

## ALEXANDER K. FREMIER

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### EDUCATION

- 2008 JSPS Postdoctoral Fellow, Ecology, Hokkaido University, Japan – Prof. Futoshi Nakamura
- 2007 Ph.D. Ecology, University of California, Davis, CA – Profs. Steven Greco and Eric Larson
- 2003 M.A. Geography, University of California, Davis, CA – Prof. Steven Greco
- 1996 B.S. Environmental Science and Mathematics, Principia College, Elsah, IL

### RESEARCH EXPERIENCE

#### Associate Professor | Washington State University

2013 – present

Perform collaborative research and education at the interface of ecology and geomorphology

- My laboratory's research projects investigate abiotic and community drivers of species distributions, and conversely, how species alter physical process. We use an array of observational, experimental (field and lab), and modeling methods to quantify ecosystem patterns and processes.
- Teaching responsibilities include *Water in the Earth* and *Rivers: Form, Function and Management* for undergraduates, *Stream Ecology* and *Water Resources* for graduate students.

#### Assistant Professor | University of Idaho

2008 - 2013

Perform collaborative research and education at the interface of science and management

- Research as outlined above. A 45/45/10 percent appointment of research, teaching and service.
- Teaching responsibilities include *Riparian Ecology and Management* (FISH430), *Semester in the Wild* for undergraduates, *Community Ecology* (FISH520) and *Stream Ecology* (FISH 530) for graduate students

#### Postdoctoral Fellow and NSF EAPSI Fellow | Hokkaido University, Sapporo, Japan

2006, 2007– 2008

Conduct fundamental and management relevant research in an international environment

- *Large Wood in Streams*: Researched how land use and river network structure influence the export of large wood in stream corridors across a gradient of snow melt driven to tropical rivers of Japan

#### Research Scientist | University of California, Davis, CA

2000 – 2007

Perform independent and collaborative research in river-riparian systems

- *River Channel Meander Migration*: Advanced a mechanism-based meander migration model by linking it to a geographic information system (GIS) and daily historic hydrology to quantify spatial patterns of channel morphology under various management and climate scenarios
- *Vegetation Dynamics*: Researched riparian vegetation patterns using field-based observational methods and repeat aerial photography. Linked observed river meander and vegetation dynamics.

#### Contract Research Scientist | Solutions Fremier, Davis, CA

2003 – present

- *Riparian Vegetation*: Designed and implemented an object-based classification of riparian vegetation using LiDAR and hyperspectral data to identify individual trees and shrubs for monitoring
- *Rare Species*: Designed statistical models to map rare plant species for the USFS
- *Landscape Genetics*: Researched landscape effects on gene flow of a threatened salamander species using GIS, statistical and field-based methods
- *Agricultural Yield*: Analyzed spatial data of pistachio orchard yields to improve practices in floodplains

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### SYNERGISTIC ACTIVITIES

#### Social-Ecological Resilience

Resilience thinking offers an alternative way of understanding the world and managing resources. I am interested in helping to build the capacity of landscapes and communities to absorb disturbance.

- I am part of a NSF funded National Social-Environmental Synthesis Center (SESYNC) on Adaptive Governance lead by B. Cosens and L. Gunderson Integrating resilience theory and law.
- I co-lead two interactive interdisciplinary seminars focused on integrating social-ecological resilience concepts in research, natural resource management and governance.
- This work lead to two Tri-State EPSCoR funded workshops. Our workshop in 2013 spotlights Resilience in Water Governance and focuses on the Columbia River Treaty Renegotiation.
- I am an active faculty advisor of two students in the UI-lead IGERT on *Evaluating Resilience of Ecological and Social Systems in Changing Landscapes*.

#### Ecosystem Services and Resilience in Sustainable Development

An ecosystem services and resilience approach to sustainable development aims help to improve development outcomes, such as poverty alleviation, human health and ecosystem productivity.

- SNAPP: Making ecosystems count in the Sustainable Development Goals. National Center of Ecological Analysis and Synthesis, Santa Barbara, CA (Participant)
- I am a member of an international advisory group to a new CGIAR – Bioversity International program on Ecosystem Services and Resilience (ESSR).
- I am co-authoring a white paper describing the ESSR principles and framework. This work is an outgrowth of work in Costa Rica with the UI-IGERT followed by a recent CGIAR workshop.
  - Principles of ecosystem services and resilience for research in development: <http://wle.cgiar.org/blog/2012/10/11/ecosystem-services-and-resilience-ess-and-r/>
  - Don't lose sight of resilience thinking in pursuit of resilience metrics: <http://wle.cgiar.org/blogs/2014/05/02/lose-sight-resilience-thinking-pursuit-resilience-metrics/>

#### River Restoration

River restoration is an ideal interactive platform for engaging students in ecological understanding and scientific thinking through community-based actions. I continue to work with multiple state and federal agencies, as well as Native American tribes in Idaho and Washington on research related to river restoration (Coeur d'Alene, Nez Perce and Yakama Nation tribes). I mentored a Coeur d'Alene tribe member previously on an NSF REU and McNair Fellow working on river restoration of blue camas, a traditional food of local tribes.

### PUBLICATIONS

Google Scholar: Citations: 789, h-index: 17 (as of June 2017)

#### In Review

Abelleira Martínez, OJ\*, Marshall, John; Günter, Sven; Mendoza, Alberth; DeClerck, Fabrice; Bosque-Perez, Nilsa; Fremier. *In review*. Functional groups and management practices modulate trait to water use relationships in dry tropical reforestation. *Ecological Applications*. (JIF 4.3).

Buxton, TH\*, Yager, E, Buffington, J, Hassan, M, & Fremier, AK. *In review*. Grain packing resistance to particle mobility. *Geophysical Research Letters*. (JIF 3.4)

Fremier, AK, B Yanites, E Yager. *In review*. Sex that moves mountains: the influence of spawning fish on river profiles over geologic timescales. *Geomorphology*. Special Issue on Geomorphology and Resilience for the Binghamton Geomorphology Symposium 2017. (JIF 2.6)

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Wood, S, S Jones, JA Johnson, K Brauman, R Chaplin-Kramer, AK Fremier, E Girvetz, LJ Gordon, C Kappel, L Mandle, M Mulligan, P O'Farrell, WK Smith, L Willemen, W Zhang, F DeClerck. *In review*. Distilling the role of ecosystem services in the Sustainable Development Goals. *Ecosystem Services*. (JIF 4.3)

*Published*

2017

Estrada-Carmona, N\*, AK Fremier, FAJ DeClerck and EB Harper. 2017. Quantifying model uncertainty to improve watershed-scale ecosystem service quantification: a global sensitivity analysis of the RUSLE. *International Journal of Biodiversity Science, Ecosystem Services & Management*. 13:40-50

Gunderson, L., B. A. Cosens, B. C. Chaffin, C. A. (Tom) Arnold, A. K. Fremier, A. S. Garmestani, R. K. Craig, H. Gosnell, H. E. Birge, C. R. Allen, M. H. Benson, R. R. Morrison, M. C. Stone, J. A. Hamm, K. Nemec, E. Schlager, and D. Llewellyn. 2017. Regime shifts and panarchies in regional scale social-ecological water systems. *Ecology and Society* 22:art31. (JIF 3.3) SPECIAL ISSUE FROM OUR SESYNC GROUP

Kundis Craig R, AS Garmestani, CR Allen, CA Arnold, H Birgé, D DeCaro, AK Fremier, H Gosnell, E Schlager. *Accepted*. Balancing stability and flexibility in adaptive governance: An analysis of tools available in U.S. environmental law. *Ecology and Society*. (JIF 3.3) SPECIAL ISSUE FROM OUR SESYNC GROUP

Ortega-Pieck A\*, Fremier AK, C Hyuck-Orr. 2017. Agricultural influences on the magnitude of whole-stream metabolism in humid tropical headwater streams. *Hydrobiologia* 1.6 (JIF 2.1)

Smith, ME, TW Henkel, GC Williams, MC Aime, AK Fremier, R Vilgalys. *In review*. Investigating vertical niche partitioning in a tropical forest: ectomycorrhizal fungal communities in specialized rooting zones of the monodominant leguminous tree *Dicymbe corymbosa*. *New Phytologist* (JIF 7.7)

2016

Abelleira Martínez, OJ\*, AK Fremier, Z Ramos-Bendaña, SM Galbraith, S Günter, L Vierling, NA Bosque-Pérez, and JC Ordoñez. 2016. Scaling-up spatial variation in functional traits to inform ecosystem service management: assumptions and methods. *Ecology and Evolution* 6(13): 4359-4371 (JIF 2.3)

DeClerck, F., S. Jones, S. Attwood, D. Bossio, E. Girvetz, B. Chaplin-Kramer, E. Enfors, A. Fremier, L. Gordon, F. Kizito, I. Lopez Noriega, N. Matthews, M. McCartney, M. Meacham, A. Noble, M. Quintero, R. Remans, R. Soppe, L. Willemen, S. Wood, and W. Zhang. 2016. Agricultural ecosystems and their services: the vanguard of sustainability? *Current Opinion in Environ. Sustainability* 23:92-99. (JIF 4.7)

Goldberg, C S, Turner, CR, Deiner, K, Klymus, KE, Thomsen, PF, Murphy, MA, Spear, SF, McKee, A, Oyler-McCance, SJ, Cornman, RS, Laramie, MB, Mahon, AR, Lance, RF, Pilliod, DS, Strickler, KM, Waits, LP, Fremier, AK, Takahara, T, Herder, JE and Taberlet, P 2016. Critical considerations for the application of environmental DNA methods to detect aquatic species. *Methods Ecology Evol.* 7: 1299-1307

Mejia, F.H.\* C.V. Baxter, E.K. Berntsen, and A.K Fremier. 2016. [Special Issue on Resource Subsidies] Linking groundwater-surface water exchange to food production and salmonid growth. *Canadian Journal of Fisheries and Aquatic Sciences*. 73(11): 1650-1660 (JIF 2.3)

2015

Benson, M.H., Lippitt, C.D., Morrison, R., Cosens, B., Boll, J., Chaffin, B.C., Fremier, A.K., Heinse, R., Kauneckis, D., Link, T.E., Scruggs, C.E., Stone, M., Valentin, V. 2015. Five ways to support interdisciplinary work before tenure. *Journal of Environmental Studies and Science*

Buxton, T.H.\*, Buffington, J.M., Yager, E.M., Hassan, M.A., Fremier, A.K., 2015. The relative stability of salmon redds and unspawned streambeds. *Water Resources Research* 51, 6074-6092. (JIF 3.7)

Buxton, T.H.\*, Buffington, J.M., Tonina, D., Fremier, A.K., Yager, E.M., Post, J., 2015. Modeling the influence of salmon spawning on hyporheic exchange of marine-derived nutrients in gravel stream beds. *Canadian Journal of Fisheries and Aquatic Sciences* 72, 1146-1158. (JIF 2.3)

Cosens, B., A.K. Fremier, and N. Bankes. Chapter 14: The Columbia River Treaty and the dynamics of transboundary water negotiations in a changing environment: How might climate change alter the game? Invited book chapter. *Western Water Policy and Planning in a Variable and Changing Climate*. Eds. Kathleen Miller, Alan Hamlet, Douglas Kenney, Kelley Remond

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- Fremier, A.K., M. Kiparsky, S. Gmur\*, J. Aycrigg, L. Svancara, R. Kundis Craig, B. Cosens, D Goble, F. Davis and J.M. Scott. 2015. A riparian conservation network for ecological resilience. *Biological Conservation* 191: 29-37 (JIF 5.0)
- Strickler, K.M.\*, Fremier, A.K., Goldberg, C.S. 2015. Quantifying effects of UV, temperature, and pH on degradation rates of eDNA in an aquatic microcosm. *Biological Conservation* 183: 85-92 (JIF 5.0) 2014
- Bellmore, J.R., A.K. Fremier, F.H. Meija\*, and M. Newsom. 2014. A mechanism-based trophic productivity model to simulate periphyton growth. *Freshwater Biology* 59(7): 1437-1451 (JIF 3.9)
- Cosens, B. and A.K. Fremier. Assessing system resilience and ecosystem services in large river basins: a case study of the Columbia River Basin. 2014 *Natural Resources Environmental Law*. 51 *Idaho Law Review* 91.
- Fremier, A.K., Girvetz, E.H., Greco, S.E., & Larsen, E.W. 2014. Quantifying process-based mitigation strategies in historical context: separating multiple cumulative effects on river meander migration. *PLoS One*. 9(6), e99736. doi:10.1371/journal.pone.0099736 (JIF 3.7)
- Niemeyer, R.N.\*, AK Fremier, R. Heinse, W. Chávez Huamán, and FA DeClerck. 2014. Woody vegetation increases saturated hydraulic conductivity in dry tropical Nicaragua. *Vadose Zone*. 13(1) (JIF 2.1) 2013
- Hegg, JC\*\*, BP Kennedy, and AK Fremier. 2013. Predicting strontium isotope variation and fish location with bedrock geology: Understanding the effects of geologic heterogeneity. *Chemical Geology*. 360: 89-98 (JIF 3.2)
- Fremier, AK, FA DeClerck, N. Bosque-Perez, N. Estrada Carmona\*, R. Hill, T. Joyal\*, L Keesecker\*\*, PZ Klos, A Martinez-Salinas, R Niemeyer\*, A Sanfiorenzo, K Welsh\*\*, and J. D. Wulfhorst. 2013. Understanding spatiotemporal lags in ecosystem services to improve incentives. *BioScience*. 63(6):472-482 (Paper from a class co-taught at UI) (JIF: 4.4)
- Smith, M.E., T. Henkel, J. Uehling, A.K. Fremier, Clarke, and R. Vilgalys. 2013. The ectomycorrhizal fungal community in a tropical forest dominated by the neotropical dipterocarp *Pakaraimaea dipterocarpacea*. *PLoS One*. (JIF 4.4) 2012
- Viers, J.H., A.K. Fremier, R.A. Hutchinson\*, J.H. Thorne, J.A. Quinn, and M.G. Vaghti. 2012. Patterns of regional and local riparian plant diversity in the California Sacramento - San Joaquin Valley. *Restoration Ecology* 20(2):160-168. (JIF 1.7) 2011
- Fremier, A.K. and K.M. Strickler\*. 2011. Topics in river structure and function. *BioScience*. Introduction to selected paper compilation. (JIF 4.6)
- Harper, E.B.\*, J.C. Stella, and A.K. Fremier. 2011. Using ecologically meaningful sensitivity analyses to quantify complex model uncertainty: A case study of Fremont cottonwood (*Populus fremontii*) population dynamics. *Ecological Applications*. 21(4):1225-1240. (JIF 5.1)
- Smith, M. E., T. W. Henkel, M. C. Aime, A. K. Fremier, and R. Vilgalys. 2011. Ectomycorrhizal fungal diversity and community structure on three co-occurring leguminous canopy tree species in a Neotropical rainforest *New Phytologist*, 192(3), 699–712 (JIF 1.7)
- Stella, J.C., M.K. Hayden, J.J. Battles, H. Piégay, S. Dufour, A.K. Fremier. 2011. The critical role of abandoned channels in sustaining pioneer riparian forest ecosystems. *Ecosystems* 14(5) 776-790. (JIF 3.5) 2010
- Fremier, A.K., J.I. Seo, and F. Nakamura. 2010. Downstream connectivity and fluvial export of large wood: dynamic patterns and processes in the river corridor. *Geomorphology* 117:33-43. (JIF 2.9)
- Savage, W.K., A.K. Fremier, and H.B. Shaffer. 2010. Within-population processes override the signal of a landscape influence on genetic structure of the southern long-toed salamander. *Molecular Ecology*. 19: 3301-3314. (JIF 5.5) 2009

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- Fremier, A.K., and T.S. Talley. 2009. Scaling riparian conservation efforts with river hydrology: lessons from blue elderberry distributions along four central California rivers. *Wetlands* 29:150-162. (JIF 1.3)
- Smith, M.E., G.W. Douhan, A.K. Fremier, and D.M. Rizzo. 2009. Are true multihost fungi the exception or the rule? Dominant ectomycorrhizal fungi *Pinus sabiniana* differ from those on co-occurring *Quercus* species. *New Phytologist*. 128:295-299 (JIF 6.7)
- Vaghti, M.G., M. Holyoak, A. Williams, T.S. Talley, A.K. Fremier, and S.E. Greco. 2009. Understanding the ecology of blue elderberry to inform landscape restoration in semi-arid river corridors. *Environmental Management* 43: 28-43. (JIF 1.7)

### Pre-2008

- Larsen, E.W., E.H. Girvetz, and A.K. Fremier. 2007. Landscape level planning in alluvial riparian floodplain ecosystems: using geomorphic modeling to avoid conflicts between human infrastructure and habitat conservation. *Landscape and Urban Planning* 79:338-346. (JIF 2.2)
- Greco, S.E., A.K. Fremier, R.E. Plant, and E.W. Larsen. 2007. A method to track surficial patterns of floodplain chronology on a large meandering river: Analysis of land production rates and riparian vegetation distribution over land age gradients. *Landscape and Urban Planning* 81:354-373. (JIF 2.2)
- Larsen, E. W., A. K. Fremier, and E. H. Girvetz. 2006. Modeling the effects of variable annual flow on river channel meander migration patterns, Sacramento River, California, USA. *Journal of the American Water Resources Association* 42:1063-1075. (JIF 1.8)
- Larsen, E. W., A. K. Fremier, and S. E. Greco. 2006. Cumulative effective stream power and bank erosion on the Sacramento River, California, USA. *Journal of the Amer. Water Resources Association* 42:1077-1097. (JIF 1.8)
- Larsen, E.W., E.H. Girvetz, and A.K. Fremier. 2006. Assessing the effects of alternative setback channel constraint scenarios employing a river meander migration model. *Environmental Management* 37:880-897. (JIF 1.7)

### Non-refereed

- Dixon, M.D., J.C. Stromberg, J.T. Price, H. Galbraith, A.K. Fremier, and E.W. Larsen. 2007. Potential Effects of Climate Change on the Upper San Pedro Riparian Ecosystem: Boon or Bane? (Chapter 3). in J. Stromberg and B. Tellman, editors. *Riparian Area Conservation in a Semi-Arid Region: The San Pedro River Example*
- Fremier, A.K. and K.M. Strickler. 2011. Topics in River Structure and Function. *BioScience*. Introduction to paper compilation.

## TEACHING

### Washington State University

- Water and the Earth (GEO315) Spring 2014, 2016
- Rivers of Washington (ENVR-SCI275) Fall 2014 - 2017
- Stream Ecology (2015, 2017) Odd Springs (graduate course)
- River Forum (ENVR-SCI592) Fall 2014-Stream Metabolism Fall 2016-Principles in Ecology (seminar)

### University of Idaho

- Riparian Ecology and Management (FISH430) Spring 2009, 2010, 2011
- Community Ecology (FISH 520) Fall 2010, 2012
- Stream Ecology (FISH530) Fall 2009, 2011, Co-taught with Dr. Brian Kennedy
- Resilience in Changing Landscapes Seminar (FISH 501), Co-taught with Dr. Fabrice DeClerck
- Riparian Solution Seminar (FISH 504) Spring 2011, Lead to BioScience publication
- Masters in Ecology Seminar (BIOL504) Fall 2012, Co-taught with Luke Harmon