

**E. ASHLEY STEEL**

PNW Research Station, USDA Forest Service  
400 North 34<sup>th</sup> Street, Suite 201, Seattle, WA 98103  
asteel@fs.fed.us, (206) 732-7823

**Supervisory Statistical Scientist**, USDA Forest Service, PNW Research Lab, WA, OR, AK

**Assistant Affiliate Professor**, School of Ocean and Fishery Sciences, College of the Environment,  
University of Washington, Seattle, WA

**Assistant Affiliate Professor**, Statistics Department, College of Arts and Sciences, University of  
Washington, Seattle, WA

**Affiliate Faculty**, Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR

#### **EDUCATION:**

1999 Ph.D. Quantitative Ecology, University of Washington  
1996 M.S. Statistics, University of Washington  
1993 M.S. River Ecology, College of Forest Resources, University of Washington  
1988 B.A. Sociology, with Distinction, Duke University

#### **HONORS AND AWARDS:**

2010 Station Director's Award for Excellence in Science Support, PNW Research Lab  
2007 Fulbright Fellowship Award for research and lecturing in Vienna, Austria  
2005 Outstanding Federal Employee, Seattle Federal Executive Board  
2003 Bronze Medal Award, Department of Commerce  
1994 Luce Fellowship to spend one year in Asia

#### **PROFESSIONAL EMPLOYMENT:**

2009 – Present Statistical consulting in research design, model sensitivity analyses, and data analysis. Conducting research to quantify riverine thermal regimes and to understand the biological impacts of altered riverine thermal regimes; to model landscape impacts to riverine systems; and to harness correlation structures induced by river networks in data analysis.

1999- 2009 Research Scientist, Landscape Ecology and Recovery Science Team Lead: Watershed Program, NW Fisheries Science Center, NOAA Fisheries, Seattle, WA.

1998 - 1999 Research Assistant: National Research Center for Statistics and the Environment, University of Washington, Seattle, WA. Designed and taught a curriculum on the scientific method for 5<sup>th</sup>-7<sup>th</sup> graders.

1996 - 1999 Statistical Consultant: Cascadia Consulting Group, Seattle, WA. Developed sampling plans and analyzed data for waste management projects.

#### **PEER REVIEWED PUBLICATIONS**

Polivka, K.M., **E.A. Steel**, and J.L. Novak. 2015. Juvenile salmon and steelhead occupancy of stream pools treated and not treated with restoration structures, Entiat River, Washington. *Canadian Journal of Fisheries and Aquatic Sciences* 72:1-9.

Barbero, R., J.T. Abatzoglou, **E.A. Steel**, and N.L. Larkin. 2014. Modeling very large fire occurrences over the continental United States from weather and climate forcing. *Environmental Research Letters* 9:124009.

Stavros, E.N., J. Abatzoglou, N. K. Larkin, D. McKenzie, and **E.A. Steel**. 2014. Climate and very large wildfire fires in the contiguous western USA. *International Journal of Wildfire* 23:899-914.

Baker, T.P., G.J. Jordan, **E.A. Steel**, N.M. Fountain-Jones, T.J. Wardlaw, and S.C. Baker. 2014. Microclimate through space and time: Microclimate variation at the edge of regeneration

- forests over daily, yearly, and decadal time scales. *Forest Ecology and Management* 334:174-184.
- Olson, D.H., J.B. Leirness, P.G. Cunningham, and **E.A. Steel**. 2014. Riparian buffers and forest thinning: Effects on headwater vertebrates 10 years after thinning. *Forest Ecology and Management* 321: 81-93.
- D.J. Isaak, Peterson, E.E. J.M. Ver Hoef, S.J. Wenger, J.A. Falke, C.E. Torgersen, Sowder, C., **E.A. Steel**, M.J. Fortin, C.E. Jordan, A.S. Ruesch, N. Som, and P. Monestiez. 2014. Applications of spatial statistical network models to stream data. *WIRES – Water* 1(3): 277-294.
- Steel, E.A.**, M.C. Kennedy, P.G. Cunningham, and J.S. Stanovick. 2013. Applied statistics in ecology: common pitfalls and simple solutions. *Ecosphere* 4:115. Available at <http://www.esajournals.org/doi/abs/10.1890/ES13-00160.1>
- Peterson, E.E. J.M. Ver Hoef, D.J. Isaak, J.A. Falke, M.J. Fortin, C.E. Jordan, K. McNyset, P. Monestiez, A.S. Ruesch, A. Sengupta, N. Som, **E.A. Steel**, D.M. Theobald, C.E. Torgersen, and S.J. Wenger. 2013. Modelling dendritic ecological networks in space: an integrated network perspective. *Ecology Letters* 16: 707-719.
- Hummel, S., M. Kennedy, **E.A. Steel**. 2013. Assessing forest vegetation and fire simulation model performance after the Cold Springs wildfire, Washington, USA. *Forest Ecology and Management* 287:40-52.
- Steel, E.A.**, A. Tillotson, D.A. Larsen, A.H. Fullerton, K.P. Denton, and B.R. Beckman. 2012. Beyond the mean: The role of variability in predicting ecological impacts of stream temperature. *Ecospheres* 3: 104. Available at <http://www.esajournals.org/doi/pdf/10.1890/ES12-00255.1>
- Sowder, C. and **E.A. Steel**. 2012. A note on the collection and cleaning of water temperature data. *Water* 4:597-606. Available at <http://www.mdpi.com/2073-4441/4/3/597>
- Seidl, R., T.A. Spies, W. Rammer, **E.A. Steel**, R.J. Pabst, K. Olsen. 2012. Multi-scale drivers of spatial variation in old-growth forest carbon density disentangled with Lidar and an individual-based landscape model. *Ecosystems* 15:1321-1335.
- Steel, E.A.**, D.W. Jensen, K.M. Burnett, K. Christiansen, J.C. Firman B.E. Feist, K. Anlauf, and D.P. Larsen. 2012. Landscape characteristics and coho salmon (*Oncorhynchus kisutch*) distributions: explaining abundance versus occupancy. *Canadian Journal of Fisheries and Aquatic Sciences* 69: 457-468.
- Anlauf, K.J., Jensen, D.W., **Steel, E.A.**, Burnett, K.B., Christiansen, K., Firman, J.C., Feist, B.E. and Larsen, D.P. 2011. Explaining spatial variability in stream habitats using both natural and management-influenced landscape predictors. *Aquatic Conservation* 21: 704-714.
- Fullerton, A.H., S.T. Lindley, G.R. Pess, B.E. Feist, **E.A. Steel**, and P. McElhany. 2011. Human influence on the spatial structure of threatened Pacific salmon metapopulations. *Conservation Biology* 25(5): 932-944.
- Firman, J.C., **E.A. Steel**, D.W. Jensen, K.M. Burnett, K. Christiansen B.E. Feist, and D.P. Larsen. 2011. Landscape models of adult coho salmon density examined at four spatial extents. *Transactions of the American Fisheries Society*, 140: 440-455.
- Lucero, Y., **E.A. Steel**, K.M. Burnett, K. Christiansen. 2011. Untangling human development and natural gradients: Implications of underlying correlation structure for linking landscapes and riverine ecosystems. *River systems* 19(3): 207-224.
- Steel, E.A.**, R.M. Hughes, A.H. Fullerton, S. Schmutz, J.A. Young, M. Fukushima, S. Muhar, M. Poppe, B.E. Feist, and C. Trautwein. 2010. Are we meeting the challenges of landscape-scale riverine research? A review. *Living Reviews in Landscape Research* 4. Available at <http://landscaperesearch.livingreviews.org/Articles/lrlr-2010-1/>
- Fullerton, A.H., K.M. Burnett, **E.A. Steel**, R.L. Flitcroft, B.E. Feist, C.E. Torgersen, D.J. Miller, B.L. Sanderson. 2010. Hydrological Connectivity for Riverine Fish: Measurement Challenges and Research Opportunities. *Freshwater Biology*, 55:2215-2237

- Feist, B.E., **E.A. Steel**, D.W. Jensen and D.N.D Sather. 2010. Does the scale of our observational window affect our conclusions about correlations between endangered salmon populations and their habitat? *Landscape Ecology* 25(5): 727–743
- Fullerton, A.H., **A. Steel**, Y. Caras, and I. Lange. 2010. Effects of spatial pattern and economic uncertainties on freshwater habitat restoration planning: a simulation exercise. *Restoration Ecology* 18(S2):354-369.
- Fullerton, A.H., D. Jensen, **E.A. Steel**, D. Miller, and P. McElhany. 2010. How certain are salmon recovery forecasts? A watershed-scale sensitivity analysis. *Environmental Modeling and Assessment* 15(1):13-26.
- McElhany, P., **E.A. Steel**, D. Jensen, K. Avery, N. Yoder, C. Busack and B. Thompson. 2010. Dealing with uncertainty in ecosystem models: lessons from a complex salmon model. *Ecological Applications* 20:465-482.
- Jensen, D.W., **E.A. Steel**, A.H. Fullerton, and G.R. Pess. 2009. Impact of fine sediment on egg-to-fry survival of Pacific salmon: a meta-analysis of published studies. *Reviews in Fisheries Biology* 17(3): 348-359.
- Sanderson, B.L., C.D. Tran, H. Coe, V. Pelekis, **E.A. Steel**, W.L. Reichert. 2009. Non-lethal sampling of fish caudal fins yields valuable stable isotope data for threatened and endangered fishes. *Transactions of the American Fisheries Society*, 138:1166-1177.
- E.A. Steel**, P. McElhany, N.J. Yoder, M.D. Purser, K. Malone, B.E. Thompsen, K.A. Avery, D. Jensen, G. Blair, C. Busack, M.D. Bowen, J. Hubble, T. Kantz, L. Mobrand. 2009. Making the best use of modeled data: Multiple approaches to sensitivity analysis. *Fisheries* 34 (July): 330-339.
- Fullerton, A., **E.A. Steel**, Y. Caras, M. Sheer, P. Olson, and J. Kaje. 2009. Putting watershed restoration in context: alternative future scenarios influence management outcomes. *Ecological Applications* 19:218-235.
- Angilletta, M.J. Jr., E.A. Steel, K.K. Bartz, J.G. Kingsolver, M.D. Scheuerell, B.R. Beckman, L.G. Crozier. 2008. Big dams and salmon evolution: changes in thermal regimes and their potential evolutionary consequences. *Evolutionary Applications* 1:286-289.
- Courbois, J., S. Katz, C. Jordan, M. Rub, **E.A. Steel**, R.F. Thurow, and D.J. Isaak. 2008. Sampling strategies for chinook-salmon spawning populations. *Canadian Journal of Fisheries and Aquatic Sciences* 65:1814-1830.
- E.A. Steel**, A.H. Fullerton, Y. Caras, M.B. Sheer, P. Olson, D.W. Jensen, J. Burke, M. Maher, and P. McElhany. 2008. A spatially explicit decision support system for watershed-scale management of salmon. *Ecology and Society* 13 (2): 50. [online] URL: <http://www.ecologyandsociety.org/vol13/iss2/art50/>
- Fukushima, M., S. Kameyama, M. Kaneko, K. Nakao, and E.A. Steel. 2007. Modelling the effects of dams on freshwater fish distributions in Hokkaido, Japan. *Freshwater Biology* 52:1511-1524.
- Steel, E.A.** and I.A. Lange. 2007. Alteration of water temperature regimes at multiple scales: Effects of multi-purpose dams in the Willamette River basin. *River Research and Applications* 23:351-359.
- Sheer, M.B. and **E.A. Steel**. 2006. Lost watersheds: barriers, aquatic habitat connectivity, and species persistence in the Willamette and Lower Columbia basins. *Transactions of the American Fisheries Society* 135:1654-1669.
- Greene, C.M., G.R. Pess, E. Beamer, **E.A. Steel**, and D.W. Jensen. 2005. Effects of environmental conditions during stream, estuary, and ocean residency on Chinook salmon return rates in the Skagit River, WA. *Transactions of the American Fisheries Society* 134:1562-1581.
- Steel, E.A.**, B.E. Feist, D. Jensen, G.R. Pess, M. Sheer, J. Brauner, and R.E. Bilby. 2004. Landscape models to understand steelhead (*Oncorhynchus mykiss*) distribution and help prioritize barrier removals in the Willamette basin, OR, U.S.A. *Canadian Journal of Fisheries and Aquatic Sciences* 61:999-1011.
- Liermann, M., **E.A. Steel**, M. Rosing, and P. Guttorp. 2004. Random denominators and the analysis of ratio data. *Journal of Environmental and Ecological Statistics* 11:55-71.

- Steel, E.A.,** K.A. Kelsey, J. Morita. 2004. The Truth about Science: A middle school curriculum teaching the scientific method. *Journal for Environmental and Ecological Statistics* **11**:21-29.
- Feist, B.E., **E.A. Steel**, G.R. Pess, and R.E. Bilby. 2003. The influence of scale on salmon habitat restoration priorities. *Animal Conservation* **6**:271-282.
- Steel, E.A.** and S. Neuhauser. 2002. A comparison of methods for measuring water clarity. *Journal of the North American Benthological Society*, **21**: 326-335.
- Pess, G.R., D.R. Montgomery, R.E. Bilby, **E.A. Steel**, B.E. Feist, and H.M. Greenberg. 2002. Correlation of landscape characteristics and land use on coho salmon (*Oncorhynchus kisutch*) abundance, Snohomish River, Washington State, USA. *Canadian Journal of Aquatic and Fisheries Science*. **59**:613-623.
- Steel, E.A.,** P. Guttorp, J.J. Anderson, and D.C. Caccia. 2001. Modeling juvenile salmon migration using a simple Markov chain. *Journal of Agricultural, Biological, and Environmental Statistics* **6**: 80-88.
- Steel, E.A.,** R.J. Naiman, and S. D. West. 1999. Use of woody debris piles by birds and small mammals in a riparian corridor. *Northwest Science* **73**:19-26.

### BOOKS

- K. Kelsey and **A. Steel**. 2002. *The Truth About Science: A Curriculum for Developing Young Scientists*. National Science Teachers Association Press, Arlington, VA. 226 pp.

### BOOK CHAPTERS

- Steel, E.A.,** T. J. Beechie, M. H. Ruckleshaus, A. H. Fullerton, P. McElhany, and P. Roni. 2009. Mind the gap: Uncertainty and model communication between managers and scientists. Pages 357-372 in E. E. Knudsen and J. H. Michael Jr., editors. Pacific salmon environmental and life history models: advancing science for sustainable salmon in the future. American Fisheries Society, Symposium 71, Bethesda, Maryland.
- Burnett, K.M., C.E. Torgersen, **E.A. Steel**, D.P. Larsen, J.L. Ebersole, R.E. Gresswell, P.W. Lawson, D.J. Miller, J.D. Rodgers. *In press*. Data and Modeling Tools for Assessing Landscape-Level Influences on Salmonid Populations: Examples from Western Oregon. *Proceedings of Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative (AYK-SSI) Conference 2006*.
- McElhany, P., **E. A. Steel**, D. Jensen, and K. A. Avery. 2009. Uncertainty in a complex habitat model. Pages 339-356 in E. E. Knudsen and J. H. Michael Jr., editors. Pacific salmon environmental and life history models: advancing science for sustainable salmon in the future. American Fisheries Society, Symposium 71, Bethesda, Maryland.
- Roni, P., M. Liermann, C.E. Jordan, and **E.A. Steel**. 2005. Steps for designing a monitoring and evaluation program for aquatic restoration. In P. Roni (Ed.), *Monitoring stream and watershed restoration*, American Fisheries Society, Bethesda, MD., pp 13-34.
- Roni, P., M. Liermann, and **E.A. Steel**. 2003. Monitoring and evaluating fish responses to instream restoration. In D.R. Montgomery, S. Bolton, D. B. Booth, and L. Wall (editors), *Restoration of Puget Sound Rivers*, University of Washington Press, Seattle, WA., pp 318-339.
- Steel, E.A.,** W.H. Richards, and K.A. Kelsey. 2003. Wood and wildlife: Benefits of river wood to terrestrial and aquatic vertebrates? *American Fisheries Society Symposium* **37**:235-247.
- Naiman, R.J., T.J. Beechie, L.E. Benda, D.R. Berg, P.A. Bisson, L.H. MacDonald, M.D. O'Connor, P.L. Olsen and **E.A. Steel**. 1993. Fundamental elements of ecologically healthy watersheds in the Pacific Northwest coastal ecoregion. In R.J. Naiman and J.R. Sedell, editors. *New Perspectives for Watershed Management*. Springer-Verlag, New York.

### OTHER PUBLICATIONS

- Oliver, M. with **Steel, E.A.** and B. Beckman. July 2014. Stream Temperature Variability: Why it Matters to Salmon. PNW Research Station Science Findings.

- Bisson, A.B., S.M. Claeson, S.M. Wondzell, A.D. Foster, and **A. Steel**. 2013. Evaluating headwater stream buffers: Lessons learned from watershed-scale experiments in Southwest Washington. Pgs 169-188 in Anderson, P.D. and K.L. Ronnenberg, eds. *Density Management in the 21<sup>st</sup> Century; west side story*. Gen. Tech. Rep. PNW-GTR-880. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 249 p. Available at <http://www.treesearch.fs.fed.us/pubs/44785>.
- O'Callaghan, J. with **Steel, E.A.** and K.M. Burnett. February 2012. Thinking Big: Linking Rivers to Landscapes. PNW Research Station Science Findings. Available at <http://www.fs.fed.us/pnw/science/scifi139.pdf>
- E. Ashley Steel**. 2009. Is science really a verb? Educating through scientific thinking. *Bulletin of the American Meteorological Society*, April: 442-443.
- E.A. Steel**, A.H. Fullerton, Y. Caras, M.B. Sheer, P. Olson, D.W. Jensen, J. Burke, M. Maher, D. Miller, and P. McElhany. 2007. Lewis River Case Study Final Report: A decision-support tool for assessing watershed-scale habitat recover strategies for ESA-listed salmonids. Northwest Fisheries Science Center, NOAA, 2725 Montlake Blvd East, Seattle, WA 98112. Available at <http://www.nwfsc.noaa.gov/research/divisions/fed/wpg/documents/lrcs/LewisRiverCaseStudyFinalReport.pdf>
- Maher, M., M.B. Sheer, **E.A. Steel**, and P. McElhany. 2005. Atlas of Salmon and Steelhead Habitat in the Oregon Lower Columbia and Willamette Basins. Northwest Fisheries Science Center, NOAA, 2725 Montlake Blvd East, Seattle, WA 98112.
- Steel, E.A.**, M.C. Liermann, P. McElhany, N.L. Scholz, A.C. Cullen. 2003. Uncertainty in habitat recovery planning. . In Beechie, T. J., P. Roni, and E.A. Steel (Editors). *Ecosystem Recovery Planning for Listed Salmon: Assessment Approaches for Salmon Habitat*, NOAA Tech. Memo. NMFS-NWFSC-58, pgs 74-89.
- Beechie, T. J., **E.A. Steel**, P. Roni, and E. Quimby (editors). 2003. Ecosystem recovery planning for listed salmon: An integrated assessment approach for salmon habitat. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-58, 183 p.
- Sanderson, B.L., **E.A. Steel**, T.J. Beechie, G.R. Pess, M.B. Sheer, and C.A. Campbell. 2003. Analyses for Phase I recovery planning: setting recovery goals. In Beechie, T. J., P. Roni, and E.A. Steel (Editors). *Ecosystem Recovery Planning for Listed Salmon: Assessment Approaches for Salmon Habitat*, NOAA Tech. Memo. NMFS-NWFSC-58, Pages 18-39
- Steel, E.A.**, L. Johnston, B.E. Feist, G. Pess, R.E. Bilby, D. Jensen, T. Beechie, and J. Myers. 2003. Pacific salmon recovery planning and the Salmonid Watershed Analysis Model (SWAM): a broad-scale tool for assisting in the development of habitat recovery plans. *Endangered Species Update*. 20(1):1-32.
- Steel, E.A.** and M. B. Sheer. 2002. Appendix I: Broad-Scale Habitat Analyses to Estimate Fish Densities for Viability Criteria. In Willamette/Lower Columbia Technical Recovery Team, *Interim Report on Viability Criteria for Willamette and Lower Columbia Basin Pacific Salmonids*. Available through the Northwest Fisheries Science Center, 2725 Montlake Blvd. East, Seattle, WA 98112.
- Steel, E.A.** 1999. Effects of temperature and water clarity on juvenile hatchery chinook salmon migration patterns. In R.Sakrison and P. Sturtevant (Editors). *Watershed Management to Protect Declining Species*. American Water Resources Association, Middleburg, VA, TPS-99-4, 561 pp.
- Steel, E.A.** 1999. In-stream factors affecting juvenile chinook salmon migration. Dissertation, University of Washington, Seattle, WA.
- Kelsey, K.A., J. Erickson, E. Martin-Yanny, S. Nickelson, C. Quade, **E.A. Steel** and A. Stringer. 1993. Book Review of *Wildlife and Vegetation of Unmanaged Douglas-Fir Forests*. Ruggerio, L.F., Aubry, K.B., Carey, A.B., and M.H. Huff (eds). U.S.D.A. Forest Service, PNW-GTR-285, May 1991. *Northwestern Naturalist* 73:88-89

## **SYNERGISTIC ACTIVITIES**

Landscape impacts to river systems: Developing and integrating statistical and spatial analyses to link land-use and landform to in-river conditions. Pess et al. (2004), Feist et al. (2005) and Steel et al. (2006) summarized initial analyses and communicated them to scientific audiences. Led special session at International Congress of IALE (2006), first-authored invited synthesis manuscript for Living Reviews in Landscape research (Steel et al. 2010), and invited travel to present to USGS (2007). Two NWFSC Internal Grants and one OWEB grant (co-author) totaling 264,832K. Awarded Fulbright Fellowship for research and teaching in Vienna Austria. Published series of three related manuscripts describing coho salmon and their habitats on Oregon Coast (Firman et al. 2011; Anlauf et al. 2011; Steel et al. 2012).

Incorporating uncertainty in natural resource decision-making. Coordinated 12 person, multi-agency team to conduct sensitivity analysis of complex and commonly used model; led to 2 manuscripts; *Fisheries Magazine* for a more general science audience and *Ecological Applications*. Taught two seminar courses at University of Washington (Scientific Information in Environmental Decision Making (2005) and The Role of Habitat in Salmon Recovery Planning: Using scientific Information in Environmental Policy (2001); book chapter and Tech Memo chapters explaining uncertainty and citing examples of better ways to incorporate it into decision-making. Development of spatially explicit, multi-model decision-support system for Lewis River that has led to multiple presentations and 4 published manuscripts. Member of Program Committee, North American Regional TIES (The International Environmetrics Society) Conference, Seattle, WA, June 2007; organized and chaired special session on The Role of Statistics in Environmental Policy. Co-authored model sensitivity analysis of FVS-FFE, a large forest vegetation model with wildfire extension and coordinated winter seminar series on model sensitivity analysis at PNW lab.

Teaching the scientific method: Published curriculum (K. Kelsey and A. Steel. 2002. *The Truth About Science: A Curriculum for Developing Young Scientists*. National Science Teachers Association Press, Arlington, VA. 226 pp.) and Ecology by Inquiry, a series of lessons teaching fundamental ecological concepts. Available at <http://www.nwfsc.noaa.gov/education/>. Awarded 3 Discuren Foundation grants and 1 NOAA Education mini-grant (107,596K). Taught UW extension course for teachers (Teaching the Scientific Method 2007) and multiple professional development workshops through school districts. Teaching set of workshops on “What is a model?” for forest and agriculture extension agents in association with lectures on climate change modeling. Taught science method workshop through WA State Science and Engineering Fair (2010, 2011, 2012); organized a prize in statistical thinking.

## **SELECTED PRESENTATIONS**

- Stream temperature variability over time and space. Invited presentation, The International Environmetrics Society, Anchorage, AK, June 2013.
- Statistical pitfalls: Errors in calculation versus contemplation. Invited presentation, The International Environmetrics Society, Anchorage, AK, June 2013.
- Beyond the mean: The importance of thermal variance in predicting Chinook salmon emergence timing. Ecological Society of America Annual Meeting, Portland, OR. August 2012.
- Experiments on Altered Thermal Regimes during Early Life Stages of Chinook Salmon. Salish Sea Ecosystem Conference, Vancouver BC, Canada, October 2011.
- Experiments on Altered Thermal Regimes during Early Life Stages of Chinook Salmon. American Fisheries Society Annual Meeting, Seattle, WA, September 2011.
- Science is a Verb: Teaching the Process of Scientific Thinking. Invited presentation, American Fisheries Society Annual Meeting, Seattle, WA, September 2011.
- Harnessing and communicating uncertainty in forest and fish management. Invited presentation, WNAR. Seattle, WA, June 2010.
- Landscape scale drivers of riverine condition: Untangling human impacts and natural gradients. North American Benthological Society Meeting. Sante Fe, June 2010.

- Riverine Thermal Regimes: Human alterations and biological consequences. Institut für Hydrobiologie und Gewässermanagement, Department Wasser - Atmosphäre – Umwelt, BOKU - Universität für Bodenkultur, Vienna, Austria. May 2010.
- Landscapes and spawning coho salmon. Joint Statistical Meetings. Washington DC. August 2009.
- Landscapes and spawning coho salmon. The International Environmetrics Society (TIES) North American Meeting, Corvallis, OR. June 2009.
- Riverine thermal regimes: Human alterations and biological consequences. Oregon Chapter, American Fisheries Society Annual Meeting, Bend, OR. April 2009.
- Uncertainty in decision-making: Communicating probabilities that meet a management need. 4<sup>th</sup> ECRR International Conference on River Restoration, Venice, Italy, June 2008.
- Large scale approaches to river research and management: A double feature from the Pacific Northwest, USA. Institut für Hydrobiologie und Gewässermanagement, Department Wasser - Atmosphäre – Umwelt, BOKU - Universität für Bodenkultur, Vienna, Austria. March 2008.
- Landscape ecology and recovery science. Invited presentation to the Biological Resources Division of USGS, Leetown Science Center, Leetown WV. November 2007.
- Mind the gap: Communicating quantitative information for use in decision-making. Invited presentation. Agroclimate Risk Workshop. Regina, Canada. June 2007.
- Mind the Gap. Invited presentation to the first meeting of Climate Research Group, funded by PIMS, at Semiyahoo, Blaine, WA. January 2007.
- Evaluating Freshwater Habitat Options for Conservation of Listed Salmonids in the Lewis River Watershed. Department of Ecology, Olympia, WA. June 2006.
- Landscape characteristics and Pacific salmon: Consistent patterns across watersheds and their management applications. North American Benthological Society annual meeting in Anchorage, AK. June 2006.
- Mind the gap: Making the most of models in fisheries management. Invited presentation. American Fisheries Society, Anchorage AK, September 2005.
- Landscape characteristics and Pacific salmon: Consistent patterns across watersheds and their management applications. Invited presentation. American Fisheries Society, Anchorage AK, September 2005.
- Linkages between climate, geology, land-use and Pacific salmon spawning habitat. American Society of Limnology and Oceanography, Santiago de Compostela, Spain, June 2005.
- Landscape Analyses for Endangered Salmon: A double feature. Food and Agriculture Organization of the United Nations, Rome, Italy, July 2005.
- Doing and assessing authentic scientific research. National Science Teachers Association, Seattle, WA, November 2004.
- Landscape analyses for understanding and managing freshwater ecosystems. World Fisheries Congress, Vancouver B.C. Canada, May 2004.
- Landscape characteristics and Pacific salmon: Consistent patterns across watersheds and their management applications. Landscape Ecology (IALE) Las Vegas NV, March 2004
- Landscape characteristics and Pacific salmon: consistent patterns across watersheds and their management applications. Western Division American Fisheries Society Annual Meeting, Salt Lake City, UT, March, 2004.
- Current, future, and potential landscapes: integrating field data, models, and remotely sensed data to estimate effects of management actions on chinook salmon in the Lewis River watershed. Western Division American Fisheries Society Annual Meeting, Salt Lake City, UT, March, 2004.
- Landscape Analyses for Recovery Planning: Big questions over big spaces. US EPA, Corvallis, OR, November 2003.
- Big questions over big areas: a simple framework for multiple landscape-scale analyses. Special session presentation, American Fisheries Society Annual Meeting, Quebec City, QC, August, 2003.

- Identifying relationships between broad-scale habitat characteristics and listed Pacific salmon abundance: use and misuse of models in recovery planning. Invited Departmental Seminar at the University of Michigan, April 2002.
- Salmonid Watershed Assessment Model (SWAM): A hierarchical model to predict salmon abundance. Invited Seminar. Cornell University, February 2001.
- Wood and Wildlife: How does riparian and in-stream riverwood benefit terrestrial and aquatic vertebrate communities? Invited Presentation, Wood in World Rivers, Corvallis, OR, October 2000.
- Linking Spatially-Explicit Steelhead (*Oncorhynchus mykiss*) Abundance Records to Habitat Characteristics in the Willamette River Basin Using a Hierarchical Statistical Model, Western Division American Fisheries Society, Telluride, CO, July 2000.
- A Comparison of Methods for Measuring Water Clarity. North American Benthological Society, Keystone, CO, May 2000.
- Modeling Juvenile Salmonid Migration using a Simple Markov Chain. WNAR International Biometrics Society, San Diego, CA, June 1998.
- Trang River Community Monitoring Network. Phase I: Generating Awareness and Baseline Data. Prince of Songkla University, Hat Yai, Thailand, March 1995
- Woody Debris Piles: Important Microhabitat in the Riparian Zone. International Workshop on Ecology and Management of Aquatic-Terrestrial Ecotones, Seattle, WA, February 1994.

### TEACHING EXPERIENCE

- Selected Topics of Aquatic Ecology and River Management, undergraduate/graduate. BOKU - Universität für Bodenkultur, Vienna, Austria. Spring 2008.
- Impacts of Large-Scale Landscape Patterns on Riverine Ecosystems, graduate. BOKU - Universität für Bodenkultur, Vienna, Austria. Spring 2008.
- Gewässerökologisches Seminar, co-instructor, graduate/undergraduate seminar. BOKU - Universität für Bodenkultur, Vienna, Austria. Spring 2008.
- Teaching the scientific method. In-service teachers, 3 credits. U Washington Extension, Seattle, WA. Winter 2007.
- Non-parametric statistics, undergraduate/graduate, 3 credits, U Washington, Seattle, WA. Spring 2006.
- Scientific Information in Environmental Decision Making, graduate seminar, 2 credits, School of Fisheries and Aquatic Science, U Washington, Seattle, WA. Spring 2005.
- The Role of Habitat in Salmon Recovery Planning: Using scientific information in environmental policy. undergraduate/graduate, 2 credits, Program on the Environment, U Washington, Seattle, WA. Spring 2001.

### GRANTS

- Participating partner for international cooperation on “LANPREF: Landscape - pressure - fish – cascades.” 223,188EUR. Awarded to Dr. Stefan Schmutz by The Austria Science Fund (FWF – fwf.ac.at), May 2009.
- "From experiments to landscapes: Physiological, behavioral, and ecological consequences of altered thermal regimes during Chinook salmon incubation." \$44,716. Competitive internal grants program, NW Fisheries Science Center, NOAA Fisheries, March 2008
- Cooperator on “Using Measures of Freshwater Habitat Connectivity for Conservation Planning.” \$27,944. Awarded to Aimee Fullerton through competitive internal grants program, NW Fisheries Science Center, NOAA Fisheries, March 2008
- “Integrated dynamic landscape and coho salmon model.” \$169,463. Oregon Watershed Enhancement Board (OWEB), October 2007. (Co-lead)

“NOAA Research as a model of the scientific method: Teaching teachers both scientific process and science content.” \$36,596. First all-NOAA education grant program (8 funded proposals of >130 proposals submitted), May 2006.

“Landscape structure versus content: Impacts of large-scale land-use on salmon and their habitats”. \$50,653. Competitive internal grants program, NW Fisheries Science Center, NOAA Fisheries, March 2005.

“Dissemination of The TRUTH About Science,” written with Kathryn Kelsey. \$25,000. Funding awarded by the Discuren Foundation to the Alliance for Education, November 1999.

“The TRUTH About Science – Phase II,” written with Kathryn Kelsey. \$5000. Funding awarded by the Discuren Charitable Foundation to the University of Washington, August 1999.

“Proposal to Design and Implement an Environmental Research Curriculum,” written with Kathryn Kelsey and June Morita. \$41,000. Funding awarded by both the by Discuren Charitable Foundation and the National Research Center for Statistics and the Environment, June 1998.

## **PROFESSIONAL AND COMMUNITY SERVICE**

Presented three full day workshops “Managing for Uncertainty: All climate change models may be wrong, but they are useful” to Forestry and Agricultural Extension Agents, October 2010 (Wenatchee WA), November 2010 (Corvallis, OR), and May 2012 (Asheville NC) at the Association of Natural Resource Education Professionals (ANREP) Annual Meeting.

Organized and co-chaired special session on Climate Change and Pacific Salmonids at the American Fisheries Society Annual Meeting, Seattle, WA 2011.

Co-hosted 2-day workshop on R. PNW Research Station, USDA Forest Service, Spring 2011.

Organized lecture series on Model Sensitivity Analysis (Winter 2011) and Bayesian Analysis (Winter 2012), PNW Research Station, USDA Forest Service.

Taught 3-lecture workshop on permutation testing. PNW Research Station, USDA Forest Service, Fall 2010.

Quantitative Ecology and Resource Management (QERM) Curriculum Committee. 2010

Editorial Board, *River Systems*. 2009 - Present

Organized and chaired special session on Landscapes and Rivers at IALE World Congress, The Netherlands, July 2007.

Program Committee, North American Regional TIES (The International Environmentrics Society) Conference, Seattle, WA, June 2007. Organized and chaired special session on The Role of Statistics in Environmental Policy.

Reviewer for Infrastructure section of “Landscape ecology in the Dutch context: nature, town, and infrastructure,” March 2007. Published by KNNV Publishing, The Netherlands.

Led workgroup on evolutionary consequences of anthropogenic changes in flow and temperature regimes to ESA-listed salmonids at the Salmon and Evolutionary Biology workshop, Seattle, WA, November 2006.

Member of Willamette, Lower Columbia Technical Recovery Team, 2002 – 2006.

Member of The Nature Conservancy advisory group, 2004.

Organized and chaired special session on freshwater restoration at American Fisheries Society Annual Meeting, Anchorage AK, September 2005.

Organized Watershed Program Open House. NW Fisheries Science Center, Seattle, WA, January 2001, March 2002, October 2003, October 2005, November 2007.

Hosted the Winter Monster Jam Seminar Series at NW Fisheries Science Center, Seattle, WA, Winter 2003.

Organized and chaired special session, Analysis of Ratio and Compositional Data (Sponsored by the Environmental Statistics section of the American Statistical Association) at the Joint Statistical Meetings, New York, NY, August 2002.

Organized and chaired special session, Role of Freshwater Habitat in Recovery Planning. Symposia at Western Division of the American Fisheries Society meeting, Spokane, WA, April 2002.

Reviewed manuscripts for *Canadian Journal of Fisheries and Aquatic Sciences*, *River Research and Applications*, *Transactions of the American Fisheries Society*, *North American Journal of Fisheries Management*, *Journal of Environmental Management*, *Journal of Computational and Graphical Statistics*, *Forest Science*, *Ecological Applications*, *Proceedings of the National Academy of Sciences*, *Ecological Modeling*, *Water SA*, *Hydrological Processes*, *Journal of the Royal Society Interface*, *Envirometrics*, *Global Change Biology*, *Environmental Modelling & Software*.

Reviewed proposals for *Wiley-Blackwell* (Book Publisher), Special Technology Development Program (USFS), Bureau of Land Management, Royalty Research Fund (University of Washington).

### **K-12 and SCIENCE EDUCATION**

Co-founder and co-director of Scientific Inquiry and Research Council (SIRC), a non-profit 501(c)3 corporation to foster inquiry-based scientific education. 1999 – Present.

Judge at the Seattle School District, Middle School Science Fair, Seattle, WA May 2010.

Judge at the Washington State Science and Engineering Fair, Bremerton WA. April 2010.

Taught 10 week after school program on creating a high quality science fair project at Mercer Middle School, Seattle, WA, Winter 2011.

Taught one-day workshop on The Process of Science Inquiry at Washington State Science and Engineering Fair, Bremerton, WA, March 2010, April 2011.

Collaborator on systems education grant at Center for Inquiry Studies, Institute for Systems Biology, funded through Howard Hughes Medical Foundation. As part of grant, co-taught 2 weeklong professional development workshops for teachers from the Renton School District, WA June 2009 and June 2010.

Kelsey, K. and **A. Steel**. Ecology by Inquiry. A series of lessons teaching fundamental ecological concepts. Available at <http://www.nwfsc.noaa.gov/education/>

Presented one-day workshop on aquatic insects at Expanding Youth Horizons (with Sarah Morley), Seattle, WA. April 2002, April 2003, March 2004.

Co-Taught scientific methods workshop for NSF-funded REVEL program, University of Washington, June 2003.

Guest scientist at NSF-Funded Summer Institute for Teachers, workshop on teaching the scientific method. August 2002, August 2007.

Lectured on asking scientific questions and teaching the scientific methods to University of Washington teacher training class, July 2001 and July 2002.

Taught 1-day statistics workshop for Seattle Public Schools middle-school science teachers using The Truth About Science curriculum, October 2001.

**GRADUATE STUDENT SUPPORT:**

Member, Graduate Committee, Tara Blackman, M.S. Student at Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR. 2013-present.

Member, Graduate Committee and funding Colin Sowder, Ph.D. student in Statistics, University of Washington, Seattle, WA. 2011-present.

Member, Graduate Committee, Abby Tillotson, M.S. Student at School of Ocean and Fishery Sciences, University of Washington, Seattle, WA. 2011-present.

Member, Graduate Committee, Aimee Fullerton, Ph.D. student at College of the Environment, University of Washington, Seattle, WA. 2009-present.

Member, Graduate Committee, Rafaela Schinegger, Ph.D. student at Universität für Bodenkultur, Vienna, Austria, 2011-2013.

Member, Graduate Committee, Clemens Trautwein, Ph.D. student at Universität für Bodenkultur, Vienna, Austria, 2011-2013.

Graduate committee co-chair and funded Marta Danielsdottir, M.S. student, in Quantitative Ecology and Resource Management, University of Washington, Seattle, WA, 2004-2006

Member, Graduate Committee Jody Brauner, Ph.D. student in Quantitative Ecology and Resource Management, University of Washington, Seattle, WA, 1999-2005

Supported Ian Lange, graduate student in Environmental Economics, University of Washington, Seattle, WA, to work on water temperature in the Willamette River basin, 2000-2003

Supported Saang-Yoon Hyun, graduate student in Quantitative Ecology and Resource Management, University of Washington, Seattle, WA, Summer 2001.

**SELECTED TRAINING:**

Congressional Briefing Training, Governmental Affairs Institute, George Washington University, Washington DC, March 2011.

Wavelet Analysis, Short Course, University of Washington. Seattle, WA. October 2006.

Leadership Development Program, Center for Creative Leadership, San Diego CA. February 2006.