

# **World Environmental and Water Resources Congress 2017**

## **Groundwater, Sustainability, and Hydro-Climate/Climate Change**

Selected Papers from the World Environmental  
and Water Resources Congress 2017

Sacramento, California, USA

21 – 25 May 2017

### **Editors:**

**Christopher N. Dunn**  
**Brian Van Weele**

ISBN: 978-1-5108-4250-2

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2017) by American Society of Civil Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact American Society of Civil Engineers  
at the address below.

American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191  
USA

Phone: (800) 548-2723  
Fax: (703) 295-6333

[www.asce.org](http://www.asce.org)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# Contents

## *Environmental*

- The Evaluation of Risk for Exposure to Groundwater during Construction/Trench Work .....1**  
Meng Ling, Jeff Heglie, Michael Acton, Jim Twiford, and Barbara Mickelson
- Lack of Correlation in Two Bacteria Indicator Species in Near-Shore Marine Waters, Sarasota County, Florida .....8**  
L. Donald Duke and Jennifer E. Clemente
- Daylighting Harbor Brook for the New Meriden Green .....17**  
James G. MacBroom, Jeanine Armstrong Gouin, and Mark Arigoni

## *Groundwater Symposium*

- Comparison of Statistical and Geostatistical Methods in Zoning the Groundwater Table: Case Study; Zayandehroudd Basin, Isfahan Province, Iran .....25**  
R. Masoudi, Gh. Zehtabian, A. Malekian, H. A. Loáiciga, M. Jafari, and M. H. Seyyed Seraji
- Estimate Dilution Factor with SEAWAT Modeling to Calculate Groundwater Cleanup Goals .....36**  
Meng Ling, Jeff Heglie, Michael Acton, Jim Twiford, and Barbara Mickelson
- SWAT and MODFLOW Modeling of Spatio-Temporal Runoff and Groundwater Recharge Distribution .....51**  
Aksara Putthividhya and Jeerapong Laonamsai
- Influence of Coastal Flooding on Seawater Intrusion in Coastal Aquifers .....66**  
Davood Mahmoodzadeh and Mohammad Karamouz
- Recognizing Climate Signals in Groundwater .....80**  
M. Lee Davisson
- Aquifer Compartmentalization at a Transitional Mountain Front: Implications for Basin Assessment and Numerical Modeling .....90**  
Barry J. Hibbs

<b>Naturally-Occurring Chaotic Advection in Groundwater and Surface-Water Systems .....</b>	<b>102</b>
Colter Ritsch, Roseanna M. Neupauer, and David C. Mays	
<b>Engineered Injection and Extraction for Remediation of Uranium-Contaminated Groundwater .....</b>	<b>111</b>
John A. Greene, Roseanna M. Neupauer, Ming Ye, Joseph R. Kasprzyk, David C. Mays, and Gary P. Curtis	
<b>Effects of Dead-End Pores on Solute Transport Processes.....</b>	<b>119</b>
Sami Maalouf	
<b>The Use of Inverse Distance Weighted Interpolation to Calibrate the Vertical Hydraulic Conductivity below an Estuary .....</b>	<b>126</b>
Wissam Al-Taliby, Ashok Pandit, Antonio Berber, and Howell Heck	
<b>Groundwater Recharge from Dams in United Arab Emirates .....</b>	<b>139</b>
Mohsen Sherif, AbdelAzim Ebraheem, and Ampar Shetty	
<b>Arsenic Removal Potential Using Naturally Occurring Iron in Groundwater: A Geo-Spatial Assessment of Household Potable Drinking Water in Bangladesh .....</b>	<b>147</b>
T. Tarannum, N. Mirza, and T. Ahmed	
<b>Contribution of Drinking Water to Dietary Intakes of Nutrient Minerals in Bangladesh.....</b>	<b>161</b>
N. Mirza, T. Tarannum, and T. Ahmed	
<b>Modeling the River-Aquifer Flow-Interaction Using a Coupled hsB-VPMM Approach .....</b>	<b>172</b>
Bhabagrahi Sahoo, Soumyaranjan Sahoo, and Ratnakar Swain	
<b>Monitoring Organochlorine Pesticides, Polychlorinated Biphenyls, and Polyaromatic Hydrocarbons in Wastewater and Groundwater .....</b>	<b>183</b>
Jim Nguyen, Crissini M. Sison, Varenka Lorenzi, Pitiporn Asvapathanagul, and Nhut M. Pham	
<b>Methodology and Applications in Developing Salt Balances in Groundwater Basins .....</b>	<b>193</b>
Barry J. Hibbs and Godina Ying	

*Sustainability*

<b>Implementing SGMA—An Update on California’s Foray into Groundwater Regulation .....</b>	<b>206</b>
Leslie Dumas	
<b>Evaluation of Soil Mixes in Shallow Bioretention Systems.....</b>	<b>212</b>
Cara J. Poor and Daniel M. Wagner	
<b>The Importance of Changings in Brazilian Law to Introduce the Use of Environmental Criteria in Public Buildings.....</b>	<b>223</b>
Luis Felipe Bismarchi, Teresa Villac, and Maria Cecília Loschiavo dos Santos	
<b>On the Coastal Topography and Storm Surge for Infrastructure Risk Assessment and Adaptation .....</b>	<b>232</b>
Marissa S. Liang and Susan Julius	
<b>Use of GCM Wind Projections in Risk Assessment and Adaptation Planning and Design .....</b>	<b>241</b>
Marissa S. Liang and Susan Julius	
<b>Evaluating the Feasibility of Photovoltaic-Based Plant for Potable Water Treatment .....</b>	<b>256</b>
Saria Bukhary, Jacimaria Batista, and Sajjad Ahmad	
<b>Using Distributed Solar for Treatment of Drinking Water in Developing Countries .....</b>	<b>264</b>
Saria Bukhary, Jennifer Weidhaas, Kamran Ansari, Rasool Bux Mahar, Christine Pomeroy, James A. VanDerslice, Steve Burian, and Sajjad Ahmad	
<b>Green Infrastructure in Urbanized Areas and Roadway Projects .....</b>	<b>277</b>
Hamed Hakimelahi, Ann McKinney, and Adam Lee	
<b>More Pop per Drop: Functional Environmental Flows to Meet Ecosystem Needs and Human Demands.....</b>	<b>284</b>
Joshua H. Viers, Jenny Ta, and Daniel M. Nover	

*Hydro-Climate/Climate Change Symposium*

<b>Future 100-Year Sea Level Trend near Miami, Florida .....</b>	<b>296</b>
C. K. Turan, Y. P. Kinfu, and K. Y. Ng	
<b>A Statistical Approach to Multisite Downscaling of Daily Precipitation Processes in the Context of Climate Change .....</b>	<b>306</b>
Malika Khalili and Van-Thanh-Van Nguyen	

<b>Incorporating Climate Change, Risk, and Resilience into Hydrologic Design Procedures .....</b>	<b>317</b>
Roger Kilgore, George (Rudy) Herrmann, Wilbert O. Thomas Jr., and David Thompson	
<b>Maximum Precipitation Estimation for Five Watersheds in the Southern Sierra Nevada .....</b>	<b>331</b>
Andres J. Diaz, Kei Ishida, M. L. Kavvas, and Michael L. Anderson	
<b>Maximum Precipitation Estimation over Shasta Dam Watershed by Means of Atmospheric Boundary Condition Shifting Method.....</b>	<b>340</b>
Kinya Toride, Kei Ishida, Levent M. Kavvas, and Michael L. Anderson	
<b>Assessing Climate Change Impacts on Water Supply Reliability for Santa Clara County, California.....</b>	<b>347</b>
Kayden Haleakala, Edwin Maurer, and Samantha Greene	
<b>Estimation of Expected Flood Damage in Seom River Basin Considering Climate Change.....</b>	<b>360</b>
Daegun Han, Duckhwan Kim, Seunghyun Oh, and Hung Soo Kim	
<b>Maximum Precipitation Estimation over American River Watershed in Northern California under Future Climate Conditions.....</b>	<b>367</b>
K. Ishida, M. L. Kavvas, and Z. Q. Chen	
<b>Dynamically Downscaled Precipitation over Northern California Based on CMIP5 Future Climate Projections .....</b>	<b>374</b>
K. Ishida, M. L. Kavvas, M. Gorguner, T. Trinh, and A. Ercan	
<b>Model Selection Tools for Hydrological Frequency Analysis: Some New Results .....</b>	<b>384</b>
Fahim Ashkar	
<b>Delineation of Homogeneous Regions Based on the Seasonal Behavior of Flood Flows: An Application to Eastern Canada .....</b>	<b>390</b>
Fahim Ashkar	
<b>Establishing Design Storm Values from Climate Models in Coastal Regions: Challenges and Opportunities .....</b>	<b>398</b>
Y. Jeffrey Yang, Marissa S. Liang, Yingying Zhao, and Jill Neal	
<b>Wildfire, Hydrologic Risk, and Climate Change.....</b>	<b>407</b>
Justin Lennon, Yanling Li, Rawlings Miller, Chris Dorney, Robert Hyman, Brian Beucler, Jake Keller, Beth Rodehorst, and Brenda Dix	

<b>Assessment Study of 21st Century Drought Conditions at Shasta Dam Based on Dynamically Projected Water Supply and Water Demand .....</b>	<b>421</b>
T. Trinh, K. Ishida, M. L. Kavvas, A. Ercan, and K. Carr	
<b>Climate Change Trend Analysis on Extreme Precipitation over the Shasta Dam Watershed Based on 159-Year Long-Term Dynamic Downscaling.....</b>	<b>427</b>
Kinya Toride, Dylan L. Cawthorne, Kei Ishida, Andres J. Diaz, Levent M. Kavvas, and Michael L. Anderson	
<b>Streamflow Pattern Variations Resulting from Future Climate Change in Middle Tianshan Mountains Region in China .....</b>	<b>437</b>
Feiyun Zhang, Lanhai Li, and Sajjad Ahmad	
<b>Operational Impact Curve for Transportation System Relating Precipitation Intensity and Flood Depth to Vehicle Speed .....</b>	<b>447</b>
A. Salemnia, H. Tavakol-Davani, D. Judi, T. McPherson, F. Youcan, and S. Burian	
<b>Development of Reservoir Operation Rules for Sustainable Water Supply Considering Climate Change on Multi-Purpose Dams in Korea .....</b>	<b>453</b>
Suhyung Jang, Jung Min Kim, Kwang Suop Lim, Kyongsik Ryoo, and Jin Hyeog Park	
<b>Assessment of Climate Change Impact on Water Resources in Drought Prone Watersheds in Nakdong River Basin .....</b>	<b>461</b>
Suhyung Jang, Hyeonung Kang, Young Teck Hur, Man Ha Hwang, and Jin Hyeog Park	
<b>Climate Change and Precipitation: Applying Global Climate Model Projections to Local Precipitation Time Series Data in Philadelphia.....</b>	<b>469</b>
S. Malter, J. Rockwell, and M. Maimone	
<b>Developing a Risk-Based Framework for Drought Contingency.....</b>	<b>484</b>
Luciana Kindl Da Cunha, David C. Curtis, and John High	
<b>Using Wavelet to Analyze Periodicities in Hydrologic Variables .....</b>	<b>499</b>
Balbhadra Thakur, Pratik Pathak, Ajay Kalra, Sajjad Ahmad, and Miguel Bernardez	
<b>Assessing the Robustness of Snow-Based Drought Indicators in the Upper Colorado River Basin under Future Climate Change.....</b>	<b>511</b>
Ben Livneh, Andrew M. Badger, and Jeffrey J. Lukas	

<b>Precipitation and Indian Ocean Climate Variability—A Case Study on Pakistan .....</b>	<b>526</b>
Kazi Ali Tamaddun, Ajay Kalra, Waqas Ahmed, Ghulam Hussain Dars, Steve Burian, and Sajjad Ahmad	
<b>Assessment of Future Rainfall Change and Its Impact on Water Resources in the Mekong River 3S Sub-Basins.....</b>	<b>536</b>
Masatsugu Takamatsu, Akiyuki Kawasaki, Minh Tue Vu, Srivatsan V. Raghavan, and Shie-Yui Liong	
<b>Statistical Downscaling Based Correction of the HadGEM2 Family General Circulation Models: Rimac Basin, Peru .....</b>	<b>545</b>
Miguel A. Astorayme and Ronald R. Gutiérrez	
<b>Reconstruction of the Precipitation Field in a Training Line/Adjoining Stratiform Mesoscale Convective System in the Simulation Mode with the Weather Research and Forecasting (WRF) Model .....</b>	<b>557</b>
Mathieu Mure-Ravaud, Kei Ishida, Levent Kavvas, Elena Yegorova, and Joseph Kanney	
<b>Regional Hydrologic Impact Assessment of Climate Change on Reservoir Inflows under the CMIP5 Climate Projections .....</b>	<b>565</b>
Merve Gorguner, Kei Ishida, M. Levent Kavvas, Noriaki Ohara, and Z. Q. Richard Chen	
<b>Effects of Climate Change on the Stream Flows in Upper Middle Fork Feather River Watershed and on the Groundwater Stresses in Sierra Valley Aquifer Based on Long-Term Dynamical Downscaling .....</b>	<b>572</b>
M. S. Ceyhan, A. Dib, K. Ishida, M. L. Kavvas, N. Ohara, and Z. Q. R. Chen	
<b>Ensemble Modeling of Saint-Venant Open-Channel Flow in One Shot under Uncertain Channel Properties.....</b>	<b>580</b>
Alain Dib and M. Levent Kavvas	
<b>Dynamically Downscaled CMIP5 Climate Projections over a Mediterranean-Climate Watershed in Western Turkey.....</b>	<b>588</b>
Merve Gorguner, Kei Ishida, and M. Levent Kavvas	
<b>Analysis of Reservoir Operation under the Uncertainties of Future Projections Based on Fine-Scale Dynamical Downscaling over a Sparsely-Gauged Small Watershed.....</b>	<b>595</b>
Alain Dib, Kei Ishida, M. Levent Kavvas, M. Sercan Ceyhan, Noriaki Ohara, and Z. Q. Richard Chen	



<b>Use of Molecular Dynamics Simulation to Identify Potential Release of Polycyclic Aromatic Hydrocarbons from Asphalt Concrete Pavements.....</b>	<b>605</b>
J. P. S. Yadavalli, M. I. Hossain, H. M. Azam, and J. Pan	
<b>Extreme Water Level Analysis and Applications to Climate Change Adaptation .....</b>	<b>619</b>
Paula Kulis and Avery Livengood	
<b>Development of IDF Relations for Thailand in Consideration of the Scale-Invariance Properties of Extreme Rainfall Processes.....</b>	<b>634</b>
P. Punlum, C. Chaleeraktragoon, and V.-T.-V. Nguyen	
<b>WeatherShift Water Tools: Risk-Based Resiliency Planning for Drainage Infrastructure Design and Rainfall Harvesting .....</b>	<b>642</b>
Mathew Bamm, Robert Dickinson, Courtney King, and Bridget Thrasher	
<b>Protecting Future Sustenance Amid Impending Climate Change: The Influence of Erosion on Crop Yields .....</b>	<b>652</b>
V. Freudenberg, A. N. Papanicolaou, B. Abban, C. Giannopoulos, C. Wilson, and S. Ghaneezad	