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2	THE ENVIRONMENTAL JUSTICE COALITION FOR WATER, A NONPROFIT PUBLIC BENEFIT		
3	CORPORATION		
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9	Attorney for Protestant The Environmental Justice Coalition for Water		
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12	BEFORE THE		
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14	CALIFORNIA STATE WATER RESOURCES CONTROL BOARD		
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16	HEARING IN THE MATTER OFPREPARED DIRECT TESTIMONY OFCALIFORNIA DEPARTMENT OF[FULL NAME] ON BEHALF OF THE		
17	WATER RESOURCES AND UNITEDENVIRONMENTAL JUSTICESTATES BUREAU OF RECLAMATIONCOALITION FOR WATER		
18	REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA		
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	1 STATEMENT OF QUALIFICATIONS OF FRASER M. SHILLING, Ph.D.		

1	FRASER M. SHILLING, Ph.D.			
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3	CONTACT Department of Environmental Science and Policy, University of California, Davis, CA 95616			
4	Phone: (530) 752-7859; fax: (530) 752-3350; <u>fmshilling@ucdavis.edu</u>			
5	RESEARCH INTERESTS			
6	Mr. Shilling's current work focuses on three research areas: landscape and transportation ecology, indicators of ecosystem performance, and policy issues associated with water pollution.			
7	He collaborates with social scientists, natural scientists, and humanities professors in inter- disciplinary investigations of land-use, water policy, and transportation policy implications. Mr.			
8 9	Shilling is co-Director of the UC Davis Road Ecology Center and the China-US Land Ecology Center and a research scientist in the Department of Environmental Science and Policy. He practices at the interface between science and policy, requiring that he collaborate and interact with regulatory agencies, resource management agencies, community organizations, and			
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11	academics of many disciplines			
12	EDUCATION			
13	Ph.D. in Biological Sciences, University of Southern California, 1991 B.Sc. in Biological Sciences, University of Southern California, 1986			
14	PROFESSIONAL RESEARCH EXPERIENCE			
15	2015-present Academic Coordinator II, Department of Environmental Science and Policy			
16	2004-presentCo-Director, UC Davis Road Ecology Center2000-2014Staff Research Associate IV, Department of Environmental Science and Policy			
17	1998-2000Research Coordinator, Sierra Nevada Network for Education and Research, UC Center for Water and Wildlands Resources			
18	1995-1998 Postdoctoral Fellow, Division of Biological Sciences and the Institute of Theoretical Dynamics, University of California, Davis (NIH and ITD-funded)			
19	1991-1994 Postdoctoral Fellow, University of Connecticut (NIH-funded)			
20	SUPERVISORY AND TEACHING EXPERIENCE			
21	Course Director " <u>General Ecology</u> " (4-unit undergraduate class) at the Thai Nguyen University for Agriculture and Forestry, Vietnem, Fall, 2013, "Social Surveying Methods" (2, &			
22	Agriculture and Forestry, Vietnam, Fall, 2013. " <u>Social Surveying Methods</u> " (2 & 4-unit graduate course), for CRD and GGG methods credit, UC Davis, Spring, 2011. " <u>Improving Community and Landscape Connectivity</u> " (2-unit graduate			
23	seminar), Transportation Studies Program, UC Davis, Fall, 2009. "Road Ecology:			
24 25	<u>Road Effect Zone</u> " (2-unit graduate seminar), Transportation Studies Program, UC Davis, Winter, 2008. " <u>Road Ecology</u> " (4-unit graduate course),			
25 26	Transportation Studies Program, UC Davis, Spring, 2007. " <u>Modeling Reserve</u> <u>Design</u> " (2-unit graduate seminar) Department of Environmental Science and			
27	Policy, UC Davis, 1995-96. " <u>Developmental Biology of Marine Invertebrates</u> " (40% of 4-unit undergraduate course), Bodega Marine Laboratory, UC Davis,			
28	Spring, 1995.			
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	2 STATEMENT OF QUALIFICATIONS OF FRASER M. SHILLING, Ph.D.			

1	Lecturer	" <u>Advanced Biochemistry (lab)</u> ", Molecular and Cellular Biology 120L, UC Davis, 1999.				
2	Guest Lecturer	"California Indian Environmental Policy II" (NAS 162), UC Davis, 2014; "Water				
3		Policy", UC Davis, 2005, 2006, 2007, 2008, 2010. "Developmental Mechanisms", Oregon Health Sciences University, 1994 "Cell Biology", UC Davis, 1996 and				
4		1997.				
5	Recent Projects	Coordinated the 3 rd California Connectivity Forum (December 3 rd , 2012). Designed and co-coordinated the California Sustainability Indicators Symposium				
6		(2011) in Sacramento and Los Angeles. Designed and coordinated the 2 nd				
7		California Connectivity Forum (2010). Co-designed and coordinated the Best Science in Connectivity Workshop sponsored by the Wildlife Conservation				
8		Society (2009). Co-designed and coordinated the California Connectivity Forum (2008). Designed and directed 3 Road Ecology Center workshops on road effects;				
9		integrated land-use, conservation, and transportation planning; and habitat connectivity. Designed and conducted a 2-day workshop for Washington				
10		Department of Natural Resources on Developing Decision-Support Systems for Forested Landscapes. Designed and directed 5 regional workshops on watershed				
11		assessment throughout California (2004-2006).				
12	ACADEMIC COMMUNITY AND PUBLIC SERVICE					
13		an Journal of Civil Engineering (former Associate Editor)				
14	Journal Reviewer: Ecological Indicators, Landscape Ecology, Conservation Biology, Biological Conservation, Environmental Management, Landscape and Urban Planning, Transportation					
15	Research Record, Ecoscience, Environmental Modeling and Software, Ecological Engineering, Land Degradation and Development, Environmental Science and Pollution Research, Open Urban Studies					
16	and Demography Journal, Biological Bulletin (past reviewer), Developmental Biology (past reviewer)					
17	Transportation Research Board: Strategic Highway Research Program 2: Expert Task Group (2007-					
18	2009); member TRB Sustainable Transportation Indicators Subcommittee (current); member TRB Ecology and Transportation Committee (ADC30, current); co-chair TRB Animal Vehicle Collision Subcommittee (ANR20.2, surrent)					
19	Subcommittee (ANB20-2, current) Federal Highways Administration: Eco-Logical Champion, providing on-call technical assistance to					
20	state DOTs and MPOs (2014-present)					
21	IENE 2016: Member of Programme Committee Review Panelist: Water Research Foundation (2015-16)					
22		f Watershed Program Sub-Committee (2002-2006) Space Commission: Member (2000-2003) and Chair (2000-2002)				
	University of Californ	nia, Davis: Diversity Award (1996)				
23	American Society of (1992-1997)	Zoologists/Society for Integrative & Comparative Biology: Conservation Chair				
24 25	RECENT ENVIRO	NMENTAL SCIENCE & POLICY PUBLICATIONS				
	Creley, C.M., F.M. S	hilling and A.E. Muchlinski (in review) Using ecological niche models to predict				
26	1 1	re range expansion of the eastern gray squirrel in California. <i>Southwest Naturalist</i> ng, R. van der Ree, M.A. McCarthy (in review) Applying a conceptual framework				
27	to determine patte	erns of wildlife-vehicle collisions on two continents: mule deer in North America				
28	and grey kangaro	os in Australia. Journal of Wildlife Management				
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³ STATEMENT OF QUALIFICATIONS OF FRASER M. SHILLING, Ph.D.

1	Fulton, J., M. Norton, and F.M. Shilling (in press) Water-indexed benefits and impacts of California almonds. <i>Ecological Indicators</i>
2	Seo, K., D. Salon, F. Shilling, M. Kuby (in press) Pavement condition and residential property values: a
3	spatial hedonic price model for Solano County, CA. <i>Public Works Management & Policy</i> Ha, H. and F. Shilling (in press) Modeling potential wildlife-vehicle collisions (WVC) locations using
4	environmental and socio-demographic factors: a case-study of 3 state highways in Central
	California. <i>Ecological Modelling</i> . Waetjen, D.P. and F.M. Shilling (2017) Large extent roadkill and wildlife observation systems as
5	sources of reliable data. Frontiers in Ecology and Evolution.
6	<i>http://journal.frontiersin.org/article/10.3389/fevo.2017.00089/full</i> Eitzel, M.V. and 21 others (2017) Citizen Science Terminology Matters: Exploring Key Terms. <i>Citizen</i>
7	Science: Theory and Practice. 2(1), p.1. DOI: http://doi.org/10.5334/cstp.96
8	Shilling, F.M. (2016). Rising above the tide. <i>Roads & Bridges</i> , October. <u>https://www.roadsbridges.com/rising-above-tide</u>
9	Shilling, F.M., J. Vandever, K. May, I. Gerhard, and R. Bregoff. (2016) Adaptive planning for sea level
-	rise-threatened transportation corridors. <i>Transportation Research Record: Journal of the</i>
10	<i>Transportation Research Board, No. 2599,</i> Transportation Research Board, Washington, D.C., 2016, pp. 9–16. DOI: 10.3141/2599-02
11	Shilling, F.M., D.P. Waetjen, A. Khan, and R. Juricich (2015). Systematic assessment of water
12	sustainability at the US state scale. <i>ASCE Journal of Water Resources Planning and Management</i> , 141(12) doi:10.1061/(ASCE)WR.1943-5452.0000551
13	Shilling, F.M. and Waetjen, D.P. (2015) Wildlife-vehicle collision observation collection and hotspot
	identification at large scales. <i>Nature Conservation</i> , 11: 41-60. doi: 10.3897/natureconservation.11.4438
14	Shilling, F.M. and B. Charry (2015). Engaging the public through citizen science research and public
15	education. In "Roads and Ecological Infrastructure: Concepts and Applications for Small Animals"
16	Andrews, K.M., P. Nanjappa, and S.D. Riley (eds.) Johns Hopkins University Press, Baltimore, MD Fulton, J. and Shilling, F.M. (2015). Water footprints and sustainability. In "The Water Sustainability
17	Reader: Lessons from California." University of California Press.
18	Shilling, F.M. Perkins, S., Collinson, W. (2015). Wildlife/roadkill observation and reporting systems. In: Handbook of Road Ecology. van der Ree, R., Smith, D.J. and Grilo, C (eds.). John Wiley & Sons,
	Oxford. 552 pp. ISBN: 978-1-118-56818-7.
19	Kagan, J.S., Shilling, F.M. and Gaines, L.J. (2014). Valuation and crediting approach for transportation and metropolitan planning agencies. <i>Transportation Research Record</i> , 2403: 1-8.
20	Golet, G.H., Brown D.L., Carlson M., Gardali T., Henderson A., Holl K.D., Howell C.A., Holyoak M.,
21	Kondolf G.M., Larsen E.W., Luster R.A., McClain C., Nelson C., Paine S., Rainey W., Rubin Z., Shilling E. Silvaira I.C. Swagarty H. Williams N.M. and Wood D.M. (2012) Swagarase failures
22	Shilling F., Silveira J.G., Swagerty H., Williams N.M., and Wood D.M. (2013). Successes, failures, and suggested future direction for ecosystem restoration of the middle Sacramento River. <i>San</i>
	Francisco Estuary Watershed Science. <u>http://www.escholarship.org/uc/item/0db0t6j1#page-1</u>
23	Shilling, F.M., Khan, A., Juricich, R., and Fong, V. (2013). Using indicators to measure water resources sustainability in California. <i>EWRI</i> (2013) Conference Proceedings.
24	Shilling, F.M., Reed, S., Boggs, J. (2012). Recreational system optimization to reduce conflict on public
25	lands. <i>Environmental Management</i> 50:381-395, DOI 10.1007/s00267-012-9906-6 Huber, P.R., Shilling, F.M., Thorne, J.H., and Greco, S.E. (2012). Municipal and regional habitat
26	connectivity planning. Landscape and Urban Planning. 105: 15-26.
27	DOI:10.1016/j.landurbplan.2011.11.019
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1	Li, T., Shilling, F.M., Li, F., Thorne, J., Schott, H., Boynton, R., and Berry, A.M. (2010). Fragmentation of China's landscape by roads and urban areas. <i>Landscape Ecology</i> . DOI 10.1007/s10980-010-9461-
2	6 Shilling, F.M., White, A.B., Lippert, L., and Lubell, M.N. (2010). Contaminated fish consumption in
3	California's Central Valley Delta. <i>Environmental Research</i> . DOI:10.1016/j.envres.2010.02.002 Shilling, F.M. (2009). Fishing for justice, or just fishing? <i>Ecology Law Currents</i> , Journal of UC
4	Berkeley School of Law, 36: 205-211.
5	Sze, J., London, J.K., Shilling, F.M., Cadenaso, M.L. (2009). Defining and contesting environmental justice: Socio-natures and the politics of scale in the Delta. <i>Antipode</i> , 41(4): 807-843.
6	Shilling, F.M., Llevanos, R., and London, J.K. (2009). Marginalization by collaboration: Environmental justice as a third party in and beyond CALFED. <i>Environmental Science and Policy</i> ,
7	12: 694-709. Shilling F.M. (2007). Repairing read impacts on landscope connectivity. Transactions of the Western
8	Shilling, F.M. (2007). Repairing road impacts on landscape connectivity. <i>Transactions of the Western Section of the Wildlife Society</i> , 43: 11-18.
9	Shilling, F.M. and Harris, R. (2007). Effectiveness monitoring by California community watershed groups. <i>IMPACT (American Water Resources Association)</i> , Volume 9(5): 21-24.
10	Shilling, F.M. and Girvetz, E. (2007). Physical and financial barriers to implementing a nature reserve
11	network in the Sierra Nevada, California, USA. <i>Landscape and Urban Planning</i> . Volume 80(1-2): 165-172.
12	Kattelmann, R. and Shilling, F.M. (2004). Aquatic systems and watersheds. In: <i>Proceedings of the</i> <i>Sierra Nevada Science Symposium</i> ; 2002 October 7-10; Kings Beach, CA. Murphy, D.D. and P.A.
13	Stine (eds.) General Technical Report PSW-GTR-193. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 287 p.
14	Girvetz E. and Shilling F. (2003). Decision support for road system analysis and modification on the Tahoe National Forest. <i>Environmental Management</i> . 32(2):218-233
15	Shilling, F.M. (2001). Watershed assessment in a Sierra Nevada river basin – Yuba River. Proc. 8 th
16	Biennial Watershed Management Conference, Robert N. Coats (ed.). Univ. California Water Resources Center Report No. 101, pp. 169-175.
17	SELECTED REPORTS TO AGENCIES
18	Shilling, F.M., D. Waetjen, P. Cramer, and K. Harrold. 2017. Remote wireless wildlife camera systems,
19	field testing, & informatics. Report to the Federal Highway Administration. 52 pages Shilling, F.M., 2017. California Abandoned Mines Prioritization Tool. Report to Department of
20	Conservation and Sierra Nevada Conservancy. 14 pages
21	Shilling, F.M., D. Waetjen, K. Taniguchi, T. Grosholz, E. Grijalva, C. Sur, K. Andrews, and A. Ballard. 2017. Using time lapse cameras to track shoreline change due to sea level rise. Report to National
22	Center for Sustainable Transportation, Davis 16 pages Cramer, P., J. Kintsch, K. Gunson, <u>F. Shilling</u> , M. Kenner, and C. Chapman. 2016. Reducing wildlife-
23	vehicle collisions in South Dakota. Final Report to South Dakota Department of Transportation, SD2014-03, Pierre, SD. 185 pages.
24	Shilling, F.M., J. Vandever, K. May, J. Villafranco, K.C. Ward, and D. Waetjen. 2016. State Route 37
25	integrated traffic, infrastructure and sea level rise analysis. Final Report to Caltrans. 116 pages. Shilling, F.M. 2015. Indicator system for the California Forest and Rangeland Assessment, 2015. Report
26	to the California Department of Forestry and Fire Protection. Shilling, F.M., A. Negrette, L. Biondini, and S. Cardenas 2014. California tribes' fish-use: Final Report.
27	Report for the State Water Resources Control Board and the US Environmental Protection Agency.
28	56 pages.
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	5 STATEMENT OF QUALIFICATIONS OF FRASER M. SHILLING, Ph.D.

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1	Shilling, F.M. (2010). Indicator species in the Integrated Natural Resources Management Plan. Final
2	Report to El Dorado County. 124 pages Lee, J.F.J., M. Springborn, S.L. Handy, J.F. Quinn, and <u>F.M. Shilling</u> . 2010. Approach for economic
	valuation of environmental conditions and impacts. Final Report to Caltrans, 123 pages.
3	Shilling, F.M. C. Cornwall, F. Knapczyk, R. Zlomke, D. DiPietro, J. Sharp, R. Adams, J. Hemmert, L.
4	Komoroske, D. Waetjen, A. Hollander, E. Aalto, and K. Keightley (2010) Application and findings
4	of the North Bay-Delta transect watershed assessment framework. Final Report to California Department of Water Resources. 322 pages.
5	Shilling, F.M. E. Aalto, J. Hemmert, A. Hollander, K. Keightley, M. L. Knecht, L. Komoroske, C.
6	Monohan, C. Murray, D. Pickard, M. Porter, D. Waetjen, K. Wieckowski (2010) Sacramento River
0	basin report card and technical report, Feather River basin. Final Report to California Department of
7	Water Resources. 205 pages.
8	Shilling, F.M., M.F. Tognelli, and H.E. Schott (2009). Integrated modeling of wildlife and traffic
8	movement. Report to the UC Berkeley/Caltrans PATH Program. 40 pages Shilling, F.M. (2009) Urban roads ecological performance index. Report to the Korea Institute for
9	Construction Technology. 71 pages
10	Shilling, F.M. and 9 others (2009). Conserving extensive connectivity in an uncertain and contested
10	landscape. Report commissioned by the Wildlife Conservation Society. 20 pages
11	Shilling, F.M., J.H. Viers, M.B. Johnson, R. Hutchinson, H.E. Schott, H. Calinchini, A. Wehrmann
12	(2009). Russian River Pathogen Project – Monitoring design for source detection and load
	quantification. Report to the North Coast Regional Water Quality Control Board. Shilling, F.M. (2009). Characterizing the population at risk for ingesting mercury through fish
13	consumption. Report to the Central Valley Regional Water Quality Control Board.
14	Shilling, F.M., S. Sommer, L. Leonelli, and D. Shimoum (2008). Community-based strategies to reduce
	mercury exposure in Delta fishing communities. Report to the California Department of Public
15	Health and the Central Valley Regional Water Quality Control Board.
16	Shilling, F.M. and J.H. Viers (2008). Russian River Pathogen Project. Report to the North Coast Regional Water Quality Control Board. 36 pages.
	Shilling, F.M. (2008). Yuba strategy project: conceptual and risk models. Report to the South Yuba
17	River Citizens League. 18 pages.
18	Shilling, F.M. (2007). Decision support for recreational route prioritization. Report to the Tahoe
10	National Forest. 10 pages.
19	Meese, R.J., <u>F.M. Shilling</u> , and J.F. Quinn (2007). Wildlife Crossings Guidance Manual. Prepared for the California Department of Transportation. 87 pages.
20	McCord, S.A., <u>F.M. Shilling</u> and others (2007). Localized mercury bioaccumulation study. Report to the
21	Sacramento Regional County Sanitation District. 78 pages.
21	Shilling, F.M., S. Sommarstrom, R. Kattelmann, B. Washburn, J. Florsheim, and R. Henly. California
22	Watershed Assessment Manual, Volume I. (2005) & Volume II (2007). Prepared for the California
23	Resources Agency and CALFED (<u>http://cwam.ucdavis.edu</u>). J. Kennedy, <u>F.M. Shilling</u> , and J.H. Viers (2005). Current and potential riparian forest condition along
	Scott River watershed tributaries. Report to the North Coast Regional Water Quality Control Board.
24	Pp. 52.
25	Shilling, F.M. (2004). Fishing activity analysis in the Sacramento/San Joaquin rivers Delta region.
26	Report for the California Department of Public Health. Shilling, F.M., E.H. Girvetz, C. Erichsen, B. Johnson, and P.C. Nichols (2002). "A Guide to Wildlands
26	Conservation Planning in the Greater Sierra Nevada Bioregion". California Wilderness Coalition,
27	187 p.
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	STATEMENT OF QUALIFICATIONS OF FRASER M. SHILLING, Ph.D.

Shilling, F.M. and 9 co-authors (2002). "Reduction of mercury in the Sacramento River watershed and San Francisco Bay-Delta". Delta Tributaries Mercury Council. 119 p.

2 Shilling, F.M. (2002). Doing roads analysis with a GIS-based decision-support system. A manual for USFS technical staff conducting road system analysis. 42 pages.

Shilling, F.M. (2001). State of the Yuba: An assessment of the Yuba River watershed. Report to the South River Citizens League. 73 pages.

CONFERENCE and INVITED PRESENTATIONS

Mr. Shilling has prepared and delivered presentations at conferences of the: American Planning Association, American Society of Limnology and Oceanography, American Society of Zoologists/Society for Integrative and Comparative Biology, American Society for Cell Biology, Gordon Conferences, Ecological Society of America, International Conference on Ecology and Transportation, Transportation Research Board, Infra Eco-Network Europe, Life Strade Project (Italy), National Congress of American Indians, National Water Quality Monitoring Council, Bay-Delta Science Conference, Marine Biological Laboratory, The Wildlife Society, Sierra Nevada Alliance, California Aquatic Bioassessment Workgroup, Great Valley Center, California Rangeland Coalition, Salmon Restoration Federation, California Association of Resource Conservation Districts, Korea Institute for Construction Technology, and other regional symposia, conferences, and workshops.