

## Ray G. Huffaker

### *Education*

- Ph.D., Agricultural Economics, University of California, Davis, 1983.
- J.D., University of California, Davis, School of Law, 1986.
- A.B., Economics and Italian, University of California, Davis, 1978.

### *Areas of Interest*

- Biomathematical economics
- Natural resource economics, law, and policy
- Water resources
- Economic dynamics

### *Professional Experience*

- Professor and Chair, Food and Resource Economics Department, University of Florida, 2008-present.
- Professor, School of Economic Sciences, Washington State University, 2000-2008.
- Participating faculty, Interdisciplinary Training of Undergraduates in Biological and Mathematical Sciences <http://www.ubm.wsu.edu/participatingfaculty.html> , 2006-2008.
- Associate Professor, Department of Agricultural and Resource Economics, Washington State University, 1993-2000.
- Assistant Professor, Department of Agricultural and Resource Economics, Washington State University, 1990-1993.
- Adjunct Professor, Department of Natural Resource Sciences, Washington State University, Pullman, 1990-present.
- Graduate Faculty, Environmental Science and Regional Planning Program, Washington State University, 1990-present.
- Assistant Professor, Department of Agricultural Economics, University of Tennessee, Knoxville, 1987-1990.
- Lecturer and Post-Doctoral Researcher, Department of Agricultural Economics, University of California, Davis, 1984-1986.
- Parole Aid and Northern California Drug Abuse Coordinator, California Youth Authority, 1975-1978.

### *Courses Taught*

- Microeconomic Analysis, doctoral level, 5 years
- Macroeconomic Analysis, doctoral level, 4 years
- Natural Resource Economic Dynamics and Policy, doctoral level, 16 years)
- Mathematical Optimization Techniques, doctoral level, 4 years

- Natural Resource Economics, master's level, 5 years
- Natural Resource Economics, junior/senior level, 1 year
- Natural Resource Law and Policy, junior/senior level, 6 years
- Workshop in Economic Dynamics, University of Bologna, 2010
- Workshop in Phase Space Reconstruction and Visual Recurrence Analysis, University of Bonn, 2010

### ***Other Teaching Activities***

- *IDEA Website: Internet Differential Equations Activities* (sponsored by a pair of two-year NSF grants). *IDEA* delivers ordinary and partial differential equations instructional material over the Internet to students and instructors worldwide. It encompasses Java-based classroom exercises from fields as diverse as mathematics, chemistry, agriculture, and economics (with Lofaro T., K.D. Cooper, and R. Poshusta). See <http://www.sci.wsu.edu/idea/>
- *Italy Study Abroad Program*. Faculty-led program that allows undergraduates to study global environmental issues in Florence, Italy every Spring Semester.

### ***Selected Professional Service and Honors***

- Senior Visiting Fellowship, Institute of Advanced Studies, University of Bologna, Summer 2011
- Editorial Board, *Journal of Natural Resources Policy Research*, 2009 to present.
- Editorial Board, *Letters in Spatial and Resource Sciences*, 2010 to present.
- Review panelist for NOAA Sectoral Applications Research Program (SARP), Climate and Water Resource Management Project, 2006.
- Review panelist for CEAP and Drainage Panel, USDA/ARS, 2006, 2007.
- Review panelist for the National Research Initiative Competitive Grants Program in the Water Resources Assessment and Protection Area, 1999-2002, 2005, 2006, 2008.
- Review panelist for the National Research Initiative Competitive Grants Program in the Water Quality Area, 2004.
- Faculty Hearing Committee Panel, Washington State University, 2006.
- Tenure and Promotion Committee, College of Agriculture, Human, and Natural Resource Sciences, Washington State University, 2003-2005.
- UCOWR Academic Advisory Committee established by the Army Corps of Engineers to develop a curriculum for a masters degree program in water resources planning, 2000.
- Advisory Board, *Choices*, American Agricultural Economics Association, 1996-2002.
- Editorial Council, *Journal of Agricultural and Resource Economics*, 1994-2002.
- Guest Co-Editor, *International Journal of Water Resources Development*, 1999-2000.
- Reviewer of state water legislation for Center of Environmental and Law and Policy, Seattle, Washington, 1997.
- Reviewer of state water legislation, Washington State Governor's Resource Policy Group, 1997.

- Secretary, Vice-Chair, Chair of W-190, Western Regional Project Technical Committee, "Water Management and Conservation in Western Irrigated Agriculture", 1995-1997.
- Reviewer of state water legislation for Washington State Senator Karen Frasier, 1996.
- Associate Editor, *Water Resources Research*, 1990-1993.
- President, Western Agricultural Economics Association, 2002-2003.
- Computational Science Award in Undergraduate Teaching, Ames Laboratory, United States Department of Energy, 1994.
- University Research Grant-In-Aid Award, Washington State University, 1992.
- Phi Beta Kappa, Phi Kappa Phi, University of California, Davis, 1977.
- Best Graduating Senior, Italian, University of California, Davis, 1978.

### ***Journal Publications***

(\* paper arising out of dissertation/thesis)

1. Huffaker, R., D. Rider, and R. Hotchkiss. "Stability and Bifurcation Analysis of Reservoir Sedimentation Management." *Open Hydrology Journal* 4(2010):184-193.
2. Huffaker, R. "Phase Space Reconstruction from Economic Time Series Data: Improving Models of Complex Real-World Dynamic Systems." *International Journal on Food System Dynamics* 3(2010):184-193.
3. Huffaker, R. "Protecting Water Resources in Biofuels Production." *Water Policy* 12(2009):129-34.
4. Huffaker, R. "The Conservation Potential of Agricultural Water Conservation Subsidies." *Water Resources Research*, 44, W00E01, doi:10.1029/2007WR006183 (2008).
5. Cembali, T.\*, R.J. Folwell, R. Huffaker, J. McCluskey, and P. Wandschneider. "Economic Evaluation of Selective Mechanical Harvesting for Asparagus." *Acta Hort.* (ISHS, 2008) 776:33-44.
6. Bhat, M., and R. Huffaker. "Optimal Management of a Transboundary Migratory Wildlife Population: A Self-Enforcing Cooperative Agreement with Renegotiation and Variable Transfer Payments." *Journal of Environmental Economics and Management* 53(2007):54-67.
7. Cembali, T.\*, Raymond J. Folwell, Ray Huffaker, Jill McCluskey, and Philip Wandschneider. "Economics of Alternative Simulated Manual Asparagus Harvesting Strategies." *Agricultural Systems* 92(2007): 266-294.
8. Cembali, T.,\* Raymond J. Folwell, Jill McCluskey, Ray Huffaker, and Philip Wandschneider, 2006. "Economic Analysis of the Inter-year Effect of Alternative Harvesting Strategies for Asparagus." *Journal of Vegetable Science* 12(2006): 29-50.
9. Huffaker, R., and R. Hotchkiss. "Economic Dynamics of Reservoir Sedimentation Management: Optimal Control with Singularly Perturbed Equations of Motion." *Journal of Economic Dynamics and Control* 30(2006):2553-2575.
10. Grimsrud, K.,\* and R. Huffaker. "Solving Multidimensional Bioeconomic Problems with Singular-Perturbation Reduction Methods: Application to Managing Pest Resistance to Pesticidal Crops." *Journal of Environmental Economics and Management* 51(May

- 2006):336-353.
11. Thimmes, A.,\* R. Huffaker, and R. Hotchkiss. "A Law and Economics Approach to Resolving Reservoir Sediment Management Conflicts." *Journal of American Water Resources Association* 41(December 2005):1449-1456.
  12. Chouinard, H., R. Huffaker, T. Heckelie, and T. Wahl (senior authorship not assigned among first two authors). "Managing the Bill Emerson Humanitarian Trust as a Successful Marriage between Farm-Support and Humanitarian Interests." *The Journal of Humanitarian Assistance* (June 2004): <http://www.jha.ac/articles/a136.htm>.
  13. Huffaker, R.G., R. Mittelhammer, P. Barkley, and R. Folwell. "Community Dynamics in a University Environment." *Nonlinear Dynamics, Psychology, and Life Sciences* 7(April 2003):181-203.
  14. Huffaker, R.G., and N. Whittlesey. "A Theoretical Analysis of Economic Incentive Policies Encouraging Agricultural Water Conservation." *International Journal of Water Resources Development* 19(March 2003):37-53.
  15. McCluskey, J., R.G. Huffaker, and G. Rausser. "Neighborhood Effects and Compensation for Property Value Diminution." *Law & Policy* 24(January 2002):36-50.
  16. Huffaker, R.G., and R. Mittelhammer. "A Case for Adopting Appellate Review into AAEA Editorial Policy." *Review of Agricultural Economics* 24(Fall/Winter 2002):551-554.
  17. Huffaker, R.G., and R. Mittelhammer. "Response: What's Good for the Goose is Good for the Gander." *Review of Agricultural Economics* 24(Fall/Winter 2002):555-558.
  18. Leigh, D, R. Huffaker, and R. Shumway. "A Long Road to Merger of Existing Programs at Washington State University." *American Journal of Agricultural Economics* 84(August 2002):854-859.
  19. Huffaker, R.G., A. Michelsen, J. Hamilton, and M. Frasier. "The Uneasy Hierarchy of Federal and State Water Laws and Policies." *Water Resources Update* 118(January 2001):3-10.
  20. Huffaker, R.G. and N.K. Whittlesey. "The Allocative Efficiency and Conservation Potential of Water Laws Encouraging Investments in On-Farm Irrigation Technology." *Agricultural Economics* 24(2000):47-60.
  21. Marsh, T.L.,\* R.G. Huffaker and G. Long. "Optimal Control of Vector-Virus-Plant Interactions in the Production of a Storable Commodity: The Case of PLRV Net Necrosis." *American Journal of Agricultural Economics* 83(August 2000):556-569.
  22. Marsh, T.L.,\* R.C. Mittelhammer, R.G. Huffaker. "Model-Driven Approach to Test and Correct Field Experiment Data for Spatial Correlation by Plot." *Journal of Agricultural, Biological and Environmental Statistics* 5(2000):22-36.
  23. Huffaker, R.G., N.K. Whittlesey and J. Hamilton. "The Role of Prior Appropriation in Allocating Water Resources into the 21<sup>st</sup> Century." *International Journal of Water Resources Development* 16(June 2000):265-275.
  24. Huffaker, R.G., M. Frasier and J. Hamilton. "The 'Intrastate-Trade-Restriction' Defense in Commerce-Clause Challenges of State-Imposed Restrictions on Water Exports to Neighboring States." *International Journal of Water Resources Development* 16(June 2000):275-279.
  25. Gopalakrishnan, C., and R.G. Huffaker. "Water and Agriculture in the American West." *International Journal of Water Resource Development* 16(June 2000):173-176.

26. Michelsen, A., R.G. Taylor, R.G. Huffaker and T. McGuckin. "Emerging Price Conservation Programs in Agricultural Water Use." *Journal of Agriculture and Resource Economics* 24(July 1999):222-238.
27. Frasier, M., A. Michelsen, R. Taylor, J. Booker, and R. Huffaker. "Evaluating Economic and Institutional Alternatives for Meeting Interstate ESA Instream Flow Requirements in the Platte River Basin." *American Journal of Agricultural Economics* 81(December 1999):1257-1261.
28. Tozer, P.,\* and R.G. Huffaker. "Dynamics of Optimal Interactions Between Pasture Production and Milk Yield of Australian Dairy Farms." *Journal of Agriculture and Resource Economics* 24(July 1999):155-172.
29. Tozer, P.,\* and R.G. Huffaker. "Mathematical Equations to Describe Lactation Curves for Holstein-Friesian Cows in New South Wales." *Australian Journal of Agricultural Research* 50(March 1999):431-40.
30. Huffaker, R.G., K. Cooper and T. Lofaro. "Small Mammal Dispersion." *The UMAP Journal* 20.1(1999):47-65.
31. Cooper, K., R.G. Huffaker and T. Lofaro. "Rangeland Ecosystems." *The UMAP Journal* 20.1(1999):29-45.
32. Huffaker, R.G., N.K. Whittlesey, A. Michelsen, R.G. Taylor and T. McGuckin. "Evaluating the Effectiveness of Conservation Water-Pricing Programs: Reply." *Journal of Agriculture and Resource Economics* 23(July1998):12-19.
33. Huffaker, R.G. "Deterministic Modeling Without (Unwarranted) Apology." *Review of Agricultural Economics* 20(Fall/Winter 1998):500-510.
34. Marsh, T.L.,\* R.G. Huffaker, R.C. Mittelhammer, R.J. Folwell, G.E. Long, D.R. Horton, and H.H. Toba. "Potato Leaf Roll Virus Net Necrosis in Tubers: Identifying Pest Management Tradeoffs between the Inoculation Interval, Storage Length, and Tuber Weight." *Journal of Economic Entomology* 91(August 1998):923-932.
35. "Evaluating the Effectiveness of Conservation Water-Pricing Programs: Reply." *Journal of Agriculture and Resource Economics* 23(December 1998):571-72.
36. Huffaker, R.G., N.K. Whittlesey, A. Michelsen, R.G. Taylor and T. McGuckin. "Evaluating the Effectiveness of Conservation Water-Pricing Programs." *Journal of Agriculture and Resource Economics* 23(July1998):12-19.
37. Roosen, J.,\* R.G. Huffaker, R.J. Folwell, T.L. Marsh and R.C. Mittelhammer. "The Relation of Potato Leaf Roll Virus Net Necrosis in Potato Tubers to Time of Inoculation and Storage Length." *Crop Protection* 16(6):533-539 (1997).
38. Cooper, K.D., and R.G. Huffaker. "The Long-Term Bioeconomic Impacts of Grazing on Plant Succession in a Rangeland Ecosystem." *Ecological Modeling* 97(1997):59-73.
39. Bhat, M.G.,\* and R.G. Huffaker. "Controlling Transboundary Wildlife Damage: Modeling Under Alternative Management Scenarios." *Ecological Modeling* 92(1996):215-224.
40. Huffaker, R.G., and K.D. Cooper. "Plant Succession as a Natural Range Restoration Factor in Private Livestock Enterprises." *American Journal of Agricultural Economics* 77(November 1995):901-913.
41. Whittlesey, N.K., and R.G. Huffaker. "Water Policy Issues for the 21st Century." *American Journal of Agricultural Economics* 77(December 1995):1199-1203.

42. Huffaker, R.G. "Encouraging Water Marketing Within the Prior Appropriation System." *Illiahee* 11 (Spring-Summer 1995):87-93. Institute for Environmental Studies, University of Washington.
43. Bhat, M.G.,\* R.G. Huffaker and S.M. Lenhart. "Controlling Forest Damage by Dispersive Beaver Populations." *Ecological Applications* 3(3):518-530, 1993, Ecological Society of America.
44. Huffaker, R.G. "Optimal Management of Game and Forage Resources in a Private Fee-Hunting Enterprise." *American Journal of Agricultural Economics* 75(August 1993):696-710.
45. Bhat, M.G.,\* and R.G. Huffaker. "Private Property Rights and Forest Preservation in Karnataka Western Ghats, India: Reply." *American Journal of Agricultural Economics* 75(May 1993):496-498.
46. Huffaker, R.G., N.K. Whittlesey and P.R. Wandschneider. "Institutional Feasibility of Contingent Water Marketing to Increase Migratory Flows for Salmon on the Upper Snake River." *Natural Resources Journal* 33 (Summer 1993):671-696.
47. Huffaker, R.G., M.G. Bhat and S.M. Lenhart. "Optimal Trapping Strategies for Diffusing Nuisance-Beaver Populations." *Natural Resource Modeling* 6(Winter 1992):71-98, Rocky Mountain Mathematics Consortium.
48. Huffaker, R.G. and J.E. Wilen. "Animal Stocking Under Conditions of Declining Forage Nutrients." *American Journal of Agricultural Economics* 73(November 1991):1213-1223.
49. Bhat, M.G.,\* and R.G. Huffaker. "Private Property Rights and Forest Preservation in Karnataka Western Ghats, India." *American Journal of Agricultural Economics* 73(May 1991):375-87.
50. Huffaker, R.G. and G.K. Pompelli. "State Native-Wine Laws: A Commerce-Clause Resistant Strain of Economic Protectionism?" *Journal of Agricultural Taxation and Law* 3(Summer 1991):148-61.
51. Huffaker, R.G., J.E. Wilen, and B.D. Gardner. "A Bioeconomic Livestock/Wild Horse Trade-off Mechanism for Conserving Public Rangeland Vegetation." *Western Journal of Agricultural Economics* 15(July 1990):73-82.
52. Huffaker, R.G., and J.E. Wilen. "Dynamics of Optimal Stocking in Plant/Herbivore Systems." *Natural Resource Modeling* 3(Fall 1989):553-575 (Rocky Mountain Mathematics Consortium).
53. Huffaker, R.G., J.E. Wilen, and B.D. Gardner. "Multiple-use Benefits on Public Rangelands: An Incentive-based System." *American Journal of Agricultural Economics* 71(August 1989):670-678.
54. Huffaker, R.G. "Market-based Policies to Increase Home Mortgage Credit in Declining Urban Neighborhoods." *The Banking Law Journal* 106(November-December 1989):538-549.
55. Huffaker, R.G., and B.D. Gardner. "Rancher Stewardship on Public Lands: A Recent Court Decision." *Natural Resources Journal* 27(Fall 1987):887-98.
56. Huffaker, R.G., and B.D. Gardner. "The Distribution of Economic Rents Arising from Subsidized Water When Land is Leased." *American Journal of Agricultural Economics* 68(May 1986):306-312.
57. Huffaker, R.G., and B.D. Gardner. "The Hammer Clause of the Reclamation Reform Act of

1982." *Natural Resources Journal* 26(January 1986):41-69.

### ***Other Peer-Reviewed Professional Publications***

58. Huffaker, R. "Dynamic Analysis." Chapter 2 in *Dynamic Analysis Research Tools in Natural Resource and Environmental Economics*, eds. A. Batabyal and P. Nijkamp, World Scientific Publishing, Forthcoming.
59. Huffaker, R. "Impacts of Biofuels on Water Supply: Proposed Cures May Worsen the Disease." *Choices* 3(2010):7-10.
60. Huffaker, R. "Impacts of Biofuels on Water Supply: Proposed Cures May Worsen the Disease." *Choices* 25(3), 2010.
61. Huffaker, R.G., and J. Hamilton. "Conflict in U.S. Irrigation." Chapter 1 (pp. 3-22) in *Irrigation of Agricultural Crops Monograph*, eds. R. Lascano and R. Sojka, American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (2007).
62. Huffaker, R.G. "Finding a Modern Role for the Prior Appropriation Doctrine in the American West," in *Water Resources Management-Structure, Evolution, and Performance of Water Institutions*. Editors: C. Gopalakrishnan, C. Tortajada, A. Biswas, Springer-Verlag, pp. 187-198, 2005.
63. Huffaker, R.G., N. Whittlesey, and J. Hamilton. "Irrigated Agriculture and Endangered Species Policy." *Encyclopedia of Water Science*. Marcel Dekker, Inc. 2003.
64. Taylor, R.G., A.M. Michelsen, and R.G. Huffaker. "Why the Price Chain for Federally-Developed Irrigation Water Doesn't Promote Conservation." *Choices* (Third Quarter 2000):13-16.
65. Huffaker, R.G. and S. Levin. "A Framework for Analyzing Regulatory Takings Issues: The Case of Grass Burning Restrictions in Eastern Washington State," in *The Economics of Environmental Regulation and Technology Adoption in Agriculture*, eds. F. Casey, A. Schmitz, S. Swinton and D. Zilberman, Kluwer Academic Press, pp. 307-322,1999.
66. Huffaker, R.G., K. D. Cooper, and T. LoFaro. "Small Mammal Dispersion." *CODEE* (Consortium for Ordinary Differential Equation Experiments) (Winter 1996):5-8.
67. Huffaker, R.G., and N.K. Whittlesey. "Agricultural conservation legislation: Will it Save Water?" *Choices* (Fourth Quarter 1995):24-28.
68. Cooper, K. D., R. G. Huffaker, and T. LoFaro. "Rangeland Ecosystems." *CODEE* (Consortium for Ordinary Differential Equation Experiments) (Winter 1995):11-13.
69. LoFaro, T., K. Cooper, and R.G. Huffaker. "Model Neurons and Fast-Slow Systems." *CODEE* (Consortium for Ordinary Differential Equation Experiments) (Spring 1995):13-14.
70. Whittlesey, N.K., R.G. Huffaker and W.R. Butcher. "Grazing Policy on Public Lands." *Choices* (Third Quarter 1993):15-19.
71. Gardner, B.D., and R.G. Huffaker. "Cutting the Loss From the Federal Water Subsidy: Reply." *Choices* (First Quarter 1989):40-41.
72. Gardner, B.D., and R.G. Huffaker. "Cutting the Loss from the Federal Water Subsidy." *Choices* (Fourth Quarter 1988): 24-26.
73. Huffaker, R.G. "The Hammer Clause: Reclamation Reform Act of 1982." *Environs* 9(2):1-4, 1985.

### ***Work Submitted/In Progress***

1. Benson, A., and R. Huffaker (dissertation paper). “The Impact of Agricultural Water Conservation Policy on Economic Growth: The Irrigation Efficiency Trap”.

Abstract: An agricultural water conservation policy prevalent worldwide encourages producers to improve on-farm irrigation efficiency. Contrary to expectation and intention, this policy may set an ‘irrigation efficiency trap’ that worsens water crises by increasingly reducing scarce water supplies and jeopardizing ongoing economic growth. We investigate the potential for an irrigation efficiency trap in a small closed economy patterned after a region (Snake River Plain aquifer, Idaho, USA) that has fallen into the trap. An agricultural sector withdraws water to irrigate crops, and the difference between water withdrawals and the amount consumed by crops (return flow) recharges water supplies used in industrial production. The source of economic growth is constant marginal returns to capital in the industrial sector. We analyze centralized management of the economy to derive a pair of hydro-economic conditions guaranteeing the sustained existence of an irrigation efficiency trap. Importantly, the irrigation efficiency trap results from a socially optimal response to improved irrigation efficiency—not from market imperfections correctable with economic instruments such as subsidies and taxes. Consequently, the best policy is to avoid the trap: Policy makers should not rely on improved on-farm irrigation efficiency to conservation water on a broader geographic scale when agricultural return flows are a significant component of a hydrologic system.

2. McCullough, M., T. Marsh, and R. Huffaker (dissertation paper). “Reconstructing Consumer Reactions to Health and Food Safety Concerns”.

Abstract: This paper applies phase space reconstruction analysis to U.S. meat demand. The results demonstrate distinct differences between intertemporal shorter run impacts from food safety incidents (e.g., E. Coli and BSE) relative to longer run health effects (e.g., cholesterol). The results also show that consumers have reacted differently to food safety events depending on the particular food contaminate associated with that event.

3. McCullough, M., T. Marsh, and R. Huffaker (dissertation paper). “Have Livestock Cycles Diminished Over Time”.

Abstract: Phase space reconstruction is applied to investigate U.S. livestock cycles. Both pork and cattle time series data demonstrate that cycles have slowly diminished. In particular, biological constraints have become less significant factors in livestock cycles while technology and information are relatively more significant.

### ***Grant and Contract Awards***

Huffaker, R., R. Clouser, and S. Larkin, “Calculating indirect and passive-use damages to Florida

- from the Deepwater Horizon Disaster,” contract with the Office of Economic and Demographic Research of the Florida Legislature, \$750,000, 2011.
- Flury, M., J. Wu, R. Huffaker, and C. Stockle, “Integrated Education and Research for Sustainable Development: Linking Engineering and Economic Sciences,” USDA Food and Agricultural Sciences National Needs Graduate Fellowship Program, Contract No: 2008-38420-04761, 9/1/2008-8/31/2013, \$258,000.
- Gomulkiewicz, R. et al., “UBM: Foundation in mathematical biology through interdisciplinary research, training, and curriculum development,” National Science Foundation, 2005-2010, \$905,000 (I am a participant on this grant drawing a month of summer salary for directing undergraduate research projects in biomathematics).
- Chenowith, C. et al., Maximizing Study Abroad Assessment Program, Washington State University Undergraduate Teaching and Learning Assessment Initiative, 2005-2006, \$22,000.
- Wahl, T., R. Huffaker, P. Andrews, J. Busboom, and R. Mittelhammer, “Tradeoffs and Resource Allocation Effects for Alternative IS Management Policies.” Resource Implications of Invasive Species Policy and Program Alternatives, NRI, USDA. 2003-2005, \$141,518.
- Huffaker, R. “Alternative Water Institutional Structures to Mitigate Producer Impacts Due to Drought and/or Federal Decisions Restricting Water for Irrigation.” Cooperative Agreement 43-3AEL-2-80094. USDA-ERS. 2002-2005, \$25,000.
- Young, R., M. Frasier, A. Michelsen, R. Huffaker, J. Booker, G. Taylor, T. Gates, S. Gloss, M. Squillace, R. Ward, L. MacDonnell, “Meeting Time-Dependent Instream Flow Requirements in a Fully Appropriated Multi-State River Basin.” Water Resources Center, Regional Competitive Grants Program, October 1998 to October 2000, \$291,932.
- LoFaro, T., K.D. Cooper, R.G. Huffaker and R. Poshusta, “IDEA: Internet Differential Equations Activities,” Renewal of NSF Grant No. DUE-9555228, April 1998 to March 31 2000, \$99,977.
- Michelsen, A., R.G. Huffaker, T. McGuckin and G. Taylor, “Effectiveness of Irrigation District Conservation Price Programs,” Water Resources Center, Regional Competitive Grants Program, September 1996 to September 1998, \$74,725.
- Tozer, P., and R.G. Huffaker, “Dynamic Interactions Between Pasture Production, Milk Yields and Economic Viability of NSW Dairy Farms,” Dairy Research and Development Program and the University of New England, Armidale, NSW, Australia, 1996-1998, \$25,000.
- LoFaro, T., K.D. Cooper, R.G. Huffaker and R. Poshusta, “IDEA: Internet Differential Equations Activities,” NSF Grant No. DUE-9555228, April 1996 to April 1998, \$93,322.
- Huffaker, R.G., "Optimal Control of Vegetation-Ungulate-Hunter Interactions in a Private Fee-Hunting Enterprise," Research Grant-In-Aid Award, WSU, 1992-1993, \$14,000.
- Huffaker, R.G., N.K. Whittlesey and P.R. Wandschneider, "Legal and Economic Problems of Converting Irrigation Water to Fish Production in the Upper Snake River," State of Washington Water Research Center, Project no. A-175-WASH, Grant no. G-2053, May 1991 to May 1992, \$15,000.

### ***Proceedings***

Cembali, Tiziano,\* Raymond J. Folwell, Ray Huffaker, Jill McCluskey, and Philip

- Wandschneider. "Economic Evaluation of Selective Mechanical Harvesting for Asparagus." *Acta Horticulturae*, Proceedings of the XIth International Asparagus Symposium, Amsterdam, Netherlands, 2005.
- Huffaker, R., and R. Hotchkiss. "Discounting the Costs and Benefits of Long-Term Public Projects." Proceeding of the International Workshop: From Watershed Slopes to Coastal Areas—Sedimentation Processes at Different Scales. UNESCO and International Coordinating Committee on Reservoir Sedimentation. Venice, Italy. 2003.
- Hotchkiss, R., and R. Huffaker. "Spatial and Temporal Impacts of Sediment-Related Projects: Need for Alternative Economic Analysis." Proceeding of the International Workshop: From Watershed Slopes to Coastal Areas—Sedimentation Processes at Different Scales. UNESCO and International Coordinating Committee on Reservoir Sedimentation. Venice, Italy. 2003.
- Huffaker, R. and R. Hotchkiss. "Slow Manifold Dynamics of Optimal Reservoir Sedimentation Management." Proceeding of the International Workshop on Ecological, Sociological and Economic Implications of Sediment Management in Reservoirs. UNESCO and International Coordinating Committee on Reservoir Sedimentation. Paestum, Italy. 2002.
- Huffaker, R.G. "Thinking the Once Unthinkable: Breaching Lower Snake River Dams." Proceedings of the International Water Resources Association Annual Meeting, June 29-July 2, 1999.
- Huffaker, R.G. "The Commerce Clause and Interstate Water Compacts." Proceedings of meeting of the International Water Resources Association, June 29-July 2, 1999.
- Huffaker, R.G. "Deterministic Modeling of Bioeconomic Grazing Systems Without (Unwarranted) Apology." Proceedings of Grazing Land Economics and Policy: A Symposium, Joint Annual Meetings of Society of Range Management and American Forage and Grassland Council, February 22, 1999.
- Huffaker, R. G. "A Framework for Analyzing Regulatory Takings Issues: The Case of Grass Burning Restrictions in Eastern Washington State." Proceedings of a USDA/ERS conference on *Flexible Incentives for the Adoption of Environmental Technologies in Agriculture*, University of Florida, June, 1997.
- Huffaker, R.G. "Water Marketing Under Prior Appropriation." Proceedings of conference on *Washington Water Issues*, Institute for Environmental Studies, University of Washington, January 1994.
- Huffaker, R.G. "Commerce-Clause Issues Raised by State Native Wine Laws." Proceedings of the 13th Viticultural Science Symposium, Florida A&M University, 1990.
- Huffaker, R.G. "Commerce-Clause Issues Raised by the Tennessee Grape and Wine Law's 75% In-state Winegrape Purchasing Requirement." Proceedings of the Tennessee Viticulture & Oenological Society, December 1989.
- Huffaker, R.G. "A Bioeconomic Livestock/Wild Horse Trade-off Mechanism for Conserving Public Rangeland Vegetation." Proceedings of the Western Agricultural Economics Association Annual Meetings, July 1989.
- Huffaker, R.G. "The Law and Economics of the Tennessee Grape and Wine Law's '75%' In-state Winegrape Purchasing Requirement." Proceedings of the 12th Viticultural Science Symposium, Florida A&M University, May 1989.
- Huffaker, R.G. "The Law and Economics of the Tennessee Grape and Wine Law's '75%' In-state

Winegrape Purchasing Requirement." Proceedings of the Tennessee Viticulture & Oenological Society, January 1989.

Huffaker, R.G. "The Use of Contracts in the Tennessee Winegrape Industry." Proceedings of the Tennessee Viticulture & Oenological Society, January 1988.

### *Consulting*

Review panelist for the Governance Committee of the Cooperative Agreement for Platte River Research of the "Water Conservation/Supply Reconnaissance Study Draft Report," 2000.

### *Invited Presentations*

"Phase Space Reconstruction: Where Theory Meets History", 4<sup>th</sup> International European Forum on System Dynamics and Innovation in Food Networks, Igls, Austria, February 2010.

"Essential Ingredients of Cutting-Edge Research", Gosnell Lecture at the Rochester Institute of Technology, New York, November 2009.

"Phase Space Reconstruction: Where Theory Meets History, Department of Biological and Agricultural Engineering, University of Florida, November 2009.

"Phase Space Reconstruction: Where Theory Meets History", Agricultural Economics Department at the University of Bonn, Germany, September 2009.

"Legal Aspects of Rights/Ownership of Water." AAAS 2009 Annual Meeting, Chicago, IL. Organized symposium entitled, "Water: Who Gets the Last Drop?"

"Sustainable Food Production", 3<sup>rd</sup> International European Forum on System Dynamics and Innovation in Food Networks, Igls, Austria, February 2009.

"Economic Dynamics of Optimal Sedimentation Dynamics." Water Resources Center Lecture Series, University of Florida, October 2008.

"Protecting Water Resources in Biofuels Production", Department of Agronomy, University of Florida, September 2008.

"Perils of Federal and State Agricultural Water Conservation Policy: Hydrologic, Economic and Legal Underpinnings." Invited presentation to USDA/NRCS, Washington, D.C., April 18, 2008.

"Protecting Water Resources in Biofuels Production", Invited presentation to The World Bank, Washington, D.C., March 6, 2008.

"The Conservation Potential of Agricultural Water Conservation Subsidies." AAAS 2007 Annual Meeting, San Francisco, CA. Organized symposium entitled, "Water Crisis in Agriculture: How to Produce More with Less."

"Existing and New Legal Paradigms for a Water Short World," Utah State University Water Initiative seminar series, Logan, UT, 2007.

"Integrating Science into Policy: The Paradox of Agricultural Conservation Policy," Plenary address to the 3rd Congress of the Association of Latin American and Caribbean Environmental Economists (ALEAR), Talca, Chile, 2007.

"Economic Dynamics of Optimal Sedimentation Dynamics." Department of Agricultural Economics, University of Bologna, Italy, 2007.

- “Do Increased Energy Prices Promote Agricultural Water Conservation?” Organized Symposium entitled, “Potential Impacts of Recent Energy Policies and Price Increases on Agriculture, Land and Water Resources, and the Environment.” Annual Meeting of the Western Agricultural Economics Association, 2006.
- “The Effectiveness of Federal Agricultural Water Conservation Policies.” Invited presentation to symposium entitled “What Price Water? Status of Water Availability for Agricultural in Changing Economic Times.” USDA-CSREES National Water Conference, February 2006.
- “Integrating Science into Water Policy: The Paradox of Agricultural Water Conservation Policy.” Plenary address to the 2005 American Water Resources Association Summer Specialty Conference. June 2005.
- “Economic Dynamics of Reservoir Sedimentation Management: Optimal Control with Singularly Perturbed Equations of Motion.” Invited seminar to the Department of Economics, University of Hawaii, June 2005.
- “The SES Italy Study Abroad Program.” Selected paper presented to a session on Innovative Approaches to Undergraduate Education at the annual meetings of the Western Economic Association, July 2005.
- “The Perilous Relationship between On-Farm Irrigation Efficiency and Agricultural Water Conservation: What Florida Water Managers Should Know.” Invited presentation to College of Agriculture, University of Florida. August 2004.
- “The Future Role of Prior Appropriation in the West.” Invited presentation to organized symposium on Pacific Northwest Water Issues, Pacific Northwest Regional Economics Conference (PNREC), May 2004.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Water Resources Research & Extension Colloquium, Washington State University, April 2004.
- “Existing and New Legal Paradigms for a Water-Short World.” Conference entitled *Agricultural Risks in a Water-Short World: Producer Adaptation and Policy Directions*. ERS/USDA, Washington, DC, May 2004.
- “Qualitative Dynamics from Empirical Data.” Invited seminar to the Department of Mathematics, Washington State University, February 2004.
- “Qualitative Dynamics from Empirical Data.” Invited seminar to Environmental Studies and Regional Planning, Washington State University, March 2004.
- “Community Dynamics in a University Environment.” Invited seminar to the Department of Agricultural and Resource Economics, University of California at Davis. November 2003.
- “The Linkage Between Irrigation Effectiveness and Water Conservation: What New Water Managers Should Know.” Invited presentation to the Water Resources Seminar: Hazards of Practicing Your Trade—Tips for New Water Managers, Colorado State University. October 2003.
- “Community Dynamics in a University Environment.” Invited seminar to the Department of Agricultural and Resource Economics, Colorado State University. October 2003.
- “A Case for Deterministic Modeling.” Organized Symposium on Quantitative Methods, American Agricultural Economics Association annual meetings. August 2003.
- “Dynamics of Graduate Education.” Organized Symposium: Tips on how to have a positive influence on students while having a beneficial situation for the faculty member, American

- Agricultural Economics Association annual meetings. August 2003.
- “The Agricultural Water Conservation Morass.” Principle paper session, Western Agricultural Economics Association annual meetings. July 2003.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited presentation to the Seattle Economists Club. Audience: Private and Government sector economists. October 2002.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited presentation to the Olympia Economists Club. Audience: Government sector economists and hydraulic engineers. October 2002.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited seminar to the Department of Economics, University of Puget Sound (Tacoma, WA). October 2002.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited seminar to Department of Economics, Seattle University. October 2002.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited seminar to Department of Economics, Saint Martins College (Olympia, WA). October 2002.
- “Equating Increased Irrigation Efficiency with Agricultural Water Conservation.” Invited presentation to the Department of Economics, University of Washington. October 2002.
- “Deterministic Modeling Without (Unwarranted) Apology.” Presidential address to the Western Agricultural Economics Association. August 2002.
- “Development of a Curriculum for a Masters Degree Program in Water Resources Planning.” UCOWR Academic Advisory Committee established by the Army Corps of Engineers, AWRA/UCOWR Conference, June 2001.
- “Community Dynamics in a University Environment.” Invited seminar to the Department of Agricultural Economics, Kansas State University. March 2001.
- “Sustainable Management of Global Water Supplies.” Invited presentation to the World Bank, Washington D.C., June 2001.
- “The Role of Prior Appropriation in Allocating Water Resources into the 21<sup>st</sup> Century.” Invited presentation to USDA-ERS, Washington D.C., June 2001.
- “Agricultural Water Conservation Laws Designed to Increase Water Levels in the Ogallala Aquifer.” Keynote address to the Water and Future of Kansas Conference. Manhattan, Kansas. March 2001.
- “Deterministic Modeling Without (Unwarranted) Apology.” Invited presentation to the Department of Economics, University of Washington, Spring 2000.
- “Economic and Institutional Alternatives for Meeting Interstate ESA Instream Flow Requirements in the Platte River Basin.” Frasier, M., A. Michelsen, R. Huffaker, and R. Taylor. Principle Paper Session entitled “Endangered Species Recovery and River Basin Policy: Contribution of Economic Analysis at the AAEA annual meetings, August 1999.
- “Law of the River: Provisions Governing the Platte River.” Invited presentation to Technical Paper Session entitled “Integrating Economics, Law and Politics to Accommodate Endangered Species in the Platte River Basin,” Universities Council on Water Resources annual meetings, June 29-July 2, 1999.
- “Thinking the Once Unthinkable: Breaching Lower Snake River Dams.” Invited presentation to

meeting of the International Water Resources Association, June 29-July 2 1999.

“The Commerce Clause and Interstate Water Compacts.” Invited presentation to meeting of the International Water Resources Association, June 29-July 2 1999.

“Deterministic Modeling Without (Unwarranted) Apology.” Seminar to the Department of Agricultural Economics, Washington State University, February 1999.

“Thinking the Once Unthinkable: Breaching Lower Snake River Dams.” Invited presentation to the Program of Environmental Science and Regional Planning, Washington State University, January 1999.

“Teaching Environmental and Resource Policy Using Case Studies.” Invited presentation at Organized Symposium, AAEA annual meetings, August 1998.

“The Law and Economics of Regulatory Takings.” Invited presentation to conference entitled: *Planetary Stewardship: an interdisciplinary conference on the environment*. Borah Foundation, University of Idaho, April 1998.

“The Law and Economics of Regulatory Takings.” Invited seminar to the Department of Economics and Statistics, University of Nevada-Reno, November 1997.

“Integrating Environmental Values into Western Water Management.” Invited presentation to the Department of Crops and Soils, Washington State University, September 1997.

“The Agricultural Water Conservation Morass.” Invited seminar to the Department of Agricultural Economics, Texas A&M University, August 1997.

“Integrating Environmental Values into Western Water Management.” Invited presentation to conference entitled “Headwaters to Economic Growth: Market Solutions to Water Allocation in Texas,” sponsored by the Federal Reserve Bank of Dallas, San Antonio, Texas, August 1997.

“Evaluating the Effectiveness of Conservation Water-Pricing Programs.” Invited Session Paper presented at WAEA annual meeting in Reno, 1997.

“Deterministic Modeling Without Apology.” Invited presentation to the Department of Agricultural Economics, University of Tennessee, March 1997.

“Water Conservation in the Agricultural Sector.” Invited presentation to the Washington Tree Fruit Industry Taskforce, March 1997.

“Water Conservation in the Agricultural Sector.” Invited paper to the 4<sup>th</sup> Annual Sinking Creek Water Law Symposium: Focus on Re-Allocation of Water Rights. King County Bar Association and the Center for Environmental Law and Policy, January 1997.

“Takings Jurisprudence with Applications to Water Issues.” Invited paper to W-190 (Water Conservation, Competition, and Quality in Western Irrigated Agriculture), Sept. 1996.

“Is Risk Necessary in Economic Analysis.” Invited presentation to SRIEG-70, “Economics and Management of Risk in Agricultural Economics,” March 1996.

“The Mathematical Economics of Increasing Irrigation Efficiency in a Closed Hydrologic System.” Department of Mathematics, Washington State University, March 1996.

“Water Policy Issues for the Twenty-First Century.” Invited paper session entitled *Property Rights Issues in Natural Resources*, AAEA annual meetings, August 1995.

“Takings Jurisprudence.” Invited paper session entitled *Takings, Property Rights, and Compensation*, AAEA annual meetings, August 1995.

“Modeling the Interface Between Agricultural Production and the Environment.” Presentation to

scientist from the USSR participating in the Pushchino Project, Washington State University, July 1995.

- “Plant Succession as a Natural Range Restoration Factor.” Department of Mathematics, Washington State University, Fall 1994.
- “Water Transfers.” Water Workshop, Washington State Association of Counties, Fall 1994.
- “Optimal Grazing Under Conditions of Declining Forage Nutrients.” Department of Mathematics, Washington State University, October 1994.
- “The Long-Term Bioeconomic Impacts of Grazing on Plant Succession in a Grassland Ecosystem.” Pacific Northwest Workshop on Mathematical Biology, Washington State University, Spring 1994.
- “Optimal Harvest of Interdependent Species.” Department of Economics, University of Washington, January 1994.
- “Making the Prior Appropriation Doctrine More Responsive to Water Marketing.” Invited paper to The Sinking Creek Water Law Symposium: “Water Rights in the 21<sup>st</sup> Century,” The School of Law and Institute for Environmental Studies, University of Washington, January 1994.
- “Optimal Trapping Strategies for Diffusing Nuisance-Beaver Populations.” Department of Mathematics, Washington State University, October 1993.
- “Optimal Trapping Strategies for Diffusing Nuisance-Beaver Populations.” Special session entitled *Applications in Optimal Control Theory*, American Mathematical Society regional meeting, University of Tennessee, Knoxville, March 1993.
- “Dynamics of Optimal Stocking in Plant-Herbivore Systems.” Math Ecology Seminar Program, Department of Mathematics, University of Tennessee-Knoxville, Spring 1990.
- “Qualifying for Tax Deductions by Granting Conservation Easements.” Tennessee Society of Rural Appraisers, June 1988.
- “Grazing Economics and the Utilization of Range and Pasture in California.” California Grazing Advisory Board to the Governor, February 25, 1986.
- “Cattle Stocking on California Ranges and Pasture.” Natural Resource/Environmental Workshop, University of California, Davis, December 6, 1985.
- “Rancher Autonomy on Public Rangelands: A Recent Court Decision.” Natural Resource/Environmental Workshop, University of California, Davis, November 18, 1985.
- “Are Farmland Leasing Restrictions on Federal Water Users Justified?” Environmental and Natural Resources Policy Series on California Water Institutions: Current Problems and Possible Reforms, University of California, Davis, October 16, 1985.

### ***Interviews by Popular Press and Radio***

Interviewed by (and cited in) *The Economist* as expert in western water law for article entitled “Water and Ecology: You say potato, I say electricity.” July 14, 2001, p. 28.

Interviewed by NPR station at Kansas State University concerning water conservation opportunities in the Ogallala aquifer. March 2001.

### **Major Professor in Supervision and Training of Graduate Students**

- Michael McCullough, Ph.D., Economics, 2008.
- Aaron Benson, Ph.D., Economics, 2008.
- Amanda Thimmes, M.A., Agricultural Economics, 2003.
- Gordon Card, M.A., Agricultural Economics, 2003.
- Kristine Grimsrud, Ph.D., Agricultural Economics, 2002.
- Bruce Heckman, M.S., Environmental Science and Regional Planning, 2002.
- Tom Marsh, Ph.D., Agricultural Economics, 1998.
- Peter Tozer, Ph.D., Agricultural Economics, 1998.
- Jutta Roosen, M.A., Agricultural Economics, 1996.
- Stina Levin, M.A., Agricultural Economics, 1995.
- Tom Guertler, M.A., Economics, 1995.
- Donald Yule, M.A., Economics, 1995.
- Robert Funk, M.A., Economics, 1993.
- Mohadev Bhat, Ph.D., Agricultural Economics, University of Tennessee, 1990.
- Gary Cole, Ph.D., Agricultural Economics, University of Tennessee, 1990.

#### **Positions Taken by Ph.D. Students**

- Aaron Benson, Department of Agricultural Economics, Texas Tech University.
- Michael McCullough, Department of Agribusiness, Cal Poly, SLO.
- Kristine Grimsrud, Department of Economics, University of New Mexico.
- Tom Marsh, Department of Agricultural and Resource Economics, Kansas State University.
- Peter Tozer, Department of Animal Science, Pennsylvania State University.
- Gary Cole, United States Environmental Protection Agency.
- Mohadev Bhat, Department of Natural Resource Sciences, Florida International University.