

Oral Testimony of David L. Sunding, University of California at Berkeley  
U.S. House of Representatives, Committee on Transportation and Infrastructure  
Subcommittee on Water, Resources and Environment  
May 11, 2011

Chairman Gibbs, members of the subcommittee, it is an honor to speak here today.

This Committee is considering an issue of regulatory policy that has significant implications for the vast range of public and private projects that must receive permits under Section 404 of the Clean Water Act. As you are aware, in 2007 the Army Corps of Engineers issued a Section 404 permit to Arch Coal in connection with the Spruce No. 1 Mine located in Logan County, West Virginia. Arch Coal subsequently operated the mine in compliance with its permit. Nonetheless, three years after the Corps issued the 404 permit, EPA moved to withdraw the authorization granted to Arch Coal. Both the Corps and the State of West Virginia disagreed with the EPA decision, finding that there was no reason to take away the permit. This precedential decision by EPA -- to exercise its limited authority to revoke the permit over the objections of the Corps and State has the potential to affect a wide range of economic activities that require authorization under Section 404 of the Clean Water Act, affecting not just project proponents, but many others as well.

There are a wide range of public and private sector activities permitted under Section 404 of the Clean Water Act. These activities are vital to the American economy, and include: utility infrastructure; housing and commercial development; renewable

energy projects like wind, solar, and biomass; pipeline and electric transmission; transportation infrastructures including roads and rail; agriculture; and many others. The Corps estimates that over \$220 billion of investment annually is conditioned on the issuance of Section 404 permits. Given the breadth of the statute, a large share of public and private infrastructure or development projects must receive and depend on the certain operation of the 404 permit.

EPA's precedential decision to override the judgment of the Corps of Engineers in this case, alters the incentives to invest in projects requiring a permit under Section 404. Project development usually requires significant capital expenditure over a sustained period of time, after which the project generates some return. Actions like the EPA's that increase uncertainty, raise the threshold for any private or public entity to undertake the required early-stage investment. In this way, the EPA's action will chill investment in activities requiring a 404 authorization.

Increasing the level of uncertainty can also reduce investment by making it more difficult to obtain project financing. Land development activities, infrastructure projects and the like often require a significant level of capital formation. Reducing the reliability of the Section 404 permit will make it harder for project proponents to find financing at attractive rates as lenders and bondholders will require higher interest rates to compensate for increased risk, and some credit rationing may also result.

It is worth remembering that public and private activities requiring Section 404 authorization generate significant indirect benefits to affiliated industries. Thus, reduced levels of investment translate directly into lost jobs and lost economic activity. You have heard testimony about the indirect impacts of mining on the economies of the Appalachian states. Similar indirect benefits are evident for housing and commercial development, road building, and other activities. In the case of housing construction (which, over the long run accounts for as much as 15 percent of economic activity in the U.S.), every \$1 spent on new housing construction, for example, produces roughly \$2 in total economic activity, and every \$1 billion in residential construction generates nearly 12,000 new jobs. Regulation that creates a disincentive for investment in development has implications for these indirect economic benefits as well.

A reduced level of investment in projects requiring a Section 404 permit would have effects to go far beyond the industry participants themselves. Private projects authorized under Section 404 increase the supply of housing, commercial development and the like. When development projects are not undertaken, these consumer benefits are reduced or lost altogether. Public sector activities like road building and repair, and utility infrastructure also contribute to the quality of life throughout the nation, as evidenced by the frequently large benefit-cost ratios associated with transportation infrastructure projects, for example. Similarly, other types of public land development projects such as libraries, schools, and emergency response infrastructure generate

significant levels of economic welfare, some part of which would be at risk as a result of the EPA's actions with respect to the Spruce Mine.

Finally, it should also be remembered that landowners could suffer losses in wealth as a result of the EPA's action. In a competitive land market, land prices reflect the discounted value of the returns earned from dedicating land to its highest and best use. For undeveloped land, this sum is typically equal to the value of rents when the land is in an undeveloped condition, plus the amount developers are willing to pay for land when they initiate their project. Regulation that lowers the profits from and development will be capitalized into current land values, meaning that the equilibrium market price of land will be lower as a result. Thus, the EPA's action will, to a degree determined by local market conditions, be borne by landowners in areas containing wetlands and other waters of the United States.

I am currently conducting a study of these various disincentive effects and economic impacts, and hope to have results on their importance within the next few weeks. I will make the results of the study available to the committee, and look forward to discussing them with you and your staff.

## CURRICULUM VITAE

**DAVID L. SUNDING**

February 2011

### **EMPLOYMENT**

Professor, Department of Agricultural and Resource Economics, UC Berkeley, 2002 – Present.

Associate Professor, Department of Agricultural and Resource Economics, University of California at Berkeley, 2000 – 2002.

Cooperative Extension Specialist, Department of Agricultural and Resource Economics, University of California at Berkeley, 1997 – Present.

Senior Economist, Council of Economic Advisers, The White House, Washington, DC, 1996–1997.

Assistant Adjunct Professor, Department of Agricultural and Resource Economics, University of California at Berkeley, 1992–1996.

Assistant Professor, Department of Economics and School of Law, Boston College, 1989–1992.

### **VISITING APPOINTMENTS**

Visiting Professor, Woods Institute of the Environment, Stanford University, 2010 - 2011.

## **EDUCATION**

Ph.D., University of California at Berkeley, 1989.  
M.A., University of California at Los Angeles, 1986.  
B.A., Claremont McKenna College, 1983.

## **COURSES TAUGHT**

Risk, Technology and the Environment (Graduate)  
Environmental and Resource Economics (Graduate)  
Economics of Water Resources (Undergraduate)  
Natural Resource Economics (Undergraduate)  
Economics of Public Law (Boalt Hall School of Law)  
Environmental Policy (Undergraduate)  
Public Finance (Graduate)  
Microeconomic Theory (Graduate and Undergraduate)  
Law and Economics (Boston College School of Law)

## **HONORS AND AWARDS**

Giannini Foundation. "Agricultural Labor Markets and Water Supplies." \$10,000. 2010 – 2011.

Giannini Foundation. "Habitat Conservation in a Working Landscape." \$10,000. 2009 – 2010.

Academic Affiliate, Natural Heritage Institute, 2009 – Present.

Thomas J. Graff Chair in the College of Natural Resources, UC Berkeley, 2009 – Present.

Giannini Foundation. "Economics of Groundwater Storage in Southern California." \$24,000. 2008-2009.

Invited Participant, Rosenberg International Forum in Water Policy, Valencia, Spain, 2008.

Energy Biosciences Institute. "Development of Biofuel Productivity Potentials for Economic Analysis Under Changing Climate, Land Use, and Societal Demands." \$154,000. 2007-2009.

U.S. Bureau of Reclamation, "Independent Review of Fisheries Restoration Programs." \$380,000. 2007-2008.

U.S. Department of Energy, "Joint Modeling of the Water and Energy Sectors."  
\$200,000. 2006-2009.

Invited Participant, Rosenberg International Forum in Water Policy, Banff, Canada,  
2006.

Giannini Foundation. "Multimarket Impacts of Water Transfers in Areas of Origin."  
\$18,000. 2005 – 2006.

Giannini Foundation. "Land Use Regulation and Housing Market Dynamics." \$20,000.  
2004-2005.

United States – Israel Binational Agricultural Research and Development Fund.  
"Dynamic Intraseasonal Irrigation Management Under Water Scarcity, Water Quality,  
Irrigation Technology and Environmental Constraints." \$200,000. 2003-2004.

Giannini Foundation. "Economics of Water Conservation in Agriculture." \$20,000. 2003-  
2004.

U.S. Environmental Protection Agency. STAR Grant. "Mechanisms for Risk Trading."  
\$206,000. 2002-2003.

Food Systems Research Group. "Optimal Commodity Promotion in Markets with  
Imperfect Competition and Differentiated Products." \$40,000. 2002-2003.

Outstanding Journal Article Award, AAEA, 2001.

Giannini Foundation. "Economic Benefits of Joint Management of Surface and Ground  
Water Storage Facilities." \$17,000. 2001–2002.

Best Published Research Award Finalist, WAEA, 1998.

California Department of Food and Agriculture. "Economic Impacts of Pesticide  
Regulation." \$1,150,000. 1994–2002.

California Department of Water Resources and U.S. Department of the Interior  
(CALFED Program). "Economic Valuation of Increased Water Supply Reliability and  
Trading Opportunities by Westside Agriculture." \$80,000. 1998–2000.

California Department of Food and Agriculture. "Economic Importance of Compound  
1080 in California Agriculture." \$60,000. 1998–1999.

U.S. Department of Interior, Bureau of Reclamation. "Financial Incentives to Encourage  
Agricultural Water Conservation." \$1,500,000. 1994–2000.

U.S. Environmental Protection Agency. "Economic Incentives to Reduce Nonpoint Source Loads in Nevada's Truckee River Basin." \$98,500. 1995-1997.

## **UNIVERSITY SERVICE**

Vice Chair, Department of Agricultural and Resource Economics, 2010-2012.

Member, Academic Senate Committee on Faculty Welfare, 2010-2012.

Co-Director and Founder, Berkeley Water Center, 2005 – 2010.

Member, UC Division of Agricultural and Natural Resources Strategic Planning Committee, 2008.

Reviewer, California Policy Research Center, UC Office of the President, 2007.

Member, Forestry Search Committee, Ecosystem Sciences Division, Department of Environmental Science, Policy and Management, 2005-2006.

Member, Giannini Hall Seismic Retrofit Design Committee, 2005 – 2006.

Member, Academic Senate Committee on American Cultures Requirements, 2004-2005.

Member, CNR Executive Committee, 2003-2005.

Member, CNR Committee on Directions, Opportunities and Initiatives, 2003.

Co-Director, Center for Sustainable Resource Development, College of Natural Resources, UC Berkeley, 1997 – 2004.

Faculty, Beahrs Environmental Leadership Program, 2001-2005.

Member, CNR Dean Search Committee, 2001-2002.

Chair, Specialist Search Committee, Department of Agricultural and Resource Economics, 2001-2002.

Member, CNR Advisory Board Development Committee, 2001-2002.

Member, Faculty Search Committee (International Trade), Department of Agricultural and Resource Economics, 1999-2000.

Member, CNR Dean Search Committee, 1999-2000.

Member, Workgroup Review Committee, University of California Division of Agriculture and Natural Resources, 1999–2002.

UC Berkeley Representative, Academic Assembly Council, University of California Division of Agriculture and Natural Resources, 1999–2001.

Departmental Affirmative Action Representative, 1999–2000.

Member, Faculty Search Committee (Environmental Health), Department of Agricultural and Resource Economics, 1998–2000.

### **PROFESSIONAL SERVICE**

National Science Foundation Workshop on Engineering and Economics, 2011.

Advisory Board, Water Policy Institute, 2008 – Present.

Advisory Board, American Groundwater Trust, 2008 – Present.

Board of Trustees, Bay Area Council Economic Institute, 2008 – Present.

Reviewer, Delta Risk Management Study (DRMS), California Department of Water Resources, 2007-2008.

Member, Economic Advisory Committee on North of Delta Offstream Storage, California Department of Water Resources, 2006-2007.

Member, Panel on Illegal Competitive Advantage Economic Benefit, Science Advisory Board, U.S. Environmental Protection Agency, 2004-2005.

Mentor, American Economic Association Pipeline Project for Minority Graduate Students, 2004 – 2005.

President, International Water Resource Economics Consortium, 2003-2009.

Member, Science Advisory Board, National Center for Housing and the Environment. 2003 – 2005.

Member, Expert Panel on Cost Allocation, CalFed Bay-Delta Program, 2001-2002.

Member, National Academy of Sciences Panel on Water Conservation and Reuse, 2001-2002.

Member, Technical Advisory Committee on Water Use Efficiency, CalFed Bay-Delta Program, 1997–1998.

Referee: *Agricultural Economics, American Journal of Agricultural Economics, California Agriculture, Contemporary Economic Policy, Environmental and Resource Economics, Journal of Agricultural and Resource Economics, Journal of Business and Economic Strategy, Journal of Environmental Economics and Management, Journal of Political Economy, Journal of Public Economics, Journal of Regulatory Economics, Journal of Law and Economics, Land Economics, Natural Resources Modeling, Resource and Energy Economics, Review of Economics and Statistics, Social Choice and Welfare, Water Resources Research.*

## **PUBLICATIONS**

### *Peer-Reviewed Publications*

“Hedonic Analysis with Locally Weighted Regression.” With Aaron Swoboda. *Regional Science and Urban Economics* 40(2010): 550-573.

“On The Spatial Nature of the Groundwater Pumping Externality.” With Nicholas Brozovic and David Zilberman. *Resource and Energy Economics* 32(2010): 154-164.

“Sustainable Management of Water Resources under Hydrologic Uncertainty.” With Newsha Ajami and George Hornberger. *Water Resources Research* 44(2008): W11406, doi:10.1029/2007WR006736.

“Estimating Business and Residential Water Supply Interruption Losses from Catastrophic Events.” With Nicholas Brozovic and David Zilberman. *Water Resources Research* 43(2007): 418-428.

*Management of Saline Wastewater Discharges in the San Joaquin Valley.* Report to the Central Valley Regional Water Quality Control Board. With Yoram Rubin, Gretchen Miller, Pascual Benito, Ulrich Meyer, Michael Kavanaugh, Todd Anderson, Mark Berkman, David Zilberman, and Steve Hamilton. September 2007.

“Consideration of Economics Under the California Porter-Cologne Act.” With David Zilberman. *Hastings West-Northwest Journal of Environmental Law & Policy* (2007): 73-116.

“Water Markets and Trading.” With Howard Chong. *Annual Review of Environment and Resources* 31(2006): 239-264.

“Panel Estimation of an Agricultural Water Demand Function.” With Karina Schoengold and Georgina Moreno. *Water Resources Research* 42(2006): 411-421.

“Fat Taxes and Thin Subsidies: Prices, Diet and Health Outcomes.” With Sean Cash and David Zilberman. *Acta Agriculturae Scand. C* 2(2006): 167-174.

“Economic Impacts.” *The Endangered Species Act at Thirty*. M. Scott, D. Goble and F. Davis, eds. Washington, DC: Island Press, 2006.

“The Economics of Environmental Regulation of Housing Development.” *Housing and Society* 32(2005): 23-38.

“Joint Estimation of Technology Adoption and Land Allocation with Implications for the Design of Conservation Policy.” With Georgina Moreno. *American Journal of Agricultural Economics* 87(2005): 1009-1019.

“Factor Price Risk and the Adoption of Conservation Technology.” With Georgina Moreno. *Frontiers in Water Resource Economics*. D. Berga and R. Goetz, eds. New York: Springer-Verlag, 2005.

“Optimal Management of Groundwater over Space and Time.” With Nicholas Brozovic and David Zilberman. *Frontiers in Water Resource Economics*. D. Berga and R. Goetz, eds. New York: Springer-Verlag, 2005.

“Response to ‘Environmental Regulation and the Housing Market: A Review of the Literature’ by Katherine Kiel.” *Cityscapes* 8(2005): 277-282.

“The Economics of Climate Change in Agriculture.” With Xuemei Liu, David Roland-Holst and David Zilberman. *Mitigation and Adaptation Strategies for Global Change* 9(2004): 365-382.

“Wetlands Regulation ... An Opening for Meaningful Reform?” *Regulation* 26(2003): 30-35.

“Government Regulation of Product Quality in Markets with Differentiated Products: Looking to Economic Theory.” *American Journal of Agricultural Economics* 85(2003): 720-724.

“The Economics of Environmental Regulation by Licensing: Observations on Recent Changes to the Federal Wetland Permitting Program.” With David Zilberman. *Natural Resources Journal* 42(Winter 2002): 59-90.

Cited in the U.S. Supreme Court’s plurality and dissenting opinions in the consolidated cases of *Rapanos v. United States* and *Carabell v. United States*.

“Trading Patterns in an Agricultural Water Market.” With Nicholas Brozovic and Janis Carey. *Water Resources Update* (2002): 3-16.

“Public Goods and the Value of Product Quality Regulations: The Case of Food Safety.” With Stephen Hamilton and David Zilberman. *Journal of Public Economics* 87(2003): 799-817.

“Regulating Pollution with Endogenous Monitoring.” With Katrin Millock and David Zilberman. *Journal of Environmental Economics and Management* 44(2002): 221-241.

“Transactions Costs and Trading Behavior in an Immature Water Market.” With Janis Carey and David Zilberman. *Environment and Development Economics* 7(2002): 733-750.

“Measuring the Costs of Reallocating Water from Agriculture: A Multi-Model Approach.” With David Zilberman, Richard Howitt, Ariel Dinar and Neal MacDougall. *Natural Resource Modeling* 15(Summer 2002): 201-225.

“Voluntary Development Restrictions and the Cost of Habitat Preservation.” With Sabrina Lovell. *Real Estate Economics* 29(March 2001): 191-206.

“Emerging Markets in Water: A Comparative Institutional Analysis of the Central Valley and Colorado-Big Thompson Projects.” With Janis Carey. *Natural Resources Journal* 41(2001): 283-328.

“Risk Management and the Environment.” With Mark Metcalfe and David Zilberman. In Richard Just and Rulon Pope (eds.). *A Comprehensive Assessment of the Role of Risk in U.S. Agriculture*. Norwell, MA: Kluwer Academic Publishers, 2002.

“A Comparison of Policies to Reduce Pesticide Poisoning Combining Economic and Toxicological Data.” With Joshua Zivin. In: Joe Moffitt (ed.). *Advances in the Economics of Environmental Resources: Volume 4*. Greenwich: JAI Press, 2001.

“The Impact of Climate Change on Agriculture: A Global Perspective.” With David Zilberman and Xuemei Liu. In: Charles Moss, Gordon Rausser, Andrew Schmitz, Tim Taylor and David Zilberman (eds.), *Agricultural Globalization, Trade, and the Environment*. New York: Kluwer, 2001.

“The Agricultural Innovation Process: Research and Technology Adoption in a Changing Agricultural Sector.” With David Zilberman. In: Bruce Gardner and Gordon Rausser (eds.), *Handbook of Agricultural and Resource Economics*. Amsterdam: North Holland, 2001, 207-261.

“Insect Population Dynamics, Pesticide Use and Farmworker Health.” With Joshua Zivin. *American Journal of Agricultural Economics* 82(August 2000): 527-540.

\* Winner of the AAEA Outstanding Journal Article Award.

“Product Liability, Entry Incentives and Market Structure.” With Stephen Hamilton. *International Review of Law and Economics* 20(September 2000): 269-283.

"Climate Change Policy and the Agricultural Sector." With David Zilberman. In: R. Lal, J.M. Kimble, R.F. Follett and B.A. Stewart (eds.), *Assessment Methods for Soil Carbon*. Boca Raton, FL: CRC Press, 2000, 629–643.

"Methyl Iodide as an Alternative to Methyl Bromide." With Brent Hueth, Bruce McWilliams and David Zilberman. *Review of Agricultural Economics* (Spring/Summer 2000): 43–54.

"Using Water Markets to Improve Environmental Quality: Two Innovative Programs in Nevada." With Sabrina Ise Lovell and Katrin Millock. *Journal of Soil and Water Conservation* 55(First Quarter 2000): 19–26.

"The Price of Water...Market-Based Strategies are Needed to Cope with Scarcity." *California Agriculture* 54(March-April 2000): 56–63.

"Designing Environmental Regulations with Empirical Microparameter Distributions: The Case of Seawater Intrusion." With Gareth Green. *Resource and Energy Economics* 22(January 2000): 63–78.

"The Economics of Inter-District Water Transfers in California." In *Proceedings of the American Society of Civil Engineers*. New York: ASCE, 1999.

"Returns to Public Investment in Agriculture with Imperfect Downstream Competition." With Stephen Hamilton. *American Journal of Agricultural Economics* 80(November 1998): 830–838.

"Reallocating Water from Agriculture to the Environment under a Voluntary Purchase Program." With Sabrina Ise. *Review of Agricultural Economics* 20(Summer 1998): 214–226.

"Allocating Product Liability in a Multimarket Setting." With David Zilberman. *International Review of Law and Economics* 18(March 1998): 1–11.

"Resolving Trans-Boundary Water Disputes: Economists' Influence on Policy Choices in the United States." In: Richard Just and Sinaia Netanyahu (eds.), *Conflict and Cooperation on Trans-Boundary Water Resources*. Norwell: Kluwer, 1998.

"Economics and Pesticide Regulation." With Erik Lichtenberg, Douglas Parker and David Zilberman. *Choices* (Fourth Quarter 1997): 26–29.

"The Effect of Farm Supply Shifts on Concentration and Market Power in the Food Processing Sector." With Stephen Hamilton. *American Journal of Agricultural Economics* 79(May 1997): 524–531.

"Land Allocation, Soil Quality and the Demand for Irrigation Technology." With Gareth Green. *Journal of Agricultural and Resource Economics* 22(November 1997): 367–375.

“Water Marketing in the '90s: Entering the Electronic Age.” With Janis Carey, David Zilberman and Douglas Parker. *Choices* (Third Quarter 1997): 15–19.

“Modeling the Impacts of Reducing Agricultural Water Supplies: Lessons from California’s Bay/Delta Problem.” With David Zilberman, Neal MacDougall, Richard Howitt and Ariel Dinar. In: Doug Parker and Yacov Tsur (eds.), *Decentralization and Coordination of Water Resource Management*. New York: Kluwer, 1997.

“The Changing Nature of Agricultural Markets: Implications for Privatization of Technology, Information Transfer and Land Grant Research and Extension.” With David Zilberman and Madhu Khanna. In: Stephen Wolf (ed.), *Privatization of Information and Agricultural Industrialization*. Boca Raton: CRC Press, 1997.

“Changes in Irrigation Technology and the Impact of Reducing Agricultural Water Supplies.” With Ariel Dinar and David Zilberman. In: Darwin Hall (ed.), *Advances in the Economics of Environmental Resources: Volume 1*. Greenwich: JAI Press, 1996.

“Measuring the Marginal Cost of Nonuniform Environmental Regulations.” *American Journal of Agricultural Economics* 78(November 1996): 1098–1107.

“Explaining Irrigation Technology Choices: A Microparameter Approach.” With Gareth Green, David Zilberman and Douglas Parker. *American Journal of Agricultural Economics* 78(November 1996): 1064–1072.

“How Does Water Price Affect Irrigation Technology Adoption?” With Gareth Green, David Zilberman, Douglas Parker, Cliff Trotter and Steve Collup. *California Agriculture* 50(March-April 1996): 36–40.

“Strategic Participation and the Median Voter Result.” *Economic Design* 1(April 1996): 355–363.

“Social Choice by Majority Rule with Rational Participation.” *Social Choice and Welfare* 12(December 1995): 3–12.

“Water Markets and the Cost of Improving Water Quality in the San Francisco Bay/Delta Estuary.” With David Zilberman and Neal MacDougall. *Hastings West-Northwest Journal of Environmental Law & Policy* 2(Spring 1995): 159–165.

“Flexible Technology and the Cost of Improving Groundwater Quality.” With David Zilberman, Gordon Rausser and Alan Marco. *Natural Resource Modeling* 9(April 1995): 177–192.

“Water for California Agriculture: Lessons from the Drought and New Water Market Reform.” With David Zilberman, Richard Howitt, Ariel Dinar and Neal MacDougall. *Choices* (Fourth Quarter 1994): 25–28.

“Methyl Bromide Regulation...All Crops Should Not Be Treated Equally.” With Cherisa Yarkin, David Zilberman and Jerry Siebert. *California Agriculture* 48(May-June 1994): 10–15.

“Cancelling Methyl Bromide for Postharvest Use to Trigger Mixed Economic Results.” With Cherisa Yarkin, David Zilberman and Jerry Siebert. *California Agriculture* 48(May-June 1994): 16–21.

“Who Makes Pesticide Use Decisions? Implications for Policymakers.” With David Zilberman, Michael Dobler, Mark Campbell and Andrew Manale. In: Walter Armbruster (ed.), *Pesticide Use and Product Quality*. Glenbrook: Farm Foundation, 1994.

“Managing Groundwater Quality under Uncertainty.” With David Zilberman and Gordon Rausser. In: Michelle Marra (ed.), *Quantifying Long-Run Agricultural Risks*. Orono: University of Maine, 1993.

“Natural Resource Cartels.” With David Teece and Elaine Mosakowski. In: Allen Kneese and James Sweeney (eds.), *Handbook of Natural Resource and Energy Economics*, Volume III. Amsterdam: Elsevier, 1993.

“Joan Robinson as a Development Economist.” With Irma Adelman. In: George Feiwel (ed.), *Joan Robinson and Modern Economic Theory*. London: Basil Blackwell, 1988.

“Economic Policy and Income Distribution in China.” With Irma Adelman. *Journal of Comparative Economics* 11(September 1987): 444–461. Reprinted in Bruce Reynolds (ed.), *China's Economic Development: How Far, How Fast?* New York: Academic Press, 1989. Reprinted in Joseph C. H. Chai (ed.), *The Economic Development of Modern China*. London: Edward Elgar, 1999.

#### *Technical Reports, Book Chapters and Other Publications*

*Economic Impacts of Water Supply Disruptions Caused by Seismic Events in the Bay-Delta Estuary*. September 2010.

“Improving Groundwater Management to Cope with Reduced Surface Water Imports: The Case of Los Angeles County.” With Steve Hamilton and Newsha Ajami. In A. Findikakis, ed., *Groundwater Management Practices*, Leiden: CRC Press, 2010.

*Economic Impacts of Residential Water Shortages in California*. With Steve Hamilton. April 2010.

“The Economics of Federal Land Use Controls.” *Rebuilding the Ark: Strategies for Reforming the Endangered Species Act*. Jonathan Adler, ed., Washington, DC: AEI-Brookings Joint Center for Regulation, 2009.

*Economic Impacts of Flow Requirements for Delta-Dependent Species.* With Newsha Ajami, David Mitchell, Steve Hatchett and David Zilberman. December 2008.

*The Economics of Stormwater Regulation.* June 2008.

*Strategies to Reduce the Economic Impacts of Drought-Induced Water Shortage in the San Francisco Bay Area.* April 2007.

*A Guide to Consideration of Economics Under the California Porter-Cologne Act.* With David Zilberman. March 2005.

“Water Allocation and Water Market Activity in California.” With Richard Howitt. *California Agriculture: Dimensions and Trends.* Jerome Siebert, ed. Giannini Foundation, 2004.

*Fiscal Costs and Economic Impacts of Recovering the Coho Salmon in California.* With Alix Peterson Zwane. California Department of Fish and Game. October 2003.

*Economic Impacts of Critical Habitat Designation for the Coastal California Gnatcatcher.* July 2003.

*The Economic Impacts of Critical Habitat Designation: Framework and Application to the Case of California Vernal Pools.* With Aaron Swoboda and David Zilberman. January 2003.

*Non-Federal and Non-Regulatory Approaches to Wetland Conservation: A Post-SWANCC Evaluation of Conservation Alternatives.* National Center for Housing and the Environment. December 2002.

*Economic Impacts of Earthquake-Induced Water Supply Shortages in the San Francisco Bay Area.* With Nicholas Brozovic and David Zilberman. Bay Area Economic Forum. October 2002.

*Economic Impacts of Organophosphate Use in California Agriculture, Parts 1 and 2.* With Mark Metcalfe, Bruce McWilliams, Brent Hueth, Robert Van Steenwyk and David Zilberman. California Department of Food and Agriculture. February 2002.

*Water Pricing and Water Use Efficiency.* U.S. Department of the Interior, Bureau of Reclamation. January 2001.

*Economic Impacts of Critical Habitat Designation for the California Red-Legged Frog.* Home Builders Association of Northern California. With David Zilberman. January 2001.

*A Proposal for Management of the Confined Aquifer in the Western San Joaquin Valley.* With David Purkey. July 2000.

*Analysis of the Army Corps of Engineers' NWP 26 Replacement Permit Proposal.* Foundation for Economic and Environmental Progress. With David Zilberman. February 2000.

*Economic Valuation of Increased Water Supply Reliability and Trading Opportunities in Westside Agriculture.* With Georgina Moreno, Daniel Osgood and David Zilberman. CalFed Bay-Delta Program. December 1999.

*Costs of Implementing the Food Quality Protection Act of 1996 on California Agriculture.* With Bruce McWilliams, Yuria Tanimichi and David Zilberman. September 1999.

*Economic Impact of Restricting Use of Compound 1080 in California's Intermountain Region.* With Brent Hueth and Michelle McGregor. California Department of Pesticide Regulation. April 1999.

*Downstream Economic Impacts of Reducing Federal Water Subsidies: The Case of Alfalfa and Dairy.* With Gergina Moreno. Natural Resources Defense Council. August 1998.

*Economic Importance of Organophosphates in California Agriculture.* With Brent Hueth, Grazyna Michalska, and David Zilberman. California Department of Food and Agriculture. August 1998.

*An Environmentally Optimal Alternative for the San Francisco Bay-Delta.* With John Cain, David Fullerton, David Purkey and Greg Thomas. Natural Heritage Institute. July 1998.

*Water Trading and Environmental Quality in the Western United States.* With David Zilberman. U.S. Environmental Protection Agency. April 1998.

*Impact of Endangered Species Legislation on California Agriculture.* With David Zilberman, Jerome B. Siebert, Joshua Zivin, Sabrina Isé and Brent Hueth. California Resources Agency. January 1998.

*Economics Impacts on California Agriculture of Banning Methyl Bromide Use.* With Bruce McWilliams, Brent Hueth, Lori Lynch, David Zilberman and Jerome Siebert. California Department of Food and Agriculture. January 1998.

*Economic Incentives for Improving Water Quality in Nevada's Truckee River Basin.* With Sabrina Ise and Katrin Millock. U.S. Environmental Protection Agency. October 1996.

*Managing Seawater Intrusion in Monterey County through Agricultural Water Conservation.* With Gareth Green and Larry Dale. Monterey County Water Resources Agency. May 1995.

*Conclusions and Recommendations on a Framework for Comparative Cost Effectiveness Assessment of CVP Yield Augmentation Alternatives.* With Greg Thomas. U.S. Department of the Interior, Bureau of Reclamation. December 1994.

*Economic Impacts of USFWS' Water Rights Acquisition Program for Lahontan Valley Wetlands.* U.S. Department of the Interior, Fish and Wildlife Service. June 1994.

*Market Implementation of Bay/Delta Water Quality Standards.* U.S. Environmental Protection Agency. March 1994.

*Economic Impacts of Mevinphos Cancellation in California.* California Department of Pesticide Regulation. March 1994.

*Economic Impacts of Federal Worker Protection Standards.* With Cheryl Brown, Valerie Brown and Bob Chavez. California Department of Food and Agriculture. October 1993.

*Water Quality Regulation in the San Francisco Bay and Delta.* With David Zilberman, Richard Howitt, Neal MacDougall and Linda Fernandez. U.S. Environmental Protection Agency. May 1993.

*The Economic Consequences of Enforcing the Delaney Clause.* With Alan Marco. U.S. Environmental Protection Agency. March 1993.

*Economic Impacts of Cancelling Methyl Bromide in California.* With Cherisa Yarkin, David Zilberman, Jerome Siebert and Alan Marco. California Department of Food and Agriculture. February 1993.

*Economic Impact of the Silverleaf Whitefly.* With Jerome Siebert, David Zilberman and Michael Roberts. California Department of Food and Agriculture. January 1993.

#### **PAPERS UNDER REVIEW**

“Hydrologic Uncertainty and the Economic Value of Improved Water Supply Forecasts.” With Newsha Ajami, George Hornberger, David Yates and David Purkey. *Water Resources Research* (2009): revise and resubmit.

“Economic Impacts of Critical Habitat Designation: Evidence from the Market for Vacant Land.” With Maximillian Auffhammer and Maya Oren. *Journal of Law and Economics* (2009): revise and resubmit.

“Prices Vs. Limits.” With Nicholas Brozovic and David Zilberman.

“The Economics of Waste Conveyance and Disposal.” With Steve Hamilton, David Zilberman and Thomas Sproul.

“The Central Role of Groundwater Management in Achieving Urban Water Sustainability.” With Newsha Ajami and Steve Hamilton.

“Optimal Speculation and the Value of Groundwater Storage.” With Jonathan Terhorst.

“The Value of Water Supply Reliability.” With Steve Hamilton.

### **WORKING PAPERS**

“Incidence of Environmental Regulation.” With Steve Hamilton.

“Environmental Regulation by Licensing.” With Aaron Swoboda and David Zilberman.

“Endangered Species Regulation as an Implicit Tax on Development.” With Haley Jones.

“Economic Analysis of Critical Habitat Designation.” With Aaron Swoboda and Jonathan ter Horst.

“Water Savings from Adoption of Precision Technology.” With Karina Schoengold and Georgina Moreno.

“Managing a Coastal Aquifer under Multiple Uncertainty.” With David Zilberman.

### **INVITED PRESENTATIONS**

“The Economics of Future Water Supplies.” California Water Association. Monterey, CA. November 2010.

“Vulnerability of Water Infrastructure to Seismic Events.” Southern California Water Committee. September 2010.

“Economics of Water Allocation.” American Bar Association. Orlando, FL. May 2010.

“Expanding the Role of the Private Sector in Water: Opportunities and Challenges.” General Electric. Los Angeles, CA. May 2010.

“Adapting to Unreliable Water Supplies.” University of the Pacific McGeorge School of Law, Sacramento, CA, February 2010.

“The Economics of Water Exports from the Delta,” American Society of Agronomy, Tulare, CA, January 2010.

“Long Term Contracts, Storage Incentives and Conjunctive Use: The Case of the Central and West Coast Basins in Los Angeles County,” International Water Resource Economics Consortium Meetings. Berkeley, CA. November 2009.

“Economic Barriers to Recycled Water.” General Electric Corporation Leadership Summit, Crotonville, NY. November 2009.

“Habitat Protection in a Dynamic Landscape.” California HCP/NCCP Conference. Vacaville, CA. November 2009.

“New Approaches to Financing Water Infrastructure.” Water Policy Institute – Berkeley Water Center Conference on Water and Economics. Washington, DC. October 2009.

“The Economics of Federal Land Use Regulation.” AEI-Brookings Joint Center on Regulation. Washington, DC. September 2009.

“Water Policy in the United States.” New York Bar Association. New York, NY. June 2009.

“The Role of the Private Sector in Water Resource Management.” American Law Institute – American Bar Association. Denver, CO. March 2009.

“Economic Analysis of Water Resources.” American Bar Association Annual Water Law Conference. San Diego, CA. February 2009.

“Benefits of Drought-Resistant Seed Varieties.” Conference on Biotechnology and Water Use. Gates Foundation and Giannini Foundation. Berkeley, CA. January 2009.

“U.S. Agriculture in Transition.” Northwest Food Processing Association. Portland, OR. January 2009.

“Economic Perspectives on Water Resources.” Water Policy Institute. Washington, DC. October 2008.

“Climate Change and Groundwater Resources.” Groundwater Resource Association. Sacramento, CA. August 2008.

“Climate Change, Energy Prices and California’s Water Resources.” BWC Conference on Biofuels and California Agriculture. Parlier, CA. May 2008.

“Sustainability and the Role of Private Investment in the Water Sector.” American Groundwater Trust. New York, NY. April 2008.

“Recent Development in Designating Critical Habitat.” Endangered Species Law. American Law Institute-American Bar Association. San Diego, CA. June 2008.

“Assessing Risks to California’s Water Systems.” Discover Cal. Redwood City, CA. November 2007.

“New Settings for HCPs and New Approaches to ESA Compliance.” CLE International. San Francisco, CA. November 2007.

“Policies to Control Point Source Discharges of Salts in the San Joaquin Valley.” Regional Water Quality Control Board. Modesto, CA. October 2007.

“Federal Land Use Controls.” Pacific Rivers Council. San Francisco, CA. October 2007.

“The Economic Implications of Conjunctive Use and Groundwater Banking.” Theis Conference, National Groundwater Association. Park City, UT. September 2007.

“Evaluating Investments in Groundwater: Hard Science or Black Art?” Groundwater Resource Association. San Francisco, CA. June 2007.

“Delta Futures and California’s Water Economy.” Public Policy Institute of California. San Francisco, CA. February 2007.

“California’s Water Infrastructure Needs.” Bay Area Economic Forum. San Francisco, CA. February 2007.

“Management of a Coastal Aquifer under Multiple Uncertainty.” Association of Environmental and Resource Economists. Chicago, IL. January 2007.

“Growth, Environment & Efficiency: California’s Water Future.” UC Berkeley Homecoming. Berkeley, CA. October 2006.

“Water Supply and the Bay Area Economy.” League of Women Voters Know Your Bay Area Day. San Francisco, CA. September 2006.

“Economics of Water Quality Regulation.” Interational Agricultural Economics Association Pre-Conference Workshop on Water Resources. Brisbane, Australia. August 2006.

“Measuring the Groundwater Pumping Externality.” American Agricultural Economics Association. Long Beach, CA. July 2006.

“Costs and Benefits of Wetland Regulation.” American Law Institute – American Bar Association Wetlands Conference. Washington, DC. June 2006.

"Economics of Water Resource Management in California." University-Industry Consortium. Oakland, CA. May 2006.

"Regulating Water Quality in California." University of California Water Resources Center Continuing Conference. Davis, CA. May 2006.

"Natural Disasters and the Resilience of the Urban Economy." Symposium on Real Estate, Catastrophic Risk and Public Policy. Berkeley, CA. March 2006.

"Economics and the Endangered Species Act: The Role of Critical Habitat." Annual Conference on the Endangered Species Act and Habitat Conservation Planning. San Francisco, CA. December 2005.

"Economics of Groundwater Management." Groundwater Resources Association. Pasadena, CA. September 2005.

"The Economics of Water Quality Regulation." Central Valley Clean Water Association. Sacramento, CA. May 2005.

"Economics of Technology Adoption and Diffusion." Conference on Sustainable Energy Futures. Berkeley, CA. April 2005.

"Consideration of Economics Under Porter-Cologne." Urban Water Institute. Newport Beach, CA. April 2005.

"Tools for a New Era of Sustainable Water Management." Barcelona, Spain. March 2005.

"Bad Neighbors: The Economics of Conflict Over New Housing." Conference on Urban Policy. Berkeley, CA. January 2005.

"Economic Analysis of Water Quality Regulations: When is It Worth the Trouble?" Industrial Environmental Association. San Diego, CA. November, 2004.

"Measuring the Cost of Conservation by Permitting." Association of Environmental and Resource Economists. Denver, CO. August 2004.

"Panel Estimation of Agricultural Water Demand Based on an Episode of Rate Reform." American Agricultural Economics Association. Denver, CO. August 2004.

"Local Public Goods and Ethnic Diversity." American Agricultural Economics Association. Denver, CO. August 2004.

"Prices vs. Quantities Revisited." American Agricultural Economics Association. Denver, CO. August 2004.

- “Managing Groundwater with Localized Externalities.” American Agricultural Economics Association. Denver, CO. August 2004.
- “Fat Taxes and Thin Subsidies.” American Agricultural Economics Association. Denver, CO. August 2004.
- “Environmental Regulation and California Agriculture: Focus on ESA and the Clean Water Act.” Western Growers’ Association. Sacramento, CA. June 2004.
- “Endangered Species Regulation and California Agriculture.” Giannini Foundation Conference on the Future of California Agriculture. Sacramento, CA. May 2004.
- “Environmental Regulation and Housing Affordability.” U.S. Department of Housing and Urban Development Conference on Regulatory Barriers to Housing Affordability. Washington, DC. April 2004.
- “Economic Analysis of Environmental Regulation.” Clean Water Act Summit Meeting. Irvine, CA. March 2004.
- “Economic Impacts of Endangered Species Regulation: A Project-Level Perspective Focusing on the Housing Industry.” Conference on the Endangered Species Act at 30. Santa Barbara, CA. November 2003.
- “Whither Reclamation Reform? Looking to the Next 100 Years of Reclamation Law.” Berkeley Conference on Water Policy Reform. San Francisco, CA. September 2003.
- “Simultaneous Estimation of Technology Choice and Land Allocation.” American Agricultural Economics Association. Montreal, Canada. July 2003.
- “Advertising in Markets with Product Differentiation and Imperfect Competition.” Food Systems Research Group, University of Wisconsin. June 2003.
- “Wetlands Protection Beyond Section 404.” American Law Institute – American Bar Association Wetlands Conference. Washington, DC. May 2003.
- “Prioritizing Habitat Conservation.” Conference on the Endangered Species Act. Land Use Research Foundation of Hawaii and the Hawaii State Bar Association Section on Real Property and Finance. May 2003.
- “Government Regulation of Product Quality in Markets with Differentiated Products: Looking to Economic Theory.” Allied Social Science Association. Washington, DC. January 2003.
- “Non-Regulatory and Non-Federal Approaches to Wetland Protection.” National Association of Home Builders. Las Vegas, NV. January 2003.

“Agricultural Water Use and the Role of Prices.” Joint Meeting of the U.S. and Iranian Academies of Sciences. Tunis, Tunisia. December 2002.

“Economic Megatrends and Water Use in the United States.” National Academy of Sciences. Washington, DC. September 2002.

“Pesticide Regulation and Changes in Human Health.” World Congress of Environmental Economics. Monterey, CA. June 2002.

“Mechanisms for Risk Trading.” World Congress of Environmental Economics. Monterey, CA. June 2002.

“Economic Damage from Water Supply Disruptions Following an Earthquake in the San Francisco Bay Area.” Bay Area Water Users’ Association. Foster City, CA. June 2002.

“Economic Perspectives on Federal Wetland Regulation.” American Law Institute – American Bar Association. Washington, DC. May 2002.

“Reconciling Competing Interests in the West Side.” CSRD Conference on the Future of the West Side. Parlier, CA. March 2002.

“Protecting Public Interests on Private Land.” Center for Sustainable Resource Development, UC Berkeley. February 2002.

“Cost-Shifting and Environmental Quality.” POWER Annual Conference. Los Angeles, CA. December 2001.

“Factor Price Risk and the Diffusion of Conservation Technology.” California Conference on Environmental and Resource Economics. UC Santa Barbara. November 2001.

“Valuation of Water Supply Reliability.” American Agricultural Economics Association. Chicago, IL. August 2001.

“Allocating Water by Markets.” American Society of Horticultural Sciences. Sacramento, CA. July 2001.

“The Farm Bill and Resource Conservation: Success Stories.” CSRD Conference on Agriculture and the Environment. Washington, DC. June 2001.

“Does Factor Price Risk Encourage Conservation?” International Water Resource Economics Consortium. Girona, Spain. June 2001.

“Optimal Control of Groundwater Over Space and Time.” International Water Resource Economics Consortium. Girona, Spain. June 2001.

“Trading Behavior in an Informal Market.” International Water Resource Economics Consortium. Girona, Spain. June 2001.

“Economics of Pesticide Cancellation: The Food Quality Protection Act of 1986.” University of California Agricultural Economics and Management Workgroup. UC Davis. May 2001.

“Economic Aspects of Biological Control.” University of California Conference on Urban Pest Management. UC Riverside. October 2000.

“Price Volatility and Resource Conservation.” American Agricultural Economics Association. Tampa, FL. July 2000.

“Economics of Water Trading in California.” UC Berkeley Water Working Group. Berkeley, CA. March 2000.

“Reforming Public Lands Policy.” *Painting the White House Green: Economics and Environmental Policy-Making in the Clinton Administration*. Laramie, WY. September 1999.

“Transaction Costs and Trading Behavior in a Permit Market.” American Agricultural Economics Association. Nashville, TN. August 1999.

“Facilitating Water Transfers with the *WaterLink* System.” American Society of Civil Engineers. Seattle, WA. August 1999.

“Valuing Agricultural Water Supply Reliability.” International Water Resource Economics Consortium. Waikoloa, HI. July 1999.

“Economics of Inter-District Water Transfers.” Western Economics Association. San Diego, CA. June 1999.

“The Value of Water Supply Reliability in Westside Agriculture.” CalFed Economics Workgroup. Sacramento, CA. June 1999.

“Economic Impacts of Pesticide Regulation.” Center for Sustainable Resource Development Conference on Pest Management. UC Berkeley. May 1999.

“Water Marketing within Irrigated Agriculture.” American Agricultural Economics Association. Salt Lake City, UT. August 1998.

“Welfare Impacts of Climate Change: Focus on Pest Problems and Water Resources.” American Agricultural Economics Association. Salt Lake City, UT. August 1998.

“Water Trading and the Costs of Bay/Delta Protection.” Water Education Foundation. San Diego, CA. July 1998.

"Federal Public Land Policy: Litmus Test Issues." Berkeley Commons Club, Berkeley, CA. June 1998.

"Recent Developments in American Agricultural Policy." Commonwealth Club, San Francisco, CA. October 1997.

"Performance of a Voluntary Water Purchase Program." Western Regional Water Economics Conference, Lihue, HI. October 1997.

"Water Marketing for the Environment: The Clinton Administration's Perspective." Conference on Regional Water Markets, Berkeley, CA. July 1997.

"Returns to Public Investment in Agriculture with Imperfect Downstream Competition." American Agricultural Economics Association, Toronto, Canada. July 1997.

"Markets for Crop Germplasm." Invited Paper, American Agricultural Economics Association, Toronto, Canada. July 1997.

"Land Allocation, Soil Quality and Irrigation Technology Choice." Western Agricultural Economics Association, Reno, NV. July 1997.

"Product Liability and Entry Incentives." Western Agricultural Economics Association, Reno, NV. July 1997.

"Agricultural Policy in the Post-1996 Farm Act World." Signature Lecture, USDA Economic Research Service, Washington, DC. May 1997.

"Federal Water Policy in the United States." International Conference on Coordination and Decentralization in Water Resources Management, Annapolis, MD. April 1997.

"Non-Uniform Regulation of Groundwater Quality." American Agricultural Economics Association, San Antonio, TX. July 1996.

"The Effect of Farm Supply Shifts on Concentration and Market Power in the Food Processing Industry." American Agricultural Economics Association, San Antonio, TX. July 1996.

"Differential Property Tax Assessment, Land Allocation and Land Values at the Urban Fringe." American Agricultural Economics Association, San Antonio, TX. July 1996.

"Efficient Strategies for Acquiring Agricultural Water Rights." Invited Paper, Australian Agricultural and Resource Economics Society, Melbourne, Australia. February 1996.

"Strategies for Agricultural Water Conservation." U.S. Bureau of Reclamation Water Users Conference, Concord, CA. January 1996.

“Voting on Environmental Health Risks.” American Agricultural Economics Association. Indianapolis, IN. August 1995.

“Explaining Irrigation Technology Choice: A Microparameter Approach.” American Agricultural Economics Association. Indianapolis, IN. August 1995.

“The Economics of United States Environmental Laws.” Symposium at Far Eastern State University. Vladivostok, Russia. March-April 1995.

“The Endangered Species Act: Impact on California Agriculture and Policy Options.” University of California Executive Seminar on Agricultural Issues. Sacramento, CA. December 1994.

“Economics of Tort Liability Rules for Pesticide Damage.” Second Occasional California Conference on Environmental and Resource Economics. Santa Barbara, CA. October 1994.

“Water Law as a Regulating Mechanism.” International Conference on Coordination and Decentralization in Water Resources Management. Rehovot, Israel. September 1994.

“Contaminant Dynamics and the Cost of Groundwater Quality Regulations.” Conference on Pesticide Economics and Policy in Memory of Carolyn Harper. Amherst, MA. April 1994.

“Water Markets and Water Quality.” University of California Conference on Regional Water Constraints. Berkeley, CA. October 1993.

“Irreversibility, Contaminant Dynamics and the Cost of Groundwater Quality Regulations.” American Agricultural Economics Association. Orlando, FL. August 1993.

“Methodological Issues in Pesticide Regulation.” First Occasional California Conference on Environmental and Resource Economics. Santa Barbara, CA. May 1993.

“Economic Impacts of the Central Valley Project Improvement Act.” First Occasional California Conference on Environmental and Resource Economics. Santa Barbara, CA. May 1993.

“Majority Rule with Rational Abstention is Globally Transitive.” Sixth World Congress of the Econometric Society. Barcelona, Spain. August 1990.

## **GOVERNMENT BRIEFINGS**

“System Integration and California Water Management.” California Assembly and Senate Members and Staff. Sacramento, CA. August 2006.

“The Endangered Species Act at 30: Lessons for Reform.” Organized with U.S. Senate Committee on Energy and Natural Resources. Washington, DC. December 2004.

“Non-Federal and Non-Regulatory Approaches to Wetland Conservation.” House Transportation and Infrastructure Committee Staff. Washington, DC. February 2003.

“Removing Barriers to Water Marketing.” California Senate Committee on Agriculture and Water and the California Foundation for Environment and Economy. Berkeley, CA. January 2003.

“Agricultural Water Pricing and Water Use Efficiency.” U.S. Bureau of Reclamation. Sacramento, CA. May 2002.

“Assessing Recent Changes to the Wetlands Permitting Process.” Congressional Real Estate Caucus. Washington, DC. September 2000.

“Water Markets in California.” California Assembly and Senate Staff. Sacramento, CA. May 2000.

“Economic Analysis of Proposed Changes in Wetlands Permitting Policies.” U.S. House of Representatives and Senate Staff. Washington, DC. March 2000.

“Groundwater Implications of Water Trading.” California Assembly Water Parks and Wildlife Committee and Senate Agriculture and Water Committee. Sacramento, CA. November 1999.

“Economic Aspects of the 1996 Food Quality Protection Act.” Office of Policy, U.S. Environmental Protection Agency. Washington, DC. October 1998.

“Innovative Approaches to Water Conservation: The Westside Case.” Joint U.S. Bureau of Reclamation and the California Department of Water Resources Water Conservation Information Committee. San Diego, CA. August 1998.

“Climate Variability and U.S. Agriculture: Mitigating the Impacts.” U.S. Environmental Protection Agency. Washington, DC. May 1998.

“New Approaches to Agricultural Water Conservation.” Congressional Water Caucus. Washington, DC. February 1996.

## **LEGISLATIVE AND ADMINISTRATIVE TESTIMONY**

“Cost Benefit Analysis as a Tool for Regulating Once Through Cooling.” State of California Water Resources Control Board. May 2010.

“Economic Impacts of the Proposed Construction General Permit for Stormwater Discharges.” State of California Water Resources Control Board. June 2008.

“Climate Change, Energy Prices and Commodity Markets: Implications for America’s Water Resource Systems.” Subcommittee on Energy and Environment, Committee on Science and Technology, U.S. House of Representatives, May 2008.

“Consideration of Economic Impacts of TMDL for PCBs in th San Francisco Bay.” San Francisco Regional Water Quality Control Board. February 2008.

“Economic Impacts of Sediment Quality Objectives for Enclosed Bays and Estuaries.” State of California Water Resources Contro Board. February 2008.

“Economic Aspects of the Proposed TMDL for PCBs in the San Francisco Bay.” San Francisco Regional Water Quality Control Board. September 2007.

“Economic Impacts of Drought-Induced Water Shortage in the San Francisco Bay Area.” San Francisco Public Utilities Commission. June 2007.

“Economic Considerations Relating to the Designation of Critical Habitat.” Committee on Resources, U.S. House of Representatives, April 2004.

“Fiscal and Socioeconomic Impacts of of Implementing the California Coho Salmon Recovery Plan.” California Fish and Game Commission, February 2004.

“Economic Impacts of Critical Habitat Designation.” Subcommittee on Fisheries, Wildlife and Water, Committee on Environment and Public Works, U.S. Senate, April 2003.

“Performance of the Federal Wetlands Permitting Program.” Subcommittee on Water and Wetlands, Committee on Transportation and Infrastructure, U.S. House of Representatives. September 2001.

“Economic Observations on Water Infrastructure Investment in California.” Subcommittee on Water and Power, Committee on Transportation and Infrastructure, U.S. House of Representatives. July 2001.

“Economic Impacts of Reduced Water Supplies on Westside Agriculture.” Bay-Delta Advisory Committee. June 1998.

“Economic Impacts of the Central Valley Project Improvement Act.” Subcommittee on Water and Power, Committee on Transportation and Infrastructure, U.S. House of Representatives. April 1998.

“Forest Service Losses on Below-Cost Timber Sales.” Committee on Energy and Natural Resources, U.S. Senate. February 1997.

“Benefits and Costs of Enhanced Flood Protection in the American River Valley.”  
Committee on Transportation and Infrastructure, U.S. House of Representatives.  
February 1996.

“Economic Impacts of Banning Methyl Bromide Use in California Agriculture.”  
Committee on Appropriations, California Senate. February 1996.

“Economic Impacts on Leeward Agriculture of Eliminating Waiahole Ditch Diversions.”  
Hawaii Water Commission. January 1996.

“Least-Cost Implementation of Bay/Delta Water Quality Standards.” State of California  
Water Resources Control Board. July 1994.

“The Potential for Agricultural Water Conservation.” State of California Water  
Resources Control Board. June 1992.

“Economic Impacts of the Central Valley Project Improvement Act.” Committee on  
Energy and Natural Resources, U.S. Senate. April 1992.

#### **MAJOR CONFERENCES ORGANIZED**

International Water Resource Economics Consortium. Berkeley, CA. November 2009.

“Water and Economics.” Water Policy Institute – Berkeley Water Center. Washington,  
DC. October 2009.

“Mixing Water and Oil: Biofuels and their Implications for California’s Natural  
Resources.” Parlier, CA. May 2008.

“Assessing Investments in Clean Water and Hygiene in Developing Countries.”  
Sponsored by the Bill & Melinda Gates Foundation. Berkeley, CA. November 2006.

“The Endangered Species Act at 30: Lessons for Reform.” Washington, DC. December  
2004.

“A Decade of Water Policy Reform: The Central Valley Project Improvement Act in  
2003.” San Francisco, CA. September 2003.

“The Future of the San Joaquin Valley.” Parlier, CA. March 2002.

“Pest Management Strategies and Policies.” Berkeley, CA. May 2001.

#### **SEMINARS**

University of Arizona, Boston College, Boston University, UC Berkeley, UC Davis, UC Irvine, UCLA, UC Riverside, UC Santa Barbara, University of Colorado, Harvard University, Hebrew University, Kansas State University, University of Maryland, Massachusetts Institute of Technology, University of Massachusetts, Montana State University, Ohio State University, University of Pennsylvania, Purdue University, Stanford University, U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Environmental Protection Agency, U.S. Department of Housing and Urban Development, University of Wisconsin, University of Wyoming.

## **GRADUATE STUDENTS SUPERVISED**

Deepak Rajagopal  
UCLA

Brian Gross  
University of British Columbia

Prof. Karina Schoengold  
University of Nebraska at Lincoln

Prof. Aaron Swoboda  
University of Pittsburgh

Prof. Nicholas Brozovic  
University of Illinois

Prof. Sean Cash  
University of Alberta

Prof. Georgina Moreno  
Scripps College

Prof Daniel Osgood  
University of Arizona

Prof. Janis Carey  
Colorado School of Mines

Prof. Joshua Zivin  
Columbia University

Prof. Katrin Millock  
EUREQua, CNRS and Université Paris I

Dr. Sabrina Ise  
U.S. Environmental Protection Agency

Prof. Steven Hamilton  
Kansas State University

Prof. Gareth Green  
Washington State University

### **PROFESSIONAL ASSOCIATIONS**

American Economic Association  
American Law and Economics Association  
Association of Environmental and Resource Economists  
Econometric Society

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE  
*Truth in Testimony Disclosure*

Pursuant to clause 2(g)(5) of House Rule XI, in the case of a witness appearing in a nongovernmental capacity, a written statement of proposed testimony shall include: (1) a curriculum vitae; and (2) a disclosure of the amount and source (by agency and program) of each Federal grant (or subgrant thereof) or contract (or subcontract thereof) received during the current fiscal year or either of the two previous fiscal years by the witness or by an entity represented by the witness. Such statements, with appropriate redaction to protect the privacy of the witness, shall be made publicly available in electronic form not later than one day after the witness appears.

(1) Name: *David Sunding*

(2) Other than yourself, name of entity you are representing: *None*

(3) Are you testifying on behalf of an entity other than a Government (federal, state, local) entity?

YES      If yes, please provide the information requested below and attach your curriculum vitae.

NO

(4) Please list the amount and source (by agency and program) of each Federal grant (or subgrant thereof) or contract (or subcontract thereof) received during the current fiscal year or either of the two previous fiscal years by you or by the entity you are representing:

*Included on CV*

*[Signature]*  
Signature

*5/9/11*  
Date