

## Brian Joyce, Ph.D.

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### BIOGRAPHICAL SKETCH

Brian Joyce is a Senior Scientist in the water and sanitation unit at the Stockholm Environment Institute. Dr. Joyce has a Ph.D. in Hydrologic Sciences from the University of California, Davis and over 10 years of experience in planning and management of water resources both in the American West and in the international arena. Brian's research at SEI focuses on the development of decision support tools for water resources systems and has participated in the development and application of databases and tools used for water resources analysis in a variety of settings worldwide. His recent work has included using SEI's Water Evaluation And Planning model (WEAP) to assess climate change impacts on agriculture, to design optimal approaches for meeting environmental flow requirements, and to create an analytical platform for use in multi-party discussions over trans-boundary water resources issues.

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### EDUCATION

- 2005 Ph.D. in Hydrologic Sciences. University of California. Davis, California  
2000 M.S. in Hydrologic Sciences. University of California. Davis, California  
1992 B.S. in Natural Resources Studies. University of Massachusetts. Amherst, Massachusetts

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### EMPLOYMENT RECORD

*2006-Present Senior Scientist, Stockholm Environment Institute  
Somerville, Massachusetts*

Scientist with an international research organization focused on the issue of sustainable development. Brian's research generally consists of developing decision support tools for water resources systems. He has participated in the development and application of databases and tools used for water resources analysis in a variety of domestic and international settings.

*2002-2006 Senior Hydrologist, Natural Heritage Institute  
Sacramento, California*

Water resource modeler for a non-profit research institute that seeks to define creative strategies for balancing agricultural, urban and environmental water demands. Brian's research focused on developing water resources systems simulation tools for use in investigating groundwater banking and conjunctive use potential and identifying operational flexibility to enhance river flows for fish and riparian habitat restoration.

*2000-2005 Research Assistant, University of California  
Davis, California*

Doctoral candidate focusing on the development of management practices to mitigate water and pesticide runoff from orchards. Developed simulation models to identify mechanisms controlling pesticide runoff from orchard floors and to assess effects of ground treatment and soil water management practices on pesticide loading into surface waters.

*1997-2000 Research Assistant, University of California  
Davis, California*

Graduate student researcher evaluating the effects of soil physical conditions on annual crop water budgets. Developed numerical models to assess fields' ability to conserve water for subsequent crops and to evaluate the effects of soil physical conditions on the water balance.

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## SELECTED PROJECT EXPERIENCE

- 2009-2011 *Central Valley Project Integrated Resources Plan* – US Bureau of Reclamation  
Assess the expected impacts of climate change on the Central Valley Project using an application of the WEAP model developed for the Sacramento and San Joaquin River Basins. Evaluate proposed action plans that are intended to keep the project viable.
- 2008-2011 *Updating the California Water Plan* – California Department of Water Resources  
Develop an application of the WEAP model that will be used as the analytical foundation for the California Water Plan Update process. This application will be used to conduct integrated scenarios analysis, wherein various management strategies are assessed within the context of a range of uncertainty relating to future trends in water demand and climate
- 2008-2011 *GLOWA Jordan River* – German Federal Ministry of Education and Research  
Worked with local partners in three riparian states - Israel, Jordan, and Palestine - to develop a regional water resources planning tool using the WEAP modeling platform. Applied the model to assess the implications of climate change and other stressors (i.e. increasing population, level of international cooperation) on water availability and evaluated the impact of various alternative management strategies to cope with water shortages.
- 2007-2008 *Maryland Climate Action Plan* – Maryland Commission on Climate Change  
Facilitated a technical working group to address issues related to climate change and how they will impact the natural resources and resources-based industries of the Chesapeake Bay. Worked with stakeholders from throughout Maryland to develop and recommend strategies for reducing the vulnerability of the State's coastal, natural, and cultural resources to the impacts of climate changes.
- 2008 *Using WEAP to Evaluate Water Supply Reliability in South Africa* – South African Department of Water and Forestry  
Developed a case study of a water resources planning model to demonstrate the utility of the WEAP modeling platform. Used local data to build a WEAP application of the Groot Marico River Basin (a tributary to the Limpopo River). Used this model to replicate water supply reliability studies conducted by DWAF staff.
- 2007-2008 *Assessing Potential Climate Change Impacts on the Massachusetts Water Resources Authority* – American Water Works Association Research Foundation  
Developed a climatically-driven water planning model that encompasses the major infrastructure of the MWRA. Used the model to assess potential impacts of changing trends in precipitation and temperature forecasted by various Global Circulations Models under a range of GHG emission scenarios.
- 2007 *Keeping Water Local – Cost-Benefit Analysis of Water Resources Planning* – Massachusetts Department of Fish and Game, Riverways Program  
Developed an integrated water resources planning tool using WEAP for the town of Sharon Massachusetts. Applied the model to evaluate the hydrologic implications and direct financial impacts of water system expansion, as well as to value the environmental consequences of this development.
- 2006-2007 *Klamath Basin-Wide Water Management* – US Bureau of Reclamation.  
Updated and adapted the planning model for the Klamath Project to reflect current and potential operational and management strategies, update the representation of groundwater supplies, and integrate economic and hydrologic models to interact dynamically with the basin-wide planning model.
- 2006-2007 *Updating Representaton of Groundwater in CalSim III* – US Bureau of Reclamation.

Integrated an alternative representation of groundwater into the standard water resource systems simulation model of the California water system. Implemented discrete kernels as a means of assessing site-specific impacts on groundwater system. Intended use of the model outputs are for evaluation of the introduction and operation of local groundwater management projects at a level of detail sufficient to address site specific issues.

- 2005-2006 *Physical Assessment of the Opportunities to Improve Water Management in the Bi-National Rio Grande/Rio Bravo Basin* – U.S. Congress  
Built a basin-wide hydrologic planning model using WEAP that will be the central information management system about the basin and how it functions, generated with all of the stakeholders in the basin a suite of the most promising scenarios for improved management of the water system and then evaluated the hydrologic, economic and legal/institutional feasibility of these scenarios, using the planning model.
- 2005-2006 *Governor's Report on Climate Change in California* – California Energy Commission and California Environmental Protection Agency  
Adapted an application of the WEAP model and used it to evaluate the impact of four future climate scenarios on agricultural water management in the Sacramento Valley of California and to investigate whether water management adaptation could reduce potential impacts.
- 2004-2006 *Global Survey of the Opportunities to Restore Aquatic Ecosystems through Reoperation of Hydraulic Infrastructure* - The MacArthur Foundation.  
Developed a methodology for evaluating managed river basins to identify dams that are promising candidates for reoperation to restore a substantial measure of the pre-existing natural fluvial processes in the downstream floodplains, estuaries and deltas, on which aquatic ecosystems and their environmental services depend. Compiled a database of water resource systems from around the world and applied methodology to screen major dams and other infrastructure for reoperation potential based upon physical and institutional characteristics.
- 2002-2005 *New Storage Options for the Central Valley Project* – U.S. Bureau of Reclamation.  
Adapted the standard water resource systems simulation model of the California water system, CalSim-II, to compare and potentially integrate three water storage options: enlargement of existing reservoirs, the construction of new off-stream reservoirs or the development of groundwater banking and conjunctive use projects. Performance criteria include supply reliability, cost and ecosystem enhancement potential.
- 2003-2004 *Sharing Water: Towards a Transboundary Consensus on the Management of the Okavango River* - U.S. Aid for International Development.  
Assisted the Okavango River Basin Commission and other stakeholders in a tri-national basin to develop future management plans to protect Botswana's ecologically important Okavango Delta while meeting the future water needs of Angola and Namibia.  
Developed for the Okavango Basin the first shared database and river basin planning model using WEAP to assess impacts of management alternatives.

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## LANGUAGES

English – Mother tongue

French – Good

Wolof (Senegal) – Good

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## COUNTRIES OF WORK EXPERIENCE

- USA            - Mexico        - Japan            - Senegal        - Angola        - Botswana  
- Namibia       - Jordan         - Israel           - Palestine      - South Africa

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## SELECTED PUBLICATIONS

- 2009 **Joyce, B.A.**, V. Mehta, D. Purkey, L. Dale, and M. Hannemann. Climate Change Impacts on Water Supply and Agricultural Water Management in California's Western San Joaquin Valley, and Potential Adaptation Strategies. White paper for the California Climate Change Center, publication #CEC-500-2009-051-F.
- 2009 **Joyce, B.A.** W.W. Wallender, and T.R. Ginn. Modeling the Transport of Spray-Applied Pesticides from Fields with Vegetative Cover. *Transactions of the American Society of Agricultural Engineers*. in press.
- 2009 Yates, D., D. Purkey, J. Sieber, A. Huber-Lee, H. Galbraith, J. West, S. Herrod-Julius, C. Young, **B.A. Joyce**, and M. Al Raey. A Climate-Driven Water Resources Model of the Sacramento Basin, California. *Journal of Water Resources Planning and Management*. 135(5): 303-313 September/October. **Winner of the 2010 Quentin Martin Best Practice Paper Award.**
- 2008 Yates, D., H. Galbraith, D. Purkey, A. Huber-Lee, J. Sieber, J. West, S. Herrod-Julius, and **B.A. Joyce**. Climate Warming, Water Storage, and Chinook Salmon in California's Sacramento Valley. *Climate Change*. DOI 10.1007/s10584-008-9427-8.
- 2008 Purkey, D.R., **B.A. Joyce**, S. Vicuna, M.W. Hanemann, L.L. Dale, D. Yates and J.A. Dracup. Robust Analysis of Future Climate Change Impacts on Water for Agriculture and Other Sectors: A Case Study in the Sacramento Valley. *Climatic Change* 87(Suppl 1): S109-S122
- 2007 Vicuna, S., E.P. Maurer, **B.A. Joyce**, J.A. Dracup, and D.P. Purkey. The sensitivity of California Water Resources to Climate Change Scenarios. *Journal of the American Water Resources Association* 43(2):482-498.
- 2006 **Joyce, B.A.**, S. Vicuna, L. Dale, J. Dracup, M. Hannemann, D. Purkey, and D. Yates. Climate Change Impacts on Water for Agriculture in California: A Case Study in the Sacramento Valley. White paper for the California Climate Change Center, publication #CEC-500-2005-194-SD.
- 2005 **Joyce, B.A.** Pesticide Transport Modeling to Evaluate Diazinon Runoff with Infiltration Enhancement and Soil Water Management. Ph.D. Dissertation. University of California, Davis.
- 2005 Sivakumar, B., W.W. Wallender, W.R. Horwath, J.P. Mitchell, S.E. Prentice, and **B.A. Joyce**. Nonlinear analysis of rainfall dynamics in California's Sacramento Valley. *Hydrological Processes* 20(8): 1723-1736.
- 2004 **Joyce, B.A.**, W.W. Wallender, T. Angermann, B.W. Wilson, I. Werner, M.N. Oliver, F.G. Zalom, and J.D. Henderson. Using Infiltration Enhancement and Soil Water Management to Reduce Diazinon in Runoff. *Journal of the American Water Resources Association* 40(4):1063-1070.
- 2002 **Joyce, B.A.**, W.W. Wallender, J.P. Mitchell, L.M. Huyck, S.R. Temple, P.N. Brostrom, and T.C. Hsiao. Infiltration and Soil Water Storage under Winter Cover Cropping in California's Central Valley. *Transactions of the American Society of Agricultural Engineers* 45(2):315-326.
- 2000 Colla, G., J.P. Mitchell, **B.A. Joyce**, L.M. Huyck, W.W. Wallender, S.R. Temple, T.C. Hsiao, and D.D. Poudel. Soil Physical Properties and Tomato Yield and Quality in Alternative Cropping Systems. *Agronomy Journal* 92(5):924-932.