



## David Freyberg

Associate Professor of Civil and Environmental Engineering, Emeritus

### Bio

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#### BIO

A hydrologist and water resources specialist, Freyberg studies reservoir sedimentation and hydrology; surface water-ground water interactions, especially in reservoir/sediment systems; collaborative governance of trans-national water resources; and the design, scaling, and spatial structure of recycled water systems.

#### ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Civil and Environmental Engineering

#### ADMINISTRATIVE APPOINTMENTS

- Co-director of Graduate Studies, Dept. of Civil & Environmental Engineering, (2019- present)
- Member, Stanford Faculty Senate, (2017-2019)

#### HONORS AND AWARDS

- Community Service Award, Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) (2014)
- Eugene Grant Award for Excellence in Teaching, Eugene L. Grant (2009, 2019)
- University Fellow in Undergraduate Education, Landreth Family (2002-2007)
- Bing Teaching Fellow, Stanford University (1994)
- Award for Excellence in Undergraduate Teaching, Tau Beta Pi (1993, 2009)
- Presidential Young Investigator, National Science Foundation (1985-1990)

#### BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Technical Advisory Committee, San Francisco Estuary Institute, Peninsula Watershed Historical Ecology Study (2017 - 2021)
- Member, Environmental Engineering Program (1981 - present)
- Stanford Representative, Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) (2008 - present)
- Member, Education & Outreach Committee, Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI) (2016 - present)
- Member, Advisory Board, NSF HydroLearn Project (2017 - present)
- Member, Technical Advisory Committee, Santa Clara Valley Urban Runoff Pollution Prevention Program, Stormwater Resource Program (2018 - present)
- Member, Science Advisory Panel, Sempervirens Fund (2018 - present)

#### PROGRAM AFFILIATIONS

- Center for East Asian Studies

## PROFESSIONAL EDUCATION

- PhD, Stanford University (1981)

## Research & Scholarship

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### CURRENT RESEARCH AND SCHOLARLY INTERESTS

My students and I study sediment and water balances in aging reservoirs, collaborative governance of transnational fresh waters, the design of centralized and decentralized wastewater collection, treatment, and reuse systems in urban areas, and hydrologic ecosystem services in urban areas and in systems for which sediment production, transport, and deposition have significant consequences.

Our methods typically combine field data collection and analysis with numerical modeling, both of physical process models and systems models with optimization.

## Teaching

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### COURSES

#### 2023-24

- Dams, Reservoirs, and their Sustainability: CEE 266C (Spr)
- Environmental Engineering Seminar: CEE 269C (Spr)
- Hydrologic Processes, Water Resources and Hazards: CEE 166B, CEE 266B (Win)
- The American West: AMSTUD 124A, ENGLISH 124, HISTORY 151, POLISCI 124A (Win)

#### 2022-23

- Dams, Reservoirs, and their Sustainability: CEE 266C (Spr)
- River and Region: The Columbia River and the Shaping of the Pacific Northwest: CEE 17SC, EARTHSYS 16SC, HISTORY 29SC, POLISCI 14SC (Sum)
- The American West: AMSTUD 124A, ARTHIST 152, ENGLISH 124, HISTORY 151, POLISCI 124A (Spr)
- Water Resources and Hazards: CEE 166B, CEE 266B (Win)
- Watershed Hydrologic Processes and Models: CEE 166A, CEE 266A (Aut)

#### 2021-22

- Dams, Reservoirs, and their Sustainability: CEE 266C (Spr)
- The American West: AMSTUD 124A, ARTHIST 152, ENGLISH 124, HISTORY 151, POLISCI 124A (Spr)
- Water Resources and Hazards: CEE 166B, CEE 266B (Win)
- Watershed Hydrologic Processes and Models: CEE 166A, CEE 266A (Aut)

#### 2020-21

- Dams, Reservoirs, and their Sustainability: CEE 266C (Spr)
- The American West: AMSTUD 124A, ARTHIST 152, ENGLISH 124, HISTORY 151, POLISCI 124A (Spr)
- Water Resources and Hazards: CEE 166B, CEE 266B (Win)
- Watershed Hydrologic Processes and Models: CEE 166A, CEE 266A (Aut)

## STANFORD ADVISEES

### Doctoral Dissertation Reader (AC)

Jenny Skerker, Ankun Wang

### Master's Program Advisor

Phoebe Chen, Maria Ridgeway-Elsner, Abby Small

## Publications

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### PUBLICATIONS

- **Van Norman Complex Retrospective Risk Evaluation: Assessing the San Fernando Dam Performance during the San Fernando Earthquake**  
McCann, M. W., Mehta, J., Davis, C. A., Freyberg, D. L., Davis, C. A., Yu, K., Taciroglu, E.  
AMER SOC CIVIL ENGINEERS.2022: 13-24
- **Climate-informed hydrologic modeling and policy typology to guide managed aquifer recharge.** *Science advances*  
He, X., Bryant, B. P., Moran, T., Mach, K. J., Wei, Z., Freyberg, D. L.  
2021; 7 (17)
- **A Retrospective Evaluation of the Performance of the Lower San Fernando Dam**  
McCann, M. W., Mehta, J., Davis, C. A., Freyberg, D. L., Meehan, C. L., Pando, M. A., Leshchinsky, B. A., Jafari, N. H.  
AMER SOC CIVIL ENGINEERS.2021: 89-100
- **Decision support toolkit for integrated analysis and design of reclaimed water infrastructure** *WATER RESEARCH*  
Lee, E., Criddle, C. S., Geza, M., Cath, T. Y., Freyberg, D. L.  
2018; 134: 234–52
- **Reachability Analysis as a Design Tool for Stormwater Systems**  
Chapman, M. P., Smith, K. M., Cheng, V., Freyberg, D. L., Tomlin, C. J., IEEE  
IEEE.2018: 165–72
- **Historical Analysis of Hydraulic Bridge Collapses in the Continental United States** *JOURNAL OF INFRASTRUCTURE SYSTEMS*  
Flint, M. M., Fringer, O., Billington, S. L., Freyberg, D., Diffenbaugh, N. S.  
2017; 23 (3)
- **An integrated planning tool for design of recycled water distribution networks** *ENVIRONMENTAL MODELLING & SOFTWARE*  
Lee, E. J., Freyberg, D. L., Criddle, C. S.  
2016; 84: 311-325
- **Impacts of Land-Use Change on Groundwater Supply: Ecosystem Services Assessment in Kona, Hawaii** *JOURNAL OF WATER RESOURCES PLANNING AND MANAGEMENT*  
Brauman, K. A., Freyberg, D. L., Daily, G. C.  
2015; 141 (12)
- **Estimating aquifer recharge in fractured hard rock: analysis of the methodological challenges and application to obtain a water balance (Jaisamand Lake Basin, India)** *HYDROGEOLOGY JOURNAL*  
Rohde, M. M., Edmunds, W. M., Freyberg, D., Sharma, O. P., Sharma, A.  
2015; 23 (7): 1573-1586
- **Fog, fog drip, and streamflow in the Santa Cruz Mountains of the California Coast Range** *ECOHYDROLOGY*  
Sawaske, S. R., Freyberg, D. L.  
2015; 8 (4): 695-713
- **An analysis of trends in baseflow recession and low-flows in rain-dominated coastal streams of the pacific coast** *JOURNAL OF HYDROLOGY*  
Sawaske, S. R., Freyberg, D. L.  
2014; 519: 599-610
- **Assessing the scale of resource recovery for centralized and satellite wastewater treatment.** *Environmental science & technology*  
Lee, E. J., Criddle, C. S., Bobel, P., Freyberg, D. L.  
2013; 47 (19): 10762-10770
- **Land cover effects on groundwater recharge in the tropics: ecohydrologic mechanisms** *ECOHYDROLOGY*  
Brauman, K. A., Freyberg, D. L., Daily, G. C.  
2012; 5 (4): 435-444

- **Potential evapotranspiration from forest and pasture in the tropics: A case study in Kona, Hawai ' i** *JOURNAL OF HYDROLOGY*  
Brauman, K. A., Freyberg, D. L., Daily, G. C.  
2012; 440: 52-61
- **A comparison of past small dam removals in highly sediment-impacted systems in the U.S.** *GEOMORPHOLOGY*  
Sawaske, S. R., Freyberg, D. L.  
2012; 151: 50-58
- **Retention of nutrients and sediment by vegetation** *NATURAL CAPITAL: THEORY & PRACTICE OF MAPPING ECOSYSTEM SERVICES*  
Conte, M., Ennaanay, D., Mendoza, G., Walter, M., Wolny, S., Freyberg, D., Nelson, E., Solorzano, L., Kareiva, P., Tallis, H., Ricketts, T. H., Daily, G. C., Polasky, et al  
2011: 89-110
- **Water supply as an ecosystem service for hydropower and irrigation** *NATURAL CAPITAL: THEORY & PRACTICE OF MAPPING ECOSYSTEM SERVICES*  
Mendoza, G., Ennaanay, D., Conte, M., Walter, M., Freyberg, D., Wolny, S., Hay, L., White, S., Nelson, E., Solorzano, L., Kareiva, P., Tallis, H., Ricketts, et al  
2011: 53-72
- **Forest structure influences on rainfall partitioning and cloud interception: A comparison of native forest sites in Kona, Hawai'i** *AGRICULTURAL AND FOREST METEOROLOGY*  
Brauman, K. A., Freyberg, D. L., Daily, G. C.  
2010; 150 (2): 265-275
- **The Effect of Social Presence on Affective and Cognitive Learning in an International Engineering Course Taught via Distance Learning** *JOURNAL OF ENGINEERING EDUCATION*  
Mackey, K. R., Freyberg, D. L.  
2010; 99 (1): 23-34
- **Implementing Hydrologic Boundary Conditions in a Multiphysics Model** *JOURNAL OF HYDROLOGIC ENGINEERING*  
Chui, T. F., Freyberg, D. L.  
2009; 14 (12): 1374-1377
- **Simulating a lake as a high-conductivity variably saturated porous medium** *GROUND WATER*  
Chui, T. F., Freyberg, D. L.  
2008; 46 (5): 688-694
- **Hydrostratigraphy and geochemistry at a coastal sandfill in Singapore** *HYDROGEOLOGY JOURNAL*  
Chua, L. H., Lo, E. Y., Freyberg, D. L., Shuy, E. B., Lim, T. T., Tan, S. K., Ngonidzashe, M.  
2007; 15 (8): 1591-1604
- **On using the equivalent conductivity to characterize solute spreading in environments with low-permeability lenses** *WATER RESOURCES RESEARCH*  
Guswa, A. J., Freyberg, D. L.  
2002; 38 (8)
- **Slow advection and diffusion through low permeability inclusions** *JOURNAL OF CONTAMINANT HYDROLOGY*  
Guswa, A. J., Freyberg, D. L.  
2000; 46 (3-4): 205-232
- **Solute transport at the borden field experiment: Grain- and field-scale rate limitations** *27th Congress of the International-Association-for-Hydraulic-Research*  
Cunningham, J., FREYBERG, D., Roberts, P.  
AMER SOC CIVIL ENGINEERS.1997: 65-70
- **UPSCALED SOIL-WATER RETENTION USING VAN GENUCHTEN'S FUNCTION** *JOURNAL OF HYDROLOGIC ENGINEERING*  
Green, T. R., Constantz, J. E., Freyberg, D. L.  
1996; 1 (3): 123-130
- **Use of sedimentological information for geometric simulation of natural porous media structure** *WATER RESOURCES RESEARCH*  
Scheibe, T. D., Freyberg, D. L.  
1995; 31 (12): 3259-3270

- **STATE-DEPENDENT ANISOTROPY - COMPARISONS OF QUASI-ANALYTICAL SOLUTIONS WITH STOCHASTIC RESULTS FOR STEADY GRAVITY DRAINAGE** *WATER RESOURCES RESEARCH*  
Green, T. R., Freyberg, D. L.  
1995; 31 (9): 2201-2211
- **EFFICIENT SIMULATION OF SINGLE-SPECIES AND MULTISPECIES TRANSPORT IN GROUNDWATER WITH LOCAL ADAPTIVE-GRID REFINEMENT** *WATER RESOURCES RESEARCH*  
Wolfsberg, A. V., Freyberg, D. L.  
1994; 30 (11): 2979-2991
- **SIMULATION OF ONE-DIMENSIONAL CORRELATED FIELDS USING A MATRIX-FACTORIZATION MOVING AVERAGE APPROACH** *MATHEMATICAL GEOLOGY*  
Black, T. C., Freyberg, D. L.  
1990; 22 (1): 39-62
- **AN EXERCISE IN GROUNDWATER MODEL CALIBRATION AND PREDICTION** *GROUND WATER*  
Freyberg, D. L.  
1988; 26 (3): 350-360
- **STOCHASTIC MODELING OF VERTICALLY AVERAGED CONCENTRATION UNCERTAINTY IN A PERFECTLY STRATIFIED AQUIFER** *WATER RESOURCES RESEARCH*  
Black, T. C., Freyberg, D. L.  
1987; 23 (6): 997-1004
- **A NATURAL GRADIENT EXPERIMENT ON SOLUTE TRANSPORT IN A SAND AQUIFER .1. APPROACH AND OVERVIEW OF PLUME MOVEMENT** *WATER RESOURCES RESEARCH*  
Mackay, D. M., Freyberg, D. L., Roberts, P. V.  
1986; 22 (13): 2017-2029
- **A NATURAL GRADIENT EXPERIMENT ON SOLUTE TRANSPORT IN A SAND AQUIFER .2. SPATIAL MOMENTS AND THE ADVECTION AND DISPERSION OF NONREACTIVE TRACERS** *WATER RESOURCES RESEARCH*  
Freyberg, D. L.  
1986; 22 (13): 2031-2046
- **MODELING THE EFFECTS OF A TIME-DEPENDENT WETTED-PERIMETER ON INFILTRATION FROM EPHEMERAL CHANNELS** *WATER RESOURCES RESEARCH*  
Freyberg, D. L.  
1983; 19 (2): 559-566
- **APPLICATION OF THE GREEN-AMPT MODEL TO INFILTRATION UNDER TIME-DEPENDENT SURFACE-WATER DEPTHS** *WATER RESOURCES RESEARCH*  
Freyberg, D. L., Reeder, J. W., FRANZINI, J. B., Remson, I.  
1980; 16 (3): 517-528
- **INFILTRATION UNDER RAPIDLY VARYING SURFACE-WATER DEPTHS** *WATER RESOURCES RESEARCH*  
Reeder, J. W., Freyberg, D. L., FRANZINI, J. B., Remson, I.  
1980; 16 (1): 97-104