



# Freshwater Initiative

The Woods Institute for the Environment launched the Freshwater Initiative to develop long-term research programs at Stanford that help solve the world's urgent demands for fresh water.

## **Town Hall Meeting**

The Woods Institute's Water Committee, chaired by Professor Richard Luthy (Civil and Environmental Engineering) and Rosemary Knight (Geophysics) held a Freshwater Town Hall Meeting with Stanford faculty on Oct. 19, 2007. Several themes emerged from the discussions including: How do we balance human and ecosystem needs? How may we better manage regional scale water resources in the West, especially with climate change? And what is the role for smaller scale and local treatment/on-site treatment for western water management and reuse, and how may that help advance water supply and sanitation in developing countries?

Participants (*see page 4*) discussed innovative ideas for research about water quality and waste management; water supply and storage; the impact of climate change on water resources and usage; geographical, historical, economic, institutional, and regulatory frameworks; balancing human and ecosystem needs; and the impact of chemical toxins and waterborne diseases on human and ecosystem health (*see pages 5-7*).

## **Water Seminar**

In autumn and winter terms of the 2007-08 academic year, Stanford faculty presented their water-related research to each other. *A list of Water Seminar presentations is found on pages 8-9.*

## **Water Planning Grants**

In spring 2008, the Woods Institute invited Stanford researchers to submit proposals for freshwater planning grants to an evaluation committee chaired by Woods Co-Director Jeff Koseff, professor of civil and environmental engineering. In July, the committee awarded the following five projects a total of \$312,520 over the next nine months:

### Global Change and Water Resource Vulnerability

Researchers will develop a strategy to identify regional freshwater systems around the world that are most vulnerable to the combined impact of people and nature, from expanding populations to climate change.

**Principal investigators:** Steven Gorelick (Environmental Earth System Science), Buzz Thompson (Law School), Scott Rozelle (Freeman Spogli Institute for International Studies)

**Research team:** Biology and the Woods Institute: Gretchen Daily; Civil and Environmental Engineering: David Freyberg; Economics: Larry Goulder; Environmental Earth Systems

Science and the Woods Institute: Eric Lambin; Interdisciplinary Graduate Program on Environment and Resources and the Woods Institute: Michael Mastandrea; School of Earth Sciences and the Woods Institute: Pamela Matson; Interdisciplinary Graduate Program on Environment and Resources: Veena Srinivasan

#### Water in the West: A Regional Approach

Jointly funded by the Woods Institute, the School of Medicine, and the Bill Lane Center for the Study of the North American West. Researchers will develop a series of workshops endeavoring to lead to regional solutions to major water challenges in the North American West. Participants will include regional utilities, government organizations, non-governmental organizations, and experts from Stanford and other universities in the western United States, Canada, and Mexico.

**Principal investigators:** David M. Kennedy (History) and Richard Luthy (Civil and Environmental Engineering)

**Research team:** Bill Lane Center: Peter Alagona, Matt Booker, Tammy Frisby, David Kennedy, Gregory Simon, Richard White; Civil and Environmental Engineering: Alexandra Boehm, Craig Criddle, Oliver Fringer, David Freyberg, Peter Kitanidis, Jim Leckie, Richard Luthy, Perry McCarty, Stephen Monismith, Len Ortolano, Martin Reinhard; Economics: Roger Noll, Frank Wolak; Environmental Earth Systems Science: Scott Fendorf; Energy Resources Engineering: Rosemary Knight; Graduate School of Business: David Brady; Management Science and Engineering: James Sweeney, Thomas Weber; Law: Buzz Thompson; Medicine: Gary Schoolnik, Abby King; Hoover Institution: Terry Anderson, Gary Libecap

#### Water and Development: Scaling Local Solutions

Jointly funded by the Woods Institute and the Stanford School of Medicine. Researchers will organize workshops in two regions of the world most affected by a lack of safe drinking water: Sub-Saharan Africa and South/Southeast Asia. The workshops will be designed to foster dialogue and debate among academics, business leaders, and regulators, with the goal of identifying promising solutions to freshwater challenges now being implemented at the local level.

**Principal investigators:** Jenna Davis (Civil and Environmental Engineering/Woods Institute) and Len Ortolano (Civil and Environmental Engineering)

**Research team:** Civil and Environmental Engineering: Alexandria Boehm, Craig Criddle, Jenna Davis (and Woods), David Freyberg, Ralph Hall, Peter Kitanidis, Len Ortolano; Freeman Spogli Institute for International Studies: Jen Burney; Economics: Walter Falcon, Roz Naylor (and Woods); Environmental Earth Systems Science: Scott Fendorf, Matthew Polizzotto; Medicine: Abby King, Gary Schoolnik; Anthropology: Karen Levy

#### Comprehensive Studies of Aquifer Depletion and Salinization

This proposal is to develop a large-scale research project focusing on the depletion and salinization of aquifers, which are significant problems in the arid West and other parts of the world that rely heavily on groundwater.

**Principal investigators:** Peter Kitanidis and Martin Reinhard (Civil and Environmental Engineering); Rosemary Knight (Geophysics); Frank Wolak (Economics)

**Research team:** Civil and Environmental Engineering: Peter Kitanidis and Martin Reinhard; Geophysics: Rosemary Knight; Law: Buzz Thompson; Economics: Frank Wolak

An Integrated Model of the California Water System

This project will bring together scholars, industry participants, and policymakers for a series of meetings that lead to the design of an integrated model of the California water system, incorporating agricultural, residential, industrial, commercial, environmental, and recreational uses of fresh water throughout the state.

**Principal investigator:** Frank Wolak (Economics)

**Research team:** Economics: Frank Wolak, Joshua Nowlis; Civil and Environmental Engineering: Peter Kitanidis; Law: Buzz Thompson

**Woods Institute Town Hall Meeting on Water**  
**Falcon Lounge, Encina Hall East, Stanford University**  
**Oct. 19,2007**

**Participants**

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# Woods Institute Town Hall Meeting on Water

**Oct. 19, 2007**

## **Agenda**

**12:45pm**

**Dick Luthy and Jeff Koseff:** Welcome and Introductions

**1:00 to 3:00pm**

Ten-minute presentations by Stanford faculty:

- \_ **Craig Criddle:** Environmental Engineering; Sanitation
- \_ **David Freyberg:** Hydrology and Water Resources; CA and Climate Change
- \_ **Scott Fendorf:** Environment and Earth Systems Dynamics
- \_ **Buzz Thompson:** Legal and Regulatory Issues
- \_ **Gordon Gao:** Public Health and Water
- \_ **David Kennedy:** Water and the West
- \_ **Stephen Monismith:** Coastal Margins, Deltas, Estuaries, Lakes
- \_ **Kate Brauman:** Natural Capital
- \_ **Rosemary Knight:** Geophysics; Imaging and Modeling Groundwater Systems

**3:00 to 5:00pm**

**Alexandria Boehm:** Discussion of Stanford's possible collaborative research priorities

# Woods Institute Town Hall Meeting on Water

Oct. 19, 2007

## Summary

**By Richard Luthy**  
**Professor, Civil and Environmental Engineering**  
**Senior Fellow, Woods Institute**

*We had a very productive and encouraging town hall meeting of faculty interested in a "freshwater initiative." The purpose of our meeting was to begin a dialog on better defining our assets and how those assets may be marshaled to solve important freshwater problems. This meeting was a first step in helping to give us a better idea of what's going on and what we may do collectively to work on new opportunities.*

*In a series of ten-minute presentations we heard from nine different individuals speaking on behalf of a range of disciplines or programs. Some main points from each were as follows. Craig Criddle described how we might harness waste streams as resources, and the importance of green manufacturing and the design of environmentally friendly chemicals to avoid future problems. David Freyberg focused the nature of connections among hydrology, climate, ecosystems, and land use; he also emphasized that work at Stanford involves collecting data, not just using other's data; and little is done now at Stanford on the impacts of climate change on freshwater in California. Scott Fendorf described water use impacts and ecosystem health including estuaries and marshlands, and water quality improvement for developing countries. Buzz Thompson described regulatory frameworks that lead to overdrafts and vulnerabilities, the need for greater allocation flexibility, and how groundwater storage is still an open territory in a regulatory sense. Gordon Gao described the resurgence of some water-borne diseases in China, chemical pollutants effecting public health in communities, and the fact that no country is invulnerable to such disease outbreaks.*

*David Kennedy focused on aridity as a defining characteristic of the west. He stressed that how we deal with availability and allocation inevitably involves tradeoffs among competing 'goods' with choices depending on ethics and beliefs. Stephen Monismith focused on how we struggle to balance human and ecosystem needs in managing lakes, estuaries, and coastal margins; we lack good forecasting techniques. Kate Brauman described how conservation or engineering alone can't solve our problems. New institutions are needed that may come from aligning economic forces with conservation. Rosemary Knight described new observational methods to better evaluate and manage groundwater resources at larger scale.*

*Ali Boehm led the open discussion with assistance from David Kennedy. Some points included the notable absence of social science researchers at the meeting, which may be indicative of the lack of applied social science research at Stanford in general. The issue of climate change is a big driver and we must consider the CO2 emissions related to water resource technologies and management. The role of agriculture looms large in western water issues, and this was not discussed. There was some unresolved discussion about whether Asia or Africa presents greater opportunities for international aspects. Water shortages and desertification and food shortages in Africa may lead to 'deadly connections', but this also makes it unsuitable [unsafe] for graduate students. Asia has huge needs and we could build on significant Stanford connections in Singapore, China, Indochina, and India, for example.*

*One compelling picture that emerged was a sense that Stanford is "the university in the west" and that other universities may be focusing on environmental challenges other than those as water-centric as we discussed at the town hall meeting. By the end of the meeting, there was a strong feeling based on our heritage, tradition, and location that we could mount something significant in the freshwater area.*

*Those in the room felt that no university had such a lead at the moment, unlike say Harvard, Colorado State, or Utah some fifty years ago.*

*There was a coming together around several related themes:*

- 1. How can we balance human and ecosystem needs? This would include human health and ecosystem health and supply.*
- 2. How may we better manage regional scale water supply in the west, how will climate change effect the way we manage western water resources, and how will we evaluate and implement adaptation strategies?*
- 3. What is the role for smaller scale and local treatment/on-site treatment for western water management and reuse, and how may that help advance water supply and sanitation in developing countries? We can study Stanford's own water reuse, including a closed-cycle water system and acceptance of students drinking "new water" in the Green Dorm.*

*Institutions and the social sciences clearly have a large role to play as we think about these questions. Partnerships will be key, since it will take years to build these resources at Stanford.*

*In addition to the themes that emerged, the group acknowledged that the Water Seminar will allow us to better understand each others research, and there may be some low-hanging fruit for collaborative research.*

*Thank you all for your participation and active engagement. Dick*

# Woods Water Seminar

Winter Quarter, 2008

Fridays, 10:00-11:00 a.m., Coffee and refreshments at 9:30 a.m.

*The Stanford faculty and graduate students are invited to attend the Water Seminar, an interdisciplinary series of talks primarily by Stanford experts on a broad range of freshwater topics. The Woods Institute for the Environment is exploring how best to move forward in the area of freshwater, with the ultimate goal of setting up a large-scale funded strategic collaboration in this area and possibly seed projects as well. As a vehicle for assessing what is currently being done in the freshwater area at Stanford, and for improving communication between members of the Stanford community with research and teaching interests in this topic, we are sponsoring a Freshwater Seminar. Please join your colleagues for coffee, tea, and refreshments at 9:30 a.m. followed by a talk and discussion from 10:00-11:00.*

**January 11, Hartley Conference Room, Mitchell Building**

Dean Carol Folt, Dartmouth College

*Sorting through nature's complexity to determine the key drivers of mercury in fish*

January 18, Y2E2, Room 299

Jef Caers

*3D Subsurface Reservoir Modeling, Engineering and Management*

**January 25, Y2E2, Room 299**

Rosemary Knight

*The Development of Geophysical Methods for Groundwater Evaluation and Management*

**February 1, Y2E2, Room 299**

Perry McCarty

*Water Quality Challenges - Past, Present and Future*

**February 8, Y2E2, Room 299**

Keith Prince, USGS

*Western Water and USGS: Funding, Structure, Research*

**February 15, Y2E2, Room 299**

Leonard Ortolano

*Implementing Water-Related Plans and Policies*

**February 22, Y2E2, Room 299**

James Leckie

*Membrane technology and photocatalytic materials development*

**February 29, Y2E2, Room 299**

Stephen Monismith

*Environmental Water Account*

**March 7, Y2E2, Room 299**

Water Committee Meeting

**March 14, Y2E2, Room 299**

Tim Quinn, Executive Director of the Association of California Water Agencies

*California Water: Managing Crisis and Opportunity*

# Woods Water Seminar

Fall Quarter, 2007

**Fridays, 9:00 to 10:00 a.m., Continental Breakfast at 8:30 a.m.**

**Hartley Conference Room**

The Stanford faculty and graduate students are invited to attend the Water Seminar, an interdisciplinary series of talks primarily by Stanford experts on a broad range of freshwater topics. The Woods Institute for the Environment is exploring how best to move forward in the area of freshwater, with the ultimate goal of setting up a large-scale funded strategic collaboration in this area and possibly seed projects as well. As a vehicle for assessing what is currently being done in the freshwater area at Stanford, and for improving communication between members of the Stanford community with research and teaching interests in this topic, we are sponsoring a Freshwater Seminar. Please join your colleagues for coffee, tea, and continental breakfast at 8:30 a.m. followed by a talk and discussion from 9:00 to 10:00 in Hartley, Mitchell Building.

## **October 26**

Professor Steven Gorelick, Cyrus Fisher Tolman Professor in the School of Earth Sciences

Geological and Environmental Sciences

*Recent Research Areas in GES in Hydrogeology and Water Resources Analysis*

## **November 2: NOTE: location change for this session only, Mitchell: 350/372**

Professor W. Michael Hanemann, Chancellor's Professor, Department of Agricultural & Resource Economics, University of California at Berkeley

*The Problem of Water*

## **November 9**

David Robinson, Dept of Geophysics

*Deciphering Ecohydrological Patterns and Processes in Small Western US Watersheds*

## **November 16**

Professor Peter K. Kitanidis, Professor of Civil and Environmental Engineering, Environmental Fluid Mechanics and Hydrology, Stanford University

*Variability and Information Issues in Water Management*

## **November 30**

Professor Richard Luthy, Silas H. Palmer Professor of Civil Engineering, Senior Fellow, Woods Institute for the Environment

*Contaminated Sediments and Water Quality*

## **December 7**

Professor Jennifer "Jenna" Davis, Assistant Professor-Civil & Environmental Engineering, Center Fellow-Woods Institute for the Environment

*Water, sanitation, health and development: Adventures of the Stanford "Poop Group"*