquatic Science and Technology: Combined analysis of time-varying sensitivity and identifiability indices to diagnose the response of complex environmental models
- Steffen Mehl**, California State University, Chico: FREEWAT, a HORIZON 2020 project to build open source tools for water management: a European perspective
- Stephen Maples**, Univ. of California Davis: Intercomparison of C2VSim and CVHM Groundwater Budgets for DWR Subregions in the Central Valley

## Climate Change and Drought Impacts

- Gabriel T. LaHue**, University of California, Davis: The influence of the recent California drought on water table levels in the Sacramento Valley

## Groundwater Management and Sustainability

- Devi Prasad Juvvadi**, Centre for Good Governance: Impact of Community Based Tank Management in Andhra Pradesh (AP) and Telangana states in India
- Abebe Guadie Shumet**, Swiss Institute of Technology: Assessing the impact of existing and future water demand on economic and environmental aspects (case study from Rift valley lake basin, Ethiopia)
- James Oltjen**, University of California, Davis: Quantifying water dynamics for cattle grazing California rangelands
- Daniel Urban**, Ceres Imaging: Improved irrigation scheduling through airborne detection of water stress
- Foad Foolad**, Department of Civil Engineering, University of Nebraska-Lincoln: Exploring relationship between evapotranspiration and groundwater level fluctuations in different land covers

## Managed Aquifer Recharge and Conjunctive Use

- Harum Mukhayer**, UC Davis: Drawing the Line: Borders and Boundaries Governing Conjunctive Use
- Paul Pavelic**, International Water Management Institute, Vientiane, Lao PDR: Community owned village ponds to mitigate floods and meet local irrigation demands: A novel conjunctive water use management approach
- Andrew Fisher**, University of California, Santa Cruz: Nitrogen cycling and water quality improvement during managed aquifer recharge: Experiments using reactive barrier technology
- E. K. Teo**, Earth and Planetary Sciences Department, University of California: Using a GIS to develop distributed stormwater collection systems linked to managed aquifer recharge
- Pavithra Prakash**, University of California, Davis: Estimating Applied Water in Alfalfa using the IWFDM Demand Calculator Model
- Jiro Ariyama**, Delta Stewardship Council, Delta Science Program: Groundwater and Nitrogen Recharge Model for the On-Farm Flood Flow Capture Project in California

## Groundwater Well and Pumping Management

- Morgan Halpenny**, Pumpsight LLC: Using High Frequency Pump Monitoring to Reduce Energy Consumption
- Oswaldo Aly**, UNIARA/IGC-USP: Water Security, productive restructuring and land use at Sepé Tiaraju settlement, São Paulo State, Brazil