

## Charles A. Young, Ph.D.

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### Professional Summary

Charles A. Young is a Senior Scientist with the Stockholm Environment Institute. He has over 25 years of professional and research experience in water management issues including specific interests in river basin planning, groundwater modeling, crop growth simulations, and rainfall-runoff hydrology. His experience includes leading the development of a WEAP model for use in analysis of water rights in the Sacramento Valley, California, development of a Plant Growth Model to study climate change impacts on crop water use, and the development of rainfall runoff models for the western Sierra Nevada. Skills include MODFLOW, IWFEM, WEAP, Visual Basic, Fortran, Java, and ArcGIS.

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### Education and Training

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| 2004 | PhD, <i>Agricultural and Biological Engineering</i> , University of California, Davis, California, USA. Thesis on issues in regional scale unsaturated zone modelling.   |
| 1997 | MS, <i>Agricultural and Biological Engineering</i> , University of California, Davis, California, USA. Thesis on calculating spatially distributed water and salts balances for the Panoche Irrigation District. |
| 1989 | BSc, <i>Agricultural Engineering Technology</i> , University of Delaware, Newark, Delaware, USA.   |

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### Personal Details

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| Sex         | Male                     |
| Nationality | United States of America |

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### Languages

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| English | • Mother tongue |
| Nepali  | • Good          |

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## Employment Record

8/2006 - Present **Senior Scientist**, Stockholm Environment Institute, Sacramento, CA, USA

Provides expertise in water resources modelling, database management, and geographic information systems. Current projects include the development of a region wide water allocation model for northern California and providing modelling expertise in the implementation of the Sustainable Groundwater Management Act.

2002-2006 **Senior Water Resources Engineer**, Natural Heritage Institute, Sacramento, CA, USA

Developed a rainfall-runoff and reservoir operations model of the American River Basin using the Water Evaluation and Planning (WEAP) system and studied the implications of climate change on water supply and reservoir operations. Worked on a team researching methods to re-operate water development projects worldwide to benefit downstream communities and ecosystems. Developed and tested a riparian vegetation growth model for analysis of Sacramento River operations. Model was developed using data collected in the field and the HYDRUS software. Developed a water balance model of the city of Portland, Oregon water distribution system in the WEAP platform. Worked with Bureau of Water Works staff on implementing model scenarios for use in ongoing wholesale contract negotiations. Developed an Excel and Visual Basic based reservoir operations model of the Lake of the Ozarks, Missouri. Assisted Missouri Department of Conservation staff in analyzing hydropower re-licensing scenarios. Lead the development of a spatial database to support Bureau of Reclamation sediment transport modeling on the Sacramento River, California using ArcGIS software.

1995–2004 **Research Assistant**, University of California, Davis, CA. USA

Ph.D. Research. (1998-2004). Utilized an extended version of the USGS created MODFLOW model which includes variably saturated flow. Developed a regional scale 3-D model of the west side of the San Joaquin Valley, California. Project goal was to elucidate challenges in the construction of such a model and propose solutions.

Klamath Project. (1998). Collaboration with an economist in the development of a water systems and economics modelling system for analysis of the economic impacts various environmental constraints have on the Klamath Falls, Oregon regional economy.

Masters Thesis Research. (1995 – 1997). Calculation of a spatially distributed water and salts balance for the Panoche Water District located on the west side of the San Joaquin Valley.

1993–1995 **Water Conservation Technician**, Monterey County Water Resource Agency, Salinas, California, USA.

Geographic Information Systems. Utilized Arc/Info GIS software to

create spatial data layers of the 2000 groundwater pumping wells within the Salinas Valley, California. Analyzed the spatial distribution of water use within the Valley and prepared reports of water use by geographic area.

Database Management/Design. Managed the testing and design improvements of an integrated Oracle-Arc/Info database that houses spatial and attribute data on all agricultural pumping within the Salinas Valley.

1989–1991

**Water Supply Engineer**, United States Peace Corps, Nepal.

Designed and built village water supply systems in eastern Nepal. Initiated a district wide maintenance program for existing water supply systems.

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### Selected Project Experience

2014 - Present Sacramento Valley Water Allocation Model, **Project Manager**. This model, developed in the WEAP software for the California State Water Resources Control Board, is being used to study in-stream flow policy in the Sacramento River Basin and Delta. My responsibilities include leading the development team and providing technical expertise.

2009 – 2013 Analysis of the impacts of climate change on crop water use. **Project Manager**. Funded by the U.S. Bureau of Reclamation. Managed the development of a computer simulation model to analyse the impact of expected changes in atmospheric CO2 concentrations and weather variables on crop water use and yield in the Central Valley Project of California.

2007-2009 *Rainfall-runoff model of the west slope of the Sierra Nevada*. **Task Manager**. Funded by the Resources Legacy Fund Foundation in cooperation with the U.C. Davis Center for Watershed Science. Managed the development of WEAP21 rainfall runoff model for watersheds from the Feather to Kern River.

2005-2009 Sacramento Valley, California, USA *Development of a Riparian Habitat Establishment Model*. **Project Manager**. Funded by the U.S. Bureau of Reclamation. Managed the development of a model to study the establishment and survival of cottonwood seedlings on the Sacramento River. The model is a modified version of the widely used HYDRUS code. It accounts for the effects of river stage, precipitation, evapotranspiration, and root growth on the survival of cottonwood seedlings. Part of the project involved management of a field data collection program using automated soil moisture sensors. The model will be used by the U.S. Bureau of Reclamation to analyse the impacts of various reservoir operations scenarios on riparian habitat establishment.

2005 New York, USA *Development of rainfall-runoff model for Sterling Creek, New York*. **Task Manager**. Funded by the Great Lakes Protection Fund. Developed a rainfall-runoff model of the Sterling Creek watershed using the WEAP software. Partnered with the Nature Conservancy to study the effect of land use changes on critical stream flow statistics using the Indicators of Hydrologic Alteration.

2005 *Development of Climate Change Analysis Model*. **Task Manager**. Funded

- American River Basin, California, USA by the U.S. Environmental Protection Agency. Developed a rainfall-runoff, snow accumulation/snowmelt, reservoir operations model of the American River Basin using the WEAP21 software. Model was used to study the impacts of climate change on water supply, reservoir operations, power production and soil moisture. Project is being expanded to include all of the Sierra Nevada.
- 2005 Worldwide *Global Survey Project. Researcher.* Funded by the MacArthur Foundation. Worked with a team of researchers identifying methods for re-operation of major water development projects to benefit downstream communities and ecosystems.
- 2004 Sacramento River, California, USA *Sacramento River Database. Task Manager.* Funded by the U.S. Bureau of Reclamation. Led development of a Microsoft Access and ArcGIS based database for use in sediment transport modelling on the Sacramento River.
- 2003–2005 Portland, OR, USA *Regional Solutions to Developing Water Supplies. Task Manager.* Funded by the American Water Works Association Research Foundation. Developed an operations model of the Portland, Oregon water supply system using the WEAP software to study the ramifications of the regionalization of municipal water supplies.
- 1998-2004 San Joaquin Valley, California, USA *Regional Scale Subsurface Water and Geochemistry Modeling. Research Assistant.* Funded by the U.S. Department of Agriculture. Conducted PH.D. research on the development of a variably saturated flow and geochemistry model. Model was used to analyze the implications of long-term irrigation of the poorly drained west side of the San Joaquin Valley.

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## Publications

- 2017 Winter, Jonathan & Young, Charles & Mehta, Vishal & Ruane, Alex & Azarderakhsh, Marzieh & Davitt, Aaron & McDonald, Kyle & Haden, Van & Rosenzweig, Cynthia. (2017). Integrating water supply constraints into irrigated agricultural simulations of California. *Environmental Modelling & Software*. 96. . 10.1016/j.envsoft.2017.06.048.
- 2017 Winter, Jonathan & Lopez, Jose & Ruane, Alex & Young, Charles & R. Scanlon, Bridget & Rosenzweig, Cynthia. (2017). Representing Water Scarcity in Future Agricultural Assessments. *Anthropocene*. 18. . 10.1016/j.ancene.2017.05.002.
- 2016 Forni, L. G., J. Medellín-Azuara, M. Tansey, C. Young, D. Purkey, and R. Howitt. "Integrating Complex Economic and Hydrologic Planning Models: An Application for Drought under Climate Change Analysis." *Water Resources and Economics*.
- 2015 Karlberg, L.; Hoff, H.; Amsalu, T.; Andersson, K.; Binnington, T.; Flores-López, F.; de Bruin, A.; Gebrehiwot, S.G.; Gedif, B.; zur Heide, F.; Johnson, O.; Osbeck, M. and Young, C. 2015. Tackling complexity: Understanding the food-energy-environment nexus in Ethiopia's Lake Tana Sub-basin. *Water Alternatives* 8(1):710-734.
- 2015 Matchett, E.L. Fleskes, J.P., Young, C.A., and Purkey, D.R., 2015, A framework for modeling anthropogenic impacts on waterbird habitats- Addressing future uncertainty in conservation planning: U.S. Geological Survey Open-File Report 2015-1017, 40 p.
- 2014 Kiparsky M, Joyce B, Purkey D, Young C (2014) Potential Impacts of Climate Warming on Water Supply Reliability in the Tuolumne and Merced River Basins, California. *PLoS ONE* 9(1): e84946. doi:10.1371/journal.pone.0084946
- 2013 Yates, D.; Averyt, K.; Flores-López, F.; Meldrum, J.; Sattler, S.; Sieber, J.; Young, C. 2013. A water resources model to explore the implications of energy alternatives in the southwestern US. *Environmental Research Letters* 8: 045004. doi:10.1088/1748-9326/8/4/045004.
- 2013 Welsch, M., S. Hermann, M. Howells, H.H. Rogner, C. Young, I. Ramma, M. Bazilian, G. Fischer, T. Alfstad, D. Gielen, D. Le Blanc, P. Steduto, A. Muller. Adding value with CLEWS – Modelling the energy system and its interdependencies for Mauritius. *Applied Energy* 113(2014) 1434-1445.
- 2013 Howells, M., S. Hermann, M. Welsch, M Bazilian, R. Segerstrom, T. Alfstad, D. Gielen, H. Rogner, G. Fischer, H. van Velthuisen, D. Wiberg, C. Young, R.A. Roehrl, A. Mueller, P. Steduto, I. Ramma, 2013. Integrated analysis of climate change, land-use, energy and water strategies. *Nature Climate Change*, Vol. 3, pp 621-626.
- 2012 Hermann S, Welsch M, Segerstrom RE, Howells MI, Young C, Alfstad T, et al. Climate, land, energy and water (CLEW) interlinkages in Burkina Faso: an analysis of agricultural intensification and bioenergy production. *Nat Res Forum* 2012;36(4):245–62.

- 2012 Auchincloss, L.C., J.H. Richards, C.A. Young, and M.K. Tansey, "Inundation depth, duration, and temperature influence Fremont Cottonwood (*Populus Fremontii*) seedling growth and survival," *Western North American Naturalist*, Vol. 72, No. 3, pp. 323-333.
- 2011 Mehta, V.K., D. E. Rheinheimer, D. Yates, D. R. Purkey, J. H. Viers, C. A. Young and J. F. Mount, "Potential impacts on hydrology and hydropower production under climate warming of the Sierra Nevada," *Journal of Water and Climate Change*, Vol. 2, No. 1, pp. 29-43, doi:10.2166/wcc.2011.054, 2011.
- 2009 Young, C., M.I. Escobar-Arias, M. Fernandes, B. Joyce, M. Kiparsky, J.F. Mount, V.K. Mehta, D. Purkey, J.H. Viers, and D. Yates (2009). Modeling the hydrology of climate change in California's Sierra Nevada for subwatershed scale adaptation. *JAWRA* 45(6):1409-1423.
- 2009 Yates, D., D. Purkey, J. Sieber, A. Huber-Lee, H. Gailbraith, J. West, S. Herrod-Julius, C. Young, B. Joyce, and M. Rayej (2009). Climate driven water resources model of the Sacramento Basin, California. *J. Water Resour. Plng. And. Mgmt*, 135(5):303-313.
- 2007 Young, C., Wallender, W., Schoups, G., Fogg, G., Hanson, B., Harter, T., Hopmans, J., Howitt, R., Hsiao, T., Panday, S., Tanji, K., Ustin, S., Ward, K. (2007) Modeling shallow water table evaporation in irrigated regions. *Irrig Drainage Syst*, 21:119-132.
- 2006 Huber-Lee, A., Swartz, C., Sieber, J., Goldstein, J., Purkey, D., Young, C., Soderstrom, E., Henderson, J., Raucher, R. (2006). Decision Support System for Sustainable Water Supply Planning. Awwa Research Foundation, Denver, CO. 67 pp.
- 2005 Schoups, G.; Hopmans, J.W.; Young, C.A.; Vrugt, J.A.; Wallender, W.W. (2005) Multi-criteria optimization of a regional spatially-distributed subsurface water flow model. *Journal of Hydrology* 311(1-4): 20-48.
- 2005 Schoups, G., Hopmans, J.W., Young, C.A., Vrugt, J.A., Wallender, W.W., Tanji, K.K., and Panday, S. (2005). Sustainability of irrigated agriculture in the San Joaquin Valley, California, *Proc. of the National Academy of Sciences*, 102, 15352-15356.
- 2004 Vrugt, J. A., G. Schoups, J. W. Hopmans, C. Young, W. W. Wallender, T. Harter, and W. Bouten (2004), Inverse modeling of large-scale spatially distributed vadose zone properties using global optimization, *Water Resour. Res.*, 40, W06503, doi:10.1029/2003WR002706.
- 2004 Huber-Lee, A., D. Yates, D. Purkey, W. Yu, C. Young, and B. Runkle. "How Can We Sustain Agriculture and Ecosystems? The Sacramento Basin." Chapter in the book, *Climate Change in Contrasting River Basins*. Edited by J. Aerts and P. Droogers. CABI Publishing, UK.
- 2004 Huber-Lee, A., D. Purkey, J. Sieber, C. Swartz and C. Young. "Sustainable Water Supply Planning for Three US Cities: Contrasts in Climates and Stakeholder Issues." Paper presented at the Stockholm Water Symposium, August 2004.
- 2002 Young, C.A., W.W. Wallender. (2002) Spatially distributed irrigation hydrology: water balance. *Trans. of ASAE* 45(3): 609-618.

2000 Mateos, L., C.A. Young, W.W. Wallender, and H.L. Carlson. (2000) Simulating Spatially Distributed Water and Salt Balances. *Journal of Irrigation and Drainage Engineering* 126(5), 288-295.

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### **Memberships**

2004–present Member, American Geophysical Union

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### **Countries of Work Experience**

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